PHASE I ARCHAEOLOGICAL SURVEY FOR TH 22 BRIDGE REPLACEMENT AT COBB RIVER AND PHASE II EVALUATION OF SITE 21BE305, BLUE EARTH COUNTY, MINNESOTA

S.P. Number 0704-100
Mn/DOT Contract No. 1000510 and 1000511

MN OSA License No. 15-009

Authorized and Sponsored by:
Minnesota Department of Transportation
and the Federal Highway Administration

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February 2016

50272-101

REPORT DOCUMENTATION PAGE	1. Report No.117	2.	3. Recipients Accession No.

4. Title and Subtitle *Phase I Archaeological Survey for TH 22 Bridge Replacement at Cobb River and Phase II Evaluation of Site 21BE305, Blue Earth County, Minnesota.*	5. Report Date: February 2016 6.
7. Author(s) Frank Florin, James Lindbeck, Kent Bakken, and Michael Kolb	8. Performing Organization Report No. 117
9. Performing Organization Name and Address Florin Cultural Resource Services, LLC N12902 273rd Street Boyceville, WI 54725	10. Project/Task/Work unit No. 11. Contract (C) or Grant (G) No. (C) Mn/DOT Contract No. 1000510 and 1000511 S.P. No. 0704-100 (G)
12. Sponsoring Organization Name and Address The Minnesota Department of Transportation 395 John Ireland Blvd., Mail Stop 620 St. Paul, MN 55155	13. Type of Report and Period Covered FINAL July 2015 - February 2015 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

Florin Cultural Resource Services, LLC conducted a Phase I archaeological survey for the replacement of Bridge #5959 over the Cobb River and construction of a stormwater holding pond on a terrace of the river adjacent to the bridge. Phase II evaluation was conducted at site 21BE305, which was identified during the survey. The project area is located in T106N, R26W, Section 9, Blue Earth County. Four new sites were identified (21BE305, 21BE306, 21BE307, and 21BE308).

Site 21BE305 is a Middle and Late Archaic period temporary camp and animal butchering site that is recommended eligible for listing on the NRHP under Criterion D. Eight radiocarbon dates were obtained from animal bone at the site, and the dates range from ca. 6400 to 2500 RCYBP (7400 to 2600 cal BP), with five of the dates clustering between 4300 to 3700 RCYBP (5000 to 4000 cal BP). The current project design restricts impacts from pond construction to the eastern portion of the site where the cultural deposits are more than two meters deep and ensures that impacts from pond excavation avoid the cultural deposits. The construction limits within the site will be fenced prior to construction. MnDOT, in consultation with the Minnesota State Historic Preservation Office, has determined that the project as currently designed will have no adverse effect on the site. Geomorphological investigations were conducted at site 21BE305 by Strata Morph Geoexploration.

Site 21BE306 is a multicomponent site that includes a historic farmstead artifact scatter (ca. 1875 to 1965) and a precontact period lithic isolate. Site 21BE307 is a sparse lithic scatter, and site 21BE308 is a lithic isolate. Under Criterion D, these sites lack the potential to provide important information on the historic and precontact periods because they have sparse and limited artifact assemblages. These sites are recommended not eligible for listing on the National Register of Historic Places (NRHP). The Phase I archaeological survey and Phase II evaluation for the project is complete. It is the opinion of FCRS that no historic properties eligible for or listed on the NRHP will be adversely affected by this project.

17. Document Analysis
a. Descriptors
b. Identifiers/Open-Ended Terms
c. COSATI Field/Group

18. Availability Statement:	19. Security Class (This Report)	21. No. of Pages:
	20. Security Class (This Page)	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

MANAGEMENT SUMMARY

The Minnesota Department of Transportation (MnDOT) plans to reconstruct a 10.5-mile segment of Trunk Highway 22 (TH 22) as part of State Project 0704-100. The few areas where impacts will occur outside of the existing TH 22 right-of-way have low archaeological site potential, except for the replacement of Bridge #5959 over the Cobb River and construction of a stormwater holding pond on a terrace of the river adjacent to the bridge. Florin Cultural Resources Services, LLC was retained by MnDOT to conduct a Phase I archaeological survey for the portion of the project at the Cobb River crossing and a Phase II evaluation of site 21BE305, which was identified during the survey. MnDOT is the lead agency, and the MnDOT Cultural Resources Unit is the delegated review agent.

The project area is located in Archaeological Region 2e – Prairie Lake East in T106N, R26W, Section 9, Blue Earth County. The archaeological survey corridor along TH 22 was 336 meters (1100 feet) long, extending across the Cobb River valley. The width of the survey corridor was variable and extended up to 175 meters on the west side of TH 22 for the holding pond and 63 meters on the east side. The archaeological survey included 9.9 acres, which encompasses the temporary easements needed for construction. The landscape in the project area included the uplands adjacent to the Cobb River valley, the side slopes of the valley walls, and the river terrace.

Fieldwork was conducted from July 20 to August 28, 2015. Frank Florin was the principal investigator. The Phase I archaeological field methods included pedestrian survey, shovel tests, and deep auger tests. Close-interval tests in five-meter intervals were dug at all archaeological sites. Four new sites were identified (21BE305, 21BE306, 21BE307, and 21BE308).

Site 21BE305 is a Middle and Late Archaic period temporary camp and animal butchering site. The site is on a low terrace of the Cobb River, and a geomorphological investigation was conducted by Strata Morph Geoexploration to better understand site formation processes and stratigraphy. Phase II testing was conducted at site 21BE305 to determine if it was eligible for listing on the National Register of Historic Places (NRHP). Testing included four (1-x-1 meter) deep excavation units and close-interval deep auger tests. A total of 62 auger tests contained artifacts from between 110 and 400 cm below surface. The site has a moderate amount of animal bone and a sparse amount of lithic debris, stone tools, and fire-cracked rock. Site activities primarily included animal processing, with sparse evidence for cooking/heating and lithic reduction. No temporally diagnostic artifacts were recovered. Eight radiocarbon dates were obtained from animal bone at the site, and the dates range from ca. 6400 to 2500 RCYBP (7400 to 2600 cal BP), with five of the dates clustering between 4300 to 3700 RCYBP (5000 to 4000 cal BP). The cultural deposits are well-preserved and have integrity. The site has the potential to provide important information on the Middle and Late Archaic periods in southern Minnesota and is recommended eligible for listing on the NRHP under Criterion D. The project design was modified to avoid impacts to site 21BE305 by restricting pond construction to the eastern portion of the site where the relatively sparse cultural deposits are more than two meters deep and ensuring that impacts from pond excavation are less than 1.5 meters deep in this area to avoid cultural deposits. The construction limits within the site area will be fenced prior to construction. MnDOT, in consultation with the Minnesota State Historic Preservation Office, has determined that the project as currently designed will have no adverse effect on the site. However, if the project design changes or if other construction projects along TH 22 adversely affects the site, then a Phase III data recovery is recommended to mitigate the project's effects.

Site 21BE306 is a multicomponent site that includes a historic farmstead artifact scatter (ca. 1875 to 1965) and a precontact period lithic isolate. Historic artifacts were primarily architectural and undetermined items, with smaller amounts of household, firearms, and personal items. The site is not directly associated with historically significant persons or events, nor does it embody the distinctive farmstead characteristics of the agricultural period from the late 1800s to middle 1900s. None of the

buildings are extant. The eastern portion of the former farmstead, where the barns and outbuildings were located, is in an agricultural field, and the western portion is a lawn. No historic structures or features are visible. The research potential of the site is low because of the limited artifact assemblage and lack of features. The precontact component includes only a utilized flake. The site is recommended not eligible for listing on the NRHP because it lacks integrity and does not meet National Register Criteria A, B, C, or D.

Site 21BE307 is a sparse lithic scatter, and site 21BE308 is a lithic isolate. No diagnostic artifacts were recovered from these sites, and their cultural contexts and ages are unknown. Under Criterion D, these sites lack the potential to provide important information on the precontact period because they have sparse and limited artifact assemblages, and 21BE307 lacks integrity as a result of soil disturbance. These sites are recommended not eligible for listing on the NRHP.

The Phase I archaeological survey and Phase II evaluation for the project is complete. It is the opinion of FCRS that no historic properties eligible for or listed on the NRHP will be adversely affected by this project.

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1. PROJECT DESCRIPTION

1.1 Overview

The Minnesota Department of Transportation (MnDOT) plans to reconstruct a 10.5-mile segment of Trunk Highway 22 (TH 22) from the town of Mapleton to 0.75 mile south of the Le Sueur River as part of State Project 0704-100 (Figure 1). Most of the work will not extend beyond the existing road ditches. The few areas where impacts will occur outside of the existing TH 22 right-of-way have low archaeological site potential, except for the replacement of Bridge #5959 over the Cobb River and construction of a stormwater holding pond on a terrace of the river adjacent to the bridge.

Florin Cultural Resources Services, LLC was retained by MnDOT to conduct a Phase I archaeological survey for the portion of the project at the Cobb River crossing and a Phase II evaluation of site 21BE305, which was identified during the survey. MnDOT is the lead agency, and the MnDOT Cultural Resources Unit is the delegated review agent. Fieldwork was conducted from from July 20 to August 28, 2015. A geomorphological investigation was conducted at site 21BE305 by Strata Morph Geoexploration to better understand the formation processes and site stratigraphy (Appendix A).

1.2 Project Setting

The project is located along TH 22 in a rural area approximately 0.5 mile south of Beauford, Minnesota. The landscape in the project area included the uplands adjacent to the Cobb River valley, side slopes of valley, and the river terrace. The area is primarily woods and agricultural fields.

1.3 Project Area and Area of Potential Effect

The project area is located in T106N, R26W, Section 9, Blue Earth County (Figures 2 and 3). The archaeological survey corridor along TH 22 was 336 meters (1100 feet) long, extending across the Cobb River valley. The width of the survey corridor was variable and extended up to 175 meters on the west side of TH 22 for the holding pond and 63 meters on the east side. The Area of Potential Effect (APE) for the project is the final construction limits and extended one meter below the surface on the uplands and side slopes and three meters below the surface on the river terrace. The archaeological survey included 9.9 acres, encompassing the final construction limits and APE, and in a few locations a slightly larger area was surveyed prior to finalizing the project design. The UTM coordinates along TH 22 for the survey area are the following: E423161 N4872560 for the north end and E423161 N4872217 for the south end (1983 Datum, UTM Zone 15).

On the west side of TH 22, the survey area is bordered on the north by the Oak Hill Cemetery and on the south by an agricultural field. On the east side of TH 22, the survey area is bordered on the north by a private residence and on the south by a farmstead. Land use is mostly woods and agricultural fields, with small areas of lawn. Land ownership included state owned right-of-way and privately owned lands outside of the ROW.

1.4 Curation

Project documentation and artifacts from site 21BE305 will be curated at the Minnesota Historical Society (MHS). Artifacts from the other sites will be returned to the landowners. Copies of project documentation are on file at the FCRS office in Boyceville, Wisconsin.

1.5 Permit and License

The Phase I archaeological survey was conducted under Minnesota Office of State Archaeologist (OSA) permit 15-009. A copy of the permit is in Appendix B.

1.6 Dating Format

Dates in this report are presented in two formats: 1) by their conventional radiocarbon age (uncalibrated) and 2) as calibrated to actual calendar years. The conventional radiocarbon age (measured radiocarbon age corrected for isotopic fractionation) is presented in the format of "RCYBP" (radiocarbon years before present; with "present" by convention being AD 1950). The use of "RCYBP" dates allows for the consistent comparison of dates from sites in previous reports, as this format has been the standard. Radiocarbon dates from older reports may not have correction for isotopic fractionation, but this correction is typically small.

Dates calibrated to actual calendar years use the convention "cal BP" (for example 8000 cal BP) to distinguish them from uncalibrated dates (RCYBP).

For various technical reasons, radiocarbon years are not equal to calendar years, and therefore calibration is necessary to assess the actual age of a sample. Radiocarbon years are converted to calendar years by a process called calibration. This process is based on dating samples with a precisely known age, such as wood that can be dated to a calendar year by tree-ring counts. These dates reveal systematic variation between radiocarbon years and calendar years, and allow the statistical estimation of actual calendar age for any given radiocarbon date. Generally speaking, dates back to about 3000 RCYBP will be close to the actual calendar (calibrated) age, while beyond that the calendar age becomes progressively older than the radiocarbon age. A date of 2000 RCYBP, for example, indicates an age of close to 2,000 calendar years ago, while a date of 10,000 RCYBP indicates a calendar age (calibrated date) of closer to 12,000 years ago.

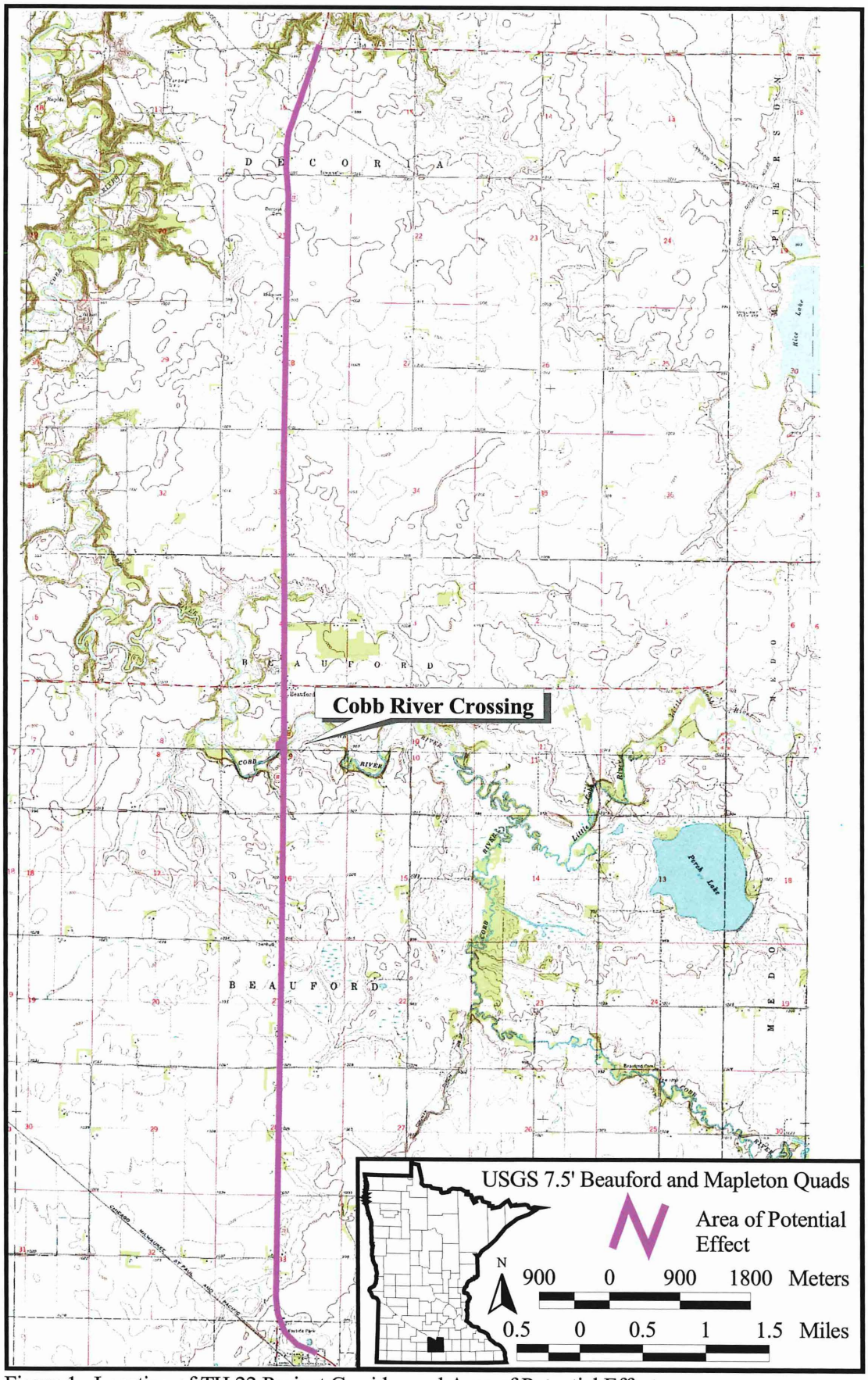


Figure 1. Location of TH 22 Project Corridor and Area of Potential Effect.

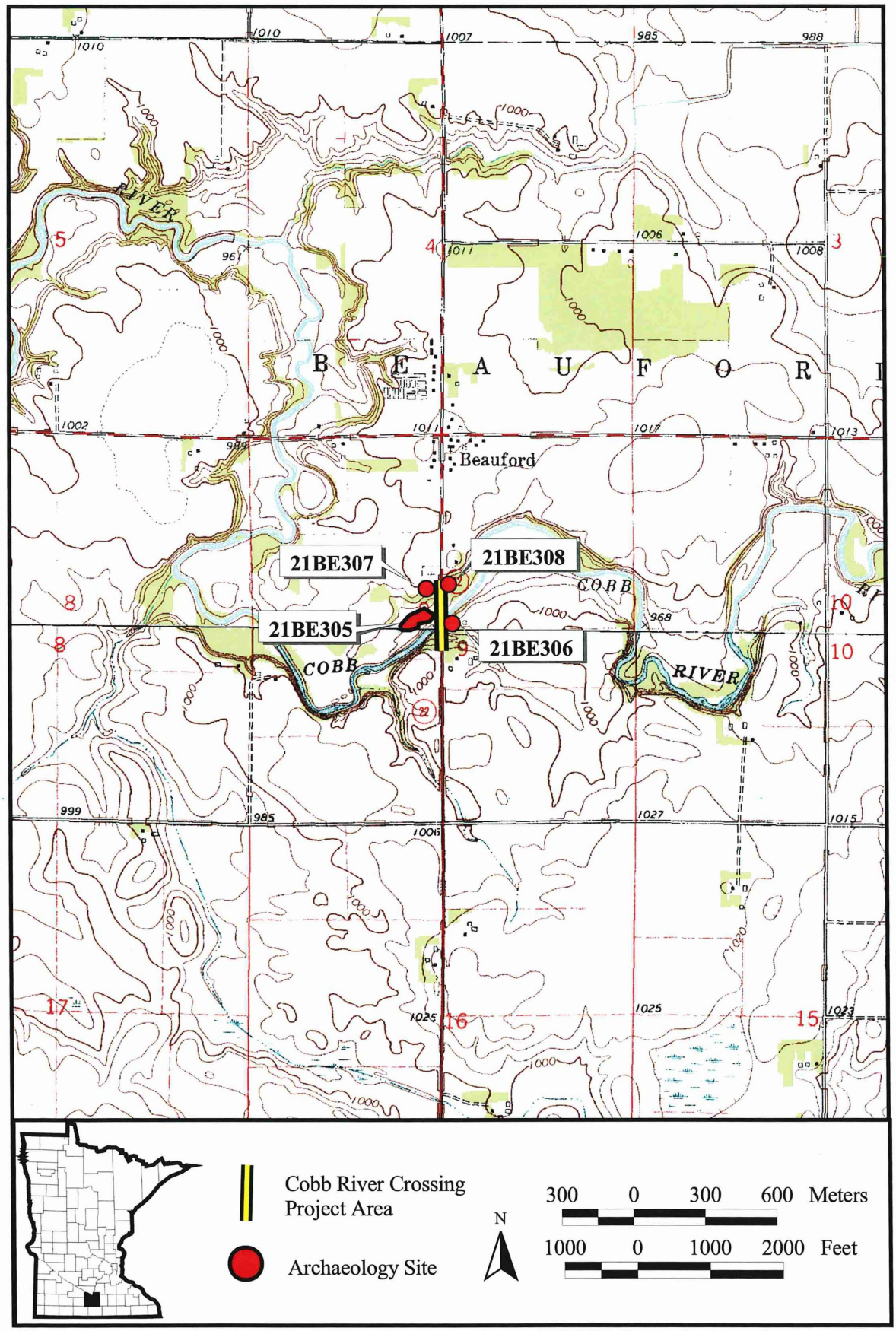


Figure 2. Location of Project Area and Archaeology Sites on USGS 7.5' Beauford Quad.

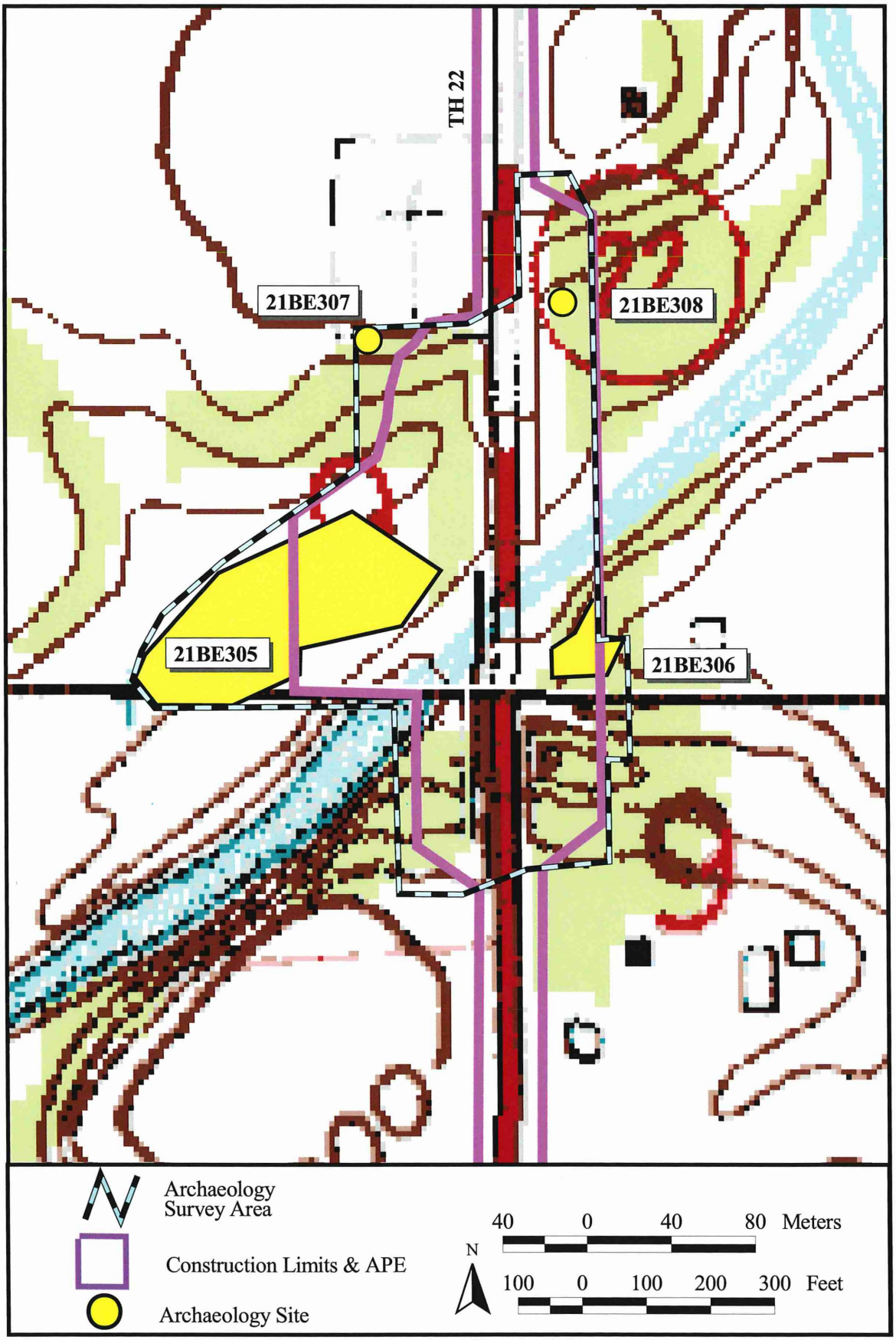


Figure 3. Location of Survey Area and Archaeology Sites on Enlarged USGS 7.5' Beauford Quadrangle.

2. RESEARCH DESIGN

2.1 Objectives

There are several objectives of the Phase I archaeological survey and Phase II site evaluation: 1) to aid project sponsors in complying with Section 106 of the National Historic Preservation Act and 36 CFR 800: Protection of Historic Properties; 2) to identify archaeological sites and assess their eligibility for listing on the National Register of Historic Places (NRHP); 3) to aid in project planning; and 4) to produce a report documenting the archaeological investigations.

2.2 Aspects of the Research Design

The research design was developed to meet project objectives, and it adhered to the research and field method guidelines established by the Minnesota State Historic Preservation Office (MnSHPO), OSA, and MnDOT. These methods, which included a literature search, fieldwork, analysis of data, and production of a technical report, are summarized below and discussed in greater detail in the following sections.

The literature search provided information on previous investigations, previously recorded sites, potential cultural resources depicted on historic maps, and the environmental setting.

Archaeological fieldwork included pedestrian survey, shovel tests, deep auger tests, excavation units (XUs), and backhoe trenching. Pedestrian survey was used to identify artifacts or archaeological remains that were present on the ground surface. Shovel tests and deep auger tests were used to identify artifacts that were present below the ground surface, characterize soils at the survey areas and archaeological sites, and provide information on the horizontal and vertical provenience of artifacts. XUs were used to recover artifacts, provide detailed information on artifact provenience and cultural stratigraphy, identify cultural features, assess site integrity, and provide exposures of soil profiles at the sites. Backhoe trenching was used to remove historic-age and culturally sterile deposits. Specific details of the field methods are presented in Section 3.

The analysis of artifacts was conducted using current methods appropriate to each artifact class. The analysis was oriented towards identifying specific attributes that would provide useful information for interpreting the function and historic context of the site. Specific analytical methods for each artifact class are discussed in detail in Section 4.

The report documents the results of research, fieldwork, and artifact analysis and provides interpretations of the data and recommendations for the sites and project.

2.3 Eligibility Criteria and Historic Contexts

Recommendations for the NRHP eligibility of sites 21BE305, 21BE306, 21BE307, and 21BE308 are based on the National Register Criteria in 36 CFR Part 60.1 guidelines established by the National Park Service (1991) and Minnesota contexts for the Archaic period, historic farm period, and lithic scatters (Anfinson 1994; Dobbs 1988; Gibbon and Anfinson 2008; Granger and Kelly 2005; Terrell 2006). Archaeological sites that retain integrity may be eligible for the National Register under the following criterion:

A. if they are associated with events that have made a significant contribution to the broad patterns of our history; or

B. if they are associated with the lives of persons significant in our past; or

C. if they embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. if they have yielded, or may be likely to yield, information important in prehistory or history.

Integrity is comprised of seven aspects that include: location, design, setting, materials, workmanship, feeling, and association. Several of these aspects must be possessed for a property to retain sufficient integrity for listing on the NRHP. The three aspects of integrity that are specifically relevant to archaeological sites are location, materials, and association. NRHP Criteria A, B, and C do not apply to the precontact sites identified for this project but were considered for historic site 21BE306. The precontact sites were evaluated for their NRHP eligibility under Criterion D.

Specific historic contexts for the precontact period in Minnesota have been developed to summarize the extent of knowledge for each context and provide a framework to aid in determining whether a site has the potential to yield information that is considered important to local and regional prehistory. These contexts propose specific research questions and themes relevant to each context. In order for the sites to be eligible for the NRHP under Criterion D, they must retain integrity and contain the potential to provide information on relevant research questions and themes that are applicable to the specific historic contexts present at the sites. These historic contexts are discussed in more detail below.

2.3.1 Archaic Contexts

Site 21BE305 yielded radiocarbon dates that place the site components in the Middle and Late Archaic periods. Historic contexts and basic research questions for the Archaic contexts have been developed and are presented together here because of the overlapping and similar research themes (Anfinson 1997; Dobbs 1988; Gibbon and Anfinson 2008). The very sparse and limited knowledge of these periods requires addressing basic research questions about this culturally and environmentally dynamic period. Based on a review of Archaic contexts, several basic research questions are proposed for the site. Site 21BE305 is likely to yield information to address the following research questions for the Late Paleoindian and Archaic periods.

Basic Research Themes and Questions

- What are the ages of the components at the site, and how do they fit within the established chronology of the region?

- What specific complexes are present at the site, and how do these complexes relate to previously defined complexes in the region?

- What are the functions of the various components at the site and what activities occurred at the site?

- What are the diagnostic artifact types (especially spear and dart points) from the components at the site, and are they similar to named types elsewhere or are there unique types in Minnesota or regional variants of named types in the state?

- What are the contents of the artifact assemblages from the components? Are specific kinds of artifacts, features, and site types associated with these assemblages?

- What were the lifeways, subsistence strategies, and settlement patterns during the Archaic period in the region? How did they change through time? To what extent were they similar or dissimilar to contemporary lifeways in adjacent areas?

- What internal developments, changes, and adaptations occurred during the Archaic period and how do these relate to environmental changes occurring at that time?

- What types of lithic technology were employed?

- What is the pattern of lithic material use and is there evidence for interaction and trade with other cultural groups from the Plains or Woodlands? How were exotic raw materials (e.g., stone) procured?

- What is the geomorphic context of the components, and what site-specific environmental changes have occurred with respect to alluviation, soil formation, and site formation processes?

2.3.2 Lithic Scatter Thematic Context

Specific historic contexts could not be defined for sites 21BE307 and 21BE308 because of the absence of diagnostic artifacts. Therefore, the sites were evaluated under the Lithic Scatter Thematic Context. In order for a lithic scatter site to be eligible for the NRHP, it must retain integrity and exhibit one or more of the following characteristics (Anfinson 1994):

- The site must have a demonstrated historic context association.
- The site must contain unusual raw materials.
- The site must be in an unusual regional location.
- The site must suggest an exceptional special use.
- The site must be of an exceptional size (greater than 100,000 square meters).
- The site must have an exceptional density of material (one artifact per square meter or more on the surface; 100 artifacts or more per square meter in formal units).

2.3.3 General Precontact Period Research Themes

General research themes related to nearly all precontact periods in Minnesota are outlined below (Arzigian 2008; Dobbs ca. 1988) and are useful for sites that lack specific historic contexts, which are not always definable from limited Phase I survey data. Sites 21BE307 and 21BE308 are included in this category. These general research themes provide a framework to aid in determining if a site has the potential to yield important historical information. They are of a general nature, given the lack of knowledge for most precontact periods throughout the state. The research themes include the following:

- Site setting, type, and function
- Chronology and temporal relationships
- Site distributions and settlement patterns
- Subsistence and seasonality
- Human ecology and environment
- Lithic raw material procurement
- Lithic technology
- Trade and regional interaction
- Site formation processes
- Internal site structure and behavior

2.3.4 Historic Contexts for Minnesota Farmsteads

A detailed overview of farmsteads is presented in *Historic Context Study of Minnesota Farmsteads, 1820-1960* (Granger and Kelly 2005), including the history of agricultural development in the state; farm types and farm practices by geographic region; the design and building of farm structures; and the variety of physical elements present on farms. The overview delineates historic periods associated with changes in agricultural practices in Minnesota and addresses major influences that led to these changes. The defined historic farm periods are:

- Period 1: Early Settlement, 1820-1870
- Period 2: Development of a Wheat Monoculture, 1860-1885
- Period 3: Diversification and the Rise of Dairying, 1875-1900
- Period 4: Industrialization and Prosperity, 1900-1920
- Period 5: Developing the Cutover, 1900-1940
- Period 6: Development of Livestock Industries, 1900-1940
- Period 7: Depression and the Interwar Period, 1920-1940
- Period 8: World War II and the Postwar Period, 1940-1960

Site 21BE306 is an historic farmstead dating to ca. 1875 to 1965, which falls within Periods 2 to 8. Specific research questions and themes have been developed for each of these periods (Terrell 2006), including general overarching research themes. Terrell (2006) also provides a comprehensive plan for appropriate research and field methods at farmstead sites, as well as guidelines for assessing site integrity and research potential.

With regard to integrity and research potential for NRHP eligibility, Terrell (2006:B.16 and 18) notes that "Farms for which no farm remnants (e.g., standing structures, foundations, or depressions) are visible are eliminated from further consideration at this step as the lack of above-ground features indicates that the subsurface integrity is likely poor and the research potential of the farmstead complex is low.... A site in which more than 75% of the farmstead area shows evidence of disturbance (grading, septic tanks and fields, new building construction; etc.)..... should be eliminated from further consideration due to its low research potential."

Site 21BE306 has no visible farm remnants, as the former farmstead is mostly in an agricultural field, with a small portion in a lawn. Therefore, 21BE306 is not eligible for the NRHP because of ground disturbances that have resulted in low integrity and low research potential. Because 21BE306 is not eligible for listing on the NRHP, specific research questions and themes relating to historic farmsteads period are not discussed.

3. ARCHAEOLOGICAL FIELD METHODS

3.1 Archaeological Field Methods

The Phase I archaeological survey and Phase II evaluation methods adhered to the MnSHPO and OSA guidelines for archaeological fieldwork. Specific field methods were discussed with MnDOT prior to conducting fieldwork. The survey design included an archaeological survey for the entire project APE.

3.1.1 Pedestrian Survey

The goal of the pedestrian survey was to identify and record archaeological sites that could be observed on the ground surface. Pedestrian survey was conducted within the entire survey area by walking transects parallel to the roadway in intervals not exceeding five meters. The pedestrian survey was a practical method for identifying certain types of potential archaeological resources such as pits, earthworks, or historical foundations. No resources were identified by pedestrian survey.

3.1.2 Shovel Tests and Deep Auger Tests

Shovel/auger testing was used to identify artifacts and features not visible on the ground surface, characterize soils at survey areas and sites, and provide information on the horizontal and vertical provenience of artifacts at the sites.

Because the survey area has high archaeological site potential, Phase I shovel testing was conducted at ten and fifteen-meter intervals in all areas without excessive ground slope. Shovel test transects were typically placed parallel to the roadway. Shovel tests in the proposed holding pond area on the low terrace were placed parallel to the Cobb River. At the archaeological sites, close-interval shovel testing was mostly conducted at five-meter intervals in cardinal directions adjacent to positive shovel tests in order to assess the extent and density of artifacts. Phase II shovel testing at 21BE305 employed a backhoe to remove the upper 80 cm of soil at most test locations so that testing could be conducted more efficiently and extend deeper.

Shovel tests were 35 to 40 cm in diameter and generally dug to 85 cmbs. A Seymour auger with a 20.3-cm (8-inch) diameter bucket was used for deep auger testing below 85 cmbs on the Cobb River terrace. Following the MnDOT protocol for deep-site testing, two deep auger tests were dug at each test location to recover a volume of soil equivalent to a standard shovel test. The goal was to auger to a depth of at least 300 cmbs on the terrace. In some areas, tests could not be augured to 300 cmbs because the water-saturated sandy soils slumped out of the auger and could not be recovered. For the sake of brevity, auger tests will be referred to as shovel tests in this report. Soil was typically dug and screened in 20 to 30 cm increments to provide vertical control of artifact provenience. All soil was screened through 1/4-inch hardware mesh. The field crew returned all excavated soil to each shovel/auger test upon completion. All shovel test locations were recorded with a GPS unit.

3.1.3 Excavation Units (XUs)

XUs were 1-x-1 meter in size. Excavation methods consisted of shovel skimming in one to two-cm increments. XUs were dug and recorded in 10-cm levels below a datum, whose relative elevation was established in cm below surface (cmbs) from the adjacent ground surface. The extent and types of soil disturbance were recorded for each level to aid in assessing site integrity.

All soil was screened through 1/4-inch hardware mesh. The units were backfilled with a backhoe after excavation was complete.

3.1.4 GPS Data Collection and Site Mapping in ArcView

GPS data was collected with a Trimble GeoExplorer 6000 for find spots, shovel tests, and XU corners. The data has a positional accuracy of 10 to 15 cm after post-processing. This data was then exported as shape files to create maps on topographic and aerial imagery.

3.1.5 Field Documentation

A record of daily activities was recorded in a log that documented fieldwork and relevant information on the survey areas and sites. Project design maps provided by MnDOT were used as a base maps for recording project information. Photographs were taken of archaeological sites, survey areas, and wall profiles of the XUs. A record of the photographs was maintained in a project photo log.

Excavation level forms were maintained for each level of an XU and were filled out after the completion of each level. These forms contained information on excavation methods, soils, artifact counts, disturbances, and other relevant observations.

A soil profile was drawn for representative shovel tests and for each positive shovel test and XU. Soil colors, textures, horizons, and disturbances were recorded on the profile. Soil colors were described using the Munsell system, and the soils were moistened prior to determining color.

4. LAB METHODS

4.1 Laboratory Methods

Artifacts were analyzed and cataloged at the FCRS laboratory in Boyceville, Wisconsin. The precontact period artifact assemblage consisted of lithic debris, stone tools, faunal remains, and fire-cracked rock (FCR). The historic artifacts included primarily architectural and undetermined items, with smaller amounts of household, firearms, and personal items.

Frank Florin was the lab supervisor, and he conducted the lithic artifact analysis. Beth Wergin was the lab technician, and she cataloged artifacts, prepared data tables, and drafted the wall profile illustrations for the report. James Lindbeck conducted background research, edited the report, and compiled the culture history. Kent Bakken conducted the lithic raw material identifications, historic artifact analysis, and farmstead research for site 21BE306. Zooarchaeologist Steven Kuehn was retained to conduct the faunal analysis.

Artifact catalog numbers are comprised of a provenience bag number and a specimen number, following the MHS system. The provenience bag number is represented in the catalog database by the column titled "Prov.", and the specimen number is represented by the column titled "Specimen #". The artifact catalogs for the sites are contained in Appendix C.

Provenience bag numbers were established by FCRS in the lab and consisted of a unique number assigned to each specific provenience by find spot (FS), shovel test (ST), or excavation unit (XU) by depth ("cmbs" for cm below surface). For example, Prov # 1 would represent Shovel Test 1 (ST 1), 0-20 cmbs, and Prov # 2 would represent ST 1, 20-40 cmbs. The specimen portion of the

artifact catalog number is a unique sequential number or number range assigned to artifacts within a specific provenience bag number. Individual artifacts were assigned a single number (e.g., 1.1), while artifacts with similar attributes and size grades were grouped together and assigned a sequential specimen number range based on their count (e.g., 1.2-10). Beginning and ending numbers in the range were recorded in one row of the database with attribute data for related artifacts.

Attribute data recorded in the catalog for each artifact, or group of artifacts, included: site number; provenience bag number; specimen number(s); provenience information; artifact class; artifact descriptions; weight (g); and size grade (in). Additional artifact information was entered in the "Notes" field of the catalog. The descriptive categories that apply to each artifact class are summarized in Table 1. Specific descriptive attributes recorded for each artifact class are discussed in detail in the following artifact sections. All data was entered in a Microsoft® Access 2010 database. Fields left blank in the database indicate that the attribute does not apply or that the attribute is absent.

Gilson standard-testing metal sieves were used for size grading. The following size grades (SG) were used to sort artifacts: $\geq$4.0 inch (SG00); <4.0 to $\geq$2 inch (SG0); <2 to $\geq$1.0 inch (SG1); <1.0 inch to $\geq$0.5 inch (SG2); <0.5 inch to $\geq$0.233 inch (SG3); and <0.233 inch (SG4). Weight was measured to the tenth of a gram with an electronic scale. Artifacts weighing less than 0.05g were given a weight of "0".

Table 1. Descriptive Categories for Artifact Classes in the Catalog.

Class	Description 1	Description 2	Description 3	Description 4	Description 5	Description 6	Description 7
Lithic	Debris	Flake type	N/A	N/A	Lithic material	Cortex amount	Heat treatment
Lithic	Tool	Tool category	Tool type	Tool flake type	Lithic material	Cortex amount	Heat treatment
Lithic	Core	Technology	Flake removals	Platform modification	Lithic material	Cortex amount	Heat treatment
Lithic	Fire-cracked rock	FCR type	N/A	N/A	Lithic material	N/A	N/A
Faunal	Class	Element/ Side	Portion	Thermal alteration	Modified	N/A	N/A
Botanical	Material	Type	Portion	N/A	N/A	N/A	N/A
Historic	Material	Type	Morphology	Condition	Decoration, Name, or Treatment	N/A	N/A

4.2 Lithic Analysis Methods

The analysis of lithics focused primarily on the identification of raw materials, lithic technologies, and specific types of flakes, tools, and cores. Information on site function, lithic economy, lithic technologies, settlement patterns, and regional interaction may be inferred from this data. Raw material, weight, size grade, and presence/absence of cortex were recorded for all lithics. Lithic debris was examined for macroscopic evidence of modification, such as use-wear or retouch. All lithics were examined using a 10x magnification hand lens, which was useful for identifying micro-flaking, lithic material, and other features not visible without the aid of magnification.

Frank Florin and Kent Bakken conducted the lithic raw material identifications. They have extensive experience in the raw materials of the region and utilized MHS sample collections as needed. Published guides to lithic resources of Wisconsin, Minnesota, and the Upper Midwest were also consulted (Bakken 1997, 2011; Gonsior 1992; Morrow 1984, 1994; Morrow and Behm 1986).

4.2.1 Thermal Alteration

Thermal alteration, commonly known as heat treatment, is the intentional alteration of a lithic material to improve its flakability. Heat treatment produces an increase in surface luster, intensifies ripple marks on flake scars, and creates reddish to orangish color in many cherts and other light-colored materials. In some materials, such as Tongue River Silica, Swan River Chert, and Prairie du Chien Chert, the effects of heat treatment are fairly well-documented and can be discerned with a good degree of accuracy. In the current analysis, materials were classified as heat treated if there was significant and noticeable reddish to orangish color and an increase in luster. If these color and texture traits were subdued, then the piece was coded as "probably heat treated". The effects of heat treatment on some materials are not well known.

In contrast to heat treatment, burning is defined by excessive heating that often compromises the stone's flakability. Traits of burning include potlid spalls, crazing, and cracks on the artifact's surface, and a notable darker color. Burning is interpreted to be unintentional, being caused either by accidental over-heating during the heat treatment process or by discard into a cooking facility.

4.2.2 The Raw Material Resource Base

The sites are located in the Hollandale Resource Region (Figure 4; Bakken 2011). While the regional resource map indicates which raw materials might be available as a local resource based on their occurrence in till, outwash, or bedrock (Table 2), it is possible to refine the picture by looking more closely at local geology. The general landscape of Blue Earth County is dominated by Des Moines lob till (Hobbs and Goebel 1982). Thus, Swan River Chert, Red River Chert, and associated South Agassiz materials would be available in the area. A recent raw material survey in Steele County, which is a short distance east of Blue Earth County, indicated that in this area, the Des Moines lobe incorporates Knife Lake Siltstone, Fat Rock Quartz, and other West Superior raw materials. Knife Lake Siltstone and Fat Rock Quartz were even found to occur as large cobbles. Therefore, West Superior raw materials could also have been derived from local sources near the project area. A more important raw material source, however, appears to be the concentrations of Prairie du Chien Chert in the valley of the Minnesota River and some of its tributaries. Although they are not yet well documented, abundant sources of Prairie du Chien Chert are reported, mostly in residual deposits near the Mankato area (Jason Reichel, personal communication 2014). In addition, it seems likely that Prairie du Chien Chert would be redistributed in glacial sediment to the south of the river valley. This picture suggests a very diverse raw material resource base near the project area. It seems that most of the raw materials available in the northern two-thirds of Minnesota could potentially be found in local sources and that only the materials with sources south of the site or outside the greater region would be nonlocal. Naturally occurring lignite (coal) occurs in the area, and it was infrequently observed in soils at site 21BE305 (Thorleifson et al. 2007:Appendix; Field and lithologic data; maps: Lignite).

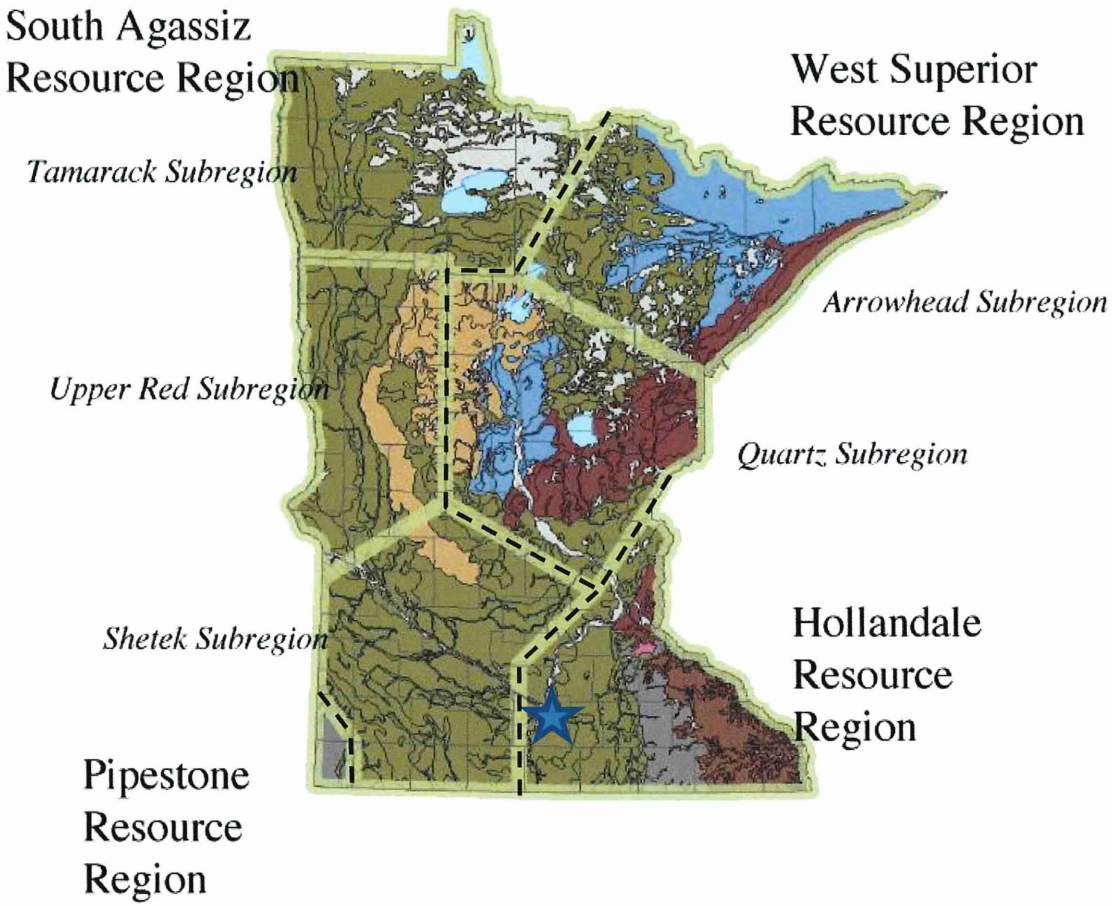


Figure 4. Lithic Resource Regions of Minnesota (adapted from Bakken 2011).

Table 2. Estimated Primary, Secondary, and Minor Lithic Raw Material Status by Region and Subregion (Bakken 2011).

Regions	Primary Raw Materials	Secondary Raw Materials	Minor Raw Materials	Main Exotic Raw Materials
South Agassiz Resource Region				
Tamarack Subregion	Swan River Chert Red River Chert	Border Lakes Greenstone Group	Quartz Tongue River Silica Western River Gravels Group ?	Knife River Flint
Upper Red Subregion	Swan River Chert	Red River Chert Tongue River Silica Quartz	Border Lakes Greenstone Group Western River Gravels Group Knife River Flint	Knife River Flint
Shetek Subregion	Swan River Chert	Tongue River Silica Red River Chert Quartz	Border Lakes Greenstone Group Western River Gravels Group Knife River Flint Fat Rock Quartz Other West Superior materials	Knife River Flint Burlington Chert
West Superior Resource Region				
Arrowhead Subregion	Gunflint Silica Knife Lake Siltstone	Quartz Hudson Bay Lowland Chert Jasper Taconite	Border Lakes Greenstone Group	Knife River Flint
Quartz Subregion	Knife Lake Siltstone Tongue River Silica Quartz *(Fat Rock and other)*	Swan River Chert	Lake of the Woods Rhyolite Biwabik Silica Gunflint Silica Jasper Taconite Kakabeka Chert Hudson Bay Lowland Chert Lake Superior Agate	Knife River Flint Hixton Group Burlington Chert
Pipestone Resource Region				
	Tongue River Silica Gulseth Silica ?	Sioux Quartzite Swan River Chert ? Red River Chert ?	Quartz	Knife River Flint
Hollandale Resource Region				
	Cedar Valley Chert Galena Chert Grand Meadow Chert Prairie du Chien Chert	Shell Rock Chert ?	Quartz Tongue River Silica Swan River Chert Red River Chert	Hixton Group

4.2.3 Lithic Debris

Lithic debris includes flakes, flake fragments, and pieces of shatter that were produced from cobble testing, core reduction, stone tool manufacturing, and stone tool maintenance. The analytical methods used in this report are based on the results of previous lithic studies and experimental replications (Bradbury and Carr 1995; Callahan 1979; Cotterell and Kamminga 1987; Flenniken 1981; Hayden and Hutchings 1989; Inizan et al. 1999; Magne 1985, 1989; Odell

1989; Root 1992, 1997, 2004; Tomka 1989; Yerkes and Kardulias 1993). These studies indicate that lithic-reduction stages and technologies can be inferred from diagnostic flake attributes.

The most promising results are derived from studies that consider a combination of several flake attributes from a large sample of lithic debris. The work of Mathew Root (2004) provides the basis for much of the current analysis because of his extensive lithic replicative studies and their relevance to the current project with regards to cultural context, regional location, comparable raw materials, and lithic technologies. The basis of this analytical framework has been used for several large data recovery projects in North Dakota, including Lake Ilo 32DU955A (Ahler et al. 1994), 32RI785 (Root 2001), and Beacon Island 32MN234 (Mitchell and Johnston 2012). Root's methodology and results are supported by the lithic studies referenced above, which tend to focus on more specific aspects of technology and flake attributes. Similar technological approaches based on flake attributes from replicative studies have been developed in other lithic studies (Callahan 1979; Ozbun 1987; Fleniken 1981; Flenniken et al. 1990; Magne 1985). While Root's work is primarily oriented to bifacial technologies of Knife River Flint, other studies consulted for this analysis provided information on bipolar and nonbifacial technologies.

The lithic analysis assessed multiple flake attributes that were identified as technologically diagnostic in numerous studies. These attributes define the specific flake types used in this study, which are summarized and described in Table 3. The lithic analysis was accomplished by 1) identifying specific flake attributes; 2) comparing the attributes with those defined for specific flake types; and 3) making a determination as to flake type. The lithic analyst, Frank Florin, has moderate experience in lithic replication and has a comparative collection of flake types comparable to the ones used in this study.

Flake attributes examined in this analysis include the following morphological and technological characteristics: presence/absence of cortex; presence/absence of percussion bulb; presence/absence of bulbar scar; extent of platform modifications and preparations (grinding, battering, and faceting); platform size; platform angle; number of dorsal flake scars; flake morphology; flake thickness; and size grade. These attributes have been determined to be diagnostic of specific lithic-reduction technologies and stages.

Decortication flakes are indicative of cobble testing and early-stage core reduction, and in this study are linked to nonbifacial technology. Bifacial technology is indicated by bifacial thinning flakes and shaping flakes, alternate flakes, bifacial cores, and bifacial tools. Bipolar flakes and bipolar cores are indicative of bipolar reduction. Nonbifacial technology is indicated by nonbifacial flakes, decortication flakes, tools made on nonbifacial flakes, and nonbifacial cores.

Shatter is most strongly associated with cobble testing, core reduction, and the earlier stages of reduction. Types of lithic debris that are not indicative of specific technologies or reduction-stages include "other size-grade 4" (other SG4) flakes, broken flakes, and unidentified flakes. Some materials, like quartz, which do not have conchoidal fracture properties, are likely to result in greater amounts of nondiagnostic flake types than other materials.

Table 3. Definitions of Technological Flake Types (primarily adapted from Root 2004).

Technological Flake Type	Definition
Decortication Flakes	Decortication flakes have most (>50%) of their dorsal surface covered with cortex. They are associated with raw material testing and the early stages of core and tool reduction (Root 2004). These flakes have a large striking platform and a bulb and bulb scars that are nearly always quite pronounced as a result of direct percussion with a hard hammer (Inizan et al. 1999). Other traits of these flakes include: a large flake platform angle (60-90 degree range); whole flakes are typically are SG1 or SG2; typically two or less flake scars on the dorsal surface; and a relatively thick cross-section.
Shatter	Shatter includes angular, cubical, and irregularly shaped chunks that lack the following: bulbs of force, systematic alignment of fracture scars on faces, striking platforms, and points of flake initiation. Interior (ventral) and exterior (dorsal) surfaces and proximal and distal ends cannot be determined on these pieces (Root 2004). Shatter may be the result of poor-quality stone with fractures along bedding planes or other material flaws. Shatter is created by most production technologies but is most strongly associated with cobble testing, core reduction, and earlier stages of reduction.
Alternate Flakes	Alternate flakes are produced when beveled edges are created from: 1) squared-off or thick edges, such as those on tabular cobbles; 2) the thick margins of flake blanks (especially at the proximal end); 3) margins with stacked-step terminations; and 4) broken flakes or bifaces. The result is the creation of a bifacial (beveled) edge that prepares it for bifacial thinning or shaping by producing edge angles appropriate for use as platforms (Flenniken et al. 1990; Root 2004). They are thick in relation to their length and width, are triangular in cross section, have a squared edge (often cortical) adjacent to the platform (this is part of the squared edge of the object piece), have single-faceted platforms, and have a skewed orientation in relation to the axis of percussion.
Bifacial Thinning Flakes – (early to middle-stage)	These flakes are strongly associated with percussion bifacial thinning (Root 2004). Bifacial thinning flakes without platforms exhibit the following attributes: 1) thin curved long sections; 2) extremely acute lateral and distal edge angles; 3) at least three dorsal flake scars (usually more) that originate from different directions, especially other than the flake itself; 4) 20% or less cortex; and 5) an expanding shape in planview. Flakes with platforms exhibit attributes 1-5 along with 6) a bending initiation and 7) a narrow and faceted striking platform without cortex. Proximal flake fragments that consist mainly of a platform are classified as bifacial thinning flakes if they have the above attributes. Flakes with platforms often have a lip at the intersection of the striking platform and the flake ventral surface (caused by a bending flake initiation), and flakes with distal ends usually have feathered terminations. Soft-hammer percussion with a billet is typically used in the removal of these flakes. The flaking angle is acute, the bulb is diffuse, and there is often abrasion on the overhang (platform) (Inizan et al. 1999).
Bipolar Flakes	These exhibit the following attributes: 1) shattered or pointed platforms with little or no surface area; 2) wedging flake initiations; 3) evidence that force has been applied to both ends of the flake, such as crushing on opposite ends; 4) no bulbs of force (due to wedging initiations); 5) pronounced compression rings from compression-controlled flake propagation; and 6) a generally parallel-sided plan form (Root 2004; see also Flenniken 1981). Flakes classified as bipolar must exhibit most but not all of these attributes. Bipolar flakes do not exhibit positive bulbs of force on opposite ends of the same flake interior surface.

Table 3. Continued.

Technological Flake Type	Definition
Bifacial Shaping Flakes by pressure or percussion – (late-stage)	These flakes are usually small, less than < 1/4 inch (SG4), but can be larger (Root 2004). Only flakes SG3 or smaller are classified as bifacial pressure flakes. These are relatively thin with multifaceted and ground platforms. Flakes must retain a platform to be placed in this class. Flakes produced early in the pressure flaking process have multiple scars on their dorsal surfaces and are curved in long section and slightly expanding, or petaloid, in planview. Flakes produced during final bifacial pressure flaking have parallel sides and a single dorsal arris that runs from platform to distal tip. These flakes are generally produced during bifacial pressure flaking. Occasionally, small flakes produced by late-stage percussion bifacial shaping possess the defining attributes of pressure flakes. Whether produced by pressure or percussion, these flakes are associated with final bifacial shaping (stage 5 as defined by Callahan [1979]) and bifacial tool maintenance.
Edge Preparation Flakes	A flake removed from the edge of a flake blank or core to change the angle of the edge to facilitate flaking in order to prepare the blank or core for further reduction (Flenniken et al. 1990). Bifacial edge preparation flakes usually have thick and wide platforms and are short in length.
Nonbifacial Flakes	Nonbifacial flakes are size-grade SG1 to SG3 and do not have the defining attributes of bifacial or decortication flakes. Diagnostic traits include 1) simple platforms with minimal platform modifications (often with no facets but up to one or two facets); 2) large platform angles (60-90 degree range); 3) generally less than three dorsal flakes scars that are likely to be unpatterned; and 4) may have bulbar scar on ventral side (Andrefsky 2005; Magne 1985, 1989; Odell 1989, 2003:126; Tomka 1989; Yohe 1998). Platform areas may be partially or wholly obliterated from hard hammer percussion. This flake type is comparable to Root's (2004) "simple flakes". In general, these flakes have relatively thick cross sections, steep lateral edge angles, and straight or slightly curving profiles. The amount of dorsal surface cortex typically ranges from 0 to 50%. This class contains conchoidal flakes that have a bulb of percussion and bending flakes. Included in this type are flakes classified as "interior flakes", which are removed from the interior of the core or cobble, with no cortex on their surface (Fleniken et al. 1990; and Yerkes and Kardulias 1993). While these flakes are produced in biface reduction, particularly the earliest stages, they are most strongly associated with cobble testing, unprepared nonbifacial cores for flake blank production, and the early stages of nonbifacial tool reduction.
Blade Flakes	These are specialized flakes defined by the presence of 1) parallel or subparallel lateral margins; 2) dorsal flake ridges that are parallel or subparallel with the lateral margins; 3) at least two flake-removal scars evident on the dorsal surface; 4) an axis of applied force that is approximately parallel with flake's margins; 5) a length-to-width ratio of at least 2:1; and 6) plano-convex ,triangular, rectangular, or trapezoidal cross sections (Crabtree 1972:42-43; Root 2004; Whittaker 1994:33).
Potlid Flakes	A flake expelled from the surface of a lithic artifact by heat-induced differential expansion when overheated in a fire, as opposed removal by the flintknapping process (Flenniken et al. 1990). The flake has a flat dorsal surface and a convex ventral surface and is shaped somewhat like the inverted lid of a pot.
Unidentified Flakes	These flakes do not fit any of the previously described types.

Table 3. Continued.

Technological Flake Type	Definition
Other Size-Grade 4 (SG4) Flakes	Other size-grade 4 (SG4) flakes (< 1/4 inch in size) are either too small to be reliably identified using the diagnostic attributes of the other defined flake types or they simply lack diagnostic attributes (Root 2004). These are produced in all reduction technologies, including cobble testing. These flakes are likely to be underrepresented in lithic assemblages because their small size makes them less likely to be recovered.
Broken Flakes	Broken flakes are flake fragments that lack a bulb of percussion, platform, or other diagnostic features that would enable a determination of flake type. Such flakes are typically distal or medial flake fragments. Broken flakes occur in all technologies and are produced during all stages of lithic reduction.

Aggregate analysis based on size grades (e.g., mass analysis) was deemed not useful for determining lithic technology and reduction stages because soils were screened through 1/4-inch mesh, and therefore SG4 artifacts were typically not recovered. In addition, aggregate analysis draws its inferences from experimental replicative data sets that do not exist for the raw materials at the sites identified in the project area. There are other weaknesses of this method related to the accuracy of separating mixed reduction stages and mixed technologies (Andrefsky 2001:5). The recovery of SG4 debris and large samples is imperative for conducting mass analysis (Ahler 1989).

4.2.4 Lithic Tools

Overview

Stone tools were vital to prehistoric lifeways, and they were used for a variety of tasks: cutting, sawing, scraping, boring or drilling, graving, whittling or slicing, perforating, chopping, pounding, and abrading.

Tool categories were defined by technological attributes (bifacial, unifacial, or pecked/groundstone) and by whether the tool was patterned or unpatterned. Patterned or formal tools include types in which the original shape of the flake blank or raw material has been substantially modified through a systematic sequence of reduction or retouch to produce a specific form that exceeds minimal functional requirements. In patterned tools, the shape of the tool reflects a distinctive style or cultural template. Projectile points, end scrapers, and bifaces are examples of patterned tools. Unpatterned or informal tools include types that were not substantially modified and still largely reflect the original shape of the flake blank or raw material. They lack the complex manufacturing methods of patterned tools and reflect an expedient technology. Flaking is typically restricted to the margin of the artifact. Utilized flakes and retouched flakes are examples of unpatterned tools.

Tool types and their inferred functions (e.g., projectile points, scrapers, cutting tools, etc.) were defined by technological attributes in conjunction with morphological attributes (form), general edge angle, size, and results from micro-wear studies that provide supporting evidence for general tool function (Root 2001; Kooyman 2000:164; Vaughan 1985; Yerkes 1987).

The use-life of a tool is an assessment of its estimated stage of manufacture and reason for discard. Use-life categories include the following: 1) unfinished tools that were not broken; 2) tools that are finished and in working condition; and 3) broken or worn out tools. This information was entered in the "notes" column of the catalog.

Numerous studies indicate that microwear analysis, which uses high-powered magnification to examine the edge of a tool in an attempt to identify the type of material that was worked by the tool and the type of motion with which the tool was used, is necessary to determine a tool's specific function (Keeley 1980; Odell 2003; Semenov 1976; Vaughan 1985; Yerkes 1987). Microwear studies clearly indicate that there can be a low correlation between tool form and specific function, as tools from different form classes were used for the same task, and a single tool form was often used for multiple functions (Yerkes 1987:128). These studies reveal that there is much more functional variation than is typically assumed from the traditional form-based tool classification.

Microwear studies also indicate that there is some viability to inferring general tool function from the form-based classification, especially for certain tool types. For example, scrapers defined morphologically by a steep working edge often correlate with micro-wear studies that show tools with steep working edges were used for scraping bone, wood, and hide (Kooyman 2000:164; Root 2001; Vaughan 1985; Yerkes 1987).

Of course, without microscopic examination of the edge wear, there is no way to tell what material was scraped. Also, microwear analysis often reveals greater functional variation than can be inferred from typological and technological classification alone (Odell 1996; Vaughan 1985). For example, some "scrapers" were also used for tasks such as cutting, engraving, wedging, shaving, chopping, and shredding. In some cases "scrapers" bear no evidence of use as scrapers. Many projectile points were also used for cutting, shaving, engraving, scraping, and drilling. Other bifacial tools were used to saw bone, antler, or wood as often as they were used for cutting meat (Yerkes 1987:186).

Thin, sharp-edged flake and blade tools (such as utilized and retouched flakes) generally correlate with microwear studies confirming their use as cutting implements (Kooyman 2000:164; Odell 1996; Root 2001; Yerkes 1987). Again, the specific material worked or specific use cannot be determined without microscopic examination of wear patterns. Some studies that tested the accuracy of identifying utilized flakes without magnification indicated a low success rate, as the multiple processes (besides use as a tool) that can produce edge wear are not discernible without microscopic analysis (Young and Bamfrorth 1990; Shen 1999). These processes include wear caused by flake production, artifact trampling, excavation damage, and artifact movement in the soil. The studies show two primary causes of incorrect identification. First, utilized flakes that exhibit no macroscopic wear go unrecognized as tools. Second, usewear is incorrectly attributed to use as a tool when it is actually created by some other cause.

Despite the benefits of microwear analysis, there are several limitations that hinder its usefulness and practicality. The time and money needed for such analysis is often not available in contract work, few individuals have the necessary training and expertise, and microscopic equipment is not available in most labs. Further, experimental studies have not been conducted on many of the lithic materials that occur in the artifact assemblages in Minnesota. It has also been found that microwear analysis does not necessarily produce conclusive results. Blind tests revealed the accuracy of tool function to be 76 percent for high-power technique and 68 percent for the low-power technique (Yerkes 1987:115). The accuracy of identifying the material worked was 62 percent for high-power technique and 32 percent for low-power technique. Finally, micro-wear analysis may not clearly identify functions of a single tool edge that was used for different tasks, nor may it identify the function use of a tool used for a short time or on very soft materials that do not cause observable wear.

Stone Tool Techno-Morphological Categories and Descriptions

Tool types recovered from sites in the project area are discussed below.

Utilized flakes are unpatterned flake tools that exhibit minimal modification. Utilized flakes have a series of micro-flakes (use-wear) along the working edge that are assumed to have been removed through use of the flake as a tool. The micro-flakes are primarily distinguished from pressure flakes by their smaller size. Utilized flakes were not intentionally modified by pressure flaking. Use-wear and experimental studies indicate that these are typically light-duty cutting, slicing, scraping, and sawing tools that were used on soft materials (meat, hides, and plant material) or moderately resistant materials (wood and bone). These tools suggest that the following activities may have occurred at the site: butchering, animal/plant processing, hide working, and bone and woodworking.

Scrapers are patterned flake tools that have been pressure flaked along a distal or lateral end to form a steeply beveled (wide-angled) edge. End scrapers have a distal working edge that is generally shorter or the same length as the lateral side and may have been hafted. Side scrapers have the working edge along the longest side of a flake and were likely not hafted. Scrapers are typically associated with scraping tasks on a variety of soft materials (meat, hides, and plant material) or moderately resistant materials (wood and bone).

4.3 Faunal Analysis

The analysis was conducted by zooarchaeologist Steven Kuehn. After separation by provenience, the following information was recorded for each specimen: element, side of the body (when applicable), section or portion of the element, weight in grams, and taxonomic classification. Relative age (e.g., adult or juvenile/sub-adult) was recorded when it could be reliably determined, based on the degree of epiphyseal fusion, tooth eruption, and occlusal wear. Refitting of bone fragments was restricted to specimens recovered from within the same shovel test or XU. Each specimen was examined for exposure to heat in the form of burned, charred, and calcined bone. Evidence of butchering (e.g., cut and chop marks, fractures) was recorded when observed. Bone tools and worked bone fragments are described in detail separately. Modifications resulting from taphonomic agents (e.g., carnivore and rodent gnawing, water abrasion, weathering, trampling) were noted and are described separately in this report.

Due to specimen fragmentation, otherwise unidentifiable pieces of mammal and bird bone are categorized as large-sized, medium-sized, or small-sized based on the relative size and thickness of each specimen. The approximate live weight of large-sized mammals is considered to be greater than 50 lbs (23 kg), 11 to 50 lbs (5 to 23 kg) for medium-sized mammals, and less than 10 lbs for small-sized mammals. Indeterminate bird remains were treated in a similar fashion, divided into large-sized (e.g., turkey, Canada goose, or larger), medium-sized (e.g., large duck, cormorant), and small-sized (e.g., teal-sized duck or smaller). When it was not possible to reliably categorize a specimen based on size, it is listed simply as mammal or bird of indeterminate size. Minimum number of individuals per taxon (MNI) determinations are based on comparison of repeating or multiple elements, relative age, and overall size, and calculated for the assemblage as a whole. In general, MNI estimates are made only for specimens minimally identifiable to the genus or species level (following Reitz and Wing 1999:198-199). An osteological comparative collection facilitated specimen identification.

4.4 FCR

Several criteria were established to provide a consistent method of identifying FCR. In order for a rock to be classified as fire-cracked, it must meet at least one of the following criteria: 1) the rock is associated with a fire hearth; or 2) the rock has angular fractures, spall fractures, or is excessively friable. The lack of cobble-size rocks in the site soils facilitated FCR identification.

4.5 Historical Artifacts

The analysis of historic artifacts was conducted using specific manuals designed to aid in interpreting and dating historical materials (Peterson 1995; University of Utah et al. 1992). These manuals were used to establish date ranges for specific artifact types and aid in site interpretation. Historic artifact classes at site 21BE306 included architectural, household, personal, and firearms. The following attributes were recorded in the catalog for each artifact when applicable: functional class, material, type, portion, morphology, condition, and decoration or type of surface treatment.

5. LITERATURE SEARCH

5.1 Archival and Background Research

FCRS staff conducted archival research prior to fieldwork to determine whether any previously recorded archaeological sites were located within one mile of the project area. This research included a review of MnSHPO site inventory files and USGS 7.5' quadrangle site location maps. Mr. Tom Cinadr, Survey and Information Management Coordinator at MnSHPO, also conducted a search of the site file database. There were no previously recorded sites within one mile of the project area. Additional research was conducted following fieldwork to identify archaeological sites within a radius of approximately eight miles of the project area to provide a better context for site 21BE305, which was evaluated for the current project.

5.2 Previously Recorded Archaeological Sites

There are no previously recorded archaeological sites within a one-mile radius of the project area. The radius of previously recorded sites was expanded to approximately eight miles because so few sites are located within several miles of the project area. Within an eight mile radius, there are 15 previously recorded archaeological sites and the reported locations of two historical mills. The precontact period sites, which are summarized in Table 4, include lithic and artifact scatters. All but three of the sites are located adjacent to or overlooking rivers, while the others (21BE145, 21BE280, and 21BE281) overlook lakes. Nearly all precontact sites were located in agricultural fields and identified during pedestrian survey. Three sites contained faunal material, including a bison tooth fragment at 21BE50. None of the sites was evaluated subsequent to Phase I identification. Notable information gleaned from the review was the prevalence of "chert" artifacts, often without a specific identification. Prairie du Chien and Grand Meadow cherts were noted at a few sites, and other less common chert types included Swan River, Galena, Burlington, Cedar Valley, and Red River cherts. Other raw materials mentioned at the sites include Tongue River Silica, quartzite, siltstone, rhyolite, quartz, silicified wood, and White River Silicate.

Table 4. Previously Recorded Sites within Approximately Eight Miles of the Project Area.

Site Number	Location	Site Type	Comments	Distance to Project Area	Reference
21BE30	T107N, R26W, Sec 9; NW ¼, SE ¼	Lithic Scatter	Side-notched projectile point, preform, and lithic debris	6.5 miles	MnSHPO site files
21BE49	T107N, R27W, Sec 23; NE ½, NE ¼, SE ¼ and S ½, SE ¼, NE ¼	Artifact Scatter	Lithic quarry or workshop on a ridge top along Maple River. Eight probable cores, a hammerstone, 134 lithic debris, five utilized flakes, and one bone	5.5 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980
21BE50	T107N, R27W, Sec 23; NW ¼, SW ¼, NE ¼, NE ¼	Artifact Scatter	12 lithic debris and a bison tooth from a shovel test on a ridge top above a tributary of the Maple River	5.6 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980
21BE51	T107N, R27W, Sec 24; NW ¼, SW ¼, NW ¼	Lithic Scatter	11 lithic debris and one core from a hilltop overlooking the Maple River	5.7 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980

Table 4. Continued.

Site Number	Location	Site Type	Comments	Distance to Project Area	Reference
21BE54	T107N, R27W, Sec 11; N ½, NE ¼, NW ¼ and Sec 2; S ½	Artifact Scatter	Landowner collection of lithic debris, projectile points, cores, and knives. Field crew observed lithic debris near a meander scar of the Le Sueur River	7.5 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980
21BE55	T107N, R27W, Sec 12; SE ¼, NW ¼, SE ¼	Lithic Scatter	19 lithic debris and two possible cores from a field on a terrace near the confluence of the Le Sueur and Maple Rivers	6.25 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980
21BE56	T107N, R27W, Sec 12; SW ¼, NE ¼, NW ¼	Lithic Scatter	69 lithic debris, three possible chert cores, and one chert knife from a field on a terrace near the confluence of the Le Sueur and Maple rivers	6.4 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980
21BE57	T107N, R27W, Sec 12; NW ¼, NW ¼, NW ¼, SE ¼	Lithic Scatter	Small area of 18 lithic debris, two possible cores, and one utilized flake from a field on a terrace of the Maple River	6.5 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980
21BE145	T107N, R25W, Sec 19; NE ¼, NE ¼, SW ¼ and NW ¼, NE ¼, SW ¼	Lithic Scatter	Lithic debris collected by landowners in a field that overlooks Rice Lake	5.3 miles	Minnesota Statewide Archaeological Survey Summary: 1977-1980
21BE194	T107N, R27W, Sec 32; SE ¼, NW ¼, NE ¼, NE ¼	Lithic Scatter	6 lithic debris recovered from a field on a terrace of a small tributary of the Blue Earth River.	8.0 miles	MnSHPO site files
21BE195	T107N, R27W, Sec 32; SE ¼, NW ¼, NE ¼	Lithic Scatter	Lithic debris ("probably hundreds") and a Preston-like corner-notched point on a terrace of the Blue Earth River	8.1 miles	MnSHPO site files
21BE280	T107N, R25W, Sec 30; NE ¼, NW ¼	Lithic Scatter	8 lithic debris from a test at the outlet of Rice Lake	5.1 miles	Magner, et al. 2007
21BE281	T107N, R25W, Sec 19; SE ¼, SW ¼	Artifact Scatter	14 lithic debris and two pieces of FCR from shovel tests on a knoll adjacent to Rice Lake	5.25 miles	Magner, et al. 2007
21BE295	T106N, R26W, Sec 13; NW ¼, NW ¼, NW ¼, NW ¼	Artifact Scatter	23 lithic debris, four cores, two utilized flakes, two FCR, a triangular point, and a large mammal femur from a hill above Little Cobb River	2.5 miles	Magner and Allen 2010
21BE296	T106N, R26W, Sec 13; N ½, NE ¼, NW ¼	Lithic Scatter	48 lithic debris, three utilized flakes, and one biface fragment from a hilltop above the Little Cobb River and Perch Lake	2.75 miles	Magner and Allen 2010
21BEz	T107N, R27W, Sec 35; SE ¼, SE ¼, SW ¼	Historic sawmill/ grist mill	Saw/grist mill on the Maple River that operated from ca. 1866 to ca. 1880	4.5 miles	MnSHPO site files
21BEag	T106N, R 26W, Sec 4; NW ¼	Historic sawmill	Sawmill dating to 1868	1.35 miles	MnSHPO site files

5.3 Previous Archaeological Surveys

T.H. Lewis conducted the first archaeological survey in Blue Earth County during the late 1800s for the Northwestern Archaeological Survey (NWAS). N.H. Winchell subsequently compiled and published the original survey notes and maps from the NWAS survey. Several mound groups were documented in Blue Earth County, mostly on bluffs above the Minnesota River. One group was recorded on the bluffs above the Blue Earth River a few miles south of Mankato (Winchell 1911). None of the mound groups documented by Lewis is located near the project area.

Many of the sites recorded within a few miles of the project area were documented by the Minnesota Statewide Archaeological Survey (MnSAS). The MnSAS was a large-scale project funded by the Minnesota Legislature and carried out by the Minnesota Historical Society during 1977-1980. The project was designed to collate information on previously-recorded sites and conduct additional surveys on significant sites. This data was then used to help formulate predictive models of site distribution, to be integrated into the Minnesota Land Management Information System with a goal of streamlining the process of project planning and environmental permitting. Blue Earth County had been surveyed by the completion of the MnSAS project.

The MnSAS sampling strategy relied on the understanding that most significant archaeological sites are (or were) located close to water, and therefore an emphasis was placed on surveying locations adjacent to water such as stream and river confluences, lakeshores, islands, and wetlands. The survey relied on pedestrian walkover at a standard interval of 50 meters; although the archaeologists were expected to diverge from strict adherence to these transects by inspecting promising landscape formations along the way. Gibbon et al. (in Hudak et al. 2002, Chapter 5.4) summarize the conclusions of the MnSAS:

> Five conclusions emerged from the analysis. They were: (1) Throughout nearly all of the surveyed portions of Minnesota, prehistoric sites were found most frequently on land adjacent to shorelines; (2) In areas where lakes are present, prehistoric archaeological sites usually occur with greater density on lakeshores, rather than on river or stream shores; (3) In regions where lakes are absent and rivers are deeply incised, sites may be located at greater distances from water; (4) In most 'away-from-water' areas, prehistoric archaeological sites are often very small and apparently occur at a low density; and, (5) The 'Driftless Area' of southeastern Minnesota is apparently different from the rest of the state. Prehistoric archaeological sites located there are not predominantly located near shorelines but are more widely dispersed.

Other systematic archaeological surveys near the project area were conducted by the Minnesota Department of Natural Resources (MnDNR) Division of Fish and Wildlife (Magner et al. 2007 and Magner and Allen 2010). The MnDNR surveys focused on reviews of facility improvement projects, such as campsites and boat landings, habitat improvement projects, and land transactions. The archaeological sites identified north of the current project area were on lakeshore settings near the Cobb River.

Several sites that are documented only in the MnSHPO site files are landowner collections and reports from sites that were not formally surveyed by professional archaeologists.

investigation included pedestrian survey, coring to evaluate site stratigraphy and geomorphology, and monitored excavation of 10 backhoe trenches. These trenches were dug to investigate stratigraphy and geomorphology, and also to expose buried archaeological deposits. Artifacts were recovered during monitoring, and limited hand excavation recovered a further sample of lithic and faunal materials. This work identified buried surfaces at around 1.5 and 2.15 meters; no archaeological materials were recovered from the lower horizon. Phase II investigations included the excavation of 2 x 2 meter excavation blocks in two backhoe trenches. Six dates on bone collagen ranged from 5410 +/- 50 to 5170 +/- 40 RCYBP (ca. 6200 to 6000 cal BP).

The Phase II work yielded over 1,600 artifacts, including faunal remains, lithics, and FCR. No features were found. Artifacts were distributed horizontally throughout the blocks, although density varied. In Block I, artifacts were distributed vertically through about 35 cm of the sediment column, although the majority came from the lower 20 cm. It appears that artifacts may have continued below the maximum depth of excavation. In Block 2, artifacts were vertically distributed through about 60 cm of the sediment column, although artifact density was higher in the lower 35 cm. Within the lower 35 cm, there were two peaks in artifact density, suggesting the possibility of multiple site occupations. The report notes a prevalence of rodent runs, which probably contributed to the movement of artifacts.

About 90 percent of the 1,891 artifacts recovered during Phase I and II investigations were faunal remains. The majority of these were small, unidentifiable pieces. The pieces that could be identified were from bovid (bison), canid, cervid, turtle, bird, and fish. Most of the bone came from medium to large mammals, with turtle, bird, and fish each constituting less than one percent of the assemblage each. Butchering, burning and calcining were noted, and one piece of worked bone was found. The report notes striations on the surface, and from a photo it appears that the bone may have been flaked.

The lithic assemblage totaled 146 artifacts. In addition to flaking debris, there were utilized flakes, scrapers, bifaces, a core, and the base of a side-notched point. It is described as having a thinned basal edge. Based on a photo in the report, the 21NL58 point base appears fairly similar to the point base found at 21CR155 in the deeper levels of Area H.

21NL63 (Fritsche Creek II)

Site 21NL63 is a multicomponent site located in a complex landform at the mouth of Fritsche Creek on the eastern edge of the Minnesota River valley near New Ulm in south-central Minnesota. The landform includes older alluvial fan deposits, substantial colluvium, as well as more recent fluvial deposits related to the modern configuration of the creek. The site was discovered in 1990 during a survey for a proposed bridge replacement over Fritsche Creek. Phase II work in 1992 included surface survey, shovel testing, investigation of a bone bed exposed in a road cut, and excavation of two square meters. This work identified a surficial Late Woodland component at the surface, and a bone bed with associated artifacts at about 85 to 100 cmbs.

A limited Phase III data recovery in 1994 (Roetzel and Strachan 1992; Roetzel et al. 1994) included excavation of three 1 x 2 meter blocks in location where electrical transmission line poles were to be placed. The depth of maximum depth of excavation varied from 130 to 240 cmbs. The report indicated the presence of a ca. 15 cm-thick bone bed in a paleosol, but also indicated that materials were found outside of the bone bed and that there was evidence of substantial rodent activity. The road cut was also re-inspected and a sample of bones and artifacts recovered. Radiocarbon dates were pending when the report was submitted. A later report indicates a single resulting date of 6080 +/- 100 RCYBP (ca. 7000 cal BP) (Monaghan et al. 2006:6.1).

The combined Phase II and III investigations recovered a total of 1,425 bone fragments and lithic artifacts from the buried component. Most of the bone consisted of small, unidentifiable fragments, and most of the identifiable bone was bison. It was noted that the bison appeared larger than modern forms, but no specific taxonomic identification was made. Pocket gopher, bird, snake, and mollusc were also noted. The assemblage included an antler tine that may have been a tool. The lithics were limited in number, but included scrapers, utilized flakes, flaking debris, and the midsection of a biface or point that was described as "the midsection of a flint projectile point.....Because the base is missing, it is necessary to simply conjecture as to the shape of the entire specimen. But because the sides of the point are almost completely parallel, it is likely that the point was relatively long in the range of 4+ inches and clearly appears to be of the Plano variety" (Roetzel and Strachan 1994:29).

Further geomorphological and archaeological work was conducted at the site in 2004 in connection with the MnDOT Minnesota Deep Testing Protocol study (Monaghan et al. 2006). This investigation included geophysical survey, excavation of trenches to evaluate site stratigraphy and geomorphology, and limited archaeological excavation to recover samples of exposed materials. Archaeological materials recovered during this work came mostly from the upper Woodland component. Recoveries from subplowzone contexts were mostly limited to animal bone fragments, many burned or calcined. The geomorphological investigations more fully explained the development and stratigraphy of the site and landform. They provided an additional date of 6570 +/- 40 RCYBP (ca. 7460 cal BP) for the previously identified buried component, and also identified an older paleosol in parts of landform. The older paleosol and associated archaeological materials were dated to 8100 +/- 40 RCYBP (ca. 9000 cal BP).

21BE271

Site 21BE271 is an Archaic period lithic procurement site located on a terrace west of Minneopa Creek near the city of Mankato (Withrow 2003). The site is within the boundaries of the NRHP-listed "Historic Minneopa Park District". Other than remnants of a nineteenth-century railroad grade near the site, the area is otherwise undisturbed. The site was identified during survey for a proposed bicycle trail when 317 pieces of lithic debris and burned rock, designated as Feature 1, were recovered from a single shovel test. The survey area was expanded into a grid, and a total of 69 shovel tests were dug, of which 22 contained cultural materials. The site was delineated to include an area of approximately 2.5 acres.

The Phase II evaluation at 21BE271 included nine additional shovel tests and four 1-x-1 meter units, all of which were placed to investigate Feature 1. A total of 9,997 artifacts were recovered from the Phase I and Phase II excavations at the site, mostly within a zone approximately 15-cm thick at an average depth of approximately 25 cmbs, in the vicinity of Feature 1. No soil discoloration or other evidence of fire hearths or pits was identified at the site. The only diagnostic artifact was the base of Table Rock Cluster projectile point, dating from ca. 5,000 to 3,000 BP that was recovered in association with Feature 1. All of the other artifacts were pieces of lithic debris or shatter, except for two flake tools, three cores, and six unfinished bifaces. More than 98 percent of the lithics were of Shakopee Formation chert, and the site was interpreted to be a lithic procurement site. The site was recommended eligible for listing on the NRHP as a short-term resource procurement camp from the Mountain Lake phase that has the potential to yield significant information about lithic resource procurement and stone tool processing in the Prairie Lake region during the Archaic period.

5.5 Mn/Model Study of the Minnesota River Prairie Subsection

The Mn/Model is a statewide GIS-based predictive model for pre-1837 archaeological site locations. The project area is located within Mn/Model's Minnesota River Prairie subsection. This subsection is characterized by rolling ground moraine of the Des Moines Lobe of Late Wisconsin Glaciation, with smaller areas of glacial lakes and outwash deposits (Hudak et al. 2002, Chapter 8.20). Presettlement vegetation of was predominantly prairie, with scattered areas of wet prairie and marshes, and river bottom forest in the river valleys. The Minnesota River divides the subsection in half from northwest to southeast. The Minnesota and Blue Earth Rivers are the primary hydrologic features of the subsection, along with several outwash channels, only some of which are occupied by present-day rivers, such as the Cobb River. River bottom forest, consisting of silver maple, elm, cottonwood, and willow, occurred in the river valleys. Small stands of the Big Woods forest community occurred along the eastern border. Many of the wetlands in this subsection have been drained for agriculture. The project area is located at the east end of this subsection. The Mn/Model depicts areas of high site potential along lakes and major rivers, including the Cobb River in the project area. The results of the current investigation support the Mn/Model prediction that river valleys in this area have a high site potential.

5.6 Historic Map and Air Imagery Review

Several historic maps were examined to aid in identifying potential historic period archaeological resources within the project area. The earliest map examined was the General Land Office (GLO) survey maps of 1855, which was available online (http://www.mngeo.state. mn.us/glo/). No potential resources are depicted on the GLO map.

Historic plat maps in Blue Earth County were reviewed for 1874, 1879, 1895, 1914, 1916, 1920, 1929, and 1938 (Andreas 1874; Warner & Foote 1879; Central Publishing Company 1895; Ogle 1914; Hixson and Company 1916; Moore and Dillon 1920; Webb Publishing Co. 1929; Hixson Map and Atlas Company 1938). Aerial photos from 1938, 1950, and 1964 were also reviewed. The aerial photos were obtained online from the Borchert Map Library at the University of Minnesota (http://map.lib.umn.edu/mhapo/).

One historic resource, a farmstead located on the south side of the Cobb River and east side of TH 22, was depicted in the survey area on the historic maps and aerial photos. The farmstead is depicted on the 1879 and all subsequent maps and air imagery. The farmstead was assigned site number 21BE306 based on historic artifacts that were recovered from the farmstead area. The site is discussed in Section 10, which includes the plat maps and aerial photos. An historic school depicted on the 1874 to 1930 maps is a short distance north of the project area.

6. CULTURE HISTORY

The following culture history of the precontact period in the project area is derived primarily from *Archaeology of Minnesota: Prehistory of the Upper Mississippi Region* (Gibbon 2012); *Minnesota Archaeology: The First 13,000 Years* (Gibbon and Anfinson 2008); the *Minnesota Statewide Multiple Property Documentation Form for the Woodland Tradition* (Arzigian 2008); and *Outline of Historic Contexts for the Prehistoric Period (ca. 12,000 B.P. - A.D. 1700)* (Dobbs 1988). The discussion follows the organization of cultural periods used by Gibbon (2012) and uses calibrated dates.

The culture history of the project area is complex for three reasons: 1) there is a lack of detailed information about most of the precontact period in the state; 2) the project area is located near the boundary of three different ecological zones (prairie, big woods, and oak savanna vegetation), which shifted during the Holocene in response to climate changes; and 3) the project area is located near the boundary of distinct physiographic settings (Late Wisconsin glacial deposits and loess plains). These complexities are reflected in the multiple MnSHPO Archaeological Regions that border the project area and in the archaeological record of the region.

The project area is located in south-central Minnesota at the intersection of MnSHPO Archaeological Regions 2s – Prairie Lake South and 2e – Prairie Lake East. Archaeological Region 2n – Prairie Lake North is also close to the project area, beginning on the north side of the Minnesota River. The Prairie Lake regions extend across southwestern and south-central Minnesota and are characterized by 1) prairie vegetation with a mixture of oak savannah in the eastern portion, and 2) numerous lakes, wetlands, and rivers resulting from the Late Wisconsin glaciation.

6.1 Paleoindian Period (13,200 to 9500 BP)

The Paleoindian period was a time of rapid environmental change as the glaciers retreated from Minnesota (Wright 1974). Substantial changes in vegetation, wildlife, waterways, and the landscape occurred as a result of the ameliorating climate, and Paleoindian lifeways reflect adaptations to these rapidly changing landscapes. The first Paleoindian peoples in the southern Minnesota encountered a subarctic environment with no direct parallel in the modern world. It is not known what animals lived in the area at this time, but it can be assumed that mammoths, giant bison, and other now-extinct megafauna were present. Fish would have been present in the newly-formed lakes and rivers soon after the establishment of open water (e.g. Pielou 1991), and plants became established on the ice-free landscape.

It is presumed that Paleoindians were highly mobile and traveled in small bands. However, the lack of Paleoindian sites in Minnesota makes it difficult to identify settlement patterns, subsistence, or site types. Only one burial of this period is known, the Browns Valley site (21TR5) in the west-central part of the state. The known sites appear oriented toward current bodies of water, but these locations are also areas that have had a greater amount of archaeological survey. The locations of known sites therefore do not necessarily represent the actual settlement patterns. It is not clear whether the paucity of sites demonstrates that there was a small Paleoindian population in Minnesota, or whether the population was more numerous but the sites have not been identified because they have been destroyed, are deeply-buried, or lack diagnostic artifacts. It is likely that some of the lithic scatter sites that are scattered throughout the state belong to this period, but without the recovery of diagnostic artifacts or datable material, it is not possible to determine the cultural affiliation of these sites. Research in other parts of the country, where Paleoindian sites are more common, suggests that the margins of lakes and

swamps were preferred habitation locations, and these landscapes were prevalent in the late-glacial and early Holocene periods of central Minnesota.

The Paleoindian period is divided into Early (13,200 to 12,500 BP) and Late (12,500 to 9500 BP) periods, as defined by the use of fluted (Early Period) or plano (Late Period) projectile points (spear points) for hunting and also possibly butchering. During the Early Paleoindian period, artifact typologies in Minnesota suggest that the culture was mostly related to the eastern Midwest. During the Late Paleoindian period, the cultural affiliation is clearly more related to the Plains, except in the Mississippi Valley region of southeastern Minnesota.

6.1.1 Early Paleoindian (13,200 to 12,500 BP)

The glaciers were gone from the southern half of the state by approximately 14,000 BP, and the Late Glacial and Early Holocene environments that followed were very dynamic, with rapidly-evolving climate, vegetation, animals, surface hydrology, and landforms. Near the project area, the most dramatic of these evolving landscapes was the cutting of the Minnesota River Valley by the Glacial River Warren and the subsequent establishment of subsidiary river valleys such as the Blue Earth.

Glacial Lake Agassiz, which covered all of northwestern Minnesota, was the source of Glacial River Warren. The current Minnesota River Valley was formed by the catastrophic discharge of glacial meltwater that drained from the lake until approximately 12,700 BP, when eastern outlets to Lake Agassiz opened and the lake retreated to the northern Red River Valley. The southern outlet of the Glacial River Warren was abandoned for a period at this time, and the landscape of the valley began to stabilize and fill in (Matsch 1983). Vegetation in this post-glacial environment included boreal forest species, with a mix of deciduous tree such as larch and ash, reflecting a wetter and cooler climate than is seen today.

Fluted point types such as Clovis, Folsom, and Gainey of the Early Paleoindian period are rare in Minnesota, and little archaeological evidence of Early Paleoindian people has been documented thus far. Isolated finds, primarily recovered from the surface of agricultural fields, have been recorded at scattered locations across Minnesota (Anfinson 1997:28-30; Buhta et al. 2011; Higginbottom 1996). In Wisconsin most fluted points occur in the southern portion of the state south of the most recent glacial ice margins (Mason 1997:87). These isolated finds are in themselves important contributions to the archaeology of the Early Paleoindians, but it is unfortunate that no other site data are available.

Early Paleoindian people are traditionally thought to have been nomadic big-game hunters, an interpretation derived from the dramatic and defining finds of lanceolate points at megafauna kill sites in the American southwest. These now-famous discoveries at places such as Blackwater Draw and Folsom in New Mexico initially established the antiquity of the Paleoindian tradition and the association of Clovis and Folsom points with mammoths and other extinct megafauna. Mason (1981:97) points out, however, that, "as eastern fluted point sites were found and investigated, and dramatic kill sites eluded discovery… enthusiasm for this idea waned. Because most Paleo-Indian sites east of the Mississippi are unaccompanied by preserved bones, it is now a popular notion that big-game hunting was a western specialization not indulged in by the easterners. But just as it is difficult to argue one way in the absence of evidence, so is it difficult to argue the other way."

While paleontological finds of extinct megafauna have been made in Minnesota, only the Itasca Bison Kill site (Shay 1971), which contained the extinct bison type *Bison occidentalis*, also

contained cultural materials. The closest known megafauna kill (or possibly scavenging) sites are in Wisconsin, including several on beach ridges of Glacial Lake Michigan. The Boaz Mammoth site in southwestern Wisconsin is the nearest site. The site, which was discovered in the late nineteenth century, contains the remains of a mammoth in apparent association with a Hixton orthoquartzite fluted point (e.g., Overstreet 1993, 1996; Mason 1981, 1997). Anfinson (1997) suggests that Early Paleoindians in the Prairie Lake Region relied on a much wider variety of resources in their boreal environment, such as smaller animals, fish, and vegetal foods, than did the Paleoindians of the southwestern United States.

6.1.2 Late Paleoindian (12,500 BC to 9500 BP)

The transition from the Early Paleoindian to the Late Paleoindian period is indicated by the appearance of some groundstone tools, such as the adze, and by a variety of large, finely-crafted stemmed and lanceolate projectile point types that lack the distinctive fluted points of the early period. Some of the Late Paleoindian points in Minnesota and the Midwest are smaller and less-finely crafted than those from the Plains, which is perhaps a result of raw material quality and cultural changes through time (Florin 1996). Many of the points from Minnesota are extensively resharpened and reworked so that their original condition is no longer apparent. Another unique feature on points from the Midwest is the presence of basal ears on some specimens, particularly the stemmed forms.

Faunal assemblages from five Late Paleoindian sites in Wisconsin contain a variety of terrestrial and aquatic animal resources, including deer, bear, beaver, muskrat, porcupine, birds, turtle, and fish, indicating a generalized foraging subsistence base (Kuehn 2010). This data contrasts with the out- dated concept of Paleoindians being primarily hunters of a few select species of large game animals such as bison, moose, and caribou. The prevalence of wetland and aquatic animals is particularly noteworthy.

Glacial River Warren began to flow briefly again around 9000 BC following a refilling of the southern end of Glacial Lake Agassiz. This was a time of rapid environmental change, and deciduous tree species moved rapidly into the area from the south. Presumably, Late Paleoindians consisted of small, highly mobile groups that foraged widely and occupied territories only briefly.

Late Paleoindian points are found more frequently than Early Paleoindian points, probably reflecting increasing population levels in the post-glacial era. Most Late Paleoindian points have been recorded from private collections, with a small amount recovered during archaeological investigations across the state (Florin 1996). Small numbers of points have been reported across the Prairie Lake Region, with a notably large amount from a private collection in Freeborn County. Only two points are reported from Blue Earth County. The point types from Minnesota resemble the stemmed and lanceolate types defined from type sites on the Plains. Point types most commonly found in the Prairie Lake Region include the lanceolate Agate Basin and Browns Valley types and the subsequent stemmed Scottsbluff and Eden types.

One of the best-documented Late Paleoindian sites in the Prairie Lake Region is the Browns Valley Site (21TR5) at the southwestern edge of Lake Traverse in western Minnesota. The site contained human remains, which date to approximately 10,000 BP, and several possibly associated lanceolate bifaces (Browns Valley type) that discovered from a gravel pit. Browns Valley points have also been recovered from site 21CP35 near Montevideo and from the Hildahl #3 site (21YM35) on a terrace of the Minnesota River Valley near Granite Falls.

6.2 Archaic Period (12,500 BC to 2500 BP)

The Archaic period is generally characterized by the following: 1) a subsistence base that relied on a variety of game animals and wild plant food resources; 2) the absence of agriculture, ceramics, and burial mounds except at the end of the period; and 3) an increasing variety of notched and stemmed projectile points (e.g., Raddatz, Little Sioux, Durst) and stone tools that included pecked- and groundstone implements (adzes, axes, and mauls), native copper artifacts, and some exotic materials such as marine shell. As with Paleoindian sites, most recorded Archaic sites are small, short-term camps and activity areas. Most of the information from this period comes from sites in the southeastern part of the state or in neighboring Wisconsin and Iowa. A few significant Archaic sites have been recorded in the Prairie Lake Region. Geological processes resulting from the climatic changes of the Altithermal may have buried or eroded many Archaic sites, and there has been no comprehensive study of the Archaic on a statewide scale. For these reasons, our knowledge of Archaic period lifeways is still very limited.

The Archaic period spanned the time when the post-glacial environment of Minnesota continued to moderate, and ecosystems similar to those of modern times evolved. During this time, the northern hemisphere experienced an episode of warm and dry weather that is variously referred to as the Altithermal, the Middle Holocene Climatic Optimum, and the Prairie period. The peak of this warming period was reached around 7000 to 6000 BP, by which time most of southern Minnesota, except the southeast corner, was dominated by a prairie landscape. The hot and dry conditions persisted at their maximum for about 1000 years before gradually giving way to a cooler and wetter climate that led to the evolution of ecological communities similar to those of the modern era by about 5000 BP. The dramatic environmental changes of the Altithermal would have caused major shifts in the lifeways of the people, as post-glacial animal species of the forest such as moose, caribou, and deer were replaced by prairie species such as bison. Plant communities also would have changed with the spread of the prairie, and wild rice may have been gathered during this time.

It is likely that Archaic period populations engaged in seasonal rounds of resource gathering as the climate stabilized following the retreat of the glaciers. Small bands would have returned to seasonal campsites, and territories may have been relatively limited. With the onset of prairie conditions, however, resources would have become less predictable, and populations would have been pushed into shrinking areas surrounding the larger lakes and streams. The appearance of groundstone milling tools suggests that there was a greater use of seeds and other plant foods. Domesticated dogs, used for transport, suggest that longer-distance travel was required to keep up with migratory bison herds. Group sizes appear to have remained small throughout the Archaic, and known site locations indicate that a high value was placed on a proximity to game, water, and supplies of wood.

The Archaic has traditionally been divided into Early, Middle, and Late periods. Gibbon (2012) adds the modifier "Eastern" to his discussion of the Early Archaic in Minnesota for complexes presumed to be derived from the East, which distinguishes it from the "Prairie" Archaic period that is centered on the northeastern plains, including southwestern Minnesota. Gibbon's "Prairie" Archaic is classified under the Middle and Late Archaic because it occurs later than the earliest Archaic manifestations in the Midwest that derive from the east. This classification system diverges from that of others in the region who continue to extend the Early Archaic later in time and include complexes that do not derives from the east, as is noted in the discussion below. Anfinson (1997:35) points out that the Prairie Archaic of the northeastern plains region began about 7500 years ago, and the Archaic of the eastern Midwest may have begun as early as 10,000 years ago.

6.2.1 Early Eastern Archaic

Most of the information we have about the Early Eastern Archaic period in the upper Midwest (ca 12,500 to 9500 BP) comes from sites in the mid-south and central Mississippi valley region. The chronology of the various regional Archaic divisions is not firmly established, and dates from adjacent areas are later than those proposed by Gibbon (2012). The Early Archaic period in Iowa extends from 10,000 to 8500 BP (Benn and Thompson 2009) and from 10,500 to 7500 BP (Alex 2000). In Wisconsin the period extends from 11,500 to 7500 BP (Pleger and Stoltman 2009). Dates for the Early Archaic on the Plains are also later, ranging from about 10,500 to 8300 BP (Frison 1998; Kay 1998; Widga 2006).

There has been no comprehensive study of Early Eastern Archaic sites and site distributions in Minnesota, and therefore Gibbon and Anfinson (2008: Chapter 5) states that there is "... little useful to say about that tradition's sites and their distributions in the state." Most Early Eastern Archaic projectile points recovered in Minnesota have come from the southeastern part of the state, although a St. Charles point was found in Martin County in the west.

6.2.2 Middle Archaic

The Middle Archaic in Minnesota spans the period of roughly 9500 to 5000 BP, although dates from adjacent areas are later than those proposed by Gibbon (2012). The Middle Archaic period in Iowa extends from 8500 to 4500 BP (Benn and Thompson 2009) and from 7500 to 5000 BP (Alex 2000). In Wisconsin the period extends from 7000 to 3700 BP (Pleger and Stoltman 2009). Dates for the Middle Archaic on the Plains are also later, ranging from about 6300 to 3450 BP (Eighmy and LaBelle 1996; Green 1998; Walker 1992).

The Middle Archaic period includes the peak of the Altithermal episode. Warming and drying during the period would have been dramatic, with prairie spreading across northwestern and southern Minnesota, except for the southeastern corner. Eventually, deciduous forests would have been restricted to river valleys and lake edges in most of the southern part of the state. As the post-glacial landscape continued to stabilize, water flows through the Minnesota River valley were reduced and water temperatures warmed. This allowed aquatic species to migrate up the river valley from the south and waterfowl likely became abundant. Few Middle Archaic sites have been discovered in Minnesota compared to more southerly portions of the Midwest.

The Prairie landscape and accompanying bison herds begin to enter Minnesota around 10,500 BP at a time when Lake Agassiz still covered the northwestern corner of the state and the glacial River Warren was flowing through the Minnesota River valley. By approximately 7000 BP, at the peak of the warming and drying, prairie covered most of northwestern and southern Minnesota, except for the southeast and northeast corners, and the Archaic-period bison hunters who used medium-sized, side-notched points spread across most of the state.

Middle Archaic projectile points are small to medium-sized and generally smaller and less well-made than the points from the Paleoindian period, and they show an increased use of local cherts. These points were most likely attached to atlatl darts rather than spears and were thrown with an atlatl. Diagnostic Middle Archaic point types common to Minnesota are divided into two broad categories (Eastern Woodlands and Plains), based on their presumed region of origin outside of Minnesota, and by the dates (*Early Phase* and *Late Phase*) of their presence in those regions (Gibbon 2012). Point types of the *Early Phase* in the Plains include Simonsen (Little Sioux) and Oxbow. *Late Phase* point types from the plains include McKean and Table Rock. Many of the Middle Archaic point types continued into the Late Archaic. Other artifacts associated with this

period include ground and polished stones used as weights and handles for the atlatl, scrapers, basalt choppers, hammerstones, and milling stones.

The most significant Middle Archaic site recorded in the state is the Itasca Bison Kill site (21CE1) near Lake Itasca in Clearwater County (Shay 1971). A number of now-extinct *Bison occidentalis* were killed in a boggy area and a campsite associated with the processing of the bison was discovered on a hill overlooking the bog. Projectile points from the site include small to medium-size types with side-notching, which have been referred to as Little Sioux or Simonsen. Similar points have been found at other sites in southwestern Minnesota, including the Granite Falls Bison Kill (21YM47), Goodrich (21FA36), Pederson (21LN2), and Hildahl #3 (21YM35) (Anfinson 1997; Christiansen 1990). The Jackpot Junction site (21RW53) in the Minnesota River valley near Redwood Falls contained bison, turtle, small mammal, and fish bone from depths of 1.5 to three meters.

Closer to the project area, site 21NL63, located on an alluvial-colluvial fan along the northern margin of the Minnesota River in Nicollet County, contains an intact buried component that appears to date to the Middle Archaic (ca. 7000 cal BP), or even earlier (Roetzel et al. 1994). The buried component may reflect a short-term occupation associated with a bison kill and processing. Site 21NL58, located near 21NL63 in a similar landscape setting, also contains a buried component with bison bone and other materials dating to the Middle Archaic (ca. 6200 to 6000 cal BP) (Terrell et al. 2005). A Middle Archaic component dating from ca. 7000 to 6500 cal BP was identified in a buried component in an alluvial fan at site 21CR141 in the Minnesota River Valley (Schoen 2006). Site 21CR155 (Florin et al. 2015), which is located in alluvial fan and lacustrine deposits on the floor of the Minnesota River valley across from the city of Shakopee, contained multiple occupations, spanning most of the Holocene from ca. 8000 to 500 cal. BP.

Anfinson (1997) proposed that an "Itasca Phase" be designated to describe the Middle Archaic (Prairie Archaic) adaptation to the widespread prairie landscape in the Prairie Lake region. The social organization during the period is poorly understood but it is likely that the need to adapt to changing environments and the hunting of bison may have led to the integration, at least seasonally, of small family-scale bands into larger groups that could more efficiently track and hunt the migratory animals.

6.2.3 Late Archaic

The Late Archaic in Minnesota begins around 5000 BP and extends to about 2500 BP, coinciding with a cooler and moister climate in which the contemporary environmental conditions and biomes became established. Late Archaic dates from adjacent regions are generally similar to those proposed by Gibbon (2012). During this time, smaller lakes that had dried up during the Altithermal once again filled in. The forests, bogs, and peatlands of the north woods expanded as the prairies retreated to the west and south. These climatic and environmental changes led to the decrease of bison as the main game animal in reforested areas and the arrival of forest animals into their historical ranges. Bison continued to be a primary species in the Prairie Lake region.

The Late Archaic is defined by diagnostic side-notched and stemmed projectile point types along with groundstone tools (such as manos, matates, and axes), the use of communal burial sites without mounds (until the period of transition between Late Archaic and Early Woodland), and the increased presence of exotic raw materials (such as native copper and marine shell). Diagnostic Late Archaic point types are divided into regional clusters (Gibbon 2012:79). The *Northern Plains region* includes the McKean and Oxbow Clusters. As Gibbon notes, however,

some Late Archaic point types overlap with the earlier Middle Archaic and later Initial Woodland occupations, and therefore the dating of Late Archaic occupations based solely on point typology is problematic.

The lifeways of the people during this period in Minnesota were marked by adaptations to the changing environmental conditions and to increasing influences from people and cultures in surrounding regions. It was a time of increasing population numbers and more diverse artifact assemblages, which together with the advent of communal burials and expanded exchange of exotic materials, indicate increased social complexity and changes in subsistence patterns.

Gibbon and Anfinson (2008) use the term Proto-Horticulturalist to describe the addition of garden produce into the resource base of the Late Archaic period, suggesting that this indicates the beginning of a fundamental social transition, although not a heavy reliance on cultivated foods. Fragments of squash (Cucurbit pepo) recovered from a probable Late Archaic context at the King Coulee site near Winona on the Mississippi River is an example of this type of early horticulture from Minnesota (Perkl 1998).

The people during this period likely inhabited a series of relatively stable "base camps" that shifted during the year to access seasonal resources. From these base camps there appear to have radiated a variety of smaller special activity areas such as quarries and butchering sites. Communal burials that appear during the Late Archaic period may indicate increasing territoriality associated with greater settlement permanence. Highly ornamented grave goods have been interpreted as an indication of increasing religious complexity; and the appearance of burial mounds at the transition of the Archaic-Woodland periods is perhaps an indication that it had become more important to make these territorial indicators more visible to outside populations.

Sites in the Prairie Lake region with confirmed or possible Late Archaic components include Pedersen (21LN2), Fox Lake (21MR2), and Mountain Lake (21CO2). In the prairies of southwestern Minnesota, the bison-centered lifeway continued until around AD 1000 with the advent of the Plains Village culture. The Pedersen site contained bison bone in all occupation levels, along with remains of other mammals, fish, and bird species. Bison bone is also the main component of the Archaic faunal assemblage at the Mountain Lake site.

6.3 Woodland Period 2500 to 350 BP)

While the Woodland period has traditionally been defined by the first appearance of pottery, burial mounds, and agriculture, Gibbon (2012:93) proposes that:

> Information gathered within the last twenty years has clearly demonstrated [that these traits] had already made their first appearance in areas of the Eastern Woodlands in the earlier Late and even Middle Archaic.... The result of these discoveries has been a redefinition of the Woodland tradition, a redefinition that now depends more on new socioeconomic adaptations than on shared diagnostic material traits. Still, the first associations of these three traits in about 2700 BP in some areas of the Midwest do seem to mark the inception of these new adaptations. Misleading reconstructions of the culture history of other areas of the Midwest have resulted, however, from the assumption that the presence of pottery, burial mounds, or cultigens, or some combination of the three, necessarily means that similar socioeconomic adaptations were present in those areas, too.

The Woodland period in the Midwest has been divided into Early, Middle, and Late periods based on cultural developments that have been documented primarily in the lower Mississippi Valley region. Gibbon, however, points out that these cultural developments occurred in Minnesota and other parts of the northern Midwest and plains much later or not at all. Furthermore, he argues (2012:93) that "...unique adaptations and artifacts appear in the prairies, northwoods, and boreal forest of Minnesota that have no specific counterparts in the traditional lower tier zone to the south." To accommodate this distinction, Gibbon divides the Woodland Period into *Initial* and *Terminal* periods rather than Early, Middle, and Late. He concludes that ... "Although awkward at times, these concepts stress the unique accomplishments of Native Americans in our region rather than their marginality to events and processes that occurred in different environments to the south."

During the late Holocene, from the end of the Archaic period through the Initial Woodland period, the climate and landscape continued to evolve. These changes are well-documented through an extensive series of a series of pollen core studies from across the state and by correlation with other research on vegetation and climate change across the continent. Arzigian (2008:8) summarizes the climate and landscape developments of the Woodland period in Minnesota:

Of greatest significance to the Woodland tradition is a period of cooler temperatures, the Sub-Boreal, that extended through the Early and Middle Woodland periods and was followed by the warmer Neo-Atlantic and Pacific periods, and then the cooler, moister Little Ice Age from about 450 to 100 BP. During these broader climatic shifts and more local changes, the most noticeable changes would have been the local expansion or contraction of the prairie-forest ecotone and the prairie bison herds. Changes in local lake levels would have affected settlement patterns adjacent to the lakes, with some lakes drying up completely. Fires would have caused changes in the composition and distribution of forests as well as expansion of shrublands and savannas. Fire frequency would have been affected by local and regional climatic conditions, and possibly also by the human population. Starting about 450 BP, the Big Woods expanded at the expense of prairies as a result of changes in fire frequency in the cooler, moister Little Ice Age climate.

6.3.1 Initial Woodland in the Prairie Lake Region

The Initial Woodland period in the Prairie Lake Region begins around 2200 BP and is marked by first presence in the prairies of a small amount of ceramic ware similar to La Moille thick. Such artifacts have also been found at sites in eastern South Dakota and north-central Iowa. The period becomes more well-defined with the appearance Fox Lake ceramics and the spread of the *Fox Lake Complex* throughout the Prairie Lake Region. Fox Lake ceramics are moderate to small-sized conoidal to subconoidal vessels with thick-walls and sand/sandy grit temper (Anfinson 1997). Surface treatment consists of well-defined exterior cordmarking that is usually vertically oriented but may be horizontal or oblique.

Gibbon (2012) cautions that the dates for the Initial Woodland period in southwest Minnesota are based on relatively few secure radiocarbon dates and may be subject to revision.

Fox Lake

The Fox Lake Phase (2200 to 1300 BP) is differentiated from the Late Archaic Mountain Lake Phase in the Prairie Lake region by the introduction of ceramics and the change to side-notched, corner-notched, and triangular points that may be associated with the bow and arrow. Fox Lake sites are generally situated along the margins of lakes, rivers, and streams and they appear to be

part of a stable bison-hunting lifeway that began during the Archaic period. Fox Lake components have also been found at sites in eastern South Dakota and north-central Iowa. There is no evidence of mound burials during this phase in the region. Fox Lake (21MR2), Pedersen (21LN2), and Big Slough (21MU1) are examples of Fox Lake Phase sites in the region.

Four types of projectile points are associated with the Fox Lake Phase, including stemmed, side-notched, corner-notched, and isosceles triangular. The stemmed types occur early in the phase and are replaced by the notched and unnotched triangular. Stemmed types are primarily the expanding stem type similar to the Stueben and Durst types and have more eastern affinities. The side-notched types are quite variable resembling a variety of Plains types such as Avonlea, Besant, and Hanna, and Oxbow. The corner-notched types are similar to the Pelican Lake type from the Plains. Absent are side-notched and corner-notched types from the east. The variety of point types may be the result of the change from using the atlatl to bow and arrow during this period.

Other artifacts recovered from Fox Lake sites include ground stone tools (mauls, celts, hammerstones, grinding stones, and abraders) although few examples of these tool types have been recovered. Bone awls and beads are also possibly associated with Fox Lake components. Lithic raw materials are dominated by local cherts with lesser amounts of quartzite, chalcedony, silicified sediment, and Knife River Flint. Gibbon (2012) points out that except for the distinctive ceramics, Fox Lake artifact assemblages have been difficult to isolate because of extensive component mixing at sites that usually also contain Archaic and later Woodland artifacts.

6.3.2 Terminal Woodland in the Prairie Lake Region

The Terminal Woodland period in southern Minnesota dates from ca. 1500-1300 BP to 350 BP, the time of first European contact. The period is marked in the archaeological record by changes in the design and manufacture of ceramic vessels and projectile points. Throughout the period, population sizes continued to increase and dependence on domesticated plants was becoming more widespread.

Lake Benton Phase

The transition from Initial to Terminal Woodland in southwestern Minnesota and the Prairie Lake Region occurred later and more gradually than in southeastern Minnesota. By the end of the Fox Lake Phase around 1300 BP, ceramic types in the region change significantly, projectile point technology reflects the onset of the bow and arrow, and burial mounds become more widespread. These shifts mark the beginning of the Lake Benton Phase.

The Lake Benton Phase (1300 to 800 BP) burial mounds are low, moderate-sized conical mounds that contained multiple secondary burials with few grave goods. Subsistence and settlement patterns show little change and are similar to the Fox Lake Phase. Pedersen (21LN2) is the type site for this phase. The Boy Scout Hill (21LN10), Gullickson (21YM2), and Big Sough (21MU1) sites are other examples of Lake Benton Phase sites within the region. Most of the sites from this period are located south of the Minnesota River and east of the Blue Earth River, though a few sites are north and east of these rivers and extend into eastern South Dakota and north-central Iowa.

Lake Benton ceramic ware is grit-tempered and the subconoidal vessels are moderately-sized with fairly thin walls. Surface treatment consists of exterior vertical cordmarking in the mid-body. Rims and upper shoulder are smoothed, with a small percentage of body sherds also being

smoothed. Cord-wrapped stick impressions are common decorative elements on the rim and shoulder while bosses are rare and trailed lines do not occur. Gibbon (2012:147) points out that Lake Benton ceramics are more difficult to identify than Fox Lake ceramics because of their strong similarity to the St. Croix/Onamia series of central Minnesota, and this association suggests that populations of the Lake Benton Phase (at least in the realm of ceramic technology) had a closer relationship with the hunters and gatherers of central and northern Minnesota than with the people to the east, south, and west.

Projectile point types include small, equilateral triangular and corner-notched forms, but the most common type is the small, side-notched style with straight to slightly concave bases. These points are similar to the small side-notched points of the Plains (Kehoe 1966). Stemmed point types are not associated with Lake Benton Phase. The relatively small size of the projectile points reflects their use for the bow and arrow. There are no other known lithic forms diagnostic of the Lake Benton Phase, although toolkits also include drilling and engraving tools.

6.3.3 Mississippian/Plains Village

The Woodland period in southern Minnesota ended between 1100 and 900 BP with the advent of cultures that began to live in larger settlements, which were often fortified. Distinctive ceramics of the period are identified by shell rather than grit temper, handles rather than collars, smoothed rather than cord-marked surfaces, and decoration on the shoulder rather than rim. These cultural complexes been grouped into a number of cultural subdivisions associated with the central Mississippi River Valley, based on material traits that are more similar to that region than to the earlier local Woodland cultures.

The Mississippian cultural manifestation in the central Mississippi River Valley is known as the Middle Mississippian. The northern region has traditionally been known as the *Upper* Mississippian and in the prairie region as the *Plains Village* Mississippian, although Gibbon (2012:159) notes that this usage suggests that the peoples of the period inhabited either "fringe" societies or were migrants from the south. Instead, he argues that the processes of change between Terminal Woodland and Mississippian cultures in Minnesota were more complex and subtle than is suggested by a dependency on cultures to the south and east, and he proposes that the terms *Upper* and *Plains Village* be eliminated – although he acknowledges that it is necessary to continue their use in making comparisons to other areas.

Mississippian complexes in Minnesota include Silvernale, Great Oasis, Cambria, Big Stone, and Blue Earth phases. Archaeological sites from these phases are concentrated along the Minnesota River trench from Mankato to the Red River and at the confluence of the Cannon and Mississippi Rivers near Red Wing.

Great Oasis Phase

Great Oasis (1150 to 900 BP) is considered to be the earliest and most widespread Plains Village phase. Ceramics are grit-tempered, globular vessels with a smooth exterior or cordmarked-smoothed and trailed line decorations and motifs. Decoration consists of bands of incised horizontal and oblique parallel lines along the rims. Lithic assemblages include small notched and triangular projectile points; a variety of ground stone tools, (celts, abraders, hammerstones, manos, and mutates). A variety of bone and shell items such as awls, chisels, and beads are also found at Great Oasis sites. Corn horticulture was a component of the complex and settlements were focused along shallow lakes in southwestern and western Minnesota, Iowa, Nebraska, and the Dakotas. The Great Oasis site (21MU2) is the primary Great Oasis phase site in Minnesota.

Cambria Phase

The Cambria Phase (900 to 800 BP) includes Woodland, Middle Mississippian, and Plains Village characteristics. The ceramics are grit-tempered, globular vessels with a smooth surface. Lithic assemblages contain small side-notched and triangular projectile points; ground stone tools such as celts, abraders, and hammerstones. Bone and shell items such as scapula hoes, punches, and awls have been recovered. Evidence suggests that this phase was linked to the trade network centered at Cahokia. Settlement patterns include village sites on terraces of the upper Minnesota River and smaller habitation areas by lakes or rivers. Subsistence was based on hunting, fishing, gathering wild plant and aquatic foods, and the cultivation of maize and sunflower. The type site is 21BE2 (the Cambria site), which is located along the Minnesota River in Blue Earth County near Mankato.

6.3.4 Oneota Tradition

Oneota sites occur south of the Minnesota River and in the St. Croix River Valley in prairie and forested areas, dating from 800 to 300 BP. Two main phases have been defined: the Blue Earth Phase and the Orr Phase, which is restricted to far southeastern Minnesota and the adjacent area in Iowa.

Blue Earth Phase

The Blue Earth Phase (800 to 500 BP) occurs across southern Minnesota, with notable sites at Red Wing (Bartron), near Stillwater (Sheffield), and also along the Blue Earth and Upper Minnesota rivers. This phase is characterized by smooth surfaced, shell-tempered ceramics and triangular unnotched arrow points. Agriculture is evident from bison scapula hoes and plant remains of maize, sunflower, squash, and beans. Sites consist of large village farming communities with smaller hunting and gathering camps.

6.4 Contact and Historic Period

Prior to direct contact with Europeans/Euro-Americans and their subsequent settlement of the region, Native American people were indirectly affected by the European presence in the eastern United States as trade goods, diseases, and displaced tribes (such as the Ojibwe) moved westward into the territory that became Minnesota. This period of first contact in the Prairie Lake region is not well understood and there is little documentation from the time. It is known that Native groups in the area at the time of French contact included the Dakota, Oto, and Ioway. The Ioway and Oto are believed to have derived from precontact Oneota groups in the region (Gibbon 1994).

In the mid-1600s, the Ioway occupied southern Minnesota along the Mississippi River and the eastern Dakota occupied much of central Minnesota (Dobbs ca. 1988). In the early 1700s, the Ioway were forced out of southern Minnesota as the Dakota began to occupy the area following years of warfare with the Ojibwe, a conflict that lasted to the mid-1800s.

The French began to explore the territory that became Minnesota in the mid-1600s and they engaged in trapping and trading activities with the Ojibwe and Dakota shortly after initial exploration. Although several forts were constructed along the Mississippi and other riverways in southern Minnesota during the French fur-trade era (ca. 1660 to 1763), including one built around 1700 near the confluence of the Blue Earth and Minnesota Rivers near the present day city of Mankato (Blegen 1975), little is known of this time period in south-central Minnesota. In 1762, the French ceded land west of the Mississippi River to Spain, and in 1763 under the Treaty of

Paris the French ceded land east of the Mississippi to the British. The fur trade continued as the British gained control of the region (1763 to 1815). The British, ignoring Spain's claim to lands west of the Mississippi River, entered the Prairie Lake Region and established posts along the Minnesota River to aid in their fur trade interests. British trade continued until shortly after the War of 1812, when the Americans deprived them of licenses to trade within the United States. American fur trade companies replaced the British until the fur trade declined in the mid-1800s. After the war of 1812, the United States gained full control of the area and trading posts began to spread along the major riverways.

6.5 Blue Earth County

Euro-Americans settlers began to claim land in and adjacent to the Minnesota River Valley in the early 1850s after the Dakota were removed under the Treaties of Traverse de Sioux and Mendota. The following discussion of early exploration and settlement is derived primarily from Neill (1882) and Hughes (1901 and 1905). Regular steamboat service between St. Paul and Mankato was established in 1853 and early settlements soon grew along almost the entire length of the Minnesota River. A blow to settlement along the river was the Panic of 1857, when financiers from the east were forced to call in loans during a financial crash. Minnesota was especially hard-hit during the panic because it was on the frontier of western expansion at the time and much of that settlement was financed by debt.

Settlement along the Minnesota River resumed following the Panic of 1857 with a continued emphasis on agriculture and associated industries such as milling and food processing. Most farmers at the time practiced a form of subsistence agriculture until the late 1860s, when there developed a national demand for spring wheat from the region. Following a brief period of intensive wheat farming to fill this market, and subsequent troubles with blights and insects, most farmers in the area returned to raising a diversity of crops and animals. In the late 1850s a German immigrant farmer in nearby Carver County cultivated a strain of alfalfa that was able to endure the northern winters. His strain, which came to be known as Grimm Alfalfa, is credited with supporting a blossoming of dairy in the region and is considered to have been instrumental in the success of dairy farming throughout the entire northern plains region.

Blue Earth County was formally created on March 5, 1853 from portions of Dakota County and free territory. The area was known to the Dakota people as the "Big Woods". The name Blue Earth is derived from one of the earliest historical episodes in the territory when, in 1700, the French explorer LeSueur made an unsuccessful attempt to mine copper from the blue earth found in the area. The major waterways in the county, including the Cobb and Little Cobb Rivers empty into the Minnesota River on the north, and these waterways were the locations of the first Euro-American settlements in the county.

Early settlement in the county was based primarily on agriculture, and it was encouraged by a wave of speculative townsite platting that occurred primarily during the 1850s and 1860s. Organized groups such as the "Blue Earth Claim Association", which platted Mankato, and the "Minnesota Settlement Association", which platted the first townsite of Mapleton, were instrumental in the development of these townsites. The population of the county in 1860 was approximately 4,800 and by 1870, the population was approximately 17,000. The spread of railroads in the county from 1868 to 1908 resulted in the platting of many towns as station points. Some of these were existing towns, which benefited greatly from the railroad, but other early towns disappeared as the railroads passed them by. Several railroad lines intersected at Mankato and this solidified its status as the regional hub of commerce, receiving agricultural products and lumber from other communities in the area. Grain elevators and railroad stations became centers

of rural agricultural development in the county. Other common commercial enterprises that benefitted from the railroad network included creameries and general stores. Mankato has been the regional center for education, commerce, and industry since the inception of the county, and the rural towns have continued to thrive primarily as agricultural service centers and shipping points.

The village of Mapleton, just south of the project area, was first settled in the spring of 1856 under the name of Sherman. The original settlers belonged to a colony named the "Minnesota Settlement Association" that was actually based in New York. The first store, school, and post office were established in 1857, and a sawmill was built on the Maple River in 1858. The town of Mapleton was formally organized by a town meeting in April, 1861. It was named after the Maple River, which was the source of abundant maple trees for milling. A new townsite was platted in January, 1871 near the original settlement, and it was formally incorporated by the state legislature in February, 1878. The town continued to grow and soon had a newspaper, a separate school house, a number of stores and churches, and by the turn of the century Mapleton had municipal water, sewer, and electric service.

The town of Beauford, known as "Beauford Corners," is located approximately 0.5 mile north of the project area. Remnant structures include an unoccupied creamery, a schoolhouse, the Methodist Church, and several original houses. The town was established in March, 1866, following removal to the reservation of the local Winnebago people in 1863 – Beauford was originally named "Winneshiek" after a prominent member of that tribe. The following historical summary is drawn from Palmer (1997).

The first settler in Beauford was James Morrow, a Scotsman who came from Ontario, Canada in March 1864 and built a log cabin in the northwest corner of Section 25. A sawmill was built on the Cobb River in 1865 west of the future town site. The township's first school was created in 1866, and this may be the school depicted on the 1874 plat map just north of the project area (Andreas 1874). Classes were held in the sawmill building until a wood frame school was constructed the following year. A second sawmill, recorded as 21BEag (see Section 5.2) was built in 1868. The first post office was established in 1867 and was housed in a settler's residence. Mail service was sporadic until 1882 when a postmaster was appointed, but the post office was closed in 1904. The first store was built next to the post office in 1874 and the "United Brethren Church of Beauford" was incorporated in 1884. The church building was started next to the store in that same year and the church was dedicated in 1886. This structure was in place until 1953, when a larger building was constructed and the name was changed from United Brethren to United Methodist. A blacksmith shop was opened in 1880 and it operated until 1897. A second store was built around 1894 and it continued until 1906, when it was converted to a house. Telephone service was established by 1904. Eventually there were three stores in the town and the last of these was open until 1954.

The largest business in Beauford was the Cooperative Creamery, which was organized in 1895 and became one of the most successful in the county. A new building was constructed in 1931 and operations continued until 1955. The creamery building became the headquarters for a mink ranch in 1961.

The decline of Beauford Corners was set when the railroad passed by without a stop. Following the closing of the post office in 1904, rural residents no longer needed to visit the town for mail and this reduced business at the local stores. The increasing popularity of automobiles after the turn of the century also allowed township residents to shop in bigger towns, such as nearby Mapleton and Mankato. The need for blacksmithing decreased as farmers switched from horses

to tractors and the local sawmill was unable to compete with larger operations nearby. Finally, in 1953 the school district was closed and Beauford students were bused to Mapleton. As of 1997, the population of the village stood at about 50 and today, an auto-salvage operation is the only business remaining along the former front of the village.

7. ENVIRONMENTAL BACKGROUND

7.1 Modern Environment

The project area is in a rural area along TH 22 and extends across the Cobb River Valley in south-central Minnesota in Blue Earth County. The landscape in the project area included the uplands adjacent to the Cobb River valley, side slopes of valley, and the river terrace. The area is primarily woods and agricultural fields, with small areas of lawn.

7.2 Glacial History

The most recent glacial activity in the region occurred during the Late Wisconsin glaciation at the end of the Pleistocene when much of the Upper Midwest was buried beneath glaciers. The Des Moines lobe covered much of western and east-central Minnesota, receding and advancing several times between 13,000 and 9,700 years BC when it finally retreated (Clayton and Moran 1982; Gilbertson 1990). The project area is situated near the eastern extent of the Des Moines lobe. These glacial deposits shaped the surficial features of the landscape that characterize the region today. Meltwater from the glaciers established the drainage system through which many of the modern day streams in the region flow, including the Minnesota River.

7.3 Physiography

The project area is located in the Blue Earth Till Plain physiographic region, which is characterized as a generally featureless till plain of the interior portion of the Des Moines lobe (Wright 1972). The southern portion of this region, including the project area, is notably flat because it was covered by Glacial Lake Minnesota.

The project area is mapped as glacial lake sediment (clay and silt) on the Geologic Map of Minnesota – Quaternary Geology (Hobbs and Goebel 1982). The Cobb River Valley contains Holocene alluvium. Specific landforms in the project area include uplands adjacent to the Cobb River valley, side slopes of the valley, and the river terrace. The north side of the Cobb River has an extensive low terrace. The south side of the river abuts the valley wall.

7.4 Hydrology

The Cobb River is part of the Blue Earth River drainage system, which was established at the end of the Late Wisconsinan, as meltwater drained from the glaciers. The Blue Earth River watershed drains a large area of north-central Iowa and south-central Minnesota, flowing northwards and draining into the Minnesota River at Mankato, before ultimately joining the Mississippi River at St. Paul. The Minnesota and Mississippi rivers drain a vast area, extending across the prairies of southern Minnesota and the woodlands of northern and southeastern Minnesota. The drainage network provided a link between these ecological zones and was likely a route for the transmission of people, goods, and ideas during the precontact period.

7.5 Modern Ecology

The prairie-woodland ecotone boundary is located just east of the project area and extends in a long arc from southwestern Manitoba across southeast Minnesota to Texas. In general, the landscape on the east side of the ecotone is forest and on the west side is prairie grasses. The Minnesota portion of this ecotone is the result of the glacial topography of the region and of

climatic forces that are driven by three prevailing air masses: the typically warm and dry Pacific that fuels prevailing westerly winds, the cold and dry Polar air that comes from the north, and the warm and moist Gulf air that brings humidity and fuel for storms from the south (Schirmer et al. 2014:25). These air masses help create the strong climatic seasonality and ecological characteristics of the prairie landscape that developed in the area during the post-glacial period.

The Minnesota Department of Natural Resources (MnDNR) used Marschner's 1974 Map of Original Vegetation, the Soil Survey from 1908, and other historic maps to prepare a study of *The Natural Vegetation at the Time of the Public Land Survey 1847-1907* (MnDNR 1998). While the project area is located in the tallgrass prairie biome, the greater Blue Earth County area also includes the eastern deciduous forest biome known as the Big Woods to the east and north of the project area. At the time of the public land survey in Blue Earth County (ca. 1850s), floodplain forests and oak woodlands were found along the banks and floodplains of the major rivers, including the Minnesota, Le Sueur, Blue Earth, Maple, and Cobb. In addition to upland prairies, significant areas of prairie wetlands, woodlands, and shallow lakes were noted across much of the county prior to extensive draining for agriculture.

Also prior to Euro-American modifications of the landscape, the MnDNR study notes that natural disturbances caused by drought, windstorms, and insect outbreaks impacted the vegetation on local and regional scales. Fires were also a very important factor in landscape evolution, often being started by lightning, but also having cultural origins as native peoples set burns to maintain open land for hunting. These fires were essential in maintaining the species composition of the tallgrass prairie. In areas where fires were less frequent or intense, the spread of trees into the prairie, which began as scattered stands, began to form woodland and parkland communities that eventually developed into the forest/prairie ecotone border to the east of the project area. River valleys and lakeshores provided natural firebreaks, allowing maple, basswood, and elm forest to flourish in these protected areas.

7.6 Post-Glacial Ecology

The project area is located in the Prairie Lake Region, which Anfinson (1997:9) describes as "...a natural region defined by a congruent distribution of tallgrass prairie vegetation and numerous shallow lakes.... It offered rich and varied resources for hunter-gatherers and early horticultural groups."

Regional vegetation changes of the Holocene are inferred primarily from pollen samples preserved in lake-bottom sediments. Analyses of these changes (Schirmer et al. 2014, Williams et al. 2009, Anfinson 1997) show that, following the retreat of the glaciers from their maximum extent, which occurred ca. 12,500 cal BP at Mankato, all of the project area was covered with an open boreal forest comprising grasses and stands of conifer trees mixed with deciduous species such as black ash; a composition that is not seen in modern landscapes. This "spruce parkland" landscape was more open on high ground and was likely swampy or contained open water in the low ground. The parkland evolved into a more uniform spruce forest by ca. 12,000 cal BP. By ca. 11,500 cal BP, deciduous forest had developed across southern Minnesota.

Continued warming and drying of the climate provided the conditions for prairie and oak savannah to flourish in the western and southern parts of the state by ca. 9000 cal BP, and the broad vegetation zones present during the time of initial settlement had begun to develop, with prairie extending from the project area west to the Dakotas, deciduous forest nearby to the north and southeast, and coniferous forest further north. Further warming and drying led to continued expansion of the prairie, which reached its maximum extent and covered all but the northeastern

quarter of the state by ca. 7000 – 6000 cal BP. The end of this "Prairie Period" occurred by ca. 5500 cal BP in southeastern Minnesota and by ca. 3000 cal BP, there was an increase in tree cover (primarily oak) in the Prairie Lake Region, although prairie remained the dominant vegetation type until the advent of intensive farming in the nineteenth century (Anfinson 1997:17).

Williams et al. (2009) suggest that the shifting boundaries of the prairie-forest ecotone in southeastern Minnesota during the mid-Holocene were abrupt and asymmetrical, following a period of relatively rapid deforestation in the early Holocene. Using fossil pollen records and modern surface analogs to map changes in "woody cover," the authors argue that fairly sudden changes in the climate led to a period of widespread large fires. These fires caused a positive feedback loop in which the spread of grasslands increased the frequency of fires, which then accelerated the burning of more forest. The loss of forest cover was also likely exacerbated by climate change-caused outbreaks of pests and pathogens that weakened trees and made forests even more susceptible to fire.

7.7 Plant and Animal Resources

Vegetation at the time of European settlement consisted of prairie on the uplands (Marschner 1974) with mixed woodlands in the river valleys and riparian zones. A wide variety of plant resources in the prairies and woodlands would have provided food, medicine, and utilitarian items to the indigenous people of the region.

Paleoenvironmental data cited by Schirmer et al. (2014) indicate that, although the landscape and environment around the project area changed through time, remnants of the major vegetation types associated with prairies and woodlands would have been present during all of the climatic episodes in limited locales and in varying amounts. The variety of landscape settings, including wetlands, lakes, and streams associated with the Blue Earth River drainage system would have created niche environments around the project area in which a wide and changing variety of vegetation and associated plant and animal resources would have been available.

Aquatic habitats around the project area would have provided fish, clams, small mammals, reptiles, waterfowl, edible tubers, and wild rice. The fauna recovered from site 21BE305 include multiple aquatic and terrestrial species that indicate a wide variety of fauna. Spector (1993:112) reports that the remains of bottom-dwelling fish, such as drumfish, along with turtles have also been found in the archaeological record along the nearby Minnesota River. While these types of aquatic resources may have been limited during warm and dry periods (when water levels declined), they would have remained viable even during those periods in the river valleys and the lake basins around the project area, which would have continued to support a diversity of flora and fauna.

Anfinson (1997) explains that plant foods were much less abundant in the prairie landscape than in the woodlands, consisting primarily of the prairie turnip and a type of bean called ground plum. Most of the prairie vegetation comprised grasses and forbs that provided excellent forage for prey species, primarily bison, with smaller numbers of elk and both white tail and mule deer.

Based on early historical accounts, a wide variety of mammalian game species were present in the Prairie Lake Region, including bison, elk, deer, muskrat, rabbit, beaver, bear, and occasionally antelope (Anfinson 1997; Ernst and French 1977; Herrick 1892). The range and abundance of species has been altered by the loss of natural habitat and hunting so that some species are no longer present. The presence of numerous lakes and rivers in the region attracted a variety of

birds, including ducks, geese, cranes, and swans. Fish included northern pike, gars, suckers, sunfish, perch, and buffalo fish. The wide variety of animal resources in the region would have provided a broad subsistence base for prehistoric inhabitants of the region.

7.8 Soils

Upland soils in the project area are mapped as Nicollett and Le Sueur series, which formed in glacial till of Late Wisconsinan age, and the Shorewood series, which formed in clayey glacial lacustrine sediments and underlying glacial till (Web Soil Survey 2015). Soils on the side-slopes of the valley are mapped as the Storden complex (very steep), which formed in glacial till. Soils on the terrace on the north side of the Cobb River are mapped as the Minneopa series, which formed in outwash. The soils on the terrace have a thick sequence of Holocene alluvium, based on radiocarbon dates obtained from site 21BE305 and the depth of artifacts. The geomorphic investigation at 21BE305 provides more detailed information for the soils on the low terrace in (Appendix A).

8. PHASE I FIELDWORK SUMMARY

Archaeological fieldwork was conducted from July 20 to August 28, 2015. Frank Florin was the principal investigator and field supervisor. The FCRS field crew included Mike Bradford, Greg Felber, Frank Koep, Ryan Letterly, James Lindbeck, Samantha Olson, Amanda Peterson, Valerie Pierce, Kevin Reider, Jeff Shapiro, Michael Strakowski, and Bob Thompson.

The location of the Phase I archaeological survey area and sites identified during the survey are presented on a USGS 7.5' quadrangle map in Figures 2 and 3. The locations of survey areas, sites, and shovel tests discussed in the subsequent section are depicted on aerial imagery in Figure 5. The archaeological survey included 9.9 acres, encompassing the final construction limits and APE, and in a few locations a slightly larger area was surveyed prior to finalizing the project design.

A discussion of the field conditions, physical setting, survey methods, and results of the investigation is presented below. The field methods are described in Section 3.1. Three precontact archaeological sites (21BE305, 21BE307, and 21BE308) and one multicomponent precontact and historical archaeological site (21BE306) were identified during the Phase I survey. Phase II evaluation was conducted at site 21BE305. The sites are discussed in detail in Sections 9 to 11.

8.1 North Side of Cobb River - West Side TH 22

The survey area on the north side of the Cobb River on the west side of TH 22 includes, from north to south: 1) an upland edge at the south end of Oak Hill Cemetery; 2) a side-slope of the valley wall; and 3) a low terrace of Cobb River.

The upland survey area at the south end of Oak Hill Cemetery includes a small area from the retaining wall along the cemetery road to the upland edge. The area from the retaining wall to the south side of the road is a hill cut, and no archaeology testing is needed as a few feet of soil has been removed from this area for construction of the cemetery road. Three shovel tests were dug south of the cemetery property on a narrow strip of wooded land between the cemetery road and the edge of the upland. The tests were placed in 10-meter intervals. Site 21BE307 was identified based on the recovery of lithic debris from one test. The site is discussed in detail in Section 11. A soil profile and a photo for this area are presented with the site discussion.

No shovel testing was conducted on the wooded side-slope of the valley because of excessive slope.

A low terrace of the Cobb River extends from the river to the base of the valley wall. This area is mostly a soybean field with good visibility (90 percent), although woods are present along the river and the northern margin of the field. An abandoned river channel with cattails extends along the northern edge of the field. Deep auger testing was conducted at 15-meter intervals on the terrace. Site 21BE305 was identified based on the recovery lithics and faunal material recovered from several shovel tests. The site is discussed in detail in Section 9. A soil profile and a photo for this area are presented with the site discussion.

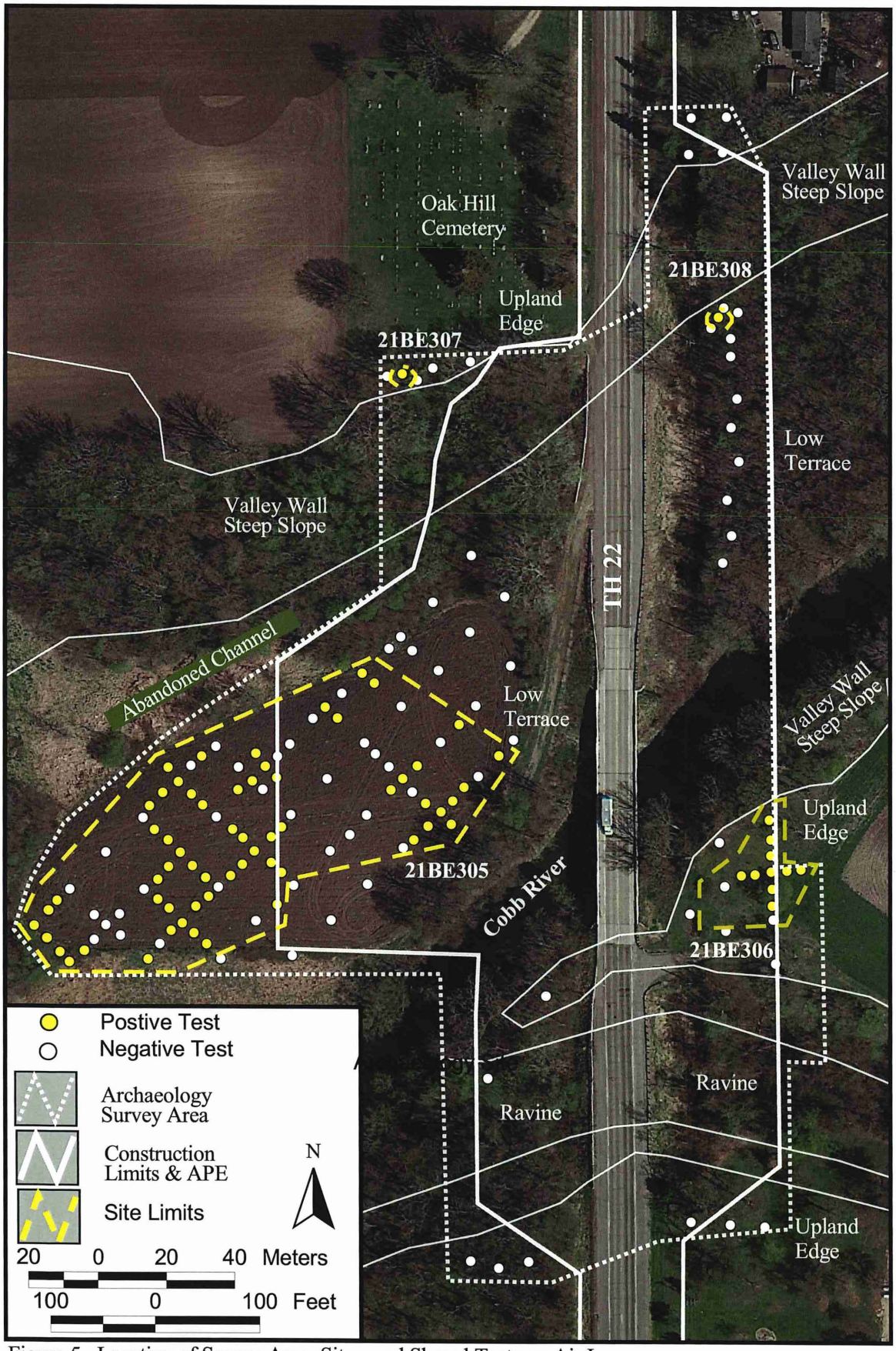


Figure 5. Location of Survey Area, Sites, and Shovel Tests on Air Imagery.

8.2 North Side of Cobb River - East Side TH 22

The survey area on the north side of the Cobb River on the east side of TH 22 includes, from north to south: 1) an upland edge; 2) a side-slope of the valley wall; and 3) a foot-slope and low terrace of Cobb River.

The wooded upland survey area is a small area adjacent to the valley edge. Four shovel tests were dug in this area in 10-meter intervals, and all tests were negative. No shoveling testing was conducted on the wooded valley side-slope because of excessive slope.

A wooded foot slope and low terrace of the Cobb River extends from the river to the base of the valley wall. Deep auger testing was conducted at 10-meter intervals on the terrace. Site 21BE308 was identified based on the recovery of lithic debris from a test. The site is discussed in detail in Section 11. A soil profile and a photo for this area are presented with the site discussion.

8.3 South Side of Cobb River - West Side TH 22

The survey area on the south side of the Cobb River on the west side of TH 22 includes an upland edge that is dissected by a ravine and side-slope of the valley wall.

The wooded upland survey area consists of two small areas separated by a ravine. Three shovel tests were dug in the southern upland area in 10-meter intervals and one test placed in the other upland area near the river. One shovel test was also placed on a semi-level bench at the bottom of the ravine. Tests were dug to an average of 85 cmbs, all tests were negative. No shovel testing was conducted in the wooded ravine or valley side-slope because of excessive slope. No sites were found in this area.

8.4 South Side of Cobb River - East Side TH 22

The survey area on the south side of the Cobb River on the east side of TH 22 includes an upland that is dissected by a ravine and a side-slope of the valley wall. The upland survey area north of the ravine consists of a former farmstead, which is now a lawn and agricultural field. Shovel testing was conducted at 15-meter intervals, and historical and precontact artifacts were recovered. The site, designated 21BE306, is discussed in detail in Section 10. A soil profile and a photo for this area are presented with the site discussion.

The upland survey area south of the ravine is the lawn of an existing farmstead. Three shovel tests were dug in 10-meter intervals. Tests were dug to an average of 80 cmbs, and all tests were negative. No shovel testing was conducted in the wooded ravine or valley side-slope because of excessive slope.

9. SITE 21BE305

9.1 Overview

Site 21BE305 is an Archaic period habitation located in the proposed holding pond area on the west side of TH 22. The site is in T106N, R26W, Section 9 and occupies an area of approximately 140 by 65 meters, encompassing 1.8 acres (Figures 2 and 3). The UTM coordinates for the center of the site are E423060 N4872350 (1983 NAD Zone 15). A map of the site on aerial imagery is presented in Figure 6, and the location of the final design of the holding pond is in Figure 7. A photo of the site area is included in Figure 8.

9.2 Physical Setting

The site is on the west side of TH 22 in a soybean field on a low terrace on the north side of the Cobb River. An abandoned channel and the steeply sloping valley wall of the Cobb River border the site on the north. The site likely continues westward across the terrace outside the survey area. The site extends from 25 to 165 meters west of TH 22. The TH 22 bridge and ROW along the site area have been raised approximately six meters above the terrace. Surface visibility was very good (90 percent) in the soybean field.

9.3 Soils and Geomorphology

The following discussion includes information from the geomorphological investigation in Appendix A and observations made during archaeological excavations. The Cobb River incised glacial lake sediment and tills to form the relatively narrow, deep valley that is present today. Three alluvial strata were defined on the low terrace from the geomorphological investigations at the site. These strata are referred to as the Upper, Middle, and Lower sequences. Artifacts were recovered from each of these sequences at depths from 110 to 400 cmbs. The ages of the sequences were estimated from radiocarbon dates on animal bone. Cross-section maps of site stratigraphy and additional soils information are contained in the geomorphological investigation in Appendix A. The water table is at approximately 150 cmbs.

The Lower sequence consists of stratified sand and gravelly sands, with occasional poorly sorted, finer-grained (sandy loam-loam-clay loam) interbeds, which sometimes have a darker color due in part to organics. Wood and shell were present in some tests. The Lower sequence is alluvial channel bedload deposits. The finer grained interbeds are either the result of lower energy flooding or spatial variations in flood energy in the channel and near channel depositional environment. The upper surface of this stratum is likely a series of bars and various sized channels that were infilled with the Middle sequence deposits. The sandy nature of this stratum caused test holes to slump when this stratum was penetrated, therefore archaeological testing often did not extend deep into this stratum, although in some tests penetration was deeper due to finer-textured deposits.

The Middle sequence is silty clay loam to clay with small percentages of very fine sand. Occasionally, thin beds or laminae of sandier sediment occur. Fine roots, wood, plant fragments, shell, and moderate amounts of bone occur in some tests. The Middle sequence is abandoned channel/floodbasin deposits that infilled the lows and covers bars on the upper surface of the Lower Alluvial Sequence. It occurs across most of the site area, except in a few locations where it was either not deposited or eroded when the Upper sequence was deposited. An ACb or ACgb horizon (buried A horizon) is present in some areas, but most of the pedogenic modifications are due to wet soil conditions and include gleyed colors and redox features.

The Upper sequence consists of very fine sand, silt, and clay in varying proportions but is generally poorly sorted. Fine gravel also occurs in trace amounts. A moderately developed soil is formed in the sequence from the modern surface. No plant remains or shell was present, and bone was scarce.

The chronology and age of the stratigraphic sequences can be inferred from radiocarbon dates on bone. One date of ca. 2500 RCYBP (cal. 2600 BP) was obtained from the Upper sequence, and there was also an anomalous old date of ca. 5400 RCYBP (cal. 6200 BP) from the bottom of the Upper or top of the Middle sequence, which is considered too old and probably was redeposited in alluvium. Two dates of ca. 3700 RCYBP (cal. 4100 BP) were obtained from samples in the Middle sequence, and a date of ca. 4300 RCYBP (cal. 5000 BP) was obtained from the bottom of the Middle or top of the Lower sequence. Three radiocarbon dates of ca. 3800, 4300, and 6400 RCYBP (cal. 4300, 5000, 7300 BP) were obtained from samples in the Lower sequence.

9.4 Phase I Survey Methods and Results

The site was identified during Phase I shovel testing in 15-meter intervals for the holding pond. A total of 12 Phase I shovel tests contained 96 artifacts, including lithic debris, stone tools, and faunal material (Table 5). Artifacts were recovered from 120 to 300 cmbs, excluding the gopher tooth from ST 41W 60 to 80 cmbs, which is probably noncultural. Two deep auger tests were dug at each test location to recover a volume of soil equivalent to a standard shovel test.

Table 5. Site 21BE305 Summary of Artifacts from Phase I Shovel Tests.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
3W	0-300*	NA	1	Nonbifacial flake, Prairie du Chien Chert (oolitic)
11W	230-240	Middle	1	Turtle, plastron fragment
			8	Turtle, carapace/plastron fragment
			2	Vertebrata, unidentifiable fragment
19W	240	Lower	1	Mammalian, large, tooth enamel fragment
			1	Mammalian, large, longbone shaft fragment
			7	Turtle, carapace/plastron fragment
			2	Mammalian, unidentifiable fragment
			2	End scraper, Galena Chert
21W	120-140	Upper	1	Other G4 flake, quartz
	180-200	Middle	2	Mammalian, medium/large, unidentifiable fragment
	270-280	Lower	1	Turtle, carapace/plastron fragment
			4	Mammalian, unidentifiable fragment
			2	Vertebrata, unidentifiable fragment
23W	240-270	Middle	1	Mammalian, large, longbone shaft, fragment
			2	Vertebrata, unidentifiable fragment
	290-300	Lower	1	Ondatra zibethicus (muskrat), femur, left proximal fragment
			1	Ondatra zibethicus (muskrat), scapula, right distal fragment
			1	Ondatra zibethicus (muskrat), ilium, left fragment
			4	Colubridae (snake), vertebra fragment
			2	Vertebrata, unidentifiable fragment, burned
			1	Broken flake, quartzite

Table 5. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
25W	140-150	Upper	3	Vertebrata, unidentifiable fragment
	290-300	Lower	1	Colubridae (snake), vertebra fragment
			1	Emydidae (turtle), carapace fragment
			4	Turtle, carapace/plastron fragment
			1	Vertebrata, unidentifiable fragment
27W	260-270	Middle	1	Ondatra zibethicus (muskrat), vertebra, caudal fragment
28W	260-270	Middle	1	Emydidae (turtle), neural fragment
31W	280-300	Lower	1	Ondatra zibethicus (muskrat), maxilla, right fragment
			2	Mammalian, unidentifiable fragment, burned
			2	Mammalian, unidentifiable fragment, calcined
			1	End scraper, unidentified chert
			1	Shatter, quartzite
			1	Shatter, unidentified material
36W	290-300	Lower	1	Ondatra zibethicus (muskrat), humerus, right, distal fragment
40W	270-290	Lower	3	Mammalian, large, unidentifiable fragment
	270-300	Lower	1	Mammalian, large, unidentifiable fragment, burned
41W	60-80	Upper	1**	Geomys bursarius (plains pocket gopher), tooth, incisor fragment
	120-130	Upper	1	Odocoileus virginianus (white-tailed deer), tooth, molar fragment
	230-250	Middle/ Lower	4	Mammalian, unidentifiable fragment
			6	Vertebrata, unidentifiable fragment
	250-290	Lower	2	Ondatra zibethicus (muskrat), humerus, right distal fragment
			1	Molluscan, unidentifiable fragment
			1	Mammalian, large, longbone fragment
			1	Mammalian, small, longbone shaft, fragment
			4	Vertebrata, unidentifiable fragment
			1	Utilized flake, unidentified chert
			1	Bipolar flake, quartzite
Total	-	-	**96**	-

* artifact found in backdirt pile – depth uncertain; ** probably noncultural

9.5 Phase II Testing Methods

The archaeological components were primarily below the water table across most of the site and often occurred in the Lower sequence, which is sandy. It was not practical or feasible to dig XUs below the water table in the sandy Lower sequence, as the soil easily slumps. Therefore, XUs were dug at a location where there was a high density of artifacts in the Middle sequence. The remaining site area was evaluated by digging tests primarily in five-meter intervals adjacent to the positive Phase I tests. Phase II shovel testing employed a backhoe to remove the upper 80 cm of soil at most test locations so that testing could be conducted more efficiently and extend deeper. The Phase II close-interval radial shovel tests were numbered based on the direction and distance from the Phase I test. For example, Shovel Test 1WW7 is located seven meters grid west of Shovel Test 1W.

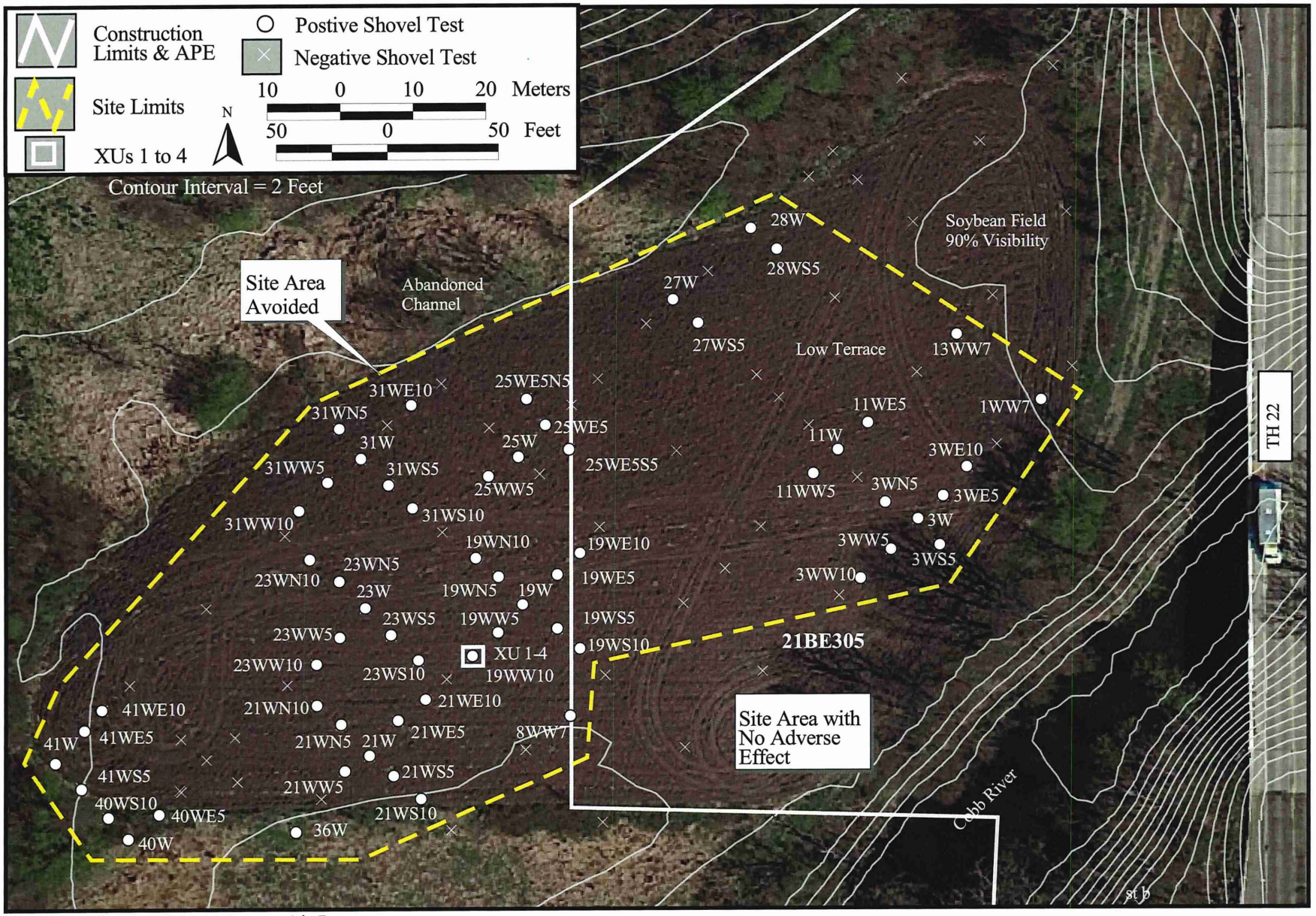


Figure 6. Site 21BE305 Map on Air Imagery.

9.6 Phase II Shovel Testing

Phase II shovel tests were dug in five- (and occasionally 7.5) meter intervals adjacent to the positive Phase I tests. A total of 49 Phase II shovel tests contained artifacts, including faunal material lithic debris, two stone tools, and a core (Table 6). Artifacts were recovered from 110 to 400 cmbs. Two deep auger tests were dug at each test location to recover a volume of soil equivalent to a standard shovel test.

Table 6. Site 21BE305 Summary of Artifacts from Phase II Shovel Tests.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
1WW7	320-335	Lower	1	Lithobates (frog), tibia/fibula shaft, fragment
	345-360		1	Ondatra zibethicus (muskrat), tooth, incisor fragment
			1	Turtle, carapace fragment, burned
			3	Mammalian, unidentifiable fragment
			3	Ondatra zibethicus (muskrat), pelvis, ilium, and ischium fragment
	360-380		20	Mammalian, unidentifiable fragment
			1	Nonbifacial flake, silicified wood
	380-400		1	Turtle, carapace/plastron fragment
			11	Mammalian, unidentifiable fragment
3WN5	280-290	Lower	1	Ondatra zibethicus (muskrat), maxilla, right fragment
			1	Ondatra zibethicus (muskrat), cranium fragment
3WS5	220-240	Lower	1	Bipolar flake, quartz
	240-265		1	Bison bison (bison), tooth, premolar/molar fragment
			2	Mammalian, large, unidentifiable fragment
			1	Ondatra zibethicus (muskrat), maxilla, right fragment
			1	Mammalian, small, ilium, lef tfragment
			2	Mammalian, unidentifiable fragment
			1	Nonbifacial flake, quartzite
3WW5	235-250	Lower	1	Turtle, carapace/plastron fragment
			1	Geomys bursarius (plains pocket gopher), humerus, left distal fragment
			1	Geomys bursarius (plains pocket gopher), ulna, left proximal fragment
			7	Mammalian, unidentifiable fragment
			1	Other G4 flake, unidentified material
	250-260		1	Mammalian, unidentifiable fragment
			1	Vertebrata, unidentifiable fragment
	260-275		1	Anas crecca/discors (teal), tibiotarsus, right distal fragment
			1	Mammalian, medium/large, petrosal fragment
			1	Emydidae (turtle), peripheral fragment
			2	Mammalian, unidentifiable fragment
	285-300		1	Emydidae (turtle), peripheral fragment
			1	Ondatra zibethicus (muskrat), caudal fragment

Table 6. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
3WW10	240-250	Middle/ Lower	3	Turtle, carapace/plastron, fragment
			1	Nonbifacial flake, Prairie du Chien Chert (oolitic)
	250-260	Lower	1	Emydidae (turtle), plastron fragment
			1	Emydidae (turtle), peripheral fragment
			1	Turtle, carapace/plastron fragment
			1	Ondatra zibethicus (muskrat), mandible, left fragment
			1	Ondatra zibethicus (muskrat), vertebra, caudal fragment
			1	Colubridae, vertebra fragment
			2	Molluscan, unidentifiable fragment
			2	Mammalian, unidentifiable fragment, burned
			1	Mammalian, unidentifiable fragment, calcined
			1	Vertebrata, unidentifiable fragment
	270-280	Lower	1	Chrysemys picta (painted Turtle), hyoplastron, left fragment
			1	Turtle, carapace/plastron fragment
			1	Mammalian unidentifiable fragment
			2	Vertebrata, unidentifiable fragment
3WE5	240-250	Middle	1	Fish, vertebra, centrum fragment
			1	Emydidae (turtle), peripheral fragment
			1	Turtle, carapace/plastron fragment
			2	Bird, longbone shaft, fragment
			1	Ondatra zibethicus (muskrat), ilium, left fragment
			2	Mammalian, large, longbon, eshaft, fragment
	260-270	Lower	1	Turtle, carapace/plastron,fragment
			1	Mammalian, medium/large, petrosal, fragment
	270-280		1	Ondatra zibethicus (muskrat), vertebra, sacrum centrum fragment
			1	Turtle, carapace fragment
			1	Bird, radius, right shaft, fragment
			2	Vertebrata, unidentifiable fragment
	290-300		1	Ondatra zibethicus (muskrat), femur, right proximal fragment
			1	Ondatra zibethicus (muskrat), tibia, right shaft, fragment
			1	Vertebrata, unidentifiable fragment
	300-310		1	Mammalian, large, unidentifiable fragment
			1	Ondatra zibethicustibia, left proximal fragment
			1	Mammalian, unidentifiable fragment
			1	Mammalian, unidentifiable fragment, burned
			1	End scraper, Western River Group
3WE10	240-250	Middle/ Lower	7	Mammalian, large, longbone shaft, fragment, charred
			1	Emydidae (turtle), peripheral fragment
	250-260	Lower	1	Geomys bursarius (plains pocket gopher), ulna, right shaft, fragment
			1	Emydidae (turtle), peripheral fragment

Table 6. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
3WE10	260-270	Lower	1	Chrysemys picta (painted Turtle), nuchal fragment, cut marks
			1	Ondatra zibethicus (muskrat), tooth, molar, burned
			1	Mammalian, medium/large, unidentifiable fragment, burned
			2	Vertebrata, unidentifiable fragment, burned
			1	Broken flake, unidentified chert
	280-290		1	Broken flake, unidentified material
	290-300		1	Chrysemys picta (painted turtle), 1st pleural, left fragment
			2	Turtle, carapace/plastron fragment
8WW7	250-260	Middle/ Lower	1	Chrysemys picta (painted Turtle), epiplastron, right fragment
			1	Ondatra zibethicus (muskrat), tooth, incisor fragment
	265-275	Lower	1	Ondatra zibethicus (muskrat), femur, left shaft, fragment
			1	Mammalian, small, humerus, right distal fragment
	280-290		1	Ondatra zibethicus (muskrat), calcaneus fragment
			1	Turtle, carapace/plastron fragment
	300-315		1	Ondatra zibethicus (muskrat), scapula, left distal fragment
			1	Turtle, carapace/plastron fragment
			1	Mammalian, unidentifiable fragment
11WE5	325-340	Lower	1	Emydidae (turtle), carapace fragment
			1	Mammalian, medium/large, unidentifiable fragment, burned
			1	Bison bison (bison), tooth, premolar/molar fragment, burned
11WW5	320-345	Lower	1	Turtle, carapace fragment
			1	Ondatra zibethicus (muskrat), tooth, molar fragment
	370-390		1	Broken flake, Hixton Group Quartzite
			1	Mammalian, large, longbone shaft, fragment, burned
13WW7	310-320	Lower	1	Broken flake, unidentified chert
			1	Mammalian, unidentifiable fragment
	320-330		1	Turtle, carapace/plastron fragment
			2	Vertebrata, unidentifiable fragment
19WN5	245-255	Lower	1	Ondatra zibethicus (muskrat), humerus, right distal fragment
			1	Emydidae (turtle), peripheral fragment
			1	Mammalian, large, longbone shaft, fragment
			3	Mammalian, unidentifiable fragment
			1	Vertebrata, unidentifiable fragment
	260-270		1	Nonbifacial flake, unidentified material
			1	Broken flake, basaltic
			1	Shatter, unidentified chert
			1	Bison bison (bison), tooth, incisor, complete
			1	Turtle, neural, complete
			1	Mammalian, unidentifiable fragment
	270-280		1	Turtle, carapace/plastron fragment
			1	Turtle, carapace/plastron fragment, burned
			1	Geomys bursarius (plains pocket gopher), tooth, incisor, fragment, burned
	280-290		2	Geomys bursarius (plains pocket gopher), mandible, right anterior, fragment

Table 6. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
19WN10	275-290	Lower	1	Shatter, unidentified material
			1	Ondatra zibethicus (muskrat), humerus, right distal fragment
			1	Turtle, peripheral fragment
			1	Mammalian, large, unidentifiable fragment
			1	Mammalian, small, longbone shaft, fragment
			1	Mammalian, unidentifiable fragment
			1	Rodentia, tooth, incisor fragment
19WS5	240-250	Lower	1	Broken flake, quartzite
			1	Broken flake, Galena Chert
19WS10	240-250	Lower	1	Mammalian, small, cranium fragment
	260-280		1	Other G4 flake, unidentified material
			1	Lithobates (frog), ilium, left, complete
			1	Turtle, carapace fragment
			1	Ondatra zibethicus (muskrat), tooth, molar fragment, burned
			3	Mammalian, medium/large, unidentifiable fragment
	325-335		1	Mammalian, medium/large, unidentifiable fragment
	340-355		1	Mammalian, large, unidentifiable fragment
19WE5	220-230	Middle/ Lower	1	Emydidae (turtle), hypoplastron, left fragment
			1	Mammalian, unidentifiable fragment
	230-240	Lower	1	Turtle, carapace/plastron fragment
	240-260		1	Nonbifacial flake, unidentified chert
			4	Mammalian, unidentifiable fragment
	260-270		1	Core, bipolar (not rotated), unprepared, unidentified chert
			1	Mammalian, large, unidentifiable fragment
			1	Geomys bursarius (plains pocket gopher), tooth, incisor fragment
19WE10	260-270	Lower	1	Other G4 flake, Prairie du Chien Chert (oolitic)
			1	Turtle, carapace fragment
19WW5	245-255	Lower	1	Mammalian, large, tooth, premolar/molar fragment, burned
			1	Ondatra zibethicus (muskrat), mandible, right fragment
			1	Turtle, carapace/plastron fragment
			2	Mammalian, unidentifiable fragment
	255-265		1	Ondatra zibethicus (muskrat), femur, right proximal fragment
			1	Mammalian, small phalanx, complete
19WW10	220-240	Middle	1	Bison bison (bison), sacrum, anterior, fragment
			5	Bison bison (bison), vertebra, lumbar, centrum fragment
			43	Bison cf. sp., unidentifiable fragment
			171	Mammalian, large, unidentifiable fragment
			434	Mammalian, unidentifiable fragment
	265-280	Lower	1	Rodentia, cranium fragment
			5	Mammalian, large, unidentifiable fragment
			12	Mammalian, unidentifiable fragment
	290-300		1	Mammalian, large, unidentifiable fragment
			1	Mammalian unidentifiable fragment

Table 6. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
21WN5	270-280	Lower	1	Ondatra zibethicus (muskrat), tooth, incisor fragment
			2	Turtle, carapace/plastron fragment
	290-295		1	Mammalian, small, metapodial proximal fragment
			4	Mammalian, unidentifiable fragment
21WN10	110-120	Upper	1	Mammalian, large, longbone shaft, fragment, burned
	245-260	Middle/ Lower	1	Colubridae (snake), vertebra fragment
			1	Mammalian, small, ischium, right fragment
			1	Vertebrata, unidentifiable fragment
21WS5	235-245	Middle	1	Turtle, carapace/plastron fragment
			1	Vertebrata, unidentifiable fragment
	280-290	Lower	1	Mammalian, large, longbone shaft, fragment
	290-300		1	Turtle, peripheral fragment
21WS10	270-280	Lower	1	Mammalian, unidentifiable fragment
	280-295		1	Ondatra zibethicus (muskrat), calcaneus fragment
			2	Ondatra zibethicus (muskrat), tooth, incisor fragment
			5	Turtle, carapace/plastron fragment
	300-310		1	Anura (frog/toad), vertebra fragment
			1	Mammalian, small, cranium fragment
			1	Turtle, carapace/plastron fragment
			4	Mammalian, unidentifiable fragment
	310-320		1	Ictidomys tridecemlineatus (ground squirrel), mandible, right fragment
	315-330		1	Broken flake, Prairie du Chien Chert
			1	Geomys bursarius (plains pocket gopher), tooth fragment
			1	Mammalian, medium/large, unidentifiable fragment
			1	Mammalian, small, phalanx fragment
			2	Turtle, carapace/plastron fragment
21WE5	255-265	Lower	2	Vertebrata, unidentifiable fragment
	270-280		1	Geomys bursarius (plains pocket gopher), ulna, right shaft, fragment
			2	Mammalian, unidentifiable fragment
21WE10	335-345	Lower	1	Ondatra zibethicus (muskrat), tooth, incisor fragment
			1	Ondatra zibethicus (muskrat), vertebra, caudal
	365-375		1	Ameiurus sp. (bullhead), dentary, right fragment
21WW5	250-260	Middle/ Lower	1	Turtle, carapace fragment
	260-270		1	Other G4 flake, quartzite
			1	Mammalian, medium/large, unidentifiable fragment
	270-280	Lower	1	Ondatra zibethicus (muskrat), tibia, left distal fragment
			2	Mammalian, unidentifiable fragment
			1	Vertebrata, unidentifiable fragment
	290-305		4	Emydidae (turtle), plastron fragment

Table 6. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
23WN5	120-150	Upper/ Middle	2	Mammalian, unidentifiable fragment
	130-155		1	Bird, femur, right shaft, fragment, gnawed
	225-240	Middle/ Lower	1	Other G4 flake, quartzite
	230-240		1	Ondatra zibethicus (muskrat), vertebra, cervical fragment
			2	Turtle, carapace/plastron fragment
	240-250		1	Ameiurus sp. (bullhead), cleithrum, right fragment, burned
			1	Geomys bursarius (plains pocket gopher), humerus, right distal fragment
			4	Turtle, carapace/plastron fragment
			2	Vertebrata, unidentifiable fragment
	255-260		2	Vertebrata, unidentifiable fragment
	260-270		1	Mammalian, unidentifiable fragment
	270-275		1	Colubridae (snake), vertebra fragment
23WN10	300-310	Middle/ Lower	2	Mammalian, unidentifiable fragment
	320-330	Lower	1	Mammalian, unidentifiable fragment
23WS5	275-285	Middle/ Lower	1	Mammalian, medium, longbone shaft, fragment, burned
23WS10	320-330	Lower	1	Ameiurus sp. (bullhead), cleithrum, right fragment
			1	Fish, cranium fragment
	355-360		1	Anaxyrus sp. (bullhead), ilium, right fragment
			1	Vertebrata, unidentifiable fragment
23WW5	270-280	Middle/ Lower	1	Chrysemys picta (painted turtle), epiplastron, right fragment
23WW10	320-330	Lower	1	Ondatra zibethicus (muskrat), tooth, incisor fragment, burned
			2	Vertebrata, unidentifiable fragment
	340-350		2	Mammalian, unidentifiable fragment
25WE5S5	260-270	Middle/ Lower	1	Ameiurus sp. (bullhead), ceratchyal & epihyal, right, complete
	310-320	Lower	1	Mammalian, small, ulna, left shaft, fragment
	320-330		1	Ondatra zibethicus (muskrat), mandible, left fragment, burned
			1	Emydidae (turtle), peripheral fragment
	340-350		1	Geomys bursarius (plains pocket gopher), mandible, right anterior, fragment
25WE5	130-140	Upper/ Middle	5	Bison bison (bison), tooth, premolar/molar fragment
	140-150		7	Bison cf. sp., unidentifiable fragment
25WE5N5	320-340	Lower	1	Broken flake, Red River Chert
			1	Mammalian, medium/large, longbone shaft, fragment
25WW5	325-345	Middle	2	Mammalian, large, longbone fragment, gnawed
			1	Vertebrata, unidentifiable fragment, calcined
27WS5	310-320	Middle/ Lower	1	Vertebrata, unidentifiable fragment
	330-340		1	Mammalian, medium/large, unidentifiable fragment, burned
	350-360	Lower	1	Mammalian, large, unidentifiable fragment
			3	Vertebrata, unidentifiable fragment, burned

Table 6. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
28WS5	200-205	Middle	1	Ondatra zibethicus (muskrat), mandible, right fragment
	280-290	Lower	3	Turtle, carapace/plastron fragment
			2	Mammalian, unidentifiable fragment
	360-370		1	Broken flake, quartzite
			1	Mammalian, medium/large, unidentifiable fragment, burned
31WN5	350-370	Lower	1	Decortication flake, basaltic
			1	Mammalian, large, longbone shaft, fragment
31WS5	265-290	Lower	1	Emydidae (turtle), neural fragment
			1	Bird, longbone shaft, fragment, burned
	290-305		1	Castor canadensis (beaver), tooth, incisor fragment, burned
			2	Mammalian, unidentifiable fragment, burned
			2	Vertebrata, unidentifiable fragment
	305-310		1	Ondatra zibethicus (muskrat), tooth, incisor fragment, burned
			1	Colubridae (snake), vertebra fragment
			1	Turtle, carapace fragment
			1	Mammalian, unidentifiable fragment
	315-325		1	Mammalian, unidentifiable fragment
	325-345		1	Ameiurus melas (bullhead), pectoral spine, left, complete
			2	Turtle, carapace/plastron fragment
			2	Mammalian, unidentifiable fragment
31WS10	330-340	Lower	1	Broken flake, Swan River Chert
			1	Ondatra zibethicus (muskrat), femur, right proximal fragment
	350-360		1	Mammalian, large, unidentifiable fragment
			1	Vertebrata, unidentifiable fragment
31WE10	200-210	Middle	1	Mammalian, small, longbone shaft, fragment
	300-310	Lower	2	Turtle, carapace/plastron fragment
			2	Vertebrata, unidentifiable fragment
	350-360		1	Ondatra zibethicus (muskrat), tooth, molar fragment, burned
31WW5	350-360	Lower	1	Broken flake, quartz
31WW10	290-310	Lower	4	Mammalian, unidentifiable fragment
40WE5	250-265	Middle/ Lower	3	Vertebrata, unidentifiable fragment
41WS5	315-325	Lower	1	Ondatra zibethicus (muskrat), tibia, right shaft, fragment
			3	Turtle, carapace/plastron fragment
41WS10	280-295	Lower	1	Other G4 flake, unidentified material
	305-335		1	Vertebrata, unidentifiable fragment
	335-345		1	Mammalian, large, unidentifiable fragment, gnawed
			1	Microtus sp. (vole), mandible, left fragment
	345-350		1	Colubridae (snake), vertebra fragment
			1	Vertebrata, unidentifiable fragment, calcined
	350-355		1	Mammalian, unidentifiable fragment
	355-360		1	Other G4 flake, Swan River Chert
			1	Vertebrata, unidentifiable fragment, calcined
	360-365		1	Ondatra zibethicus (muskrat), mandible, right , burned
			1	Other G4 flake, quartz

Table 6. Continued.

Shovel Test	Depth (cmbs)	Strata	Count	Artifact type
41WE5	265-275	Middle	1	Other G4 flake, unidentified chert
	300-305	Lower	1	Bison bison (bison), rib shaft, fragment
41WE10	260-275	Lower	1	Utilized flake, Western River Group
Total	-	-	**1071**	-

9.7 Phase II XUs 1 to 4

XUs 1 to 4 were a contiguous block of units placed at the location of ST 19WW10, which contained a concentration of faunal material at 220 to 240 cmbs. A backhoe was used to remove the historic and culturally sterile deposits to a depth of 150 cmbs. Several nearly complete bison bones were encountered at 150 cmbs. These remains, which also include many smaller fragments (n=111) were collected as Findspots 1 and 2 (Table 7). Another large bison bone was present at this depth along the eastern wall of the trench, but it was not recovered. Findspot 3 was recovered in the sump pit adjacent to XU 2.

Table 7. Site 21BE305 Summary of Artifacts from Findspots Near XUs 1 to 4.

Find Spot	Depth (cmbs)	Strata	Count	Artifact Type
1	150-160	Middle	5	Bison bison (bison), vertebra, lumbar fragment
			1	Bison bison (bison), vertebra, thoracic centrum fragment
			69	Bison bison (bison), vertebra fragment
2	155-165	Middle	1	Bison bison (bison), vertebra, axis fragment
			1	Bison bison (bison), horn fragment
			29	Bison bison (bison), cranium fragment
			1	Bison bison (bison), vertebra, atlas complete
			3	Bison bison (bison), vertebra, cervical fragment
			1	Bison bison (bison), basioccipital fragment
3	172-177	Middle	1	Bison bison (bison), vertebra, cervical centrum fragment
			5	Bison bison (bison), vertebra, cervical fragment
			1	Bison bison (bison), vertebra, thoracic neural spine, **cut marks**
Total	-	-	**118**	-

Excavation was conducted in 10-cm levels below a unit datum, whose relative elevation was established in cm below surface (cmbs). XUs were placed in this location because of the high artifact density in the Middle sequence, which was less likely to slump than the sandy Low sequence. Excavation began at 150 cmbs in all XUs and extended to 210 cmbs in XU 1, 240 cmbs in XU 2, and 220 cmbs in XUs 3 and 4. Excavation was terminated at these depths because of the lack of artifacts and slumping soils in the sandy Lower sequence that were undercutting the XU walls. A summary of artifacts recovered in the units is presented in Tables 8 and 9. Photos of the backhoe trench and XUs 1 to 4 are included in Figures 9 and 10.

Table 8. Site 21BE305 Artifacts by Count in XUs 1 to 4.

Depth (cmbs)	Strata	Faunal	Faunal Thermally Altered	Lithic Debris	Lithic Tool/Core	FCR	Total	%
140-160	Middle	47	-	-	-	-	47	10
150-160	Middle	4	-	1	-	-	5	1
160-170	Middle	92	-	4	-	1	97	21
170-180	Middle	249	-	3	1	1	254	55
180-190	Middle	31	-	2	-	-	33	7
190-200	Middle	5	-	1	-	-	6	1
200-210	Middle	1	-	-	-	-	1	<1
210-220	Middle/ Lower	8	1	-	-	-	9	2
220-230	Lower	6	-	-	-	-	6	1
230-240	Lower	3	-	1	-	-	4	1
Total	-	446	1	12	1	2	462	-
%	-	97	<1	3	<1	<1	-	100

Table 9. Site 21BE305 Artifacts by Weight from XUs 1 to 4.

Depth (cmbs)	Strata	Faunal	Faunal Thermally Altered	Lithic Debris	Lithic Tool/Core	FCR	Total	%
140-160	Middle	33.1	-	-	-	-	33.1	1
150-160	Middle	66.9	-	6.2	-	-	73.1	3
160-170	Middle	696.8	-	5.1	-	1	702.9	28
170-180	Middle	959.8	-	2.3	39.6	107	1108.7	44
180-190	Middle	512.7	-	1.1	-	-	513.8	20
190-200	Middle	19.9	-	0.1	-	-	20	1
200-210	Middle	52.9	-	-	-	-	52.9	2
210-220	Middle/ Lower	13	0.1	-	-	-	13.1	1
220-230	Lower	11.8	-	-	-	-	11.8	<1
230-240	Lower	0.9	-	3.3	-	-	4.2	<1
Total	-	2367.8	0.1	18.1	39.6	108	2533.6	-
%	-	93	<1	1	2	4	-	100

9.7.1 Artifact Summary and Vertical Distribution

A total of 462 artifacts were recovered from XUs 1 to 4, including 447 faunal fragments, 12 pieces of lithic debris, one stone tool, and two pieces of FCR (Tables 8 and 9). The stone tool was an abrader. Artifacts were recovered from 140 to 240 cmbs. Artifact density by count and weight was concentrated between 160 and 190 cmbs, with the majority from 170 to 180 cmbs. Radiocarbon dates from Find Spot 1 at 150 cmbs and XU 1 Piece Plot 10 at 185-192 cmbs were essentially the same (ca. 3700 RCYBP / cal. 4100 BP), indicating that the component is a single occupation and includes artifacts from 150 to 200 cmbs in the Middle stratigraphic sequence.

Planview maps and photos of the larger bison bones, which were piece plotted during excavation of levels from 170 and 190 cmbs, are presented in Figures 11 to 13. The concentration of fauna in Shovel Test 19WW10 from 200 to 220 cmbs actually correlates with the concentration of faunal between 160 and 190 cmbs in the XUs, as we were able to see the auger test holes and bone bed that they penetrated.

Artifacts from 200 to 220 cmbs may be from earlier components, although they could have been translocation down through natural processes. Artifacts recovered below 220 cmbs were in the Lower stratigraphic sequence and represent a separate component.

9.7.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons are presented in Figures 14 to 18. The Upper and Middle sequences are fine textured alluvium, predominantly silty clay loam, with a loamy sand interbed near the base of the Middle sequence. The Lower sequence is sand and gravelly sand. Cross-section maps of site stratigraphy and additional soils information are contained in the geomorphological investigation in Appendix A. Geomorphic Core 14, which was placed near the XUs, had a gap in recovery between 180 to 213 cmbs, and so it does not provide a detailed record of the Middle sequence.

9.8 Radiocarbon Dating

Nine non-thermally altered faunal samples were submitted to Beta Analytic, Inc for AMS dating, with eight of the samples being successfully dated (Table 10). Representative samples were selected from each stratigraphic sequence (Upper, Middle, and Lower) in order to understand the depositional history and to date the archaeological occupations.

Overall the samples appear to provide accurate dates, except for the sample from ST 25WE5 130-140 cmbs, which seems to be too old based on its depth and position at the base of the Upper or top of the Middle sequence. The dates and site stratigraphy provide clear evidence of multiple occupations at the site, spanning from the Middle and Late Archaic periods.

Plant material and wood were submitted for dating as part of the geomorphological investigation at the site (Appendix A). Two of those dates agree with the bone dates, while the other two dates are obvious anomalies, being much too old or young. The dates from the faunal material likely provide a more accurate date of the site occupations, as the charcoal was more likely to have been redeposited in flood sediments, as indicated by the two charcoal dates that are anomalous.

Table 10. Site 21BE305 Radiocarbon Dates.

Material/ Provenience	Beta Lab No.	Strata	$^{13}C/^{12}C$ Ratio (o/oo)	Conventional ^{14}C Age B.P.	2 Sigma Calibrated Results (95% Probability)
Bone collagen ST 41W 120-130 cmbs	426433	Upper	-21.0 o/oo	2530 +/- 30 BP	Cal BC 795 to 735 (Cal BP 2745 to 2685) and Cal BC 690 to 660 (Cal BP 2640 to 2610) and Cal BC 645 to 545 (Cal BP 2595 to 2495)
Bone collagen ST 25WE5 130-140 cmbs	426432	Base of Upper or top of Middle	-14.0 o/oo	5410 +/- 30 BP	Cal BC 4335 to 4235 (Cal BP 6285 to 6185)
Bone collagen XU1 PP10 185-192 cmbs	426430	Middle	-11.2 o/oo	3740 +/- 30 BP	Cal BC 2270 to 2260 (Cal BP 4220 to 4210) and Cal BC 2205 to 2115 (Cal BP 4155 to 4065) and Cal BC 2100 to 2035 (Cal BP 4050 to 3985)
Bone collagen XU 1-4 Area FS1 150 cmbs	426429	Middle	-13.3 o/oo	3700 +/- 30 BP	Cal BC 2195 to 2165 (Cal BP 4145 to 4115) and Cal BC 2150 to 2020 (Cal BP 4100 to 3970) and Cal BC 1990 to 1980 (Cal BP 3940 to 3930)
Bone collagen XU 2 220-230 cmbs	426431	Base of Middle or top of Lower	-16.8 o/oo	4340 +/- 30 BP	Cal BC 3020 to 2895 (Cal BP 4970 to 4845)
Bone collagen ST 41WE5 300-305 cmbs	426435	Lower	-13.0 o/oo	3820 +/- 30 BP	Cal BC 2395 to 2385 (Cal BP 4345 to 4335) and Cal BC 2345 to 2195 (Cal BP 4295 to 4145) and Cal BC 2165 to 2150 (Cal BP 4115 to 4100)
Bone collagen ST 21WS5 280-290 cmbs	426436	Lower	-16.0 o/oo	4380 +/- 30 BP	Cal BC 3090 to 2910 (Cal BP 5040 to 4860)
Bone collagen ST 41WS10 335-345 cmbs	426434	Lower	-12.4 o/oo	6420 +/- 30 BP	Cal BC 5475 to 5320 (Cal BP 7425 to 7270)
Bone collagen ST 3WE5 300-310 cmbs	426437	Lower	NA	SAMPLE NOT DATABLE	

9.9 Artifact Summary

A total of 1,747 artifacts weighing 5,583.1 grams (g) were recovered from the site during Phase I survey and Phase II evaluation (Table 11). Faunal material was significantly more abundant than lithics and FCR.

Table 11. Site 21BE305 Summary of Artifacts by Count and Weight (g).

Artifact Type	Total by Count (Weight)	% by Count (Weight)
Faunal	**1689 (5342.1)**	**97 (96)**
Lithic	**56 (133.0)**	**3 (2)**
FCR	**2 (108.0)**	**<1 (2)**
Total	**1747 (5583.1)**	**-**
%	**-**	**100**

9.10 Faunal Analysis by Steven Kuehn

The faunal assemblage contains 1,689 faunal remains weighing 5,342.1 grams (Table12). Bone preservation is good with the majority of specimens minimally identifiable to the class level. The method of analysis is presented in Section 3.3. The most abundant remains by weight are bison. The most numerous remains are mammalian, which consist mostly of small unidentified fragments. Small amounts of a wide variety of other animals are present.

Table 12. Site 21BE305 Faunal Material by Count and Weight (g).

Class	Unmodified Count (Weight)	Thermally Altered Count (Weight)	Total by Count (Weight)	% by Count (Weight)
Bison bison (bison)	285 (4835.2)	1 (1.1)	286 (4836.3)	17 (91)
Mammalian, large	274 (202.4)	11 (38)	285 (240.4)	17 (5)
Mammalian	757 (94.8)	10 (3.7)	767 (98.5)	45 (2)
Turtle	76 (11.8)	2 (0.5)	78 (12.3)	5 (<1)
Vertebrata	52 (5.7)	11 (1.1)	63 (6.8)	4 (<1)
Ondatra zibethicus (muskrat)	46 (17.8)	7 (1.5)	53 (19.3)	3 (<1)
Bison cf. sp.	50 (72.6)	-	50 (72.6)	3 (1)
Emydidae (turtle)	19 (10.9)	-	19 (10.9)	1 (<1)
Mammalian, medium/large	12 (10.5)	4 (3.3)	16 (13.8)	1 (<1)
Mammalian, small	12 (1.8)	-	12 (1.8)	1 (<1)
Geomys bursarius (plains pocket gopher)	11 (2.6)	1 (0.1)	12 (2.7)	1 (<1)
Colubridae (snake)	10 (0.8)	-	10 (0.8)	1 (<1)
Chrysemys picta (painted turtle)	8 (12.8)	-	8 (12.8)	<1 (<1)
Molluscan	5 (4.5)	-	5 (4.5)	<1 (<1)
Ameiurus sp. (bullhead)	3 (0.4)	1 (0.1)	4 (0.5)	<1 (<1)
Bird	3 (0.2)	1 (0.1)	4 (0.3)	<1 (<1)
Rodentia	2 (0.2)	-	2 (0.2)	<1 (<1)
Fish	2 (0.2)	-	2 (0.2)	<1 (<1)
Anas crecca/discors (teal)	2 (0.4)	-	2 (0.4)	<1 (<1)
Lithobates (frog)	2 (0.2)	-	2 (0.2)	<1 (<1)
Anura (frog/toad)	1 (0.1)	-	1 (0.1)	<1 (<1)
Ictidomys tridecemlineatus	1 (0.2)	-	1 (0.2)	<1 (<1)
Odocoileus virginianus (white-tailed deer)	1 (5.3)	-	1 (5.3)	<1 (<1)
Castor canadensis (beaver)	-	1 (0.2)	1 (0.2)	<1 (<1)
Anaxyrus sp. (bullhead)	1 (0.1)	-	1 (0.1)	<1 (<1)
Microtus sp. (vole)	1 (0.1)	-	1 (0.1)	<1 (<1)
Ameiurus melas (black bullhead)	1 (0.2)	-	1 (0.2)	<1 (<1)
Ameiurus nebulosus (brown bullhead)	1 (0.1)	-	1 (0.1)	<1 (<1)
Mammalian, medium	-	1 (0.5)	1 (0.5)	<1 (<1)
Total	**1638 (5291.9)**	**51 (50.2)**	**1689 (5342.1)**	**-**
%	**97 (99)**	**99 (3)**	**-**	**100**

9.10.1 Results

Vertebrata

Sixty-three small pieces of bone cannot be identified to element or a specific taxon and are listed as taxon indeterminate (Vertebrata). Eight Vertebrata remains are burned black, and three are calcined. None of the Vertebrata display butchery marks or evidence of modification. Species and other classes identified are discussed in detail below.

Mammals

A total of 286 specimens weighing 4,836.3 g are identifiable as bison (*Bison* sp.). Another 50 pieces of bone weighing 72.6 g compare favorably with bison (cf. *Bison* sp.) and will be included in the overall discussion of bison remains in the assemblage. Bison elements identified include cranial pieces and a portion of a horn core, a caudal vertebra, the distal portion of a metapodial, several ribs, two femur shaft fragments, a sacrum, and multiple cervical (including the atlas and axis), thoracic, and lumbar vertebrae (Table 13). Eight premolar or molar fragments are also present, along with a number of non-diagnostic fragments that likely represent unidentifiable vertebra, rib, or innominate bones. One tooth fragment is burned black. Cut marks were observed on one thoracic vertebra neural spine, and are typically associated with removal of the hump meat (e.g., Frison 1970, 1991; Wheat 1972). Most of the bison remains are from individuals classified as older juvenile/young adult or adult based on fusion of the centrum epiphyses. One tooth, a left maxillary 4th premolar, displays occlusal wear that is consistent with an older adult. Based on these results, a minimum of two individual bison is indicated. The majority of bison bones were recovered from the west-central portion of the site, with 95 percent (319/335) of bison and cf. bison elements recovered from ST19WW10, XU1, XU2, XU4, and FS1-3. In vertical distribution, bison remains occurred between 130 and 360 cm below surface, with the majority (252/335 or 75 percent) of bison/cf. bison bones recovered between 150 and 180 cm in XUs 1-4. In addition, 214 large mammal remains from XUs 1-4 and ST19WW10 compare favorably with bison, and these remains are likely bison given the conclusive identification of numerous bison remains at this location. Bison are primarily found in prairie habitats but also occupy dry marshes and forest edge or border settings (Jackson 1961).

Table 13. Site 21BE305 Medium and Large Size Mammal Remains with Identifiable Elements.

Provenience (cmbs)	Count	Class	Element
ST 19W; 240-240	1	Mammalian, large	Tooth, enamel fragment
	1		Longbone shaft, fragment
ST 23W; 240-270	1	Mammalian, large	Longbone shaft, fragment
ST 41W; 120-130	1	Odocoileus virginianus (white-tailed deer)	Tooth, molar fragment
ST 41W; 250-290	1	Mammalian, large	Longbone fragment
ST 3WS5; 240-265	1	Bison bison (bison)	Tooth, premolar/molar fragment
ST 3WW5; 260-275	1	Mammalian, medium/large	Petrosal fragment
ST 3WE5; 240-250	2	Mammalian, large	Longbone shaft, fragment
ST 3WE5; 260-270	1	Mammalian, medium/large	Petrosal fragment
ST 3WE10; 240-250	7	Mammalian, large	Longbone shaft, fragment, charred
ST 11WE5; 345-360	1	Bison bison (bison)	Tooth, premolar/molar fragment, burned
ST 11WW5; 370-390	1	Mammalian, large	Longbone shaft, fragment, burned
ST 19WN5; 245-255	1	Mammalian, large	Longbone shaft, fragment
ST 19WN5; 260-270	1	Bison bison (bison)	Tooth, incisor complete

Table 13. Continued.

Provenience (cmbs)	Count	Class	Element
ST 19WW5; 245-255	1	Mammalian, large (cf. bison or elk)	Tooth, premolar/molar fragment burned
ST 19WW10;220-240	1	Bison bison (bison)	Sacrum anterior, fragment
	5	Bison bison (bison)	Vertebra, lumbar centrum fragment
ST 21WN10; 110-120	1	Mammalian, large	Longbone shaft, fragment, burned
ST 21WS5; 280-290	1	Mammalian, large (cf. bison or elk)	Longbone shaft, fragment
ST 23WN5; 130-155	1	Bison bison (bison)	Femur, right shaft, fragment
ST 23W; 240-270	1	Mammalian, large (cf. bison or elk)	Longbone shaft, fragment
ST 23WS5; 275-285	1	Mammalian, medium	Longbone shaft, fragment, burned
ST 25WE5; 130-140	5	Bison bison (bison)	Tooth, premolar/molar fragment
ST 25WE5N5; 320-340	1	Mammalian, medium/large	Longbone shaft, fragment
ST 25WW5; 325-345	1	Mammalian, large	Longbone fragment
	1	Mammalian, large	Longbone fragment
ST 31WN5; 350-370	1	Mammalian, large	Longbone shaft, fragment
ST 41WE5; 300-305	1	Bison bison (bison)	Rib shaft, fragment
XU 1; 170-180	18	Bison bison (bison)	Vertebra/rib, fragment
	36		Rib shaft, fragment
	2		Vertebra, centrum epiphysis fragment
XU 1; 180-190	4	Bison bison (bison)	Vertebra, centrum fragment
XU 1; 170-180	1	Bison bison (bison)	Vertebra, thoracic complete
	1		Rib shaft, fragment
	2		Vertebra, thoracic fragment
	4		Vertebra, thoracic centrum fragment
XU 1; 180-190	1	Bison bison (bison)	Vertebra, thoracic fragment
	1		Vertebra, thoracic centrum fragment
	1		Rib, right proximal fragment
	1		Rib, left complete
XU 2; 160-170	1	Bison bison (bison)	Rib, left shaft, fragment
	2		Vertebra, lumbar fragment
XU 2; 170-180	1	Bison bison (bison)	Vertebra, thoracic centrum fragment
	1		Vertebra, lumbar fragment
	1		Tooth, premolar complete
	24		Rib shaft, fragment
XU 2; 220-230	1	Bison bison (bison)	Metapodial, distal fragment
XU 3; 150-160	1	Bison bison (bison)	Femur, right shaft, fragment
XU 3; 190-200	3	Bison bison (bison)	Rib shaft, fragment
XU 3; 200-210	1	Bison bison (bison)	Rib shaft, fragment
XU 3; 210-220	5	Bison bison (bison)	Rib shaft, fragment
XU 4; 150-160	1	Bison bison (bison)	Sacrum, fragment

Table 13. Continued.

Provenience (cmbs)	Count	Class	Element
XU 4; 160-170	1	Bison bison (bison)	Vertebra, lumbar complete
	5		Vertebra, lumbar fragment
	1		Mandible, right fragment
	1		Scapula, left fragment
	1		Femur, left shaft, fragment
	1		Vertebra, caudal centrum fragment
	8		Rib shaft, fragment
	4		Sacrum, fragment
FS 1; 150-160	5	Bison bison (bison)	Vertebra, lumbar fragment
	1		Vertebra, thoracic centrum fragment
	69		Vertebra, fragment
FS 2; 155-165	1	Bison bison (bison)	Vertebra, axis fragment
	1		Horn, fragment
	17		Cranium, fragment
	1		Vertebra, atlas complete
	1		Basioccipital, fragment
	3		Vertebra, cervical fragment
	12		Cranium, fragment
FS 3; 172-177	1	Bison bison (bison)	Vertebra, cervical centrum fragment
	5		Vertebra, cervical fragment
	1		Vertebra, thoracic neural spine, **cut marks**
Total	**509**	-	-

Muskrat (*Ondatra zibethicus*) is the next most common mammal, with 53 pieces of bone and teeth identified. At least five individuals are represented, with both adult and juvenile muskrats present. Mandibles, cranial fragments, and teeth (n=22) are the most common elements present followed by appendicular elements (n=20), vertebrae (n=6), and girdle bones (n=5). Seven muskrat bones are burned black. None exhibit butchery marks or evidence of cultural modification. Muskrat occur in marshes, lakes, ponds, rivers, streams, and most aquatic habitats (Jackson 1961).

In addition to bison and muskrat, several other mammals were identified in the assemblage. One right third maxillary molar fragment is identifiable as white-tailed deer (*Odocoileus virginianus*). The tooth is from an adult deer and shows no evidence of burning or modification. White-tailed deer occur in a variety of habitats but prefer forest-edge settings (Jackson 1961).

One beaver (*Castor canadensis*) element, an incisor fragment, was observed in the assemblage. The specimen is burned black. Beaver inhabit lakes and rivers in wooded areas (Jackson 1961).

Twelve bones and teeth are identifiable as plains pocket gopher (*Geomys bursarius*). A minimum of three individuals is represented. Elements present include humeri, ulnae, mandibles, and incisors. One incisor is burned black. Only adult elements were observed. None of the gopher

remains exhibit butchery marks or evidence of modification. Pocket gophers occur in prairie and plains habitats, preferably areas with sandy soil or loose soft loam (Jackson 1961).

One right mandible is identifiable as thirteen-lined ground squirrel (*Ictidomys tridecemlineatus*) and one left mandible is from an indeterminate vole (*Microtus* sp.). Both mandibles are from adult animals. Neither specimen displays butchery marks or modification evidence. Thirteen-lined ground squirrels are found in dry meadows, grassy fields, and open woodlands with sufficient vegetation for concealment (Jackson 1961). Voles typically inhabit prairies, meadows, grassy marshes, and grasslands near rivers and lakes (Jackson 1961). One cranial fragment and an incisor are listed as indeterminate rodent (Rodentia). Neither bone shows butchery marks or modification evidence.

The remaining mammal bones can only be categorized in terms of relative size. A total of 285 specimens weighing 240.4 g are classified as large-sized mammal. Most of these are indeterminate to element but their overall size suggests non-diagnostic bison remains, considering the widespread presence of bison at the site. Two long bone shaft pieces and a premolar/molar fragment are likely from either bison or elk (*Cervus elaphus*). Four large-sized mammal bones are burned black and seven are charred. Seventeen bone fragments are listed as medium-large mammal, five of which are burned black. Twelve specimens are categorized as small-sized mammal. One small-sized mammal humerus fragment shows slight polish, but it may be taphonomic in origin. Indeterminate mammal remains account for 767 specimens with a total weight of 98.5 g. Seven indeterminate mammal bones are burned and three are calcined. None of the mammal bones categorized by size exhibits butchery marks or evidence of cultural modification.

Birds

Six bird remains were noted in the assemblage. One right tibiotarsus and a left scapula fragment are identifiable as green-winged or blue-winged teal (*Anas crecca/discors*). Both elements are from an adult individual. One right radius fragment and a long bone shaft fragment are classified as small-sized bird. The long bone shaft is burned black. Two long bone shaft pieces are categorized as indeterminate bird. None of the bird remains exhibit butchery marks or evidence of modification. Teal are seasonally abundant migrants, found in marshes, ponds, and rivers (Kaufman 1996).

Reptiles and Amphibians

Eight carapace and plastron fragments are identifiable as painted turtle (*Chrysemys picta*), with at least three individuals represented. Both adult and juvenile painted turtles are present. One nuchal fragment displays cut marks. Painted turtles are found in a variety of aquatic habitats but are most common in shallow, weedy settings in lakes, ponds, marshes, and river backwaters (Phillips et al. 1999). Nineteen carapace/plastron pieces are categorized as indeterminate pond/box turtle (Emydidae). One pond/box turtle neural fragment has a smoothed interior, which may reflect manufacture of a shell bowl or scoop. Seventy-eight carapace and plastron fragments are listed as indeterminate turtle. Two indeterminate turtle shell pieces are burned black.

Two trunk vertebra fragments are classified as indeterminate water snake (*Nerodia* sp.) and most likely represent the northern water snake (*Nerodia sipedon*). Water snakes inhabit streams, lakes, ponds, and marshes (Phillips et al. 1999). Eight additional trunk vertebrae are categorized as indeterminate non-venomous snake (Colubridae). None of the snake remains exhibit butchery marks, modification evidence, or evidence of burning.

One tibiofibula shaft and a left ilium fragment are classified as indeterminate frog (*Lithobates* sp.). One right ilium is identifiable as indeterminate toad (*Anaxyrus* sp.). One vertebra fragment is from either a frog or toad (Anura). None of the frog or toad remains in the assemblage show butchery marks, evidence of burning, or other modification evidence. Frogs are found in essentially all aquatic and riparian settings, while toads are most common in an array of forest and prairie habitats (Phillips et al. 1999).

Fish

Eight fish bones are present in the assemblage. One ethmoid fragment is identifiable as brown bullhead (*Ameiurus nebulosus*) and one left pectoral spine is classified as black bullhead (*Ameiurus melas*). Four cranial elements are listed as indeterminate bullhead (*Ameiurus* sp.) and consist of two right cleithra, a right dentary, and a fused right ceratohyal and epihyal. One vertebral centrum and a cranial fragment are categorized as indeterminate fish.

None of the fish remains in the assemblage display butchery marks or evidence of modification. One indeterminate bullhead cleithrum is burned black. Black bullheads are common in low-gradient streams, ponds, lakes, oxbows, and quiet backwaters, while brown bullheads prefer weedy backwater lakes and slow-moving streams (Becker 1983).

Freshwater Mussels

Five pieces of freshwater mussel shell weighing 4.5 g were identified in the assemblage. One is recognizable as a left valve fragment; the other three consist of small, non-diagnostic pieces of shell. None of the remains can be specifically identified. No evidence of burning, butchery, or cultural modification was observed on any of the mussel remains.

9.10.2 Taphonomic Modification

Thirty-two specimens in the assemblage display evidence of taphonomic modification (Table 14). Rodent gnawing was observed on five bison and large-sized mammal bones, and one bison rib shows scratches and grooves on one surface that appear to reflect carnivore gnawing. Four specimens exhibit slight pitting or light polish, generally indicative of weathering, trampling, or abrasion. Twenty-two bone fragments display varying degrees of water abrasion, rounding, and smoothing. The horizontal and vertical distribution of taphonomically modified remains reveals no distinct spatial patterning. Relatively few bones (n=32/1476, or 2.2 percent) show taphonomic modification, suggesting minimal exposure of discarded remains (e.g., few rodent-gnawed elements) or impact resulting from large-scale flooding (e.g., few water abraded specimens).

Table 14. Site 21BE305 Faunal Remains with Evidence of Taphonomic Modification.

Taxon	Count, Element	Provenience	Depth (cmbs)	Modification
Bison bison (bison)	1 premolar/molar	ST11W E5	345-360	water abrasion
Bison bison (bison)	1 rib	XU3	200-210	scratches/grooves; gnawing?
Bison bison (bison)	1 femur	ST23W N5	130-155	rodent gnawed
Ondatra zibethicus (muskrat)	1 femur	ST8W W7	265-275	slight polish
Ondatra zibethicus (muskrat)	1 humerus	ST36W	290-300	slight water abrasion
Large mammal	1 indeterminate	ST27W S5	350-360	water abrasion
Large mammal	1 indeterminate	ST19W N10	275-290	slightly worn
Large mammal	1 indeterminate	ST19W S10	340-355	slightly worn

Table 14. Continued.

Taxon	Count, Element	Provenience	Depth (cmbs)	Modification
Large mammal	1 indeterminate	ST41W S10	335-345	rodent gnawed
Large mammal	1 indeterminate	XU1	140-160	rodent gnawed
Large mammal	1 long bone	ST19W	240	slight water abrasion
Large mammal	1 long bone	ST19W N5	245-255	worn
Large mammal	2 long bone	ST3W E5	240-250	water rounded
Large mammal	7 long bone	ST3W E10	240-250	slightly rounded, water worn
Large mammal	2 long bone	ST25W W5	325-345	rodent gnawed
Small mammal	1 humerus	ST8W W7	265-275	slight polish
Mammal	1 indeterminate	ST19W	240	wear, polish
Mammal	1 indeterminate	ST23W W10	340-350	slight abrasion
Mammal	1 indeterminate	ST41W	230-250	water worn
Emydidae (Pond/box turtle)	1 peripheral and 1 plastron	ST3W W10	250-260	water abrasion
Emydidae (Pond/box turtle)	1 peripheral	ST3W W10	250-260	slightly pitted, worn
Emydidae (Turtle)	1 carapace	ST19W E10	260-270	slight water abrasion
Emydidae (Turtle)	1 carapace/plastron	ST3W E5	240-250	water rounded

9.10.3 Discussion

The composition of the faunal assemblage suggests the use of a range of terrestrial and aquatic faunal resources that were available in the area. Taxa identified include bison, white-tailed deer, muskrat, beaver, plains pocket gopher, teal, painted turtle, black bullhead, and brown bullhead, birds, reptiles, fish, along with various small rodents and unidentifiable mammals. The taxa present demonstrate exploitation of local prairie-forest edge and aquatic resources that likely derived from the nearby Cobb River.

The majority of bison remains recovered from the location of XUs 1-4 and Shovel Test 19W are axial elements, primarily vertebrae and ribs, with some cranial bones also present. This pattern is broadly consistent with a bison kill or natural death location. At many kill sites, the meatier and more easily transported limbs are removed to another location for further processing, and only select meat portions removed from the rest of the carcass, which is left in place. At natural and catastrophic kills, scavengers (including humans) and taphonomic agents may remove and disperse limbs, leaving the axial elements relatively undisturbed.

Longbone fragments from large mammals (bison or elk) were recovered from several shovel tests across the site area, and several of these bones, as well as those of other animals are burned. This suggests that the site not only includes the bison kill and processing activities identified in XUs 1-4, but also includes activities related to habitation and consumption of animal resources.

The presence of bison and a range of other faunal remains may reflect distinct but not mutually exclusive hunting strategies, including the focused procurement of bison (when available) and a broad-based procurement strategy designed to take advantage of the variety of prairie, forest, and aquatic resources available in proximity to the site. However, additional study is needed to examine faunal exploitation at the site, and to compare the patterns observed with those noted for other prehistoric sites in the region.

9.11 Lithic Analysis

The lithic assemblage consists of 56 artifacts, including 48 pieces of lithic debris, seven stone tools, and one core (Table 15). A variety of flake types, tools, and lithic materials are present in the assemblage, which is discussed below.

Table 15. Site 21BE305 Lithic Artifacts by Material, Flake, and Tool/Core Types.

Material, Resource Region, and Source Distance	Nonbifacial	Decortication	Bifacial Thinning	Bipolar Flake	Other Grade 4	Shatter	Broken Flake	Tool/Core	Total	%
Quartzite **Multiple Regions** *(local)*	1	-	-	1	3	1	4	1 grooved abrader	**11**	**20**
Unidentified Chert **Unknown Region** (local or nonlocal)	1	-	-	-	1	1	2	1 bipolar core; 1 end scraper; 1 utilized flake	**8**	**14**
Unidentified Material **Unknown Region** (local or nonlocal)	1	-	-	-	4	2	1	-	**8**	**14**
Quartz **Multiple Regions** (local)	-	-	-	1	2	1	1	-	**5**	**9**
Prairie du Chien Chert **Hollandale Region** (local)	2		1	-	1	-	1	-	**5***	**9**
Swan River Chert **South Agassiz Region** (local)	-	-	-	-	1	2	1	-	**4**	**7**
Galena Chert **Hollandale Region** (nonlocal)	-	-	-	-	-	-	1	2 end scrapers	**3**	**5**
Hixton Group Quartzite **West Central WI** (nonlocal exotic)	1	-	-	-	-	-	1	-	**2**	**4**
Western River Gravels Group **South Agassiz Region** (local)	-	-	-	-	-	-	-	1 end scraper; 1 utilized flake	**2**	**4**
Chalcedony **Unidentified Region** (local or nonlocal)	-	-	-	1	-	-	1	-	**2**	**4**
Silicified wood **South Agassiz Region** (local)	1	-	-	-	-	-	1	-	**2**	**4**
Basaltic **West Superior Region** (local)	-	1	-	-	-	-	1	-	**2**	**4**
Red River Chert **South Agassiz Region** (local)	-	-	-	-	-	-	1	-	**1**	**2**
Cedar Valley Chert **Hollandale Region** (nonlocal)	-	-	-	-	-	-	1	-	**1**	**2**
Total	**7**	**1**	**1**	**3**	**12**	**7**	**17**	**8**	**56**	**-**
%	**13**	**2**	**2**	**5**	**21**	**13**	**30**	**14**	**-**	**100**

* four artifacts are oolitic Prairie du Chien Chert and one is non-oolitic Prairie du Chien Chert

The lithics are not separated into components because of the sparse assemblage and the lack of clear component delineations at the site.

The lithic debris was concentrated in the smaller size-grade classes, mostly SG3. Size grade counts for the lithic debris were as follows: SG2 <1.0 inch to ≥0.5 inch (n=4; 8%); SG3 <0.5 inch to ≥0.233 inch (n=32; 67%); and SG4 < 0.233 inch (n=12; 25%).

Flake Types

The lithic debris assemblage is relatively small. A variety of flake types occurred, indicating a range of lithic-reduction technologies and stages. Diagnostic flake types, along with their associated technologies and stages of reduction, are summarized in (Table 16). The data indicates that bipolar, bifacial, and nonbifacial technologies are all represented. The assemblage includes lithics from the early and middle stages of reduction, but not the late stage. Additional supporting evidence for the various technologies includes: 1) a bipolar core indicates bipolar technology; and 2) four stone tools made on nonbifacial flakes are indicative of nonbifacial technology. Types of lithic debris that are not indicative of specific technologies or reduction-stages comprise the largest portion of the assemblage and include other SG4 (n=12), and broken flakes (n=17).

Table 16. Site 21BE305 Summary of Diagnostic Flake Types, Technologies, and Reduction Stages.

Count & Flake Type	Technology	Stage of Reduction
7 - Nonbifacial flakes	Nonbifacial	Cobble testing, reducing unprepared nonbifacial cores for flake blank production, and the early stages of nonbifacial tool reduction (early to middle-stages of reduction).
7 - Shatter	N/A	Mostly from cobble testing, core reduction, and earlier stages of reduction
3 - Bipolar flakes	Bipolar	N/A
1 - Bifacial thinning flake	Bifacial	Early to middle-stage of reduction
1 - Decortication flake	Nonbifacial	Earliest stage of core reduction

Heat treatment was confirmed on one piece of Prairie du Chien Chert, and one piece of Swan River Chert was probably heat treated. Two unidentified chert lithics were burned from excessive heating, as indicated by crazing and/or potlid fractures. The burnt lithics indicate that a cooking facility is probably present near the locations where these artifacts were recovered, which is Shovel Test 19WN5 260 to 270 cmbs and Shovel Test 3WE10 260 to 270 cmbs.

Stone Tools

Seven stone tools were recovered. Flake stone tools include four end scrapers and two utilized flakes. These tools were made on nonbifacial flakes, a decortication flake, and a piece of shatter (Table 17). The other tool is a grooved abrader that consists of a small cobble broken in half. The flake tools were manufactured from unidentified chert, Galena Chert, and Western River Gravels Group. The grooved abrader is quartzite.

Table 17. Site 21BE305 Tool Type by Flake Type.

Tool Type	Flake Type				
	Nonbifacial	Decortication	Shatter	Total	%
Utilized Flake	1	1	-	**2**	
End Scraper	2	1	1	**4**	
Total				**6**	**-**
%				**-**	**100**

Scrapers are typically associated with scraping tasks on a variety of soft materials (meat, hides, and plant material) or moderately resistant materials (wood and bone). Utilized flakes are primarily light-duty cutting and slicing tools used on animal remains, wood, and plants. The abrader has very fine, linear grooves ground or incised into its surface by friction, probably from preparing the edges of a biface or core for flaking or from abrasion by another hard material. These tools suggest that site activities included butchering, animal/plant processing, hide working, bone and woodworking, and flintknapping.

Lithic Material Types

Small amounts of a wide variety of lithic materials were recovered from the site (Table 15). The most numerous materials include quartzite, unidentified chert, and unidentified materials, with slightly smaller amounts of other materials. Most of the identifiable materials were locally available and probably procured local areas where rocks were exposed on erosional surfaces such as ravines, stream bottoms, and lakeshores (See Section 4.2.2 The Raw Material Resource Base). The unidentified chert and unidentified materials may be local or nonlocal.

Nonlocal materials include 1) Cedar Valley Chert, which is available in Mower and Fillmore counties in southeastern Minnesota and adjacent areas of west-central Wisconsin (Bakken 2011); and 2) Galena Chert, which is available in lag deposits and bedrock exposures in southeastern Minnesota and adjacent areas of Wisconsin, Iowa, and Illinios (Morrow 1994). The only exotic material was Hixton Group Quartzite, which is derived from west-central Wisconsin (Boszhardt 1998) and was procured though long-distance trades networks or possibly travel to source areas.

Because there is only a small amount of lithics that are mostly locally available materials, no discussion of materials is provided by site component or strata, except to say that the only exotic material (Hixton Group Quartzite) was recovered from the component in the Middle sequence.

Lithic Material Use

Although the lithic data is sparse, it is interesting to note that cherts, (unidentified chert and Galena Chert), were the most common raw material used for stone tools. The other materials occur primarily or only as lithic debris. The sparsity of lithic debris does not allow for a meaningful assessment of flake types by material.

9.12 FCR

Only two pieces of granitic FCR were recovered, and it is plausible that these are naturally decomposed granite, although granite was not common in the alluvium, and all natural stones were pebble size. The FCR were recovered from the XUs. One piece of FCR was extremely weathered and friable, and it disintegrated into hundreds of small fragments upon removal from the ground. The other piece of FCR was a small crumb-size piece.

9.13 Artifact Patterning and Geomorphic Context

Artifacts recovered from 21BE305 consist primarily of faunal material and lithic debris. The horizontal distribution of these artifact classes is fairly similar across the site, suggesting that site activities were similar in many areas, with more intensive activities of animal processing occurring at some locations (Tables 5, 6, and 18). Faunal material was the most widespread and abundant artifact type, and it occurs in each positive shovel test, except one. Lithic debris is sparser, and it occurs in about half of the positive shovel tests in scattered locations across the site. The most notable pattern in artifact distribution is the high density of faunal material in the area of ST 19WW10 and XUs 1 to 4.

Thermally altered (burned and calcined) faunal material occurs in small amounts in numerous tests across the site, including XU 4 and Shovel Tests 23W, 31W, 40W, 1WW7, 3WW10, 3WE5, 3WE10, 11WE5, 11WW5, 19WN5, 19WS10, 19WW5, 21WN10, 23WN5, 23WS5, 23WW10, 25WE5S5, 25WW5, 27WS5, 28WS5, 31WS5, 31W10, and 41WS10.

Artifact density across the site varies from low to high, based on the shovel test data. However, the test sampling strategy may not detect high-density areas between test locations. The highest artifact density occurs in the vicinity of Shovel Test 19W, where XUs 1 to 4 were placed. This area is the location of a bison kill and processing area. Other areas of moderate artifact density are located in the vicinity of Shovel Tests 1WW7, 3W, 11W, 21W, 23W, 25W, 31W, and 41W, which appear to be animal processing and habitation locations based on artifact types.

The vertical distribution of artifacts ranges from 110 to 400 cmbs (Table 18). This extensive range is the result of successive occupations occurring at different stages of alluviation in the river valley during the middle and late Holocene. Artifacts depths from occupations of the same age may vary across the site because the ground surface was not level across the site area.

Artifacts were recovered from all three strata at the site, with most of the artifacts being recovered from the lower stratum (Tables 5 and 6). Multiple components are clearly represented in several areas of the site. Shovel Tests 21W, 21WN10, 23WN5, 25W, and 41W all have artifacts extending between about 120 to 280 cmbs, a vertical span of 1.6 meters. The vertical patterning illustrates that the shallower components (ca. 110 to 200 cmbs) are only present in the western portion of the site and are absent from the eastern portion of the site.

Table 18. Site 21BE305 Vertical Distribution of Artifacts Across the Site from Shovel Tests and XUs from West to East.

	West	ST# includes all radials, except where listed in separately - **KEY** L= Lithic, F=Faunal Material, R=FCR																			East
Depth (cmbs)	**40W**	**41W**	**41W S10**	**36W**	**21W**	**21W S5**	**23W**	**8W W7**	**19W**	**19W W5**	**XUs 1–4 & FS 1-3**	**31W**	**31W S5**	**25W**	**27W**	**28W**	**11W**	**11W W5**	**3W ****	**3W S5**	**13W**	**1W W7**
0-110		1F*																				
110-120					1F																	
120-130		1F			1L		3F															
130-140														5F								
140-150											126F 1L			10F								
150-160																						
160-170											128F 4L, 1R											
170-180											256F 4L, 1R											
180-190					2F						2L, 31F											
190-200											1L, 5F											
200-210											1F	1F				1F						
210-220											9F											
220-230							1L 3F		657F		6F									1L		
230-240		10F				2F					1L,3F						11F		2L 29F			
240-250					1L 7F		14F	2F	5L 23F	7F									16F	1L 7F		
250-260	3F	4L						2F	7L 41F					1F	1F	1F			1L 22F			
260-270	4F	9F	1L		18F	1F	3F	2F				3L 13F	2F			5F			1L 10F			
270-280				1F	24F	1F	1L, 9F		2F				9F	7F					1L, 4F			
280-290		1F	5F		1L 6F		2F 6F	3F	1F			1L	6F	1F 1L 7F	1F		2F	2F			1L,1F 3F	1F
290-300		4F			2F		2F		1F						4F		1F					8F
300-310							2F					2L 5F				1L, 1F						1L 20F
310-320			2L 3F		1F													1L 1F				12F
320-330																						
330-340																						
340-350																						
350-360																						
360-370																						
370-380																						
380-390																						
390-400																						

Upper Sequence

Middle Sequence

Lower Sequence

* gopher tooth 60-80 cmbs probably noncultural; ** One lithic artifact was recovered from the back-dirt pile of ST 3W (depth 0-300 cmbs)

9.14 Site Integrity

There was no evidence in our tests of modern disturbances affecting the archaeological components, and only a small amount of rodent runs and bioturbation was observed in the shovel tests and excavation units. The dense soil in the Upper and Middle sequence likely inhibited vertical displacement of artifacts. The vertical patterning of artifacts in the excavation units was clustered within a 30-cm zone, indicating that there is only minimal artifact displacement from natural causes in the Middle sequence. A high degree of integrity is expected in the Upper and Middle sequence in other site areas, based on the similar soils and site formation processes.

The integrity of artifacts in the Lower sequence remains undetermined, as it was not possible to dig excavation units in this stratum to assess the integrity of the archaeological deposits because the sandy soil in this stratum is below the water table and easily slumps. Very few artifacts from this stratum have signs of water abrasion, which indicates the deposits may be intact and not redeposited, or conversely they may have only been transported a short distance. Dark colored soil horizons with fine textures occur in the Lower sequence in some portions of the site, which may also indicate multiple depositional events with periodic intervals of landscape stability. A dewatering system using multiple well points for lowering the water table would be needed to excavate in the Lower stratum.

Faunal material is moderately well-preserved, with a small amount of fauna likely being redeposited in alluvium based on signs of water abrasion on a very small number of bones and an anomalous radiocarbon date on one bone. In summary, the site appears to have well-preserved cultural deposits that retain integrity, particularly in the Upper and Middle strata.

9.15 Conclusions

Site 21BE305 is a multicomponent temporary camp and animal butchering site, spanning from the Middle to Late Archaic periods. The site is on a low terrace of the Cobb River. Eight radiocarbon dates were obtained from animal bone at the site, and the dates range from ca. 6400 to 2500 RCYBP (7400 to 2600 cal BP), with five of the dates clustering between 4300 to 3700 RCYBP (5000 to 4000 cal BP).

The Phase I and II investigations included 62 positive shovel tests and four 1-x-1 meter XUs. Artifacts were recovered from 110 to 400 cmbs in alluvium. Multiple components are present at the site based on the radiocarbon dates, the vertical distribution of artifacts, and site stratigraphy.

Artifacts recovered from the site are primarily faunal remains, with much smaller amounts of lithic debris, stone tools, and FCR. Site activities consisted primarily of animal butchering, with sparse evidence for cooking/heating and lithic reduction. The presence of FCR and thermally-altered faunal material suggests that fire heaths or cooking pits were present, although none were identified, and these appear to be minor activities at the site. The site has well-preserved cultural deposits that have integrity, and the soils are conducive to faunal preservation. A wide variety of terrestrial and aquatic animal remains were recovered, including bison, deer, fish, turtle, duck, snake, gopher, squirrel, muskrat, beaver. A small amount (n=51) of the faunal remains were thermally altered (burned or calcined), and one bison bone and one turtle bone had cut marks from butchering. Fire hearths are likely present at the site, although none were identified.

The lithic debris assemblage is sparse and includes the early and middle stages of reduction, but not the late stage. Bipolar, bifacial, and nonbifacial technologies are all represented. A wide variety of lithic materials were recovered from the site, and most identifiable materials were

locally available. The only exotic material were two flakes of Hixton Group Quartzite, which is derived from west-central Wisconsin and was procured though long-distance trade networks or possibly travel to source areas. Non-local materials include Galena and Cedar Valley cherts, which are available in southeastern Minnesota. Stone tools consist primarily of scrapers and utilized flakes, which are indicative of butchering, animal/plant processing, hide working, and bone and woodworking activities.

9.16 Recommendations

The site is recommended eligible for listing on the NRHP under Criterion D because it has integrity and is likely to yield important information on the Middle and Late Archaic periods. The site contains data that could provide significant information on the following Archaic period research themes:

- Age and regional chronology
- Relationship to other regional Archaic complexes
- Developments and changes during the Archaic period
- Diagnostic artifacts and overall artifact assemblage
- Subsistence strategy and settlement pattern
- Site function
- Environmental adaptation
- Lithic technology and raw material use
- Regional interaction and trade
- Site environment
- Site formation processes and geomorphology

A discussion of these themes is presented in Section 2.3.1. The current project design (Figure 7) accomplishes the following with regard to site avoidance: 1) it restricts impacts from pond construction to the eastern portion of the site where the cultural deposits are more than two meters deep and below the water table; and 2) it ensures that impacts from pond excavation are less than 1.5 meters deep in the eastern portion of the site to avoid cultural deposits. The construction limits within the site will be fenced prior to construction. MnDOT, in consultation with the Minnesota State Historic Preservation Office, has determined that the project as currently designed will have no adverse effect on the site. However, if the project design changes or if other construction projects along TH 22 adversely affects the site, then a Phase III data recovery is recommended to mitigate the project's effects.

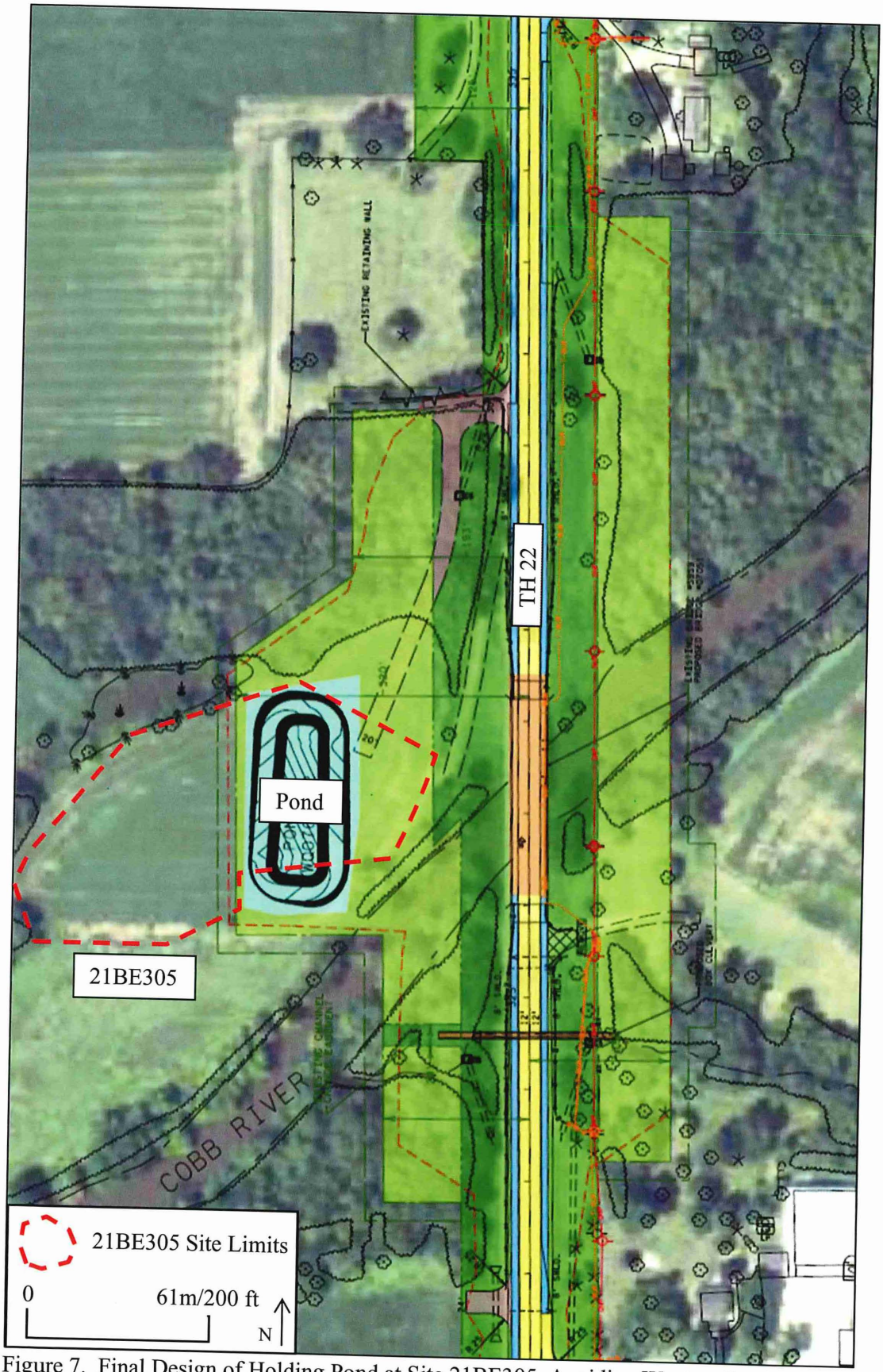


Figure 7. Final Design of Holding Pond at Site 21BE305, Avoiding Western Portion of Site.

Figure 8. Site 21BE305 Photo, Facing West from Cobb River Bridge.

Figure 9. Site 21BE305 Photo XUs 1 to 4 Area Before Dewatering, Floor at ca. 150 cmbs.

Figure 10. Site 21BE305 Photo XUs 1 to 4 at ca. 210 cmbs.

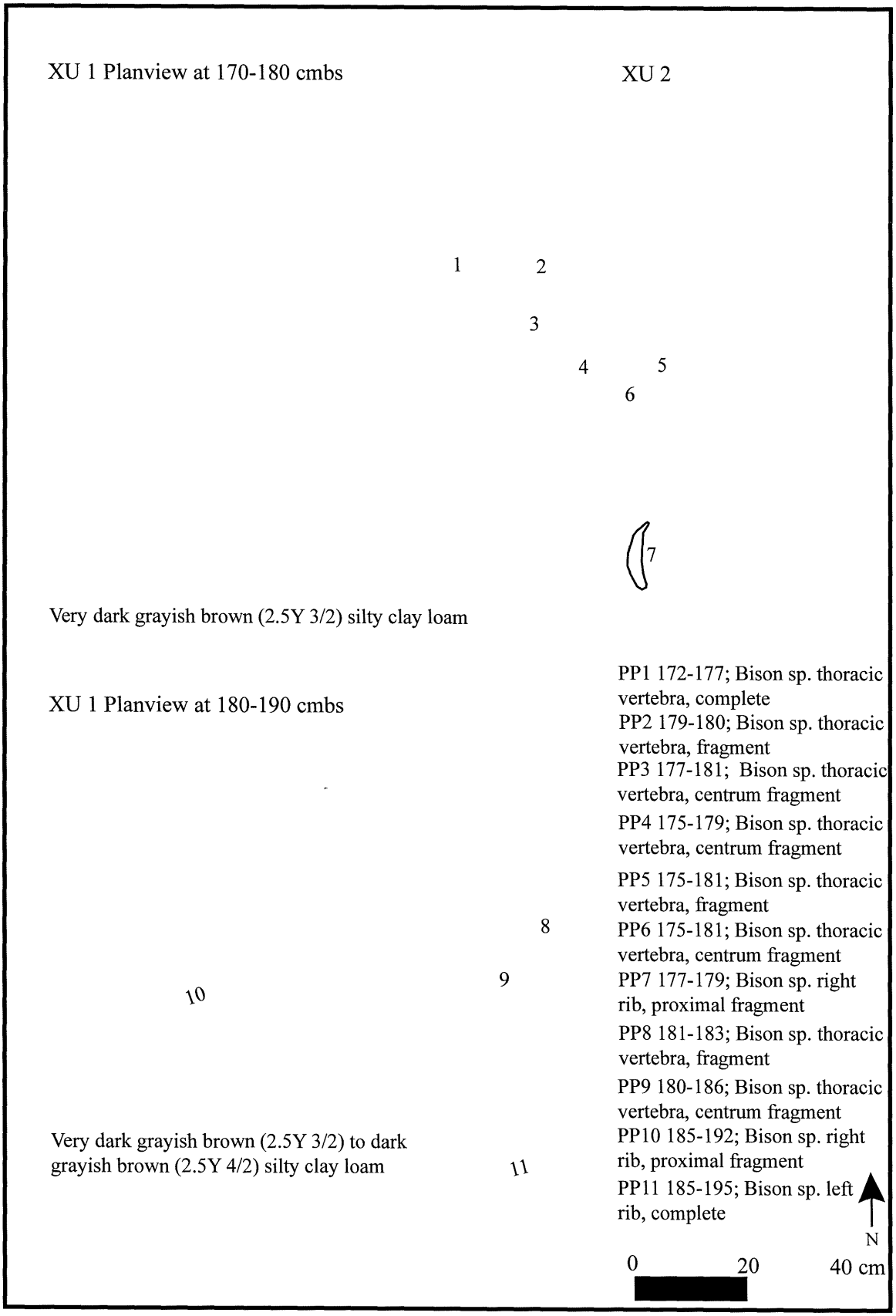
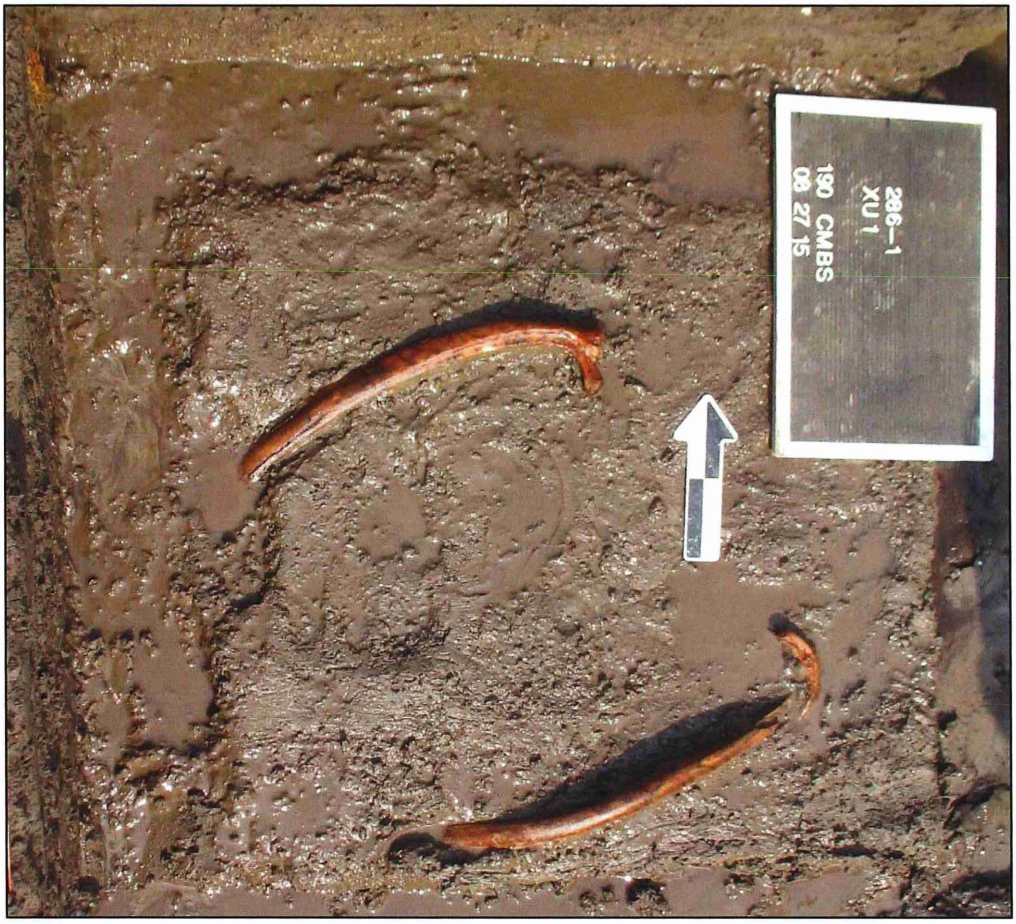


Figure 11. Site 21BE305 XU 1 and 2 Planview at 170 to 180 and 180 to 190 cmbs.

Scale length = 20cm

Figure 12. Site 21BE305 XU 1 and 2 Photo of Planview at 175 cmbs.



Scale length = 20cm

Figure 13. Site 21BE305 XU 1 Photo of Planview at 190 cmbs.

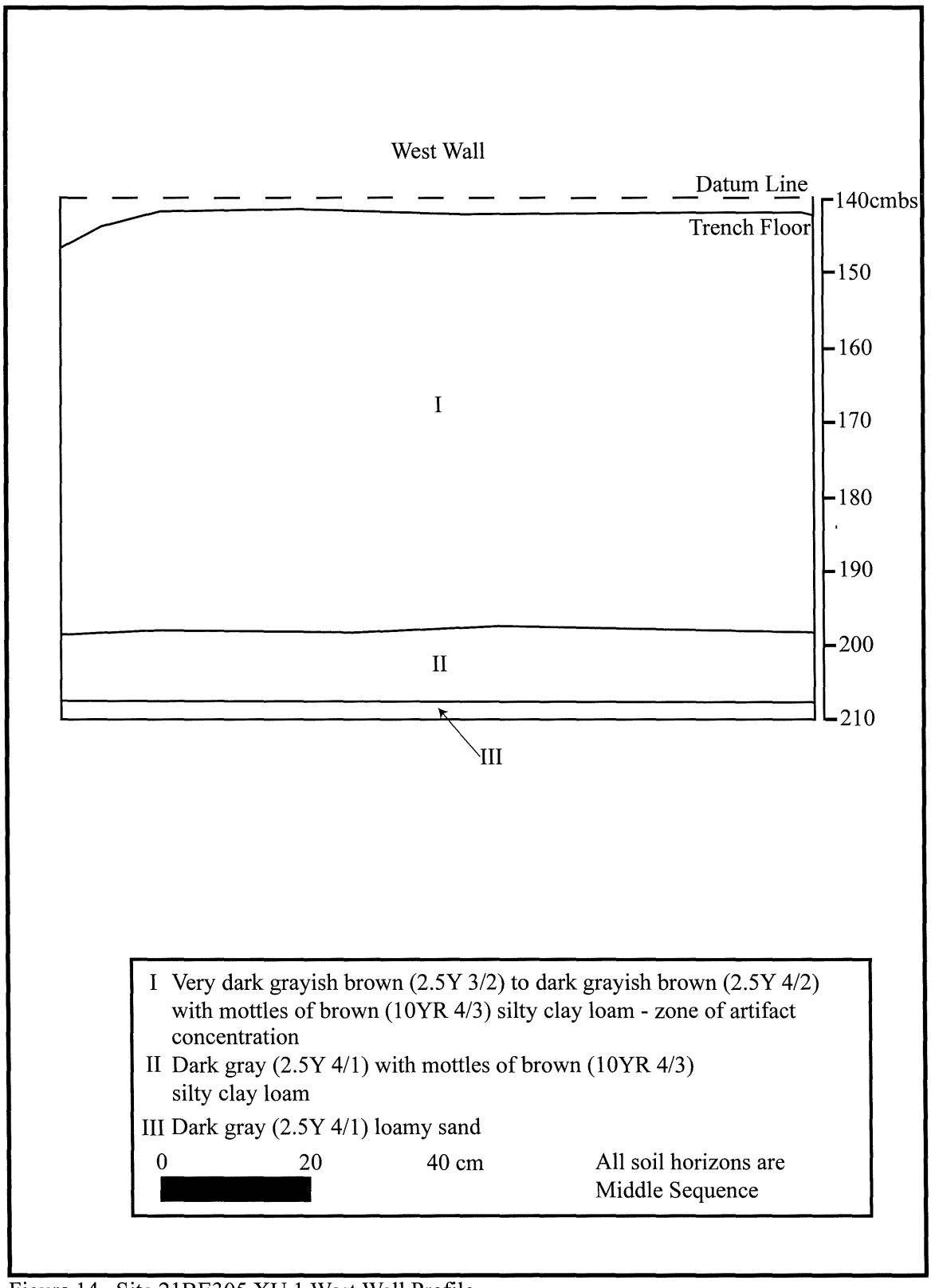


Figure 14. Site 21BE305 XU 1 West Wall Profile.

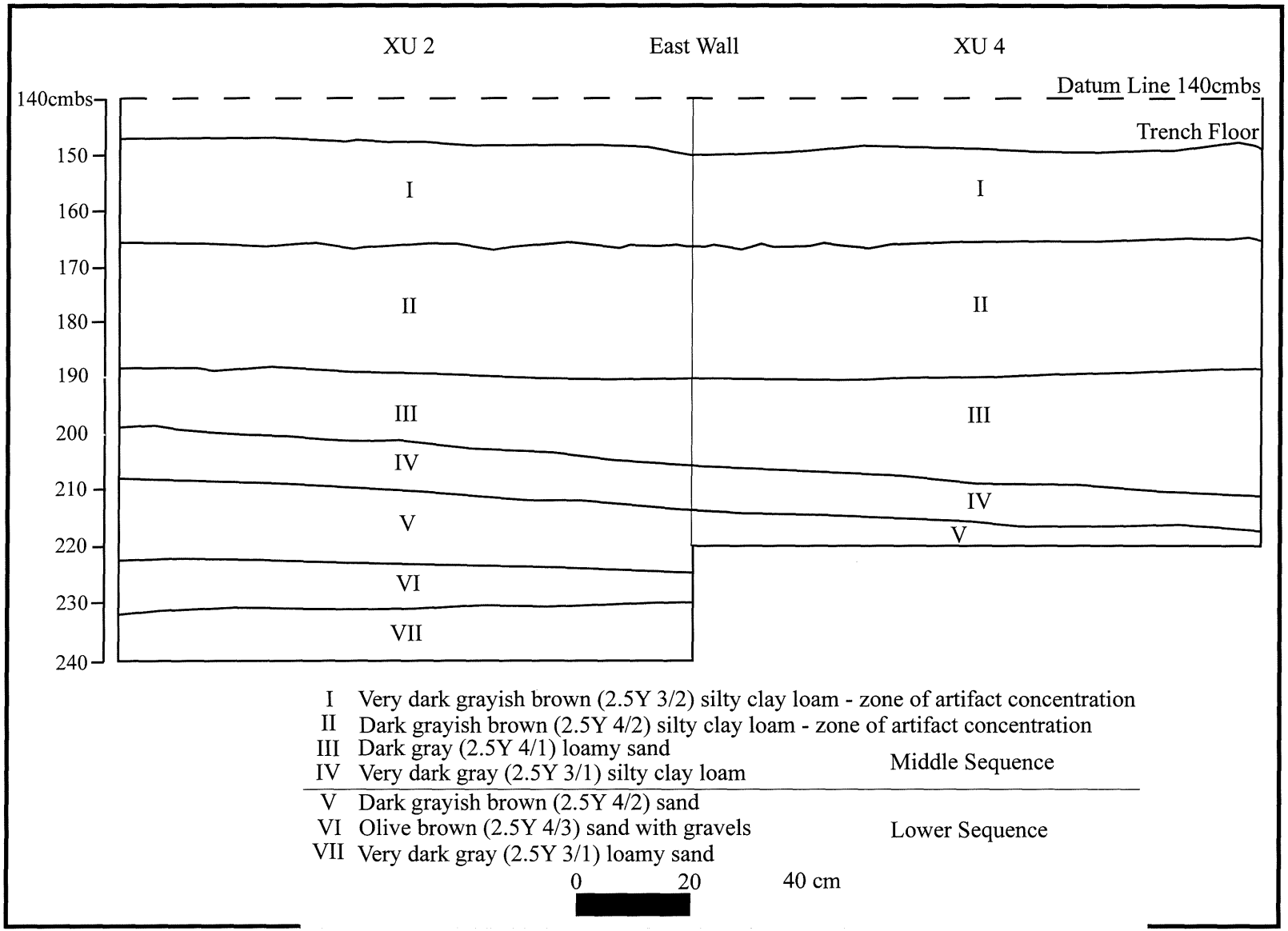


Figure 15. Site 21BE305 XUs 2 & 4 East Wall Profile.

Figure 16. Site 21BE305 Photo XU 2 and 4 East Wall Profile (zone of artifact concentration in upper half of profile).

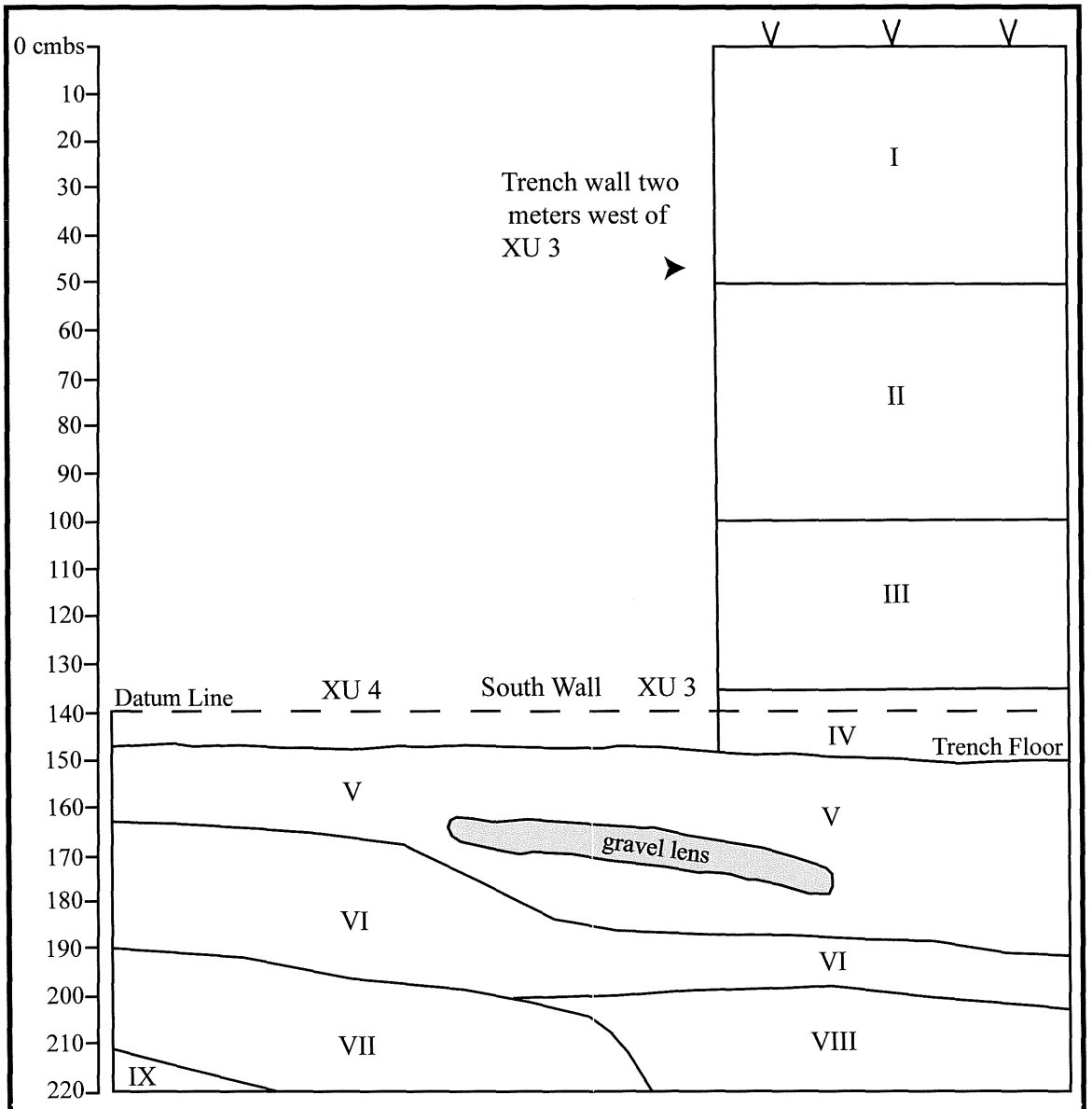


Figure 17. Site 21BE305 Trench Wall and XUs 3 & 4 South Wall Profile.

Figure 18. Site 21BE305 Photo XU 3 and 4 South Wall Profile (zone of artifact concentration in upper half of profile).

10. SITE 21BE306

10.1 Overview

Site 21BE306 is a multicomponent site that includes a ca. 1875 to 1965 historic farmstead artifact scatter and a precontact period lithic isolate. The site is in T106N, R26W, Section 9 and occupies an area of approximately 25 by 30 meters, encompassing 0.1 acre (Figures 2 and 3). The UTM coordinates for the center of the site are E423206 N4872342 (1983 NAD Zone 15). A map of the site on aerial imagery is presented in Figure 19. A photo of the site area is included in Figure 20.

10.2 Physical Setting

The site is on an upland overlooking the Cobb River valley on the south side of the Cobb River and east side of TH 22. The site area consisted of a lawn, with an agricultural field in the eastern portion of the site. The site is bordered on the north by the steeply sloping valley wall of the Cobb River, and a steep ravine borders the south end of the site. The former farmstead at the site has been razed, and there is no surficial evidence of the farmstead except a septic tank located just west of ST 15ES10. Surface visibility was very low (<10 percent) in the lawn and was low to moderate (35 percent) in the agricultural field.

Soils at the site are mapped as the Le Sueur series (Web Soil Survey 2015). A typical soil profile is presented in Table 19. Some tests had a thin layer of fill overlying the A horizon.

Table 19. Site 21BE306 Representative Soil Profile.

Depth Below Surface (cm)	Description
0-40	Black (10YR 2/1) loam; A horizon
40-55	Very dark grayish brown (10YR 3/2) sandy clay loam; B1 horizon
55-75	Brown (10YR 4/3) sandy clay loam; B2 horizon

10.3 Phase I Survey Methods and Results

Shovels tests were dug in 15-meter intervals, with five and 10-meter interval tests dug adjacent to Shovel Test 15E, which contained a precontact lithic artifact. A total of 206 historic artifacts, including fauna, were recovered from ten shovel tests. The artifacts were recovered from 0 to 75 cmbs and included a variety of domestic and architectural items, which were mostly recovered between 0 and 30 cmbs (Table 20).

Table 20. Site 21BE306 Phase I Summary of Artifacts.

Shovel Test	Depth (cmbs)	Count	Artifact type
15EN5	0-20	1	Mammalian, medium/large, unid. frag, modern cut/saw marks
		2	Mammalian, medium/large, unidentifiable fragment
		2	Ceramic, whiteware fragment
		1	Glass, clear window fragment
		2	Glass, clear bottle fragment
		1	Glass, clear fragment
		2	Metal, unidentified fragment
		4	Metal, iron nail, square
		9	Metal, iron fragment
	20-40	2	Metal, iron wire fragment
		1	Asbestos fragment
15EN10	0-30	3	Ceramic, whiteware fragment
		1	Glass, milk fragment
		1	Glass, clear bottle fragment
		1	Other, unidentifiable fragment
15ES5	0-30	1	Ceramic, stoneware fragment, salt glazed
		2	Ceramic, whiteware fragment
		8	Glass, clear fragment
		2	Glass, clear window fragment
		1	Metal, brass shotgun shell
		1	Metal, brass .22 shell
		4	Metal, unidentified fragment
		2	Metal, iron fragment
		1	Metal, iron strap fragment
		1	Composite, unidentifiable fragment
		1	Metal, iron fragment
		3	Metal, iron nail, wire
		19	Metal, iron nail, square
	30-50	1	Gallus gallus (domestic chicken) vertebra, cervical, complete
		1	Mammalian, unidentifiable fragment
		1	Ceramic, whiteware fragment
		2	Glass, clear window fragment
		1	Composite, unidentifiable fragment
		1	Metal, unidentified fragment
		13	Metal, iron nail, square
15ES10	0-25	3	Mammalian, unidentifiable fragment
		3	Bird, unidentifiable fragment
		1	Ceramic, yelloware fragment
		1	Ceramic, whiteware rim fragment
		1	Jewelry fragment
		2	Metal, iron fragment
		1	Ceramic, stoneware fragment, salt glazed
		1	Metal, brass.22 shell
		16	Metal, iron nail, square
		9	Plastic fragment
	25-50	1	Metal, iron fragment
		1	Metal, iron wire fragment
		4	Metal, iron nail, square
	50-75	2	Metal, iron nail, square
		1	Metal, iron fragment

Table 20. Continued.

Shovel Test	Depth (cmbs)	Count	Artifact type
15EW5	0-30	1	Gallus gallus (domestic chicken) vertebra, thoracic fragment
		7	Metal, iron nail, square
		3	Metal, iron nail, wire
		1	Metal, iron strap fragment
		4	Ceramic, stoneware fragment, rockingham glaze
		1	Ceramic, stoneware fragment
		1	Glass, clear window fragment
		4	Plastic fragment
	30-40	2	Vertebrata, unidentifiable fragment
15EW10	0-25	1	Glass, aqua fragment
		3	Glass, clear window fragment
		2	Metal, iron nail, wire
		1	Asbestos fragment
	25-50	1	Glass, clear fragment
		1	Metal, iron fragment
	50-75	1	Glass, aqua bottle fragment
		1	Foundation stone fragment
15E	0-20	1	Glass, clear bottle fragment
		2	Glass, clear window fragment
		2	Metal, brass .22 shell
		2	Metal, iron fragment
	20-45	1	**Utilized flake, nonbifacial, Grand Meadow Chert**
		1	Glass, clear window fragment
		1	Metal, iron fragment
15EE5	0-25	1	Bos tarus (cow), ilium fragment, modern cut/saw marks
		1	Glass, clear window fragment
		1	Metal, iron staple
		2	Metal, iron nail, wire
		1	Metal, iron nail, square
		1	Metal, iron wire fragment
		1	Metal, iron fragment
	25-50	1	Metal, iron nail, square
		1	Metal, iron fragment
15EE10	0-25	1	Glass, clear window fragment
		2	Metal, iron nail, square
		1	Metal, iron wire fragment
		1	Asbestos fragment
16E	0-30	1	Metal, iron nail, wire
Total	-	**207**	-

10.4 Precontact Artifact Analysis

The lithic assemblage includes a utilized flake of Grand Meadow Chert. Utilized flakes are primarily light-duty cutting and slicing tools used on animal remains, wood, and plants. Grand Meadow Chert is available in bedrock and secondary sources in southeastern Minnesota. The specific locations of the sources are not well known, but precontact quarry pits have been identified near the town of Grand Meadow in Mower County, Minnesota about 70 miles east of the project area and secondary deposits have also been identified in gravel pits along the south

branch of the Root River in Fillmore County (Bakken 2011). Very small amounts of the Grand Meadow Chert are likely present in glacial till in the region.

10.5 Historic Artifact Analysis

The historic assemblage includes 191 artifacts, excluding fauna. The assemblage includes a broad range of artifacts from several classes (Table 21). Architectural items were the most common followed by undetermined, household, firearms, and personal items.

Many of the historic artifacts are small and fragmentary and were not amenable to precise dating, as they had long manufacturing periods or lacked temporally diagnostic attributes, such as maker's marks or datable elements. These items provide only broad dates and are of limited research value. Artifacts that retained temporally diagnostic attributes, which would allow for a narrow date range to be determined, are discussed below with their respective class (Peterson 1995; University of Utah et al. 1992). The general date range for the historic assemblage spans from the mid to late 1800s to the present based on manufacturing dates of specific artifacts. The artifacts are all less than one inch in size (SG 1 or smaller).

Table 21. Site 21BE306 Summary of Historic Artifacts.

Material Class	Window Glass	Bottle Glass	Other Glass	Ceramic	Square Nail	Wire Nail	Staple	Strap	Wire	Brass	Other Metal	Unidentified Metal	Foundation Stone	Jewelry	Asbestos	Composite	Plastic	Other	Total
Architectural	14				69	11	1	2	4				1		3				**105**
Undetermined			12								23	7				2	13	1	**58**
Household		5		17															**22**
Firearms										5									**5**
Personal														1					**1**
Total	**14**	**5**	**12**	**17**	**69**	**11**	**2**	**2**	**4**	**5**	**23**	**7**	**1**	**1**	**3**	**2**	**13**	**1**	**191**

10.5.1 Architectural Class

Architectural items consist primarily of square nails (n=69), which were recovered in more than half of the positive shovel tests. Square nails are the most widespread artifact type at the site. There are almost six times the amount of square (cut) nails (n= 69) than wire (round) nails (n=11). Square nails were in use from about 1830 to 1890, and were replaced by round nails around 1890. Window glass fragments (n=14) were also common in the architectural class assemblage. Four fragments of wire, two straps, three fragments of asbestos, and one foundation stone fragment were also recovered.

The asbestos-cement board was first produced in the United States in 1907 (Wilson et al. 2008). The material gained in popularity through the 1970s, when the Environmental Protection Agency began regulating uses of asbestos. The manufacture, import and use of asbestos-cement board remains legal, however (http://www2.epa.gov/asbestos/us-federal-bans-asbestos, accessed 9 November 2015), so the available information only allows us to date asbestos as post-1907.

10.5.2 Household Class

Household items consist of bottle glass (n=5) and ceramics (n=17). Bottle glass consisted of the following colors: clear (n=4), and aqua (n=1). Nearly all of the bottle glass consists of pieces too small to identify. Approximate ages for the glass are as follows: clear glass (1875 to present), and aqua glass (1800 to 1910).

Ceramics included whiteware (n=9), earthenware (n=4), stoneware (n=3), and yellow ware (n=1). Most of the ceramics consist of pieces too small to identify or date. One stoneware fragment has brown slip on the interior and exterior, with a salt glaze, produced post 1805. The whiteware has a broad date of 1830 to 1969. The earthenware ceramics with Rockingham glaze were manufactured in the United States beginning in 1812 and were most popular from about 1840 to the 1890s (Brown and Bewick 1982; Claney 2004; Stelle 2001). Use of this glazing technique persisted well into the twentieth century, however, so the sherd does not provide any particularly useful dating information in this context.

10.5.3 Personal Class

The personal class consists of a 6-cm long fragment of jewelry necklace or bracelet fragment (Figure 21). It consists of two baroque pearls (probably fresh water pearls) on a fine cord (possibly silk), with one side of a gold clasp attached to the cord at one end. The other end of the cord is broken and frayed. The clasp is stamped "R.T.I. 14 K." 14 K indicates that the clasp is made of 14 carat gold. R.T.I is likely a maker's mark, although the mark could not be associated with a specific manufacturer. A web search for the stamp returned a number of results for pearl jewelry, mostly featuring freshwater pearls. Dating information for these pieces of jewelry, however, was scant, so the artifact does not provide any particularly useful chronological information in this context.

10.5.4 Firearms Class

The firearms class includes five brass .22 caliber shell casings, and one brass shotgun shell casing. The rim-fire .22 caliber casing is stamped with an "F" that identifies it as the product of the Federal Cartridge Company of Anoka, Minnesota. Federal was founded in 1917, but did not begin production of .22 caliber ammunition until 1924 (Rocketto 2011; Huegel 2012). The company continues to produce .22 caliber rimfire cartridges, so the cartridge can only be dated as no earlier than 1924. There are also two .22 caliber casing stamped with a distinctive "C," but this mark could not be specifically identified. It is possible that the headstamp denotes the Creedmore Cartridge Company of Barberton, Ohio (http://www.cartridgecollectors.org/headstampcodes, accessed 4 November 2015), although the specific form of the C could not be associated with Creedmore.

The base of the 12 gauge shotgun shell bears the headstamp "W.C.CO. No. 12 SURESHOT". W.C.CO. identifies the Western Cartridge Company of East Alton, Illinois. Western was incorporated in 1898 and was renamed Winshester-Western in 1925 upon merger with the Winchester Repeating Arms Company. The headstamp predates this merger. In addition, in 1920 the headstamp was changed from "No. 12" to "21 GA," indicating that this shell was not produced later than 1920 (Farrar 2000). Thus available information allows us to bracket this shell between 1898 and 1920.

10.5.5 Undetermined Class

The undetermined class consists of items of unknown association. Most of these items are small (less than ½" in size), fragmentary pieces of clear glass and rusty metal that are likely household and architectural.

10.6 Faunal Analysis by Steven Kuehn

The faunal assemblage contains 15 pieces of bone weighing 26.9 g, recovered from five different shovel tests (Table 22). None of the faunal remains exhibit evidence of burning, rodent or carnivore gnawing, or similar modification. The method of faunal analysis is presented in Section 3.3.

One ilium fragment is identifiable as cattle (*Bos taurus*). The element has saw cuts on each end and represents a sirloin cut. Three indeterminate fragments, one of which also shows a saw cut mark, are classified as medium-large mammal. Four pieces of bone unidentifiable to element are listed as indeterminate mammal.

Two domestic chicken (*Gallus gallus*) bones were observed, consisting of a complete cervical vertebra and a portion of the fused thoracic vertebra. Three indeterminate fragments, possibly from a pelvis, are categorized as indeterminate bird. None of the chicken or indeterminate bird remains display butchery marks.

Table 22. Site 21BE306 Faunal Remains.

Provenience	Count	Weight (g)	Taxon	Element, Section	Age	Comments
ST15E E5 0-25cmbs	1	20.5	cattle (*Bos taurus*)	ilium, fragment	--	sawn; sirloin cut
ST15E N5 0-20cmbs	3	2.4	medium-large mammal	indeterminate, fragment	--	1 with saw cut
ST15E S5 30-50cmbs	1	0.4	mammal, indeterminate	indeterminate, fragment	--	
ST15E S5 30-50cmbs	1	0.9	chicken (*Gallus gallus*)	cervical vertebra, complete	A	
ST15E S10 0-25cmbs	3	0.7	mammal, indeterminate	indeterminate, fragment	--	
ST15E S10 0-25cmbs	3	0.3	bird, indeterminate	indeterminate, fragment	--	cf. pelvis fragment
ST15E W5 0-30cmbs	1	1.6	chicken (*Gallus gallus*)	thoracic vertebra, fragment	A	
ST15E W5 30-40cmbs	2	0.1	taxon indeterminate (Vertebrata)	indeterminate, fragment	--	
Total	**15**	**26.9**				

The last two specimens are small, indistinct pieces of bone that cannot be identified to element or specific taxon, and are listed as taxon indeterminate (Vertebrata). Neither specimen displays butchering marks.

The faunal assemblage is small with only three specifically identifiable specimens, precluding any detailed discussion of dietary behavior at the site. The presence of domesticated taxa (e.g., cattle, chicken) indicates consumption of beef and chicken, a pattern consistent with that seen in larger, more representative nineteenth and early twentieth century faunal assemblages.

The faunal assemblage includes four fragments that are associated with the historic component based on species and butchering marks. It is likely that the other remains are also historic, but some could also be associated with the precontact component.

10.7 Map Review and Ownership History

Historic plat maps in Blue Earth County were reviewed for 1874, 1879, 1895, 1914, 1916, 1920, and 1929 (Andreas 1874; Warner & Foote 1879; Central Publishing Company 1895; Ogle 1914; Hixson and Company 1916; Moore and Dillon 1920; Webb Publishing Co. 1929). Aerial photos from 1938, 1950, and 1964 were obtained online from the Borchert Map Library at the University of Minnesota (http://map.lib.umn.edu/mhapo/). The farmstead at 21BE306 is depicted on the 1879 plat map and all subsequent maps and air imagery (Figures 22 to 29). The farmstead house was extant on a 2003 Google Earth air image, but was razed shortly thereafter, as it does not appear in 2006 air imagery. No structures or features (except the septic tanks) are currently extant. The farm buildings were razed prior to 1991 based on the Google Earth air imagery.

The land where the farm is located was part of the Winnebago Indian reservation until 1863 (see Hughes 1901:224). The land patent for the northwest quarter of T106N, R26W, Section 9 was issued to William F. Lewis in 1866 (General Land Office online records, www.glorecords. blm.gov, record 446 MN, MN 2850.092). The Andreas atlas shows no building at the farmstead in 1874. The 1879 plat (Warner & Foote 1879) shows a building at the location of 21BE306, however, suggesting that the farmstead was established between 1874 and 1879. The county plat books and other records indicate that the farm was held by three generations of the Cramer family over approximately the next century (Tables 23 and 24). The first generation was Frederick E. "Fred" and Jeanette (Hislop) Cramer. He was born in Hamburg, Germany, while she was born in Janesville, Wisconsin to Scottish emigrant parents (www.findagrave.com). Frederick E. "Fred" Cramer's son was named Frederick E. "Ernest" Cramer. According to Neill (1882), Fred Cramer was at one time chairman of the township board. Hughes (1901:225) notes that in 1887 Cramer bought a building which had housed a then-defunct store, founded in 1875, north of the farm. The Blue Earth County Enterprise (Oct 1910, www.newspaperabstracts. com/link.php?if=27332, accessed 29 October 2015) calls "Mrs. Fred Cramer... one of the substantial residents of Beauford."

The farm was passed to their son David T. and his wife Mary E. (Lumburg) Cramer apparently between 1914 and 1916. The farmstead parcel on the 1971 plat (Rockford Map Publishers, Inc. 1971) shows a change of ownership, to A. and C. Cramer, indicating that Adrian B. (son of David and Mary) and Camilla E. (Stevens) Cramer were the new farm owners. The history of ownership was not traced past 1971.

Table 23. Site 21BE306 Farmstead Owners from 1870s to 1970.

Owners	Born - Died	Notes
Cramer, Frederick E. "Fred" Hislop, Jeanette	1842 - 1917 1849 - 1920	(b.Hamburg, Germany) (b. Janesville, Wisconsin)
Cramer, David T. Lumburg, Mary E.	1875 - 1947 1881 - 1962	
Cramer, Adrian B. Stevens, Camilla E.	1908 - 1998 1914 - 2004	

Table 24. Site 21BE306 Farmstead Ownership Per County Plat Books.

Year	Owner per plat books	Source
1874	*No farmstead*	Andreas 1874
1879	F.E. Cramer	Warner & Foote 1879
1895	*No name*	Central Publishing Company 1895
1914	Fred Kramer	Ogle 1914
1916	D. Cramer	Hixson 1916
1920	David T. Cramer	Moore and Dixon 1920
1929	David T. Cramer	Webb 1929
1938	David T. Cramer	Hixson 1938
1956	D.T. Cramer	Farm Plat Book Publishing Co. 1956
1962	Mrs. David T. Cramer	Thomas O. Nelson Co. 1962
1971	A. and C. Cramer	Rockford Map Publishers, Inc. 1971

10.8 Conclusions and Recommendation

Site 21BE306 is a multicomponent site that includes a historic farmstead (ca. 1875 to 1965) artifact scatter and a precontact period lithic isolate.

10.8.1 Historic Component

Historic artifacts recovered from shovel tests consisted mostly of architectural and undetermined items, with smaller amounts of household, firearms, and personal items. The site is interpreted to be a primary refuse deposit of farmstead architectural and domestic items. None of the buildings are extant. The eastern portion of the former farmstead, where the barns and outbuildings were located, is in an agricultural field, and the western portion is a lawn. No historic structures or features are visible. These factors indicate most of the former farmstead lacks integrity.

A review of the local and regional history indicates that the historical component at the site is not directly associated with historically significant persons or with events that have made a significant contribution to the broad patterns of our history (NRHP Criteria A and B). The site does not embody the distinctive characteristics of the agricultural period from the late 1800s to middle 1900s (NRHP Criterion C).

The historic research potential of the site is low because of the limited artifact assemblage, lack of integrity, and absence of features. The historic component is not capable of providing information important to relevant research themes under NRHP Criterion D for the historic period (See Section 2.3.3 Research Themes).

10.8.2 Precontact Component

The precontact component includes a utilized flake. The research potential of the precontact component is very low because of the very sparse and limited artifact assemblage and lack of features. The precontact component is not capable of providing information important to relevant research themes under NRHP Criterion D for precontact periods (See Section 2.3 Research Themes).

10.9 Recommendation

The site is recommended not eligible for listing on the National Register of Historic Places because it lacks integrity and does not meet National Register Criteria A, B, C, or D. No further archaeological work is recommended at the site.

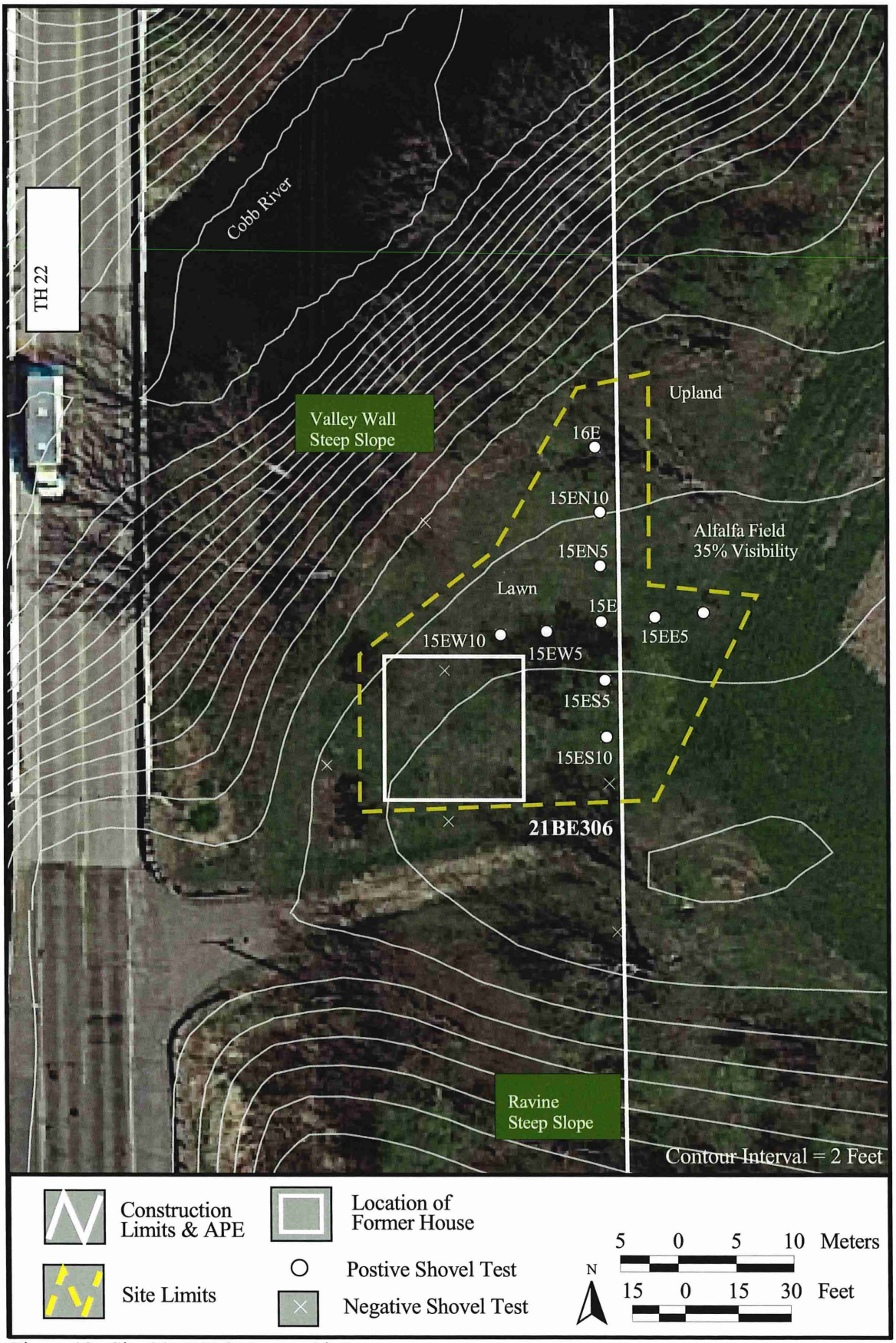


Figure 19. Site 21BE306 Map on Air Imagery.

Figure 20. Site 21BE306 Photo Lawn (former farm house location), Facing North.

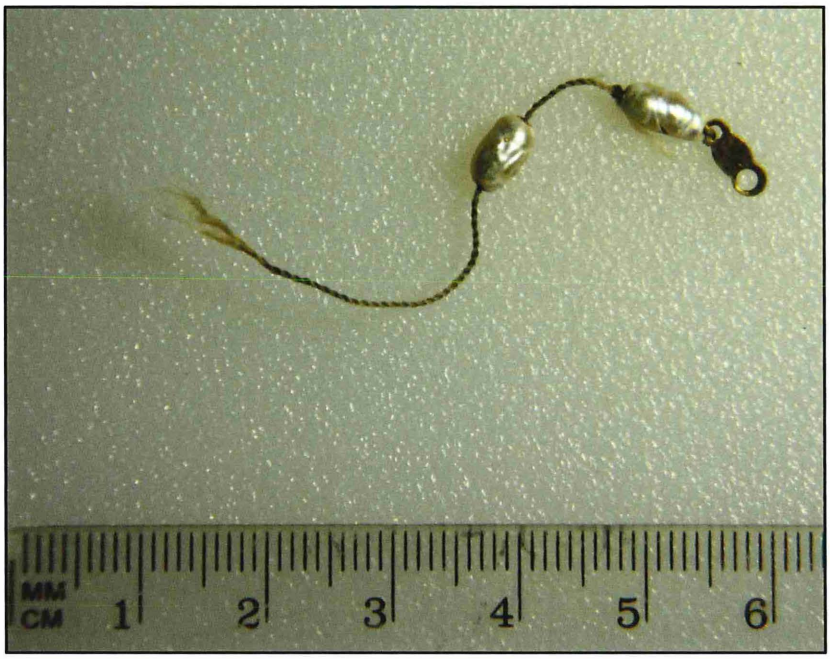


Figure 21. Site 21BE306 Photo of Jewelry from Shovel Test 15ES10.

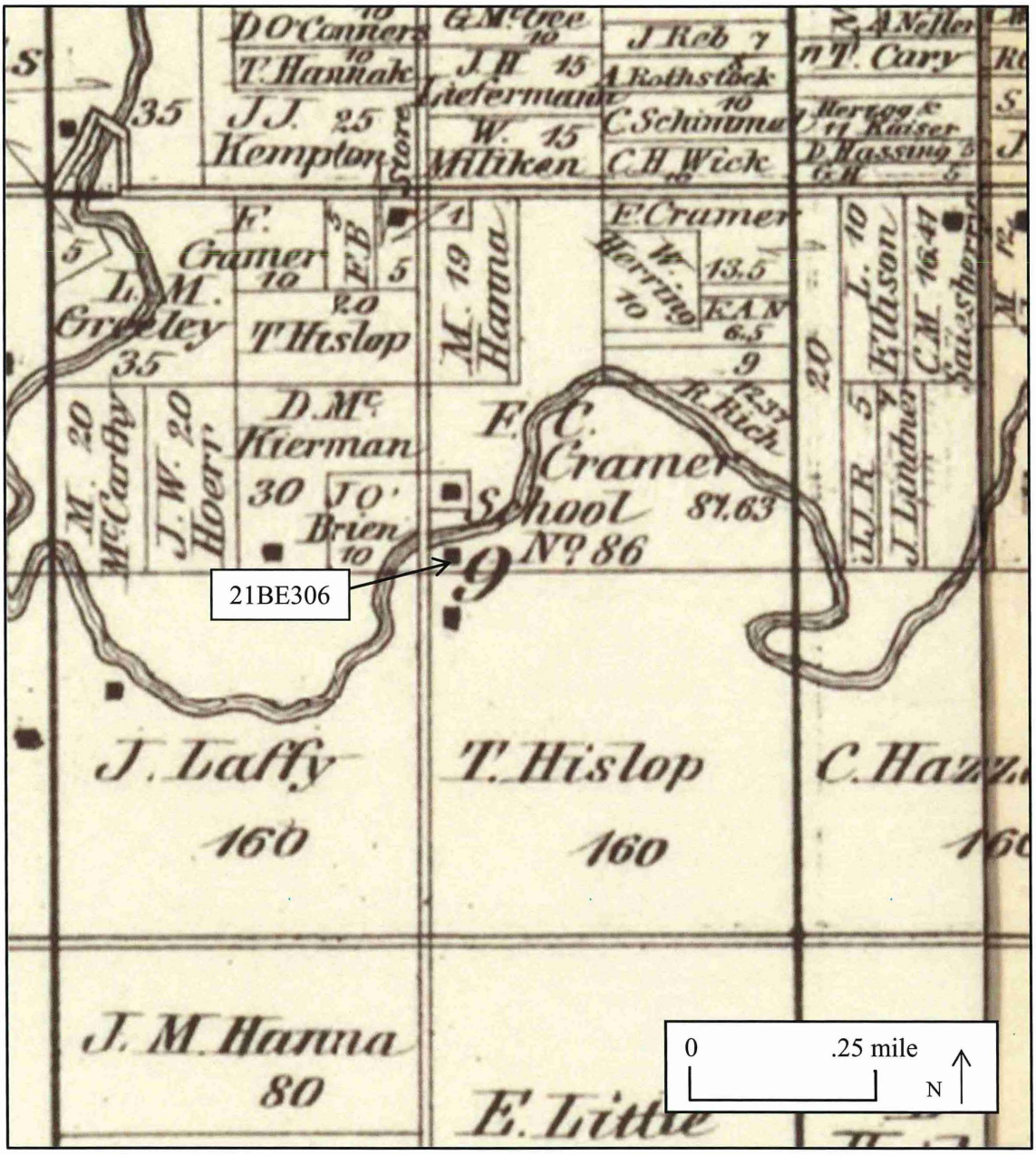


Figure 22. 1879 Plat Map (Warner & Foote 1879) of Farmstead at Site 21BE306.

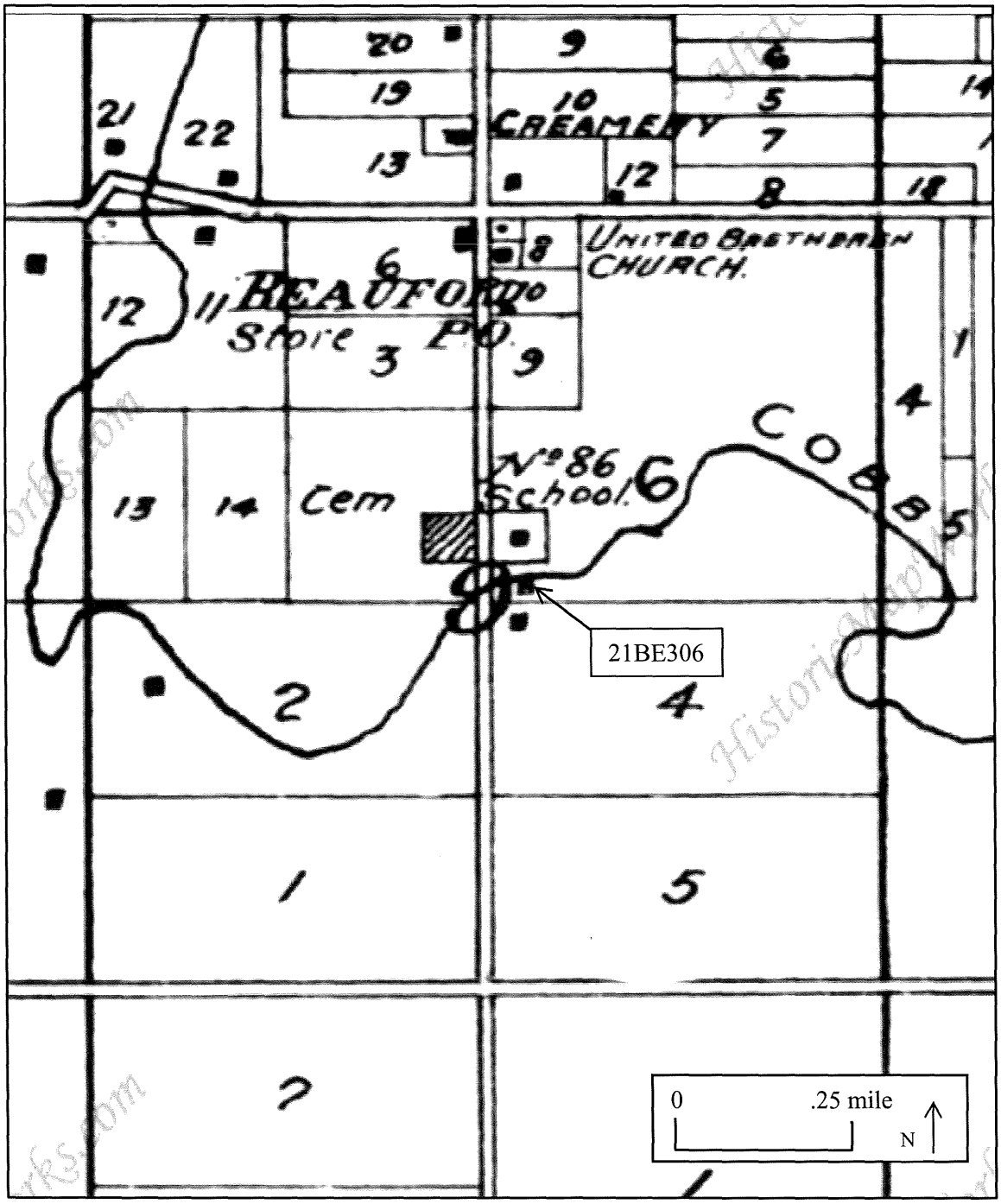


Figure 23. 1895 Plat Map (Central Publishing Company 1895) of Farmstead at Site 21BE306.

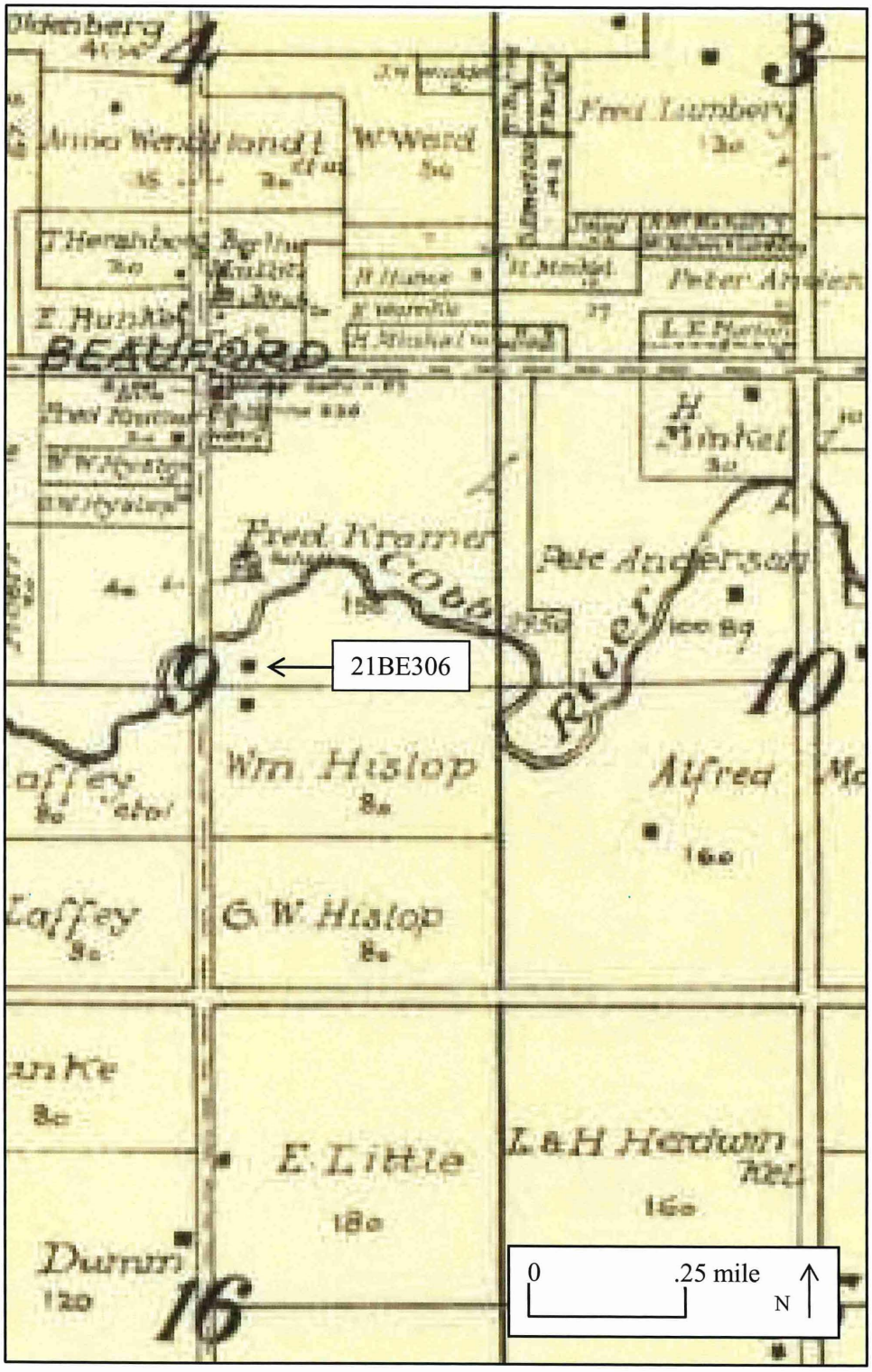


Figure 24. 1914 Plat Map (Ogle 1914) of Farmstead at Site 21BE306.

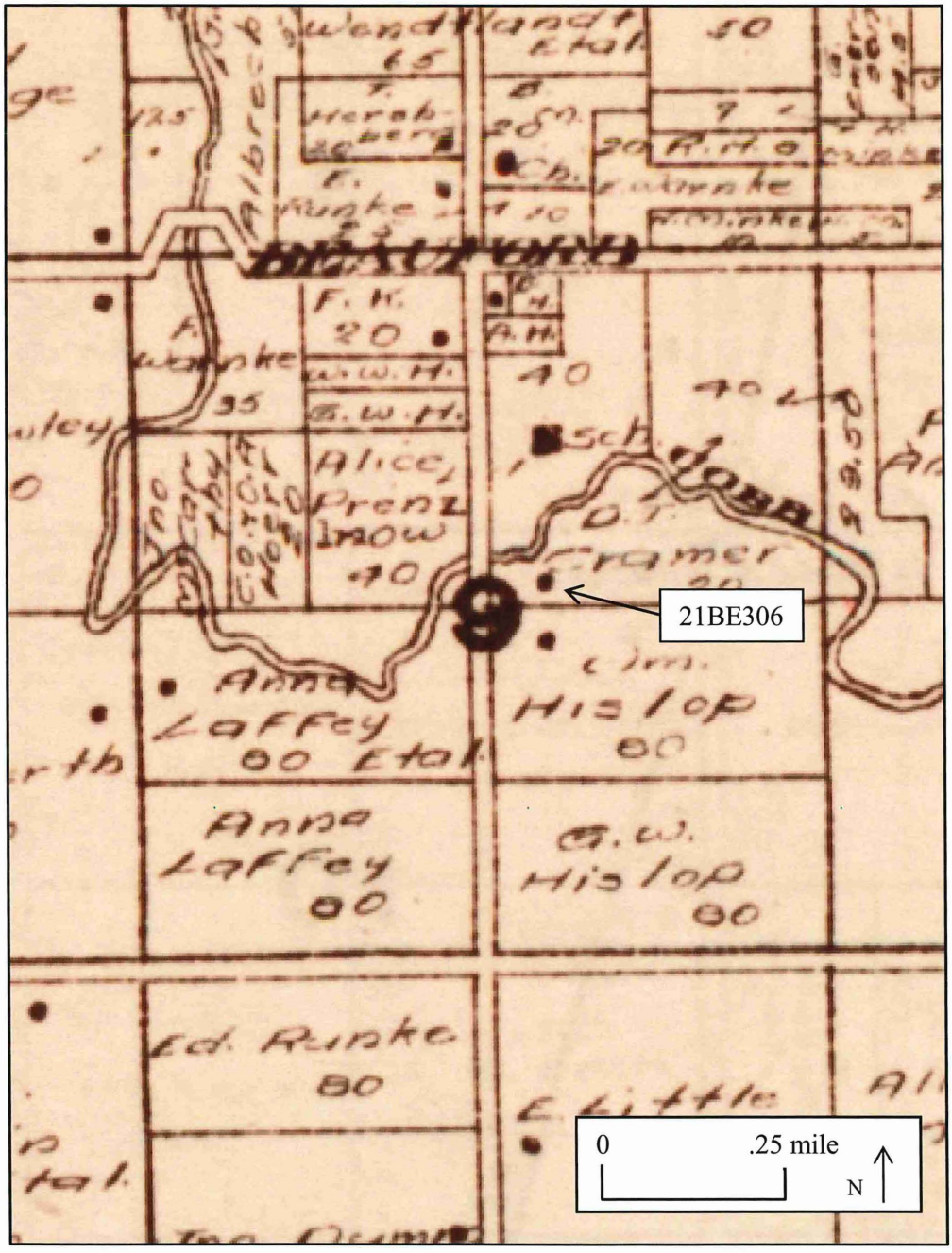


Figure 25. 1916 Plat Map (Hixson and Company 1916) of Farmstead at Site 21BE306.

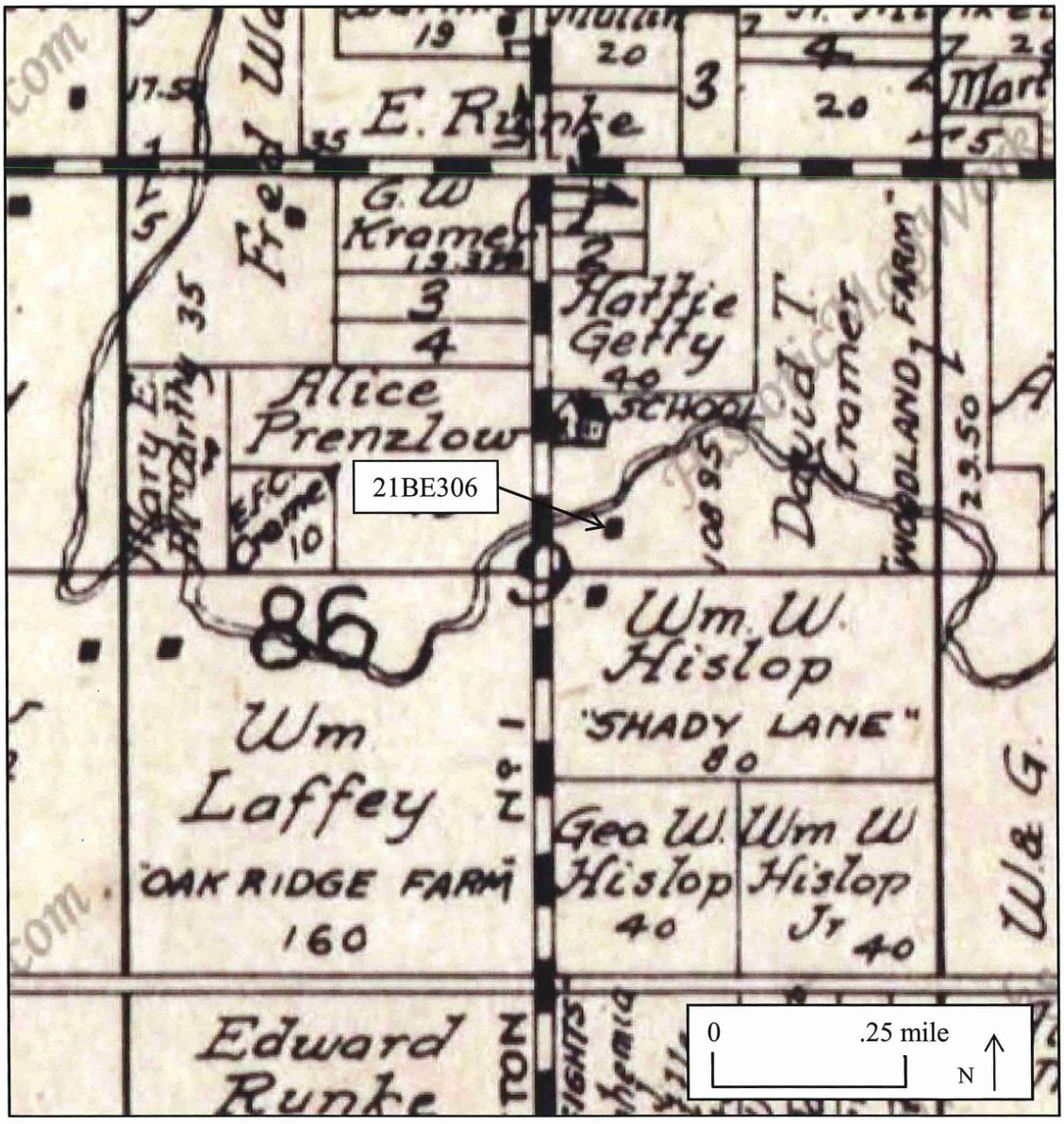


Figure 26. 1929 Plat Map (Webb Publishing Co. 1929) of Farmstead at Site 21BE306.

Figure 27. 1938 Aerial Photograph of Farmstead at Site 21BE306.

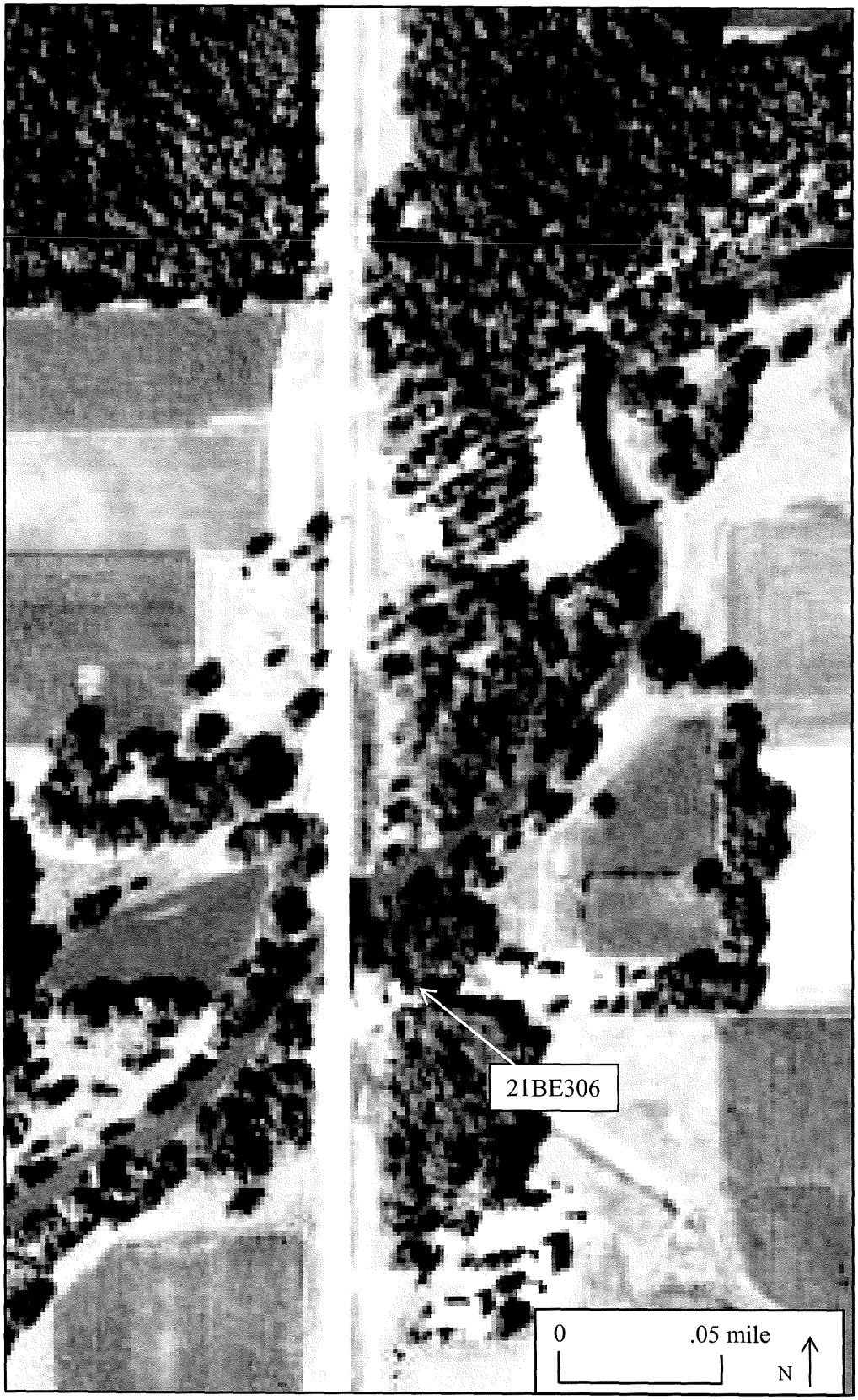


Figure 28. 1950 Aerial Photograph of Farmstead at Site 21BE306.

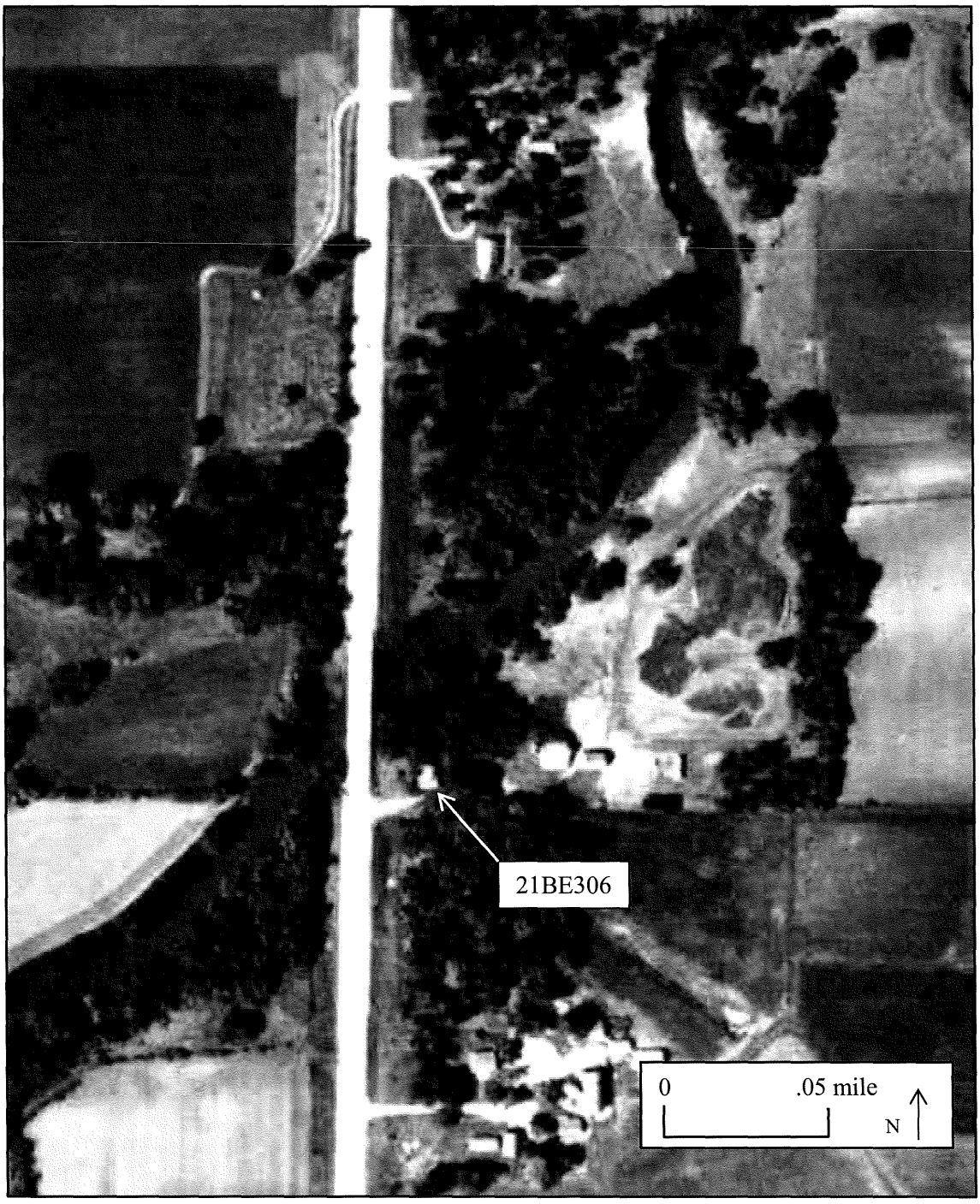


Figure 29. 1964 Aerial Photograph of Farmstead at Site 21BE306.

11. SITES 21BE307 AND 21BE308

11.1 Overview

Site 21BE307 is a sparse lithic scatter, and site 21BE308 is a lithic isolate. The ages and cultural affiliations of the sites are unknown because of the absence of diagnostic artifacts. The sites are in T106N, R26W, Section 9 (Figures 2 and 3). Each of the sites is one by one meter in size and encompass less than 0.1 acre. UTM coordinates for 21BE307 are E423099 N4872484 and for 21BE308 are E423191 N4872501 (1983 NAD Zone 15). A map of the sites on aerial imagery is presented in Figure 30. Photos of the sites are included in Figures 31 and 32.

11.2 Physical Setting

Site 21BE307 is located 50 meters west of TH 22 on the south side of the Oak Hill Cemetery on the edge of the upland above the Cobb River valley. The site was within the initial survey area but is outside of the final construction limits. The site is in the woods on the south side of the road that leads into the cemetery. North of the site is a hill cut for the cemetery road, and south of the site is the steeply sloping valley wall of the Cobb River. The site occupies a small area of land between the hill cut and valley wall slope. Surface visibility was very low (<10 percent).

Site 21BE308 is on the toe slope of the valley wall along the northern margin of a low terrace in the Cobb River valley. The site area is wooded, and surface visibility was very low (<10 percent). The site is 20 meters east of TH 22.

Soils at site 21BE307 are mapped as Litchfield-Nicollet complex (Web Soil Survey 2015), but the profiles at the site are most similar to the Nicollet series. A typical soil profile is presented in Table 25. The profiles from the five-meter radial tests had 50 cm of fill that overlay an A horizon in the western test and overlay a truncated B2 horizon in the eastern test. Shovel Test 1 and the radial test to the east indicated the area is extensively disturbed, as the A horizon has been bladed off and fill overlies B1 or B2 horizons.

Table 25. Site 21BE307 Shovel Test 1 Profile.

Depth Below Surface (cm)	Description
0-40	Fill
40-55	Very dark grayish brown (10YR 3/2) sandy clay loam; B1 horizon
55-75	Dark grayish brown (10YR 4/2) sandy clay loam; B2 horizon

Soils at site 21BE308 are mapped as Storden series (Web Soil Survey 2015), but the profiles at the site are most similar to the Minneopa series that occurs on low terraces. A typical soil profile is presented in Table 26.

Table 26. Site 21BE308 Shovel Test 1 Profile.

Depth Below Surface (cm)	Description
0-80	Black (10YR 2/1) silt loam; A horizon
80-130	Very dark gray (2.5Y 3/1) ; AB horizon
130-145	Very dark grayish brown (2.5Y 3/2) silty clay loam; B1 horizon
145-220	Dark grayish brown (2.5Y 4/2) clay loam; B2 horizon
220-240	Dark yellowish brown (10YR 4/4) silty clay; B3 horizon
240-300	Grayish brown (10YR 5/2) silty clay; C horizon

11.3 Survey Methods and Results

Each site was identified during shovel testing at 10-meter intervals. Four tests were dug at five-meter intervals around the positive test at 21BE308, but 5-meter interval tests were dug only east and west of the positive test at 21BE307, as the area to the north was hill cut and the area to the south was valley side slope. A summary of artifacts recovered from the sites is presented in Table 27.

Table 27. Sites 21BE307 and 21BE308 Artifact Summary.

Site #	Shovel Test #	Depth (cmbs)	Count	Artifact Description
21BE307	1	50-60	1	broken flake, Prairie du Chien Chert (oolitic)
		65-75	1	broken flake, granitic
21BE308	1E	110-120	1	broken flake, basaltic
	Total		**3**	

11.4 Artifact Analysis

The lithic assemblage from each site is very sparse and has limited interpretive potential. The broken flakes from the sites are not diagnostic of specific reduction stages. All of the lithic raw materials from the sites are available in the regional glacial till and were likely procured from local sources.

11.5 Conclusions and Recommendations

Site 21BE307 is a sparse lithic scatter, and site 21BE308 is a lithic isolate. No diagnostic artifacts were recovered from these sites, and their cultural contexts and ages are unknown. The sites are locales of lithic reduction or stone tool manufacture. Radial shovel tests placed in five-meter intervals adjacent to the positive tests were negative.

Under Criterion D, these sites lack the potential to provide important information on the precontact period because they have sparse and limited artifact assemblages, and 21BE307 lacks integrity as a result of soil disturbance. These sites are recommended not eligible for listing on the NRHP. No further archaeological work is recommended at the sites.

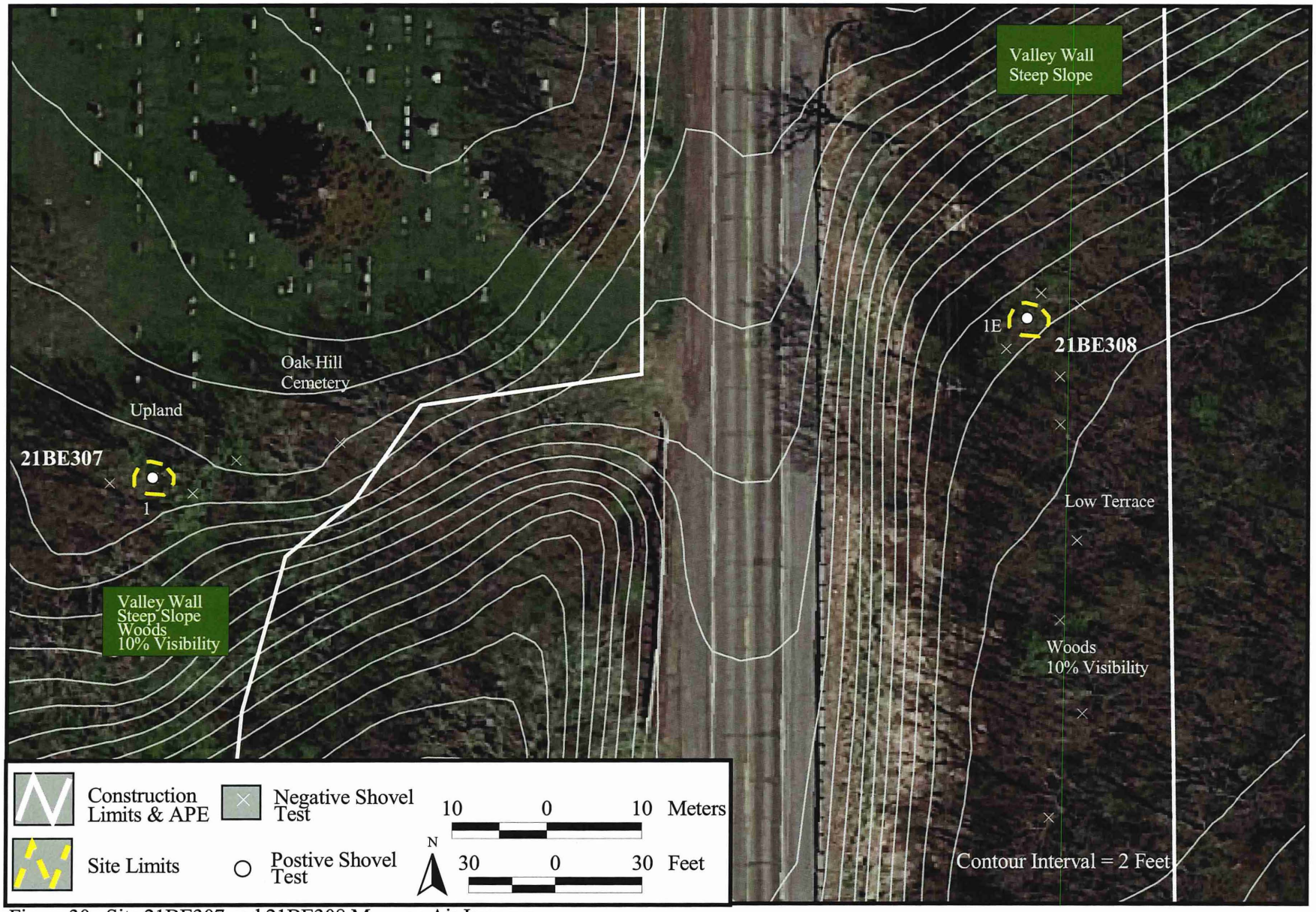


Figure 30. Site 21BE307 and 21BE308 Maps on Air Imagery.

Figure 31. Site 21BE307 Photo, Facing South from Cemetery.

Figure 32. Site 21BE308 Photo, Facing North from Cobb River Bridge.

12. SUMMARY AND RECOMMENDATIONS

Four sites were identified during survey for the project. Site 21BE305 is an Archaic period habitation and animal processing site. Site 21BE306 is a multicomponent historic farmstead and precontact isolated lithic. Site 21BE307 is a sparse lithic scatter, and site 21BE308 is a lithic isolate.

Phase II testing was conducted at site 21BE305, and the site is recommended eligible for listing on the NRHP under Criterion D. The other sites are recommended not eligible for listing on the NRHP. A summary of the sites, their NRHP status, and recommendations is presented in Table 28.

The project design at site 21BE305 was modified to avoid impacts to the site. The current project design restricts impacts from pond construction to the eastern portion of the site where the cultural deposits are more than two meters deep and ensures that impacts from pond excavation are less than 1.5 meters deep in this area to avoid cultural deposits. The construction limits within the site will be fenced prior to construction. MnDOT, in consultation with the Minnesota State Historic Preservation Office, has determined that the project as currently designed will have no adverse effect on the site. However, if the project design changes or if other construction projects along TH 22 adversely affects the site, then a Phase III data recovery is recommended to mitigate the project's effects.

Table 28. Site Summary and Recommendations.

Site	Cultural Context, Type, & Function	Eligible for NRHP	Project Affect	Recommendation
21BE305	Middle to the Late Archaic period, subsurface artifact scatter, animal butchering and habitation	Yes	No Adverse Effect	Fence Western Portion of Site; No further archaeology work unless project design changes
21BE306	Historic farmstead (ca. 1875 to 1965), subsurface artifact scatter & Indeterminate precontact period, lithic isolate, temporary camp	No	No effect	No further archaeology work
21BE307	Indeterminate precontact period, sparse subsurface artifact scatter, temporary camp	No	No effect	No further archaeology work
21BE308	Indeterminate precontact period, subsurface lithic isolate, temporary camp	No	No effect	No further archaeology work

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APPENDIX A:
GEOMORPHOLOGICAL INVESTIGATION BY STRATA MORPH GEOEXPLORATION, INC.

Geomorphological Investigations in Support of Archaeological Survey and Testing at Archaeological Site 21BE305 in the Cobb River Valley Blue Earth County, Minnesota

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Strata Morph Geoexploration Report of Investigation No. 260

January 2016

Introduction

The project area, including archaeological site 21BE305, is located on a terrace in the Cobb River valley just west of Highway 22 and 0.8 km (0.5 miles) south of Beauford in Blue Earth County, Minnesota (Figure 1). Geomorphological investigations were conducted to construct a soil-stratigraphic framework to aid in interpreting the buried archaeological deposits in the project area. Sixteen cores were extracted within the project area (Figure 2)

The Cobb River incised glacial lake sediment and tills to form the relatively narrow, deep valley present today. The valley formed in response to down-cutting in the Minnesota River valley caused by flood discharges from Glacial Lake Agassiz (Fisher 2003, Gran et al. 2009, Teller 1985). Initial incision of the Minnesota River valley by the River Warren spillway occurred about 11,800 ^{14}C yrs B.P. and was completed by 10,800 ^{14}C yrs B.P. with a possible re-occupation between 9900 and 9400 ^{14}C yrs B.P. (Fisher 2003).

An intensive geomorphological investigation of the Le Sueur River watershed (the Cobb River is tributary to the Le Sueur) was undertaken as part of a larger effort to quantify the sediment contributions from the Minnesota River watershed to Lake Pepin in the Mississippi River valley (Gran et al. 2009, Gran et al. 2011). The following are some of their results that may be relevant to this investigation:

> The valleys in the watershed formed by incision as the knick zone migrated upstream. This incision is still occurring so the valleys are divided into reaches above and below the knick zone. Sediment sources are somewhat different above and below the knick zone. Blow the knick zone besides valley sediment sources sediment also comes from the ravines and high bluffs. The knick zone on the Cobb River is 47.2 km up the valley and the project area is ±29.9 km up the valley so it is in or below the knick zone. Terrace height correlates with age in the lower Le Sueur valley. Low terraces date from 1.5 to 2.0 ka and modeled as less that 3000 ka.
>
> The channels in the Le Sueur watershed responded to the increased historic runoff by lateral channel migration and increased channel size. No thick aggradational sequences of historic alluvium are present eliminating a typically available fine-grained sediment source. Largest sediment sources, currently and likely in the past, are near channel bluffs, terrace margins and incision

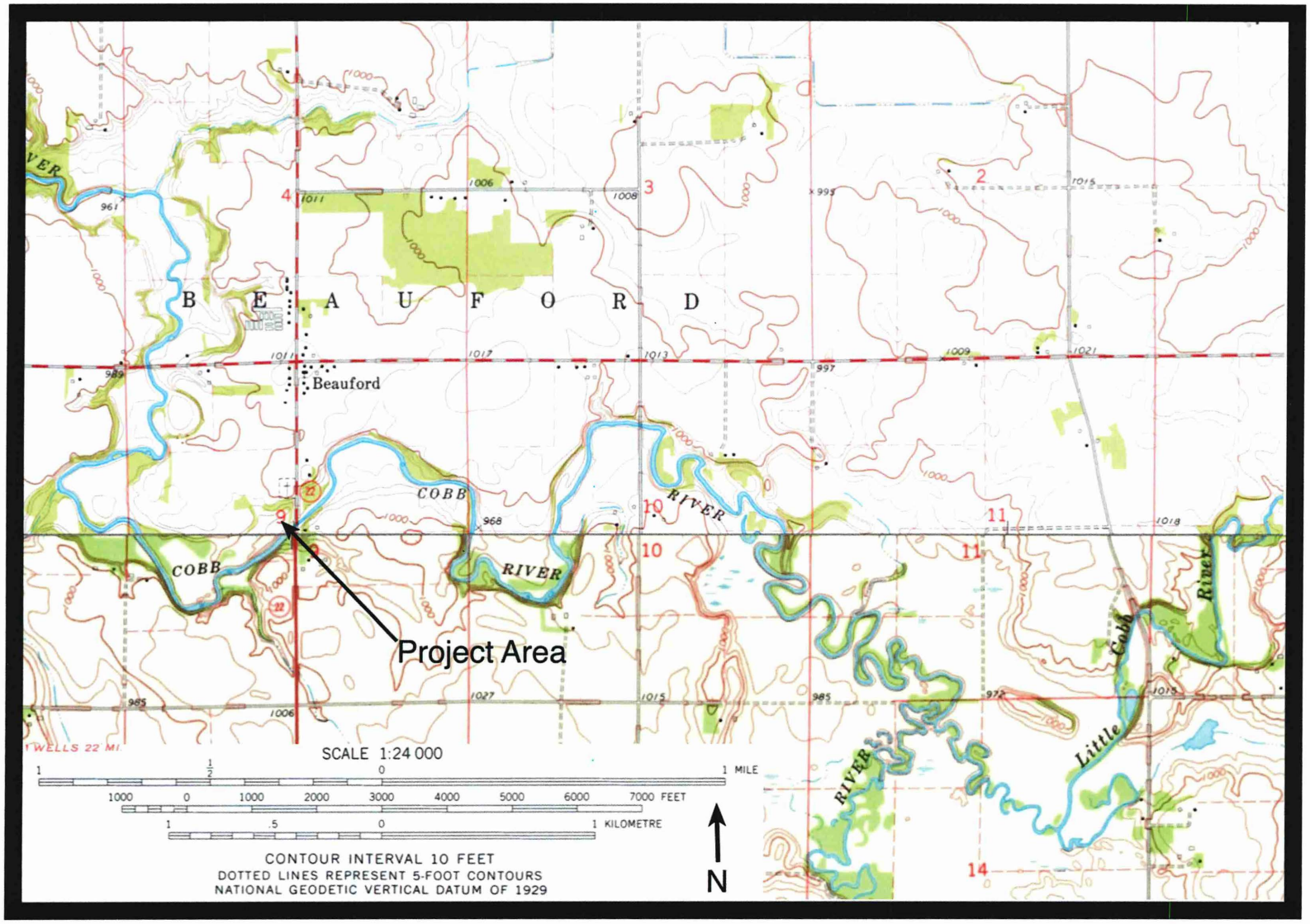

Figure 1. Location of the project area plotted on a 1:24,000 topographic map.

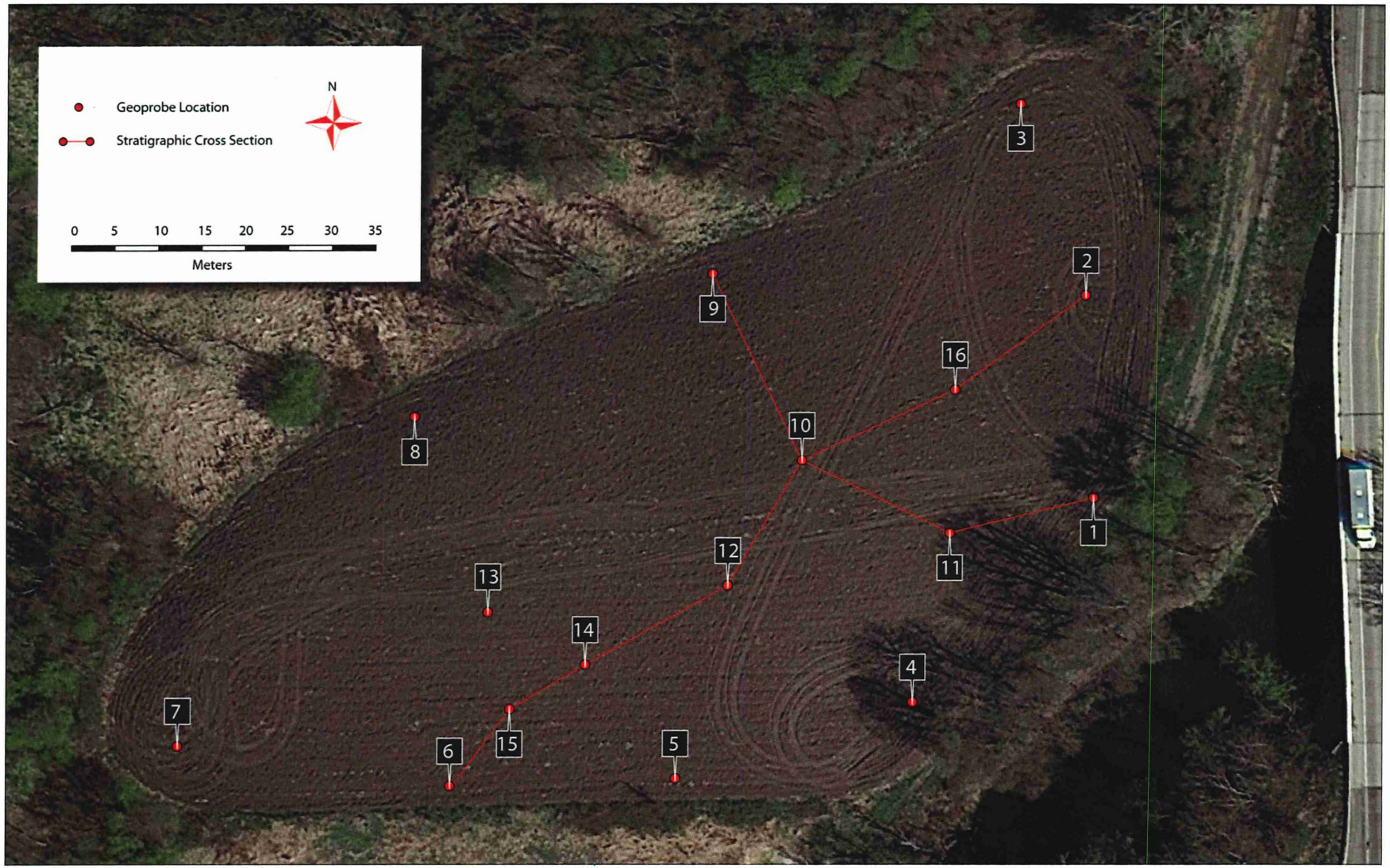

Figure 2. Location of cores and stratigraphic cross-sections in the project area

within the knick zone. Overbank deposition is not a dominant component of the sediment budget. A high suspended load that at peak flows includes a lot of fine sand is not being stored on the floodplain.

Methods

A truck mounted Geoprobe® was used to extract 5 cm (2 inch) diameter cores where truck access was possible. Core samples were described in the field using standard systems from soils (Schoeneberger et al. 1998, Soil Survey Staff 1975) and geology (Collinson and Thompson 1982, Folk 1974) and returned to the borehole or discarded.

Results

Landforms

The project area is on a terrace. The terrace consists of a higher surface expressed as ridges or bars separated by abandoned flood channels (Figure 3). The ridge at the south edge of the project area is the highest surface on the terrace and it rises 3.1 – 3.7 m above the river at an elevation of 296.3 m (972 ft). It extends downstream along the channel to the southwest. It is equivalent to the terrace attached to the uplands just southwest of the project area where they are separated by a flood channel. The ridge also extends northeast across the project area along the channel margin but is lower and not as well expressed. The channel at the project area is at an elevation of 292.6 m (960 ft) and the modern floodplain is at an elevation of 294.4 m (966 ft) just down stream of the project area.

Deposits and Stratigraphy

Deposits in the project area are organized into three alluvial stratigraphic sequences referred to as upper, middle, and lower. The upper and middle sequences are part of the vertical accretion top stratum and the lower sequence is the lateral accretion bottom stratum.

The Lower Alluvial Sequence (LAS) is stratified sand and gravelly sands with occasional poorly sorted finer grained (sandy loam-loam-clay loam) interbeds (Appendix A). The sand and gravelly sand beds are better sorted and in the 2.5Y hue in the southern and southwestern parts of the project area and more poorly sorted and on the gley page of the Munsell color charts to the west where the landscape surface is slightly lower. The finer-grained interbeds are darker colored

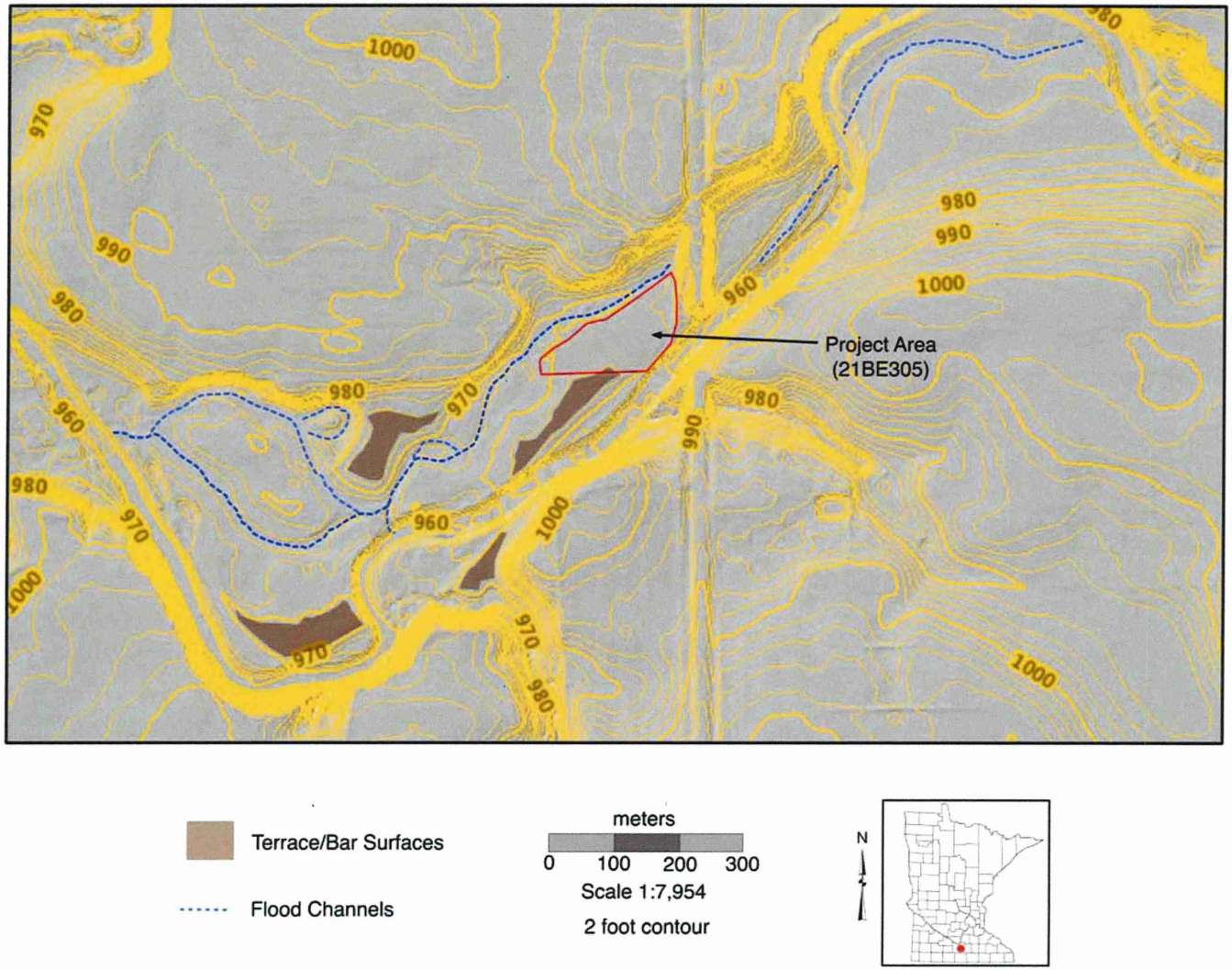

Figure 3. Topographic map overlain on hillshade LIDAR showing the landforms in the valley around the project area.

than the adjacent beds in part due to the presence of organics and they occasionally contain artifacts. Wood is present in some cores. The LAS is alluvial channel bedload deposits. The finer grained interbeds are either the result of lower energy flooding or spatial variations in flood energy in the channel and near channel depositional environment. Some of the sediment that is lithologically LAS, especially in the upper part of the sequence, may be a channel facies and the Middle Alluvial Sequence (MAS) deposits are the overbank facies. In other words they are of the same age just different lateral facies being deposited on the same landscape surface. The LAS is the basal stratum in the project area except in the area of Core 4 where glacial till is the basal unit. The upper surface of the LAS is a series of bars and various sized channels that were then infilled and covered with the MAS deposits (Figures 4 and 5). The upper boundary transition to the MAS is either a diastem (break in sedimentation) or a gradational boundary that indicates a change in the conditions of sedimentation. Gradational boundaries may mark a waning flow deposit laid down immediately after the floods that deposited the sand and gravel abated.

Table 1. Core data; depth and nature of strata boundaries.

Core #	**Slope Position**	**Lower Sequence Top (cmbs)**	**Lower to Middle Boundary**	**Middle Sequence Top (cmbs)**	**Middle to Upper Boundary**
1	low	264	gradational	175	erosional
2	low	300	gradational	181	erosional
3	low	250	diastem	183	erosional
4	transition	325	erosional (till)	169	erosional
5	ridge	268	diastem	200	interval not recovered
6	ridge	188	gradational (lower-upper)	NA	no middle sequence
7	transition	230	diastem	153	gradational
8	low	256	diastem	173	diastem
9	low	333	diastem	181	erosional
10	transition	266	gradational	180	erosional
11	low	230	gradational	192	erosional
12	transition	200	interval not recovered	NA	no middle sequence
13	ridge	223	gradational	168	erosional
14	ridge	224	diastem	169	erosional
15	ridge	200	diastem	169	erosional
16	low	266	gradational	138	erosional

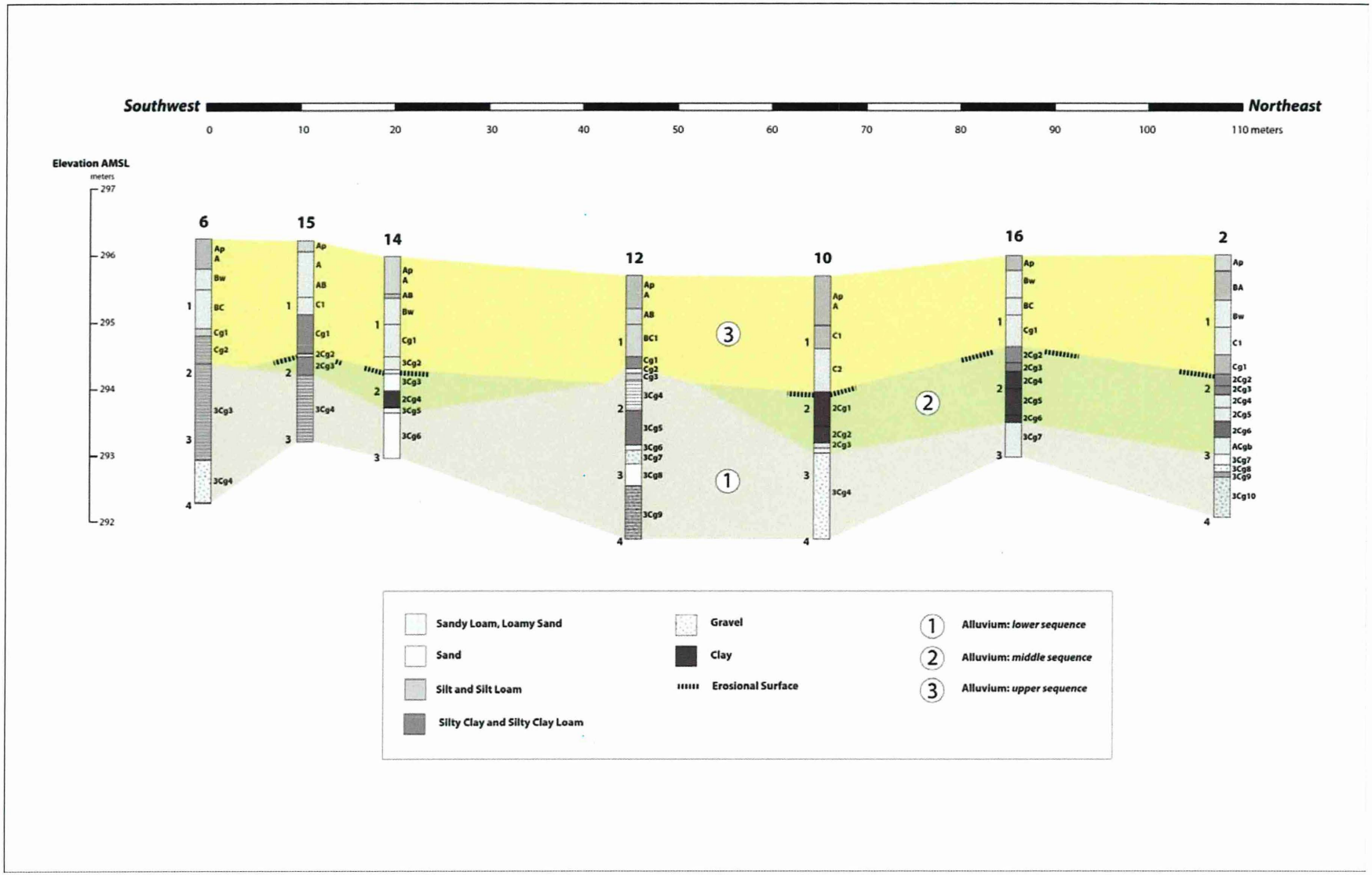

Figure 4. West to east stratigraphic cross-section illustrating the relationship among the three alluvial sequences (see Figure 2 for cross-section location). Note the middle sequence (2) is missing in cores 6 and 12 where the lower sequence top occurs at a higher elevation.

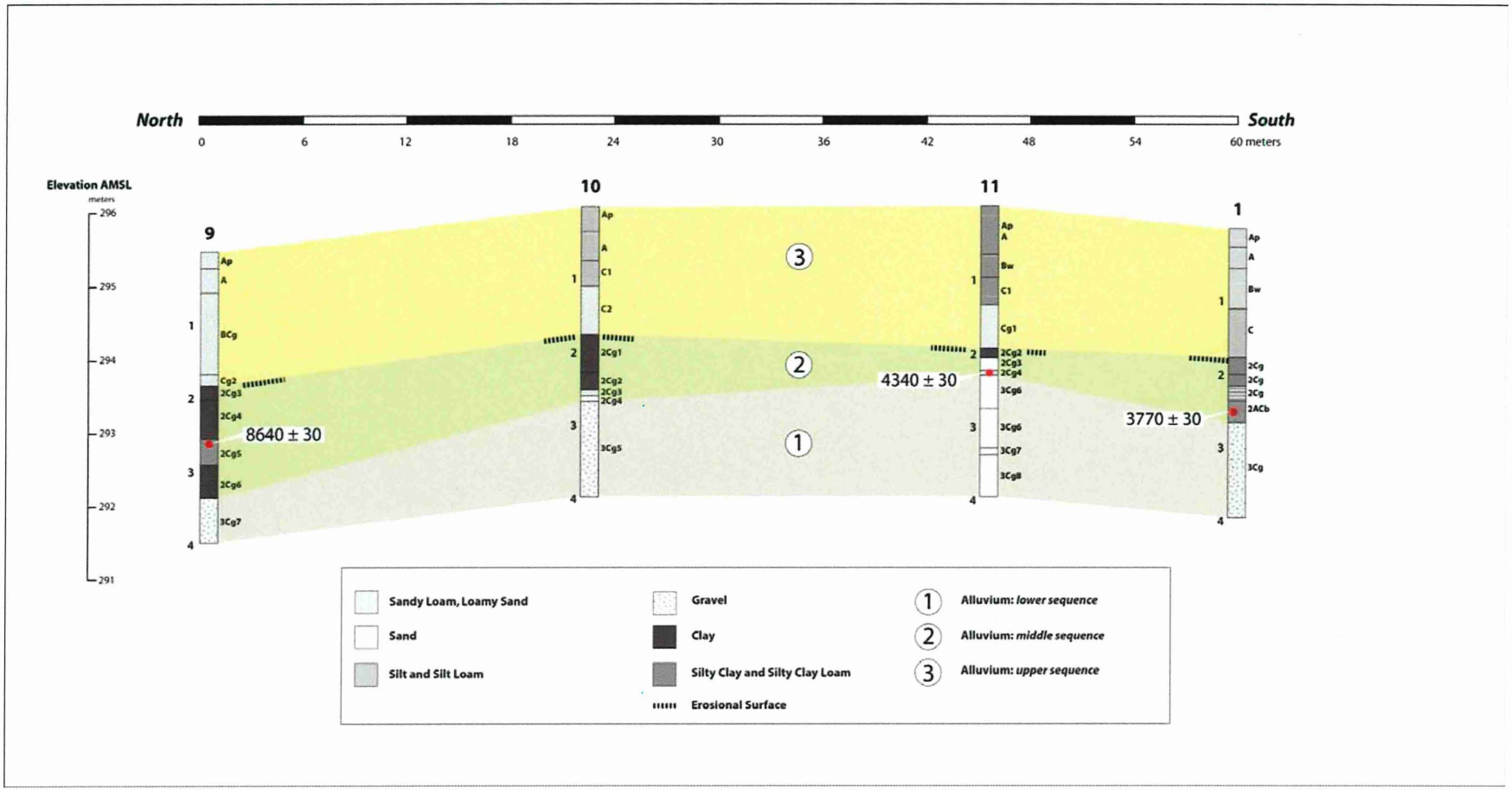

Figure 5. North to south stratigraphic cross-section illustrating the relationship among the three alluvial sequences (see Figure 2 for cross-section location). Dates are expressed in radiocarbon years before present

The Middle Alluvial Sequence (MAS) is silty clay loam to clay with small percentages of very fine sand. Occasionally thin beds or laminae of sandier sediment do occur. Fine roots, wood and other plant fragments, shell, and bone occur in some beds (Appendix A). The MAS is abandoned channel/floodbasin deposits that in filled the lows and covers bars on the upper surface of the LAS (Figures 4 and 5). It occurs in all of the cores except numbers 6 and 12 where it was either not deposited or eroded when the Upper Alluvial Sequence (UAS) was deposited. An ACb or ACgb horizon is present in Cores 1-3 and 8 but most of the pedogenic modifications are due to wet soil conditions that include gleyed colors and redox features. The ACb and ACgb horizons are differentiated by a dark color indicative of the accumulation of organic matter in a seasonal subaerial environment and tend to occur in the abandoned channels. The remainder of the MAS deposits (labeled Cg horizons) were also at or near the landscape surface seasonally as indicated by the presence of fine roots is some strata. Carbonate masses are also present often at the top of the sequence and the entire sequence is unleached. The boundary between the middle and the upper sequence is erosional or in a few cases gradational (Table 1, Appendix A).

The Upper Alluvial Sequence (UAS) consists of very fine sand, silt, and clay in varying proportions but is generally poorly sorted (Appendix A). Fine gravel also occurs in trace amounts. The upper sequence was difficult to hand texture because of the large amount of very fine sand in the deposits. As a check on the field texturing a soil sample taken from Core 5 located on the ridge was washed through a #230 sieve (sand-silt boundary) to determine the percent sand. Sand is 65% of the sample and the sand fraction is almost all very fine and fine textured. Medium through very coarse sand was about 1-2% of the sand fraction. The UAS tends to be finer grains toward the abandoned channel and away from the channel margin ridge where the percent silt and clay increases to produce loam, silt loam, and silty clay loam textures but always with some very fine and fine sand (Figures 4 and 5). No sedimentary structures are present but in places there appears to be weak grading. No sub-fossil plant remains, shell, or bones are present. A moderately developed soil is formed in the sequence from the modern surface. All of the UAS sediment is leached of free carbonates except in Core 15.

Chronology

Chronology can be determined from the relative stratigraphic order, estimated age of the landform, and absolute dates, in this case radiocarbon. The stratigraphy was covered previously and it indicates there was a channel or channels in the project area that eroded tills and deposited

sand and gravel. This was followed by relative stability and the accumulation of fine-grained sediment over the bar and channel topography at the top of the LAS. This was followed by the deposition of the UAS in a single event or from a series of overbanks floods.

Wood and plant remains from four (4) cores were submitted for radiocarbon dating (Table 2). Eight (8) samples of bone were submitted for dating by the project archaeologist (see archaeology report). The radiocarbon age assays from cores all come from the MAS but they range from modern to 8640±30 ^{14}C yrs B.P. (Table 2). The bone dates range from 2500 to 6390 ^{14}C yrs B.P. and they come from all three alluvial sequences. Stratigraphically archaeological material occurs (1) in the upper part of the Lower Alluvial Sequence, (2) throughout the Middle Alluvial Sequence, where it is most concentrated, and (3) possibly in the lower Upper Alluvial Sequence (see archaeology report). The LAS was deposited during the incision that created the valley in the project area. The incision and head cutting began about 9800 ^{14}C yrs B.P. at the mouth of the Le Sueur River. It then took an unknown amount of time to work its way up the Cobb River valley to the project area. The oldest date on bone from the site is 6420 ^{14}C yrs B.P. so the valley was likely formed by at least that time. Bone dates from archaeological contexts in the upper LAS and the MAS cluster around 4300 BP and 3700 BP ^{14}C yrs B.P. (see archaeological report) so the MAS accumulated sometime between about 6420 BP and 3000 ^{14}C yrs B.P. The only date from the UAS is 2500 ^{14}C yrs B.P. on bone (see archaeological report). The project area landform is a low terrace that, according to Gran et al. (2011), is likely less than 3000 years old. This indicates the best age estimate for the UAS is between 3000 BP -2500 ^{14}C yrs B.P. The modern date from Core 8 is likely physical contamination during the coring process.

Table 2: Radiocarbon ages (See Appendix B for details).

Core No. (Depth cmbs)	Material	Beta No.	Strata	^{13}C/^{12}C Ratio (o/oo)	Conventional ^{14}C Age	2 Sigma Calibrated Results (95% Probability)
8 (183)	plant	422880	Middle	-26.4	105±0.3pMC	pMC
1 (250)	wood	422033	Middle	-27.1	3770±30	Cal BC 2285 to 2130 (Cal BP 4235 to 4080) and Cal BC 2080 to 2060 (Cal BP 4030 to 4010)
11 (221)	wood	422036	Middle	-27.3	4340±30	Cal BC 3020 to 2895 (Cal BP 4970 to 4845)
9 (270)	plant	422035	Middle	-23.7	8640±30	Cal BC 7730 to 7585 (Cal BP 9680 to 9535)

Geoarchaeology

Archaeological deposits (artifacts and faunal remains) are associated with the [redacted] (LAS). Artifacts within the [redacted] be in primary physical context with possible minor reworking by small to moderate [redacted] MAS exhibits fine stratification indicating the archaeological deposits are likely, at [redacted] places, stratified. Intermittent occupation, biological activity, and minor reworking could [redacted] result in artifact palimpsests.

Artifacts in the the LAS, according to the project archaeologist, are found in sand and also in silty to loamy, dark-colored beds interstratified with the sand or gravelly sand beds. The context of these artifacts needs to be evaluated. The darker beds were encountered in some cores where they range from 2 cm to about 8 cm thick and are overlain and underlain by beds consisting of sandy loam to sand with sand textures ranging from medium –very coarse often with fine gravel. This stratigraphy indicates alternating high energy and relatively low energy sedimentation. No paleosols (in the strict sense of the word) are present but the contact between these beds may have been subaerially exposed for a short period of time prior to being buried. Also because sedimentation is discontinuous and episodic deposits do not form sheets of sediment over the entire channel bar surface. Given the sedimentary environment an artifact assemblage left on the floodplain could be all or in part buried in place or moved and then buried. It depends on a wide range of variables from the size of the artifacts and their distribution relative to the floodplain topography and flood flow velocities, to the time between floods. A study of site formation processes to determine the context of these artifacts would need to address artifact patterning and meso-stratigraphy over a relatively large area. Data from bucket augers and cores is not sufficient except to say artifacts are present in a unique and possibly informative context that needs further study.

Artifacts at or just above the contact between the Upper and Middle Alluvial Sequences may be in an erosional lag formed by the removal of fine sediment and therefore not in pure primary alluvial context although horizontal context (x and y coordinates) may be preserved.

Artifacts in the the Upper Alluvial Sequence are in primary physical context.

Discussion

Discussion consists of outlining a series of events that explain the stratigraphy delineated in the project area:

Event 1 is the initial incision of the valley that occurred after 9800 BP and before about 6300 BP. The incising channel migrated laterally across the valley bottom depositing the sand, gravelly sand, and poorly sorted loamy interbeds of the LAS. The resulting landform consisted of abandoned channels and bars with perhaps 1-2 meters of relief. No soil is formed in these deposits meaning it was (1) a wet landscape, and/or (2) not exposed for long, or (3) the soil was not preserved (regressed when the soil environment changed).

During Event 2 a floodplain formed on the alluvial surface created during Event 1. This occurred between about 6300 BP and 3000 BP. The floodplain consists of silty and clayey poorly sorted vertical accretion deposits (Middle Alluvial Sequence) with some sandy interbeds and laminae. The deposits are dark in color and gleyed with preserved plant fragments, wood, and bone indicating this was a wet soil-forming environment. This valley bottom soil-geomorphic setting may have consisted of multiple active and inactive channels with intervening bars or a main channel with multiple flood channels. Floods were large enough to regularly carry a very fine sand component onto the floodplain and occasional coarser sediment. Native Americans occupied or utilized the floodplain during this period of time. The archaeological record of their occupations appears to be a complex palimpsest resulting from the long term of occupation as well as minor erosion and deposition on the floodplain.

During Event 3 the MAS was buried by the poorly sorted silty and clayey sediment of the UAS. This event occurred after 3770 ^{14}C yrs B.P and before 2500 ^{14}C yrs B.P, if you discount the historic date. The contact between the two sequences is often erosional. The deposits are (1) finer grained to the north in the slightly lower part of the terrace toward the flood channel. The only sedimentary structures are a weak grading in some intervals. A moderately developed soil formed from the modern surface may have destroyed finer sedimentary structures in the upper part of the sequence. The lack of bedding or other sedimentary structures and the poor sorting indicate the UAS may have been deposited rapidly.

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Kolb-APPENDIX A: Core Logs

Core 1

Depth (cm)	Horizon	Description
0-25	Ap	*Upper Alluvial Sequence* Very dark brown (10YR 2/2) SILT LOAM; 20% sand; 2.5Y hue clayey inclusions at base; abrupt boundary.
25-53	A	Very dark brown – black (10YR 2/2 – 2/1) SILT LOAM; 20% sand; poorly sorted; weak medium and coarse angular blocky structure; clear boundary.
53-100	Bw	Very dark grayish brown (10YR 3/2) heavy SILT LOAM; 25% sand; poorly sorted; weak coarse parting to medium and fine angular blocky structure; 1 fine pebble; leached.
100-122	gap	
110-175	C1	Dark gray (10YR 4/1) LOAM – SILT LOAM; 20% sand; few faint redox features; few fine pebbles; sand fraction is poorly sorted; few roots; lower 4cm has mixed sand and dark clayey soil; very abrupt boundary.
175-199	2Cg1	*Middle Alluvial Sequence* Dark gray (2.5Y 4/1) LOAM – SILTY CLAY LOAM; sticky; poorly sorted; fine roots; common faint redox features; mixed; possibly bedded; unleached.
199-213	2Cg2	Dark gray – very dark gray (2.5Y 4/1 – 3/1) SILTY CLAY LOAM; 25% very fine sand; common distinct redox features; roots; unleached.
213-234	2Cg3	Dark gray (2.5Y 4/1) heavy SILT LOAM; indistinct lamination; common distinct redox features; few roots; unleached; very abrupt boundary.
234-264	2ACgb	Very dark gray (N/3) SILTY CLAY LOAM; 5% very fine sand to 247cm; thin laminated and very thin bedded silty clay loam and loam – sandy loam; roots; common redox features from plant fragments on laminae surfaces; unleached; abrupt gradational boundary. Radiocarbon Assay: **3770±30 BP**
264-396	3Cg	*Lower Alluvial Sequence* Gray – dark gray (2.5Y 4/1 – 5/6) graded SANDY LOAM with thin bedded medium and coarse SAND – GRAVELLY SAND. Gap between 285 and 302 cm

Core 2

Depth (cm)	Horizon	Description
0-25	Ap	*Upper Alluvial Sequence* Very dark gray (10YR 3/1) heavy SILT LOAM; 5% sand; abrupt boundary.
25-70	BA	Very dark brown (10YR 2/2) heavy SILT LOAM – LOAM; weak – moderate medium angular blocky parting to fine angular blocky structure; leached; clear boundary.
70-100	Bw	Very dark grayish brown (10YR 3/2) sticky LOAM; moderate – weak medium parting to fine angular blocky structure; graded; leached.
100-122	gap	
122-151	C1	Dark gray – dark grayish brown (10YR 4/1 – 4/2) LOAM; massive; common faint redox features; leached; very abrupt boundary.
151-181	Cg1	Dark gray (2.5Y 4/1) SILT LOAM – LOAM; common – few distinct redox features; poorly sorted; few granules; leached; very abrupt boundary.
181-198	2Cg2	*Middle Alluvial Sequence* Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) SILTY CLAY LOAM; 2-3% sand; soft white masses; organic colored soil inclusions; unleached.
198-210	2Cg3	Dark gray – olive green (5Y 4/1 – 4/2) SILTY CLAY LOAM; many white carbonate masses; unleached.
210-231	2Cg4	Dark grayish brown – grayish brown (2.5Y 6/2 – 5/3) CLAY LOAM; unleached; very abrupt boundary.
231-250	2Cg5	Olive brown SANDY CLAY LOAM with sand bed at base; unleached; very abrupt gradational boundary.
250-275	2Cg6	Dark brown (2.5Y 5/2) – dark gray (2.5Y 4/1) LOAM – SILTY CLAY LOAM with sand mode; unleached; very abrupt boundary.
275-295	2ACgb	Dark greenish gray – very dark gray (10Y 3/1 – N3/) LOAM; roots and shell fragments; poorly sorted; unleached.
295-302	gap	
302-316	3Cg7	*Lower Alluvial Sequence* Dark greenish gray (10GY 3/1) SANDY LOAM; abrupt boundary.
316-328	3Cg8	Dark greenish gray gravelly coarse SAND with wood.
328-336	3Cg9	Laminated SILT LOAM and coarse SANDY LOAM; very abrupt boundary.
336-396	3Cg10	Gravelly LOAM.

Core 3

Depth (cm)	Horizon	Description
0-55	Ap A	*Upper Alluvial Sequence* Black (10YR 2/1) light SILTY CLAY LOAM; 15% very fine and fine sand; weak – moderate medium – fine angular blocky structure; leached; clear boundary.
55-195	AB	Very dark gray – very dark grayish brown (10YR 3/1 – 3/2) SILTY CLAY LOAM; 10% sand; weak medium – fine angular blocky structure; leached; clear boundary.
195-152	Cg1	Dark gray (2.5Y 4/1) SILTY CLAY LOAM – CLAY LOAM (15-20% very fine and fine sand); common faint redox features; leached; abrupt boundary.
152-161	Cg2	Dark gray (2.5Y 4/1) heavy SILT LOAM; 20% very fine sand; common distinct redox features; leached; abrupt gradational boundary.
161-183	Cg3	Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) SILTY CLAY LOAM; 20% very fine and fine sand; leached; very abrupt boundary.
183-200	2ACgb	*Middle Alluvial Sequence* Dark gray (2.5Y 4/1) – very dark gray (N3/) CLAY; common white masses; roots; bone; unleached. Radiocarbon Assay: **modern**
200-234	2Cg4	Grayish brown (2.5YR 5/2) CLAY; 3% poorly sorted sand; unleached; abrupt gradational boundary.
234-243	2Cg5	Grayish brown (2.5Y 5/2) SANDY CLAY; common distinct redox features; unleached; very abrupt boundary.
243-250	2Cg6	Dark gray (N4/1) CLAY; indistinct very thin laminated; unleached; very abrupt boundary.
250-396	3Cg	*Lower Alluvial Sequence* Dark greenish gray (10Y 3/1) SANDY LOAM – coarse SAND with granules and fine pebbles – gravelly coarse SAND.

Core 4

Depth (cm)	Horizon	Description
0-11	Ap1	*Upper Alluvial Sequence* Heavy SILT LOAM; mixed from road; leached; abrupt boundary.
11-33	Ap2	Black (10YR 2/1) heavy SILT LOAM; 10% very fine sand; weak – medium pedo-structure; leached; very abrupt boundary.
33-56	C1	Mixed soil in upper 8cm; very dark brown (10YR 2/2) heavy SILT LOAM; 10% very fine and fine SAND; sand blebs; sand bed at base; leached; very abrupt boundary.
56-110	Bw1	Dark grayish brown – very dark grayish brown (10YR 4/2 – 3/2) heavy SILT LOAM with 20% sand; weak coarse angular blocky parting to medium and fine angular blocky structure; 1 fine pebble; leached.
110-156	Bw2	Very dark grayish brown (10YR 3/2) SILTY CLAY LOAM; 10% sand; weak pedo-structure; leached; clear gradational boundary.
156-169	C2	Dark gray – dark grayish brown (10YR 4/1 – 4/2) sticky LOAM; massive; leached; clear gradational boundary.
169-238	2C3	*Middle Alluvial Sequence* Dark gray (10YR 4/1) SILTY CLAY LOAM with 15% sand; few faint redox features; roots; leached; very abrupt boundary at sand bed.
238-280	2Cg1	Dark gray (2.5Y 4/1) SILTY CLAY LOAM – SILT LOAM – LOAM; indistinct laminae – thin laminae; sand fraction is very fine; common distinct redox features; leached.
280-335	2Cg	Dark gray (2.5Y 4/1) heavy SILT LOAM and laminated very fine – fine SANDY LOAM; common distinct redox features; leached; very abrupt boundary.
335-396	4C	*Glacial Deposits* TILL; unleached.

Core 5

Depth (cm)	Horizon	Description
0-38	Ap	*Upper Alluvial Sequence* Black (10YR 2/1) SILT LOAM – LOAM; very abrupt boundary.
38-100	Bw	Very dark grayish brown (10YR 3/2) sticky LOAM; weak coarse – medium angular blocky structure; leached.
100-155	Cg1	Dark grayish brown (2.5Y 4/2) LOAM – SANDY LOAM; common faint redox features; massive; leached; very abrupt gradational boundary.
155-185	Cg2	Dark grayish brown and dark gray (2.5Y 5/2 & 4/1) LOAM; weak grading; common faint redox features; leached.
185-213	gap	
213-234	2Cg3	*Middle Alluvial Sequence* Dark grayish brown (2.5Y 4/2) LOAM – SANDY LOAM; leached; abrupt gradational boundary.
234-250	2Cg4	Grayish brown – dark grayish brown (2.5Y 5/2 – 4/2) sticky LOAM over SANDY LOAM bed; common distinct redox features; leached; very abrupt boundary.
250-260	2Cg5	Dark gray (2.5Y 4/1) heavy SILT LOAM with 15% sand; few shell and organic fragments; common redox features; leached; abrupt gradational boundary.
260-268	2Cg6	Dark gray – gray (2.5Y 4/2 – 5/2) heavy SILTY CLAY LOAM; 2% sand; two sand laminae near base; unleached; very abrupt boundary.
268-346	3Cg7	*Lower Alluvial Sequence* Grayish brown (2.5Y 6/2) poorly sorted SANDY LOAM – coarse and very coarse sand with granules – gravelly coarse and very coarse SAND; unleached.
346-396	3Cg8	Dark gray (N 4/) gravelly LOAM; unleached.

Core 6

Depth (cm)	Horizon	Description
0-46	Ap A	*Upper Alluvial Sequence* Black (10YR 2/1) SILT LOAM – LOAM; leached; gradual boundary.
46-78	Bw	Very dark grayish brown (10YR 3/2) sticky LOAM; weak medium – fine angular blocky structure; leached; clear boundary.
78-134	BC	Very dark grayish brown (10YR 3/2) sticky LOAM; massive; few faint redox features; leached; abrupt boundary.
134-146	Cg1	Dark gray – very dark gray (10YR 4/1 – 3/1) sticky SILT LOAM; 20% sand; leached; sand fraction contains medium sand mode; common faint redox features; abrupt gradational boundary.
146-188	Cg2	Dark gray – very dark gray (10YR 4/1 – 3/1) SILT LOAM – LOAM; sand fraction is all very fine textured; leached; abrupt gradational boundary.
188-332	3Cg3	*Lower Alluvial Sequence* Grayish brown (2.5Y 5/2) poorly sorted laminated Loam and SILT LOAM – very coarse and coarse SAND with loam interbeds; gravel at base; unleached.
332-396	3Cg4	Dark gray (2.5Y 4/1) gravelly loamy SAND.

Core 7

Depth (cm)	Horizon	Description
0-46	Ap A	*Upper Alluvial Sequence* Black (10YR 2/1) sticky SILT LOAM – LOAM; leached; moderate – weak coarse angular blocky parting to medium and fine angular blocky structure; leached; clear boundary.
46-73	Bw	Black – very dark gray (10YR 2/1 – 3/1) sticky SILT LOAM – LOAM; leached; clear boundary.
73-92	BC	Dark gray – very dark gray (10YR 4/1 – 3/1) SILTY CLAY LOAM; 5% very fine sand; leached; abrupt gradational boundary.
92-153	Cg1	Dark gray (2.5Y 4/1) sticky LOAM; 1 weathered limestone pebble; few faint redox features; leached; abrupt boundary.
153-230	2Cg2	*Middle Alluvial Sequence* Dark gray (N 4/) SILTY CLAY LOAM over indistinct stratified (laminate) SILT LOAM and LOAM – SANDY LOAM & LOAM; few faint redox features; leached above 161cm; very abrupt boundary.
230-396	3Cg3	*Lower Alluvial Sequence* Grayish brown (2.5Y 5/2) and gray (2.5Y 5/4) gravelly very coarse SAND and medium and coarse SANDY LOAM; unleached; large pebble at 350cm.

Core 8

Depth (cm)	Horizon	Description
0-15	Ap	*Upper Alluvial Sequence* Very dark brown (10YR 2/2) SILT LOAM – LOAM; very abrupt boundary.
15-69	Bw	Black (10YR 2/1) SILTY CLAY LOAM; 15% sand; weak – moderate coarse angular blocky parting to medium and fine angular blocky structure; leached; abrupt boundary.
69-145	Cg1	Very dark gray (N3/) SILTY CLAY LOAM; 10% very fine sand; massive; leached; very abrupt boundary.
145-173	Cg2	Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) heavy SILT LOAM; many prominent redox features and nodules; leached; very abrupt boundary.
173-256	2Cg3	*Middle Alluvial Sequence* Very dark gray (2.5Y 3/1) CLAY; 2% very fine sand; few faint redox features; grades to dark gray (2.5Y 4/1) CLAY to 237cm then clay with 1% very fine sand which increases slightly with depth; common roots; unleached; indistinct laminations at base; very abrupt gradational boundary. Gap: 200-213
256-396	3Cg	*Lower Alluvial Sequence* Grayish brown and gray (2.5Y 5/2 & 5/1) stratified SAND and GRAVEL; unleached.

Core 9

Depth (cm)	Horizon	Description
0-22	Ap	*Upper Alluvial Sequence* Black (10YR 2/1) sticky LOAM; very abrupt boundary.
22-56	A	Black (N 2.5/) sticky LOAM; weak pedo-structure; clear boundary.
56-168	Cg1	Very dark gray (10YR N3/) sticky LOAM grading down to CLAY; 30% sand – 10% very fine sand; leached; sandy clay loam bed at 152cm.
168-181	Cg2	Very dark gray (N3/) sticky LOAM; common faint redox features; leached; very abrupt boundary.
181-190	2Cg3	*Middle Alluvial Sequence* Dark gray (2.5Y 4/1) CLAY; 20% sand; common roots and plant fragments; leached.
190-213	gap	
213-254	2Cg4	Very dark gray – dark greenish gray (N3/ - 10Y 3/1) CLAY; 20% sand; very sticky; leached.
254-290	2Cg5	Dark greenish gray (10Y 3/1 – 4/1) SILTY CLAY LOAM; 15% very fine sand; roots; very thin laminated; clam shell fragments at 277cm; unleached. Radiocarbon Assay: **8640±30 BP**
290-302	gap	
302-333	2Cg6	Dark gray (N4/) CLAY; 25% sand; unleached; very abrupt boundary.
333-396	3Cg7	*Lower Alluvial Sequence* Gravelly coarse SAND.

Core 10

Depth (cm)	Horizon	Description
0-73	Ap A	*Upper Alluvial Sequence* Black (10YR 2/1) sticky SILT LOAM – LOAM; 20% very fine sand; weak – moderate coarse – medium and fine angular blocky structure; abrupt boundary.
73-100	C1	Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) heavy SILT LOAM – LOAM; massive; leached.
100-122	gap	
122-160	C2	Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) LOAM; sand % increases with depth; leached; massive.
160-213	gap	
213-224	2Cg1	*Middle Alluvial Sequence* Dark grayish brown (2.5Y 4/2) CLAY LOAM – CLAY; layers with white carbonate masses; loam bed at base; unleached; very abrupt boundary.
224-250	2Cg2	Dark greenish gray (10Y 4/1) CLAY; 10% very fine sand; few white masses; few fine roots; unleached; abrupt gradational boundary.
250-256	2Cg3	Very dark gray (N3/) sticky LOAM over laminated grayish brown (2.5Y 5/2) sand and silt loam; unleached; very abrupt boundary.
256-266	2Cg4	Very dark gray (2.5Y 3/1) sticky SANDY LOAM; unleached; very abrupt boundary.
266-396	3Cg	*Lower Alluvial Sequence* Stratified SAND and SANDY LOAM over GRAVELLY SAND; unleached. Gap: 270-302 cm

Core 11

Depth (cm)	Horizon	Description
0-66	Ap A	*Upper Alluvial Sequence* Black (10YR 2/1) SILTY CLAY LOAM; 10% - 20% very fine sand; weak medium – fine angular blocky structure; clear boundary.
66-97	Bw	Dark grayish brown (10YR 4/2 – 2.5Y 4/2) SILTY CLAY LOAM; 15% very fine sand; few distinct redox features; weak medium – fine angular blocky structure; leached; abrupt gradational boundary.
97-132	C1	Dark grayish brown (2.5Y 4/2) SILTY CLAY LOAM; 15% very fine sand; few distinct redox features; massive; leached; very abrupt gradational boundary.
132-192	Cg1	Dark grayish brown – dark gray (2.5Y 4/2 – 4/1) sticky LOAM – sticky SANDY LOAM; few faint redox features; sand laminae at base; clay bed at 170cm; leached; very abrupt boundary.
192-195	2Cg2	*Middle Alluvial Sequence* Very dark gray – dark gray (2.5YR 3/1 – 4/1) CLAY; leached.
195-213	gap	
213-222	2Cg3	Grayish brown (2.5YR 5/2) coarse SAND with 1 clay laminae; leached; very abrupt boundary. Radiocarbon Assay: **4380±30 BP**
222-230	2Cg4	Heavy SILT LOAM with sandy loam interbed; shell and bone in silt loam; organics; unleached; abrupt gradational boundary.
230-260	3Cg5	*Lower Alluvial Sequence* Coarse SAND; laminated and thin bedded over loamy sand; unleached.
260-302	gap	
275-330	3Cg6	Grayish brown (2.5YR 5/2) coarse SAND; unleached.
330-338	3Cg7	Gravelly loamy coarse SAND; unleached.
338-396	3Cg8	Dark gray (N4/) SANDY LOAM over SAND.

Core 12

Depth (cm)	Horizon	Description
0-48	Ap/A	*Upper Alluvial Sequence* Black – very dark brown (10YR 2/1 – 2/2) SILT LOAM – LOAM; weak medium angular blocky parting to fine angular blocky structure; leached; clear gradational boundary.
48-71	AB	Very dark grayish brown (10YR 3/2) heavy SILT LOAM; 20% very fine sand; leached; abrupt gradational boundary.
71-110	BC	Dark grayish brown – dark gray (2.5Y 4/2 – 4/1) heavy SILT LOAM with 20% very fine sand; common faint redox features; leached.
110-122	gap	
122-139	2Cg1	Dark gray (2.5Y 4/1) SILTY CLAY LOAM; 10% very fine sand; common faint redox features; massive; leached; very abrupt gradational boundary.
139-146	3Cg2	*Lower Alluvial Sequence* Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) graded sticky SANDY LOAM bed; leached; very abrupt gradational boundary.
146-155	3Cg3	Dark gray (2.5Y 4/1) heavy SILT LOAM; 10% very fine sand; unleached; very abrupt gradational boundary.
155-180	3Cg4	Grayish brown and dark gray (2.5YR 5/2 and 4/1) very fine – fine SANDY LOAM; laminated intervals; unleached.
180-213	gap	
213-255	3Cg5	Stratified grayish brown (2.5YR 5/2) very fine and fine SAND and very dark gray and black (N3/ and N2.5/) SILTY CLAY LOAM; sand is medium – very coarse below 237cm; unleached; very abrupt boundary.
255-260	3Cg6	Very coarse and coarse sand with granules; unleached.
260-275	3Cg7	Very dark gray (2.5Y 3/1) SANDY LOAM with fine gravel; unleached.
274-302	gap	
280-312	3Cg8	Very coarse and coarse SAND; unleached.
312-396	3Cg9	Interbedded dark gray (N4/) medium SANDY LOAM and very dark gray (N3/) SILT LOAM & fine gravelly SAND.

Core 13

Depth (cm)	Horizon	Description
0-10	Ap	*Upper Alluvial Sequence* Disturbed from bulldozer.
10-18	Ap2	Disturbed from bulldozer.
18-24	Ap3	Disturbed from bulldozer.
24-77	A	Very dark brown – black (10YR 2/2- 2/1) SILTY CLAY LOAM; 10% very fine sand; weak coarse parting to medium and fine angular blocky structure; stickier with depth; leached; clear boundary.
77-100	Cg1	Very dark gray – black (10YR 3/1 – 2/1) heavy SILTY CLAY LOAM; 2% very fine sand; massive; bioporous; leached.
100-122	gap	
122-168	Cg2	Very dark gray – very dark gray – dark gray (2.5Y 3/1 – 3/1-4/1) SILTY CLAY LOAM; large 10-15% coarse silt – very fine sand fraction; finer than usual; leached; very abrupt boundary.
168-170		*Middle Alluvial Sequence* Heavy SILT LOAM laminae.
170-192	2Cg3	Dark gray (2.5Y 4/1) SILTY CLAY LOAM; <1% very fine sand; matrix-supported coarse and very coarse sand granules; 1 pebble; few distinct redox features; leached; very abrupt boundary.
192-195	2Cg4	Heavy SILT LOAM laminae with heavy redox.
195-223	2Cg5	Dark gray (2.5Y 4/1) SILT LOAM – SILTY CLAY LOAM grading to SILT LOAM and SANDY LOAM that is laminated; leached; very abrupt gradational boundary.
223-302	3Cg6	*Lower Alluvial Sequence* Stratified SAND and GRAVEL; unleached.

Core 14

Depth (cm)	Horizon	Description
0-53	Ap A	*Upper Alluvial Sequence* Black – very dark brown (10YR 2/1 – 2/2) heavy SILT LOAM; 15% very fine sand.
53-60	AB	Very dark gray (10YR 3/1) SILT LOAM – LOAM; sticky; leached.
60-180		Dark grayish brown and black LOAM; pebble at top; leached.
180-122	gap	
122-149	Cg1	Very dark gray – dark gray (2.5Y 3/1 – 4/1) sticky LOAM; pebble at 131; many faint redox features; clay increases with depth; leached; abrupt gradational boundary.
149-169	Cg2	Dark gray (2.5Y 4/1) LOAM; few faint redox features; leached; very abrupt boundary.
169-173	2Cg3	*Middle Alluvial Sequence* Granules and very fine pebble lag laminae.
173-180	2Cg4	Granules and very fine pebble lag laminae.
180-213	gap	
213-224	2Cg5	Dark gray (2.5Y 4/1) CLAY; 5% very fine sand; few very fine pebbles; common distinct redox features; leached.
224-232	3Cg6	*Lower Alluvial Sequence* Coarse SAND with sticky LOAM matrix; unleached.
232-302	3Cg7	Thin bedded very coarse SAND, medium SAND and granules; unleached.

Core 15

Depth (cm)	Horizon	Description
0-17	Ap	*Upper Alluvial Sequence* Bulldozer scrape.
17-83	A AB	Black – very dark gray (10YR 2/1 – 3/1) sticky LOAM; weak – moderate medium – fine angular blocky structure; unleached; abrupt gradational boundary.
83-100	C1	Dark gray – dark grayish brown (10YR 4/1 – 4/3) sticky LOAM; massive; no redox; unleached.
100-122	gap	
122-169	Cg1	Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) SILTY CLAY LOAM; 15% very fine sand; few distinct redox features; unleached; very abrupt boundary.
169-171	2Cg2	*Middle Alluvial Sequence* Dark grayish brown (2.5Y 4/2) SANDY CLAY LOAM; unleached.
171-180	2Cg3	Dark grayish brown (2.5Y 4/2) SILTY CLAY LOAM; 2% very fine sand; leached.
180-213	gap	
213-302	3Cg	*Lower Alluvial Sequence* Dark grayish brown – strong brown (2.5Y 4/2 – 5/2) and dark gray – dark greenish gray (N4/ - 10Y 4/1) interbedded SANDY LOAM, SILT LOAM, and granular coarse and very coarse SAND; unleached.

Core 16

Depth (cm)	Horizon	Description
0-22	Ap	*Upper Alluvial Sequence* Black (10YR 2/1) sticky SILT LOAM – LOAM; abrupt boundary.
22-65	Bw	Very dark gray – very dark grayish brown (10YR 3/1 – 3/2) sticky LOAM; moderate – weak coarse angular blocky parting to medium and fine angular blocky structure; leached; clear boundary.
65-90	BC	Very dark grayish brown (10YR 3/2) sticky LOAM; common faint redox features; weak pedo-structure; leached; very abrupt gradational boundary.
90-138	Cg1	Dark grayish brown (2.5Y 4/2) and dark gray (2.5Y 4/1) sticky LOAM – CLAY LOAM; many distinct redox features; leached; very abrupt boundary. gap: 110-122 cm
138-161	2Cg2	*Middle Alluvial Sequence* Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) SILTY CLAY LOAM; 5% very fine sand; common distinct redox features; leached; very abrupt gradational boundary.
161-174	2Cg3	Dark gray (2.5Y 4/1) laminated poorly sorted SILTY CLAY LOAM and LOAM; leached; very abrupt boundary.
174-180	2Cg4	Dark gray (2.5Y 4/1) CLAY; common white carbonate masses; common distinct redox features; leached.
180-213	gap	
213-240	2Cg5	Dark gray – dark grayish brown (2.5Y 4/1 – 4/2) CLAY with small % coarse sand; common distinct redox features; leached; abrupt boundary.
240-250	2Cg6	Dark grayish brown (2.5Y 4/2) SANDY CLAY; leached.
250-302	3Cg2	*Lower Alluvial Sequence* Interbedded very coarse SAND and CLAY; unleached.

Kolb-APPENDIX B: Radiocarbon Assay Data Sheets

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Michael F. Kolb

Report Date: 11/2/2015

Strata Morph Geoexploration, Incorporated

Material Received: 10/23/2015

Sample Data	Measured Radiocarbon Age	d13C	Conventional Radiocarbon Age(*)
Beta - 422033	3800 +/- 30 BP	-27.1 o/oo	3770 +/- 30 BP
SAMPLE : SMG1-CR1250			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 2285 to 2130 (Cal BP 4235 to 4080) and Cal BC 2080 to 2060 (Cal BP 4030 to 4010)			
Beta - 422035	8620 +/- 30 BP	-23.7 o/oo	8640 +/- 30 BP
SAMPLE : SMG3-CR9270			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 7730 to 7585 (Cal BP 9680 to 9535)			
Beta - 422036	4380 +/- 30 BP	-27.3 o/oo	4340 +/- 30 BP
SAMPLE : SMG4-CR11221			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (wood): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal BC 3020 to 2895 (Cal BP 4970 to 4845)			

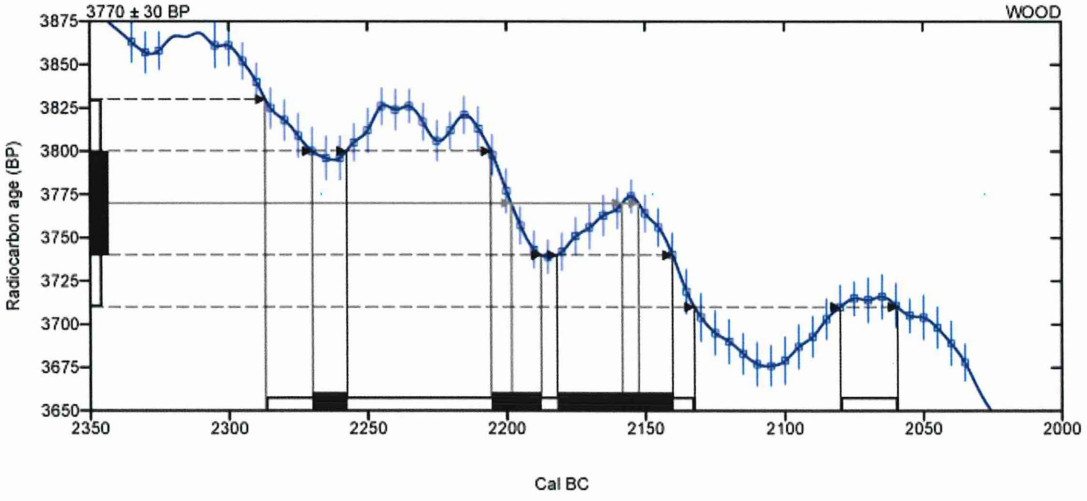
Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -27.1 o/oo : lab. mult = 1)

Laboratory number	**Beta-422033 : SMG1-CR1250**
Conventional radiocarbon age	**3770 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 2285 to 2130 (Cal BP 4235 to 4080)** **Cal BC 2080 to 2060 (Cal BP 4030 to 4010)**
Intercept of radiocarbon age with calibration curve	Cal BC 2200 (Cal BP 4150) Cal BC 2160 (Cal BP 4110) Cal BC 2150 (Cal BP 4100)
Calibrated Result (68% Probability)	Cal BC 2270 to 2260 (Cal BP 4220 to 4210) Cal BC 2205 to 2190 (Cal BP 4155 to 4140) Cal BC 2180 to 2140 (Cal BP 4130 to 4090)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

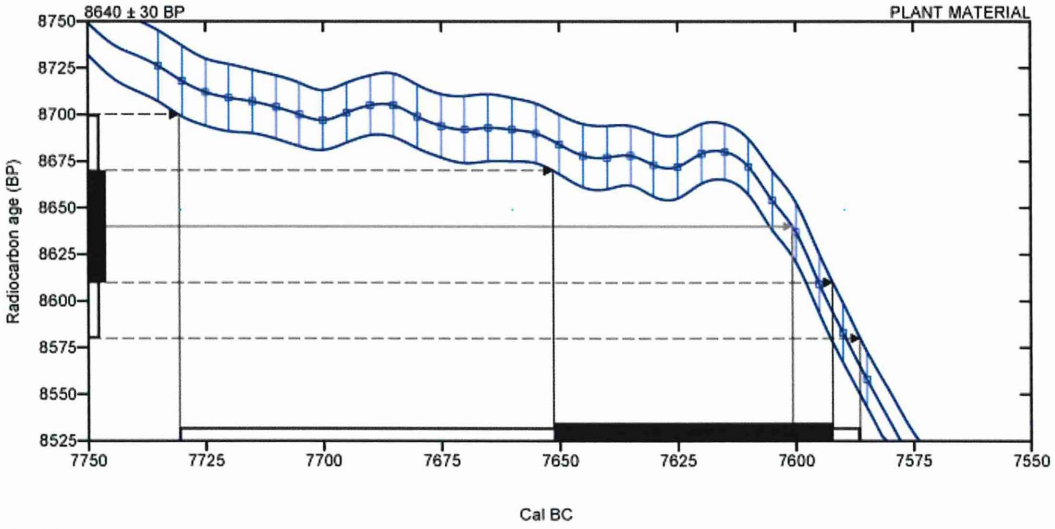
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0– 50,000 years cal BP. Radiocarbon 55(4):1869– 1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -23.7 o/oo : lab. mult = 1)

Laboratory number	**Beta-422035 : SMG3-CR9270**
Conventional radiocarbon age	**8640 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 7730 to 7585 (Cal BP 9680 to 9535)**
Intercept of radiocarbon age with calibration curve	Cal BC 7600 (Cal BP 9550)
Calibrated Result (68% Probability)	Cal BC 7650 to 7590 (Cal BP 9600 to 9540)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2) 317-322

References to INTCAL13 database

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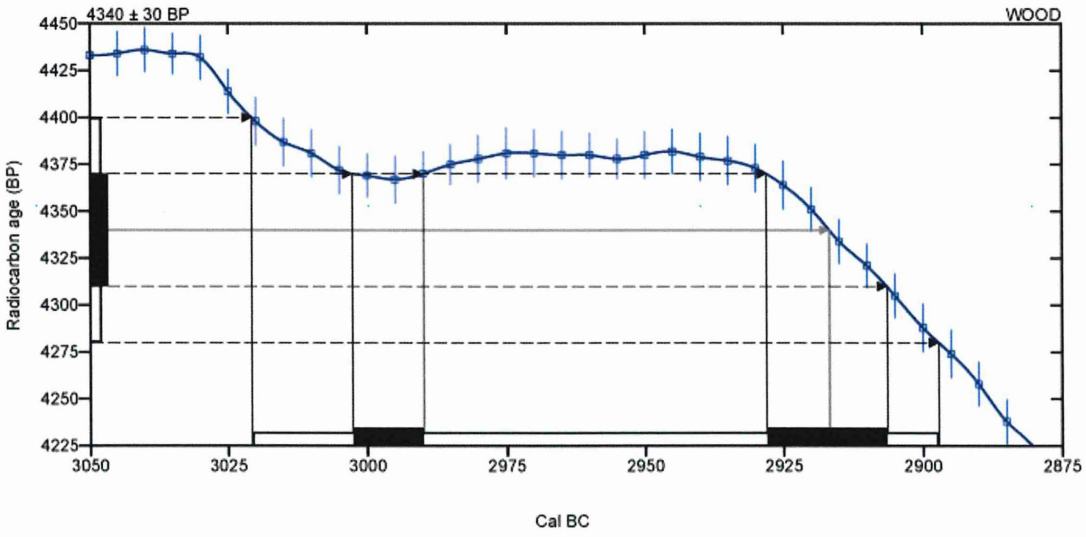
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -27.3 o/oo : lab. mult = 1)

Laboratory number	**Beta-422036 : SMG4-CR11221**
Conventional radiocarbon age	**4340 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 3020 to 2895 (Cal BP 4970 to 4845)**
Intercept of radiocarbon age with calibration curve	Cal BC 2915 (Cal BP 4865)
Calibrated Result (68% Probability)	Cal BC 3005 to 2990 (Cal BP 4955 to 4940) Cal BC 2930 to 2905 (Cal BP 4880 to 4855)



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INTCAL13

References

Mathematics used for calibration scenario

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Michael F. Kolb

Report Date: 11/13/2015

Strata Morph Geoexploration, Incorporated

Material Received: 11/3/2015

Sample Data	Measured Radiocarbon Age	d13C	Conventional Radiocarbon Age(*)
Beta - 422880	105.2 +/- 0.3 pMC	-26.4 o/oo	105.5 +/- 0.3 pMC

SAMPLE : SMG2-CRB183
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid
COMMENT: The reported result indicates an age of post 0 BP and has been reported as a % of the modern reference standard, indicating the material was living about the last 60 years or so ("pMC" = percent modern carbon).

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

APPENDIX B: OFFICE OF STATE ARCHAEOLOGIST LICENSE

APPLICATION FOR MINNESOTA
ANNUAL ARCHAEOLOGICAL RECONNAISSANCE SURVEY LICENSE

This license only applies to reconnaissance (Phase I) surveys conducted under Minnesota Statutes 138.31-.42 during calendar year _**2015**_. Separate licenses must be obtained for site evaluation (Phase II) surveys, for major site investigations (Phase III), for burial site authentications under Minnesota statutes 307.08, and for survey work that will continue into another calendar year. Only the below listed individual is licensed as a Principal Investigator, not the institution/agency/company or others who work for that entity. The licensed individual is required to comply with all the conditions attached to this license form. Permission to enter land for the purposes of archaeological investigation must be obtained from the landowner or land manager.

Name: Frank Florin

Institution/Agency/Company Affiliation: Florin Cultural Resource Services, LLC

Title/Position: Owner and Principal Investigator

Address: N12902 273rd Street, Boyceville, WI 54725

Work Phone: (715) 643-2918 E-Mail: florin@pressenter.com

Name of Advanced Degree Institution: U of MN, Minneapolis Year: 1996

Name of Department: Interdisciplinary Archaeological Studies Degree: _X_MA __MS __PhD

Purpose: (check all that may apply)
CRM _X_ Academic Research ___ Institutional Field School ___

Type of Land: (check all that may apply)
State Owned _X_ County Owned _X_ Township/City Owned _X_
Other non-federal public ___ List: _____

MHS Repository Agreement # __674_____ Other Approved Curation Facility:_____

Previous License: Year 2014 Type: Annual Number: 14-038

Signed (applicant): Frank Florin _____ Date: 1/16/15

Required Attachments: *Curriculum Vita* and Documentation of Appropriate Experience ___ for previously unlicensed individuals.

Submit one copy of this form and attachments to:
Office of the State Archaeologist, Ft. Snelling History Center, St. Paul, MN 55111
612-725-2411 612-725-2729 FAX 612-725-2427 email: mnosa@state.mn.us

Minnesota Historical Society Approval: _____ Date: 1-20-15
State Archaeologist Approval: _____ Date: 1/20/15
License Number: 15-009

Form Date: 4/9/12

APPENDIX C: ARTIFACT CATALOGS

21BE305 Catalog-Phase I

Prov#	Count	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
1.1	1	230-240	Faunal	turtle	plastron	fragment				3 (<1/2"-1/4")	0.4	7/22/2015	
1.2-7	6	230-240	Faunal	turtle	carapace/plastron	fragment				3 (<1/2"-1/4")	0.8	7/22/2015	
1.8-9	2	230-240	Faunal	turtle	carapace/plastron	fragment				4 (<1/4")	0.2	7/22/2015	
1.10-11	2	230-240	Faunal	vertebrata	unidentifiable	fragment				4 (<1/4")	0.1	7/22/2015	
2.1	1	240-240	Faunal	mammalian, large	tooth, enamel	fragment				3 (<1/2"-1/4")	0.2	7/23/2015	cf. Cervid/Bovid; cheek tooth
2.2	1	240-240	Faunal	mammalian, large	longbone	shaft, fragment				2 (<1"-1/2")	3.9	7/23/2015	slightly water worn
2.3-9	7	240-240	Faunal	turtle	carapace/plastron	fragment				4 (<1/4")	0.3	7/23/2015	
2.10-11	2	240-240	Faunal	mammalian	unidentifiable	fragment				3 (<1/2"-1/4")	1	7/23/2015	one has slight polish
2.12	1	240-240	Lithic	tool	patterned flake	end scraper	nonbifacial	Galena Chert	>0-<50%	2 (<1"-1/2")	8.5	7/23/2015	finished; whole
2.13	1	240-240	Lithic	tool	patterned flake	end scraper	decortication	Galena Chert	50-<100%	2 (<1"-1/2")	11.8	7/23/2015	finished; whole
3.1	1	270-280	Faunal	turtle	carapace/plastron	fragment				3 (<1/2"-1/4")	0.1	7/23/2015	
3.2-3	2	270-280	Faunal	mammalian	unidentifiable	fragment				3 (<1/2"-1/4")	0.4	7/23/2015	
3.4-5	2	270-280	Faunal	mammalian	unidentifiable	fragment				4 (<1/4")	0.4	7/23/2015	
3.6-7	2	270-280	Faunal	vertebrata	unidentifiable	fragment				4 (<1/4")	0.1	7/23/2015	
4.1	1	240-270	Faunal	mammalian, large	longbone	shaft, fragment				2 (<1"-1/2")	11.2	7/27/2015	cf Bison/Cervus
4.2-3	2	240-270	Faunal	vertebrata	unidentifiable	fragment				4 (<1/4")	0.1	7/27/2015	
5.1	1	290-300	Faunal	Ondatra zibethicus	femur, left	proximal fragment				3 (<1/2"-1/4")	0.2	7/24/2015	
5.2	1	290-300	Faunal	Ondatra zibethicus	scapula, right	distal fragment				3 (<1/2"-1/4")	0.2	7/24/2015	
5.3	1	290-300	Faunal	Ondatra zibethicus	ilium, left	fragment				4 (<1/4")	0.2	7/24/2015	
5.4-7	4	290-300	Faunal	Colubridae	vertebra	fragment				4 (<1/4")	0.2	7/24/2015	
5.8-9	2	290-300	Faunal	vertebrata	unidentifiable	fragment	burned			4 (<1/4")	0.3	7/24/2015	

21BE305 Catalog-Phase I

Prov#	Count	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
5.1	1	290-300	Lithic	debris	broken flake			quartzite	50-<100%	3 (<1/2"-1/4")	0.3	7/24/2015	
6.1-3	3	140-150	Faunal	vertebrata	unidentifiable	fragment				4 (<1/4")	0.2	7/27/2015	
7.1	1	290-300	Faunal	Colubridae	vertebra	fragment				3 (<1/2"-1/4")	0.1	7/27/2015	
7.2	1	290-300	Faunal	Emydidae	carapace	fragment				3 (<1/2"-1/4")	0.3	7/27/2015	juvenile
7.3	1	290-300	Faunal	turtle	carapace/plastron	fragment				3 (<1/2"-1/4")	0.2	7/27/2015	
7.4	1	290-300	Faunal	turtle	carapace/plastron	fragment				4 (<1/4")	0.1	7/27/2015	
7.5-6	2	290-300	Faunal	turtle	carapace/plastron	fragment				4 (<1/4")	0.1	7/27/2015	
7.7	1	290-300	Faunal	vertebrata	unidentifiable	fragment				4 (<1/4")	0.1	7/27/2015	
8.1	1	260-270	Faunal	Ondatra zibethicus	vertebra, caudal	fragment				3 (<1/2"-1/4")	0.2	7/27/2015	juvenile
9.1	1	260-270	Faunal	Emydidae	neural	fragment				3 (<1/2"-1/4")	0.3	7/27/2015	smoothed interior
10.1	1	280-300	Faunal	Ondatra zibethicus	maxilla, right	fragment				3 (<1/2"-1/4")	0.4	7/25/2015	adult
10.2-3	2	280-300	Faunal	mammalian	unidentifiable	fragment	burned			3 (<1/2"-1/4")	0.9	7/25/2015	
10.4-5	2	280-300	Faunal	mammalian	unidentifiable	fragment	calcined			4 (<1/4")	0.2	7/25/2015	
10.6	1	280-300	Lithic	tool	patterned flake	end scraper	shatter	unidentified chert	>0-<50%	2 (<1"-1/2")	2.6	7/25/2015	finished; whole
10.7	1	280-300	Lithic	debris	shatter			quartzite	0%	3 (<1/2"-1/4")	0.5	7/25/2015	
10.8	1	280-300	Lithic	debris	shatter			unidentified material	50-<100%	3 (<1/2"-1/4")	0.4	7/25/2015	
11.1	1	290-300	Faunal	Ondatra zibethicus	humerus, right	distal fragment				3 (<1/2"-1/4")	0.3	7/29/2015	slight polish; water abrasion
12.1	1	120-140	Lithic	debris	other G4 flake			quartz	50-<100%	4 (<1/4")	0.2	7/23/2015	
13.1	1	270-290	Faunal	mammalian, large	unidentifiable	fragment				2 (<1"-1/2")	1.7	7/30/2015	
13.2-3	2	270-290	Faunal	mammalian, large	unidentifiable	fragment				3 (<1/2"-1/4")	1.3	7/30/2015	

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Prov#	Count	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
14.1	1	270-300	Faunal	mammalian, large	unidentifiable	fragment	burned			2 (<1"-1/2")	4	7/30/2015	cancellous bone
15.1	1	60-80	Faunal	Geomys bursarius (plains pocket gopher)	tooth, incisor	fragment				4 (<1/4")	0.2	7/30/2015	adult; left; maxillary
16.1	1	120-130	Faunal	Odocoileus virginianus (white-tailed deer)	tooth, molar	fragment				2 (<1"-1/2")	5.3	7/30/2015	adult; right; 3rd maxillary; Beta
17.1-2	2	180-200	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (<1/2"-1/4")	0.9	7/30/2015	
18.1	1	230-250	Faunal	mammalian	unidentifiable	fragment				3 (<1/2"-1/4")	0.2	7/30/2015	
18.2-4	3	230-250	Faunal	mammalian	unidentifiable	fragment				4 (<1/4")	0.1	7/30/2015	
18.5-6	2	230-250	Faunal	vertebrata	unidentifiable	fragment				3 (<1/2"-1/4")	1	7/30/2015	
18.7-10	4	230-250	Faunal	vertebrata	unidentifiable	fragment				4 (<1/4")	0.1	7/30/2015	
19.1-2	2	250-290	Faunal	Ondatra zibethicus	humerus, right	distal fragment				3 (<1/2"-1/4")	0.6	7/30/2015	adult; refit
19.3	1	250-290	Faunal	molluscan	unidentifiable	fragment				4 (<1/4")	0.1	7/30/2015	
19.4	1	250-290	Faunal	mammalian, large	longbone	fragment				3 (<1/2"-1/4")	2.3	7/30/2015	
19.5	1	250-290	Faunal	mammalian, small	longbone	shaft, fragment				4 (<1/4")	0.1	7/30/2015	
19.6-9	4	250-290	Faunal	vertebrata	unidentifiable	fragment				3 (<1/2"-1/4")	1.3	7/30/2015	
19.1	1	250-290	Lithic	tool	unpatterned flake	utilized flake	nonbifacial	unidentified chert	50-<100%	3 (<1/2"-1/4")	0.6	7/30/2015	finished; whole
19.11	1	250-290	Lithic	debris	bipolar flake			quartzite	50-<100%	3 (<1/2"-1/4")	1.7	7/30/2015	
20.1	1	0-300	Lithic	debris	nonbifacial			Prairie du Chien Chert (oolitic)	0%	2 (<1"-1/2")	1.8	7/24/2015	

21BE305-Phase II

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
1.1	1	ST 1WW7	320-335	Faunal	Lithobates	tibia/fibula	shaft, fragment					4 (<1/4")	0.1	8/26/2015	
2.1	1	ST 1WW7	345-360	Faunal	Ondatra zibethicus	tooth, incisor	fragment					4 (<1/4")	0.6	8/26/2015	adult; right; maxillary
2.2	1	ST 1WW7	345-360	Faunal	turtle	carapace	fragment	burned				3 (<1/2"-1/4")	0.3	8/26/2015	
2.3-5	3	ST 1WW7	345-360	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	2.3	8/26/2015	
2.6-8	3	ST 1WW7	345-360	Faunal	Ondatra zibethicus	pelvis, ilium, and ischium	fragment					3 (<1/2"-1/4")	0.9	8/26/2015	adult; right
3.1-8	8	ST 1WW7	360-380	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	1.9	8/26/2015	
3.9-20	12	ST 1WW7	360-380	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	1.1	8/26/2015	
3.21	1	ST 1WW7	360-380	Lithic	debris	nonbifacial			silicified wood	50-<100%		3 (<1/2"-1/4")	0.7	8/26/2015	
4.1	1	ST 1WW7	380-400	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.3	8/26/2015	
4.2-9	8	ST 1WW7	380-400	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	2.4	8/26/2015	
4.10-12	3	ST 1WW7	380-400	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.3	8/26/2015	
5.1	1	ST 3WN5	280-290	Faunal	Ondatra zibethicus	maxilla, right	fragment					3 (<1/2"-1/4")	0.6	8/26/2015	adult
5.2	1	ST 3WN5	280-290	Faunal	Ondatra zibethicus	cranium	fragment					3 (<1/2"-1/4")	0.2	8/26/2015	
6.1	1	ST 3WS5	240-265	Faunal	Bison bison (bison)	tooth, premolar/molar	fragment					3 (<1/2"-1/4")	2	8/27/2015	
6.2-3	2	ST 3WS5	240-265	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	10.5	8/27/2015	cf. Bison
6.4	1	ST 3WS5	240-265	Faunal	Ondatra zibethicus	maxilla, right	fragment					3 (<1/2"-1/4")	0.2	8/26/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
6.5	1	ST 3WS5	240-265	Faunal	mammalian, small	ilium, left	fragment					4 (<1/4")	0.2	8/26/2015	
6.6-7	2	ST 3WS5	240-265	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.3	8/26/2015	
6.8	1	ST 3WS5	240-265	Lithic	debris	nonbifacial			quartzite	50-<100%		3 (<1/2"-1/4")	0.8	8/26/2015	
7.1	1	ST 3WW5	235-250	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.1	8/26/2015	
7.2	1	ST 3WW5	235-250	Faunal	Geomys bursarius (plains pocket gopher)	humerus, left	distal fragment					3 (<1/2"-1/4")	0.2	8/26/2015	
7.3	1	ST 3WW5	235-250	Faunal	Geomys bursarius (plains pocket gopher)	ulna, left	proximal fragment					4 (<1/4")	0.1	8/26/2015	adult
7.4-5	2	ST 3WW5	235-250	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.6	8/26/2015	
7.6-10	5	ST 3WW5	235-250	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.2	8/26/2015	
7.11	1	ST 3WW5	235-250	Lithic	debris	other G4 flake			unidentified material	0%		4 (<1/4")	0.2	8/26/2015	
8.1	1	ST 3WW5	250-260	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.2	8/25/2015	
8.2	1	ST 3WW5	250-260	Faunal	vertebrata	unidentifiable	fragment					3 (<1/2"-1/4")	0.1	8/25/2015	
9.1	1	ST 3WW5	260-275	Faunal	Anas crecca/discors	tibiotarsus, right	distal fragment					3 (<1/2"-1/4")	0.2	8/25/2015	adult
9.2	1	ST 3WW5	260-275	Faunal	mammalian, medium/large	petrosal	fragment					3 (<1/2"-1/4")	1.3	8/25/2015	
9.3	1	ST 3WW5	260-275	Faunal	Emydidae	peripheral	fragment					3 (<1/2"-1/4")	0.2	8/25/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
9.4-5	2	ST 3WW5	260-275	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.5	8/25/2015	
10.1	1	ST 3WW5	285-300	Faunal	Emydidae	peripheral	fragment					3 (<1/2"-1/4")	0.2	8/25/2015	juvenile
10.2	1	ST 3WW5	285-300	Faunal	Ondatra zibethicus	caudal	fragment					4 (<1/4")	0.1	8/25/2015	juvenile
11.1-3	3	ST 3WW10	240-250	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.5	8/26/2015	
11.4	1	ST 3WW10	240-250	Lithic	debris	nonbifacial			Prairie du Chien Chert (oolitic)	100%		3 (<1/2"-1/4")	1.1	8/26/2015	
12.1	1	ST 3WW10	250-260	Faunal	Emydidae	plastron	fragment					3 (<1/2"-1/4")	0.8	8/26/2015	worn/abraded
12.2	1	ST 3WW10	250-260	Faunal	Emydidae	peripheral	fragment					3 (<1/2"-1/4")	0.4	8/26/2015	worn/abraded
12.3	1	ST 3WW10	250-260	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.2	8/26/2015	
12.4	1	ST 3WW10	250-260	Faunal	Ondatra zibethicus	mandible, left	fragment					3 (<1/2"-1/4")	0.3	8/26/2015	
12.5	1	ST 3WW10	250-260	Faunal	Ondatra zibethicus	vertebra, caudal	fragment					4 (<1/4")	0.1	8/26/2015	juvenile
12.6	1	ST 3WW10	250-260	Faunal	Colubridae	vertebra	fragment					4 (<1/4")	0.1	8/26/2015	
12.7-8	2	ST 3WW10	250-260	Faunal	molluscan	unidentifiable	fragment					4 (<1/4")	0.2	8/26/2015	refit
12.9-10	2	ST 3WW10	250-260	Faunal	mammalian	unidentifiable	fragment	burned				3 (<1/2"-1/4")	1.4	8/26/2015	
12.11	1	ST 3WW10	250-260	Faunal	mammalian	unidentifiable	fragment	calcined				4 (<1/4")	0.2	8/26/2015	
12.12	1	ST 3WW10	250-260	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/26/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
13.1	1	ST 3WW10	270-280	Faunal	Chrysemys picta (painted turtle)	hyoplastron, left	fragment					2 (<1"-1/2")	0.8	8/27/2015	juvenile
13.2	1	ST 3WW10	270-280	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.1	8/27/2015	
13.3	1	ST 3WW10	270-280	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.4	8/27/2015	
13.4-5	2	ST 3WW10	270-280	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.2	8/27/2015	
14.1	1	ST 3WE5	240-250	Faunal	fish	vertebra	centrum fragment					3 (<1/2"-1/4")	0.1	8/27/2015	
14.2	1	ST 3WE5	240-250	Faunal	Emydidae	peripheral	fragment					3 (<1/2"-1/4")	0.6	8/26/2015	
14.3	1	ST 3WE5	240-250	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.4	8/26/2015	water worn
14.4-5	2	ST 3WE5	240-250	Faunal	bird	longbone	shaft, fragment					4 (<1/4")	0.1	8/26/2015	
14.6	1	ST 3WE5	240-250	Faunal	Ondatra zibethicus	ilium, left	fragment					3 (<1/2"-1/4")	0.3	8/26/2015	
14.7-8	2	ST 3WE5	240-250	Faunal	mammalian, large	longbone	shaft, fragment					3 (<1/2"-1/4")	2.6	8/26/2015	water worn
15.1	1	ST 3WE5	260-270	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.3	8/27/2015	
15.2	1	ST 3WE5	260-270	Faunal	mammalian, medium/large	petrosal	fragment					3 (<1/2"-1/4")	1.4	8/27/2015	
16.1	1	ST 3WE5	270-280	Faunal	Ondatra zibethicus	vertebra, sacrum	centrum fragment					3 (<1/2"-1/4")	0.3	8/27/2015	
16.2	1	ST 3WE5	270-280	Faunal	turtle	carapace	fragment					3 (<1/2"-1/4")	0.2	8/27/2015	
16.3	1	ST 3WE5	270-280	Faunal	bird	radius, right	shaft, fragment					4 (<1/4")	0.1	8/27/2015	
16.4-5	2	ST 3WE5	270-280	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/27/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
17.1	1	ST 3WE5	290-300	Faunal	Ondatra zibethicus	femur, right	proximal fragment					3 (<1/2"-1/4")	0.8	8/27/2015	
17.2	1	ST 3WE5	290-300	Faunal	Ondatra zibethicus	tibia, right	shaft, fragment					4 (<1/4")	0.2	8/26/2015	juvenile
17.3	1	ST 3WE5	290-300	Faunal	vertebrata	unidentifiable	fragment					3 (<1/2"-1/4")	0.2	8/26/2015	
18.1	1	ST 3WE5	300-310	Faunal	Ondatra zibethicus	tibia, left	proximal fragment					3 (<1/2"-1/4")	0.3	8/26/2015	
18.2	1	ST 3WE5	300-310	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.4	8/27/2015	
18.3	1	ST 3WE5	300-310	Faunal	mammalian	unidentifiable	fragment	burned				3 (<1/2"-1/4")	0.2	8/27/2015	
18.4	1	ST 3WE5	300-310	Lithic	tool	patterned flake	end scraper	nonbifacial	Western River Group	100%		3 (<1/2"-1/4")	0.9	8/27/2015	
18.5	1	ST 3WE5	300-310	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	4.6	8/25/2015	Beta
19.1-4	4	ST 3WE10	240-250	Faunal	mammalian, large	longbone	shaft, fragment	charred				2 (<1"-1/2")	23.4	8/25/2015	
19.5-7	3	ST 3WE10	240-250	Faunal	mammalian, large	longbone	shaft, fragment	charred				3 (<1/2"-1/4")	7.2	8/25/2015	
19.8	1	ST 3WE10	240-250	Faunal	Emydidae	peripheral	fragment					2 (<1"-1/2")	1.2	8/25/2015	
20.1	1	ST 3WE10	250-260	Faunal	Geomys bursarius (plains pocket gopher)	ulna, right	shaft, fragment					4 (<1/4")	0.1	8/25/2015	
20.2	1	ST 3WE10	250-260	Faunal	Emydidae	peripheral	fragment					2 (<1"-1/2")	0.7	8/25/2015	slight pitting; some abrasion

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
21.1	1	ST 3WE10	260-270	Faunal	Chrysemys picta (painted turtle)	nuchal	fragment		cut marks			3 (<1/2"-1/4")	0.6	8/25/2015	
21.2	1	ST 3WE10	260-270	Faunal	Ondatra zibethicus	tooth, molar		burned				4 (<1/4")	0.1	8/20/2015	3rd molar; mandibular
21.3	1	ST 3WE10	260-270	Faunal	mammalian, medium/large	unidentifiable	fragment	burned				3 (<1/2"-1/4")	1	8/20/2015	
21.4-5	2	ST 3WE10	260-270	Faunal	vertebrata	unidentifiable	fragment	burned				4 (<1/4")	0.1	8/14/2015	
21.6	1	ST 3WE10	260-270	Lithic	debris	broken flake			unidentified chert	0%	burned	3 (<1/2"-1/4")	0.2	8/11/2015	
22.1	1	ST 3WE10	290-300	Faunal	Chrysemys picta (painted turtle)	1st pleural, left	fragment					2 (<1"-1/2")	1.9	8/10/2015	adult
22.2	1	ST 3WE10	290-300	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.2	8/14/2015	
22.3	1	ST 3WE10	290-300	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/13/2015	
23.1	1	ST 8WW7	250-260	Faunal	Chrysemys picta (painted turtle)	epiplastron, right	fragment					2 (<1"-1/2")	2.7	8/12/2015	adult
23.2	1	ST 8WW7	250-260	Faunal	Ondatra zibethicus	tooth, incisor	fragment					4 (<1/4")	0.2	8/12/2015	adult; right; maxillary
24.1	1	ST 8WW7	265-275	Faunal	Ondatra zibethicus	femur, left	shaft, fragment					3 (<1/2"-1/4")	1.1	8/12/2015	slight polish
24.2	1	ST 8WW7	265-275	Faunal	mammalian, small	humerus, right	distal fragment					3 (<1/2"-1/4")	0.2	8/12/2015	slight polish
25.1	1	ST 8WW7	280-290	Faunal	Ondatra zibethicus	calcaneus	fragment					4 (<1/4")	0.2	8/13/2015	
25.2	1	ST 8WW7	280-290	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.3	8/13/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
26.1	1	ST 8WW7	300-315	Faunal	Ondatra zibethicus	scapula, left	distal fragment					4 (<1/4")	0.2	8/13/2015	adult
26.2	1	ST 8WW7	300-315	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/13/2015	
26.3	1	ST 8WW7	300-315	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.3	8/11/2015	
27.1	1	ST 11WE5	325-340	Faunal	Emydidae	carapace	fragment					3 (<1/2"-1/4")	0.9	8/7/2015	
27.2	1	ST 11WE5	325-340	Faunal	mammalian, medium/large	unidentifiable	fragment	burned				3 (<1/2"-1/4")	0.6	8/25/2015	
28.1	1	ST 11WE5	345-360	Faunal	Bison bison (bison)	tooth, premolar/molar	fragment	burned				3 (<1/2"-1/4")	1.1	8/25/2015	water worn
29.1	1	ST 11WW5	320-345	Faunal	turtle	carapace	fragment					3 (<1/2"-1/4")	0.3	8/26/2015	
29.2	1	ST 11WW5	320-345	Faunal	Ondatra zibethicus	tooth, molar	fragment					3 (<1/2"-1/4")	0.6	8/6/2015	adult; 1st molar; mandibular
30.1	1	ST 11WW5	370-390	Faunal	mammalian, large	longbone	shaft, fragment	burned				3 (<1/2"-1/4")	2.5	8/12/2015	
30.2	1	ST 11WW5	370-390	Lithic	debris	broken flake			Hixton Group Quartzite	0%		3 (<1/2"-1/4")	3.7	8/12/2015	
31.1	1	ST 13WW7	310-320	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.1	8/12/2015	
31.2	1	ST 13WW7	310-320	Lithic	debris	broken flake			unidentified chert	50-<100%		3 (<1/2"-1/4")	0.4	8/12/2015	
32.1	1	ST 13WW7	320-330	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.1	8/6/2015	
32.2-3	2	ST 13WW7	320-330	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/12/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
33.1	1	ST 19WN5	245-255	Faunal	Ondatra zibethicus	humerus, right	distal fragment					3 (<1/2"-1/4")	0.4	8/24/2015	
33.2	1	ST 19WN5	245-255	Faunal	Emydidae	peripheral	fragment					3 (<1/2"-1/4")	0.5	8/17/2015	
33.3	1	ST 19WN5	245-255	Faunal	mammalian, large	longbone	shaft, fragment					3 (<1/2"-1/4")	1.3	8/9/2015	worn
33.4-6	3	ST 19WN5	245-255	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	1.7	8/9/2015	
33.7	1	ST 19WN5	245-255	Faunal	vertebrata	unidentifiable	fragment					3 (<1/2"-1/4")	0.4	8/9/2015	
34.1	1	ST 19WN5	260-270	Faunal	Bison bison (bison)	tooth, incisor	complete					3 (<1/2"-1/4")	1.6	8/19/2015	adult; 1st incisor; mandibular
34.2	1	ST 19WN5	260-270	Faunal	turtle	neural	complete					3 (<1/2"-1/4")	0.1	8/20/2015	
34.3	1	ST 19WN5	260-270	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/20/2015	
34.4	1	ST 19WN5	260-270	Lithic	debris	nonbifacial			unidentified material	100%		3 (<1/2"-1/4")	0.5	8/20/2015	
34.5	1	ST 19WN5	260-270	Lithic	debris	broken flake			basaltic	0%		3 (<1/2"-1/4")	0.5	8/25/2015	
34.6	1	ST 19WN5	260-270	Lithic	debris	shatter			unidentified chert	100%	burned	3 (<1/2"-1/4")	1.2	8/25/2015	
35.1	1	ST 19WN5	270-280	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.3	8/25/2015	
35.2	1	ST 19WN5	270-280	Faunal	turtle	carapace/plastron	fragment	burned				3 (<1/2"-1/4")	0.2	8/25/2015	
35.3	1	ST 19WN5	270-280	Faunal	Geomys bursarius (plains pocket gopher)	tooth, incisor	fragment	burned				4 (<1/4")	0.1	8/25/2015	left; maxillary

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
36.1-2	2	ST 19WN5	280-290	Faunal	Geomys bursarius (plains pocket gopher)	mandible, right	anterior, fragment					3 (<1/2"-1/4")	0.2	8/27/2015	
37.1	1	ST 19WN10	275-290	Faunal	Ondatra zibethicus	humerus, right	distal fragment					3 (<1/2"-1/4")	0.3	8/26/2015	
37.2	1	ST 19WN10	275-290	Faunal	turtle	peripheral	fragment					3 (<1/2"-1/4")	0.3	8/27/2015	cf. Emydidae
37.3	1	ST 19WN10	275-290	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	3.8	8/25/2015	slightly worn
37.4	1	ST 19WN10	275-290	Faunal	mammalian, small	longbone	shaft, fragment					4 (<1/4")	0.3	8/25/2015	
37.5	1	ST 19WN10	275-290	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/26/2015	
37.6	1	ST 19WN10	275-290	Faunal	Rodentia	tooth, incisor	fragment					4 (<1/4")	0.1	8/26/2015	
37.7	1	ST 19WN10	275-290	Lithic	debris	shatter			unidentified material	>0-<50%		3 (<1/2"-1/4")	1	8/26/2015	
38.1	1	ST 19WS10	240-250	Faunal	mammalian, small	cranium	fragment					3 (<1/2"-1/4")	0.1	8/26/2015	zygomatic
39.1	1	ST 19WS10	260-280	Faunal	Lithobates	ilium, left	complete					3 (<1/2"-1/4")	0.1	8/26/2015	
39.2	1	ST 19WS10	260-280	Faunal	turtle	carapace	fragment					3 (<1/2"-1/4")	0.3	8/26/2015	
39.3	1	ST 19WS10	260-280	Faunal	Ondatra zibethicus	tooth, molar	fragment	burned				3 (<1/2"-1/4")	0.3	8/25/2015	adult; 1st molar; mandibular
39.4-6	3	ST 19WS10	260-280	Faunal	mammalian, medium/large	unidentifiable	fragment					3 (<1/2"-1/4")	1.1	8/25/2015	
39.7	1	ST 19WS10	260-280	Lithic	debris	other G4 flake			unidentified material	50-<100%		4 (<1/4")	0.1	8/25/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
40.1	1	ST 19WS10	325-335	Faunal	mammalian, medium/large	unidentifiable	fragment					3 (<1/2"-1/4")	0.6	8/25/2015	
41.1	1	ST 19WS10	340-355	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	1.3	8/25/2015	slightly water worn
42.1	1	ST 19WE5	220-230	Faunal	Emydidae	hypoplastron, left	fragment					3 (<1/2"-1/4")	0	8/25/2015	cf. Chrysemys picta
42.2	1	ST 19WE5	220-230	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.2	8/25/2015	
43.1	1	ST 19WE5	230-240	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.1	8/25/2015	
44.1-4	4	ST 19WE5	240-260	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	1	8/25/2015	3 refit
44.5	1	ST 19WE5	240-260	Lithic	debris	nonbifacial			unidentified chert	0%		3 (<1/2"-1/4")	0.8	8/25/2015	
45.1	1	ST 19WE5	260-270	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	2.9	8/25/2015	cf longbone shaft
45.2	1	ST 19WE5	260-270	Faunal	Geomys bursarius (plains pocket gopher)	tooth, incisor	fragment					4 (<1/4")	0.2	8/24/2015	adult; left; maxillary
45.3	1	ST 19WE5	260-270	Lithic	core	bipolar (not rotated)	unpatterned (multi-directional)	unprepared	unidentified chert	>0-<50%		2 (<1"-1/2")	18.5	8/24/2015	
46.1	1	ST 19WE10	260-270	Faunal	turtle	carapace	fragment					3 (<1/2"-1/4")	0.5	8/24/2015	slight water polish
46.2	1	ST 19WE10	260-270	Lithic	debris	other G4 flake			Prairie du Chien Chert (oolitic)	0%	heat treated	4 (<1/4")	0.1	8/24/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
47.1	1	ST 19WW5	245-255	Faunal	mammalian, large	tooth, premolar/molar	fragment	burned				4 (<1/4")	0.4	8/24/2015	cf Cervid/Bovid
47.2	1	ST 19WW5	245-255	Faunal	Ondatra zibethicus	mandible, right	fragment					3 (<1/2"-1/4")	0.2	8/24/2015	ascendius ramus fragment
47.3	1	ST 19WW5	245-255	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.1	8/27/2015	
47.4-5	2	ST 19WW5	245-255	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.2	8/27/2015	
48.1	1	ST 19WW5	255-265	Faunal	Ondatra zibethicus	femur, right	proximal fragment					3 (<1/2"-1/4")	1	8/27/2015	juvenile
48.2	1	ST 19WW5	255-265	Faunal	mammalian, small	phalanx	complete					4 (<1/4")	0.1	8/27/2015	adult
49.1	1	ST 19WW10	220-240	Faunal	Bison bison (bison)	sacrum	anterior, fragment					1 (<2"-1")	36.8	8/27/2015	adult
49.2-6	5	ST 19WW10	220-240	Faunal	Bison bison (bison)	vertebra, lumbar	centrum fragment					1 (<2"-1")	116.9	8/27/2015	
49.7-18	12	ST 19WW10	220-240	Faunal	Bison cf. sp.	unidentifiable	fragment					2 (<1"-1/2")	31.4	8/20/2015	
49.19-49	31	ST 19WW10	220-240	Faunal	Bison cf. sp.	unidentifiable	fragment					3 (<1/2"-1/4")	30	8/6/2015	
49.50-51	2	ST 19WW10	220-240	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	2.1	8/10/2015	cf. Bison
49.52-163	112	ST 19WW10	220-240	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	37.3	8/24/2015	cf. Bison
49.164-220	57	ST 19WW10	220-240	Faunal	mammalian, large	unidentifiable	fragment					4 (<1/4")	6	8/24/2015	cf. Bison
49.221-253	33	ST 19WW10	220-240	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	5.7	8/24/2015	
49.254-654	401	ST 19WW10	220-240	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	18.2	8/24/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
50.1	1	ST 19WW10	265-280	Faunal	Rodentia	cranium	fragment					4 (<1/4")	0.1	8/24/2015	
50.2	1	ST 19WW10	265-280	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	2.1	8/24/2015	
50.3-6	4	ST 19WW10	265-280	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	1.4	8/24/2015	
50.7-9	3	ST 19WW10	265-280	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.6	8/24/2015	
50.10-18	9	ST 19WW10	265-280	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.8	8/24/2015	
51.1	1	ST 19WW10	290-300	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	0.7	8/24/2015	
51.2	1	ST 19WW10	290-300	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/24/2015	
52.1	1	ST 21WN5	270-280	Faunal	Ondatra zibethicus	tooth, incisor	fragment					4 (<1/4")	0.2	8/25/2015	right; maxillary
52.2-3	2	ST 21WN5	270-280	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/25/2015	
53.1	1	ST 21WN5	290-295	Faunal	mammalian, small	metapodial	proximal fragment					4 (<1/4")	0.1	8/25/2015	
53.2-3	2	ST 21WN5	290-295	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.9	8/11/2015	
53.3-4	2	ST 21WN5	290-295	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.3	8/11/2015	
54.1	1	ST 21WN10	110-120	Faunal	mammalian, large	longbone	shaft, fragment	burned				3 (<1/2"-1/4")	0.5	8/11/2015	
55.1	1	ST 21WN10	245-260	Faunal	Colubridae	vertebra	fragment					3 (<1/2"-1/4")	0.1	8/11/2015	
55.2	1	ST 21WN10	245-260	Faunal	mammalian, small	ischium, right	fragment					4 (<1/4")	0.1	8/11/2015	
55.3	1	ST 21WN10	245-260	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/11/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
56.1	1	ST 21WS5	280-290	Faunal	mammalian, large	longbone	shaft, fragment					1 (<2"-1")	12.8	8/11/2015	cf. Bison/Cervus; Beta
57.1	1	ST 21WS10	270-280	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.5	8/11/2015	
58.1	1	ST 21WS10	280-295	Faunal	Ondatra zibethicus	calcaneus	fragment					4 (<1/4")	0.1	8/11/2015	
58.2-3	2	ST 21WS10	280-295	Faunal	Ondatra zibethicus	tooth, incisor	fragment					4 (<1/4")	0.3	8/11/2015	
58.4-6	3	ST 21WS10	280-295	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.3	8/11/2015	
58.7-8	2	ST 21WS10	280-295	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/6/2015	
59.1	1	ST 21WS10	300-310	Faunal	Anura (frog/toad)	vertebra	fragment					4 (<1/4")	0.1	8/6/2015	
59.2	1	ST 21WS10	300-310	Faunal	mammalian, small	cranium	fragment					4 (<1/4")	0.2	8/6/2015	
59.3	1	ST 21WS10	300-310	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.1	8/6/2015	
59.4-7	4	ST 21WS10	300-310	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.7	8/6/2015	
60.1	1	ST 21WS10	310-320	Faunal	Ictidomys tridecemlineatus	mandible, right	fragment					3 (<1/2"-1/4")	0.2	8/6/2015	adult
61.1	1	ST 21WS10	315-330	Faunal	Geomys bursarius (plains pocket gopher)	tooth	fragment					4 (<1/4")	0.1	8/6/2015	cheek tooth
61.2	1	ST 21WS10	315-330	Faunal	mammalian, medium/large	unidentifiable	fragment					3 (<1/2"-1/4")	1.4	8/6/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
61.3	1	ST 21WS10	315-330	Faunal	mammalian, small	phalanx	fragment					4 (<1/4")	0.1	8/6/2015	adult; 1st phalanx
61.4-5	2	ST 21WS10	315-330	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.2	8/6/2015	
61.6	1	ST 21WS10	315-330	Lithic	debris	broken flake			Prairie du Chien Chert	0%		3 (<1/2"-1/4")	1	8/6/2015	
62.1-2	2	ST 21WE5	255-265	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.2	8/6/2015	
63.1	1	ST 21WE5	270-280	Faunal	Geomys bursarius (plains pocket gopher)	ulna, right	shaft, fragment					4 (<1/4")	0.3	8/6/2015	
63.2	1	ST 21WE5	270-280	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.3	8/6/2015	
63.3	1	ST 21WE5	270-280	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
64.1	1	ST 21WE10	335-345	Faunal	Ondatra zibethicus	tooth, incisor	fragment					4 (<1/4")	0.2	8/6/2015	mandibular
64.2	1	ST 21WE10	335-345	Faunal	Ondatra zibethicus	vertebra, caudal						3 (<1/2"-1/4")	0.3	8/6/2015	
65.1	1	ST 21WE10	365-375	Faunal	Ameiurus sp.	dentary, right	fragment					4 (<1/4")	0.1	8/6/2015	
66.1	1	ST 21WW5	250-260	Faunal	turtle	carapace	fragment					3 (<1/2"-1/4")	0.3	8/6/2015	
67.1	1	ST 21WW5	260-270	Faunal	mammalian, medium/large	unidentifiable	fragment					3 (<1/2"-1/4")	1	8/6/2015	
67.2	1	ST 21WW5	260-270	Lithic	debris	other G4 flake			quartzite	>0-<50%		4 (<1/4")	0.3	8/6/2015	
68.1	1	ST 21WW5	270-280	Faunal	Ondatra zibethicus	tibia, left	distal fragment					3 (<1/2"-1/4")	0.2	8/6/2015	
68.2-3	2	ST 21WW5	270-280	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.6	8/6/2015	refit

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
68.4	1	ST 21WW5	270-280	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
69.1-4	4	ST 21WW5	290-305	Faunal	Emydidae	plastron	fragment					2 (<1"-1/2")	2.4	8/6/2015	refit
70.1-2	2	ST 23WN5	120-150	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.6	8/6/2015	
71.1	1	ST 23WN5	130-155	Faunal	Bison bison (bison)	femur, right	shaft, fragment		gnawed			1 (<2"-1")	288.6	8/6/2015	refit
72.1	1	ST 23WN5	230-240	Faunal	Ondatra zibethicus	vertebra, cervical	fragment					3 (<1/2"-1/4")	0.1	8/6/2015	adult
72.2	1	ST 23WN5	230-240	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.3	8/6/2015	
72.3	1	ST 23WN5	230-240	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/6/2015	
73.1	1	ST 23WN5	240-250	Faunal	Ameiurus sp.	cleithrum, right	fragment	burned				4 (<1/4")	0.1	8/6/2015	
73.2	1	ST 23WN5	240-250	Faunal	Geomys bursarius (plains pocket gopher)	humerus, right	distal fragment					3 (<1/2"-1/4")	0.4	8/6/2015	3 refit
73.3-6	4	ST 23WN5	240-250	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.4	8/6/2015	
73.7-8	2	ST 23WN5	240-250	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
74.1-2	2	ST 23WN5	255-260	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
75.1	1	ST 23WN5	260-270	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.2	8/6/2015	
76.1	1	ST 23WN5	270-275	Faunal	Colubridae	vertebra	fragment					4 (<1/4")	0.1	8/6/2015	poss. Nerodia sp.
77.1	1	ST 23WN10	300-310	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.6	8/6/2015	
77.2	1	ST 23WN10	300-310	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
78.1	1	ST 23WN10	320-330	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.1	8/6/2015	
79.1	1	ST 23WS5	275-285	Faunal	mammalian, medium	longbone	shaft, fragment	burned				3 (<1/2"-1/4")	0.5	8/6/2015	
80.1	1	ST 23WS10	320-330	Faunal	Ameiurus sp.	cleithrum, right	fragment					4 (<1/4")	0.1	8/6/2015	
80.2	1	ST 23WS10	320-330	Faunal	fish	cranium	fragment					3 (<1/2"-1/4")	0.1	8/6/2015	
81.1	1	ST 23WS10	355-360	Faunal	Anaxyrus sp.	ilium, right	fragment					4 (<1/4")	0.1	8/6/2015	
81.2	1	ST 23WS10	355-360	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
82.1	1	ST 23WW5	270-280	Faunal	Chrysemys picta (painted turtle)	epiplastron, right	fragment					3 (<1/2"-1/4")	0.7	8/6/2015	
83.1	1	ST 23WW10	320-330	Faunal	Ondatra zibethicus	tooth, incisor	fragment	burned				4 (<1/4")	0.2	8/6/2015	
83.2-3	2	ST 23WW10	320-330	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
84.1	1	ST 23WW10	340-350	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.4	8/6/2015	slight abrasion/worn
84.2	1	ST 23WW10	340-350	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.2	8/6/2015	
85.1	1	ST 25WE5S5	260-270	Faunal	Ameiurus sp.	ceratchyal & epihyal, right	complete					3 (<1/2"-1/4")	0.2	8/6/2015	refit
86.1	1	ST 25WE5S5	310-320	Faunal	mammalian, small	ulna, left	shaft, fragment					4 (<1/4")	0.1	8/6/2015	refit
87.1	1	ST 25WE5S5	320-330	Faunal	Ondatra zibethicus	mandible, left	fragment	burned				3 (<1/2"-1/4")	0.2	8/6/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
87.2	1	ST 25WE5S5	320-330	Faunal	Emydidae	peripheral	fragment					3 (<1/2"-1/4")	0.4	8/6/2015	juvenile
88.1	1	ST 25WE5S5	340-350	Faunal	Geomys bursarius (plains pocket gopher)	mandible, right	anterior, fragment					3 (<1/2"-1/4")	0.8	8/6/2015	adult
89.1-3	3	ST 25WE5	140-150	Faunal	Bison cf. sp.	unidentifiable	fragment					2 (<1"-1/2")	9.6	8/6/2015	
89.4-6	3	ST 25WE5	140-150	Faunal	Bison cf. sp.	unidentifiable	fragment					3 (<1/2"-1/4")	1.5	8/6/2015	
89.7	1	ST 25WE5	140-150	Faunal	Bison cf. sp.	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
90.1	1	ST 25WE5N5	320-340	Faunal	mammalian, medium/large	longbone	shaft, fragment					3 (<1/2"-1/4")	0.6	8/6/2015	
90.2	1	ST 25WE5N5	320-340	Lithic	debris	broken flake			Red River Chert	100%		3 (<1/2"-1/4")	0.4	8/6/2015	
91.1	1	ST 25WW5	325-345	Faunal	mammalian, large	longbone	fragment		gnawed			2 (<1"-1/2")	12.2	8/6/2015	refit
91.2	1	ST 25WW5	325-345	Faunal	mammalian, large	longbone	fragment		gnawed			3 (<1/2"-1/4")	1.8	8/6/2015	
91.3	1	ST 25WW5	325-345	Faunal	vertebrata	unidentifiable	fragment	calcined				4 (<1/4")	0.1	8/6/2015	
92.1	1	ST 27WS5	310-320	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/6/2015	
93.1	1	ST 27WS5	330-340	Faunal	mammalian, medium/large	unidentifiable	fragment	burned				3 (<1/2"-1/4")	0.7	8/6/2015	
94.1	1	ST 27WS5	350-360	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	0.7	8/6/2015	water worn
94.2-4	3	ST 27WS5	350-360	Faunal	vertebrata	unidentifiable	fragment	burned				3 (<1/2"-1/4")	0.4	8/6/2015	
95.1	1	ST 28WS5	200-205	Faunal	Ondatra zibethicus	mandible, right	fragment					3 (<1/2"-1/4")	1.5	8/6/2015	2 refit; adult

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
96.1	1	ST 28WS5	280-290	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.5	8/6/2015	
96.2-3	2	ST 28WS5	280-290	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/6/2015	
96.4	1	ST 28WS5	280-290	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.2	8/11/2015	
96.5	1	ST 28WS5	280-290	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/11/2015	
97.1	1	ST 28WS5	360-370	Faunal	mammalian, medium/large	unidentifiable	fragment	burned				3 (<1/2"-1/4")	1	8/11/2015	
97.2	1	ST 28WS5	360-370	Lithic	debris	broken flake			quartzite	0%		3 (<1/2"-1/4")	0.1	8/11/2015	
98.1	1	ST 31WN5	350-370	Faunal	mammalian, large	longbone	shaft, fragment					3 (<1/2"-1/4")	0.6	8/11/2015	
98.2	1	ST 31WN5	350-370	Lithic	debris	decortication			basaltic	100%		3 (<1/2"-1/4")	1.5	8/11/2015	water worn?
99.1	1	ST 31WS5	265-290	Faunal	Emydidae	neural	fragment					3 (<1/2"-1/4")	0.1	8/11/2015	
99.2	1	ST 31WS5	265-290	Faunal	bird	longbone	shaft, fragment	burned				4 (<1/4")	0.1	8/11/2015	
100.1	1	ST 31WS5	290-305	Faunal	Castor canadensis (beaver)	tooth, incisor	fragment	burned				3 (<1/2"-1/4")	0.2	8/11/2015	
100.2-3	2	ST 31WS5	290-305	Faunal	mammalian	unidentifiable	fragment	burned				3 (<1/2"-1/4")	0.8	8/7/2015	
100.4-5	2	ST 31WS5	290-305	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/7/2015	
101.1	1	ST 31WS5	305-310	Faunal	Ondatra zibethicus	tooth, incisor	fragment	burned				4 (<1/4")	0.2	8/7/2015	adult; left; maxillary
101.2	1	ST 31WS5	305-310	Faunal	Colubridae	vertebra	fragment					4 (<1/4")	0.1	8/7/2015	
101.3	1	ST 31WS5	305-310	Faunal	turtle	carapace	fragment					3 (<1/2"-1/4")	0.2	8/7/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
101.4	1	ST 31WS5	305-310	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.2	8/7/2015	
102.1	1	ST 31WS5	315-325	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.2	8/11/2015	
103.1	1	ST 31WS5	325-345	Faunal	Ameiurus melas	pectoral spine, left	complete					4 (<1/4")	0.2	8/11/2015	
103.2-3	2	ST 31WS5	325-345	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.2	8/11/2015	
103.4	1	ST 31WS5	325-345	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.4	8/13/2015	
103.5	1	ST 31WS5	325-345	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/13/2015	
104.1	1	ST 31WE10	200-210	Faunal	mammalian, small	longbone	shaft, fragment					4 (<1/4")	0.2	8/13/2015	
105.1	1	ST 31WE10	300-310	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.2	8/13/2015	
105.2	1	ST 31WE10	300-310	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/13/2015	
105.3-4	2	ST 31WE10	300-310	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/13/2015	
106.1	1	ST 31W10	350-360	Faunal	Ondatra zibethicus	tooth, molar	fragment	burned				3 (<1/2"-1/4")	0.3	8/13/2015	adult; left; 1st molar; mandibular
107.1-3	3	ST 31WW10	290-310	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.3	8/13/2015	
107.4	1	ST 31WW10	290-310	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/13/2015	
108.1-3	3	ST 40WE5	250-265	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/13/2015	
109.1	1	ST 41WS5	315-325	Faunal	Ondatra zibethicus	tibia, right	shaft, fragment					3 (<1/2"-1/4")	0.7	8/13/2015	
109.2	1	ST 41WS5	315-325	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.4	8/13/2015	

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
109.3-4	2	ST 41WS5	315-325	Faunal	turtle	carapace/plastron	fragment					4 (<1/4")	0.1	8/13/2015	
110.1	1	ST 41WS10	305-335	Faunal	vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/13/2015	
111.1	1	ST 41WS10	335-345	Faunal	Microtus sp.	mandible, left	fragment					3 (<1/2"-1/4")	0.1	8/13/2015	adult
111.2	1	ST 41WS10	335-345	Faunal	mammalian, large	unidentifiable	fragment		gnawed			1 (<2"-1")	13.3	8/13/2015	Beta
112.1	1	ST 41WS10	345-350	Faunal	Colubridae	vertebra	fragment					4 (<1/4")	0.1	8/13/2015	refit
112.2	1	ST 41WS10	345-350	Faunal	vertebrata	unidentifiable	fragment	calcined				4 (<1/4")	0.1	8/13/2015	
113.1	1	ST 41WS10	350-355	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.2	8/12/2015	
114.1	1	ST 41WS10	355-360	Faunal	vertebrata	unidentifiable	fragment	calcined				4 (<1/4")	0	8/12/2015	
114.2	1	ST 41WS10	355-360	Lithic	debris	other G4 flake			Swan River Chert	100%		4 (<1/4")	0.2	8/12/2015	
115.1	1	ST 41WS10	360-365	Faunal	Ondatra zibethicus	mandible, right	fragment	burned				3 (<1/2"-1/4")	0.2	8/12/2015	
115.2	1	ST 41WS10	360-365	Lithic	debris	other G4 flake			quartz	0%		4 (<1/4")	0.1	8/12/2015	
116.1	1	ST 41WE5	300-305	Faunal	Bison bison (bison)	rib	shaft, fragment					1 (<2"-1")	13.9	8/12/2015	refit; adult; Beta
117.1-8	8	XU 1	140-160	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	23.9	8/12/2015	cf. Bison
117.9-21	13	XU 1	140-160	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	5.5	8/12/2015	cf. Bison
117.22-41	20	XU 1	140-160	Faunal	mammalian, large	unidentifiable	fragment					4 (<1/4")	2	8/12/2015	cf. Bison

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
118.1	1	XU 1	160-170	Faunal	Emydidae	peripheral	fragment					2 (<1"-1/2")	1.9	8/12/2015	
118.2	1	XU 1	160-170	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	6	8/12/2015	cf. Bison
118.3-5	3	XU 1	160-170	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.7	8/12/2015	
118.6	1	XU 1	160-170	Lithic	debris	shatter			quartz	0%		3 (<1/2"-1/4")	0.9	8/12/2015	
119.1-2	2	XU 1	170-180	Faunal	Bison bison (bison)	vertebra, centrum epiphysis	fragment					2 (<1"-1/2")	5.7	8/12/2015	juvenile
119.3-4	2	XU 1	170-180	Faunal	Bison bison (bison)	vertebra/rib	fragment					2 (<1"-1/2")	15.9	8/12/2015	
119.5-20	16	XU 1	170-180	Faunal	Bison bison (bison)	vertebra/rib	fragment					3 (<1/2"-1/4")	53.6	8/12/2015	
119.21-35	15	XU 1	170-180	Faunal	Bison bison (bison)	rib	shaft, fragment					2 (<1"-1/2")	59.2	8/12/2015	
119.36-56	21	XU 1	170-180	Faunal	Bison bison (bison)	rib	shaft, fragment					3 (<1/2"-1/4")	26.6	8/12/2015	
119.57-61	5	XU 1	170-180	Faunal	mammalian	unidentifiable	fragment					2 (<1"-1/2")	4.7	8/12/2015	
119.62-109	48	XU 1	170-180	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	15.2	8/12/2015	
119.110-151	42	XU 1	170-180	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	1.9	8/13/2015	
120.1	1	XU 1	180-190	Faunal	Bison bison (bison)	vertebra	centrum fragment					2 (<1"-1/2")	1.1	8/13/2015	juvenile
120.2-4	3	XU 1	180-190	Faunal	Bison bison (bison)	vertebra	centrum fragment					3 (<1/2"-1/4")	1.3	8/13/2015	juvenile
120.5	1	XU 1	180-190	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	2.5	8/13/2015	cf. Bison

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
120.6-12	7	XU 1	180-190	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	2.7	8/13/2015	
120.13-19	7	XU 1	180-190	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.8	8/13/2015	
120.2	1	XU 1	180-190	Lithic	debris	other G4 flake			unidentified material	0%		4 (<1/4")	0.3	8/13/2015	
121.1	1	XU 1	190-200	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	0.4	8/13/2015	
121.2	1	XU 1	190-200	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/13/2015	
122.1	1	XU 1	170-180	Faunal	Bison bison (bison)	vertebra, thoracic	complete					1 (<2"-1")	155.1	8/12/2015	juvenile
122.2	1	XU 1	170-180	Faunal	Bison bison (bison)	rib	shaft, fragment					1 (<2"-1")	58.3	8/12/2015	refit
123.1	1	XU 1	170-180	Faunal	Bison bison (bison)	vertebra, thoracic	fragment					1 (<2"-1")	37.4	8/12/2015	9 refit
124.1	1	XU 1	170-180	Faunal	Bison bison (bison)	vertebra, thoracic	centrum fragment					1 (<2"-1")	87.2	8/12/2015	juvenile
125.1	1	XU 1	170-180	Faunal	Bison bison (bison)	vertebra, thoracic	centrum fragment					1 (<2"-1")	97.4	8/12/2015	refit; adult/young adult
126.1	1	XU 1	170-180	Faunal	Bison bison (bison)	vertebra, thoracic	fragment					1 (<2"-1")	33.6	8/13/2015	refit; neural spine fragment
127.1	1	XU 1	170-180	Faunal	Bison bison (bison)	vertebra, thoracic	centrum fragment					1 (<2"-1")	97.4	8/13/2015	adult/ young adult
128.1	1	XU 1	170-180	Faunal	Bison bison (bison)	rib, right	proximal fragment					1 (<2"-1")	23.6	8/14/2015	adult; right
129.1	1	XU 1	180-190	Faunal	Bison bison (bison)	vertebra, thoracic	fragment					1 (<2"-1")	68.2	8/14/2015	refit; neural & spine
130.1	1	XU 1	180-190	Faunal	Bison bison (bison)	vertebra, thoracic	centrum fragment					1 (<2"-1")	71.5	8/14/2015	adult/ young adult

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
131.1	1	XU 1	180-190	Faunal	Bison bison (bison)	rib, right	proximal fragment					1 (<2"-1")	166.4	8/14/2015	refit; adult/young adult; one bone sent for Beta dating (10.6g)
132.1	1	XU 1	180-190	Faunal	Bison bison (bison)	rib, left	complete					1 (<2"-1")	190	8/14/2015	refit; adult
133.1-4	4	XU 2	140-160	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	1.5	8/14/2015	
133.5-6	2	XU 2	140-160	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.2	8/14/2015	
134.1	1	XU 2	160-170	Faunal	Bison bison (bison)	rib, left	shaft, fragment					1 (<2"-1")	75	8/14/2015	refit
134.2	1	XU 2	160-170	Faunal	Bison bison (bison)	vertebra, lumbar	fragment					1 (<2"-1")	24.4	8/14/2015	neural arch
134.3	1	XU 2	160-170	Faunal	Bison bison (bison)	vertebra, lumbar	fragment					2 (<1"-1/2")	4.9	8/15/2015	
134.4-5	2	XU 2	160-170	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	4.3	8/14/2015	
134.6-14	9	XU 2	160-170	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	2.6	8/14/2015	
134.15-23	9	XU 2	160-170	Faunal	mammalian, large	unidentifiable	fragment					4 (<1/4")	0.8	8/14/2015	
135.1	1	XU 2	170-180	Faunal	Bison bison (bison)	vertebra, thoracic	centrum fragment					1 (<2"-1")	107.4	8/14/2015	adult
135.2	1	XU 2	170-180	Faunal	Bison bison (bison)	vertebra, lumbar	fragment					1 (<2"-1")	16.1	8/14/2015	nueral arch
135.3	1	XU 2	170-180	Faunal	Bison bison (bison)	tooth, premolar	complete					2 (<1"-1/2")	11.2	8/14/2015	adult; 4th maxillary

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
135.4-7	4	XU 2	170-180	Faunal	Bison bison (bison)	rib	shaft, fragment					2 (<1"-1/2")	11.2	8/14/2015	
135.8-27	20	XU 2	170-180	Faunal	Bison bison (bison)	rib	shaft, fragment					3 (<1/2"-1/4")	17.6	8/14/2015	
135.28-30	3	XU 2	170-180	Faunal	Bison bison (bison)	unidentifiable	fragment					2 (<1"-1/2")	7.2	8/14/2015	
135.31-32	2	XU 2	170-180	Faunal	Bison bison (bison)	unidentifiable	fragment					3 (<1/2"-1/4")	1	8/13/2015	
135.33-67	35	XU 2	170-180	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	8.5	8/13/2015	
135.68-86	19	XU 2	170-180	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	1.3	8/13/2015	
136.1	1	XU 2	180-190	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	4.8	8/13/2015	
136.2-3	2	XU 2	180-190	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	1.9	8/13/2015	
136.4-5	2	XU 2	180-190	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.3	8/13/2015	
137.1	1	XU 2	210-220	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	0.8	8/13/2015	
138.1	1	XU 2	220-230	Faunal	molluscan	unidentifiable	fragment					4 (<1/4")	0.5	8/13/2015	
138.2	1	XU 2	220-230	Faunal	turtle	neural	fragment					3 (<1/2"-1/4")	0.3	8/13/2015	
138.3	1	XU 2	220-230	Faunal	Chrysemys picta (painted turtle)	hypoplastron, right	fragment					2 (<1"-1/2")	2.5	8/13/2015	
138.4	1	XU 2	220-230	Faunal	Chrysemys picta (painted turtle)	epiplastron, right	fragment					3 (<1/2"-1/4")	2.2	8/13/2015	
138.5	1	XU 2	220-230	Faunal	mammalian, medium/large	unidentifiable	fragment					2 (<1"-1/2")	2.2	8/13/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
138.6	1	XU 2	220-230	Faunal	Bison bison (bison)	metapodial	distal fragment					1 (<2"-1")	4.1	8/14/2015	Beta
139.1	1	XU 2	230-240	Faunal	Ondatra zibethicus	humerus, right	distal fragment					3 (<1/2"-1/4")	0.1	8/14/2015	
139.2	1	XU 2	230-240	Faunal	mammalian	unidentifiable	fragment					2 (<1"-1/2")	0.7	8/14/2015	
139.3	1	XU 2	230-240	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.1	8/14/2015	
139.4	1	XU 2	230-240	Lithic	debris	bifacial thinning			Prairie du Chien Chert (oolitic)	0%		2 (<1"-1/2")	3.3	8/14/2015	
140.1	1	ST 3WS5	220-240	Lithic	debris	bipolar flake			quartz	100%		2 (<1"-1/2")	3	8/14/2015	
141.1	1	ST 3WE10	280-290	Lithic	debris	broken flake			unidentified material	0%		3 (<1/2"-1/4")	0.4	8/26/2015	
142.1	1	ST 19WS5	240-250	Lithic	debris	broken flake			quartzite	0%		3 (<1/2"-1/4")	1.3	8/24/2015	
142.2	1	ST 19WS5	240-250	Lithic	debris	broken flake			Galena Chert	0%		3 (<1/2"-1/4")	1.1	8/25/2015	
143.1	1	ST 21WS5	235-245	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.2	8/25/2015	
143.2	1	ST 21WS5	235-245	Faunal	Vertebrata	unidentifiable	fragment					3 (<1/2"-1/4")	0.1	8/25/2015	
144.1	1	ST 21WS5	290-300	Faunal	turtle	peripheral	fragment					3 (<1/2"-1/4")	0.3	8/24/2015	
145.1	1	ST 23WN5	225-240	Lithic	debris	other G4 flake			quartzite	>0-<50%		4 (<1/4")	0.3	8/24/2015	
146.1	1	ST 31WS10	330-340	Lithic	debris	broken flake			Swan River Chert	0%		3 (<1/2"-1/4")	0.3	8/24/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
147.1	1	ST 31WS10	350-360	Faunal	Ondatra zibethicus	femur, right	proximal fragment					3 (<1/2"-1/4")	0.8	8/24/2015	
147.2	1	ST 31WS10	350-360	Faunal	mammalian, large	unidentifiable	fragment					2 (<1"-1/2")	3.5	8/24/2015	
147.3	1	ST 31WS10	350-360	Faunal	Vertebrata	unidentifiable	fragment					4 (<1/4")	0.1	8/24/2015	
148.1	1	ST 31WW5	350-360	Lithic	debris	broken flake			quartz	0%		3 (<1/2"-1/4")	1.8	8/24/2015	
149.1	1	ST 41WS10	280-295	Lithic	debris	other G4 flake			unidentified material	50-<100%		4 (<1/4")	0.3	8/24/2015	
150.1	1	ST 41WE5	265-275	Lithic	debris	other G4 flake			unidentified chert	0%		4 (<1/4")	0.1	8/24/2015	
151.1	1	ST 41WE10	260-275	Lithic	tool	unpatterned flake	utilized flake	decortication	Western River Group	>0-<50%		2 (<1"-1/2")	4	8/24/2015	
152.1	1	XU 1	170-180	Lithic	fire-cracked rock	crumb	fragment		granitic			4 (<1/4")	107	8/21/2015	@250 small fragments
153.1	1	XU 3	150-160	Faunal	Bison bison (bison)	femur, right	shaft, fragment					1 (<2"-1")	47.5	8/21/2015	refit
153.2-3	2	XU 3	150-160	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	1.8	8/21/2015	
154.1	1	XU 3	160-170	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	2	8/21/2015	
154.2	1	XU 3	160-170	Lithic	debris	broken flake			quartzite	0%		3 (<1/2"-1/4")	0.4	8/21/2015	
154.3	1	XU 3	160-170	Lithic	debris	shatter			Swan River Chert	>0-<50%		3 (<1/2"-1/4")	1.4	8/21/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
154.4	1	XU 3	160-170	Lithic	debris	shatter			Swan River Chert	0%	probably heat treated	3 (<1/2"-1/4")	2.4	8/21/2015	
155.1	1	XU 3	170-180	Faunal	Chrysemys picta (painted turtle)	hypoplastron, right	fragment					2 (<1"-1/2")	1.4	8/21/2015	
155.2	1	XU 3	170-180	Faunal	molluscan	valve, left	fragment					2 (<1"-1/2")	3.7	8/21/2015	
155.3	1	XU 3	170-180	Faunal	turtle	carapace/plastron	fragment					3 (<1/2"-1/4")	0.2	8/21/2015	
155.4	1	XU 3	170-180	Lithic	tool	pecked/ground stone (unpatterned)	abrader (grooved)		quartzite	50-<100%		1 (<2"-1")	39.6	8/10/2015	
155.5	1	XU 3	170-180	Lithic	debris	bipolar flake			chalcedony	0%		3 (<1/2"-1/4")	1.2	8/10/2015	
155.6	1	XU 3	170-180	Lithic	debris	broken flake			chalcedony	0%		3 (<1/2"-1/4")	0.8	8/10/2015	
155.7	1	XU 3	170-180	Lithic	debris	broken flake			silicified wood	>0-<50%		3 (<1/2"-1/4")	0.3	8/10/2015	
156.1-2	2	XU 3	190-200	Faunal	Bison bison (bison)	rib	shaft, fragment					2 (<1"-1/2")	19	8/10/2015	
156.3	1	XU 3	190-200	Faunal	Bison bison (bison)	rib	shaft, fragment					3 (<1/2"-1/4")	0.4	8/5/2015	
156.4	1	XU 3	190-200	Lithic	debris	other G4 flake			quartzite	0%		4 (<1/4")	0.1	8/5/2015	
157.1	1	XU 3	200-210	Faunal	Bison bison (bison)	rib	shaft, fragment					2 (<1"-1/2")	52.9	8/5/2015	refit; possible scratches/grooves on surface
158.1	1	XU 3	210-220	Faunal	Bison bison (bison)	rib	shaft, fragment					2 (<1"-1/2")	8.6	8/10/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
158.2-3	2	XU 3	210-220	Faunal	Bison bison (bison)	rib	shaft, fragment					3 (<1/2"-1/4")	3	8/11/2015	
158.4-5	2	XU 3	210-220	Faunal	Bison bison (bison)	rib	shaft, fragment					4 (<1/4")	0.3	8/11/2015	
159.1	1	XU 4	150-160	Faunal	Bison bison (bison)	sacrum	fragment					1 (<2"-1")	17.6	8/11/2015	
159.2	1	XU 4	150-160	Lithic	debris	nonbifacial			Hixton Group Quartzite	0%		2 (<1"-1/2")	6.2	8/11/2015	
160.1	1	XU 4	160-170	Lithic	fire-cracked rock	crumb			granitic			3 (<1/2"-1/4")	1	8/11/2015	
160.2	1	XU 4	160-170	Faunal	Bison bison (bison)	vertebra, lumbar	complete					1 (<2"-1")	239.4	8/11/2015	adult
160.3	1	XU 4	160-170	Faunal	Bison bison (bison)	vertebra, lumbar	fragment					1 (<2"-1")	112	8/11/2015	adult
160.4	1	XU 4	160-170	Faunal	Ondatra zibethicus	mandible, right	fragment					3 (<1/2"-1/4")	1.1	8/11/2015	adult
160.5	1	XU 4	160-170	Faunal	Anas crecca/discors	scapula, left	fragment					4 (<1/4")	0.2	8/11/2015	adult
160.6	1	XU 4	160-170	Faunal	Ondatra zibethicus	femur, left	shaft, fragment					3 (<1/2"-1/4")	1	8/11/2015	
160.7	1	XU 4	160-170	Faunal	Bison bison (bison)	vertebra, caudal	centrum fragment					2 (<1"-1/2")	4.1	8/11/2015	adult
160.8-9	2	XU 4	160-170	Faunal	Bison bison (bison)	rib	shaft, fragment					2 (<1"-1/2")	9	8/11/2015	
160.10-15	6	XU 4	160-170	Faunal	Bison bison (bison)	rib	shaft, fragment					3 (<1/2"-1/4")	6.3	8/11/2015	
160.16-19	4	XU 4	160-170	Faunal	Bison bison (bison)	sacrum	fragment					1 (<2"-1")	67.3	8/14/2015	adult
160.20-23	4	XU 4	160-170	Faunal	Bison bison (bison)	vertebra, lumbar	fragment					1 (<2"-1")	80	8/17/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
160.24	1	XU 4	160-170	Faunal	Bison bison (bison)	unidentifiable	fragment					1 (<2"-1")	19	8/17/2015	
160.25-33	9	XU 4	160-170	Faunal	Bison bison (bison)	unidentifiable	fragment					2 (<1"-1/2")	24.5	8/17/2015	
160.34-37	4	XU 4	160-170	Faunal	Bison bison (bison)	unidentifiable	fragment					3 (<1/2"-1/4")	4	8/17/2015	
160.38-52	15	XU 4	160-170	Faunal	mammalian	unidentifiable	fragment					3 (<1/2"-1/4")	5.2	8/17/2015	
160.53-64	12	XU 4	160-170	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	1.1	8/17/2015	
161.1	1	XU 4	170-180	Faunal	mammalian	unidentifiable	fragment					4 (<1/4")	0.2	8/17/2015	
162.1-3	3	XU 4	180-190	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	1.2	8/17/2015	
162.4	1	XU 4	180-190	Lithic	debris	broken flake			Cedar Valley Chert	>0-<50%		3 (<1/2"-1/4")	0.8	8/17/2015	
163.1	1	XU 4	210-220	Faunal	Ameiurus nebulosus	ethmoid	fragment					3 (<1/2"-1/4")	0.1	8/17/2015	
163.2	1	XU 4	210-220	Faunal	Vertebrata	unidentifiable	fragment	burned				4 (<1/4")	0.1	8/17/2015	
163.3	1	XU 4	210-220	Faunal	mammalian, large	unidentifiable	fragment					3 (<1/2"-1/4")	0.2	8/17/2015	
164.1-5	5	ST 25WE5	130-140	Faunal	Bison bison (bison)	tooth, premolar/molar	fragment					2 (<1"-1/2")	9.6	8/17/2015	adult; Beta
165.1-5	5	FS 1	150-160	Faunal	Bison bison (bison)	vertebra, lumbar	fragment					1 (<2"-1")	173.4	8/17/2015	adult
165.6	1	FS 1	150-160	Faunal	Bison bison (bison)	vertebra, thoracic	centrum fragment					1 (<2"-1")	40	8/17/2015	
165.7-10	4	FS 1	150-160	Faunal	Bison bison (bison)	vertebra	fragment					2 (<1"-1/2")	5.8	8/19/2015	Beta

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
165.11-36	26	FS 1	150-160	Faunal	Bison bison (bison)	vertebra	fragment					3 (<1/2"-1/4")	6.1	8/19/2015	
165.37-75	39	FS 1	150-160	Faunal	Bison bison (bison)	vertebra	fragment					4 (<1/4")	2.9	8/19/2015	
166.1	1	FS 2	155-165	Faunal	Bison bison (bison)	vertebra, axis	fragment					1 (<2"-1")	414.2	8/19/2015	young adult
166.2	1	FS 2	155-165	Faunal	Bison bison (bison)	horn	fragment					1 (<2"-1")	64.1	8/19/2015	horn core
166.3-10	8	FS 2	155-165	Faunal	Bison bison (bison)	cranium	fragment					1 (<2"-1")	160	8/19/2015	
166.11-16	6	FS 2	155-165	Faunal	Bison bison (bison)	cranium	fragment					2 (<1"-1/2")	14.2	8/20/2015	
166.17-19	3	FS 2	155-165	Faunal	Bison bison (bison)	cranium	fragment					3 (<1/2"-1/4")	1.6	8/20/2015	
166.2	1	FS 2	155-165	Faunal	Bison bison (bison)	vertebra, atlas	complete					1 (<2"-1")	466	8/20/2015	adult
166.21	1	FS 2	155-165	Faunal	Bison bison (bison)	vertebra, cervical	fragment					1 (<2"-1")	212.9	8/20/2015	young adult; 3rd cervical
166.22	1	FS 2	155-165	Faunal	Bison bison (bison)	basioccipital	fragment					1 (<2"-1")	115.3	8/20/2015	
166.23-24	2	FS 2	155-165	Faunal	Bison bison (bison)	vertebra, cervical	fragment					1 (<2"-1")	39.9	8/20/2015	
166.25	1	FS 2	155-165	Faunal	Bison bison (bison)	cranium	fragment					1 (<2"-1")	18.3	8/20/2015	
166.26-31	6	FS 2	155-165	Faunal	Bison bison (bison)	cranium	fragment					2 (<1"-1/2")	13.1	8/20/2015	
166.32-36	5	FS 2	155-165	Faunal	Bison bison (bison)	cranium	fragment					3 (<1/2"-1/4")	4	8/20/2015	
167.1	1	FS 3	172-177	Faunal	Bison bison (bison)	vertebra, cervical	centrum fragment					1 (<2"-1")	12.1	8/20/2015	young adult

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Desc7	Size Grade	Weight (g)	Date	Artifact Notes
167.2-6	5	FS 3	172-177	Faunal	Bison bison (bison)	vertebra, cervical	fragment					2 (<1"-1/2")	23.9	8/20/2015	
167.7	1	FS 3	172-177	Faunal	Bison bison (bison)	vertebra, thoracic	neural spine		cut marks			1 (<2"-1")	333.5	8/20/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
1.1	1	ST 15EN5	0-20	Faunal	mammalian, medium/large	unidentifiable	fragment		modern cut/saw marks		2 (<1"-1/2")	1.1	8/7/2015	
1.2-3	2	ST 15EN5	0-20	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (<1/2"-1/4")	1.3	8/7/2015	
1.4	1	ST 15EN5	0-20	Historic	ceramic	whiteware	fragment				2 (<1"-1/2")	14.9	8/7/2015	
1.5	1	ST 15EN5	0-20	Historic	ceramic	whiteware	fragment				2 (<1"-1/2")	3.6	8/7/2015	
1.6	1	ST 15EN5	0-20	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	0.6	8/7/2015	
1.7-8	2	ST 15EN5	0-20	Historic	glass	clear	bottle fragment				3 (<1/2"-1/4")	1.5	8/7/2015	
1.9	1	ST 15EN5	0-20	Historic	glass	clear	fragment				3 (<1/2"-1/4")	0.9	8/7/2015	
1.10-11	2	ST 15EN5	0-20	Historic	metal	metal, unidentified	fragment				3 (<1/2"-1/4")	1.1	8/7/2015	refit
1.12-15	4	ST 15EN5	0-20	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	11	8/7/2015	
1.16-23	8	ST 15EN5	0-20	Historic	metal	iron	fragment				3 (<1/2"-1/4")	3.6	8/7/2015	
1.24	1	ST 15EN5	0-20	Historic	metal	iron	fragment				4 (<1/4")	0	8/7/2015	
2.999	1	ST 15EN5	20-40	Historic	composite	asbestos	fragment				3 (<1/2"-1/4")	0.5	8/7/2015	CULL
2.1	1	ST 15EN5	20-40	Historic	metal	iron	wire fragment				4 (<1/4")	0.4	8/7/2015	
2.2	1	ST 15EN5	20-40	Historic	metal	iron	fragment				3 (<1/2"-1/4")	0.8	8/7/2015	
3.1	1	ST 15EN10	0-30	Historic	ceramic	whiteware	fragment				2 (<1"-1/2")	2.7	8/7/2015	
3.2-3	2	ST 15EN10	0-30	Historic	ceramic	whiteware	fragment				3 (<1/2"-1/4")	0.4	8/7/2015	
3.4	1	ST 15EN10	0-30	Historic	glass	milk	fragment				3 (<1/2"-1/4")	1.4	8/7/2015	black paint on exterior
3.5	1	ST 15EN10	0-30	Historic	glass	clear	bottle fragment				3 (<1/2"-1/4")	0.9	8/7/2015	filigree
3.6	1	ST 15EN10	0-30	Historic	other	unidentifiable	fragment				3 (<1/2"-1/4")	0.4	8/7/2015	

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Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
4.1	1	ST 15ES5	0-30	Historic	ceramic	stoneware	fragment		salt glazed		1 (<2"-1")	15	8/7/2015	brown slip on exterior and interior
4.2-3	2	ST 15ES5	0-30	Historic	ceramic	whiteware	fragment				2 (<1"-1/2")	2.8	8/7/2015	
4.4	1	ST 15ES5	0-30	Historic	glass	clear	fragment				2 (<1"-1/2")	6.6	8/7/2015	
4.5-7	3	ST 15ES5	0-30	Historic	glass	clear	fragment				3 (<1/2"-1/4")	5	8/7/2015	
4.8-9	2	ST 15ES5	0-30	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	1.2	8/7/2015	
4.10-13	4	ST 15ES5	0-30	Historic	glass	clear	fragment				4 (<1/4")	0.2	8/7/2015	
4.14	1	ST 15ES5	0-30	Historic	metal	brass	shotgun shell				2 (<1"-1/2")	3.1	8/7/2015	post 1898 & pre 1920
4.15	1	ST 15ES5	0-30	Historic	metal	brass	.22 shell				3 (<1/2"-1/4")	0.6	8/7/2015	
4.16-19	4	ST 15ES5	0-30	Historic	metal	metal, unidentified	fragment				3 (<1/2"-1/4")	1.7	8/7/2015	
4.20-21	2	ST 15ES5	0-30	Historic	metal	iron	fragment				3 (<1/2"-1/4")	0.9	8/7/2015	
4.22	1	ST 15ES5	0-30	Historic	metal	iron	strap fragment				2 (<1"-1/2")	27.7	8/7/2015	1 1/4" wide
4.23	1	ST 15ES5	0-30	Historic	composite	unidentifiable	fragment				2 (<1"-1/2")	1	8/7/2015	
4.24	1	ST 15ES5	0-30	Historic	metal	iron	fragment				3 (<1/2"-1/4")	1.7	8/7/2015	
4.25-27	3	ST 15ES5	0-30	Historic	metal	iron	nail, wire				4 (<1/4")	3.1	8/7/2015	
4.28-43	16	ST 15ES5	0-30	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	71	8/7/2015	
4.44-46	3	ST 15ES5	0-30	Historic	metal	iron	nail, square				4 (<1/4")	2.8	8/7/2015	
5.1	1	ST 15ES5	30-50	Faunal	Gallus gallus (domestic chicken)	vertebra, cervical	complete				2 (<1"-1/2")	0.9	8/7/2015	adult
5.2	1	ST 15ES5	30-50	Faunal	mammalian	unidentifiable	fragment				3 (<1/2"-1/4")	0.4	8/7/2015	
5.3	1	ST 15ES5	30-50	Historic	ceramic	whiteware	fragment				2 (<1"-1/2")	2.6	8/7/2015	

21BE306 Catalog-Phase I

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
5.5-6	2	ST 15ES5	30-50	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	2.8	8/7/2015	
5.6	1	ST 15ES5	30-50	Historic	composite	unidentifiable	fragment				3 (<1/2"-1/4")	0.9	8/7/2015	
5.7	1	ST 15ES5	30-50	Historic	metal	metal, unidentified	fragment				2 (<1"-1/2")	0.9	8/7/2015	
5.8-14	7	ST 15ES5	30-50	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	23.3	8/7/2015	
5.15-20	6	ST 15ES5	30-50	Historic	metal	iron	nail, square				4 (<1/4")	3.6	8/7/2015	
6.1-3	3	ST 15ES10	0-25	Faunal	mammalian	unidentifiable	fragment				3 (<1/2"-1/4")	0.7	8/7/2015	
6.4-6	3	ST 15ES10	0-25	Faunal	bird	unidentifiable	fragment				3 (<1/2"-1/4")	0.3	8/7/2015	cf. pelvis fragment
6.7	1	ST 15ES10	0-25	Historic	ceramic	yelloware	fragment				3 (<1/2"-1/4")	1	8/7/2015	
6.8	1	ST 15ES10	0-25	Historic	ceramic	whiteware	rim fragment				2 (<1"-1/2")	4.4	8/7/2015	
6.9	1	ST 15ES10	0-25	Historic	organic	jewelry	fragment				4 (<1/4")	0.3	8/7/2015	twisted cord with two freshwater pearls; clasp stamped "R.T.I. 14K"
6.10	1	ST 15ES10	0-25	Historic	metal	iron	fragment				3 (<1/2"-1/4")	3.3	8/7/2015	
6.11	1	ST 15ES10	0-25	Historic	ceramic	stoneware	fragment		salt glazed		3 (<1/2"-1/4")	2.3	8/7/2015	brown slip exterior; gray interior
6.12	1	ST 15ES10	0-25	Historic	metal	brass	.22 shell				3 (<1/2"-1/4")	0.8	8/7/2015	
6.13	1	ST 15ES10	0-25	Historic	metal	iron	fragment				3 (<1/2"-1/4")	1.7	8/7/2015	
6.14-22	9	ST 15ES10	0-25	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	43	8/7/2015	

21BE306 Catalog-Phase I

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
6.23-29	7	ST 15ES10	0-25	Historic	metal	iron	nail, square				4 (<1/4")	9.8	8/7/2015	
6.30-32	3	ST 15ES10	0-25	Historic	nonorganic	plastic	fragment				2 (<1"-1/2")	3.5	8/7/2015	flat gray; plexiglass?
6.33-35	3	ST 15ES10	0-25	Historic	nonorganic	plastic	fragment				3 (<1/2"-1/4")	0.6	8/7/2015	flat gray; plexiglass?
6.36	1	ST 15ES10	0-25	Historic	nonorganic	plastic	fragment				4 (<1/4")	0.1	8/7/2015	flat gray; plexiglass?
6.37	1	ST 15ES10	0-25	Historic	nonorganic	plastic	fragment				2 (<1"-1/2")	0.8	8/7/2015	
6.38	1	ST 15ES10	0-25	Historic	nonorganic	plastic	fragment				4 (<1/4")	0.1	8/7/2015	
7.1	1	ST 15ES10	25-50	Historic	metal	iron	fragment				3 (<1/2"-1/4")	0.5	8/7/2015	button?
7.2	1	ST 15ES10	25-50	Historic	metal	iron	wire fragment				4 (<1/4")	0.4	8/7/2015	
7.3	1	ST 15ES10	25-50	Historic	metal	iron	nail, square				2 (<1"-1/2")	3.8	8/7/2015	head portion
7.4-5	2	ST 15ES10	25-50	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	9.4	8/7/2015	
7.6	1	ST 15ES10	25-50	Historic	metal	iron	nail, square				4 (<1/4")	0.9	8/7/2015	
8.1	1	ST 15ES10	50-75	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	4.4	8/7/2015	
8.2	1	ST 15ES10	50-75	Historic	metal	iron	nail, square				4 (<1/4")	0.9	8/7/2015	
8.3	1	ST 15ES10	50-75	Historic	metal	iron	fragment				2 (<1"-1/2")	2	8/7/2015	
9.1	1	ST 15EW5	0-30	Faunal	Gallus gallus (domestic chicken)	vertebra, thoracic	fragment				2 (<1"-1/2")	1.6	8/7/2015	
9.2-8	7	ST 15EW5	0-30	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	34	8/7/2015	
9.9-11	3	ST 15EW5	0-30	Historic	metal	iron	nail, wire				4 (<1/4")	2.9	8/7/2015	

21BE306 Catalog-Phase I

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
9.12	1	ST 15EW5	0-30	Historic	metal	iron	strap fragment				2 (<1"-1/2")	4.7	8/7/2015	
9.13-15	3	ST 15EW5	0-30	Historic	ceramic	earthenware	fragment		rockingham glaze		2 (<1"-1/2")	15.2	8/7/2015	refit
9.16	1	ST 15EW5	0-30	Historic	ceramic	earthenware	fragment		rockingham glaze		3 (<1/2"-1/4")	0.3	8/7/2015	
9.17	1	ST 15EW5	0-30	Historic	ceramic	stoneware	fragment				4 (<1/4")	0.1	8/7/2015	
9.18	1	ST 15EW5	0-30	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	0.5	8/7/2015	
9.19	1	ST 15EW5	0-30	Historic	nonorganic	plastic	fragment				4 (<1/4")	0.5	8/7/2015	cinch tie
9.20	1	ST 15EW5	0-30	Historic	nonorganic	plastic	fragment				4 (<1/4")	0	8/7/2015	
9.21	1	ST 15EW5	0-30	Historic	nonorganic	plastic	fragment				3 (<1/2"-1/4")	0.1	8/7/2015	red
9.22	1	ST 15EW5	0-30	Historic	nonorganic	plastic	fragment				4 (<1/4")	0	8/7/2015	red
10.1-2	2	ST 15EW5	30-40	Faunal	Vertebrata	unidentifiable	fragment				4 (<1/4")	0	8/7/2015	
11.999	1	ST 15EW10	0-25	Historic	composite	asbestos	fragment				3 (<1/2"-1/4")	1	8/7/2015	
11.1	1	ST 15EW10	0-25	Historic	glass	aqua	fragment				3 (<1/2"-1/4")	0.4	8/7/2015	
11.2-4	3	ST 15EW10	0-25	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	4.3	8/7/2015	
11.5-6	2	ST 15EW10	0-25	Historic	metal	iron	nail, wire				3 (<1/2"-1/4")	1.8	8/7/2015	
12.1	1	ST 15EW10	25-50	Historic	glass	clear	fragment				3 (<1/2"-1/4")	0.1	8/7/2015	
12.2	1	ST 15EW10	25-50	Historic	metal	iron	fragment				3 (<1/2"-1/4")	3.2	8/7/2015	
13.1	1	ST 15EW10	50-75	Historic	glass	aqua	bottle fragment				3 (<1/2"-1/4")	1.5	8/7/2015	base, shoulder, or neck fragment
13.2	1	ST 15EW10	50-75	Historic	nonorganic	rock	foundation stone				1 (<2"-1")	0	8/7/2015	
14.1	1	ST 15E	0-20	Historic	glass	clear	bottle fragment				2 (<1"-1/2")	2	8/7/2015	

21BE306 Catalog-Phase I

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc3	Desc4	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
14.2-3	2	ST 15E	0-20	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	1.1	8/7/2015	
14.4-5	2	ST 15E	0-20	Historic	metal	brass	.22 shell				3 (<1/2"-1/4")	1.6	8/7/2015	
14.6-7	2	ST 15E	0-20	Historic	metal	iron	fragment				3 (<1/2"-1/4")	0.8	8/7/2015	
15.1	1	ST 15E	20-45	Lithic	tool	unpatterned flake	utilized flake	nonbifacial	Grand Meadow Chert	0%	3 (<1/2"-1/4")	0.9	8/7/2015	finished; whole
15.2	1	ST 15E	20-45	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	0.1	8/7/2015	
15.3	1	ST 15E	20-45	Historic	metal	iron	fragment				3 (<1/2"-1/4")	0.5	8/7/2015	
16.1	1	ST 15EE5	0-25	Faunal	Bos tarus (cow)	ilium	fragment		modern cut/saw marks		1 (<2"-1")	20.5	8/7/2015	sirloin cut
16.2	1	ST 15EE5	0-25	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	0.4	8/7/2015	
16.3	1	ST 15EE5	0-25	Historic	metal	iron	staple				2 (<1"-1/2")	4.4	8/7/2015	fence staple
16.4	1	ST 15EE5	0-25	Historic	metal	iron	nail, wire				3 (<1/2"-1/4")	3.8	8/7/2015	
16.5	1	ST 15EE5	0-25	Historic	metal	iron	nail, wire				4 (<1/4")	0.4	8/7/2015	
16.6	1	ST 15EE5	0-25	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	6.6	8/7/2015	
16.7	1	ST 15EE5	0-25	Historic	metal	iron	wire fragment				4 (<1/4")	0.2	8/7/2015	
16.8	1	ST 15EE5	0-25	Historic	metal	iron	fragment				3 (<1/2"-1/4")	1.2	8/7/2015	
17.1	1	ST 15EE5	25-50	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	1.2	8/7/2015	
17.2	1	ST 15EE5	25-50	Historic	metal	iron	fragment				3 (<1/2"-1/4")	0.8	8/7/2015	
18.1	1	ST 15EE10	0-25	Historic	glass	clear	window fragment				3 (<1/2"-1/4")	0.4	8/7/2015	
18.2-3	2	ST 15EE10	0-25	Historic	metal	iron	nail, square				3 (<1/2"-1/4")	7	8/7/2015	
18.4	1	ST 15EE10	0-25	Historic	metal	iron	wire fragment				4 (<1/4")	0.1	8/7/2015	
18.999	1	ST 15EE10	0-25	Historic	composite	asbestos	fragment				2 (<1"-1/2")	4.7	8/7/2015	CULL
19.1	1	ST 16E	0-30	Historic	metal	iron	nail, wire				4 (<1/4")	0.6	8/7/2015	

21BE307 Catalog-Phase I

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc5	Desc6	Size Grade	Weight (g)	Date	Artifact Notes
1.1	1	ST 1	50-60	Lithic	debris	broken flake	Prairie du Chien Chert (oolitic)	0%	3 (<1/2"-1/4")	0.2	8/4/2015	
2.1	1	ST 1	65-75	Lithic	debris	broken flake	granitic	0%	3 (<1/2"-1/4")	1.5	8/4/2015	

21BE308 Catalog-Phase I

Prov#	Count	Location	Depth (cmbs)	Class	Desc1	Desc2	Desc5	Desc6	Size Grade	Weight (g)	Artifact Notes	Date
1.1	1	ST 1E	110-120	Lithic	debris	broken flake	basaltic	0%	3 (<1/2"-1/4")	0.9		7/31/2015

APPENDIX D: RADIOCARBON DATING REPORTS FROM BETA ANALYTIC INC.

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Consistent Accuracy . . .
. . . Delivered On-time

January 4, 2016

Mr. Frank Florin
Florin Cultural Resource Services
N12902 273rd Street
Boyceville, WI 54725
USA

RE: Radiocarbon Dating Results For Samples 21BE305 FS1 150, 21BE305 PP10 180, 21BE305 XU2 220-230, 21BE305 25WE5 130-140, 21BE305 41W 120-130, 21BE305 41WS10 335-345, 21BE305 41WE5 300-305, 21BE305 21WS5 280-290

Dear Mr. Florin:

Enclosed are the radiocarbon dating results for eight samples recently sent to us. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable. The Conventional Radiocarbon Ages have all been corrected for total fractionation effects and where applicable, calibration was performed using 2013 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

Reported results are accredited to ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators here. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 program participated in the analyses.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result. The reported d13C values were measured separately in an IRMS (isotope ratio mass spectrometer). They are NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
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MIAMI, FLORIDA, USA 33155
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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Frank Florin

Report Date: 1/4/2016

Florin Cultural Resource Services

Material Received: 12/11/2015

Sample Data	Measured Radiocarbon Age	d13C	Conventional Radiocarbon Age(*)
Beta - 426429	3510 +/- 30 BP	-13.3 o/oo d15N= +5.4 o/oo	3700 +/- 30 BP

SAMPLE : 21BE305 FS1 150
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 2195 to 2165 (Cal BP 4145 to 4115) and Cal BC 2150 to 2020 (Cal BP 4100 to 3970) and Cal BC 1990 to 1980 (Cal BP 3940 to 3930)

Beta - 426430	3510 +/- 30 BP	-11.2 o/oo d15N= +4.0 o/oo	3740 +/- 30 BP

SAMPLE : 21BE305 PP10 180
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 2270 to 2260 (Cal BP 4220 to 4210) and Cal BC 2205 to 2115 (Cal BP 4155 to 4065) and Cal BC 2100 to 2035 (Cal BP 4050 to 3985)

Beta - 426431	4210 +/- 30 BP	-16.8 o/oo d15N= +5.8 o/oo	4340 +/- 30 BP

SAMPLE : 21BE305 XU2 220-230
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 3020 to 2895 (Cal BP 4970 to 4845)

Beta - 426432	5230 +/- 30 BP	-14.0 o/oo d15N= +7.8 o/oo	5410 +/- 30 BP

SAMPLE : 21BE305 25WE5 130-140
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 4335 to 4235 (Cal BP 6285 to 6185)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Frank Florin

Report Date: 1/4/2016

Sample Data	Measured Radiocarbon Age	d13C	Conventional Radiocarbon Age(*)
Beta - 426433	2460 +/- 30 BP	-21.0 o/oo d15N= +7.6 o/oo	2530 +/- 30 BP

SAMPLE : 21BE305 41W 120-130
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 795 to 735 (Cal BP 2745 to 2685) and Cal BC 690 to 660 (Cal BP 2640 to 2610) and Cal BC 645 to 545 (Cal BP 2595 to 2495)

Beta - 426434	6210 +/- 30 BP	-12.4 o/oo d15N= +5.2 o/oo	6420 +/- 30 BP

SAMPLE : 21BE305 41WS10 335-345
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 5475 to 5320 (Cal BP 7425 to 7270)

Beta - 426435	3620 +/- 30 BP	-13.0 o/oo d15N= +3.9 o/oo	3820 +/- 30 BP

SAMPLE : 21BE305 41WE5 300-305
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 2395 to 2385 (Cal BP 4345 to 4335) and Cal BC 2345 to 2195 (Cal BP 4295 to 4145) and Cal BC 2165 to 2150 (Cal BP 4115 to 4100)

Beta - 426436	4230 +/- 30 BP	-16.0 o/oo d15N= +8.0 o/oo	4380 +/- 30 BP

SAMPLE : 21BE305 21WS5 280-290
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 3090 to 2910 (Cal BP 5040 to 4860)

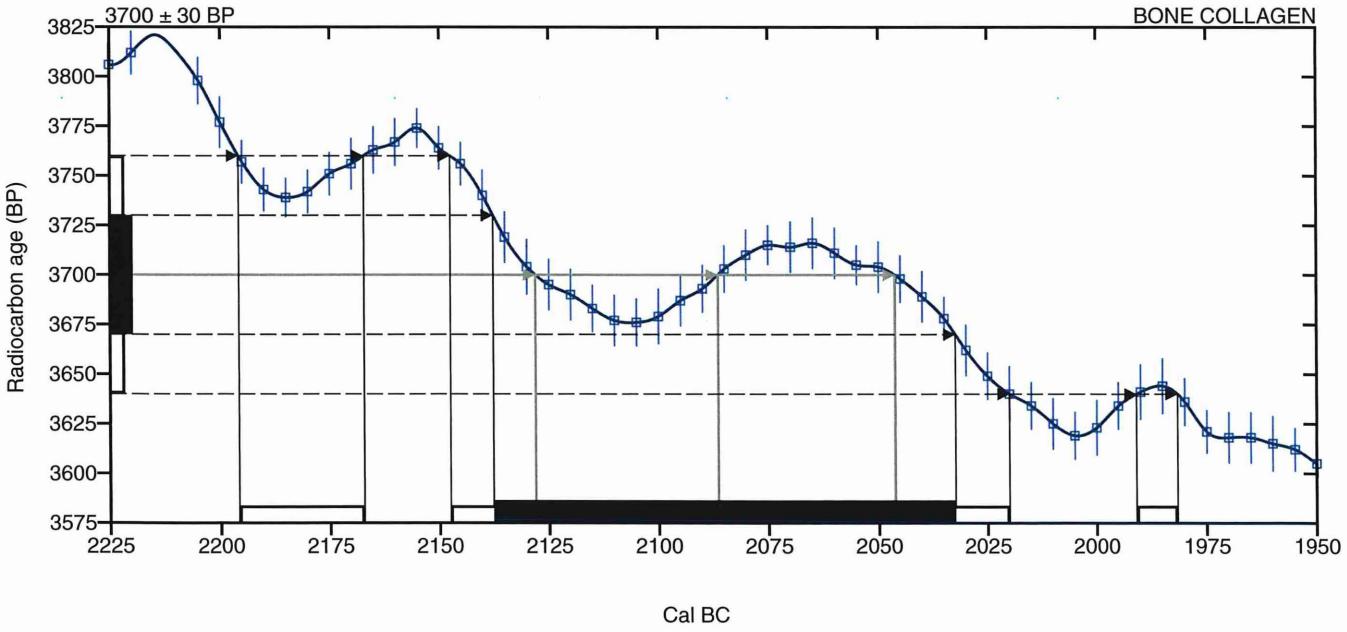
Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -13.3 o/oo : lab. mult = 1)

Laboratory number	**Beta-426429 : 21BE305 FS1 150**
Conventional radiocarbon age	**3700 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 2195 to 2165 (Cal BP 4145 to 4115)** **Cal BC 2150 to 2020 (Cal BP 4100 to 3970)** **Cal BC 1990 to 1980 (Cal BP 3940 to 3930)**
Intercept of radiocarbon age with calibration curve	Cal BC 2130 (Cal BP 4080) Cal BC 2085 (Cal BP 4035) Cal BC 2045 (Cal BP 3995)
Calibrated Result (68% Probability)	Cal BC 2140 to 2030 (Cal BP 4090 to 3980)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

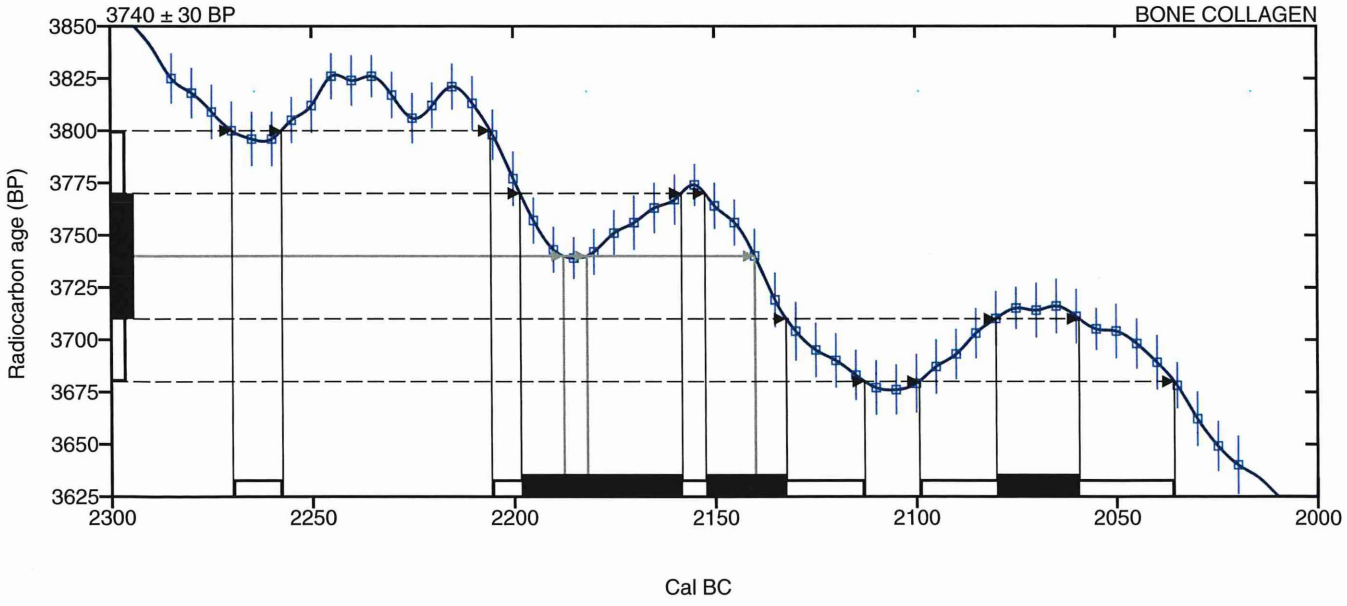
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0– 50,000 years cal BP. Radiocarbon 55(4):1869– 1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -11.2 o/oo : lab. mult = 1)

Laboratory number	**Beta-426430 : 21BE305 PP10 180**
Conventional radiocarbon age	**3740 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 2270 to 2260 (Cal BP 4220 to 4210)** **Cal BC 2205 to 2115 (Cal BP 4155 to 4065)** **Cal BC 2100 to 2035 (Cal BP 4050 to 3985)**
Intercept of radiocarbon age with calibration curve	Cal BC 2190 (Cal BP 4140) Cal BC 2180 (Cal BP 4130) Cal BC 2140 (Cal BP 4090)
Calibrated Result (68% Probability)	Cal BC 2200 to 2160 (Cal BP 4150 to 4110) Cal BC 2150 to 2130 (Cal BP 4100 to 4080) Cal BC 2080 to 2060 (Cal BP 4030 to 4010)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

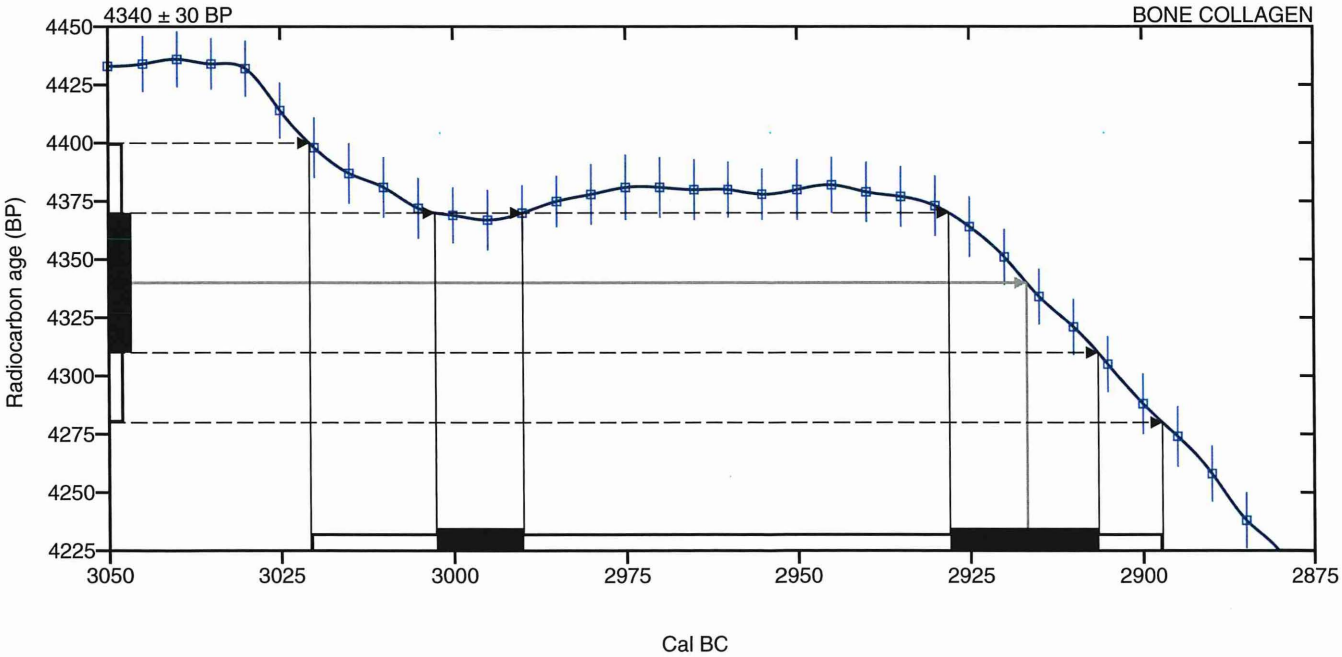
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0– 50,000 years cal BP. Radiocarbon 55(4):1869– 1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -16.8 o/oo : lab. mult = 1)

Laboratory number	**Beta-426431 : 21BE305 XU2 220-230**
Conventional radiocarbon age	**4340 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 3020 to 2895 (Cal BP 4970 to 4845)**
Intercept of radiocarbon age with calibration curve	Cal BC 2915 (Cal BP 4865)
Calibrated Result (68% Probability)	Cal BC 3005 to 2990 (Cal BP 4955 to 4940) Cal BC 2930 to 2905 (Cal BP 4880 to 4855)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

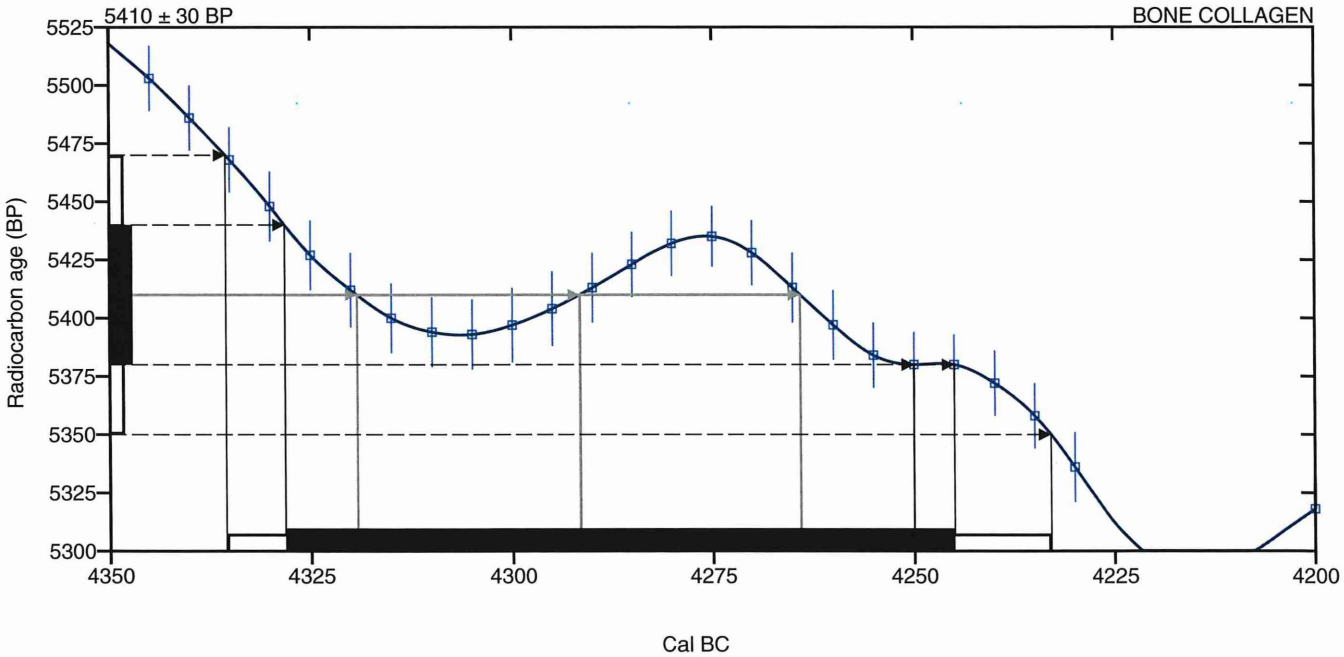
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -14 o/oo : lab. mult = 1)

Laboratory number	**Beta-426432 : 21BE305 25WE5 130-140**
Conventional radiocarbon age	**5410 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 4335 to 4235 (Cal BP 6285 to 6185)**
Intercept of radiocarbon age with calibration curve	Cal BC 4320 (Cal BP 6270) Cal BC 4290 (Cal BP 6240) Cal BC 4265 (Cal BP 6215)
Calibrated Result (68% Probability)	Cal BC 4330 to 4245 (Cal BP 6280 to 6195)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

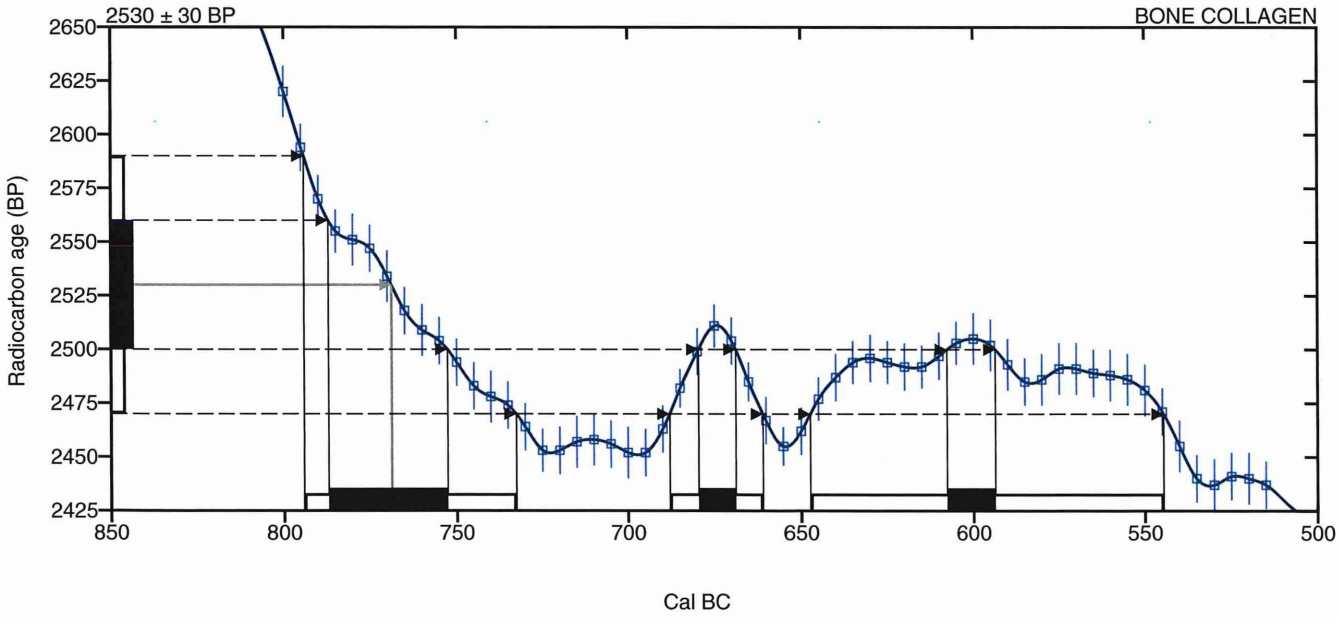
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -21 o/oo : lab. mult = 1)

Laboratory number	**Beta-426433 : 21BE305 41W 120-130**
Conventional radiocarbon age	**2530 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 795 to 735 (Cal BP 2745 to 2685)** **Cal BC 690 to 660 (Cal BP 2640 to 2610)** **Cal BC 645 to 545 (Cal BP 2595 to 2495)**
Intercept of radiocarbon age with calibration curve	Cal BC 770 (Cal BP 2720)
Calibrated Result (68% Probability)	Cal BC 785 to 755 (Cal BP 2735 to 2705) Cal BC 680 to 670 (Cal BP 2630 to 2620) Cal BC 610 to 595 (Cal BP 2560 to 2545)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

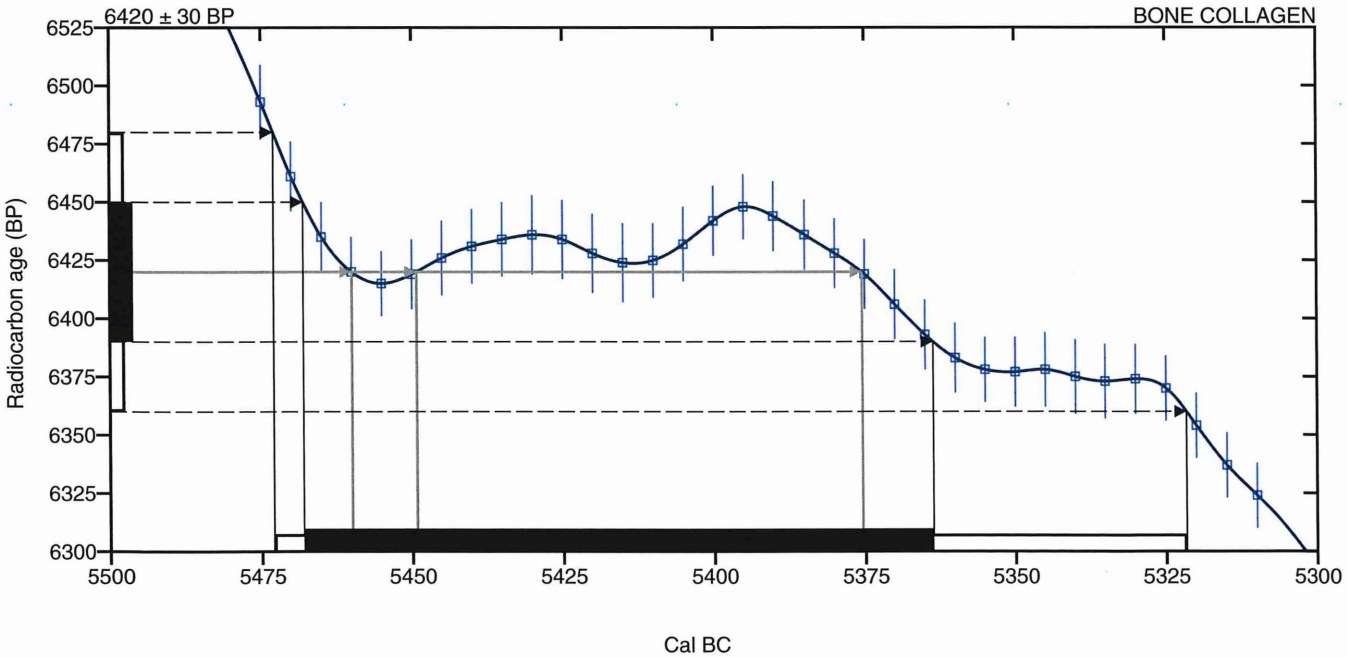
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -12.4 o/oo : lab. mult = 1)

Laboratory number	**Beta-426434 : 21BE305 41WS10 335-345**
Conventional radiocarbon age	**6420 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 5475 to 5320 (Cal BP 7425 to 7270)**
Intercept of radiocarbon age with calibration curve	Cal BC 5460 (Cal BP 7410) Cal BC 5450 (Cal BP 7400) Cal BC 5375 (Cal BP 7325)
Calibrated Result (68% Probability)	Cal BC 5470 to 5365 (Cal BP 7420 to 7315)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

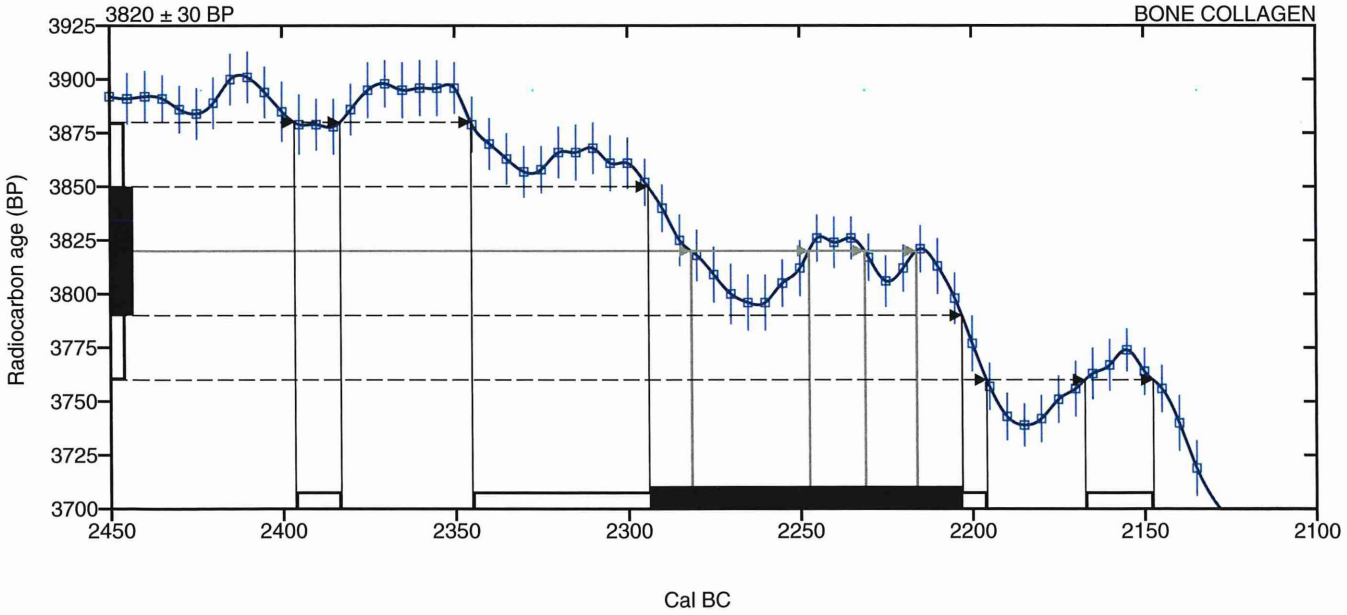
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -13 o/oo : lab. mult = 1)

Laboratory number	**Beta-426435 : 21BE305 41WE5 300-305**
Conventional radiocarbon age	**3820 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 2395 to 2385 (Cal BP 4345 to 4335)** **Cal BC 2345 to 2195 (Cal BP 4295 to 4145)** **Cal BC 2165 to 2150 (Cal BP 4115 to 4100)**
Intercept of radiocarbon age with calibration curve	Cal BC 2280 (Cal BP 4230) Cal BC 2245 (Cal BP 4195) Cal BC 2230 (Cal BP 4180) Cal BC 2215 (Cal BP 4165)
Calibrated Result (68% Probability)	Cal BC 2295 to 2205 (Cal BP 4245 to 4155)



Database used

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References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

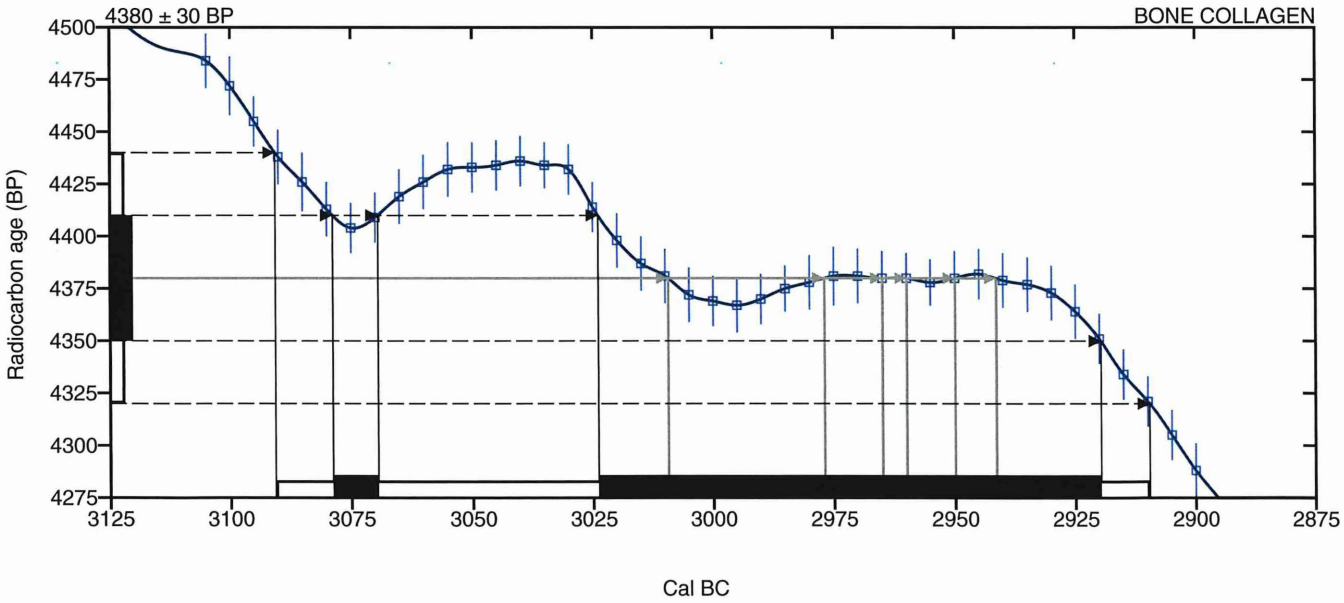
References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0– 50,000 years cal BP. Radiocarbon 55(4):1869– 1887., 2013.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -16 o/oo : lab. mult = 1)

Laboratory number	**Beta-426436 : 21BE305 21WS5 280-290**
Conventional radiocarbon age	**4380 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 3090 to 2910 (Cal BP 5040 to 4860)**
Intercept of radiocarbon age with calibration curve	Cal BC 3010 (Cal BP 4960) Cal BC 2975 (Cal BP 4925) Cal BC 2965 (Cal BP 4915) Cal BC 2960 (Cal BP 4910) Cal BC 2950 (Cal BP 4900) Cal BC 2940 (Cal BP 4890)
Calibrated Result (68% Probability)	Cal BC 3080 to 3070 (Cal BP 5030 to 5020) Cal BC 3025 to 2920 (Cal BP 4975 to 4870)



Database used

INTCAL13

References

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates, Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

References to INTCAL13 database

Reimer PJ et al. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4):1869–1887., 2013.