Final Report
Archaeological Data Recovery:
Battle Area Complex, Donnelly Training Area,
Fort Wainwright, Alaska 2009

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List of Acronyms

AHRS – Alaska Heritage Resource Survey
AMT – The Alaska Meteorological Team
APE – Area of Potential Effect
BAX– Battle Area Complex
BS – below surface
BP– **(**radiocarbon years) Before Present
CEMML – Center for Environmental Management of Military Lands,
DOE– Determination of Eligibility
DTA – Donnelly Training Area
FP – Firing Points
FWA – Fort Wainwright
ICRMP –Integrated Cultural Resources Management Plan
masl – meters above sea level
MOU – Memorandum of Understanding
NHPA – National Historic Preservation Act
NRHP – National Register of Historic Places
OP – Observation Points
SDZ – Surface Danger Zone
SHPO – Alaska State Historic Preservation Officer
TFTA – Tanana Flats Training Area
TR – Texas Range
USARAK – U.S. Army Alaska
USAG FWA – United States Army Garrison, Fort Wainwright
XRF – X-ray fluorescence

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1. Introduction

U.S. Army Alaska (USARAK) and United States Army Garrison, Fort Wainwright (USAG FWA) have constructed a Battle Area Complex (BAX) on lands at Fort Wainwright's Donnelly Training Area (DTA). The BAX is a range designed for gunnery training of vehicle-mounted weapon systems and dismounted infantry platoons. The BAX undertaking consists of two components, both of warranted consideration under stipulations provided in Section 106 of the National Historic Preservation Act: (1) construction of the BAX range complex, and (2) the establishment of a safety buffer area known as a "Surface Danger Zone (SDZ)" downrange of the BAX range complex. Section 106 (National Historic Preservation Act) consultation and mitigation of adverse effects to historic properties for the construction of the BAX range complex and the SDZ have been completed (see Section 3.1 of this report).

This report details the 2009 archaeological work and analysis that was conducted as part of the mitigation for the establishment of the BAX SDZ outlined in a Programmatic Agreement (PA) between USAG FWA and the State Historic Preservation Office (SHPO), finalized on February 5, 2010. The archaeological data recovery was conducted by USAG FWA and the Center for Environmental Management of Military Lands (CEMML, Colorado State University), and followed procedures defined in "*U.S. Army Alaska's Monitoring and Data Recovery Plan for Cultural Resources within the Battle Area Complex Surface Danger Zone, Fort Wainwright, Donnelly Training Area, 2009*" (Robertson and Gains 2009) and the Integrated Cultural Resources Management Plan (ICRMP; Office of History and Archaeology 2001). An archaeological crew of 35 conducted the data recovery work for this project.

1.1 Setting

DTA is located in central Alaska, north of the Alaska Range in the Tanana River Valley (Figure 1). The post lies 120 miles south of the Arctic Circle near the city of Delta Junction. DTA consists of the West and East Training Areas and three outlying training sites: Gerstle River Training Area, Black Rapids Training Area, and Whistler Creek Rock Climbing Area. DTA West is an 894-square-mile parcel bounded by the Delta River to the east and the Little Delta River to the west. It covers approximately 571,995 acres. The East Training Area is an 81-square-mile parcel stretching east of the Delta River to Granite Creek. It covers approximately 51,590 acres.

DTA has the northern continental climate of Interior Alaska, which is characterized by short, moderate summers; long, cold winters; and low precipitation and humidity. Weather is influenced by mountain ranges on three sides that form an effective barrier to the flow of warm, moist maritime air during most of the year. Surrounding upland areas tend to aid drainage and the settling of cold arctic air into the Tanana Valley lowlands (Natural Resources Branch 2001).

The Alaska Meteorological Team (AMT) monitors the weather at Fort Greely and Donnelly Training Area. According to their records, average monthly temperatures range from -6.4ºF in January to 60.0ºF in July, with an average annual temperature of 27.4ºF. The record low temperature is -63ºF, and the record high is 92ºF. The average frost-free period is 95-100 days (based on 27 years of AMT data).

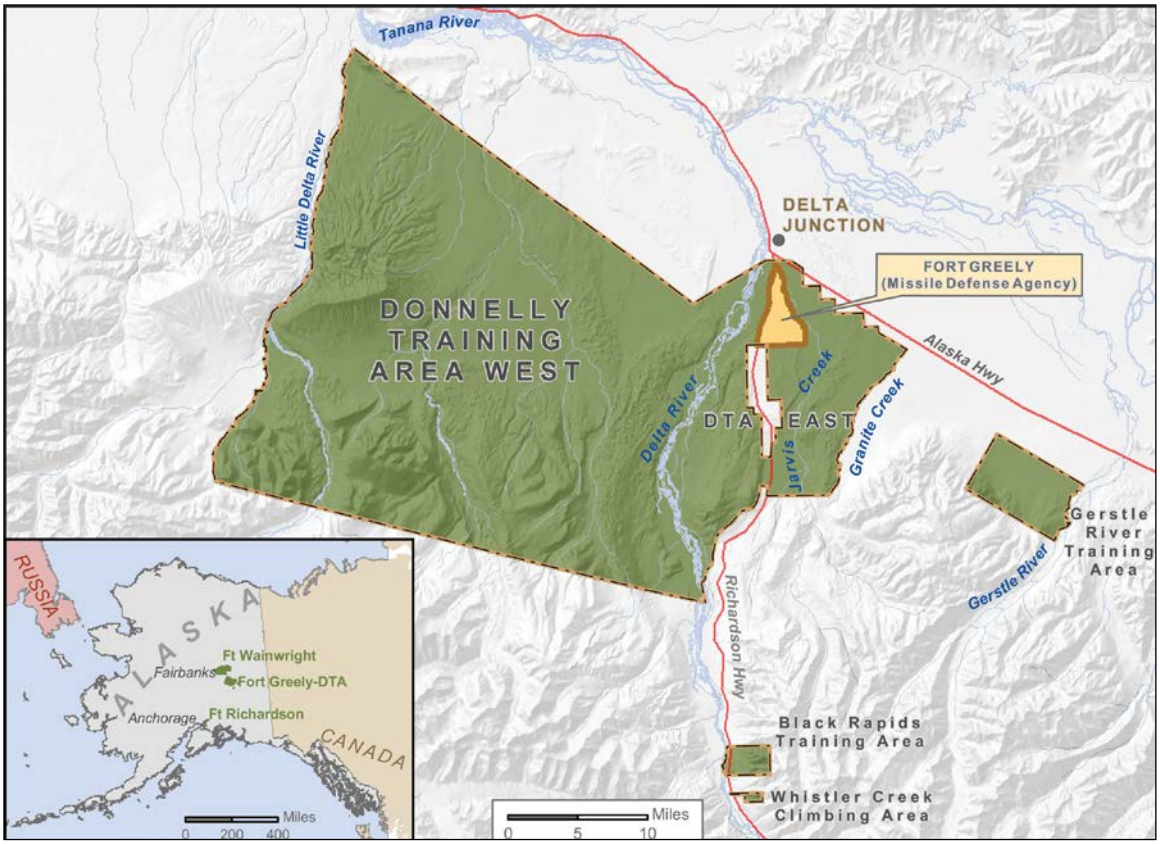

Figure 1. Location of Fort Wainwright's Donnelly Training Area

Prevailing winds are from the east-southeast from September through March and from the west, southwest, or south from April through August. Average wind velocity is 8.2 miles per hour (mph). The greatest wind speeds occur during winter, with a record of 104 mph recorded in the month of February. Winds are 5 mph or less only 13.6 percent of the time, and wind speeds greater than 60 mph have been recorded in every month. Thunderstorms are infrequent and occur only during summer (based on 27 years of AMT data) (Natural Resources Branch 2001).

Average annual precipitation is 11.12 inches, which falls over 90.4 days, mostly during summer and early fall. Average monthly precipitation ranges from a low of 0.24 inches in April to a high of 2.38 inches in June. Average annual snowfall is 40.5 inches (based on 27 years of AMT data), with a record 99.7 inches in 1945 (Natural Resources Branch 2001).

2. Historic Context

2.1 Prehistoric Context

Interior Alaska has been continuously inhabited for the last 14,000 years, and evidence of this continuum of human activity has been preserved within and around FWA's training lands. Interior Alaska's ice-free status during the last glacial period provided a corridor connecting the Bering Land Bridge and eastern Asia to North America. This allowed small bands of nomadic peoples to colonize Alaska and the rest of the continent and began a period of habitation in Interior Alaska that has persisted through the entire Holocene, the arrival of European traders in the late 1810s, the Klondike Gold Rush of the late 19th and early 20th centuries, and the military development of the Interior during the middle of the 20th century. FWA's cantonment and training lands comprise a vast and still relatively unsurveyed region with areas of high potential for yielding evidence of this activity.

Alaska has long been regarded as the gateway to the Americas and has held archaeological interest as the possible location for the oldest archaeological sites in the New World. This is due to more than Alaska's proximity to Asia and ice-free condition at the end of the Pleistocene. Similarities between archaeological assemblages in Siberia and Alaska and the discovery of lanceolate projectile points in the muck deposits around Fairbanks in the early 1900s (which bore a resemblance to Clovis points of some antiquity in the American Southwest) also sparked interest in Alaska as a source area for all Native Americans.

After initial colonization, archaeologists generally divide Interior Alaska's prehistory into three broad archaeological themes: the Paleoarctic Tradition (12,000-6,000 years ago[1]), the Northern Archaic Tradition (6,000-1,000 years ago), and the Athabaskan Tradition (1,300-800 years ago) (Potter 2008). Archeological materials from these cultures are generally limited to lithic artifacts such as projectile points, cutting tools, scrapers, waste flakes from tool manufacturing, faunal remains, and hearths.

Reconstructions of paleoecological evidence suggest that the end of the Pleistocene was marked by a warming trend in Interior Alaska that may have contributed to initial colonization of the area (Bigelow and Powers 2001). Several sites in areas surrounding Army lands demonstrate that people began living in Interior Alaska 14,000 years ago. Significant sites in the Tanana Valley dating between 14,000-12,000 years ago include Healy Lake (Cook 1996), Walker Road (Goebel et al. 1996), Swan Point (Holmes et al. 1996), Mead (Holmes 2001), and Broken Mammoth (Holmes 1996). There are no sites in Alaska, however, that predate the oldest sites in the contiguous United States, nor do Alaska's oldest sites resemble the Clovis culture (Bigelow and Powers 2001). The Younger Dryas cooling event from 13,000-12,000 years ago may have led to a temporary population decline (Potter 2008) in the Interior before permanent colonization.

The Paleoarctic Tradition is a term now generally used by archaeologists to refer to the earliest settled people known from all over Alaska. It was originally defined by Anderson[2] (Anderson 1968, 1970) as the earliest microblade-using tradition in the American Arctic, with a proposed relationship to northeast Asian late Pleistocene cultures based on similarities in these distinctive artifact types. Archaeological evidence indicates that early settlers camped on terraces, lakeshores, buttes, and bluffs. By using these locations on high ground, they could locate and track prey that included large mammals such as mammoth and bison. Evidence from the Upward Sun River Site, located just 5 km southeast of Tanana Flats Training Area (TFTA), for example, demonstrates that hunter-gatherers in Interior Alaska were concentrating on bison and wapiti at the end of the Pleistocene (The Upward Sun River Site is also known

[1] All dates are given in calendar years *before present*.
[2] Anderson called it the "American Palaeoarctic Tradition," but most researchers use the shortened version.

for one of the earliest burials in the Americas [Potter 2008; Potter et al. 2008; Potter et al. 2011]). It is likely that the treeless environment and nomadic nature of these peoples had a direct impact on the kinds of tools they fashioned. Stone, bone, antler, and ivory provided the most abundant material for manufacturing weapons and cutting tools. Artifacts typically associated with this culture include small stone microblades, microblade cores, bifacial projectile points, and unifacial scraping tools.

In Interior Alaska, the Paleoarctic Tradition historically included two cultural divisions called the Nenana and Denali complexes. The Nenana Complex was identified by Powers and Hoffecker from sites in the Nenana Valley (Powers and Hoffecker 1989). This complex began approximately 11,000 years ago with an artifact assemblage that included triangular or teardrop-shaped, bifacially worked projectile points ("Chindadn" points [Cook 1969; 1975; Holmes and Cook 1999]); large unifacial chopper-like tools; and flake tools. The Nenana Complex is defined as lacking microblades, microblade cores, and burins, and was proposed to predate the microblade-rich Denali Complex. Many Nenana Complex archaeological sites are located in the Tanana Valley, adjacent to FWA training lands (Broken Mammoth [Holmes 1996; Yesner et al. 1999], Chugwater [Lively 1996], Donnelly Ridge [West 1967; 1996, Donnelly Ridge is located in DTA], Healy Lake [Cook 1989], Mead [Holmes 2007] and Swan Point [Holmes et al. 1996; Holmes 1998; 2007]).

The Denali Complex, dated roughly to 10,500 to 8,000 years ago, was originally defined by West (West 1967, 1975) and includes distinctive wedge-shaped microblade cores, core tablets and their derivative microblades, large blades, biconvex bifacial knives, certain end-scraper forms, and burins. West later defined the Denali Complex as a regional variant of the American Paleoarctic Tradition (West 1981). Denali sites in the vicinity of FWA's training lands include Mt. Hayes (West 1996), Swan Point (Holmes et al. 1996; Holmes 1998, 2007), and Gerstle River (Potter 2001). At least one site in TFTA (FAI-2043) has also been dated to this period.

The relationship between the proposed Nenana and Denali complexes is as of yet unresolved. As discussed above, some researchers view the Nenana Complex as a bifacial industry that predates the microblade-based Denali Complex. However, current research at sites such as Swan Point and Broken Mammoth indicates that microblades and burins were used by the earliest known cultures in Interior Alaska, with a later co-occurrence with Chindadn points—the defining artifact type of the Nenana Complex. Although some archaeologists still believe that there is a cultural distinction between the Nenana and Denali complexes (e.g., Dumond 2001), the general understanding from Interior Alaskan archaeologists is that there is a behavioral explanation for the presence or absence of microblades in different assemblages (Holmes 2001; Potter 2008; Yesner and Pearson 2002). Moreover, both Nenana and Denali technology persist in central Alaska throughout the Holocene (Bever 2006).

Site density declined in the areas around FWA in the early Holocene, suggesting a slight depopulation during a period of climate change that initiated the widespread establishment of spruce forests (Potter 2008). The boreal forest in Interior Alaska was established by 8,000 years ago (Bigelow and Powers 2001). Sites from this time period are less well publicized than the older sites, but include Houdini Creek (circa 8,600 years old), Hurricane Bluff (c. 9,800 years old), Lucky Strike (c. 8,500 years old), Gerstle River (c. 10,000 years old), and the Campus Site (c. 7,700 years old) (Pearson and Powers 2001; Potter et al. 2007; Potter 2008). Bison, wapiti, and birds were the most important subsistence game during this period (Potter 2007, 2008).

Site density increased again after about 6,000 years ago in Interior Alaska (Potter 2008). This population increase coincides roughly with the Northern Archaic Tradition and the appearance of side-notched projectile points. Anderson originally defined the Northern Archaic Tradition to specifically address notched point-bearing stratigraphic horizons that did not contain microblades at the Onion Portage site in northern Alaska (Anderson 1968). Alaskan notched points were generally similar to Archaic-age dart points in the contiguous United States. Time has shown middle Holocene assemblages in Alaska to be

quite diverse, however, and it is questionable whether this trait is related to southern forms or if it is a reliable indicator of cultural affiliation (Clark 1992; Cook and and Gillespie 1986). Artifact assemblages associated with this culture can vary but generally contain myriad tools ranging from bifacial knives and microblades to end scrapers and side-notched points. Middle Holocene hunter-gatherers had a subsistence economy focused on seasonally abundant game including caribou, fish, and moose (Potter 2008). Notched point assemblages occur in many sites in Interior Alaska, including over one dozen on Army lands (XBD-277, XMH-277, XMH-283, XMH-303, XMH-309, XMH-874, XMH-950, XMH-1130, XMH-1168, XMH-1300, Robertson et al. 2004, Raymond-Yakoubian and Robertson 2005.) Several sites (XBD-270, XMH-915, XMH-925), including the excavated Banjo Lake site in DTA (XMH-874), have also produced middle Holocene dates from hearth charcoal. The 6,300-6,700-year-old dates from Banjo Lake were also associated with a microblade component (Robertson et al. 2008).

Utilization of microblade and burin-based industries appears to continue through the middle and late Holocene in Interior Alaska (Esdale 2008; Potter 2004). By the late Holocene, archaeologists see a shift from seasonal large mammal hunting with a nomadic lifestyle to a focus on seasonally over-abundant resources, use of storage, and more permanent settlements (Potter 2008b). Artifact assemblages do not drastically change until the last millennium of the Holocene when microblades disappear from the archaeological record (Potter 2008).

Linguistic evidence suggests that the Athabaskan culture may have appeared in the Tanana Valley as early as 2,500 years ago. Through ethnography, oral history, and a broad array of cultural items, much has been learned about Athabaskan culture and history in the region. Artifacts associated with the Athabaskan culture are exceptionally diverse and include bone and antler projectile points, fishhooks, beads, buttons, birch bark trays, and bone gaming pieces. In the Upper Tanana region, copper was available and used in addition to the traditional material types to manufacture tools such as knives, projectile points, awls, ornaments, and axes (Clark 1981). A late prehistoric Athabaskan occupation is recognized at several sites in and around FWA's training lands (Andrews 1975; Andrews 1987; Cook 1989; Mishler 1986; Sheppard et al. 1991; Shinkwin 1979; Yarborough 1978). Of particular interest in this regard is a copper projectile point recently found in a buried context at DTA (XBD-272) (Robertson et al. 2009).

The Athabaskan Tradition includes late prehistoric and proto-historic cultures generally believed to be the ancestors of Athabascan tribes who currently inhabit Interior Alaska. Excavated Athabaskan sites are rare, but the limited body of evidence allows for several generalizations. Raw material usage was reorganized in the Athabaskan Tradition, which de-emphasized stone tool-making and increased the emphasis on the manufacture of items from native copper and organic materials (Dixon 1985). Assemblages include ground and pecked stone artifacts and an increased use of expedient tools. There was a broadening and diversifying of the resource base at this time to include small mammal and freshwater marine animals such as fish and mollusks (McFadyen Clark 1981; McFadyen Clark 1996; Ream 1986; Sheppard et al. 1991; Shinkwin 1979). Athabaskan sites tend to occur in resource-rich areas near lakes, streams and rivers, and are generally characterized by large house pit and cache pit features. Proto-historic Athabaskan assemblages include Euro-American trade goods such as glass beads and iron implements. Sites of this time period reflect an increased reliance on outside trade and include log cabins co-occurring with traditional house pits, as well as a change in site location to maximize trading opportunities (Andrews 1975; Andrews 1977; Andrews 1987; McFadyen Clark 1981; VanStone and Goddard 1981).

Athabascan settlement patterns depended greatly on the availability of subsistence resources, and Interior bands lived a nomadic lifestyle. They often traversed vast areas to support themselves and spent considerable time engaged in subsistence activities. It was often necessary for bands to divide into smaller groups to find game, and preserved fish were used as a staple of the diet in addition to fresh game (Andrews 1975).

Four Athabascan linguistic and geographic groups have inhabited the Tanana Valley: the Upper Tanana, Tanacross, Tanana and Koyukon. Each group is further distinguished according to geographic location. Bands of the Tanana and Tanacross groups are historically associated with the geographic area that embodies Forts Wainwright and Greely. Salcha, Chena, Wood River, Goodpaster, and Healy Lake bands have inhabited the region since protohistoric times and possibly even prehistoric times (Andrews 1975). Use of the region varied from one band to the next. The Salcha, Chena, Goodpaster, and Wood River bands of the Tanana Athabascans and the Healy Lake band of the Tanacross Athabascans used certain parts of what are now Forts Wainwright and Greely (McKennan 1981). Several villages have been reported on or near FWA. One occupied by the Wood River band is said to have been located in the southern part of FWA but has not been found (Dixon 1980; Reynolds 1986). The Blair Lakes Archaeological District (FAI-335) on FWA may relate to the prehistory of the Athabaskan Tradition. Euro-American historic archaeological sites are also present (Gamza 1995; Phillips 1984).

2.2 Historic Context

With the beginning of Euro-American contact in Interior Alaska in the early 19th century, trade influences and influxes of new populations began to change life in the region. Land use patterns shifted from traditional indigenous uses to activities based on Euro-American economic and political systems. FWA's training lands fall within an area occupied at the time of Euro-American contact by Lower-Middle Tanana Athabascans, including bands described generally as the Salcha, Big Delta-Goodpaster, Wood River, and Chena bands (McKennan 1981; Andrews 1975; Mishler 1986). Historical accounts document traditional settlement patterns that were focused on a widely mobile seasonal round, with the fall caribou hunt playing a pivotal role in subsistence preparations for the winter and summer activities focused at fish camps, berry and root collecting, and in sheep hunting. These activities were frequently communal, with several local bands connected by common interest, geography, and intermarriage. Despite anthropological attempts to define boundaries for the peoples living in the lower Tanana River Valley, natural terrain served as the only definable boundary to settlement patterns (McKennan 1981).

As Euro-American traders, miners, missionaries, and explorers moved into the Tanana River Valley, the traditional life ways of local Athabascan groups were disrupted. Access to trade goods and the development of the fur trade not only affected traditional material culture, but also began to dramatically affect subsistence activities and settlement patterns. Similarly, the arrival of missionaries in the Alaskan Interior profoundly influenced traditional social organization. The introduction of mission schools for Native children and the doctrine of new religious beliefs contributed to an erosion of traditional practices (McKennan 1981).

Russian fur traders began settling Interior Alaska starting in the 1810s, establishing a post at Nulato on the Yukon River and one at Taral on the Copper River. British traders established Fort Yukon in 1847. Trade goods from these posts may have passed to Tanana Athabascans and Upper Tanana Athabascans through intra-Native trade networks. Direct contact between Tanana Athabascans and white traders increased after the 1860s. With the U.S. purchase of Alaska in 1867, control of trading stations and the fur trade passed to Americans. Through the 1880s, American traders established several additional posts on the Yukon and Tanana rivers, including locations at Nuklukayet (modern-day Tanana), Belle Isle (modern-day Eagle), and Fort Yukon.

Trade goods introduced by Euro-American settlers influenced the Native lifestyle. Clothing, staples, tools, and other necessities could be obtained through trade. Guns allowed hunters to obtain game with greater efficiency. Gradually, Athabascan Native groups began to alter their traditional nomadic patterns in favor of more permanent settlements. However, while significant, this contact would not have as dramatic an impact on the region as the discovery of gold in the Interior during the last decades of the 19th century. The towns established by Euro-American settlers at the turn of the 20th century, in response to

the Klondike Gold Rush and the eventual military development of the region, would rapidly and permanently change the demography and economy of Interior Alaska.

Gold strikes in the Fortymile River region, Birch Creek area, and the Canadian Klondike began drawing miners and prospectors north in the 1880s and 1890s. In response to this gold rush, E.T. Barnette established a trading post on the Chena River in 1901. The following year, prospector Felix Pedro discovered gold nearby, and a new gold rush soon led to the founding of Fairbanks at the site of Barnette's original trading post. Most mining activities in the region occurred on creeks north of Fairbanks, with the town serving as a supply center. Agricultural and other commercial activities, such as logging, also developed to support mining activities in the Fairbanks area. Homesteads existed on parts of what is today the main post of FWA as early as 1904.

In 1898, the discovery of gold in the Tanana uplands began a rush of Euro-American settlement into the Tanana River Valley. As the economic importance of the Tanana Valley increased, the need for reliable transportation routes and communication systems rose in tandem. Existing trails, such as the Bonnifield, Donnelly-Washburn, and Valdez-Fairbanks trails, saw increased use and development in the first decade of the 20th century. This increase in activity also resulted in the establishment of several roadhouses and posts. In 1906, Congressional appropriations led to improvement of the Valdez-Fairbanks Trail, crossing the Alaska Range south of Delta Junction, following the Tanana River to Fairbanks. Completion of the Alaska Railroad in 1923 was followed two decades later by construction of the Alaska Highway in 1942, firmly tying the Alaskan Interior to the outside.

As Fairbanks grew in the first decade of the 20th century, several agricultural homesteads were developed on lands now encompassed by sections of the FWA cantonment. These homesteads provided Fairbanks with a variety of agricultural products and wood for fuel, but were subsumed when lands were withdrawn for the creation of Ladd Field, which later became FWA (Price 2002).

Riverboats were the primary means of getting people and supplies into the Interior at the turn of the 20th century. The Fairbanks town site was located at the upper limit of navigation for stern-wheeler riverboats on the Chena River. Upriver from that point, residents navigated the river using shallow-draft boats in summer and sleds in winter. As commerce in the area increased, roads and trails were constructed, sometimes following earlier indigenous routes. The major overland route to the coast was the Valdez-Fairbanks Trail, which began as a military trail from Valdez to Eagle in 1899.

Transportation and communication networks, including the Alaska Railroad, were developed to serve new settlements in Interior Alaska. A branch of the railroad route was extended to Fairbanks in 1904. Roadhouses along the route catered to travelers. Some were located on what are now Fort Wainwright training lands. One property was on the Bonnifield Trail in TFTA, and two roadhouses and a seasonal tent operation existed along the Donnelly-Washburn Trail in the current Donnelly Training Area. Secondary routes connected Fairbanks to the surrounding mining districts.

By 1910, most of the easily accessible placer gold deposits were exhausted, and capital-intensive technologies became necessary to extract remaining deposits. These methods were not possible with the existing transportation infrastructure. The completion of the Alaska Railroad in 1923 expanded transportation options for the region, connecting Fairbanks to Seward and making large-scale dredging operations economically feasible. Aviation also became a key component of Interior transportation, beginning in earnest in the 1920s. However, it was not until 1931 that Weeks Field, originally constructed in 1923, was officially dedicated as an airfield. Industrialized corporate activity became the hallmark of the region's mining in the remaining years before World War II.

Development in the Alaskan Interior increased dramatically with the advent of World War II and subsequent military build-up in Alaska. Of particular significance was the development of airfields near

Delta Junction (Fort Greely), Fairbanks (Ladd Field, later FWA), and North Pole (Eielson Air Force Base). These locations began as Lend-Lease bases and cold weather testing centers, but soon expanded with the increased need for military support during World War II and later during the Cold War.

Full historic contexts of early mining, transportation, and homesteads on FWA have been completed. These studies have determined that there are no properties eligible for the National Register under these contexts. Several village sites associated with the early contact period have been reported near FWA. One was reported near Wood River Buttes, two just northwest of the installation's boundary and one near Fairbanks (Reynolds 1986). None have been reported or located on the main post.

2.3 Ladd Field and Fort Wainwright

In 1935 Ladd Field was authorized as a small cold weather testing station that was envisioned by General H. H. Arnold. Construction began in 1939, and by 1940 Ladd Field was operational.
Cold weather testing at Ladd Field helped to improve the aircraft and equipment used by front-line aircrews. The Cold Weather Test Detachment's experimental tests contributed to the development of aircraft design, ground procedures and personnel equipment with stateside research agencies and manufacturers. After the start of World War II, Ladd Field also served as the transfer point for the Alaska Siberia (ALSIB) Lend-Lease aid to the Soviet Union. From 1942 to the end of the war in 1945, Ladd Field saw 7,926 aircraft and associated cargo change hands. Though it was controversial, the Lend-Lease aid to the Soviet Union played some part in the eventual defeat of Nazi Germany. Ladd Field also served as an air depot for the repair and supply of aircraft under the Air Transport Command, processing thousands of passengers as well as tons of cargo and mail.

In 1984, Ladd Field was listed on the National Register of Historic Places. Ladd Field was listed as significant for three main themes:1) cold weather testing, 2) aircraft repair, supply depot and air transfer hub and 3)as the transfer point for aircraft and cargo transiting the ALSIB route to the Soviet Union.

In 1947, the Air Force became a separate service, and Ladd Field became known as Ladd Air Force Base (AFB). Missions flown out of Ladd AFB played a significant role in the early years of the Cold War confrontation with the Soviet Union. Early in the Cold War, military planners decided on a heartland concept for Alaskan defense, concentrating on bases near Anchorage and Fairbanks as the strategic anchor points. Ladd AFB became the Northern Sector Headquarters for the Alaskan Air Command, and its foremost missions during the Cold War were air defense, strategic reconnaissance and arctic research. Ladd AFB's air defense mission was part of the plan to deter the Soviet Union from taking Alaskan territory and using it as a base from which to threaten the continental United States. Ladd AFB hosted tactical fighter intercept squadrons and combat alert cells. An Air Defense Command Center located on Ladd AFB was responsible for directing air battles in Alaska's northern sector. It also provided support to segments of the Distant Early Warning Line. In the earliest years of the Cold War, Ladd AFB hosted some of the first long-range strategic aerial reconnaissance units.
Ladd AFB was also the scene of significant Cold War arctic research. The cold weather equipment testing, begun during World War II, continued through the Cold War and expanded to include the Arctic Aero medical Laboratory (AAL). The AAL studied human adaptation to Arctic and Sub-Arctic climates with an eye toward military applications.

In 2001, the Ladd AFB Cold War Historic District was determined eligible for the National Register of Historic Places. It was determined to be significant for its role in the early Cold War missions of the 46th/72nd Air Reconnaissance unit and for the fighter intercept squadrons stationed here.

In 1960, Ladd AFB was transferred to the Army and was renamed Fort Jonathan Wainwright on January 1, 1961. In Alaska, Cold War missions were predominately under the command of the Air Force with the Army providing ground force defense and logistical supply. The Army also carried out cold weather training tactics and cold weather equipment testing. The onset of the Vietnam War and its high costs

drained the Army's resources; troops at Wainwright were reassigned or deployed, causing a significant decrease in the post's population. In 1986, the mission of the post changed once again with the assignment of the 6th Light Infantry Division to FWA. Since 1986, FWA's mission has been to support worldwide deployment.

2.4 Fort Greely and the Donnelly Training Area

Today's Donnelly Training Area was formerly part of Fort Greely, an arctic training and testing installation south of Delta Junction. Fort Greely's predecessor was Allen Army Airfield, a World War II airfield built in 1942 to support the Lend-Lease operation along the Northwest Staging Route. In 1948, the Army began to use the installation and surrounding lands for much-needed arctic testing and training. In 1955, the airfield and training lands became part of the new post of Fort Greely. As the home of the Northern Warfare Training Center and the Army's Cold Regions Test Center, Fort Greely continued to support arctic training and testing missions. Fort Greely briefly closed in 1995 and then reopened in 2001 under the management of the Missile Defense Command. The former Fort Greely training lands were transferred to Fort Wainwright and are presently known as the Donnelly Training Area.

2.5 Status of Archaeological Resources

Archaeological research on FWA training areas has resulted in numerous technical reports (Bacon 1979; Bacon and Holmes 1979; Dixon et al. 1980; Esdale and Robertson 2007; Esdale et al. 2012a, 2012b, 2012c; Espenshade 2010; Bradley et al. 1973; Gaines 2009; Gaines et al. 2010, 2010; Hedman et al. 2003; Higgs et al. 1999; Holmes 1979a, 1979b; Johnson and Bozarth 2008; Marshal 2007; Potter 2005; Potter et al. 2000; Rabich and Reger 1978; Raymond-Yakoubian 2006; Raymond-Yakoubian and Robertson 2005; Robertson 2009, 2010; Robertson et al. 2004, 2006, 2007, 2008, 2009; Staley 1993) and several scientific papers (Holmes and Anderson 1986; West 1967, 1975).

FWA and its training lands contain 640 known archaeological sites and 4 archaeological districts. Fifty-nine sites are eligible for the National Register of Historic Places (NRHP), 509 sites have not been evaluated, and 72 additional sites have been determined ineligible for the NRHP. Of the eligible or un-evaluated sites, 11 are historic sites and 557 are prehistoric sites.

Archaeological investigations in what is now the Donnelly Training Area began in the 1960s, when Frederick West was searching for sites related to the first Americans (West 1967). He excavated the Donnelly Ridge site (XMH-5) in 1964 and found an assemblage containing microblade core technology similar to early Holocene Denali Complex sites. Several surveys of Fort Greely and adjacent training lands in the late 1970s documented 64 new sites (Rabich and Reger 1977; Bacon 1979; Holmes 1979; Bacon and Holmes 1979). Julia Steele surveyed various locations in DTA from 1980-1983, finding four additional new sites (Steele 1980, 1980, 1982, 1982, 1983, and 1983), and Georgianne Reynolds surveyed the Donnelly Dome area in 1988, locating one more (Reynolds 1988). Investigations in DTA from 1992-2002 were undertaken by D. Staley (Staley 1993), T. Gamza (Gamza 1995), A. Higgs (Higgs et al. 1999), and D. Odess (Odess 2002). Sixteen new sites were found during this decade of fieldwork, and attempts were made to relocate old sites.

Concentrated efforts to expand survey coverage of DTA East began with CEMML archaeologists in 2002. Over 200 new sites were located in the Texas Range, Donnelly Drop Zone, and Eddy Drop Zone in the first half of the decade. In 2007, one site was found in the northernmost portion of DTA West by Ben Potter and others during survey for the Alaska Railroad Northern Rail Extension Project (Potter et al. 2007). In recent years, CEMML research aimed to evaluate many known archaeological sites in DTA for inclusion in the National Register in conjunction with use of the Battle Area Complex and its surface danger zone. Sites have also been discovered during surveys for road and trail maintenance. Potential expansions into DTA West, west of the Delta River, prompted 2011 and 2012 surveys into new areas

such as Molybdenum Ridge, where 21 new sites were discovered in 2011. Because of its remote setting, however, the archaeology of Donnelly West is still poorly understood and represents a gap in USAG FWA's inventory of cultural properties. The Cold Regions Test Center (CRTC) has also contracted with CEMML and others since the last Integrated Cultural Resources Management Plan (ICRMP) to survey areas in DTA West, east of the Little Delta River, and many new archaeological sites have been recorded (Espenshade 2010).

To date, 453 archaeological sites have been identified within DTA. Forty-eight sites have been found to be eligible for the National Register, and 53 were found not eligible. An additional 352 sites remain to be evaluated. Historic archaeology sites are poorly represented in this region, with only six currently known to exist. The Donnelly Ridge District (XMH-388) encompasses Denali sites identified by Frederick West, south and west of Donnelly Dome. Future archaeological studies in DTA will concentrate on completing survey of 100% of the land in DTA East, conducting determinations of eligibility (DOEs) on archaeological sites in high traffic areas, and exploring parts of DTA West that are opening up for expansion of military training activities.

Despite its incomplete nature, the archaeological record known from DTA represents all of the currently recognized prehistoric cultures of the Alaskan Interior. Of significance is the role played by sites located on DTA in the definition of the Denali Complex of the American Paleoarctic Tradition (Anderson 1970; West 1967, 1981). The oldest date for human habitation at DTA is roughly 10,100 years at site XBD-00167 (Higgs et al. 1999); however, undisturbed stratigraphic deposits 12,800-12,930-years-old indicate the potential for intact archaeological occupations of this age. Sites yielding Northern Archaic side-notched points are common (Robertson et al. 2004, 2005; Raymond-Yakoubian and Robertson 2005). At DTA, site XMH-874 yielded an AMS date of 5720 +/- 50 BP from hearth charcoal associated with a microblade component (Robertson et al. 2008). A late prehistoric Athabaskan occupation is recognized at several sites (e.g., Andrews 1975, 1987; Cook 1989; Mishler 1986; Sheppard et al. 1991; Shinkwin 1979; Yarborough 1978). Of particular interest in this regard is a copper projectile point recently found in a buried context at DTA at site XBD-00272 (Roberston et al. 2009). Euro-American historic archaeological sites are also present (Gamza 1995; Phillips 1984).

3. Undertaking

U.S. Army Alaska (USARAK) and United States Army Garrison, Fort Wainwright (USAG FWA) have constructed a Battle Area Complex (BAX) on lands at Fort Wainwright's Donnelly Training Area (DTA) (Figure 2). The BAX undertaking consists of two main components: (1) construction of the BAX range complex; and (2) the establishment of a safety buffer area known as a "Surface Danger Zone" (SDZ) downrange of the BAX range complex (Figure 3). Construction of the BAX range complex has been completed. USAG FWA began training exercises in the BAX in early spring of 2010.

The focus of this section is a description of the SDZ and associated Section 106 considerations; however, a brief introduction detailing BAX range complex construction is necessary to place the SDZ in its proper context.

3.1 BAX Range Complex

With the transformation of the Army's Alaska-based 176th light infantry brigade to the 176th Stryker Brigade in 2003, USARAK and USAG FWA needed new ranges to meet the needs of Stryker vehicle-mounted weapon systems. The largest of these new ranges is termed the Battle Area Complex (BAX). The BAX is designed for gunnery training of crew-served, vehicle-mounted weapon systems and dismounted infantry platoon tactical live-fire operations (Table 1). Primary features of the BAX include course roads, stationary armor targets, moving armor targets, stationary infantry targets, moving infantry targets, machine gun bunkers and breaching obstacles. In addition to the range, the BAX complex includes an after-action review facility, ammunition breakdown building, ammunition loading dock, operations/storage building, arctic latrines, bleacher enclosure, bivouac, unit staging area, covered mess area, building information systems, electric service, water and septic system, storm drainage and general site improvements.

Table 1. BAX range weapons systems

Weapons System	**Description**
Small Arms	Man portable, individual, and crew-served weapons systems used mainly against personnel and lightly armored equipment. Ammunition for small arms includes all ammunition up to and including 40mm.
Artillery/ Indirect Fire Systems	Self-propelled, man-packed or towed, large caliber (60mm or larger) tube-launched or rocket-propelled munitions.
Vehicle	A weapon that is integral to the vehicle on which it is mounted and intended for use from the vehicle (i.e., the MK-19 40mm automatic grenade launcher on the Stryker or the main gun (105mm) on the mobile gun system).

Survey for the construction footprints of the BAX range complex was conducted in 2002 and 2003 (Hedman et al. 2003; Robertson et al. 2004). Site evaluations and determinations of eligibility (DOEs) for listing in the National Register of Historic Places were conducted in 2004 and 2005 (NRHP) (Raymond-Yakoubian and Robertson 2005; Robertson et al. 2006). On March 17, 2006, USARAK released the BAX/CACTF Supplemental Draft EIS, and USAG FWA and the Alaska State Historic Preservation Officer (SHPO) entered into Section 106 consultation to mitigate adverse effects of the BAX undertaking.

There are five archaeological sites—XMH-00290, XMH-00873, XMH-00874, XMH-00877 and XMH-01160—located in the BAX construction footprint. Four of these—XMH-00290, XMH-00873, XMH-00877, and XMH-01160—were determined ineligible for listing in the NRHP. Mitigation of adverse effects consisting of an archaeological excavation to recover data from XMH-00874 began in July 2006 and was completed in 2008. The mitigation agreement is detailed in a Memorandum of Agreement (MOA) between USAG FWA and the SHPO signed on July 12, 2006. Section 106 requirements have been completed for the construction footprint of the BAX range complex.

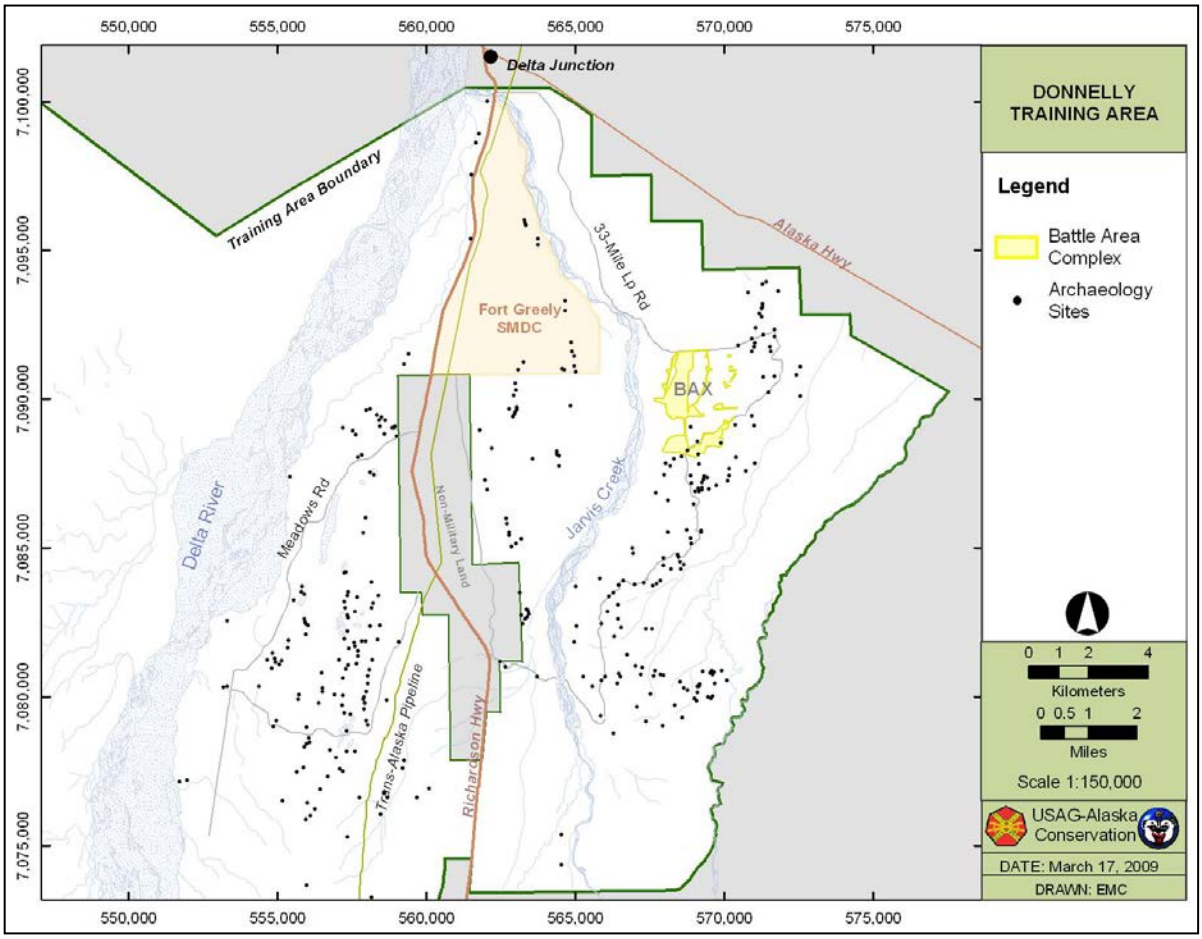

Figure 2. BAX range complex

3.2 Surface Danger Zone

For the purposes of implementing a cultural resources management strategy, it is important to emphasize the difference between the BAX range complex and the BAX SDZ:

- The BAX range complex includes the maneuver areas, firing points and targets that will be utilized for training (Figure 2).

- The BAX SDZ is an area of risk that extends lengthwise from the firing point to the ultimate ballistic distance or maximum range of munitions utilized at the range (Figure 27). No construction or training activities will occur within the BAX SDZ while the BAX is in use. No targets will be located in the BAX SDZ. Essentially, the BAX SDZ is a downrange safety buffer zone that covers the maximum distance stray rounds may travel, established for the purposes of protecting human health and safety.

Establishing the SDZ is simply a matter of restricting access to the downrange areas where stray rounds resulting from live-fire exercises in the BAX range complex could fall. SDZs are created to ensure the safety of the public and military personnel. They do not indicate where rounds will most likely go; rather, they indicate all possible places where they could go in a completely flat landscape (which the BAX SDZ is not). Different calibers and different munitions have different effective and maximum ranges. Thus, the BAX SDZ is a composite SDZ that incorporates the SDZs from all the different types of munitions that will be used—from 5.56mm to 105mm.

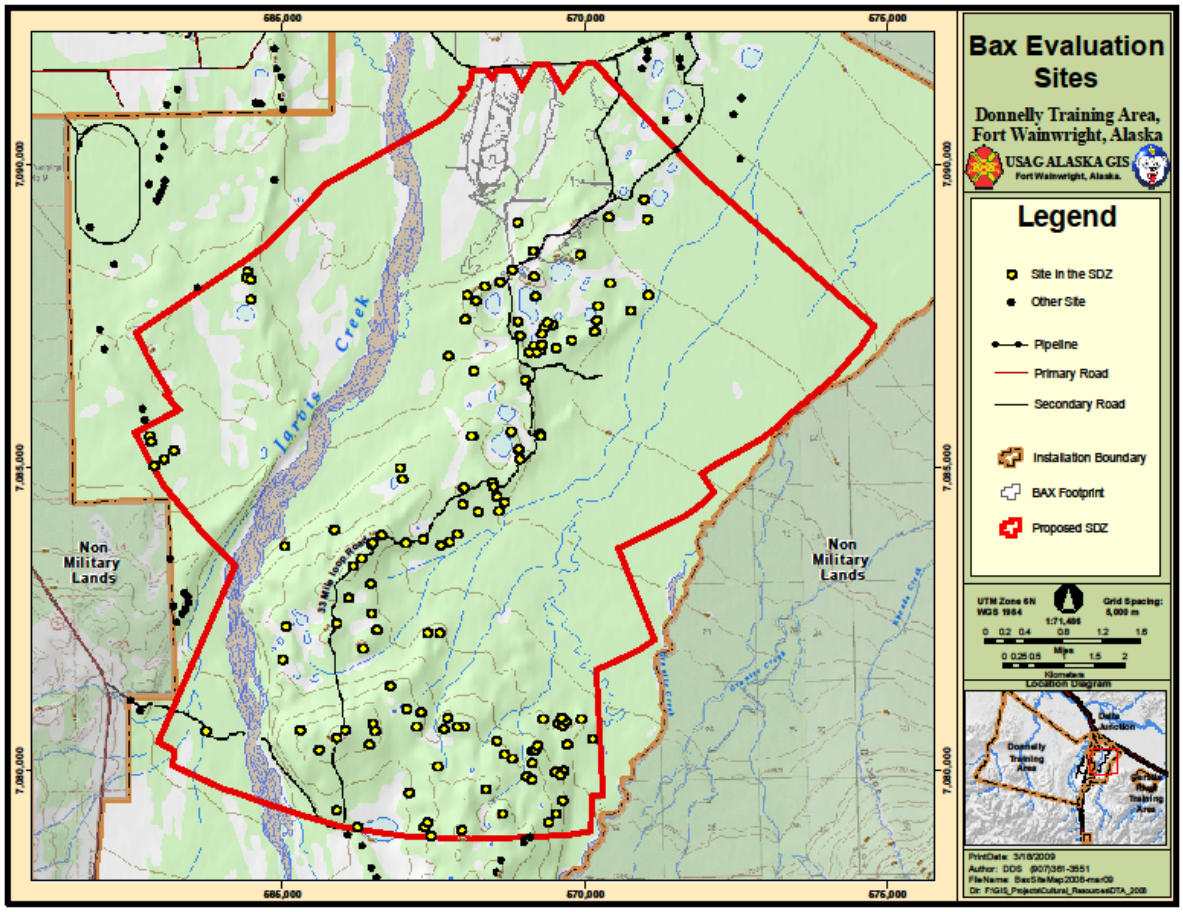

Figure 3. Location of sites in BAX SDZ

The BAX SDZ is an irregular, fan-shaped area roughly 12 km north to south and 12 km east to west at its widest point. It encompasses 23,741 acres found on the USGS Mount Hayes D-4 topographic map.

Survey efforts have identified 136 archaeological sites within the BAX SDZ. In the early spring of 2009, USAG FWA and the SHPO entered into Section 106 consultation to determine the effects the BAX SDZ could have on those sites. Through detailed analysis conducted by USAG FWA (*U.S. Army Alaska's Monitoring and Data Recovery Plan for Cultural Resources within the Battle Area Complex Surface Danger Zone, Fort Wainwright, Donnelly Training Area, 2009*) and in consultation with the SHPO, it was determined that use of the BAX range will have no evident effect to sites in the SDZ. A Programmatic Agreement (FWA-PA-1003) between USAG FWA and the SHPO to monitor any future impacts to sites in the BAX SDZ was finalized on February 5, 2010.

4. Cultural Resources

As a good faith measure, USGA FWA conducted baseline data recovery at 29 archaeological sites located within the first two kilometers of the BAX SDZ: XMH-00278, XMH-00279, XMH-00842, XMH-00875, XMH-00878/XMH-00908, XMH-00906, XMH-00907, XMH-00909, XMH-00910/XMH-00911, XMH-00912, XMH-00913, XMH-00914, XMH-00915, XMH-00916, XMH-00917, XMH-00919, XMH-00920, XMH-00921, XMH-00923/XMH-00922, XMH-00924, XMH-00925, XMH-00926, XMH-00927, XMH-00945, XMH-01122, XMH-01092 and XMH-01303 (Figure 27). Each of these sites was visited by a crew of CEMML archaeologists during the 2009 field season. All sites were mapped with a high presentation GPS, and 2% to 3% of each site with subsurface components was excavated.

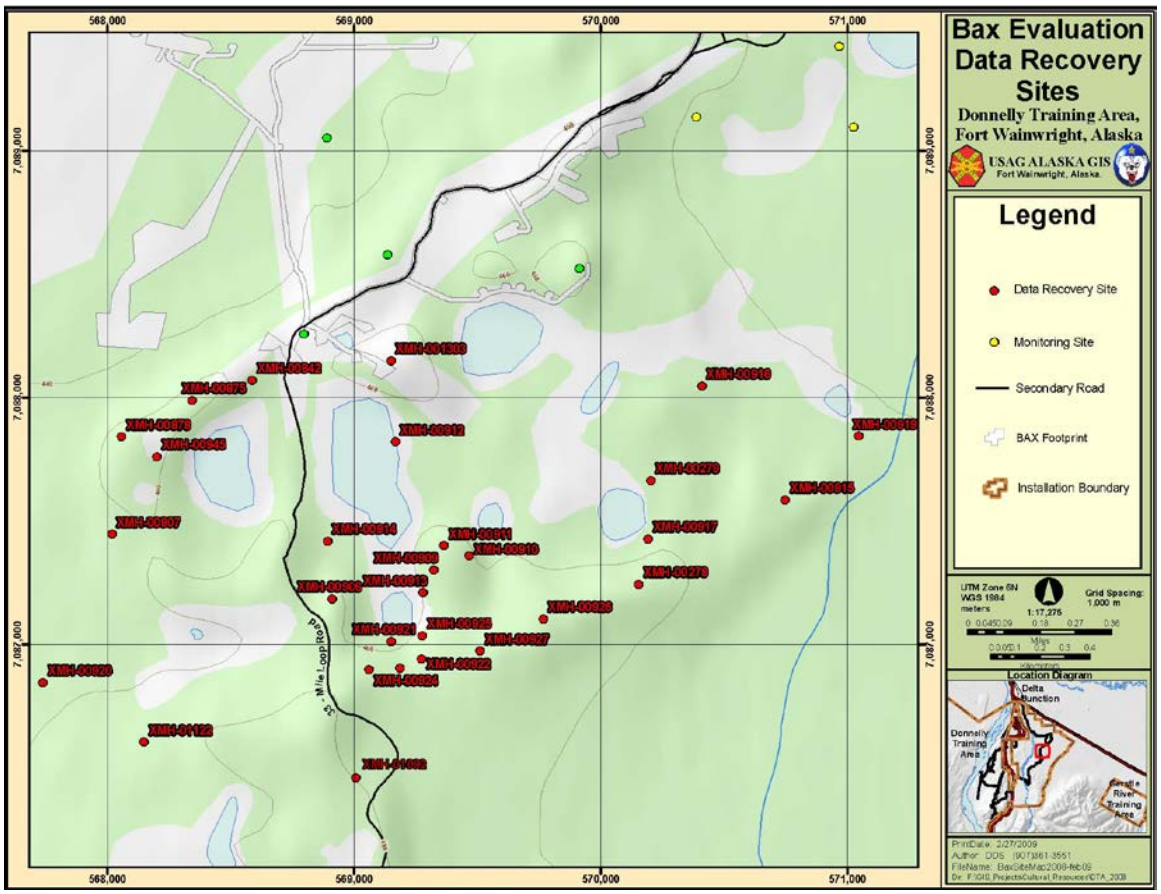

Figure 4. Data recovery sites within SDZ

The results of the excavations of these sites are described below. The sites descriptions were separated into three categories based on potential site significance. The thirteen sites with the highest research potential are: XMH-00278, XMH-00878/908, XMH-00907, XMH-00910/911, XMH-00915, XMH-00917, XMH-00923/922, XMH-00925, XMH-00945, XMH-01092, and XMH-01303. Nine additional sites have limited research potential: XMH-00279, XMH-00875, XMH-00906, XMH-00914, XMH-00919, XMH-00920, XMH-00912, XMH-00924, and XMH-01122. Seven additional sites were isolated finds or small lithic scatters with no research potential: XMH-00842, XMH-00909, XMH-00912, XMH-00913, XMH-00916, XMH-00926, and XMH-00927.

4.1 Buried Sites with Significant Research Potential

XMH-00278

[redacted]

Determination: Not Evaluated

Originally located by Holmes (1979), site XMH-00278 is located on the south face of a northeast to southwest trending ridgeline (Figure 27) at UTM coordinates Zone 6, [redacted]. The ridge on which the site is located provides a prominent view of the Granite Mountains, Donnelly Dome, and the immediate surrounding terrain, which consists of flat plains with numerous low knobs, hills, ridges, and lakes. The ecosystem is characterized as a lowland spruce-hardwood forest and low brush-bog muskeg.

During 2002 and 2008 site visits, XMH-00278 yielded a large amount of lithic debitage (over a dozen flakes of multiple material types), at least four biface fragments, and two fragmentary scrapers from the surface (UA2011-386, 402). Buried cultural remains in the form of one flake were recovered from a depth of 0-10 cm BS. Only one test pit out of 26 excavated yielded buried material, indicating a low density of subsurface material. Fine-grained deposition across the land form varies from 20 to 55 cm. Stratigraphy consists of a dark brown to black organic layer overlying a reddish brown silt layer, which in turn overlies yellowish-brown fine very well-sorted sand. The basal sand overlies poorly sorted glacial gravels (till).

Figure 5. General overview of site XMH-00278, facing west

Archaeological data recovery at site XMH-00278 began on 8/20/2009 and extended through 8/24/2009. Twenty-five square meters were excavated in m x m units during the 2009 field season (Figure 6). Excavation units were placed across the site ridgeline along an east/west axis within areas containing previously located surface artifacts and positive shovel tests. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 15 cm to 51 cm BS. The soil in this area consists of root/moss mat on top of loosely compacted dark brown, organically rich loess, with an average depth of 5 cm. Below this organic horizon (7.5YR 3/1 very dark gray silty organic), the soil

consists of: 10YR 6/2 light brownish gray silt, 10YR 5/6 yellowish-brown coarse sand, 10YR 5/4 brown coarse sandy silt, and 7.5 YR 4/4 brow sandy silt. Glacial till is encountered below this silt deposit and consists of a 7.5 YR 4/4 brown sandy silt to coarse sand with poorly sorted gravels and cobbles (Figure 7). These transitions occurred at varying depths and could be sharp or gradual.

A total of 73 artifacts were recovered, all of which were lithics (UA2011-284). Artifacts include seven tools and diagnostics: one projectile point (in two pieces), one biface fragment, one microblade core, one microblade, two scrapers, and one retouched flake. The remaining finds are lithic debitage. Material types of the tools and debitage included: obsidian, basalt, chert, rhyolite, andesite and quartz. Eight samples of obsidian debitage were submitted for x-ray fluorescence (XRF) sourcing. Five of the samples were large enough to determine a source. All 5 were assigned to the Batza Tena obsidian source.

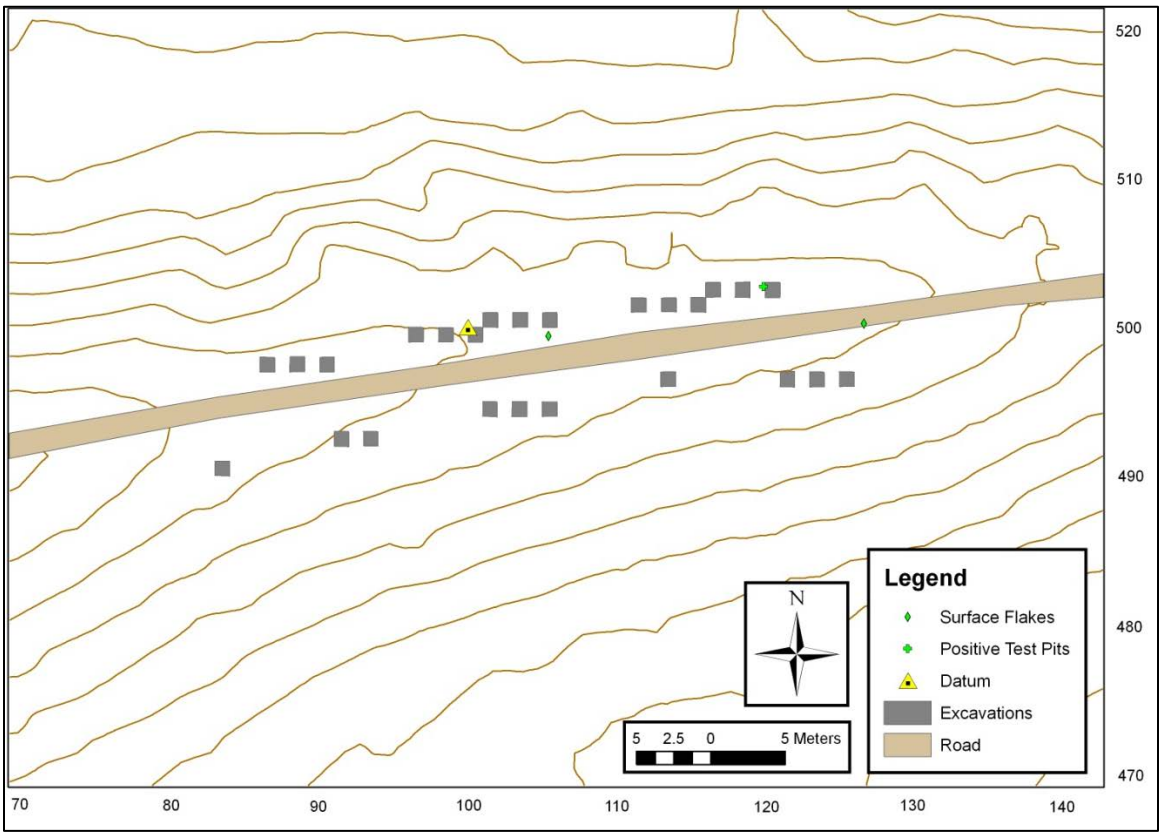

Figure 6. Site map of XMH-00278

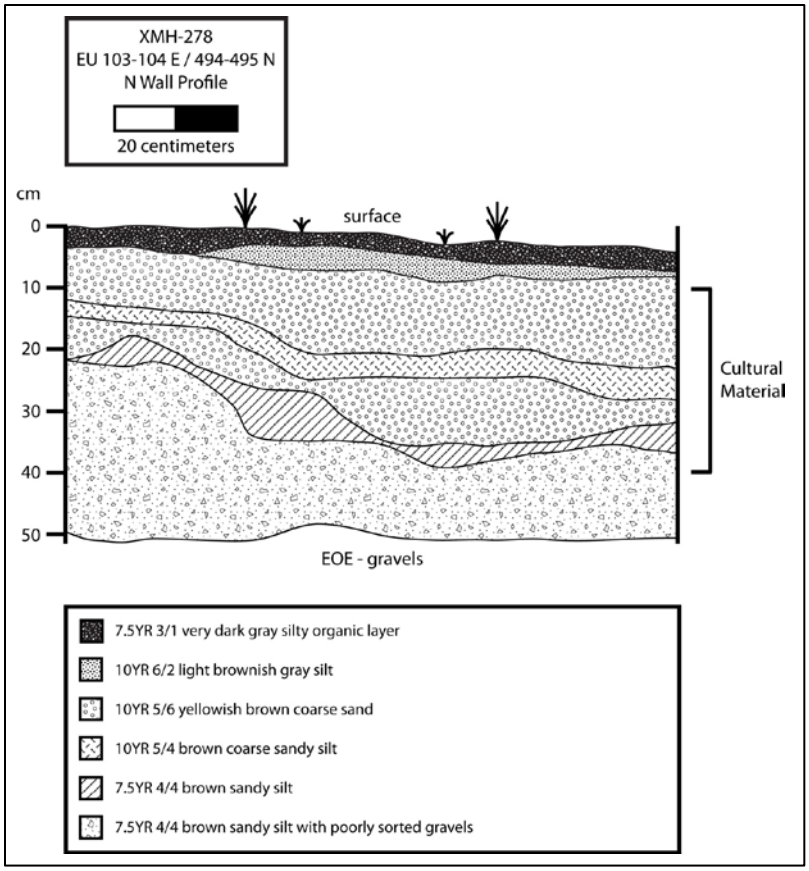

Figure 7. XMH-00278 stratigraphy

XMH-00878/908

[redacted]

Determination: Eligible

Site XMH-00878 is located on the highest point of a north-south trending ridge (Figure 8) at UTM coordinates Zone 6, [redacted]. A surface concentration of lithic debitage, originally identified as a separate site—XMH-00908—extends 200 m south of XMH-00878's datum down the south-facing slope of the ridge. Phase II evaluation identified surface artifacts along the ridge between the two loci of material, and Site XMH-00908 was incorporated into site XMH-00878. The resulting site area is estimated at approximately 300m x 30m (Figure 9, Figure 10). The landform on which the site is located provides a 180° unobstructed view to the west and a particularly commanding view of Jarvis Creek. Additional sites have also been identified on high points in the vicinity. These sites are XMH-00907, located less than 200 m to the south, and XMH-00945, less than 200 m to the east.

During initial investigations at the site in 2004, a total of 86 artifacts were recorded (UA2011-392). Thirty-seven of these were found on the surface, while 49 were recovered from buried contexts. The majority of the artifacts are lithic debitage of multiple material types including gray rhyolite, gray chert, obsidian, purple medium-grained quartzite, black fine-grained basalt, and quartz. Recovered tool forms include two chert microblade rejuvenation flakes, two chert microblade fragments, one obsidian scraper, one basalt scraper and one unifacially retouched chert flake.

Archaeological data recovery excavations at site XMH-00878 were conducted between 7/01 and 7/22/09. One hundred seventy-five square meters were excavated as 1m x 1m units during the 2009 field season (Figure 9, Figure 10). Excavation units were placed across the north-south trending ridgeline of the site within areas containing previously located surface artifacts and positive shovel tests. Additionally, units were placed throughout the site to determine artifact distributions and activity areas. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 15 cm to 65 cm BS. Stratigraphy at the site consists of root/moss mat on top of 7.5 YR 5/3 brown sandy silt with organic matter, 7.5 YR 4/4 brown silt, 10YR 4/5 dark yellowish-brown silt, 7.5 YR 4/6 strong brown silt and 10YR 4/6 dark yellowish-brown silt. Glacial till is encountered below the silt deposit consisting of a 2.5Y 5/4 light olive-brown sandy gravel with cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 11). One piece of charcoal was found in association with the cultural levels at the site. This sample (Beta 271222) produced a radiocarbon date of 230±40 BP.

A total of 2,198 lithic artifacts were recovered, including 25 surface finds. Artifacts include 156 tools and diagnostics: a projectile point fragment, 7 biface fragments, 3 end scrapers, a microblade core tab, and 123 microblades (Table 2). The remaining finds are lithic debitage. Material types were predominantly basalt, chert, jasper, quartz and rhyolite, with some obsidian, a non-locally occurring material type. Fifty-five samples of obsidian debitage were submitted for XRF sourcing. Of the samples, 36 were sourced to Batza Tena, 2 to Wiki Peak, 1 to A', and 16 were too small for reliable determinations.

Figure 8. General view of XMH-00878, facing west

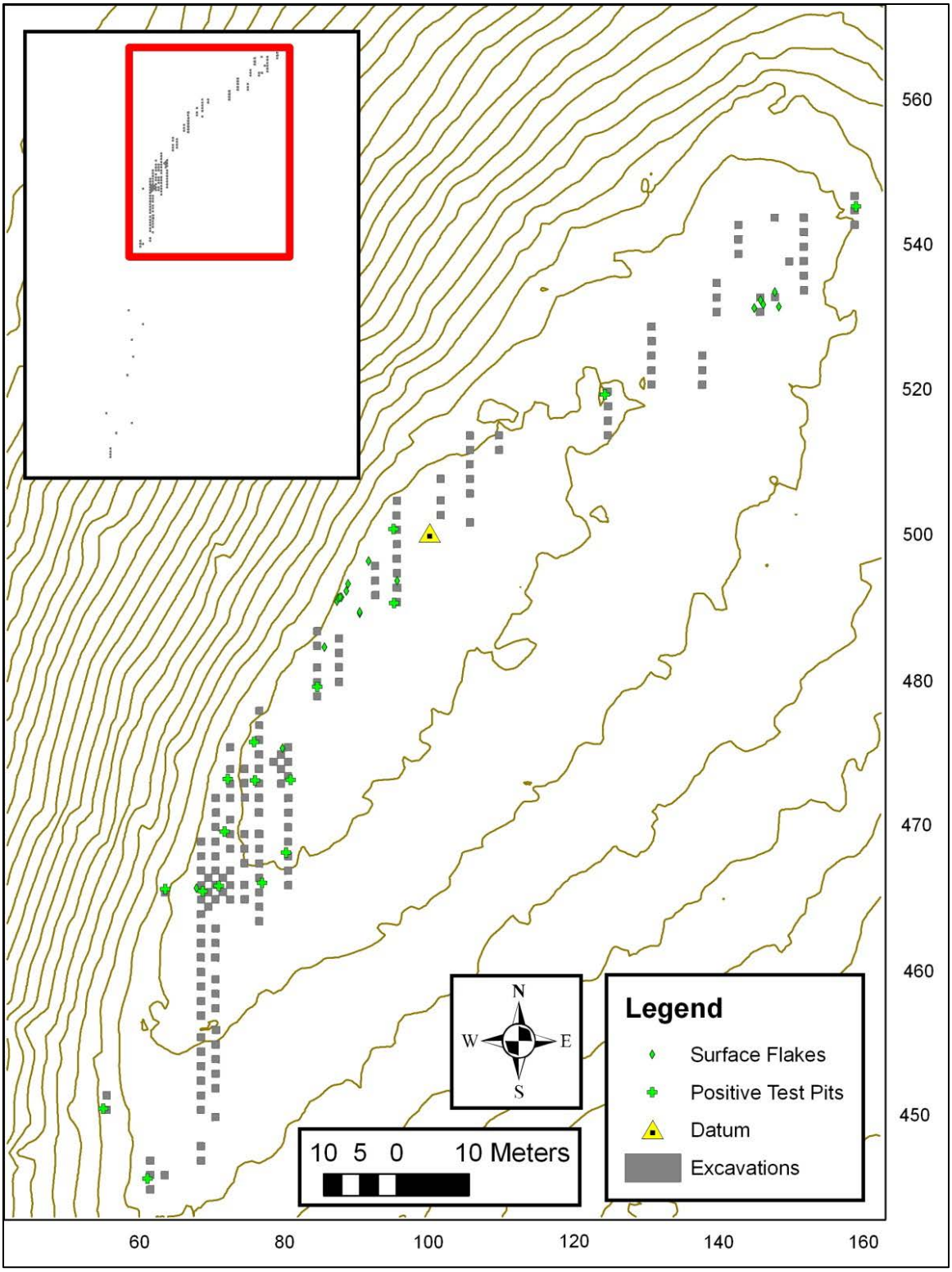

Figure 9. Site map of XMH-00878, north

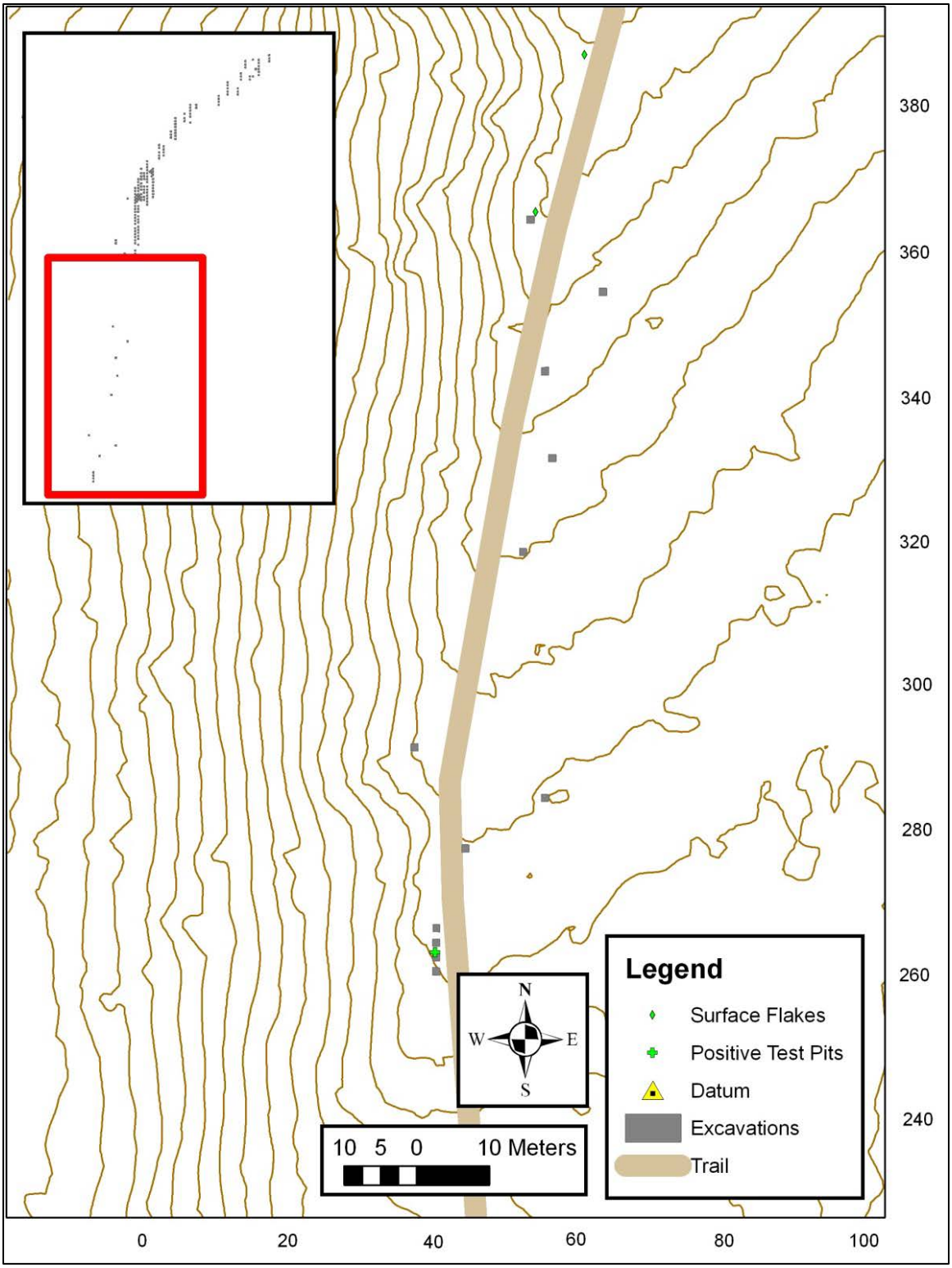

Figure 10. Site map of XMH-00878, south

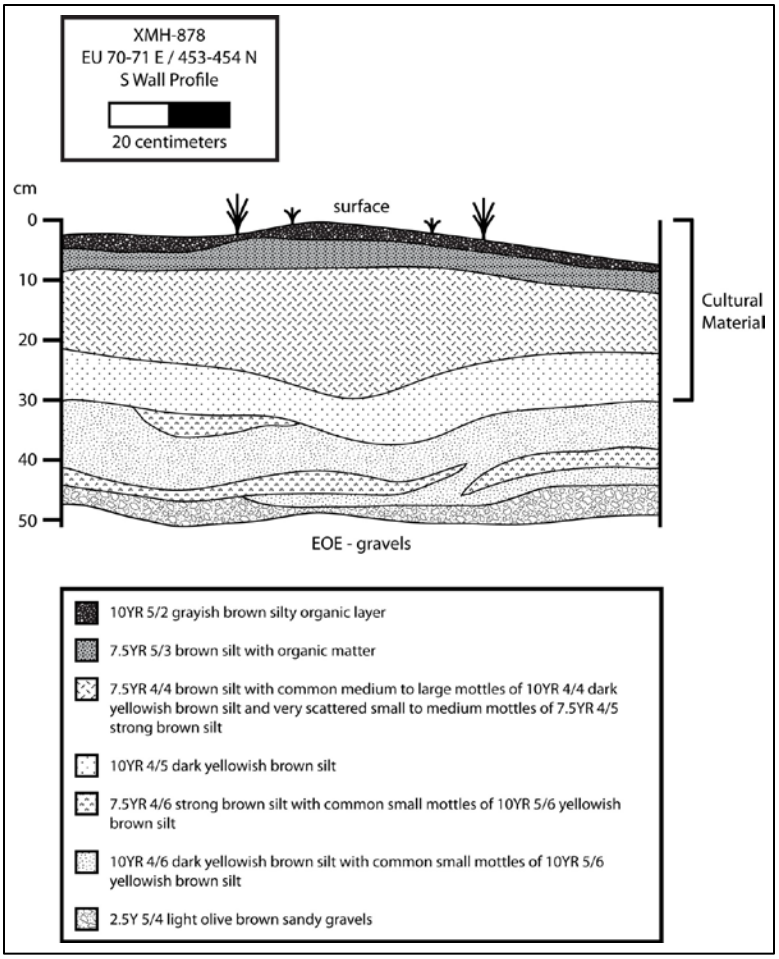

Figure 11. XMH-00878 stratigraphy

Table 2. Lithic assemblage recorded from XMH-00878 in 2009

Artifact Class	**Frequency**
Projectile point fragments	1
Bifaces fragments	7
End scraper	3
Scraper fragment	1
Unifaces	1
Unifaces fragment	1
Retouched flakes	4
Tci thos	4
Microblade core tab	6
Microblades	123
Crested blade	1
Blade fragment	1
Burin spalls	1
Flake cores	1
Flakes	2042
Total	**2198**

XMH-00907

[redacted]

Determination: Not Evaluated

Site XMH-00907 is located on the southern end of a long north-south trending glacial moraine (Figure 12) at UTM coordinates Zone 6 [redacted] Based on the results of the survey and testing during the 2008 field season, the site area was estimated at approximately 10m x 20m.

Investigations at the site during the 2008 investigations produced 15 total artifacts, including 11 complete or fragmentary microblades, 2 microblade core rejuvenation flakes, and 2 tertiary flakes (UA2011-405). One flake made of tan siltstone was recovered from the surface; the rest of the artifacts were found in a buried context from one shovel test pit (out of 40 excavated). All of the microblades are of the same reddish brown chert. Stratigraphy in the positive shovel test pit consists of 3 cm of organic material overlying 5-7 cm of grayish brown silt. Beneath this is dark yellowish-brown silt, 10 cm thick, which is in turn, overlying poorly sorted gravels (till). The cultural material was encountered at depths of 10-20 cm BS.

Archaeological data recovery excavations at site XMH-00907 were conducted between 7/16/2009 and 7/23/2009. Six square meters were excavated in 1m x 1m units during the 2009 field season (Figure 13). A total of four excavation units were placed around a previously excavated shovel test containing 13 microblades of reddish-brown chert and one brown chert flake to determine the extent of the microblade reduction station. Two additional units were placed at high points on the site with an open viewshed. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 30 cm to 50 cm BS. Stratigraphic layers consists of root mat on top of loosely compacted 5YR 5/2 dark grayish-brown, organically rich loess, with an average depth of 5cm and 7.5 YR 5/3 brown silt with organic matter. Below this organic horizon, the sediment consists of moderately compacted 10YR 4/3 brown loess and with 10YR 5/4 yellowish-brown loess and 10YR 4/6 dark yellow brown loess. Glacial till is encountered below this loess deposit and consists of a 10YR 4/6 dark yellowish-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 14).

A total of 13 lithic artifacts were recovered within two excavation units adjacent to the positive shovel test (UA2011-289). Artifacts include 12 microblades, with only two pieces of debitage. Rhyolite and chert were the predominant material types.

The highest concentration of artifacts came from unit N500/E120, which contained 11 microblades.

Figure 12. General view of site XMH-00907, facing south

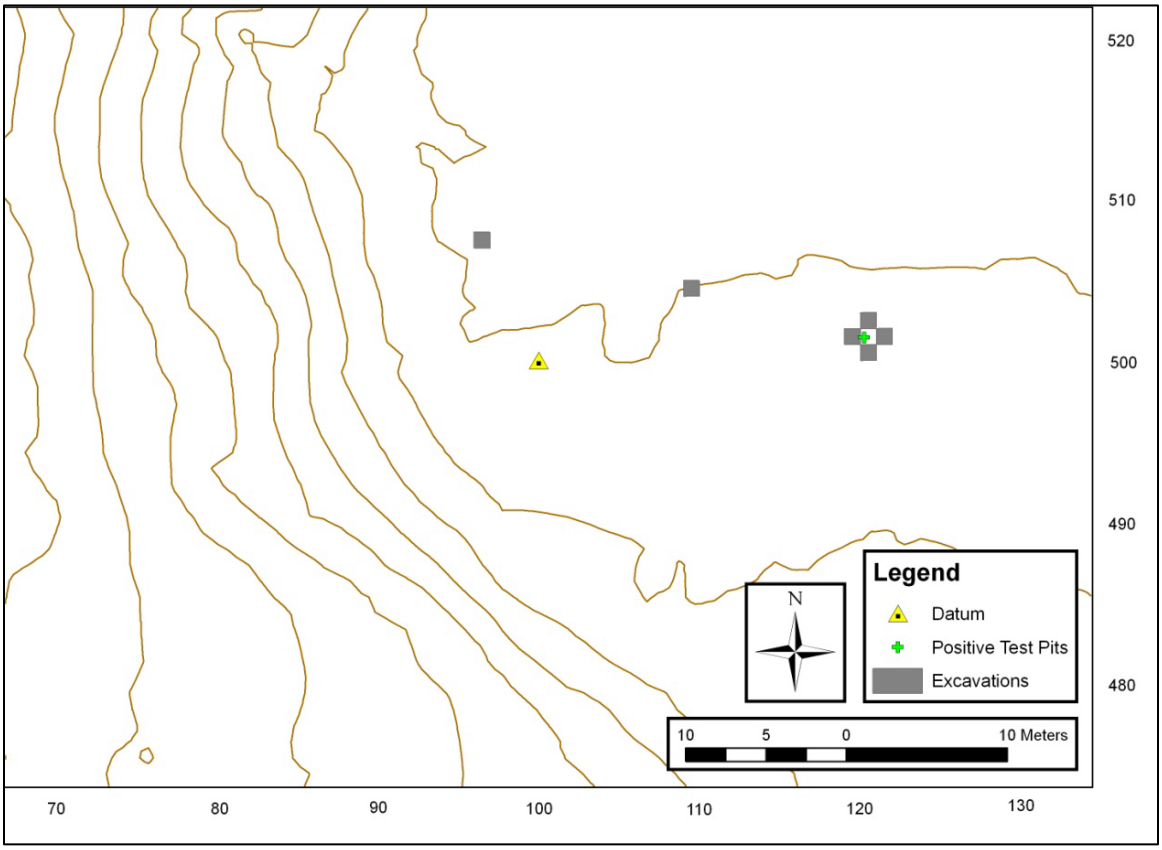

Figure 13. Map of XMH-00907

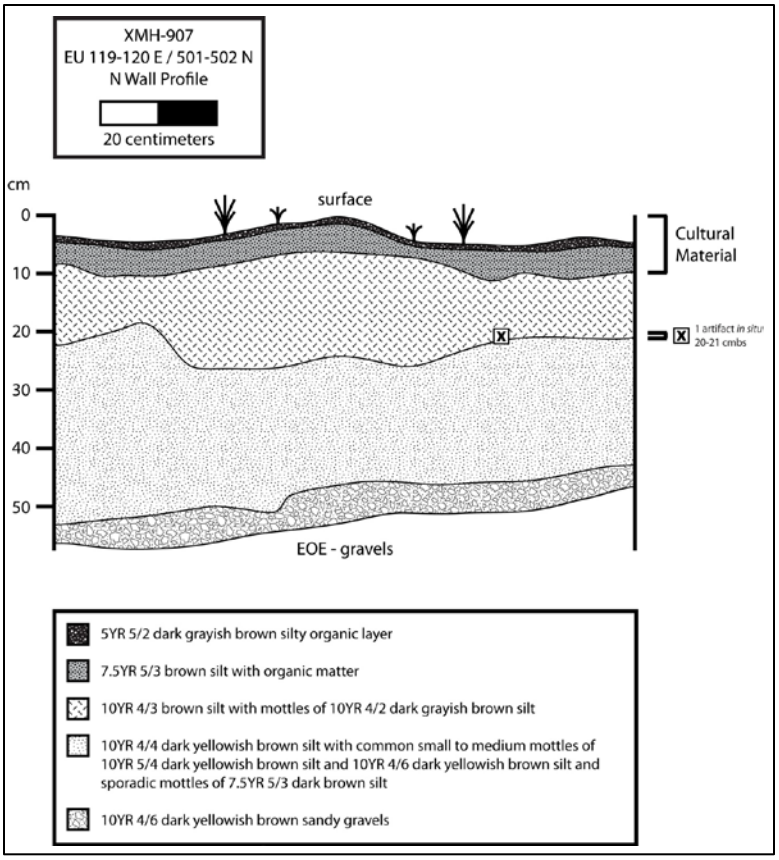

Figure 14. XMH-00907 stratigraphy

XMH-00910/911

[redacted]

Determination: Not Evaluated

Site XMH-00910 is located on the top of a prominent ridge line (Figure 15) at UTM coordinates Zone 6, [redacted]. A concentration of lithic material located roughly 80 m to the north on the south face of the same ridge was originally given the AHRS site number XMH-00911. A Phase II evaluation recovered artifacts along the ridge between the two loci of material, and Site XMH-00911 was incorporated into site XMH-00910. Based on the results of survey and testing, the site area is estimated to be approximately 130m x 65m. The resulting site is roughly 150m x 50m.

Archaeological data recovery at site XMH-00910/XMH-911 was conducted between 6/15/2009 and 7/02/2009. One hundred-sixty square meters were excavated in 1m x 1m units during the 2009 field season (Figure 16, Figure 17). Excavation units were placed across the northeast-southwest trending moraine within areas containing previously located surface artifacts and positive shovel tests. Additionally, units were placed within the site boundary to determine artifact distributions and activity areas within the site. The units were excavated in 10-cm levels until glacial till.

Soil deposition varied across the site, with excavation depths ranging from 10 cm to 55 cm BS. Soil in this area consists of root mat on top of a loosely compacted 10YR 4/2 dark grayish-brown, organically rich loess and 7.5 YR 5/3 brown silt with organic matter with an average depth of 5cm. Below this organic horizon, the soil consists of moderately compacted 10YR 4/6 yellowish-brown loess, then 7.5YR

4/4 brown loess mottled with of 10YR 4/4 dark yellow-brown silt. Glacial till is encountered below this loess deposit and consists of a 2.5Y 5/4 light olive-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 18). One piece of charcoal was excavated from 45cm BS. It provided a date of 8500±50 BP (Beta 271223).

A total of 927 lithic artifacts were recovered, including 41 surface finds (UA2011-291). Artifacts include lithic debitage and 21 tools including 1 biface, 1 projectile point, and 6 scrapers. Material types include basalt, chert, quartz, rhyolite and obsidian, a non-locally occurring material. Eighteen samples of obsidian debitage were submitted for XRF sourcing. One sample came from Batza Tena, 13 from Wiki Peak, and 5 were not assigned to a source because they were too small to provide reliable results.

Figure 15. General view of site XMH-00910, facing east

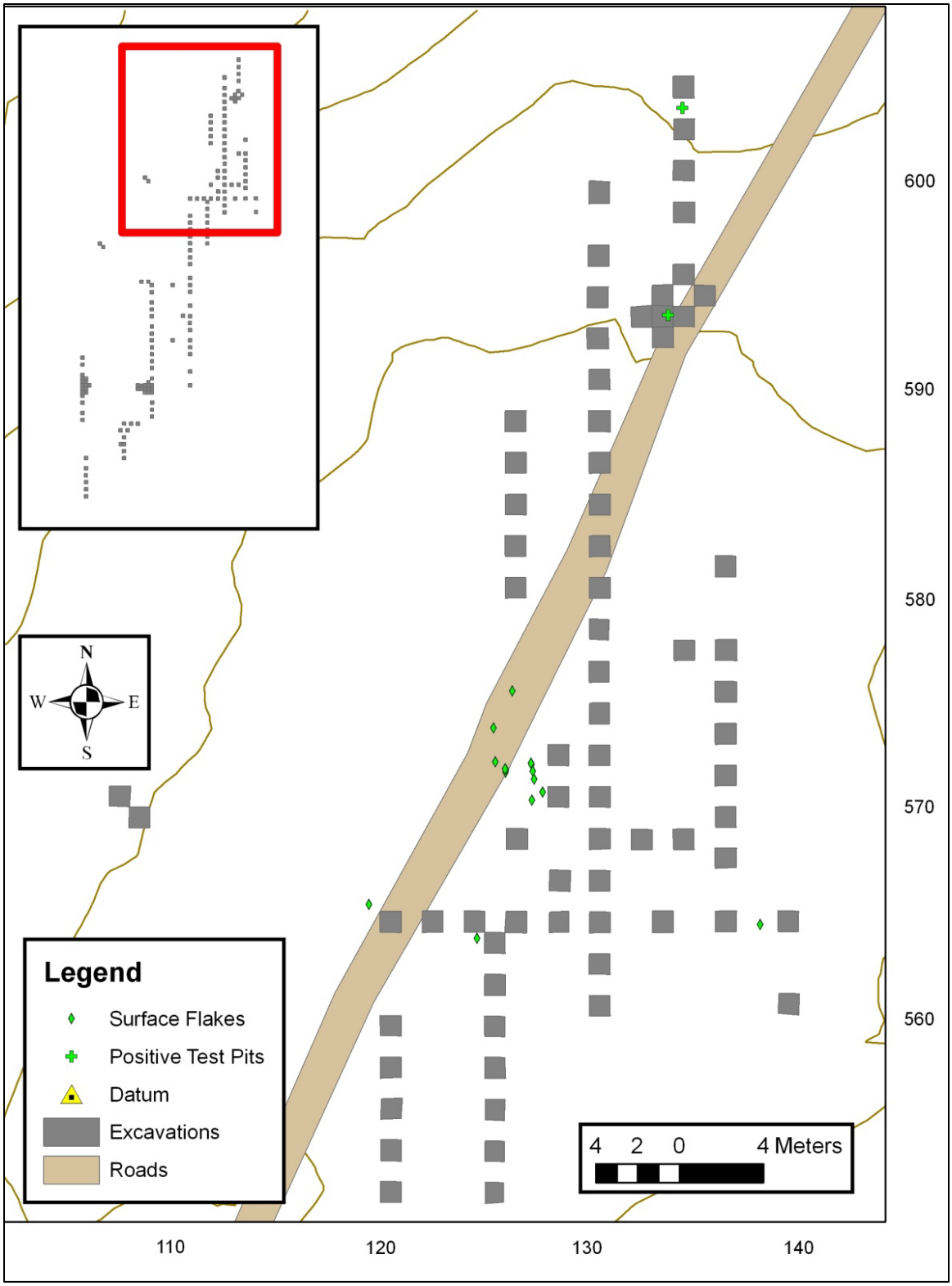

Figure 16. Map of XMH-00910, north

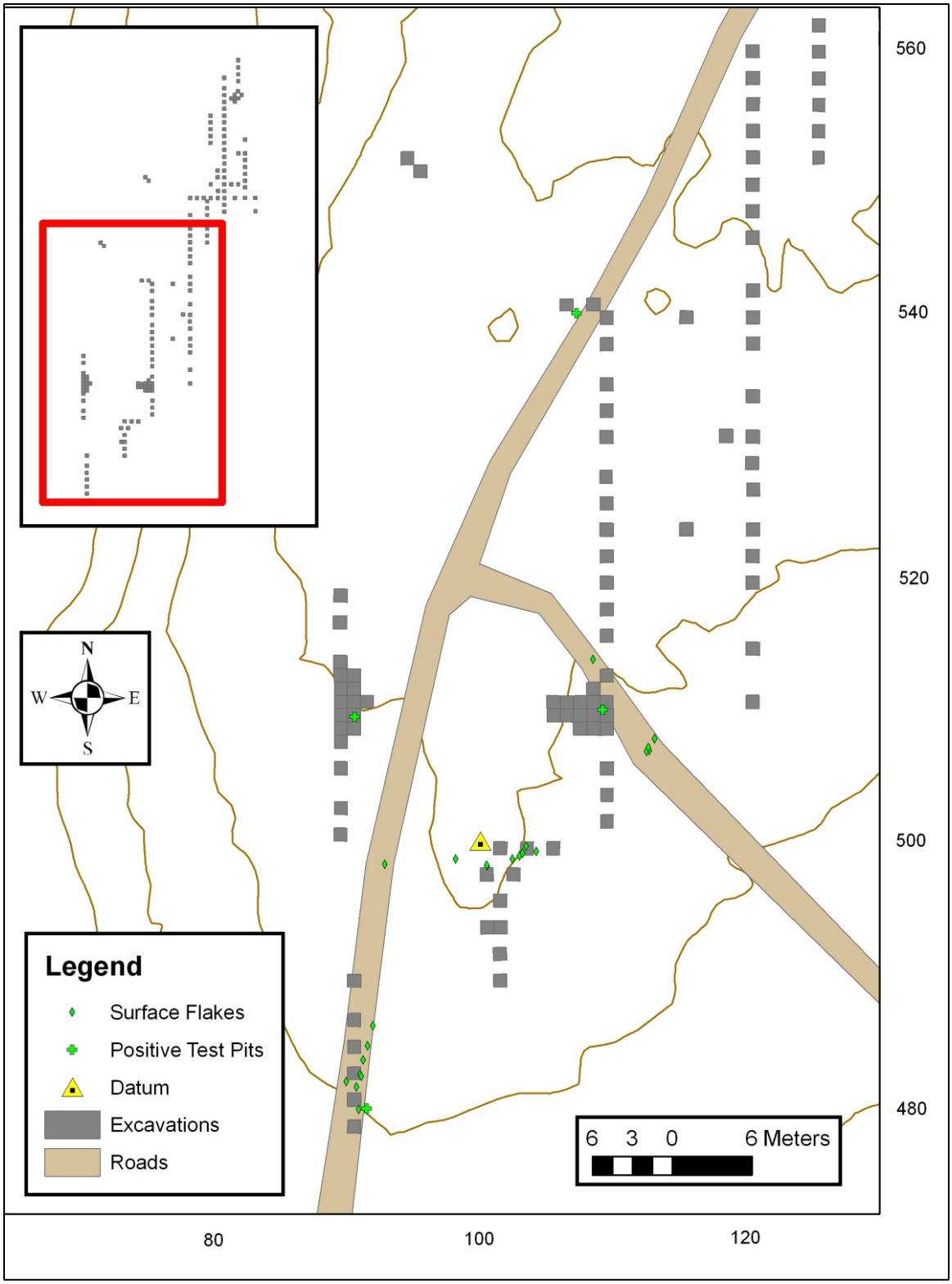

Figure 17. Map of XMH-00910, south

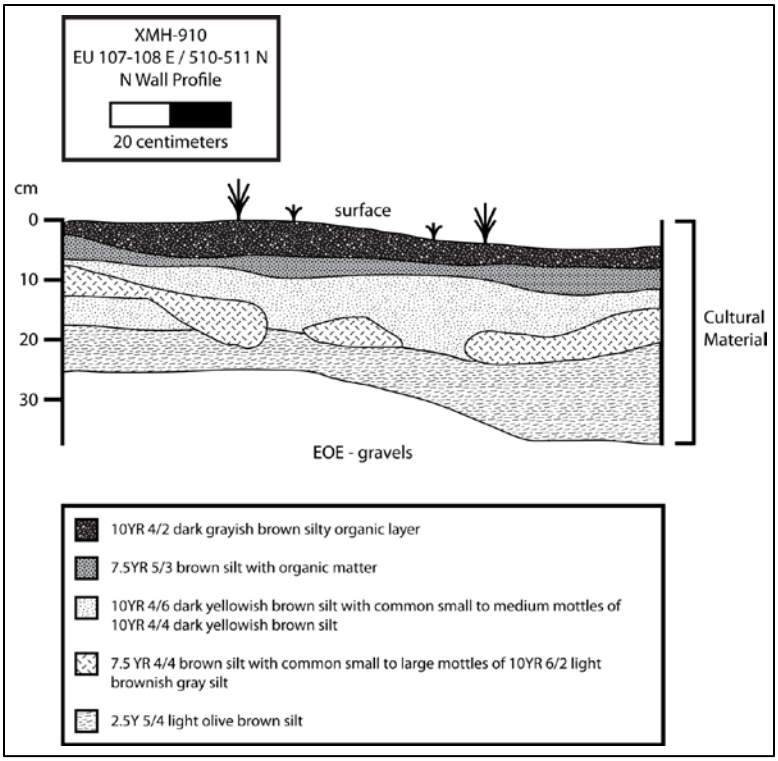

Figure 18. XMH-00910 stratigraphy

Table 3. Lithic assemblage recorded from XMH-00910 in 2009

Artifact Class	Frequency
Projectile point	1
Biface	1
Bifaces fragment	1
End Scrapers	6
Scraper fragment	1
Retouched flakes	10
Microblade	1
Flakes	906
Total	927

XMH-00915

[redacted]

Determination: Not Evaluated

Site XMH-915 is located on the crest of a northeast-southwest trending moraine (Figure 19) at UTM coordinates Zone 6, [redacted] (WGS 84).

During the 2008 investigations at this site, 55 total artifacts were recovered from surface and subsurface contexts including flakes, microblades, a projectile point base, and a scraper (UA2011-248). Material types from the site include basalt, several varieties of chert, obsidian, quartz crystal and rhyolite.

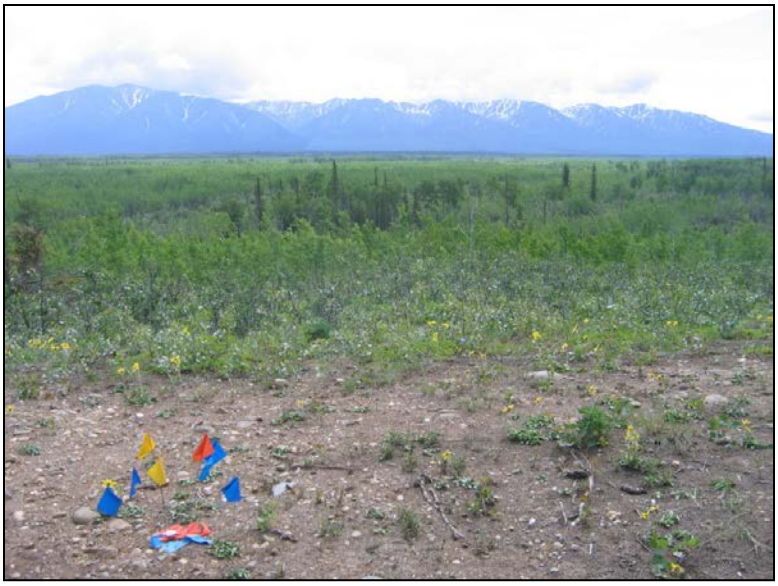

Figure 19. General view of site XMH-915, facing southeast

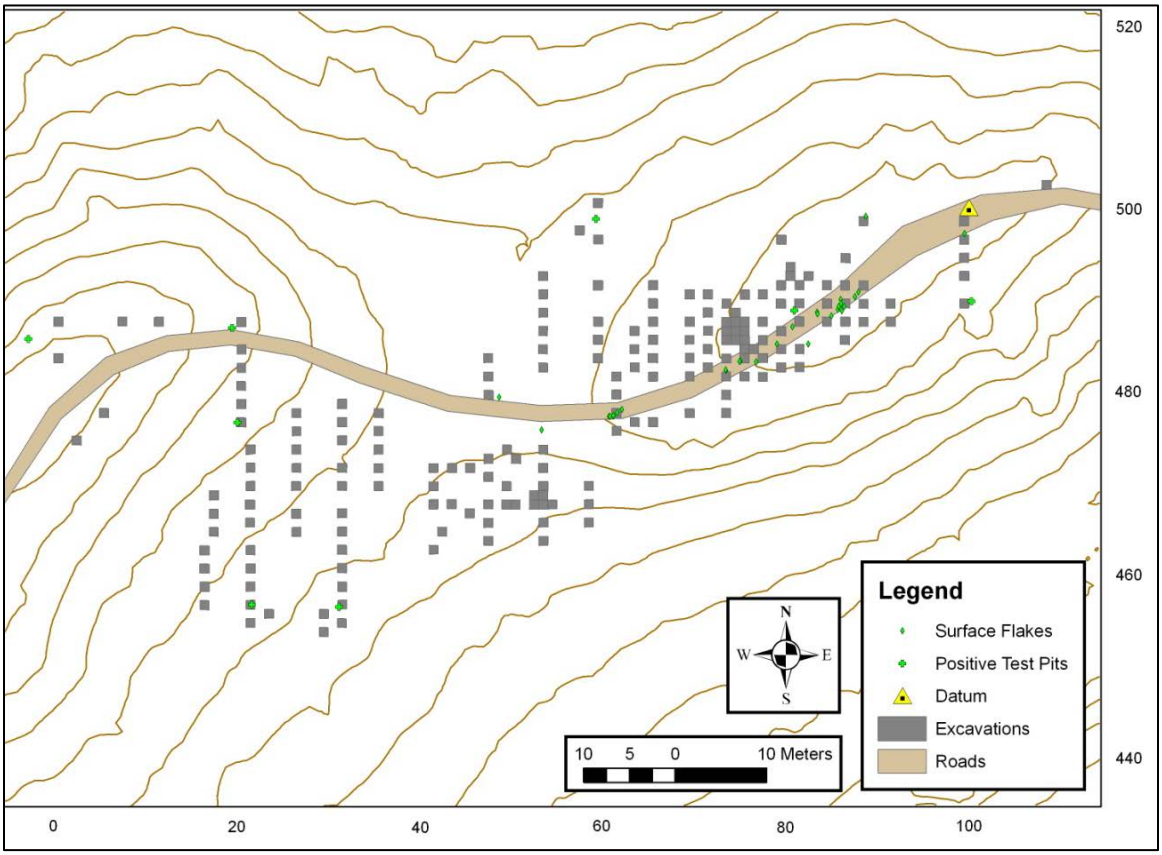

Figure 20. Map of XMH-00915

Archaeological data recovery excavations at site XMH-915 were conducted between 7/24/2009 and 8/20/2009. One hundred-eighty-five square meters were excavated in 1m x 1m units during the 2009 field season (Figure 20). Excavation units were placed across the northeast-southwest trending moraine within areas containing previously located surface artifacts and positive shovel tests. Additional units were placed within the site boundary to determine artifact distributions and activity areas within the site. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Stratigraphy consists of a surface organic layer (10YR 2/1 black silty organic layer) up to 10 cm thick overlying 10YR 5/2 grayish brown silt with organic matter, 10YR 3/4 dark yellowish-brown silt, 10YR 4/4 dark yellowish-brown silt. Glacial till is encountered below this silt deposit and consists of a 10YR 4/6 dark yellowish-brown sandy gravel with some cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 21). Two mid-Holocene age radiocarbon dates were gained from charcoal associated with cultural material 37 and 39 cm BS. Beta 271224 was dated to 5840±40 BP and Beta 272086 provided an age of 5710±40 BP.

A total of 4935 lithic artifacts were recovered, including 34 surface finds (UA2011-295). Artifacts include lithic debitage and 635 tools and diagnostics (Table 4). Material types also include basalt, chert, quartz, rhyolite and obsidian, a non-locally occurring material. Forty-two samples of obsidian including one projectile point and fifteen microblades were submitted for XRF sourcing. Of these, 9 were sourced to Batza Tena, 16 to Wiki Peak, 1 to Mt. Edziza, and one was unassigned.

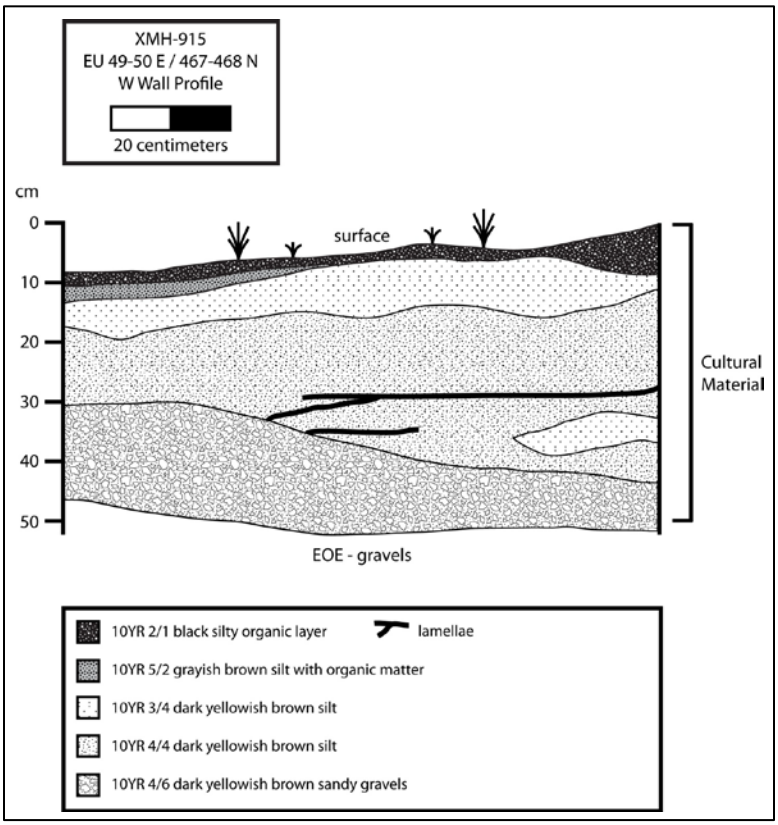

Figure 21. XMH-00915 stratigraphy

Table 4. Lithic assemblage recorded from XMH-00915 in 2009

Artifact Class	Frequency
Projectile points	5
Projectile point fragments	5
Bifaces Fragments	9
End scraper	3
Unifaces fragment	6
Retouched flakes	39
Tci thos	12
Microblade core	7
Microblade core tab	6
Microblade core fragments	3
Microblade core rejuvenation flake	1
Microblades	570
Crested blade	3
Blade	1
Burin	3
Flake cores	2
Flakes	4263
Total	**4933**

XMH-00917

[redacted]

Determination: Not Evaluated

Site XMH-00917 is located on the northwestern edge of a knoll (Figure 22) at UTM coordinates Zone 6, [redacted] (WGS 84).

Figure 22. General view of site XMH-917, facing south

Archaeological data recovery excavations at site XMH-917 were conducted between 8/21/09 and 8/27/09. Six square meters were excavated in 1m x 1m units during the 2009 field season (Figure 23). Excavation units were placed at open level areas throughout the site and adjacent to the only positive shovel test. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

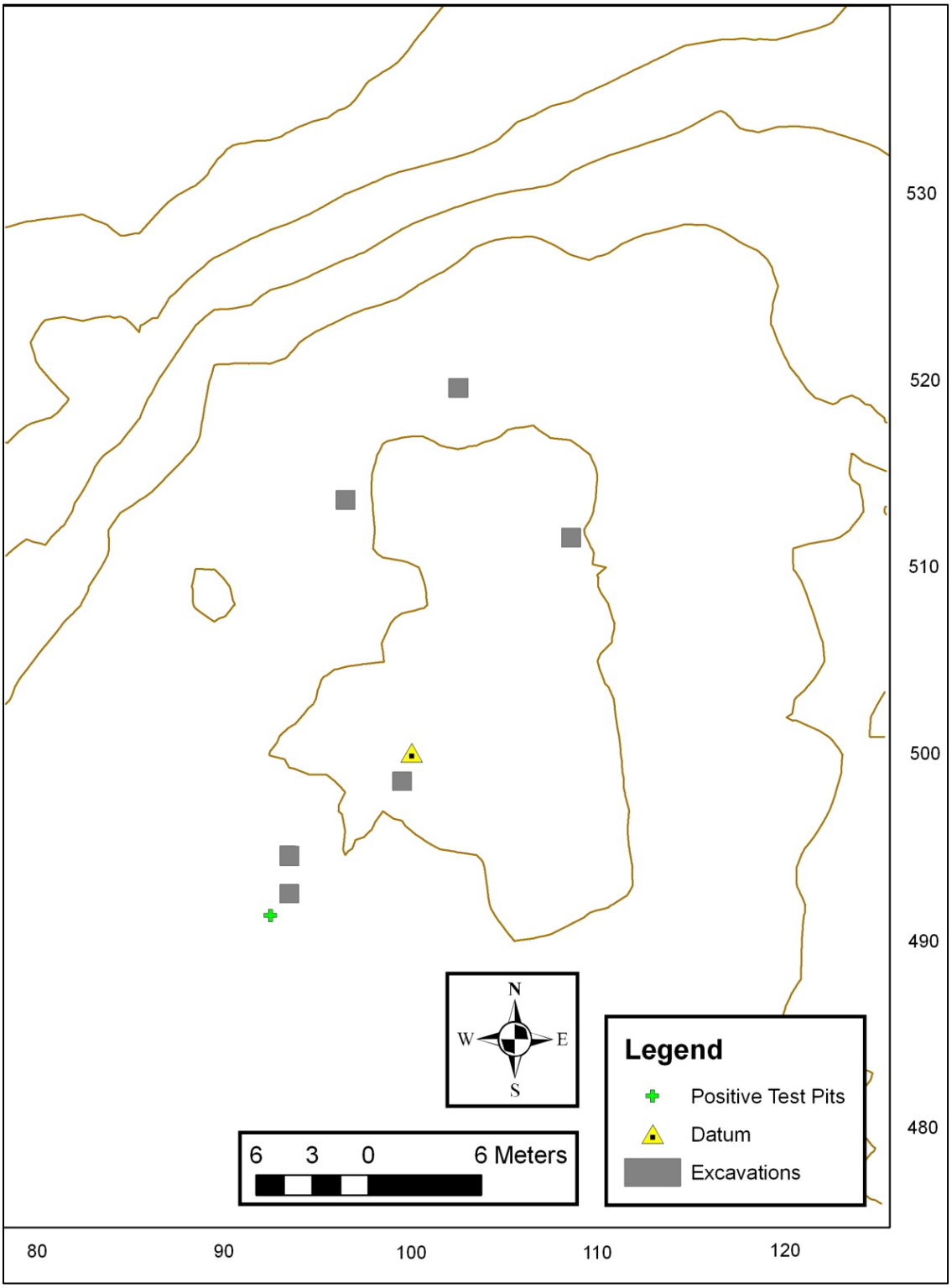

Figure 23. Site map of XMH-00917

Soil deposition varied across the site. Excavation depths ranged from 20 to 50 cm BS. Four distinct stratigraphic layers were observed: a root/moss mat on top of a loosely compacted 10YR 2/1 black, organically rich loess, with an average depth of 5cm; a moderately compacted 2.4YR 4/4 olive-brown loess; a 7.5 YR 3/3 dark yellowish-brown loess; finally a glacial till of 10YR 4/6 yellow-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 24).

A total of 349 lithic artifacts and 2,600+ bone fragments were recovered, and a hearth feature with charcoal was excavated (UA2011-297). The lithic artifacts include lithic debitage and 11 tools and diagnostics including one biface fragment, one scraper (in three fragments), a large sandstone biface and one hammerstone. The predominant material types are chert, basalt and rhyolite.

Hearth charcoal from 30 and 41cm BD dated to 2010±40 BP (Beta 271227) and 1420±40 BP (Beta 271226).

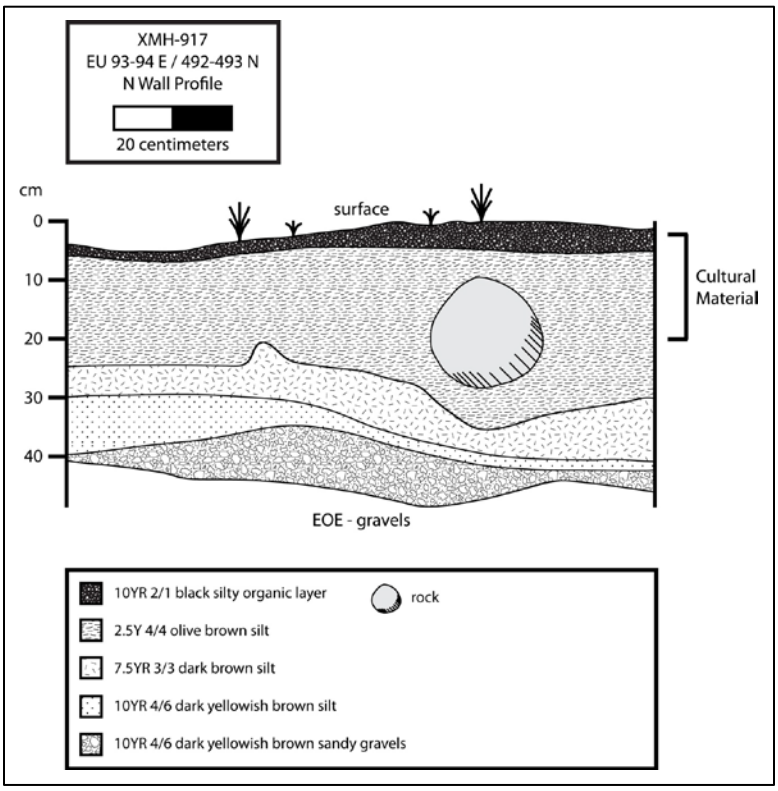

Figure 24. XMH-00917 stratigraphy

XMH-00923

[redacted]

Determination: Not Evaluated

Site XMH-00923 is situated on two high points on a relatively narrow east-west trending glacial moraine (Figure 25) at UTM coordinates Zone 6, [redacted] (NAD27). It was

originally identified as two separate sites—XMH-00923 (Locale A) and XMH-00922 (Locale B) — but the sites were combined after 2008 Phase II evaluation (Figure 26).

In 2008, 35 lithic artifacts were recovered from two locales (UA2011-408). Artifacts found at Locale A have only been found on the surface. These include: a brown rhyolite biface fragment, a black chert biface fragment, and 14 chert flakes. Locale B has both surface and sub-surface artifacts. The surface artifacts include two white and black chert flakes and 12 red chert flakes. The sub-surface component includes five basalt flakes and a basalt biface.

Archaeological data recovery excavations at site XMH-00923/922 were conducted between 5/28/2009 and 6/15/2009. Sixty-five 1m x 1m units were excavated during the 2009 field season. Excavation units were placed along an east-west trending glacial moraine extending from a high point on the ridge to the east to a high point on the ridge to the west. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Figure 25. General overview of site XMH-00923, facing east

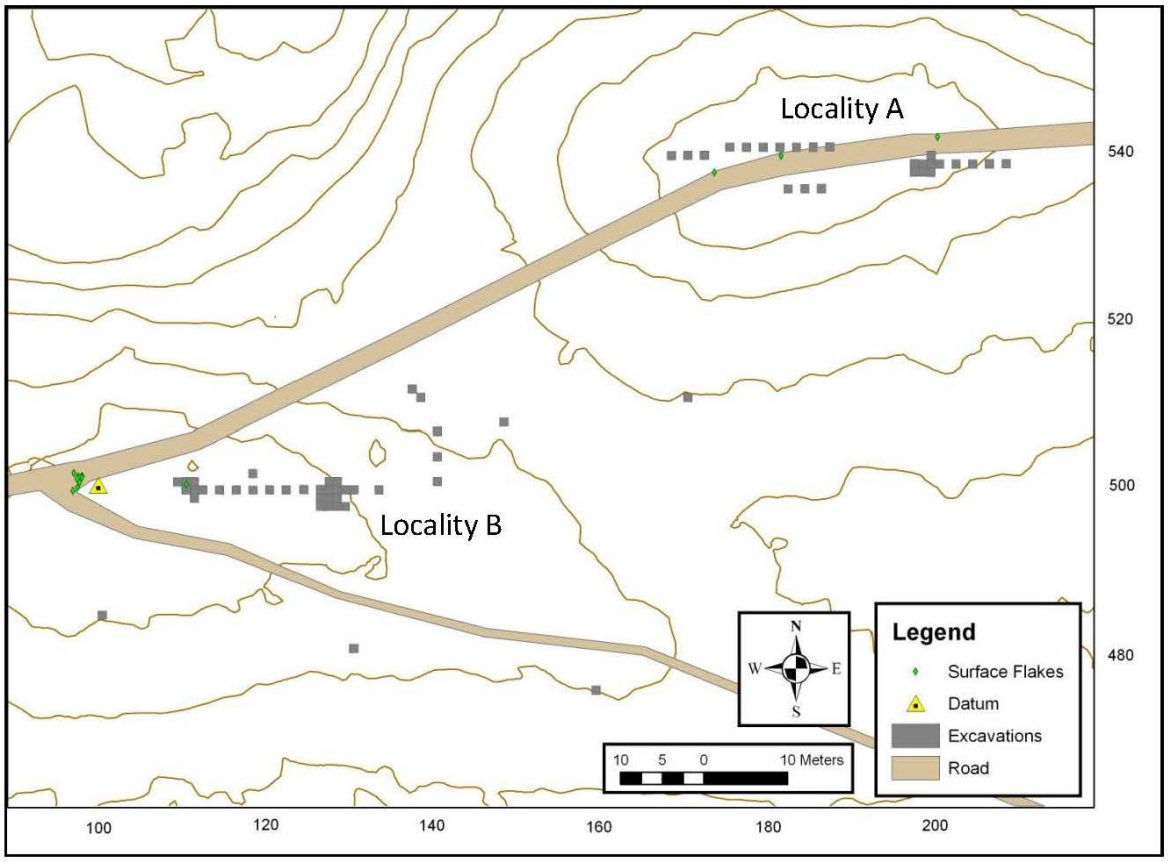

Figure 26. Site map of XMH-00923

Soil deposition varied across the site. Excavation depths ranged from 10 cm to 90 cm BS. Four distinct stratigraphic layers were observed: a root/moss mat on top of loosely compacted 10YR 5/2 dark grayish-brown, organically rich loess, with an average depth of 5cm; a moderately compacted 7.5YR 5/3 brown loess; a 7.5YR 4/4 brown silt loam, mottled with 10YR 4/4 dark yellowish-brown loess; and a base of glacial till consisting of 10YR 4/6 yellow-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 27).

Over 1,158 lithic artifacts were recovered, including 12 surface finds (UA2011-301). Artifacts include 3 bifaces and nine retouched flakes. The remaining artifacts are lithic debitage of basalt, chert, quartz and rhyolite.

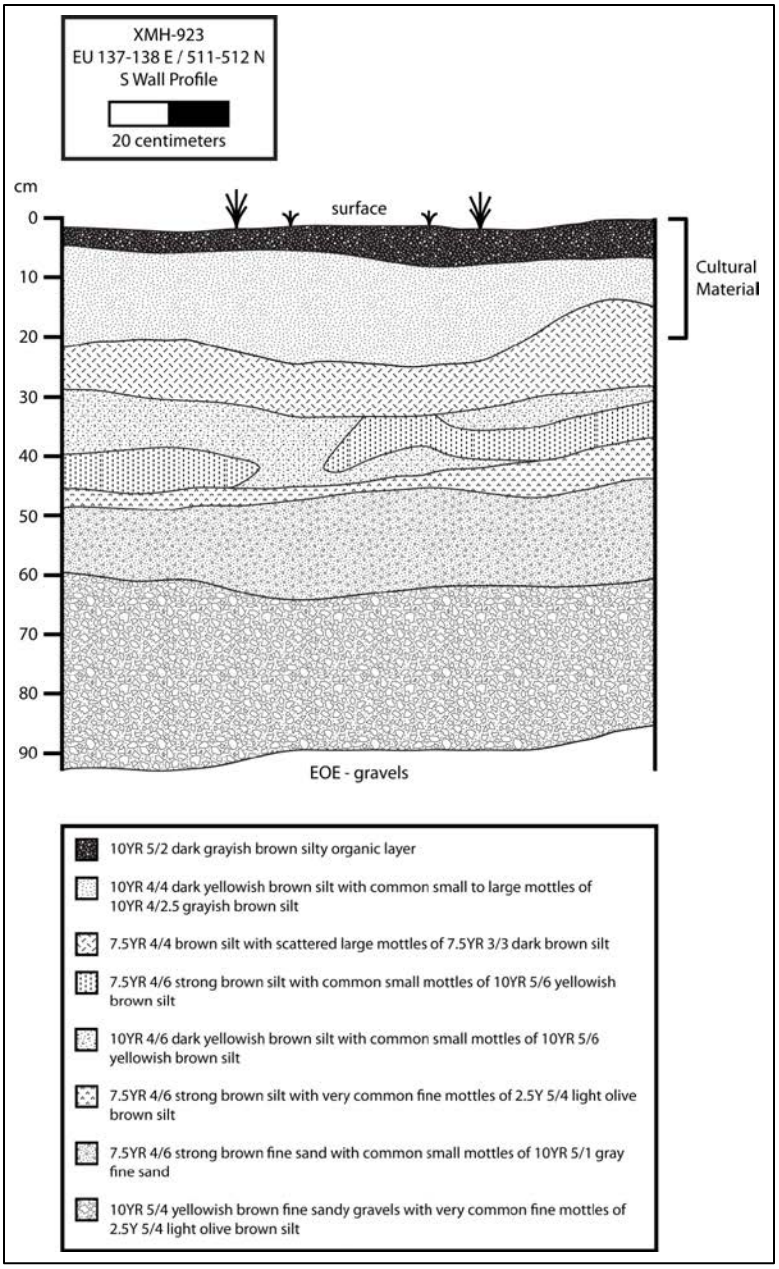

Figure 27. XMH-00923 stratigraphy

XMH-00925

[redacted]

Determination: Not Evaluated

Site XMH-00925 is located on small southeast-facing knoll at UTM coordinates Zone 6, [redacted] (WGS 84) (Figure 28). Initial evaluation in 2008 recovered 17 total artifacts (UA2011-410). Eight of these were found on the surface, and nine were recovered from buried contexts. The assemblage includes one gray chert retouched flake found on the surface. All of the flakes are made of gray chert, black chert or basalt.

Archaeological data recovery excavations at site XMH-00925 were conducted between 6/22/2009 and 6/30/2009. Twenty-five 1m x 1m units were excavated during the 2009 field season (Figure 29). Excavation units were placed throughout the small hilltop, primarily in areas containing surface artifacts and positive shovel tests. Additional units were placed within the site boundary to determine artifact distributions and activity areas within the site. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 20 cm to 55cm BS. Soil in this area consists of root/moss mat on top of a loosely compacted 10YR 4/2 dark grayish-brown, organically rich loess, with an average depth of 5cm. Below this organic horizon, the soil consists of moderately compacted loess, with colors ranging from 10YR 4/3 brown to 7.5YR 5/4 strong brown loess mottled with 10YR 5/6 yellow-brown silt. Glacial till is encountered below this loess deposit and consists of 10YR 4/4 dark yellowish-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 30). One radiocarbon date (Beta 271228) of 5560±40 BP came from charcoal 31 cm BD.

Over 486 lithic artifacts were recovered, including 10 surface finds. Artifacts include lithic debitage, one chert end scraper, one projectile point and 23 microblades (UA2011-303) (Table 1). Material types include basalt, chert, quartz, rhyolite and obsidian, a non-locally occurring material. Fourteen samples of obsidian artifacts, including ten microblades, were submitted for XRF sourcing. None of these were large enough to be able to assign a source reliably.

Figure 28. General view of site XMH-00925, facing west

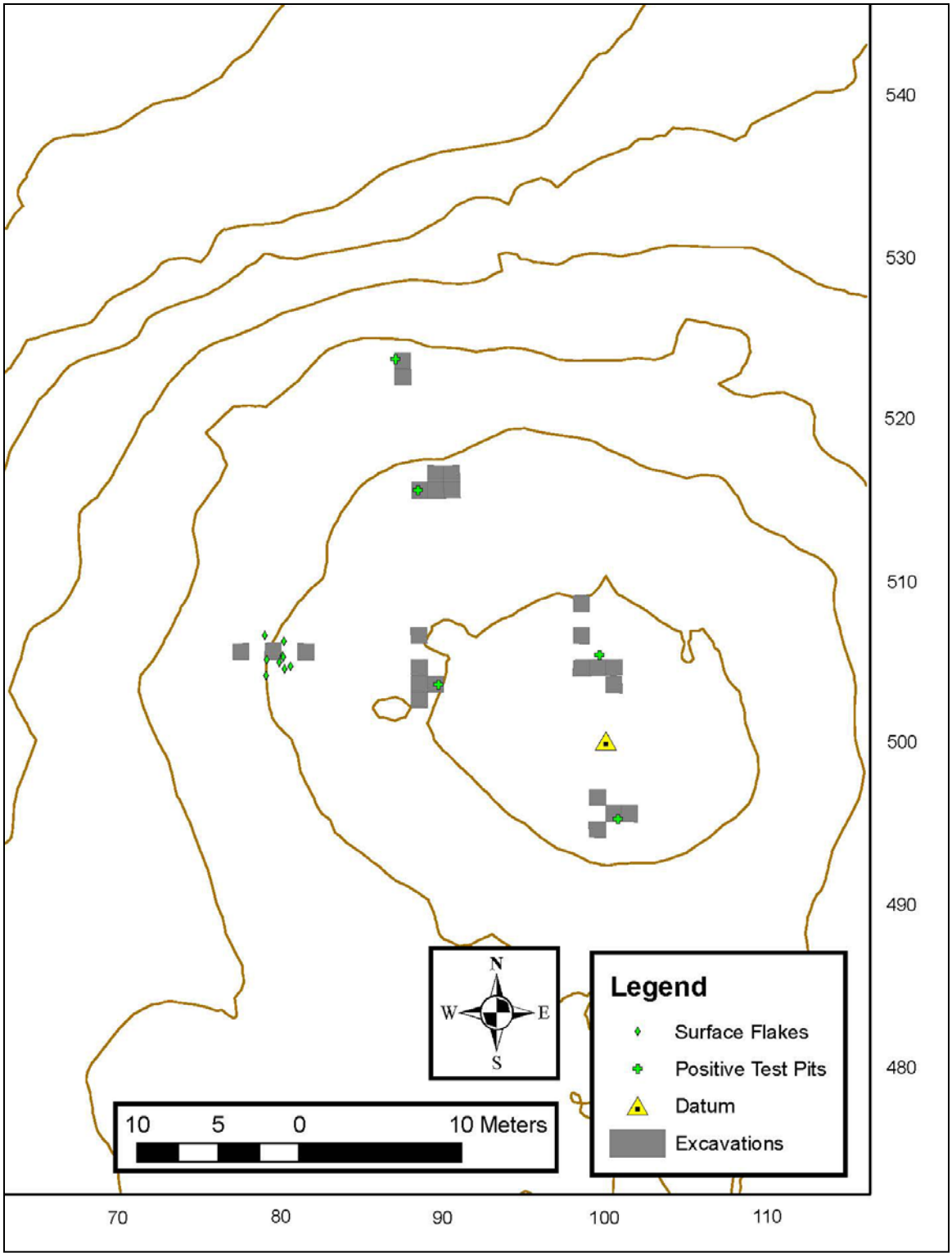

Figure 29. Site map of XMH-00925

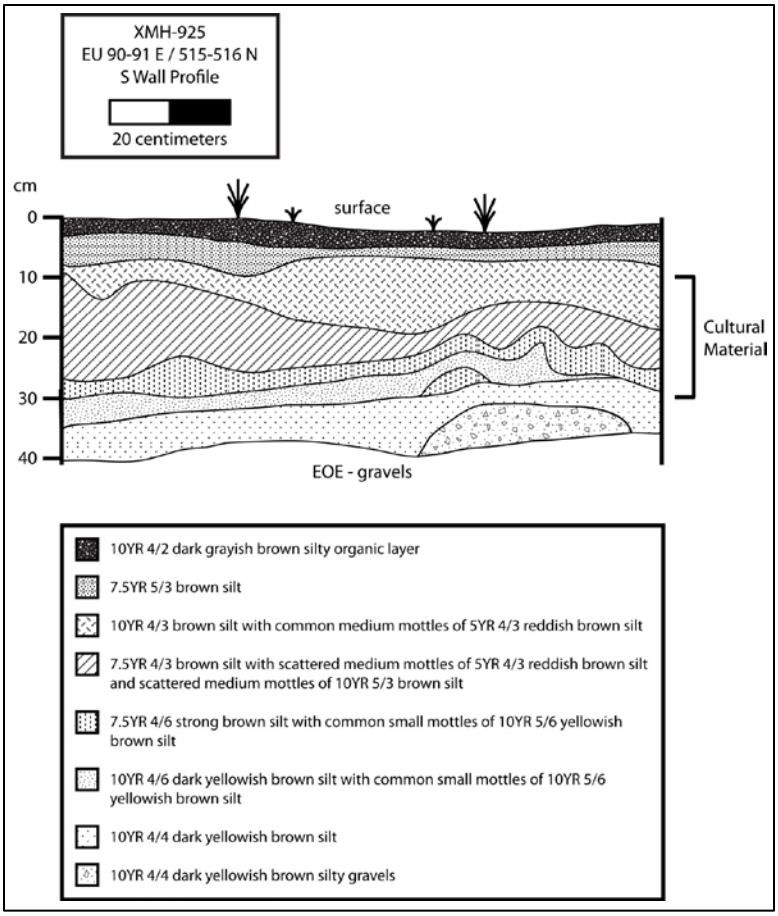

Figure 30. XMH-00925 stratigraphy

Table 5. Lithic assemblage recorded from XMH-00925 in 2009

Artifact Class	Frequency
Projectile point	1
Biface fragment	1
End scraper	1
Retouched flake	1
Microblade core tablets	2
Microblades	23
Flakes	457
Total	**486**

XMH-00945

[redacted]

Determination: Eligible (2004)

Site XMH-00945 is located on the crest of a northwest-southeast trending glacial moraine (Figure 31) at UTM coordinates Zone 6, [redacted] Archaeological data recovery

excavations at site XMH-945 were conducted between 7/13/2009 and 7/27/2009. Fifty-five 1m x 1m units were excavated during the 2009 field season. Excavation units were placed throughout the northwest-southeast trending glacial moraine, primarily in areas containing surface artifacts and positive shovel tests (Figure 32). The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 15 cm to 60 cm BS. Stratigraphy at the site exhibited four distinct layers: (Layer 1) root/moss mat on top of a loosely compacted 10YR 5/2 dark grayish-brown, organically rich loess, with an average depth of 5cm; (Layer II) moderately compacted 7.5YR 3/3 brown loess; (Layer III) a 7.4YR 4/3 brown silt loam, mottled with a 10YR 5/2 grayish-brown loess; (Layer IV) glacial till, a 10YR 4/6 dark yellowish-brown sandy loess with a very high density of gravels and cobbles (Figure 33). These transitions occurred at varying depths and could be sharp or gradual. One radiocarbon date of 1230±40 BP was produced from charcoal in cultural levels (Beta 271229).

A total of 1,038 lithic artifacts were recovered, including one projectile point base, 11 biface fragments, and 13 microblades (Table 6) (UA2011-305). Material types include basalt, chalcedony, chert, quartz and rhyolite.

Figure 31. General view of site XMH-00945, facing southwest

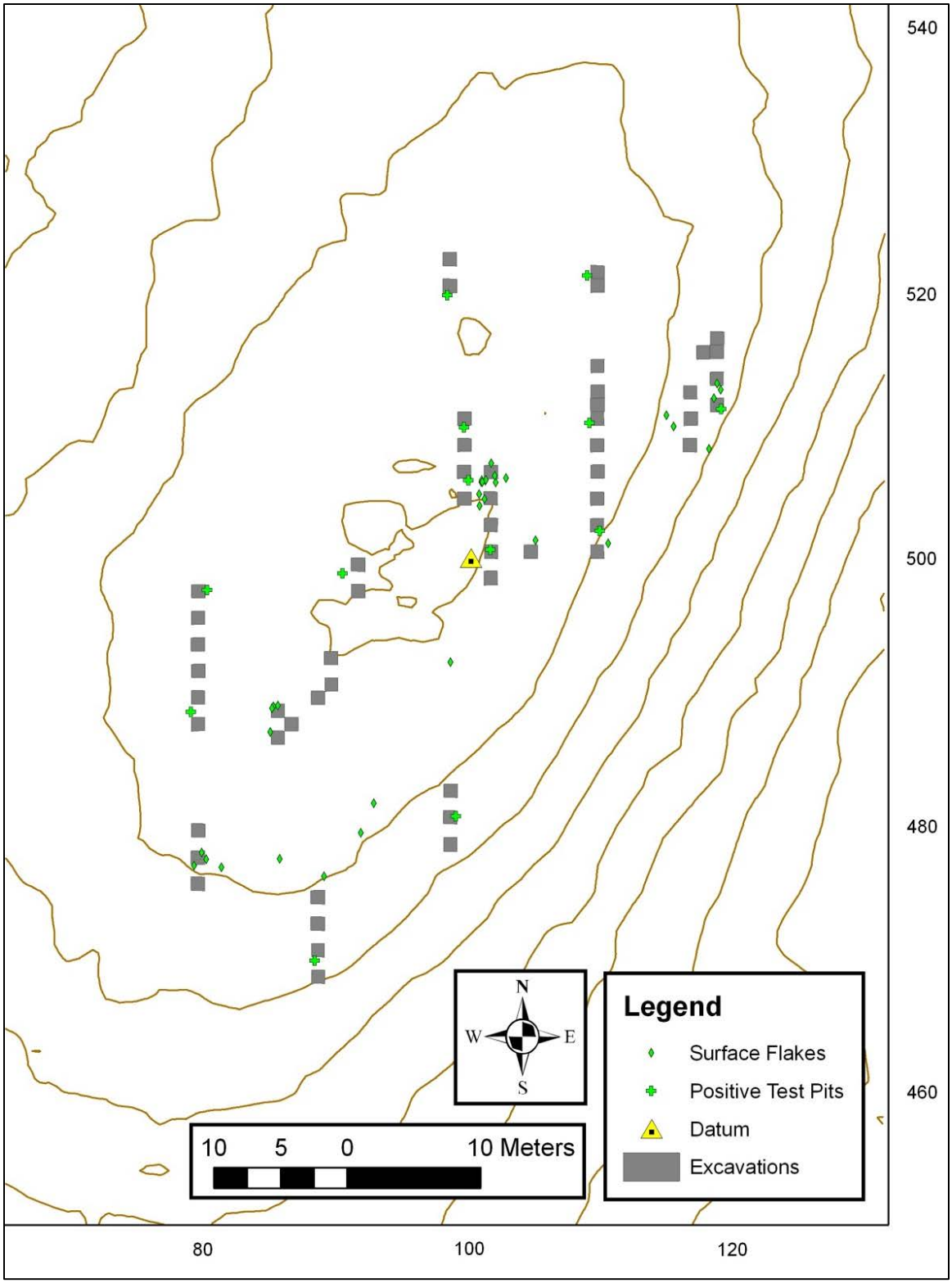

Figure 32. Site map of XMH-00945

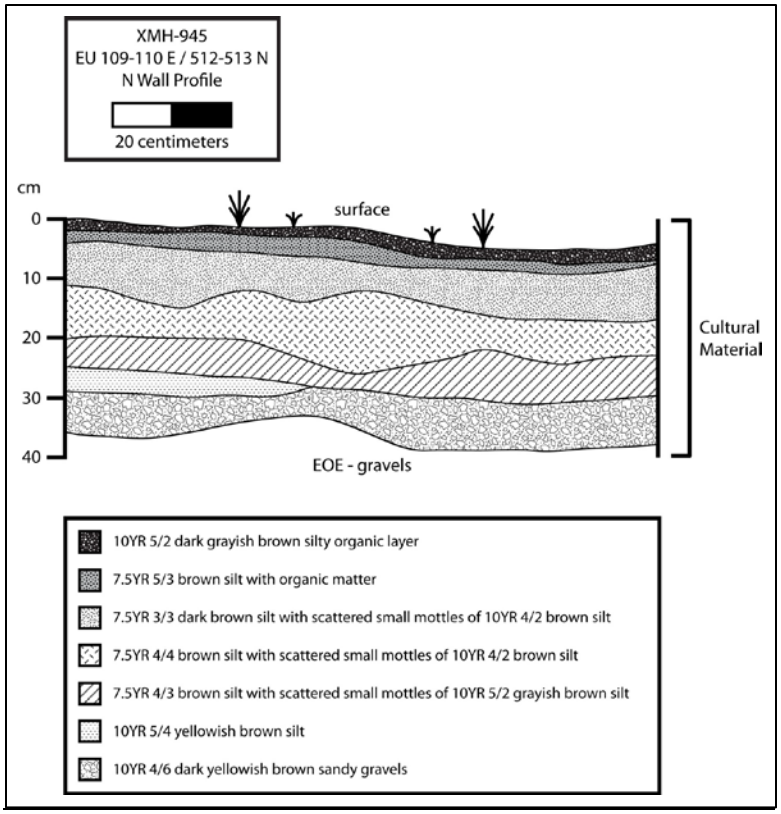

Figure 33. XMH-00945 stratigraphy

Table 6. Lithic assemblage recorded from XMH-00945 in 2009

Artifact Class	
Projectile point fragment	1
Biface fragments	11
Uniface fragment	3
Tci thos	1
Retouched flakes	12
Microblade core tab	1
Microblades	13
Abraidors	2
Hammerstones	2
Graver	1
Flakes	989
Total	**1,038**

XMH-01092

[redacted]

Determination: Eligible (2004)

Site XMH-01092 is located on a narrow northwest-southeast trending ridge (Figure 34) at UTM coordinates Zone 6, [redacted] (WGS 84). Phase II work located 66

artifacts in 2004, all of which were found in a buried context. Lithic material types include chert, basalt and rhyolite. The assemblage includes nine tools, including the following: two fragmentary bifaces, one scraper, one tci tho, three blades, one blade core fragment, one flake core fragment, and one hammerstone (UA2011-396). All of the artifacts were recovered from one (out of 24 excavated) shovel test pit and one 1x1m unit.

Phase III excavations at site XMH-1092 took place from 21 July 2009 to 27 July 2009 (Figure 35). Eight units in total were excavated with a yield of 25 subsurface artifacts, which consist of 23 flakes and three tools: 1 grey rhyolite blade and 2 gray rhyolite bifacial tools (UA2011-307). No surface artifacts were found.

Stratigraphy consists of five stata (Figure 36). Stratum I is an organic layer comprised of a 10YR 2/1 (black) fine silt and is found at the surface of all units excavated. Stratum II is 7.5YR 4/4 brown silt. Stratum III is an inconsistent 5YR 3/4 (dark reddish brown) silt. Stratum IV is 10YR 4/6 dark yellowish-brown silt. Stratum V consists of 10YR 5/4 yellowish-brown fine to course sand with cobble-sized inclusions. Strata I-IV are culture bearing layers. Unit depths range from approximately 30 cm to 50 cm. All excavation of units terminated at glacial till.

Figure 34. General view of site XMH-01092, facing southwest

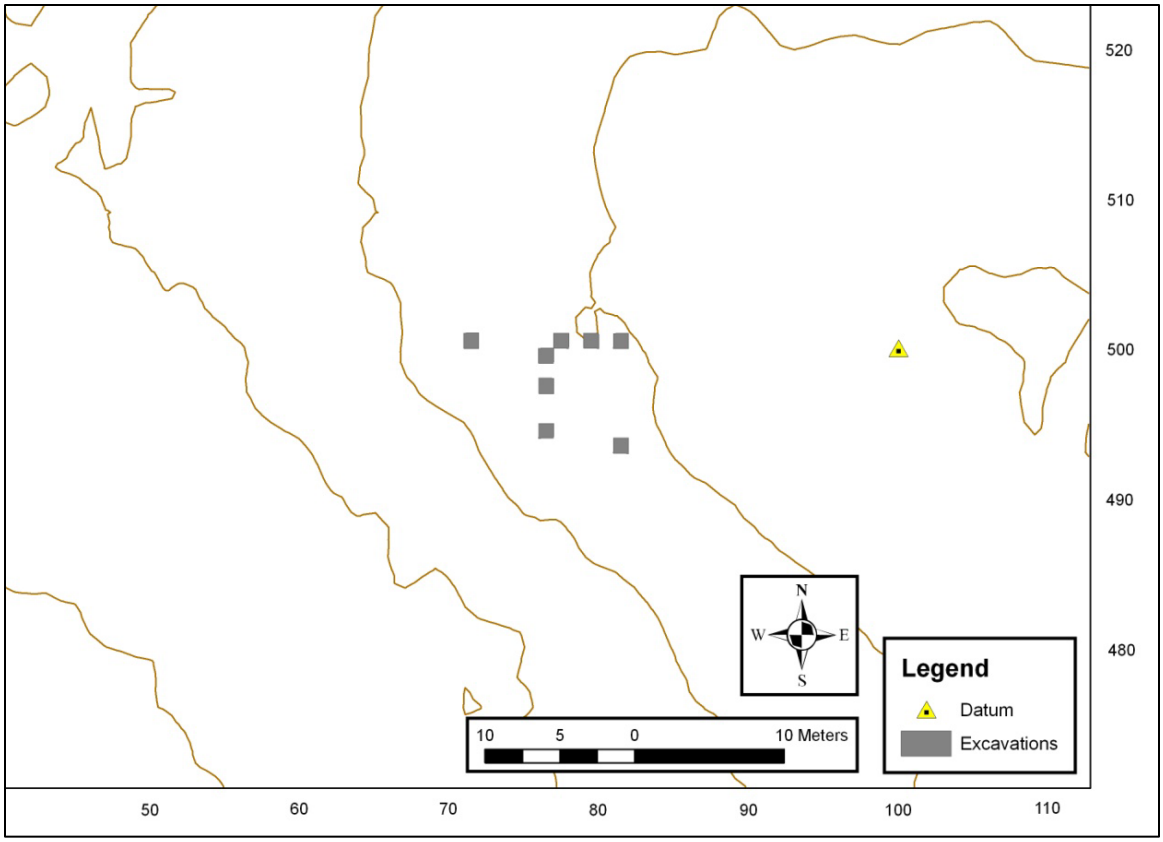

Figure 35. Site map XMH-01092

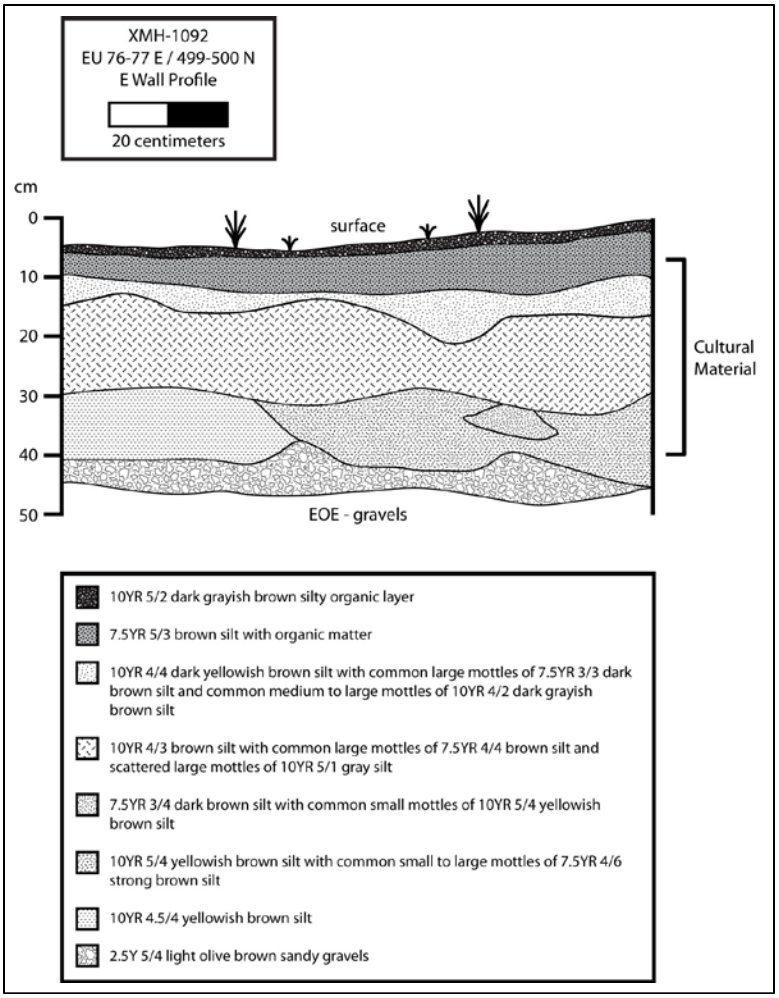

Figure 36. XMH-01092 stratigraphy

XMH-01303
[redacted]
Determination: Eligible (2006)

Site XMH-01303 is located on the crest of north-south ridge overlooking a small lake (Figure 37) at UTM coordinates Zone 6, [redacted] (WGS 84). During preliminary investigations in 2006, a total of 60 artifacts were recovered from XMH-01303 (UA2011-401). Four artifacts were found on the surface and 56 were recovered from a buried context.

Archaeological data recovery excavations at site XMH-1303 were conducted between 7/28/2009 and 8/28/2009. Forty 1m x 1m units were excavated during the 2009 field season (Figure 38). Excavation units were placed across the north-south ridge of the site. The units were excavated within several 1-m-wide trenches, two oriented north/south and three oriented east/west, through areas containing previously located surface artifacts and positive shovel tests. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Figure 37. View of site XMH-01303, facing south

Soil deposition varied across the site, with excavation depths ranging from 22 cm to 52 cm BS. Soil in this area consists of root/moss mat on top of loosely compacted 10YR 5/2 dark grayish-brown, organically rich loess, with an average depth of 5cm. Below this organic horizon, the soil consists of moderately compacted loess, with colors ranging from 5YR 3.5/4 reddish-brown to 10YR 4/4 dark yellowish-brown mottled with 7.5YR 4/4 brown. Glacial till is encountered below this loess deposit and consists of a 2.5Y 5/4 light olive-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 39).

A total of 649 lithic artifacts were recovered. Artifacts include lithic debitage and 24 tools and diagnostics, including one lanceolate point, one projectile point tip, one projectile point base, one biface fragment, three end scrapers, and two microblades (UA2011-309) (Table 7). Material types consist of basalt, chert, quartzite and rhyolite.

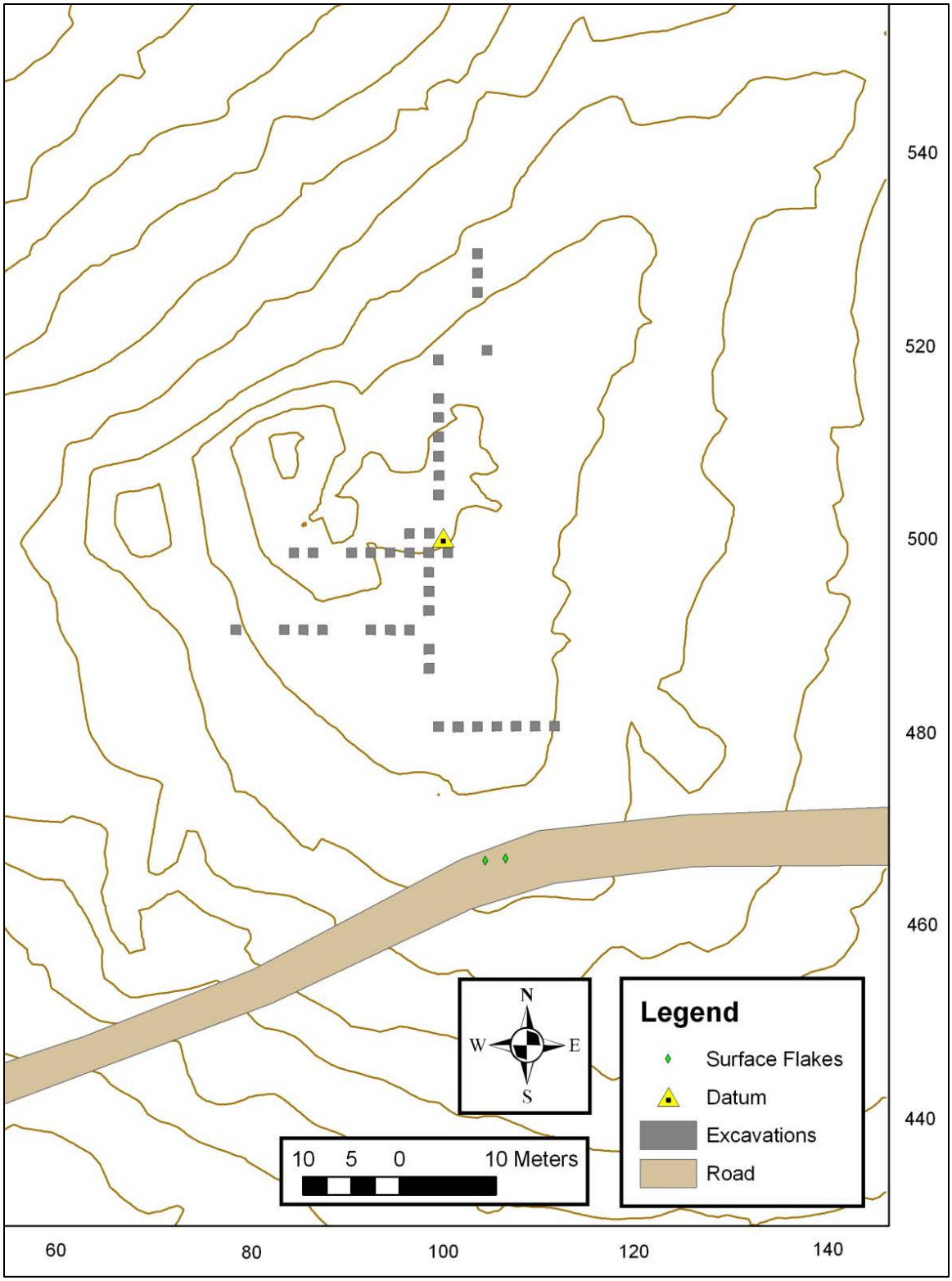

Figure 38. Site map of XMH-01303

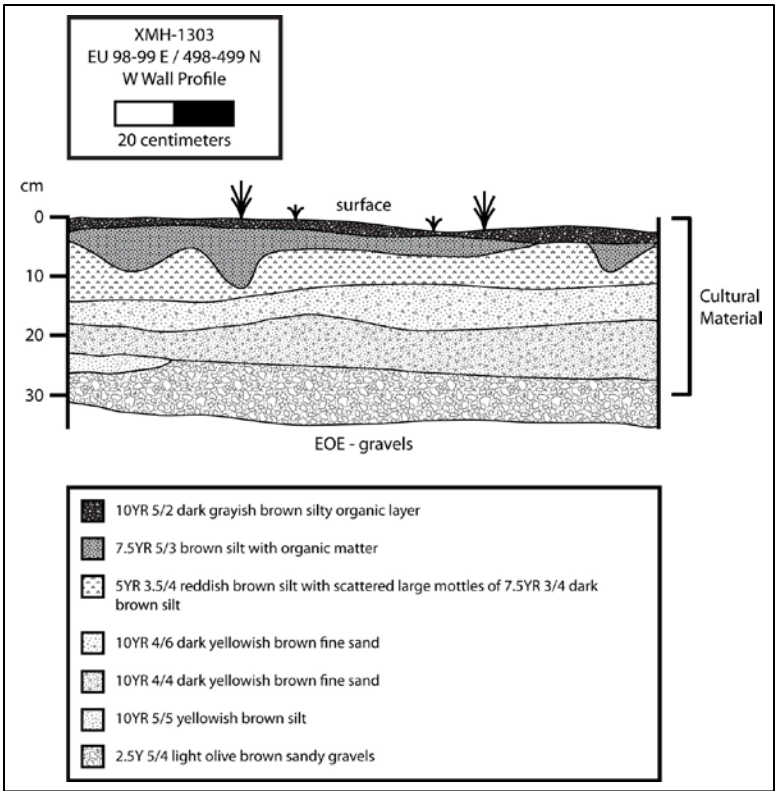

Figure 39. XMH-01303 stratigraphy

Table 7. Lithic assemblage recorded from XMH-01303 in 2009

Artifact Class	**Frequency**
Projectile point	1
Projectile point fragments	2
Biface	1
Biface fragments	2
End scraper	2
Uniface fragment	1
Retouched flakes	7
Microblade core fragments	2
Microblades	3
Crested blade	1
Flakes	625
Total	**649**

4.2 Buried Sites with Limited Research Potential

XMH-00279

[redacted]

Determination: Eligible (2005)

Site XMH-00279 is located on the crest of a narrow knoll that overlooks a small lake (Figure 40. General view of site XMH-00279, facing north) at UTM coordinates Zone 6, [redacted] Based on the results of survey and testing, the site area is estimated at approximately 20m x 35m.

Archaeological data recovery excavations at site XMH-279/XMH-918 began on 8/24/2009 and extended through 8/26/2009. Ten square meters were excavated in 1m x 1m units during the 2009 field season (Figure 41). Excavation units were placed across the site along an east/west axis on the crest of a narrow knoll, adjacent to previously excavated positive shovel tests and a positive 1m x 1m unit. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 25 cm to 50 cm BS. The soil in this area consists of root/moss mat on top of loosely compacted dark brown, organically rich loess, with an average depth of 5 cm. Below this organic horizon, the soil consists of moderately compacted 7.5YR 4/4 red-brown loess to a 10YR 5/6 yellow-brown loess with a low density of gravels. Glacial till is encountered below this loess deposit and consists of a 10YR 6/8 yellow-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 42).

A total of 41 lithic artifacts were recovered. Artifacts include three tools and diagnostics including one quartz biface and one microblade core. The remaining finds are lithic debitage, predominantly of basalt, chert and quartz (UA2011-285).

Figure 40. General view of site XMH-00279, facing north

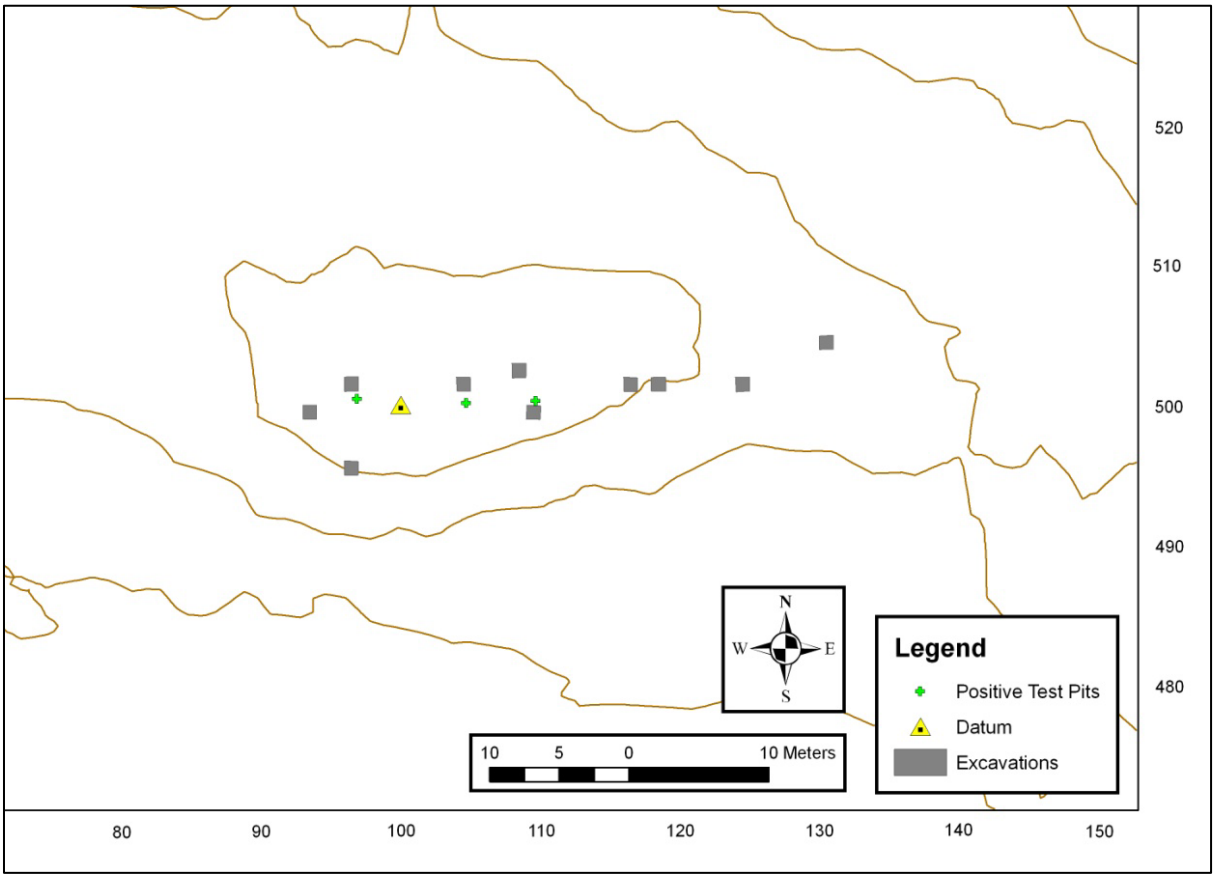

Figure 41. Site map of XMH-00279

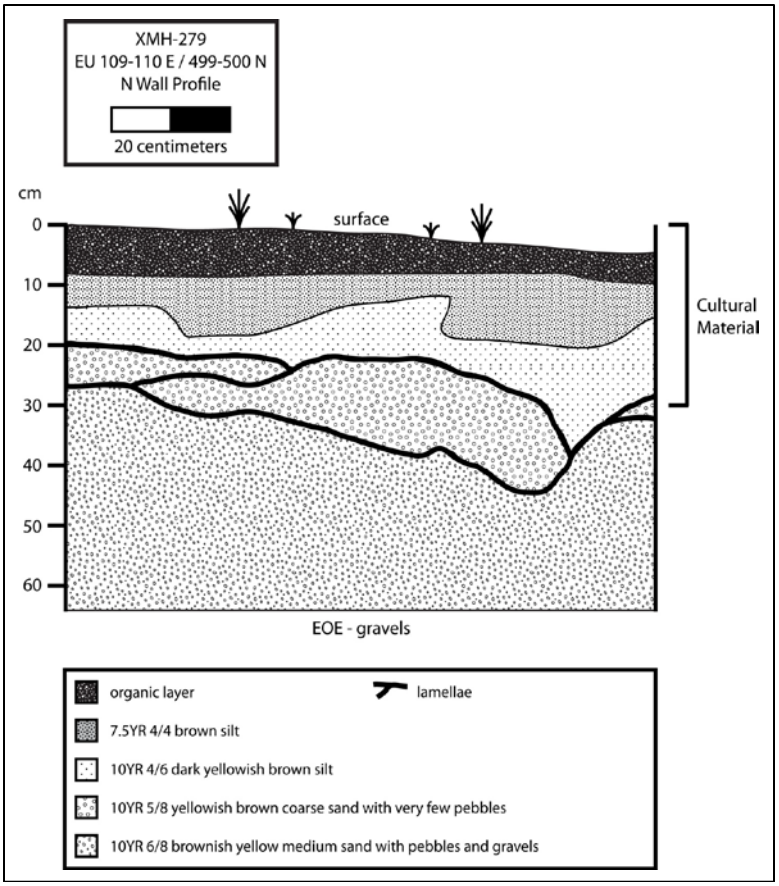

Figure 42. XMH-00279 stratigraphy

XMH-00875
[redacted]
Determination: Not Eligible (2002)

Site XMH-00875 is located on the crest of a small knoll (Figure 43) UTM coordinates Zone 6, [redacted]

Site XMH-875 was excavated from 4 August 2009 to 10 August 2009. Nine units in total were excavated with a yield of eight subsurface artifacts (Figure 44). Subsurface artifacts include six red chert flakes and one microblade. Surface artifacts consist of one retouched flake and five flakes (UA2011-286).

Stratigraphy consists of three strata in the shallow units (approximately 10 cm to 30 cm). An organic layer comprised of a 10YR2/1 (black) fine silt is found at the surface of all units excavated. In shallow units, stratum II consists of 7.5YR4/6 (strong brown) silt. Stratum III consists of 10YR5/8 (yellowish brown) fine to coarse sand with cobble sized inclusions. Deeper units (approximately 30 cm to 40 cm) consist of four strata. Below the organic layer consistent in all units is stratum II, a 7.5YR 4/3 brown silt. Stratum III is 10YR5/6 yellowish brown silt mottled with 5YR4/4 (weak red) and 5YR4/6 (red) silt. Stratum IV consists of 10YR5/6 (yellowish brown) fine to coarse sand with cobble-sized inclusions. Strata I and II were culture bearing layers. All excavation of units terminated at glacial till (Figure 45).

Figure 43. General view of site XMH-875, facing southwest

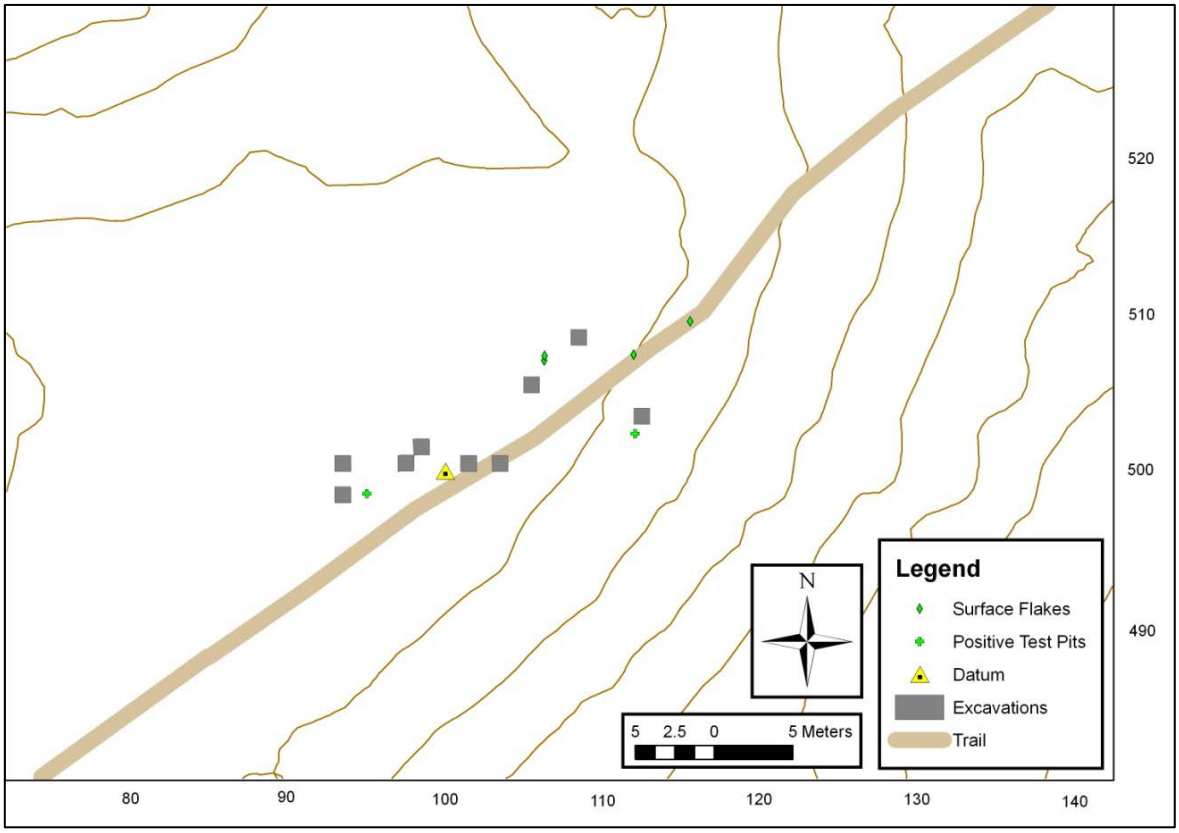

Figure 44. Site map of XMH-00875

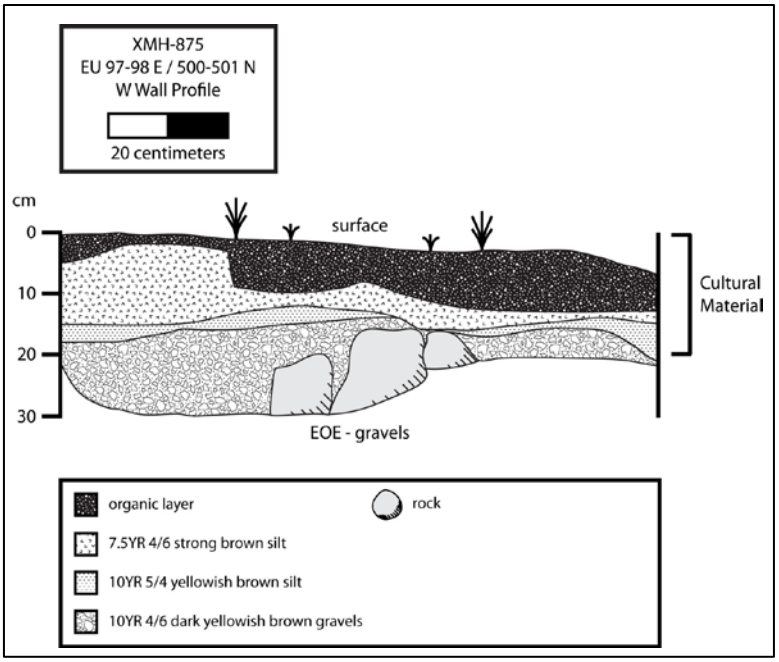

Figure 45. XMH-00875 stratigraphy

XMH-00906
[redacted]
Determination: Not Evaluated

Site XMH-00906 is located on the top of a small knoll (Figure 46) at UTM coordinates Zone 6, [redacted]. Prior to 2009, XMH-00906 consisted of 16 artifacts—11 surface flakes and five sub-surface flakes.

Site XMH-906 was excavated from 16 June 2009 to 22 June 2009. Twelve units in total were excavated with a yield of 10 flakes and five surface flakes collected (Figure 47) (UA2011-288). Material types include chert, and obsidian. One obsidian sample was submitted for XRF sourcing and was returned with a Group W (unknown) source group.

Stratigraphy consists of two strata on the exposed surface of the knoll on which the site is situated and three strata on the downslope. An organic layer comprised of a 10YR2/1 (black) fine silt is found at the surface of all units excavated. In shallow units on the exposed surface of the knoll, only a second stratum (III) is found consisting of 10YR4/6 (dark yellowish brown) fine to coarse sand with cobble-sized inclusions. Deeper units on the downslope have a medial stratum (II) consisting of 7.5YR4/6 (strong brown) silt. Strata I and II were culture bearing layers. All excavation of units terminated at glacial till. One unit (100-101E/510-511N) includes a possible paleosol of 5YR3/3 (dark reddish brown) and is only present in the north wall. Unit depths range from approximately 10 cm to 50 cm (Figure 48).

Figure 46. General view of site XMH-00906, facing south

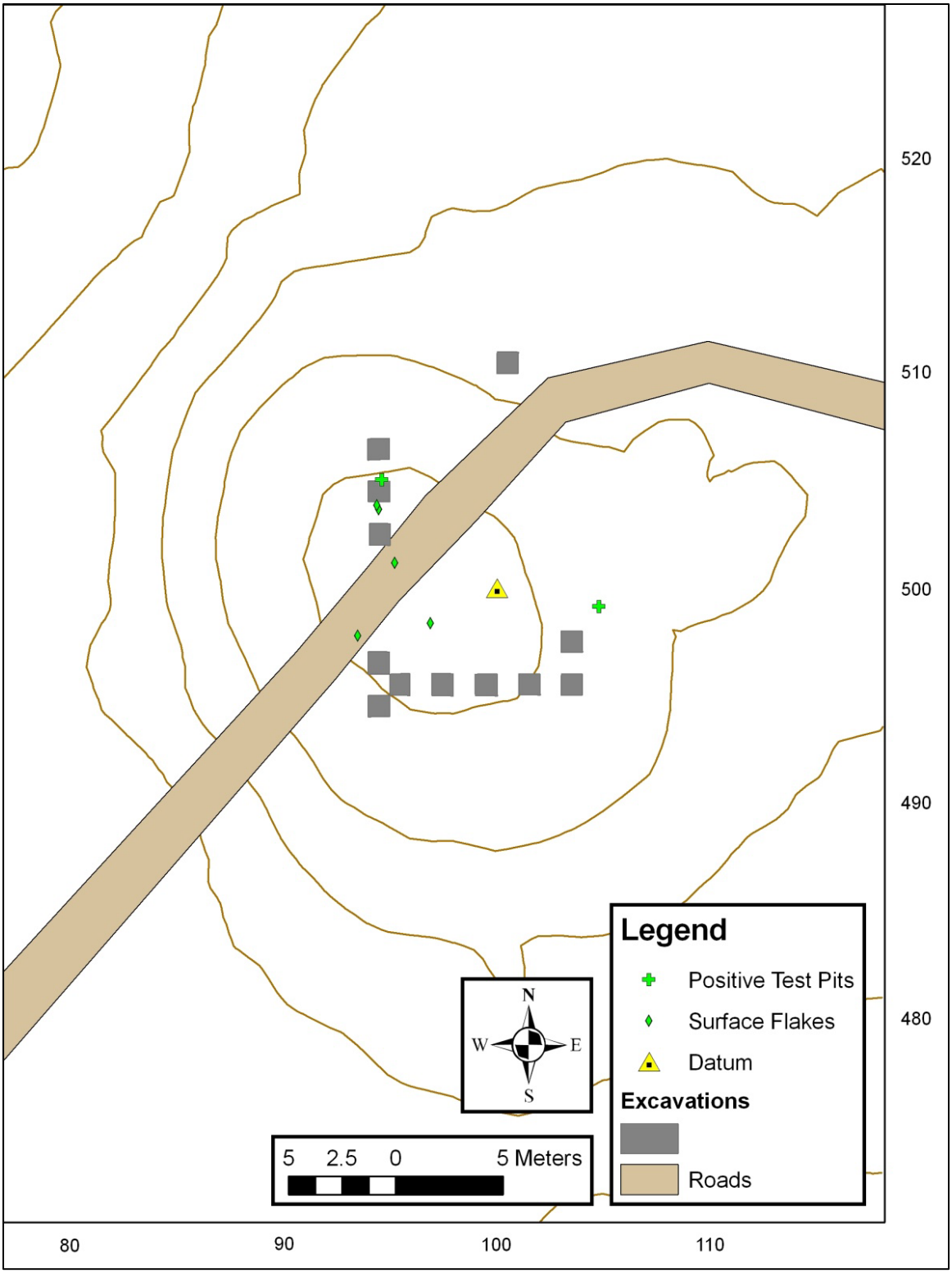

Figure 47. Site map of XMH-00906

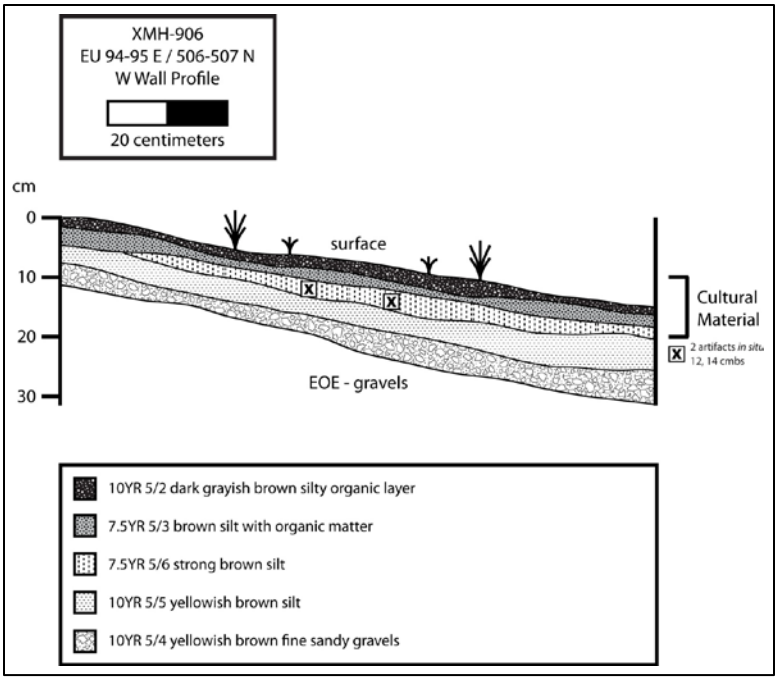

Figure 48**.** XMH-00906 stratigraphy

XMH-00914
[redacted]
Determination: Not Evaluated

Site XMH-00914 is located on a small hilltop (Figure 49) at UTM coordinates Zone 6, [redacted] (WGS 84). Prior to 2009, XMH-00914 consisted of 12 total flakes (UA2011-406). All of these except for one basalt flake were found on the surface. The assemblage is entirely lithic debitage with the exception of one chert microblade core tablet.

Site XMH-914 was excavated from 16 July 2009 to 21 July 2009. Six units in total were excavated with a yield of 15 subsurface artifacts (Figure 50). Subsurface artifacts consist of 11 tan rhyolite flakes, 1 gray chert flake, 1 light gray chert flake. Two tools were found: 1 tan rhyolite microblade fragment and 1 possible tci thos. Three surface artifacts were collected: 2 flakes and 1 microblade fragment (UA2011-294).

Stratigraphy consists of three distinct strata. An organic layer comprised of a 10YR2/1 (black) fine silt is found at the surface of all units excavated. Stratum II consists of a 7.5 YR3/3 (dark brown) silt. Stratum III contains 7.5YR4/6 (strong brown) silt with cobble-sized inclusions. Strata I and II were culture bearing layers. All excavation of units terminated at glacial till (Figure 51).

Figure 49. General view of site XMH-00914, facing east

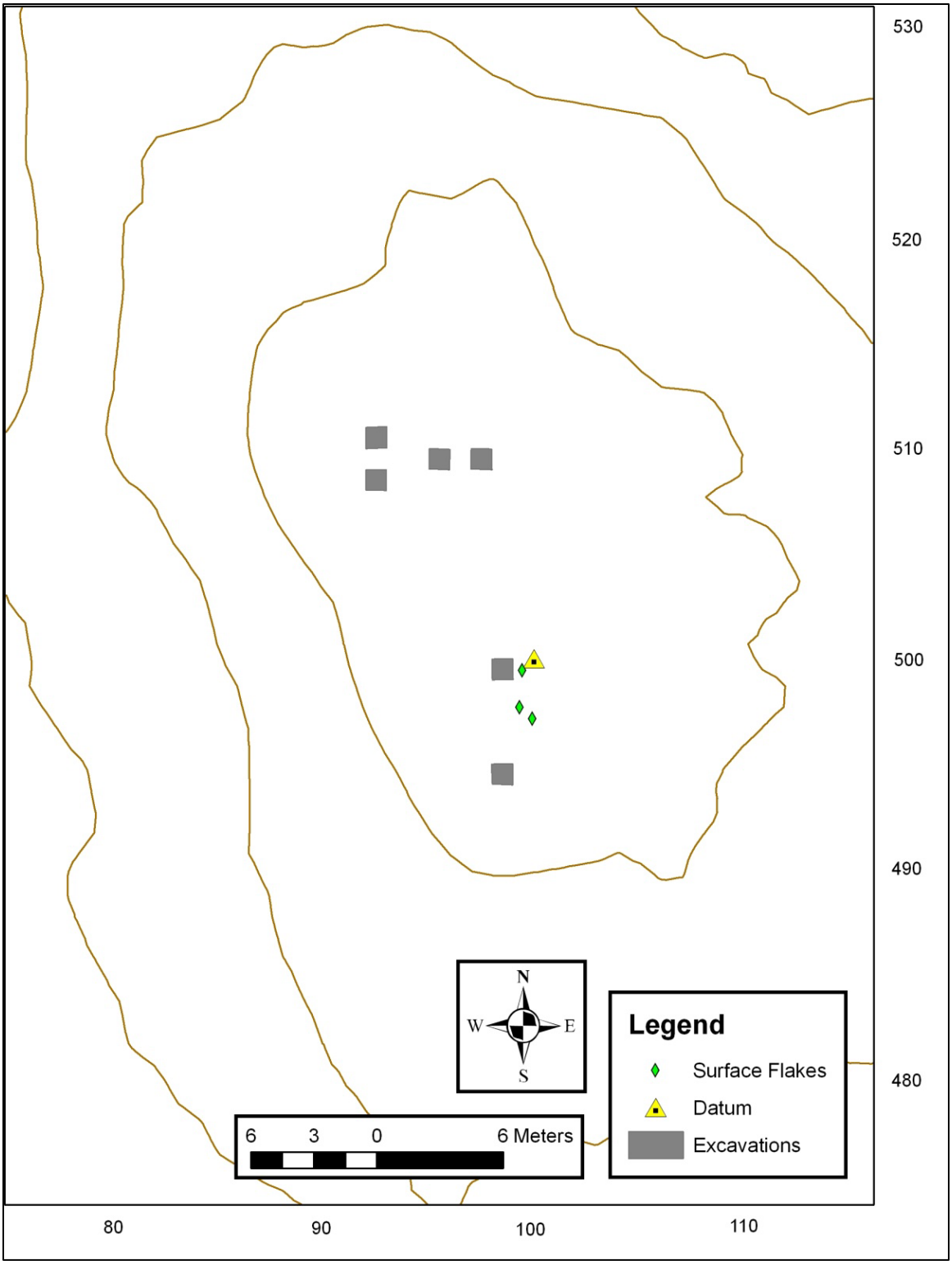

Figure 50. Map of site XMH-00914

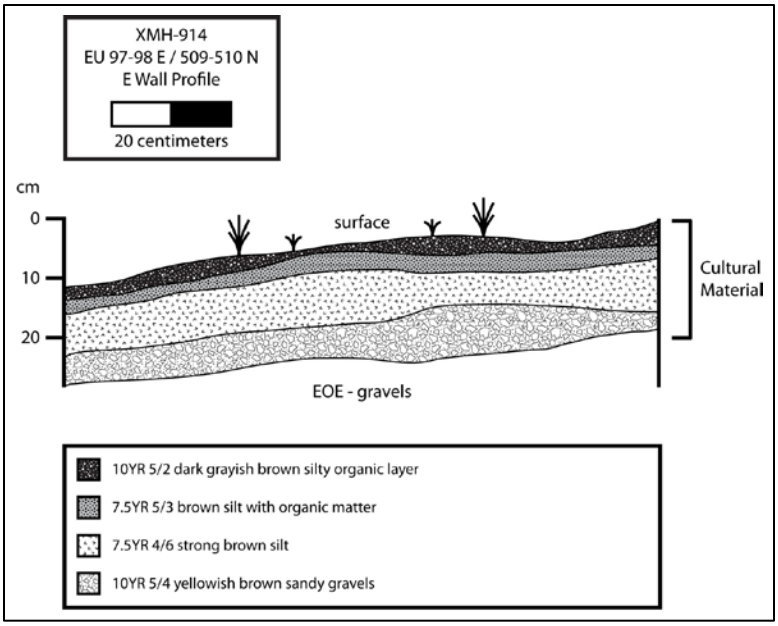

Figure 51. XMH-00914 stratigraphy

XMH-00919

[redacted]

Determination: Eligible (2005)

Site XMH-00919 is located on the high point of a northeast-southwest trending ridge (Figure 52) at UTM coordinates Zone 6, [redacted] Prior to 2009, XMH-00919 consisted of six flakes (UA2011-393).

Archaeological data recovery excavations at site XMH-919 were conducted on 8/21/09. Six square meters were excavated as 1m x 1m units during the 2009 field season (Figure 53). Excavation units were placed along the northeast-southwest trending ridge of the site. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site, with excavation depths ranging from 30 cm to 50 cm BS. Soil in this area consists of root/moss mat on top of a loosely compacted 10YR 3/2 dark grayish-brown, organically rich loess, with an average depth of 5 cm. Below this organic horizon, the soil consists of moderately compacted 10YR 4/4 dark yellowish-brown loess. Glacial till is encountered below this loess deposit and consists of a 10YR 4/6 dark yellowish-brown sand with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 54).

A total of eight pieces of lithic debitage were recovered from four of the units (UA2011-298). Material types consist of basalt, rhyolite and chert. The remaining two excavation units were sterile.

Figure 52. General view of site XMH-00919, facing east

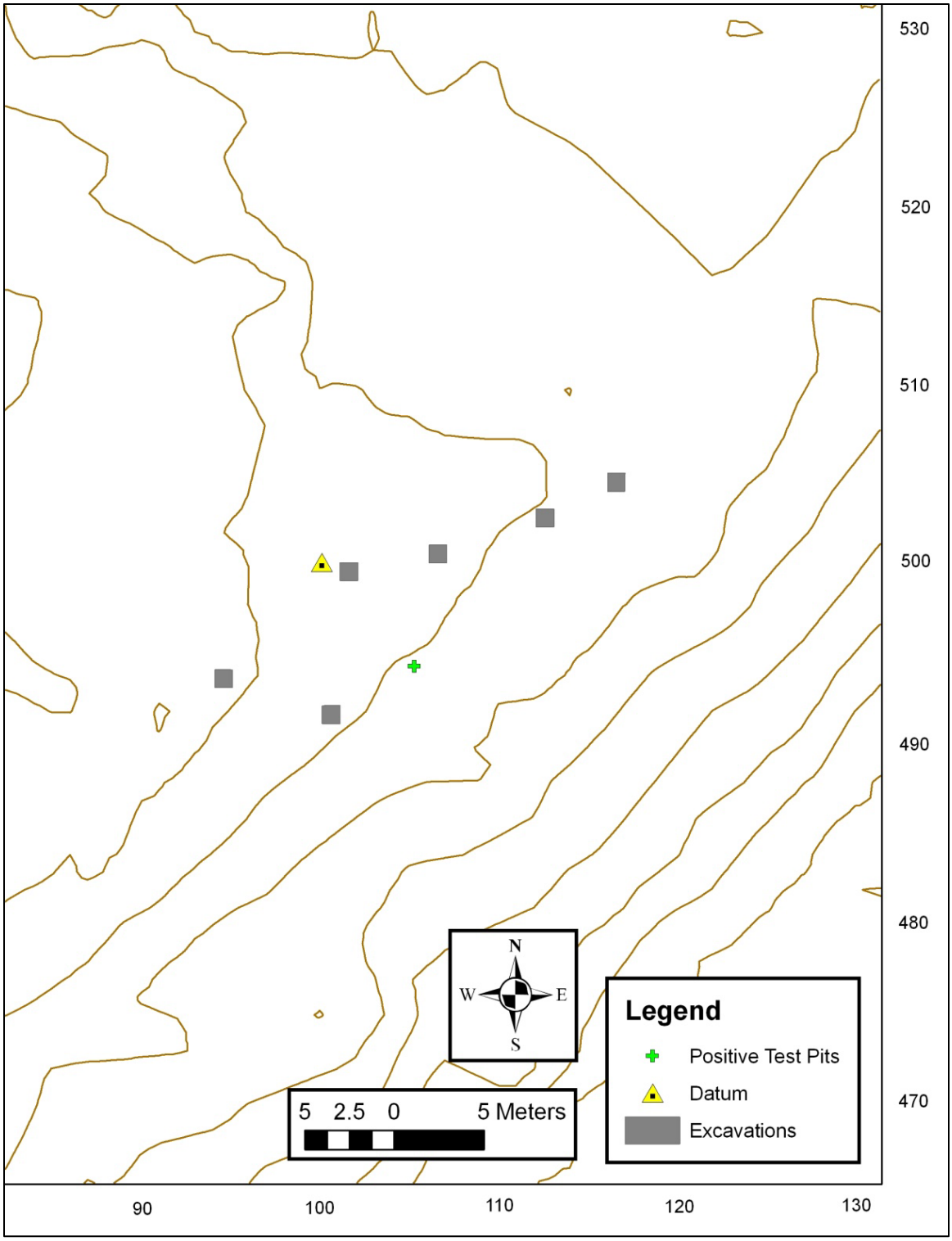

Figure 53. Site map of XMH-00919

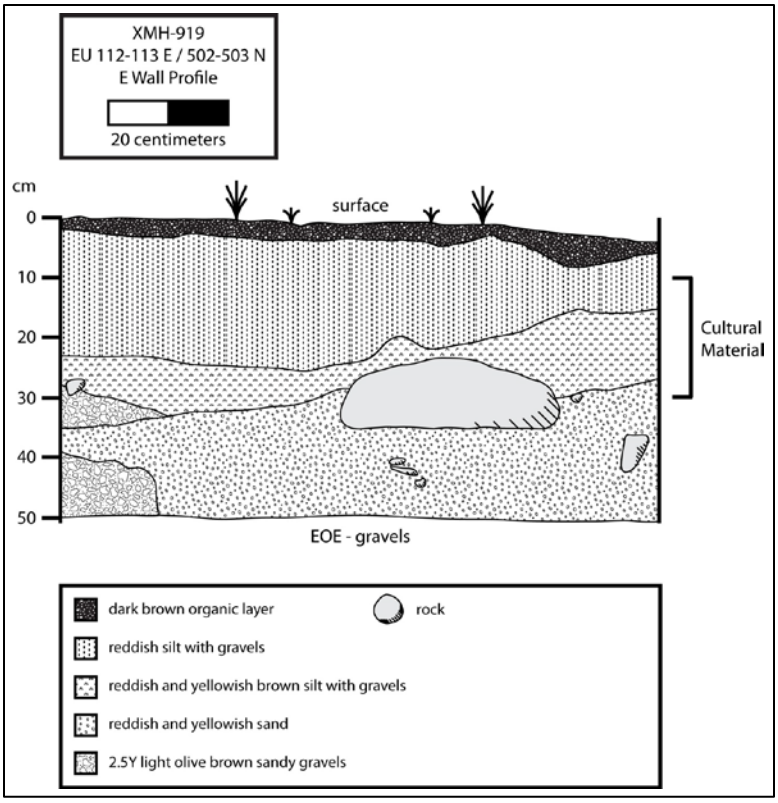

Figure 54. XMH-00919 stratigraphy

XMH-00920

[redacted]

Determination: Eligible (2005)

Site XMH-00920 is located on the northern edge of a north-south trending terrace overlooking the Jarvis Creek floodplain. Bow and Fiddle lakes are located 1.5 km to the northeast and Jarvis Creek is located 1 km to the west. The UTM coordinates for the site are: Zone 6, [redacted]. Prior to 2009, XMH-00920 consisted of 14 artifacts (UA2011-394). Seven flakes and one uniface were found on the surface. The tan rhyolite uniface is approximately 30.9-mm long, 35.9-mm wide, and weighs 15.1g. An additional five flakes and one obsidian uniface fragment were found subsurface in either shovel test pits or the excavation unit. All artifacts encountered at the site were collected.

Archaeological data recovery excavations at site XMH-920 were conducted on 7/14/09. Three 1m x 1m units were excavated during the 2009 field season (Figure 55). Units were placed at the high point on the northern edge of a north-south trending terrace within an area containing a previously located concentration of surface artifacts, a positive shovel test and a 1m x1m test unit. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

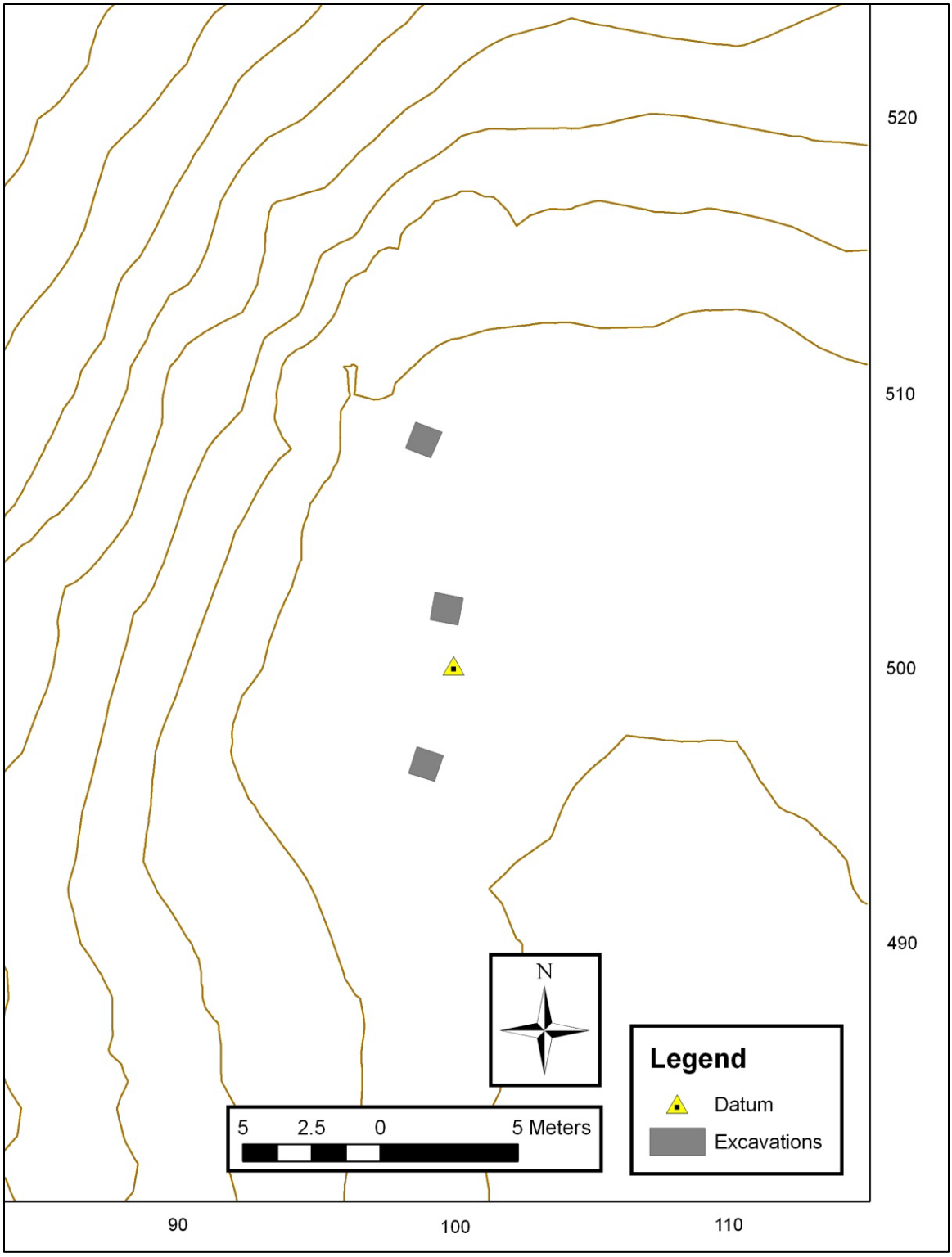

Figure 55. Site map of XMH-00920

A total of 31 lithic artifacts were recovered, including debitage and two microblade fragments (UA2011-299). Material types include chert, quartz, and obsidian, a non-locally occurring material type. Nine

samples of obsidian debitage were submitted for XRF sourcing. Seven of these were determined to have originated from Wiki Peak, and 2 were too small for identification.

Soil deposition varied across the site. Excavation depths ranged from 15 cm to 40 cm BS. Soil in this area consists of root/moss mat on top of a loosely compacted 5YR 3/4 reddish-brown, organically rich loess, with an average depth of 5 cm. Below this organic horizon, the soil consists of moderately compacted 7.5YR 4/4 dark brown to 10YR 4/6 dark yellowish-brown loess. Glacial till is encountered below this loess deposit and consists of a 10YR 3/4 dark yellowish-brown sand with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 56).

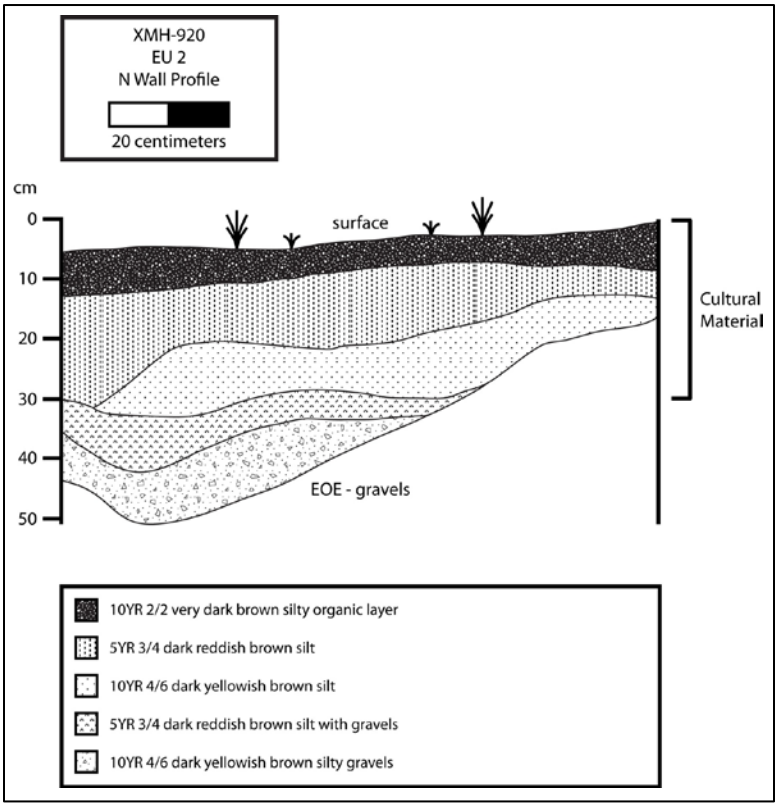

Figure 56. XMH-00920 stratigraphy

XMH-00921

[redacted]

Determination: Not Evaluated

Site XMH-00921 is located at the terminal end of a well-defined glacial moraine ridge trending north to south (Figure 57). UTM coordinates of the site datum are Zone 6, [redacted] (WGS 84). Prior to 2009, XMH-00921 consisted of two gray chert artifacts found on the surface.

Archaeological data recovery excavations at site XMH-921 were conducted between 6/24/09 and 6/25/09. Three 1m x 1m units were excavated during the 2009 field season (Figure 58). Excavation units were placed along a north/south axis at the terminal end of a well-defined glacial moraine ridge within an area

containing previously located surface artifacts. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 30 cm to 75 cm BS. Soil in this area consists of root/moss mat on top of a loosely compacted 10YR 4/2 dark grayish-brown, organically rich loess, with an average depth of 5 cm. This organic horizon is followed by moderately compacted 10YR 4/4 brown loess mottled with 7.5YR 5/4 brown silt. Glacial till is encountered below this loess deposit and consists of a 10YR 5/6 yellow-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 59).

A total of 23 lithics were recovered, including 17 surface finds. Artifacts include lithic debitage and one tool, a microblade of red chert (UA2011-300). Material types include chert and rhyolite.

Figure 57. General view of site XMH-00921, facing south

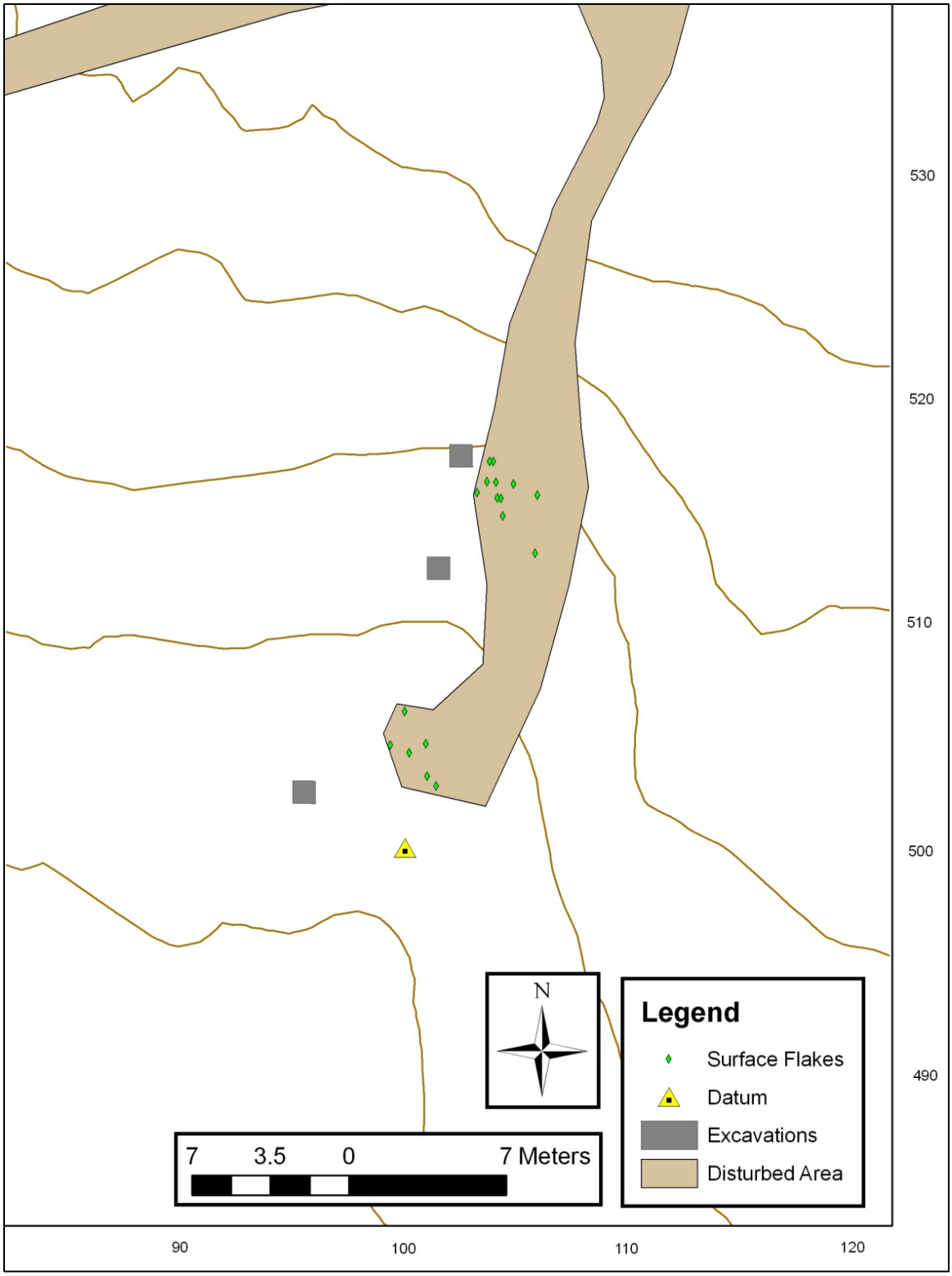

Figure 58. Site map of XMH-00921

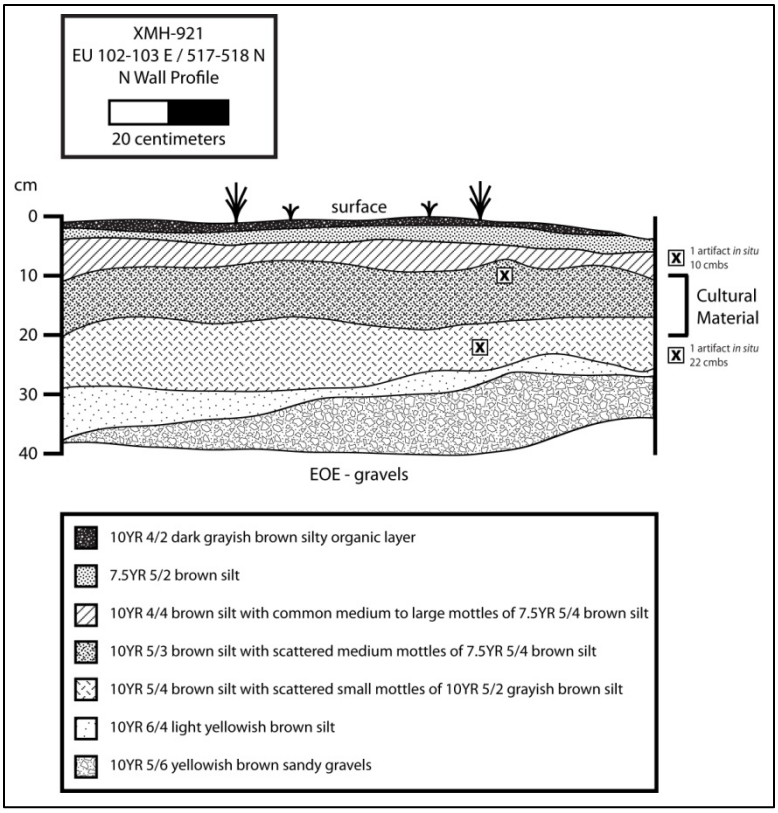

Figure 59. XMH-00921 stratigraphy

XMH-00924
[redacted]
Determination: Not Evaluated

Site XMH-00924 is located on top of a narrow ridge line (Figure 60) at UTM coordinates Zone 6, [redacted]. Prior to 2009, XMH-00924 consisted of four flakes, two of which were encountered in a buried context (UA2011-409).

Archaeological data recovery excavations at site XMH-924 were conducted between 6/10/09 and 6/15/09. Fifteen 1m x 1m units were excavated during the 2009 field season (Figure 61). Units were placed along the narrow northeast-southwest trending ridge line of the site and excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site, with excavation depths ranging from 15 cm to 70 cm BS. Soil in this area consists of root/moss mat on top of a loosely compacted 10YR 5/2 dark grayish-brown, organically rich loess, with an average depth of 5 cm. Below this organic horizon, the soil consists of moderately compacted loess, ranging in color from 7.5YR 4/4 brown to 10YR 4/4 dark yellowish-brown mottled with 10YR 5/4 yellow-brown. Glacial till is encountered below this loess deposit and consists of 10YR 4/4 dark yellowish-brown sandy loess with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 62).

A total of two pieces of lithic debitage were recovered from unit N490/E89 (UA2011-302). This unit contained the only positive shovel test located during Phase II testing. The additional 14 excavation units were sterile.

Figure 60. General overview of site XHM-00924, facing west

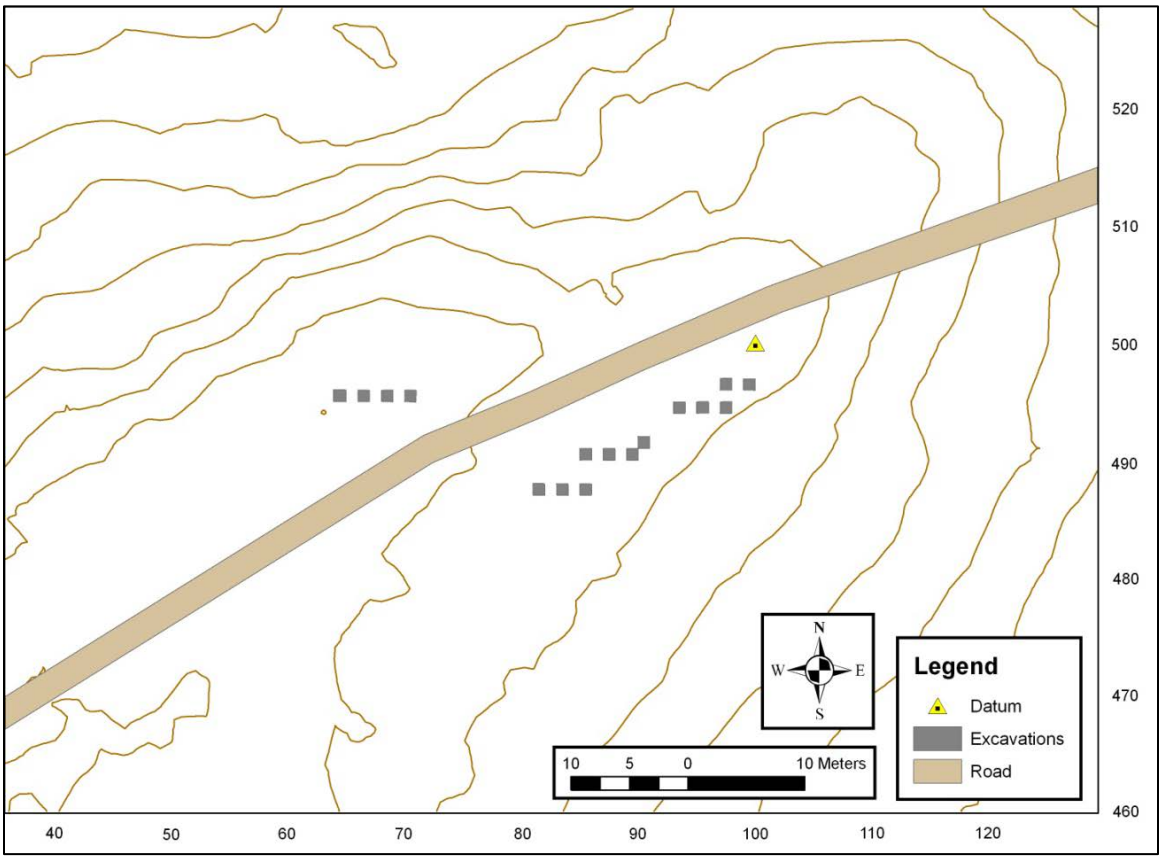

Figure 61. Site map of XMH-00924

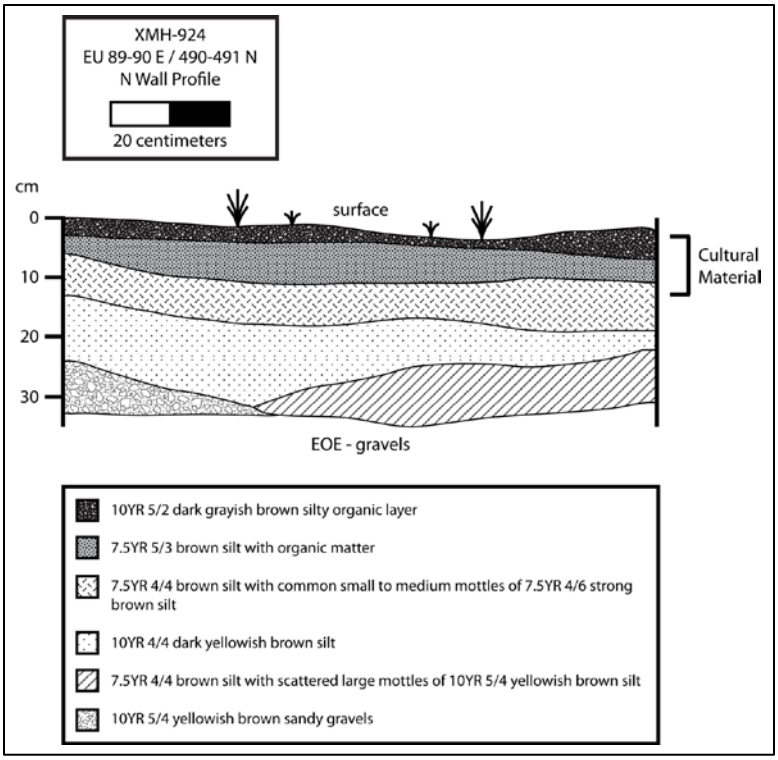

Figure 62. XMH-00924 stratigraphy

XMH-01122

[redacted]

Determination: Not Evaluated

The site is located on a northeast/southwest running glacial moraine (Figure 63) at UTM coordinates Zone 6, [redacted] (WGS84). Prior to 2009, XMH-01122 consisted of 20 artifacts, most of which are late-stage lithic debitage. Three tools, including a biface fragment, one uniface fragment, and microblade fragment, were found on the surface. Two flakes were found in a buried contexts. Material types include gray chert, black chert, basalt, and rhyolite.

Archaeological data recovery excavations at site XMH-01122 were conducted on 8/27/2009. Six 1m x 1m units were excavated during the 2009 field season (Figure 64). Excavation units were placed within an area containing a previously located surface artifact concentration and a positive shovel test. The units were excavated in 10-cm levels until glacial till was reached throughout the entire unit floor.

Soil deposition varied across the site. Excavation depths ranged from 20 to 30 cm BS. Soil in this area consists of root/moss mat on top of a loosely compacted 10YR 6/3 pale-brown, organically rich loess, with an average depth of 5cm. Below this organic horizon, the soil consists of moderately compacted 7.5YR 3/4 dark brown loess to 10YR 3/4 dark yellowish-brown loess. Glacial till is encountered below this loess deposit and consists of a 10YR4/6 dark yellowish-brown sand with a very high density of gravels and cobbles. These transitions occurred at varying depths and could be sharp or gradual (Figure 65).

A total of eight lithic artifacts were recovered, including three surface finds (UA2011-308). Artifacts include lithic debitage, of rhyolite, chert, and basalt, and a projectile point of green chert. All artifacts

were recovered from excavation unit N498/E82, adjacent to the previously excavated positive shovel test. The other five units were sterile.

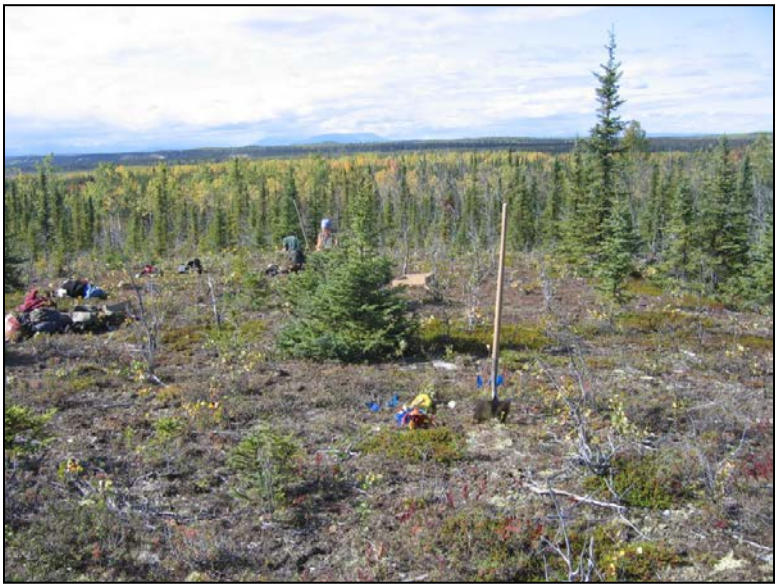

Figure 63. General overview of site XMH-01122, facing west

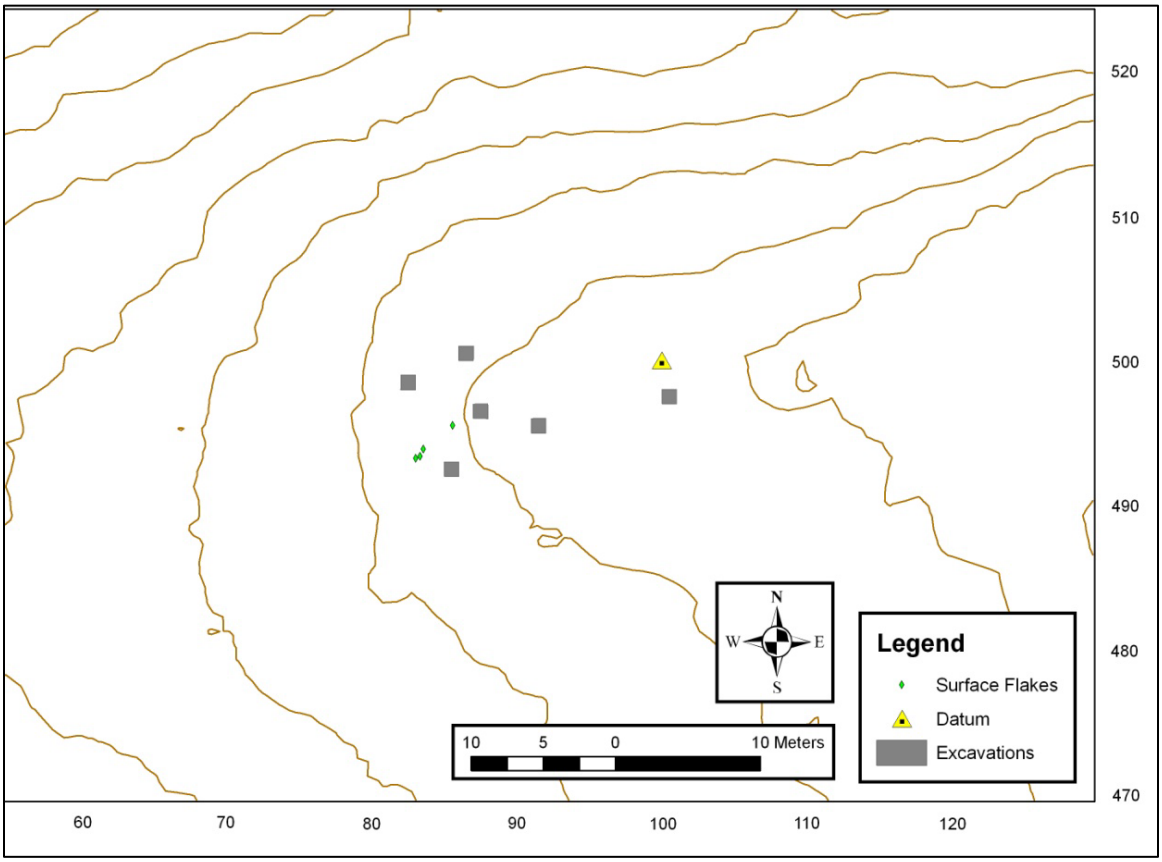

Figure 64. Site map of XMH-01122

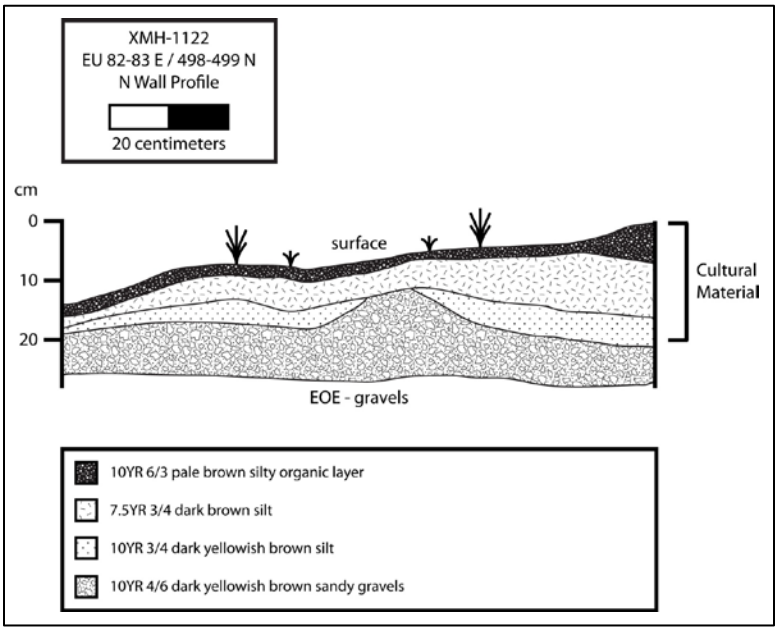

Figure 65. XMH-01122 stratigraphy

4.3 Small Surface Lithic Scatters and Isolated Finds

XMH-00842

[redacted]

Determination: Not Eligible (2005)

Site XMH-00842 is located on a military trail 100 m off of 33 Mile Loop Trail (Figure 66). The site was identified during a 1998 NLUR Phase I survey and consists of one red chert secondary flake found on the surface of a heavily disturbed area (Higgs et al. 1999). This site was revisited for a Phase II in 2004 and no new artifacts were located either on the surface or in buried contexts. UTM coordinates for the site are: Zone 6,[redacted] (WGS 84). Site XMH-00842 is an isolated find (Figure 67).

This site was revisited again in 2009 and no new artifacts were observed.

Figure 66. General overview of site XMH-0842, facing east

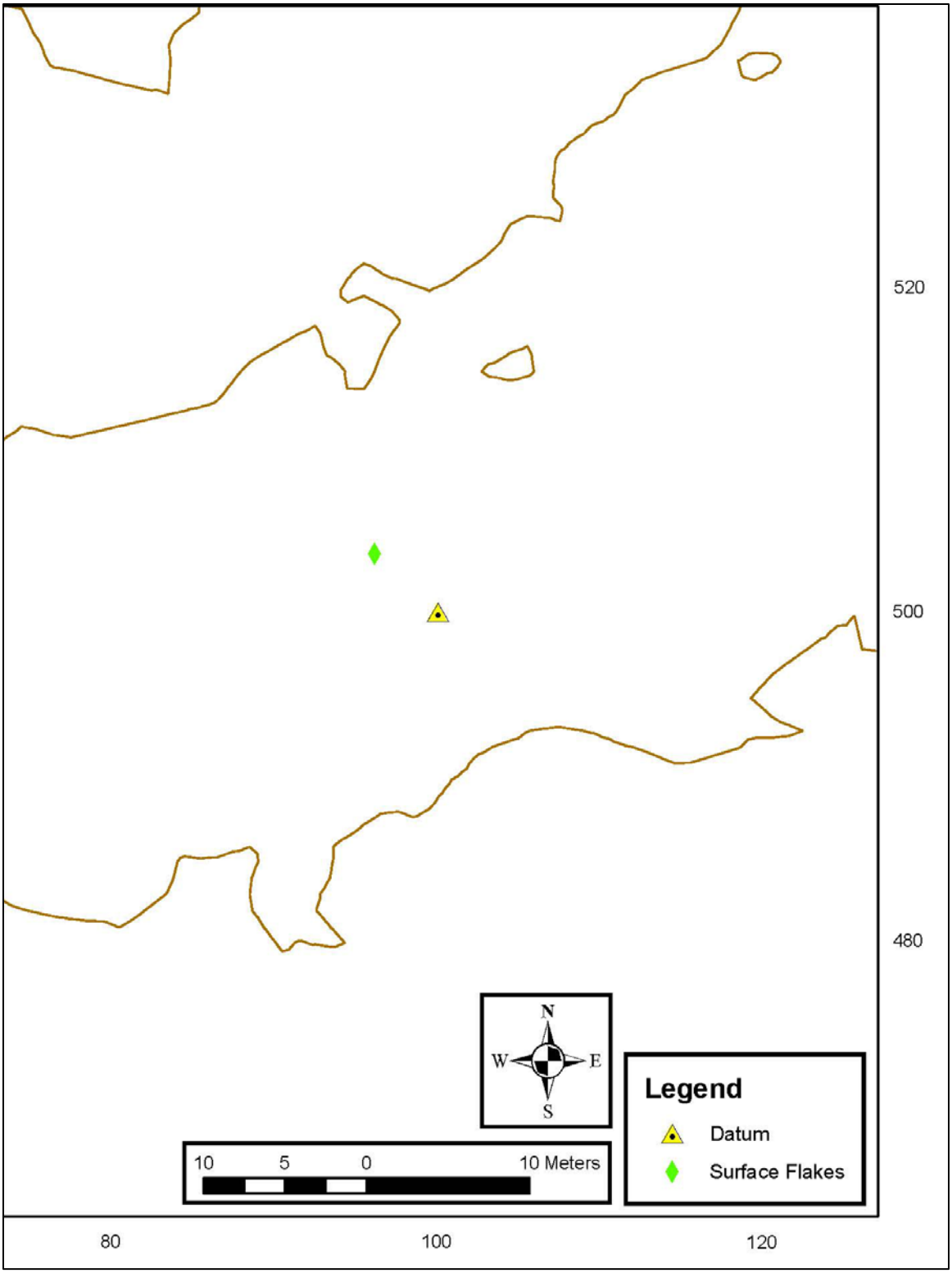

Figure 67. Site map of XMH-00842

XMH-00909

[redacted]

Determination: Not Evaluated

XMH-00909 is located on the east side of Fiddle Lake, on the relatively flat lake margin in an exposed area between the edge of the lake and the slope juncture approximately 30 m to the east (Figure 68). UTM coordinates of the site datum are Zone 6, [redacted] (WGS 84).

The site was identified by the presence of a single banded chert scraper found on the surface (UA2011-403). During 2008, phase II evaluations were conducted; however, intensive ground survey and 20 shovel tests yielded no additional artifacts (Figure 69). XMH-00909 is an isolated find.

This site was revisited again in 2009 and no new artifacts were observed.

Figure 68. General view from site XMH-00909, facing west

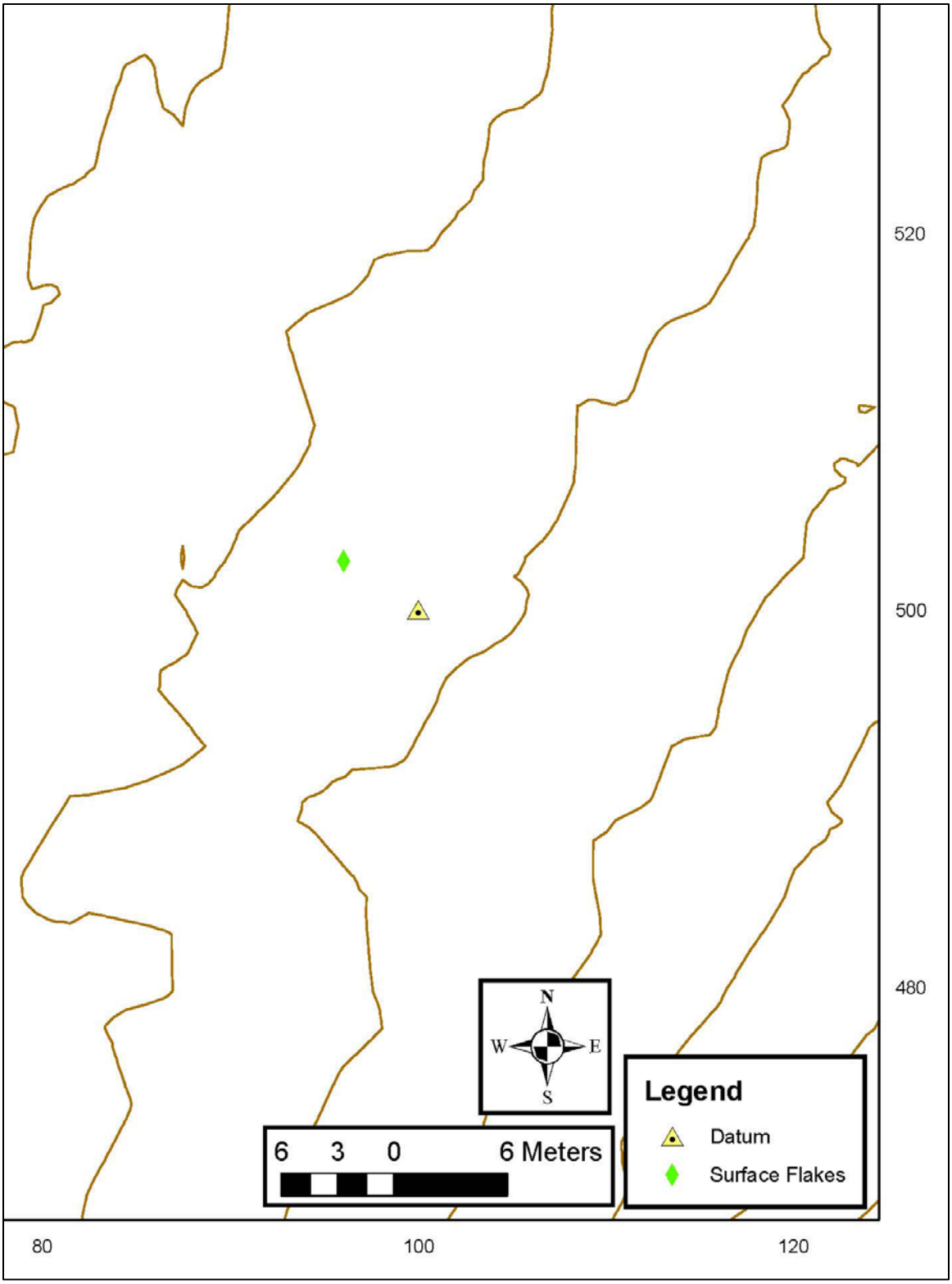

Figure 69. Site map of XMH-00909

XMH-00912
[redacted]
Determination: Not Eligible (2005)

Site XMH-00912 is located in an exposed area on the eastern edge of Fiddle Lake below the high water mark (Figure 70). The surrounding terrain is dotted with small kettle lakes and includes bogs, low ridges, and knolls. Site XMH-00912 was identified during pedestrian survey and consists of two flakes observed on the surface (UA2011-318). The UTM coordinates for the site are: Zone 6, [redacted].

During phase II evaluations, shovel tests were systematically placed throughout the site area at intervals of 10 m (Figure 71). A total of 15 shovel tests were excavated at the site. The depth of the shovel tests varied, but all were excavated to glacial till. All shovel tests were negative, and intensive surface examinations failed to identify any additional artifacts.

Site XMH-00912 is an isolated surface occurrence. This site was revisited again in 2009 and no new artifacts were observed.

Figure 70. General overview of site XMH-00912, facing north

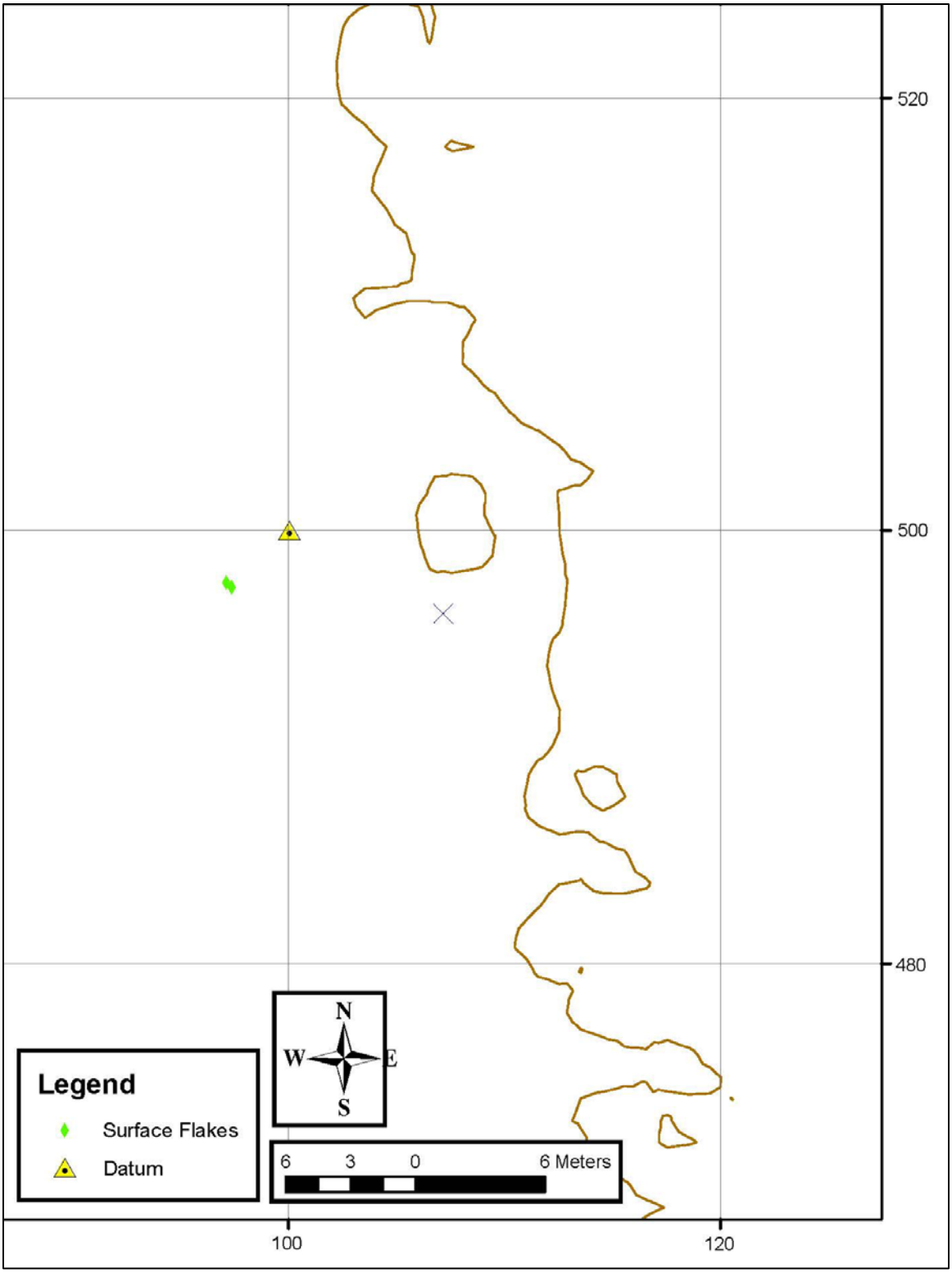

Figure 71. Site map of XMH-00912

XMH-00913

[redacted]

Determination: Not Evaluated

Site XMH-00913 is located on the east side of Fiddle Lake in an exposed area between the edge of the lake and the slope juncture approximately 60 m to the east (Figure 72). UTM coordinates of the site are Zone 6, [redacted] (WGS 84).

XMH-00913 was originally located by the presence of a single milky quartz flake recovered from a shovel test along the lake margin (UA2011-100). During phase II evaluations during the summer of 2008, a total of 24 shovel test pits were excavated, all of which were negative (Figure 73). Intensive surface examinations also failed to identify any additional surface artifacts.

This site was revisited again in 2009 and no new artifacts were observed. The quartz flake was reexamined and determined not to be an artifact. This evidence indicates that XMH-00913 is not an archaeological site.

Figure 72. General view from site XMH-00913, facing west

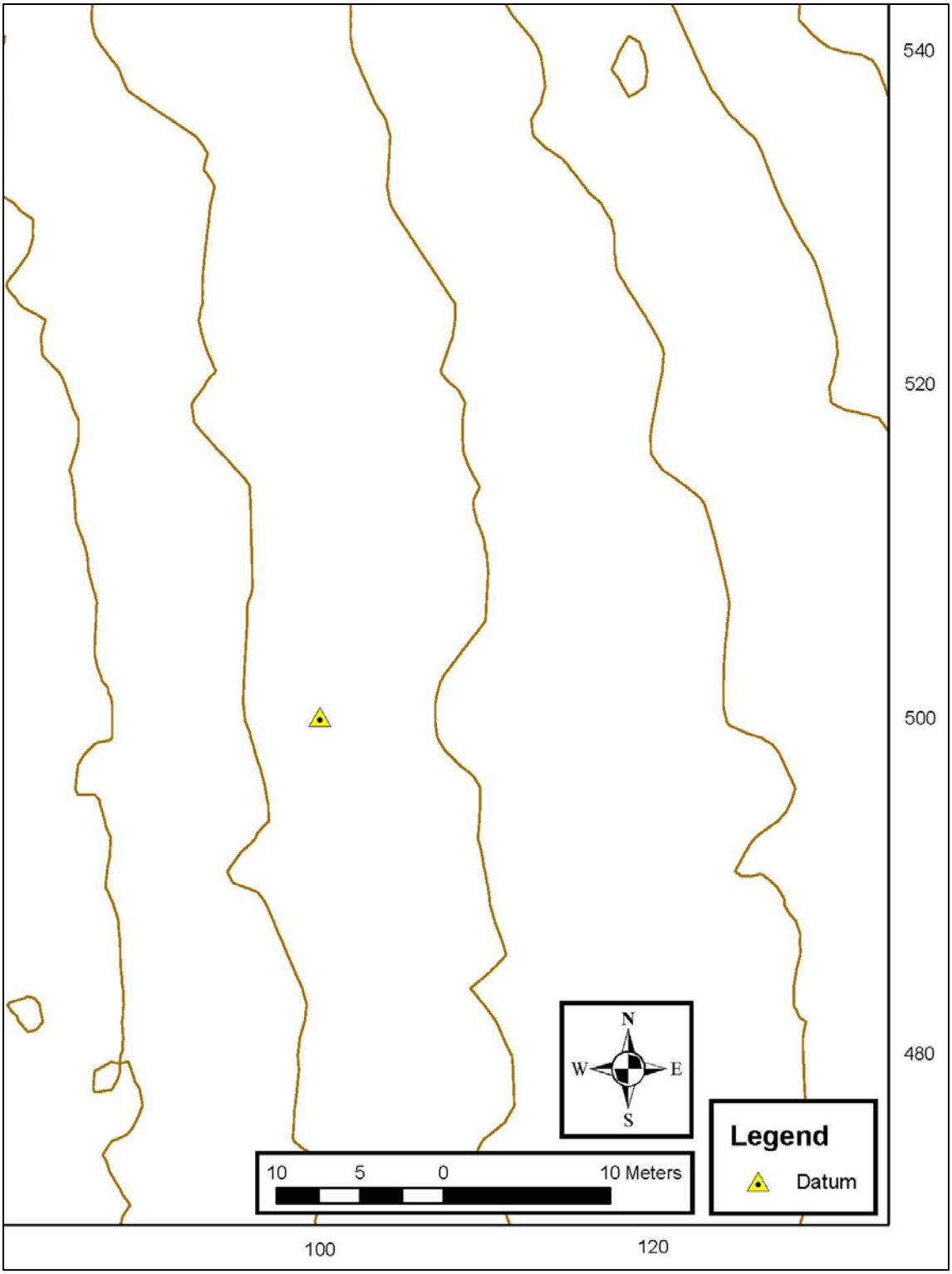

Figure 73. Site map of XMH-00913

XMH-00916

[redacted]

Determination: Ineligible (2005)

Site XMH-00916 is located on a small ridge (Figure 74) and consists of four flakes found in one shovel test pit. These artifacts were later determined to be ecofacts. The UTM coordinates for XMH-00916 are: Zone 6, [redacted]

In 2004, the location was resurveyed, and shovel tests were systematically placed throughout the area at intervals of 10 m (Figure 75). A total of 17 shovel tests were excavated. The depth of the shovel tests varied, but all were excavated to glacial till. All shovel tests were negative and no artifacts were found on the surface.

This site was revisited again in 2009 and no new artifacts were observed. The ecofacts were re-examined and again determined not to be artifacts. This evidence indicates that XMH-00916 is not an archaeological site.

Figure 74. General overview of site XMH-00916, facing west

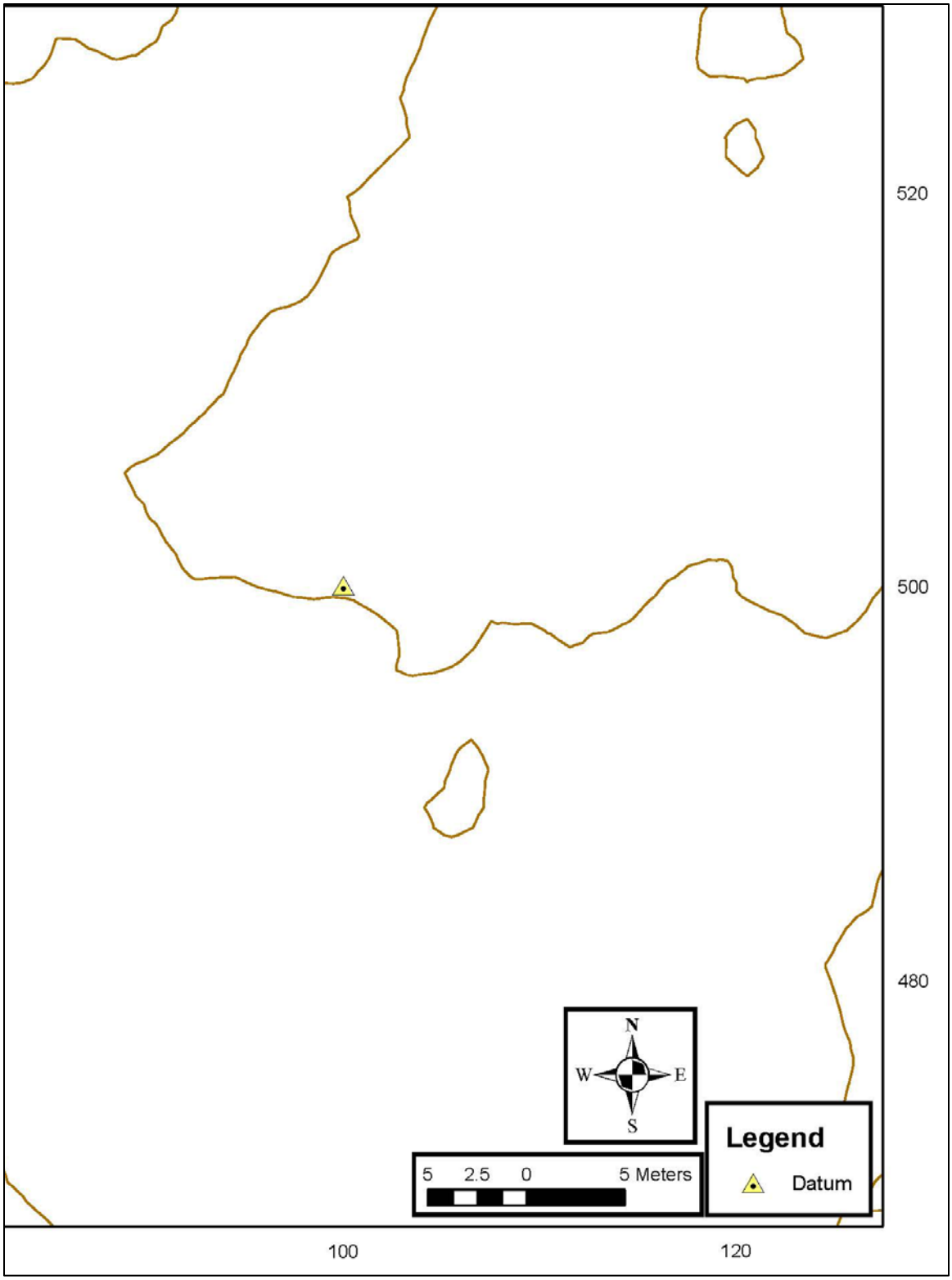

Figure 75. Site map of XMH-00916

XMH-00926
[redacted]
Determination: Not Evaluated

Site XMH-00926 is located on a knoll on a large northeast-southwest trending ridge (Figure 76) at UTM coordinates Zone 6, [redacted].

Prior to 2009, XMH-00926 consisted of five flakes and one unifacial tool found on the surface (Figure 77) (UA2011-411). Material types include black basalt, tan rhyolite, white gray banded chert, and white chert. Site XMH-00926 was revisited again in 2009, and eight flakes were observed on the surface (UA2011-304).

Figure 76. General overview of site XMH-00926, facing east

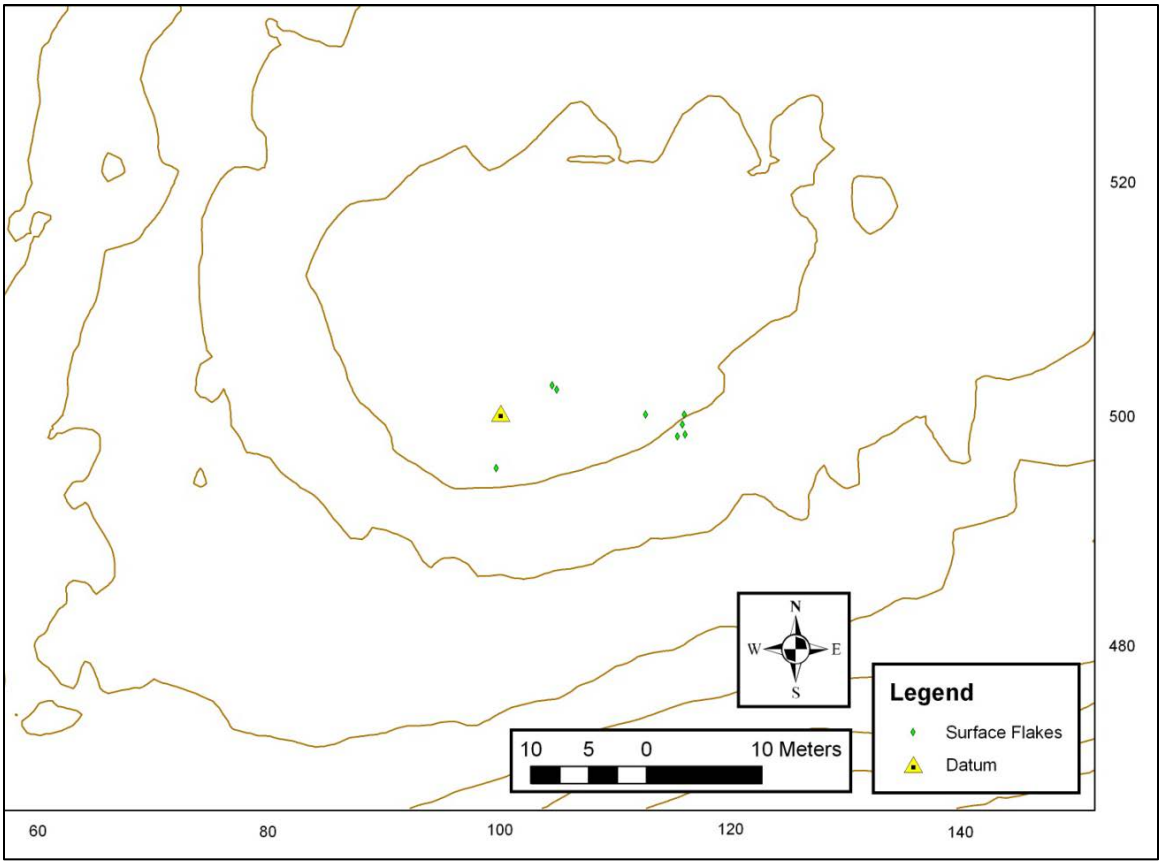

Figure 77. Site map of XMH-00926

XMH-00927
[redacted]
Determination: Not Evaluated

Site XMH-00927 is located on the western edge of a southeast-northwest trending ridge (Figure 78) at UTM coordinates Zone 6, [redacted].

Site XMH-00927 consists of two surface artifacts located in 2002 (Figure 79). Phase II evaluations were conducted in 2008. No new artifacts were located, and the 2002 surface artifacts were not relocated.

This site was revisited again in 2009. No new artifacts were observed, and the 2002 surface artifacts were not relocated.

Figure 78. General overview of site XHM-00927, facing east

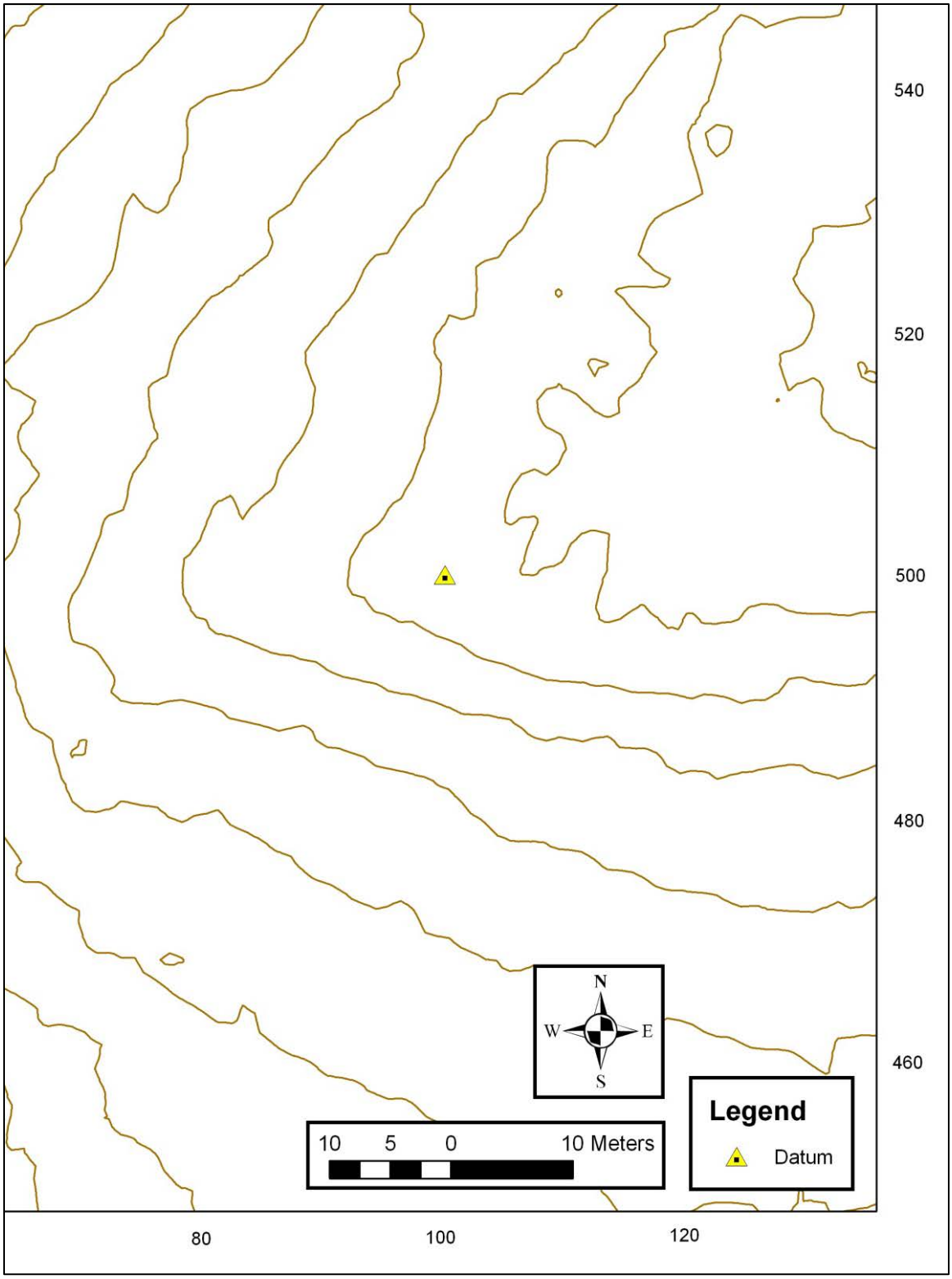

Figure 79. Site map of XMH-00927

5. Results and Synthesis

5.1 Results of the Excavations

The archaeological sites excavated as part of the BAX SDZ mitigation plan produced 132 different stone tools, over 16,000 pieces of lithic debitage, and over 2,500 faunal fragments. Most of the sites represent small, undated, lithic scatters, but two of these sites have been studied in more depth due to their large assemblages and associated chronological information (XMH-878 and XMH-915). Furthermore, and several other sites can provide information about past landscape use and technological strategies.

Dating and Geology

Chronological information from archaeological sites is essential for contributing to the local and regional context of the site. Eight different charcoal samples provide dates for six of the sites in this investigation (Table 8). These dates span the entire Holocene and suggest that people have inhabited the morainal landscape east of the Delta River since early postglacial times. The earliest date comes from XMH-910/911. Few sites in the region date to this time period. There are several sites along the Tanana River approximately 75 km to the northwest of XMH-910/911 with late Pleistocene dates, including Upward Sun River (Potter et al. 2011) and XBD-167 (Potter 2004), but these sites are in a much different environmental context. The Donnelly Ridge site (XMH-00005) is part of the Donnelly Ridge Archaeological District overlooking the Delta River 20 km northeast of Donnelly Dome. It is located on a terminal moraine of the Donnelly glaciation (Péwé and Holmes 1964). It has long been cited as having a Denali complex assemblage typical of other Interior Alaska sites dating to the late Pleistocene or early Holocene, although it has never been radiometrically dated (West 1996).

Table 8. Radiocarbon date list for the sites excavated as part of the BAX mitigation

Site	Date	Beta #
XMH-878	250±40	271222
XMH-910/911	8500±50	271223
XMH-915	5840±40	271224
XMH-915	5710±40	272086
XMH-917	2010±40	271227
XMH-917	1420±40	271226
XMH-925	5560±40	271228
XMH-945	1230±40	271229

The moraine complex where these excavated sites are located appears to have had a Northern Archaic occupation. At least three of the sites (XMH-915, XMH-925, and XMH-874 described in Robertson et al. 2009) have middle Holocene radiocarbon dates. As discussed below, all three of these have similar lithic assemblages emphasizing late-stage projectile point and microblade production. XMH-915 also contains "traditional Northern Archaic" notched projectile points (Esdale 2008).

All of these excavated and tested sites are shallowly buried on the moraine complex, and excavation units contain basal sterile glacial till (Table 9). No cultural material was buried more than 40 cm below surface, and artifacts were frequently found on the surface as well as buried close to the level of glacial materials, suggesting a large amount of post-depositional movement from freeze-thaw activities (Johnson et al. 1977, Mackay 1984, Washburn 1980). All excavation units contained silts from post-glacial aeolian deposition. Soil development is weak, although thick organic horizons occur in some of the units. Almost all of the sites were identified because of their surface expression. Two sites were identified through excavation (XMH-919 and XMH-1092).

Table 9. Geological context of archaeological sites in this report

Site	Sterile Basal Parent Material	Depth to Till (approx.)	Parent Material	Depth of Artifacts
XMH-278	glacial till	30 cm	aeolian sand/silt	0-30 cm
XMH-279	glacial till	40 cm	aeolian silt	0-30 cm
XMH-842	surface find			0 cm
XMH-875	glacial till	20 cm	aeolian silt	0-20 cm
XMH-878/908	glacial till	50 cm	aeolian silt	0-30 cm
XMH-906	glacial till	10 cm	aeolian silt	0-7 cm
XMH-907	glacial till	55 cm	aeolian silt	0-10 cm
XMH-909	isolate			0 cm
XMH-910/911	glacial till	30 cm	aeolian silt	0-30 cm
XMH-912	isolate			0 cm
XMH-913	not a site			
XMH-914	glacial till	25 cm	aeolian silt	0-25 cm
XMH-915	glacial till	50 cm	aeolian silt	0-50 cm
XMH-916	not a site			
XMH-917	glacial till	40 cm	aeolian silt	0-20 cm
XMH-919	glacial till	50 cm	aeolian silt	5-30 cm
XMH-920	glacial till	40 cm	aeolian silt	0-35 cm
XMH-921	glacial till	35 cm	aeolian silt	0-20 cm
XMH-923	glacial till	60 cm	aeolian silt	0-20 cm
XMH-924	glacial till	35 cm	aeolian silt	0-10 cm
XMH-925	glacial till	40 cm	aeolian silt	0-35 cm
XMH-926	surface finds			0 cm
XMH-927	surface finds			0 cm
XMH-945	glacial till	30 cm	aeolian silt	0-30 cm
XMH-1092	glacial till	40 cm	aeolian silt	5-40 cm
XMH-1122	glacial till	20 cm	aeolian sand/silt	0-20 cm
XMH-1303	glacial till	25 cm	aeolian sand/silt	0-25 cm

Lithic Raw Materials

Six main raw material categories were represented in the lithic assemblages of the BAX SDZ sites. These are chert, obsidian, basalt, andesite, rhyolite, and quartz (Table 10). Chert is an extremely broad category including the most common black and gray varieties, as well as banded or striped gray and black chert, red chert, brown chert, green chert, and chalcedony. The source areas for the chert are not known, although chert is available in geological outcrops approximately 80-100 km southwest of the sites (Figure 80) (Beikman 1980, Wilson 1998). Glacial till and river deposits closer to the sites are also likely sources of this material. Tertiary volcanic rocks such as basalt, andesite, and rhyolite were also available to prehistoric people in glacial and fluvial deposits south of the area, originating in the Alaska Range southwest of the sites. Bedrock outcrops of quartzite are more common to the northeast, although their precise location is not known.

Obsidian tools and flakes were found at seven of the excavated sites. Obsidian artifacts were analyzed using a portable x-ray fluorescence (XRF) machine in order to generate a trace element signature that was used to match stone with source locations. This analysis was done under the direction of J. Speakman at the Smithsonian Institution and J. Rasic at the University of Alaska Museum as part of the Alaska Obsidian Database Project. Obsidian in Army sites in DTA comes from five different source locations

(Table 11). Batza Tena (400 km northwest) and Wiki Peak (300 km southeast) are the most common source locations, although obsidian has also been sourced to Mt. Edziza (1000 km southeast) and groups A' and W, which are unknown sources likely in the Wrangell Mountains near Wiki Peak.

Given the great distance to lithic source materials of all types, it is likely that materials from glacial and fluvial deposits were being used for expedient technologies. Tools, such as lanceolate projectile points, would have required large blanks from large cobbles. Blanks may have been formed closer to primary source locations. This conclusion is consistent with evidence from debitage assemblages (see below).

Table 10. Presence and absence of major raw materials in each excavated site

Site	**Chert**	**Obsidian**	**Basalt**	**Andesite**	**Rhyolite**	**Quartzite**
XMH-278	x	x	x	x	x	x
XMH-279	x		x			x
XMH-842	x					
XMH-875	x					
XMH-878/908	x	x	x		x	x
XMH-906	x	x				
XMH-907	x				x	
XMH-909	x					
XMH-910/911	x	x	x		x	x
XMH-912	x					
XMH-913						x
XMH-914	x		x		x	
XMH-915	x	x	x		x	x
XMH-916						
XMH-917	x		x		x	
XMH-919	x		x		x	
XMH-920	x	x			x	x
XMH-921	x				x	
XMH-923	x		x		x	x
XMH-924	x					
XMH-925	x	x	x		x	x
XMH-926	x		x		x	
XMH-927	x					
XMH-945	x		x		x	x
XMH-1092	x		x		x	x
XMH-1122	x		x		x	
XMH-1303	x		x		x	x

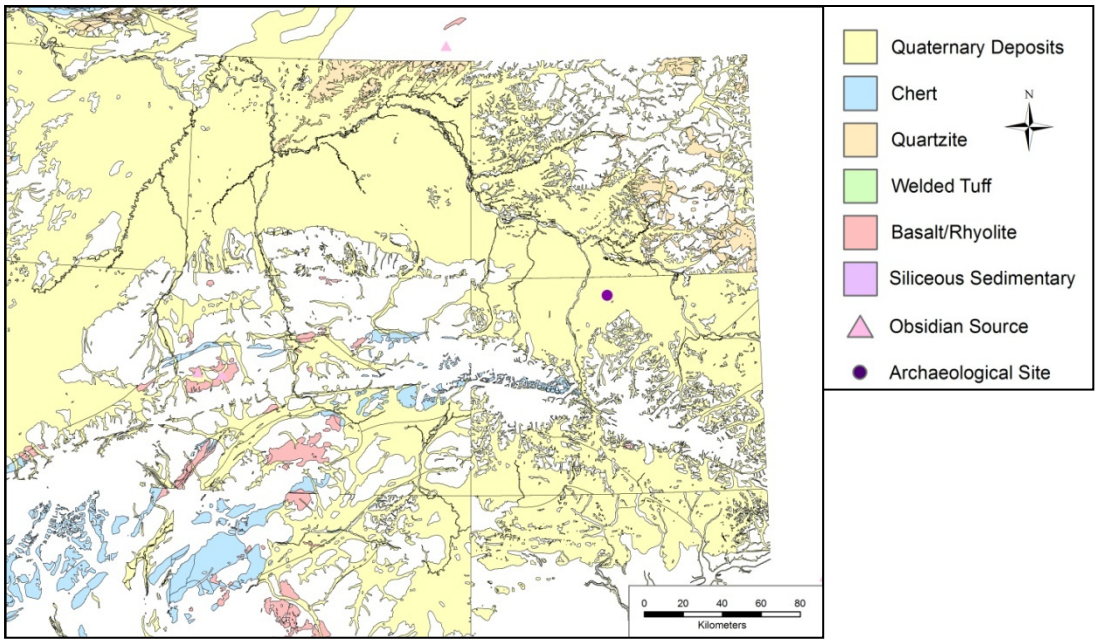

Figure 80. Bedrock sources of raw materials near DTA (Esdale 2013)

Table 11. Obsidian source locations of flakes

Site	Batza Tena	Wiki Peak	Mt. Edziza	Group A'	Group W	Unassigned
XMH-278	5					3
XMH-878/908	36	3		1		16
XMH-906					1	
XMH-910/911	1	13				5
XMH-915	9	16	1			17
XMH-920		7				2
XMH-925						14

Lithic Assemblages

Excavations at the sites in the BAX SDZ produced over 16,000 pieces of lithic material. Less than 1% of these were formal tools (Table 12). Three stone tool production strategies are represented by the tools and associated debitage. These production techniques are bifacial projectile-point production, unifacial scraping tool production, and core and blade reduction to produce microblades. No ground stone or bipolar tools or flakes were discovered.

Finished projectile points found in these assemblages come in a variety of forms, which would be expected given the wide date span represented by various sites. They range from large lanceolate points (e.g. XMH-878) to small triangular forms (e.g. XMH-915). Several are thin with straight bases (e.g. XMH-945) (Figure 81). Almost all of the points are broken bases, and many of them were broken during manufacture. No remaining projectile points are diagnostic on their own, although, coupled with a middle Holocene radiocarbon date, several of the points from XMH-915 are consistent with Northern Archaic projectile points from other areas. These notched and shouldered projectile points closely resemble those from middle Holocene Palisades and Portage levels at the Onion Portage site (Figure 82) (Anderson 1988).

Table 12. Formal tools found in lithic assemblages

Site	Blanks and Preforms	Projectile Points	Scrapers	Microblade Cores	Other Tools
XMH-278	5	1	3	1	
XMH-279	1			1	
XMH-842					
XMH-875					
XMH-878/908	7	1	5		microblades and mb debitage
XMH-906					
XMH-907					microblades and mb debitage
XMH-909			1		
XMH-910/911	2	1	7		
XMH-912					
XMH-913					no artifacts
XMH-914			1		microblades and mb debitage
XMH-915	9	10	21	7	microblades, burins
XMH-916					no artifacts
XMH-917	2		1		hammerstone
XMH-919					
XMH-920			2		microblades
XMH-921					microblade
XMH-923	6				
XMH-924					
XMH-925	1	1	1		microblades and mb debitage
XMH-926			1		
XMH-927					
XMH-945	11	1			microblades
XMH-1092	4		2	1	hammerstone, flake core
XMH-1122	1	1	1		microblade
XMH-1303	3	3	3	2	microblades and mb debitage

Figure 81. Projectile points from XMH-878, XMH-915, and XMH-945 (left to right)

Figure 82. Projectile points from XMH-915

Bifacial blanks, preforms, and other manufacturing rejects make up half of the tool assemblages at the excavated sites. All sites with finished projectile points have evidence of later stages of bifacial reduction, which include discarded blanks and preforms in addition to the debitage assemblage. Evidence of early-stage biface production, including flake cores, hammerstones, and cortical flakes, are rare in these assemblages, suggesting mainly late-stage preform and projectile point shaping and sharpening.

Debitage analysis has been completed in detail only for XMH-878 and XMH-915, but these assemblages also show an emphasis on late-stage bifacial preform and point production over earlier blank production for all raw materials (Table 13). Remains from early core reduction occur only for quartzite at XMH-878 (9%) and for an andesite cobble at XMH-915 (14%). The majority of bifacial thinning flakes also relate to the final stages of tool production. Early bifacial thinning flakes comprise 7% of banded chert flakes at XMH-915, 11% of obsidian flakes at XMH-915, and 9% of quartzite flakes at XMH-878, whereas late-stage bifacial thinning flakes and bifacial pressure flakes occur in much greater frequencies. Forty percent of debitage at XMH-878 and 15% of debitage at XMH-915 is from preform and projectile point shaping and sharpening.

Table 13. Percentage of each debitage category in XMH-878 and XMH-915 lithic assemblages

	Core Reduction				**Early Bifacial Reduction**				**Late Bifacial Reduction**						**Core and Blade**		**Fragments**	
	pd		**sd**		**eb**		**af**		**lb**		**ep**		**bp**		**mb**		**frag**	
Raw Material	**915**	**878**	**915**	**878**	**915**	**878**	**915**	**878**	**915**	**878**	**915**	**878**	**915**	**878**	**915**	**878**	**915**	**878**
andesite	0	0	14	0	0	0	0	0	14	36	0	2	0	2	0	0	71	60
banded chert	0	0	0	0	7	0	0	0	30	26	0	4	7	19	0	0	57	52
basalt	0	0	0	0	2	5	0	0	15	30	0	0	1	7	0	1	83	56
chalcedony	0	0	0	0	0	0	0	0	7	15	0	0	3	23	70	24	20	37
chert	0	0	0	0	2	2	0	0	3	25	1	1	8	17	24	13	61	42
obsidian	0	0	0	0	11	0	0	0	22	0	0	0	11	0	11	100	44	0
quartzite	0	9	0	0	0	9	0	0	13	27	0	0	13	0	0	0	73	55
rhyolite	0	1	0	0	1	4	0	0	15	29	1	0	5	9	13	9	65	48
TOTAL	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**10**	**27**	**0**	**1**	**5**	**12**	**21**	**9**	**62**	**49**

pd: primary decortications flakes, sd: secondary decortications flakes, eb: early bifacial thinning flakes, af: alternate flakes, lb: late bifacial thinning flakes, ep: edge preparation flakes, bp: bifacial pressure flakes, mb: microblades, frag: flake fragments

The remainder of diagnostic debitage at these sites is related to microblade production. Chalcedony, chert, obsidian, and rhyolite microblades were produced on site. The majority of core and blade debitage is in the form of microblades at both sites (Table 13). Core tablets and microblade core face rejuvenation flakes were found in frequencies of less than 1% and therefore do not appear in Table 13. The paucity of debitage related to core production, shaping, or repair suggests that microblade cores came into XMH-915 and XMH-878 already formed and in an intermediate stage of reduction. No microblade cores were found at XMH-878, and seven were discarded in the XMH-915 assemblage (Figure 83). Microblade cores are all small wedge shaped varieties made on flake blanks. Although originally called “campus cores” and thought to relate to the late Pleistocene Denali complex, these kinds of cores have been shown to date through the entire Holocene (Coutuoly 2012).

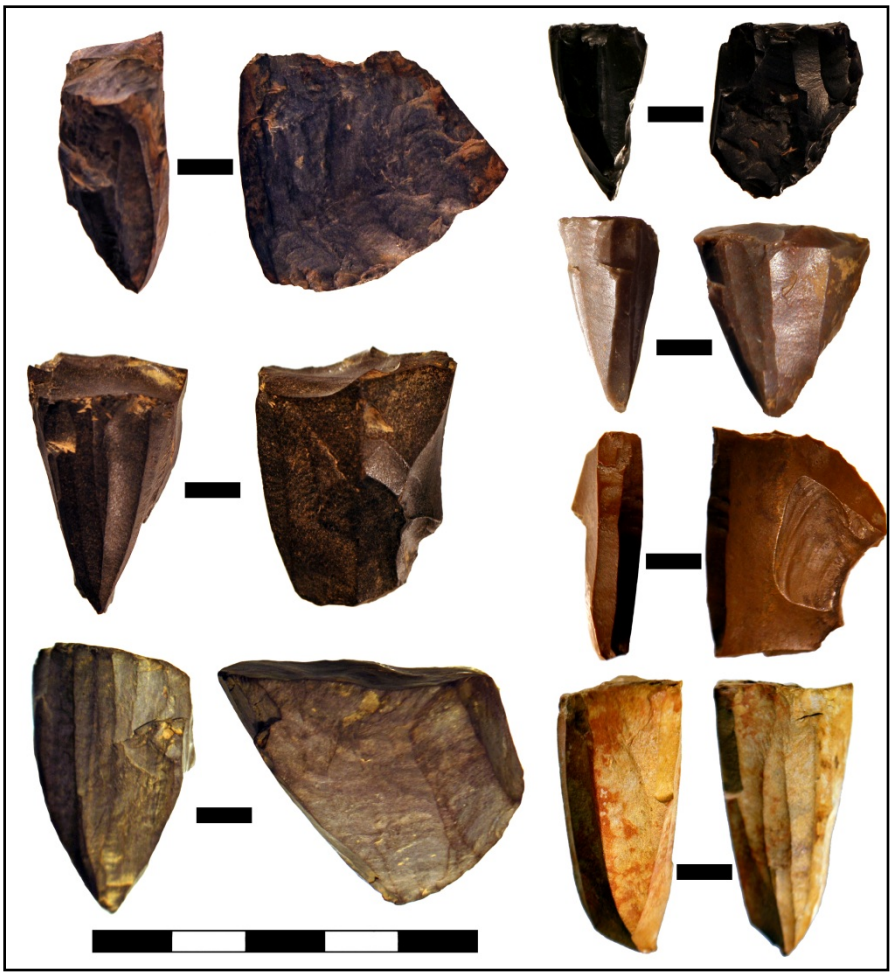

Figure 83. Microblade cores from XMH-915

Microblades, microblade cores, and/or microblade core reduction debitage were found at 13 of 27 sites (Table 12). Of sites with radiocarbon dates, microblade technology was found at XMH-915 and XMH-917 (dating to the middle Holocene) and XMH-945 and XMH-878 (dating to the late Holocene). No core or blade debitage has yet been discovered at the 8,500 year old site XMH-910. Burins are commonly found in association with microblade activity. Three were discovered at XMH-915.

Figure 84. Endscrapers from XMH-878 (3 on left) and XMH-915 (2 on right)

Figure 85. Tci-tho from XMH-915 (4 on left) and XMH-917 (right)

Tci-thos are found in four of the dated sites and demonstrate technological continuity from the middle Holocene Northern Archaic period to the late prehistoric Athabaskan period in Interior Alaska.

Faunal Assemblage

Faunal material, in the form of bone fragments, was found only at XMH-917. Although over 2,600 pieces were recovered, they are all small and calcined, and no determination to genus or species level is possible.

5.2 Conclusions

A clear cultural-historical sequence of occupation has not yet been established for the upper Tanana region, although people have been living in the area since the late Pleistocene (Holmes 2001, Potter et al. 2011). Radiocarbon dates from archaeological sites on Army lands suggest that these areas have been inhabited for the same time period (Gaines et al. 2012). However, the earliest date from this investigation is 8,500 years BP, and no sites have archaeological assemblages with large lanceolate spear points suggesting great antiquity. The archaeological assemblages from these sites are most similar to other mid-to-late Pleistocene archaeological sites in the area, demonstrating a transition from Northern Archaic to Athabaskan archaeological cultures. The radiocarbon dates obtained from associated charcoal corroborates this conclusion.

The glacial moraine that forms the base of each of these sites was stabilized by at least the early Holocene. The thin loess mantle capping the till and associated modern soil has been studied in detail for the nearby XMH-874 (Banjo Lake) site. The modern soil has been characterized as a Eutrocryept with week horizonation developed under shrub and conifer cover (Johnson and Bozarth 2008). Phytolith studies from the same site show the loess immediately above the till contains phytoliths, indicating a cold, treeless grassland environment. Overlying loess contains phytoliths from shrubs and suggests increasing surface stability after 6,000 years ago (Johnson and Bozarth 2008).

Archaeological sites formed on this landscape are all relatively small lithic scatters (Table 14). They range in area, from 50-900 m^2, and in content, from an isolated artifact to nearly 5,000 pieces, although few have likely been excavated in their entirety. Small sites are often considered to represent short occupations of a few individuals and therefore result from specific activities or behaviors that can be potentially reconstructed (Hall 1982, Kent 1992, and Moseley and Mackey 1972). Large sites can indicate many things, including multiple occupations, large groups of people, or heavy processing (Stein et al. 2003).

The majority of these sites likely represent single, short term occupations. Half of the sites have debitage and discarded tools related to late-stage projectile point production and resharpening, while the other half also include scraping tools. These likely indicate hunting stops and campsites. Only XMH-878, XMH-910, and XMH-915 have large assemblages (>2,000 items) located over large areas (>5,000 m^2). These three assemblages also contain the greatest number of discarded scrapers, indicating hide processing and longer term camping sites.

Raw materials found in the assemblages discussed in this report are dominated by those materials found in glacial deposits and streams within 100-200 km of the sites (cherts, volcanic rocks, quartzites), although travel or trade for obsidian was as far as 1,000 km away. Medium to high quality local materials were selected for all tool types. Lower quality materials, such as quartzite, were most commonly made into expedient tools such as cobble spall scrapers (tci-thos).

Table 14. Site size and artifact count

Site	Area (m^2)	Artifact #	Bone #
XMH-278	150	91	
XMH-279	700	41	
XMH-842	isolate	1	
XMH-875	200	13	
XMH-878/908	9000	2284	
XMH-906	120	31	
XMH-907	200	28	
XMH-909	isolate	1	
XMH-910/911	7500	4935	
XMH-912	isolate	2	
XMH-913	not a site		
XMH-914	150	30	
XMH-915	5000	4990	
XMH-916	not a site		
XMH-917	120	349	>2600
XMH-919	400	14	
XMH-920	100	45	
XMH-921	200	25	
XMH-923	5500	1193	
XMH-924	100	6	
XMH-925	875	503	
XMH-926	50	6	
XMH-927	isolate	2	
XMH-945	2250	1038	
XMH-1092	150	91	
XMH-1122	100	13	
XMH-1303	2000	709	

The debitage analyses from XMH-878 and XMH-915, as well as analyses of discarded flake cores, biface blanks, and preforms from the remainder of the sites, indicate only late-stage processing for all technologies and all raw materials. No primary processing or flake and biface blank production occurred at any of the sites. Biface blanks and preforms came into these sites and were finished, re-sharpened, or discarded. This pattern suggests that either the sources for the raw materials were distant from the site, or that site activities were focused on non-lithic tool production activities. Microblade production occurred on-site at half of the sites, but cores were also brought into these sites already shaped and ready to use. The debitage scatters may reflect tool repair at hunting camps or some other secondary activity.

Half of the excavated sites demonstrate multiple production strategies. Unifacial, bifacial, core, and blade technology were used simultaneously. Sites like XMH-915 show the co-occurrence of notched projectiles and some kind of microblade projectile point. The coexistence of microblade and bifacial (especially notched point) technology has been explained by archaeologists in many different ways (Esdale 2008). Archaeologists have argued that microblade cores are used by mobile groups in order to conserve raw materials where they are scarce (Morrow 1987) or highly seasonal (Clark 2001). Another explanation for the coexistence of technologies is multiple cultures and palimpsest deposits (Ackerman 2007, Anderson 1968, Workman 1978). Recent studies have suggested that many past mobile foragers employed multiple weapon systems for different types of game and would have chosen different types of lithic and organic weapon tips (Rasic and Slobodina 2008).

The home range for people living in the moraine complex southeast of Delta Junction was probably on the order of 200 km in diameter. These groups would have included raw material prospecting in part of their seasonal round. Raw material procurement had to have been a spring, summer, or fall activity (May-September) given snow cover and frozen deposits at other times. Although the southern range of raw material sources is not currently known, glaciers and rivers would have likely transported raw materials from approximately 200 km away into closer proximity to the archaeological sites studied here. Because glaciers did not move from the north, the quartzites from 100 km north of the area present a possible northern range boundary.

Although these sites have not been studied yet in great detail, the information gained from their locations, geological context, raw materials, and lithic assemblages can still contribute to cultural historical frameworks and settlement models of the upper Tanana region. The sites on the moraine complex in DTA East demonstrate a fair amount of continuity in technology and land use strategies from at least the middle Holocene to near contact times.

5.3 Public Presentations

Numerous publications have been given to public and archaeological audiences incorporating the results of the research at the 29 Data Recovery sites in the BAX area. These include:

Robertson, A.C. and Gaines, E.P. 2009. Monitoring and Data Recovery Plan for Cultural Resources within the Battle Area Complex Surface Danger Zone, Fort Wainwright, Donnelly Training Area, 2009. Presentation given in to a meeting of Upper Tanana tribes in the spring of 2009.

Gaines, E.P., Yeske, K.S., and McLaren, W.E. 2010. Recent Archaeological Research on U.S. Army Training Lands, Tanana Valley, Central Alaska. Poster given at the 2011 Alaska Anthropological Association Meeting in Fairbanks, AK.

Esdale, J.E. 2012. Northern Archaic-Athabaskan Transition in Central Alaska. Paper presented at the 2012 Alaska Anthropological Association Meeting in Seattle, WA.

McLaren, W.E. and Esdale, J.E. 2013. Comparing Two Sites of the Tanana Basin of Central Alaska. Paper presented at the 2013 Alaska Anthropological Association Meeting in Anchorage, AK.

Esdale, J.E. 2013. Archaeology on Army Lands. Paper presented as a visiting speaker at Texas A&M University, 2013.

Esdale, J.E. 2013. Stone Tool Production Strategies in Northern Archaic Assemblages. Paper presented as a visiting speaker at Texas A&M University, 2013.

Esdale, J.E. 2013. Tool Stone Procurement and Lithic Assemblage Variability in the North. Paper presented at the 2013 Society for American Archaeology Meeting in Honolulu, HI.

6. References

Ackerman, R.E. 2007. “Security Cove and the Northern Archaic Tradition Revisited.” Paper presented at the 34th annual meeting of the Alaska Anthropological Association, Fairbanks, AK.

Anderson, D.D. 1968. “Early Notched Point and Related Assemblages in the Western American Arctic.” Paper presented at the 67th Annual Meeting of the American Anthropological Association, Seatle, WA.

Anderson, D.D. 1968. "A Stone Age Campsite at the Gateway to America." *Scientific American 218(6)*: 24-33.

Anderson, D.D. 1970. "Microblade Traditions in Northwestern Alaska." *Arctic Anthropology 7(2)*: 2-16.

Anderson, D.D. 1988. *Onion Portage: The Archaeology of a Stratified Site from the Kobuk River, Northwest Alaska.* Anthropological Papers of the University of Alaska 22(1-2).

Andrews, E.F. 1987. "Archaeological Evidence of European Contact: The Han Athabascans near Eagle, Alaska." *High Plains Applied Anthropologist 7(2)*: 51-64.

Andrews, E.F. 1977. *Report on the Cultural Resources of the Doyon Region, Central Alaska: Volumes I and II.* Fairbanks: Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska Occasional Paper No. 5.

Andrews, E.F. 1975. *Salcha: an Athabaskan Band of the Tanana River and its Culture.* M.A. Thesis, Fairbanks: Department of Anthropology, University of Alaska.

Bacon, G.H. 1978. *Final Report on the Archeological Survey of the XM-1 Tank Range, Fort Greely, Alaska.* Fairbanks: Prepared for the U.S. Army Corps of Engineers, Alaska District, by Alaskaarctic.

Bacon, G.H., and C.E. Holmes. 1979. *Archaeological Survey and Inventory of Cultural Resources at Fort Greely.* Fairbanks: Prepared by Alaskaarctic.

Beikman, H.M. 1980. *Geological Map of Alaska.* United States Geological Survey Miscellaneious Publication 138.

Bever, M.R. 2001a. "An Overview of Alaskan Late Pleistocene Archaeology: Historical Themes and Current Perspectives." *Journal of World Prehistory 15(2)*: 125-191.

Bever, M.R. 2001b. "Stone Tool Technology and the Mesa Complex: Developing a Framework of Alaska Paleoindian Prehistory." *Arctic Anthropology 38(2)*: 98-118.

Bever, M.R. 2006. "Too Little, Too Late? The Radiocarbon Chronology of Alaska and the Peopling of the New World." *American Antiquity 71(4)*: 595-620.

Bigelow, N.H., and R.W.M. Powers. 2001. "Climate, Vegetation, and Archaeology 14,000-9000 Cal Yr B.P. In Central Alaska." *Arctic Anthropology 38(2)*: 171-195.

Bradley, Z., J. Cook, and A. Frizzera. 1973. *Preliminary Survey Report, Blair Lakes Alaska.* Fairbanks: University of Alaska Fairbanks, Anthropology Department.

Buchanan, B., and M. Collard. 2008. "Phenetics, Cladistics, and the Search for the Alaskan Ancestors of the Paleoindians: a Reassessment of Relationships Among the Clovis, Nenana, and Denali Archaeological Complexes." *Journal of Archaeological Science 35*: 1683-1694.

Bureau of Land Management and U.S. Army. 1994. *Fort Wainwright Fort Greely: Resource Management Plan, Final Environmental Impact Statement.* Anchorage: Bureau of Land Management, Steese/White Mountains District and U.S. Army, 6th Infantry Division.

Clark, D.W. 2001. "Microblade-Culture Systematics in the Far Interior Northwest." *Arctic Anthropology 38(2)*: 64-80.

Clark, D.W. 1981. "Prehistory of the Western Subarctic." In *The Handbook of North American Indian: Subarctic, Volume 6*, by J. Helm, 120. Washington, D.C.: Smithsonian Institution.

Clark, D.W. 1992. "The Archaic in the Extreme Northwest of North America." *Revista de Arqueologia Americana 5*: 71-99.

Cook, J.P. 1975. "Archaeology of Interior Alaska." *Western Canadian Journal of Anthropology 3*: 125-133.

Cook, J.P. 1996. "Healy Lake." In *American Beginnings: The Prehistory and Palaeoecology of Beringia*, by F.H. West, 323-327. Chicago: University of Chicago Press.

Cook, J.P. 1989. "Historic Archeology and Ethnohistory at Healy Lake, Alaska." *Arctic 42(3)*: 109-118.

Cook, J.P. 1979. *Site XBD-094: Aircraft Assault Strip Fort Wainwright, Alaska.* Fairbanks: Final Report to U.S. Army Corps of Engineers.

Cook, J.P. 1969. *The Early Prehistory of Healy Lake, Alaska.* Ph.D. Dissertation, Madison: Department of Anthropology, University of Wisconsin.

Cook, J.P., and T.E. and Gillespie. 1986."Notched Points and Microblades." Paper presented at the 13th Annual Meeting of the Alaska Anthropological Association. Fairbanks: Alaska.

Coutouly, Y.A.G. 2012. “Pressure Microblade Industries in Pleistocene-Holocene Interior Alaska: Current Data and Discussions”. In *The Emergence of Pressure Blade Making: From Origin to Modern Experimentation*, edited by P.M. Desrosiers, 347-374. New York: Springer.

Dixon, E.J. 1985. "Cultural Chronology of Central Interior Alaska." *Arctic Anthropology 22*: 47-66.

Dixon, E.J., G.S. Smith, and D. Plaskett. 1980. *Archeological Survey and Inventory of Cultural Resources, Fort Wainwright, Alaska.* Prepared for the U.S. Army Corps of Engineers, Alaska District.

Dumond, D.E. 2001. "The Archaeology of Eastern Beringia: Some Contrasts and Connections." *Arctic Anthropology 38(2)*: 196-2005.

Esdale, J.A. 2013. "Tool Stone Procurement and Lithic Assemblage Variability in the North." Paper presented at the 78th annual meeting of the Society for American Archaeology, Honolulu, HI.

Esdale, J.A. 2008. "A Current Synthesis of the Northern Archaic." *Arctic Anthropology 45(2)*: 3-38.

Esdale, J.A., and A.C. Robertson. 2007. *Final Report: Archaeological Data Recovery for Sites XMH-00284 and XMH-00881, 33-Mile Loop Road Gravel Source Mitigation: Donnelly Training Area, Fort Wainwright, Alaska 2007.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Esdale, J.A., J. Quinn, K.S. Yeske, and W.E. McLaren. 2012a. *2011 Archaeological Survey and Report of CRTC Project Areas in Donnelly Training Area for the Cold Regions Test Center.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Esdale, J.A., E.P. Gaines, W.E. McLaren, and J. Quinn. 2012b. *Battle Area Complex Surface Danger Zone Archaeological Site Monitorin, Donnelly Traiing Area: Annual Report 2010 and 2011.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Esdale, J.A., E.P. Gaines, W.E. McLaren, and J. Quinn. 2012c. *Section 110 Report, Cultural Resources Survey and Evaluation, Fort Wainwright and Training Lands: 2010 and 2011.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Espenshade, C.T. 2010. *Archaeological Investigations, Donnelly Training Area near Delta Junction, Alaska.* Greensboro: Prepared by New South Associates. Technical Report 1922.

Gaines, E.P. 2009. *Report: Archaeological Survey and Evaluation Fort Wainwright and Fort Richardson, Alaska 2008.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Gaines, E.P., H. Hardy, and H. Brown. 2010. *Final Report: Determination of National Register Eligibility for Eleven Archaeological Sites at Fort Greely, Alaska 2010.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Gaines, E.P., K.S. Yeske, S.J. Shirar, W.C. Johnson, and J.F. Kunesh. 2011. “Pleistocene Archaeology of the Tanana Flats, Eastern Beringia.” *Current Research in the Pleistocene* 29:42-44.

Gaines, E.P., K.S. Yeske, and S.J. McGowan. 2010. *Annual Report: Cultural Resources Survey and Evaluation, Fort Wainwright, Alaska 2009.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Gamza, T. 1995. *Excavation and Evaluation of Sullivan's Roadhouse (XBD-061), Fort Greely, Alaska 1994.* Anchorage: Final Report, Prepared for the Office of History and Archaeology, Division of Parks and Recreation, Alaska Department of Natural Resources.

Goebel, T., W.R. Powers, N.H. Bigelow, and A.S. Higgs. 1996. "Walker Road." In *American Beginnings: The Prehistory and Palaeoecology of Beringia*, by Frederick H. West, 356-363. Chicago: University of Chicago Press.

Hall, E.S., Jr. 1982. The Potential Significance of Small, Single Component Archaeological Sites for Elucidating the Culture History of Northern Alaska.” *Anthropological Papers of the University of Alaska* 20(1-2):7-13.

Haynes, T.L., and W.E. Simeone. 2007. *Upper Tanana Ethnographic Overview and Assessment, Wrangell St. Elias National Park and Preserve.* Juneau: Alaska Department of Fish and Game, Division of Subsistence.

Hedman, W., A. Robertson, N. Fichter, and K. Anderson. 2003. *Report: Archaeological Survey and Evaluation, Fort Richardson and Fort Wainwright, 2002.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Higgs, A.S., B.A. Potter, P.M. Bowers, and O.K. Mason. 1999. *Cultural Resource Survey Report of the Yukon Training Area and Fort Greely Army Lands Withdrawal, Alaska. Vol. 2.* Fairbanks: Prepared by Northern Land Use Research, Inc.

Holmes, C.E. 1979a. *Report on Archeological Reconnaissance: Yukon Training Command Withdrawal Area. Ft. Wainwright.* Report prepared for the U.S. Army Corps of Engineers under Contract DACA85-79-M-0001.

Holmes, C.E. 1979b. *Archaeological Reconnaissance Report for Fort Wainwright, Fort Greely, and Fort Richardson Withdrawal Lands, Alaska.* Fairbanks: Prepared for the 172nd Infantry Brigade.

Holmes, C.E. 1996. "Broken Mammoth." In *American Beginnings: The Prehistory and Palaeoecology of Beringia*, by F.H. West, 312-318. Chicago: University of Chicago Press.

Holmes, C.E. 1998. "New Data Pertaining to Swan Point, the Oldest Micoblade Site Known in Alaska." *Current Research in the Pleistocene 15*: 21-22.

Holmes, C.E. 2001."Tanana River Valley Archaeology Circa 14,000 to 9,000 B.P." *Arctic Anthropology 38(2)*: 154-170.

Holmes, C.E. 2007."The East Beringian Tradition and the Transitional Period: New Data from Swan Point." 34th Annual Meeting of the Alaskan Anthropological Association. Fairbanks.

Holmes, C.E., and J. Anderson. 1986. *Archaeology and Paleoecology of the Delta River Area, Interior Alaska.* . Anchorage: National Science Foundation Project Summary Manuscript on file at the State Historic Preservation Office.

Holmes, C.E., R. VanderHoek, and T.E. Dilley. 1996. "Swan Point." In *American Beginnings: The Prehistory and Palaeoecology of Beringia*, by F.H. West, 319-323. Chicago: University of Chicago Press.

Holmes, G.W. 1965. *Geologic Reconnaissance Along the Alaska Highway, Delta River to Tok Junction, Alaska. Bulletin B 1181-H.* Anchorage: U.S. Geological Survey.

Johnson, D.L., Muhs, D.R., and M.L. Barhardt. 1977. "The effects of frost heaving on objects in soil II: Laboratory experiments." *Plains Anthropologist 22:* 133–147.

Johnson, W.C., and S.R. Bozarth. 2008. *Geoarchaeology and Environmental Reconstruction at XMH-874, Fort Wainwright Donnelly Training Area.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Kent, S. 1992. “Studying Variability in the Archaeological Record: an Ethnoarchaeological Model for Distinguising Mobility Pattrns.” *American Antiquity* 57(4):636-660.

Lively, R.A. 1996. "Chugwater." In *American Beginnings: The Prehistory and Palaeoecology of Beringia*, by F.H. West, 308-311. Chicago: University of Chicago Press.

Mackay, J.R. 1984. "The Frost Heave of Stones in the Active Layer above Permafrost with Downward and Upward Freezing." *Arctic and Alpine Research (16):* 439–446.

Marshall, T. 2007. *Archaeological Survey and Evaluation: Fort Wainwright, 2006.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

McFadyen Clark, A. 1981."Koyukon." In *Handbook of North American Indians, Volume 6: Subarctic,* by J. Helm, 582-601. Washington, D.C.: Smithsonian Institution.

McFadyen Clark, A. 1996. *Who Lived in This House? A Study of Koyukuk River Semi Subterranean Houses.* Hull: Mercury Series Archaeological Survey of Canada Paper 153. Canadian Museum of Civilization.

McKennan, R.A. 1981."Tanana." In *Handbook of North American Indians, Volume 6: Subarctic,* by J. Helm. Washington, D.C.: Smithsonian Institution.

Meltzer, D.J. 2001. "Late Pleistocene Cultural and Technological Diversity of Beringia: A View from Down Under." *Arctic Anthropology 38(2)*: 206-213.

Mishler, C.W. 1986. *Born With the River: An Ethnographic History of Alaska's Goodpaster and Big Delta Indians.* Fairbanks: Alaska Departmet of Natural Resources, Division of Geological and Geophysical Surveys Reports, Public Data File 68-14.

Moseley, M.E., and C.J. Mackey. 1972. “Peruvian Settlement Pattern Studies and Small Site Methodology.” *American Antiquity* 37(1):67-82.

Muhs, D.R. and J.R. Budahn. 2006. “Geochemical Evidence for the Origin of Late Quaternary Loess in Central Alaska.” *Canadian Journal of Earth Science* 43: 323-337.

Natural Resource Conservation Service. 2010. *Soil Survey for Alaska: Fort Greely and Donnelly Training Area.* Palmer: Natural Resource Conservation Service.

Odess, D. 2002. *Preliminary Report of Archaeological Investigations on Military Lands in the Vicinity of Donnelly Dome, Alaska, Under TCC Contract #DAPC49=01-D-0004.* Fairbanks: Report on file with the Tanana Chiefs Conference.

Odess, D., and J.T. Rasic. 2007. "Toolkit Composition and Assemblage Variability: The Implications of Nogahabara I, Northern Alaska." *American Antiquity 72(4)*: 691-717.

Péwé, T.L., and G.W. Holmes. 1964. Geology of the Mt. Hayes D-4 Quadrangle, Alaska. *Miscellaneous Geologic Investigations Map I-394.* Washington, D.C.: U.S. Geological Survey.

Pearson, G.A., and W.R. Powers. 2001. "The Campus Site Re-Excavation: New Efforts to Unravel Its Ancient and Recent Past." *Arctic Anthropology 38(1)*: 100-119.

Phillips, W.T., Sr. 1984. *Roadhouses of the Richarson Highway, the First Quarter Century: 1898-1923.* Anchorage: State of Alaska, Alaska Historical Commission,

Pink, T. 2005. *Soil Survey of Fort Greely and Donnelly Training Area, Alaska.* Washington D.C.: USDA-Natural Resources Conservaiton Service.

Potter, B.A. 2008. "Exploratory Models of Intersite Variability in Mid to Late Holocene Central Alaska." *Arctic 61(4)*: 407-425.

Potter, B.A. 2004. "Modeling Intersite Variability in Interior Alaska: Overcoming Conceptual Ambiguity Through Pattern Recognition." 60th Annual Meeting of the Society for American Archaeology. Montreal.

Potter, B.A. 2007. "Models of Faunal Processing and Economy in Early Holocene Interior Alaska." *Environmental Archaeology 12(1)*: 3-23.

Potter, B.A. 2008. "Radiocarbon Chronology of Central Alaska: Technological Continuity and Economic Change." *Radiocarbon 50(2)*: 181-204.

Potter, B.A. 2001. "Recent Investigations at the Gerstle River Site, a Multicomponent Site in Central Alaska." *Current Research in the Pleistocene 18*: 52-54.

Potter, B.A. 2005. *Site Location Model and Survey Strategy for Cultural Resources in the Alaska Railroad Northern Rail Extension Project Area.* Fairbanks: Report submitted by Northern Land Use Research, Inc. and ICF Consulting Services, LLC.

Potter, B.A., J.D. Irish, J.D. Reuther, C.l Gelvin-Reymiller, and V.T. Holliday. 2011. "A Terminal Pleistocene Child Cremation and Residential Structure from Eastern Beringia." *Science 331*: 1058-1062.

Potter, B.A., J.D. Reuther, P.M. Bowers, and C. Gelvin-Reymiller. 2008. "Little Delta Dune Site: A Late-Pleistocene Multicomponent Site in Central Alaska." *Current Research in the Pleistocene 25*: 132-135.

Potter, B.A., J.D. Reuther, P.M. Bowers, and C. Gelvin-Reymiller. 2007a. *Results of the 2007 Cultural Resource Survey of Proposed Alaska Railroad Northern Rail Extension Routes, Alaska.* Fairbanks: Report submitted by Northern Land Use Research, Inc.

Potter, B.A., P.M. Bowers, J.D. Reuther, and O.K. Mason. 2007b. "Holocene Assemblage Variability in the Tanana Basin: NLUR Archaeological Research, 1994-2004." *Alaska Journal of Anthropology 5(1)*: 23-42.

Potter, B.A., S.C. Gerlach, A.S. Higgs, and P.M. Bowers. 2000. *Final Cultural Resources Survey: Fort Greely, Yukon Training Area (Fort Wainwright), Alaska for the National Missile Defense Program, for USAR Space and Missile Defense Command.* Fairbanks: Report prepared by Northern Land Use Research, Inc.

Powers, W.R., and J.F. Hoffecker. 1989. "Late Pleistocene Settlement in the Nenana Valley, Central Alaska." *American Antiquity 54(2)*: 263-287.

Price, K. 2002. *Homesteads on Fort Wainwright, Alaska.* Fort Collins: Center for Environmental Management of Military Lands, Colorado State University.

Rabich, J.C., and D.R. Reger. 1977. *Archaeological Excavations at the Gerstle River Quarry Site. In, Archaeological Survey Projects 1977.* Anchorage: OHA Miscellaneous Publications 18, Office of History and Archaeology.

Racine, C.H., R. Lichvar, B. Murray, G. Tande, R. Lipkin, and M. Duffy. 1997. *A Floristic Inventory and Spatial Database for Fort Wainwright, Interior Alaska.* Fairbanks: U.S. Army Cold Regions Research and Engineering Laboratory, Special Report 97-23.

Rasic, J.T. and N.S. Slobodina. 2008. "Weapon Systems and Assemblage Variability during the Northern Archiac Period in Northern Alaska." *Arctic Anthropology* 45(1):71-88.

Raymond-Yakoubian, J., and A. Robertson. 2005. *Annual Report: Archaeological Survey and Evaluation, Fort Richardson and Fort Wainwright, 2004.* Annual Report, Fort Collins: Center for Environmental Management of Military Lands (CEMML).

Raymond-Yakoubian, J., and A. Robertson. 2006. *Annual Report: Archaeological Survey and Evaluation, Fort Richardson and Fort Wainwright, 2005.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Ream, B.A. 1986. *Old Fish Camp: an Ethnohistoric and Archeological Analysis of a Lower Yukon Koyukon Athapaskan Winter Village, Khotol River, Alaska.* M.A. Thesis, Department of Anthropology, Western Washington University.

Reynolds, G.L. 1983. *Archaeological Reconnaissance of Four Borrow Pits, Fort Wainwright, Alaska.* Anchorage: Submitted to the U.S. Army Corps of Engineers.

Reynolds, G.L. 1998. *Archaeological Site Report Fort Greely Cantonment Area.* Anchorage: Manuscript on file at the Office of History and Archaeology.

Reynolds, G.L. 1986. *Inventory of Cultural Resources and Overview, Phase I.* Prepared for the 172nd Infantry Brigade by Georgeanne Reynolds, Fairbanks: Alaska Heritage Group, Inc.

Reynolds, G.L. 1985. *Survey of Construction Projects, Fort Wainwright Cantonment.* Anchorage: Manuscript onfile at the Office of History and Archaeology.

Robertson, A.C. 2009. *U.S. Army Alaska's Monitoring and Data Recovery Plan for Cultural Resources within the Battle Area Complex Surface Danger Zone, Fort Wainwright, Donnelly Training Area, 2009.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Robertson, A.C., J. Esdale, W.C. Johnson, S.R. Bozarth, S. McGowan, M. Proue, C.K. Paraso, S. Shirar, and P. Gilbert. 2009. *Final Report: 2006-2007 Archaeological Data Recovery for Site XMH-00874 Battle Area Complex (BAX) Mitigation, Donnelly Training Area, Fort Wainwright, Alaska.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Robertson, A.C., M. Proue, C.K. Paraso, S. Shirar, and P. Gilbert. 2008. *Archaeological Data Recovery for Site XMH-00874, Battle Area Complex (BAX) Mitigation, Donnelly Training Area, Fort Wainwright, Alaska, 2007.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Robertson, A.C., M. Proue, P. Hall, S. Shirar, and C.K. Paraso. 2007. *Archaeological Survey, Evaluation, and Mitigation: Donnelly Training Area, Fort Wainwright, Alaska 2006.* Fort Collins: Prepared by the Center for Environmental Management of Military Lands.

Robertson, A.C., N. Fichter, and K. Anderson. 2004. *Annual Report: Archaeological Survey and Evaluation, Fort Richardson and Fort Wainwright 2003.* Ft. Collins: Prepared by the Center for Environmental Management of Military Lands.

Robertson, A.C., S.J. Meitl, D. White, P. Gilbert, and C. Ciancibelli. 2009. *Archaeological Survey and Evaluation: Donnelly Training Area, Fort Wainwright.* Ft. Collins: Prepared by the Center for Environmental Management of Military Lands.

Sheppard, W., A.F. Seffian, D.P. Staley, and N.H. Bigelow. 1991. *Late Holocene Occupations at the Terrace Site, Tok, Alaska.* Final Report, Fairbanks: Prepared for U.S. Air Force Over-the-Horizon Backscatter Radar Program.

Shinkwin, A.D. 1979. *Dakah De'nin's Village and the Dixthada Site: a Contribution to Northern Alaskan Prehistory.* National Museum of Man Mercury Series NO. 91.

Staley, D.P. 1993. *A Phase 1 Cultural Resources Survey of 19 Locations for the Proposed Yukon Measurement and Debriefing System in Interior Alaska.* Albuquerque: Mariah and Associates.

Steele, J.L. 1982. *Archaeological Assessment of Proposed Range Control Headquarters Building, Fort Wainwright, Alaska.* Anchorage: Alaska District, U.S. Army Corps of Engineers.

Steele, J.L. 1980. *Archaeological Assessment of Squad Assault Range, Powerline Extension, and M-16 Record Fire Range, Fort Greely, Alaska.* Anchorage: Alaska District, U.S. Army Corps of Engineers.

Steele, J.L. 1982. *Cultural Resource Assessment for a Quarry Site at Donnelly Dome, Fort Greely, Alaska.* Anchorage: Alaska District, U.S. Army Corps of Engineers.

Steele, J.L. 1983. *Cultural Resource Assessment of a Powerline Extension: Fort Greely, Alaska.* Anchorage: Alaska District, U.S. Army Corps of Engineers.

Steele, J.L. 1983. *Cultural Resources Assesment of Proposed Borrow Area, Fort Wainwright, Alaska.* Anchorage: Report on file at the Office of History and Archaeology.

Steele, J.L. 1980. *Fort Greely Bison Trail Archaeological Survey, Fort Greely, Alaska.* Anchorage: Alaska District, U.S. Army Corps of Engineers.

Stein, J.K., J.N.Deo, and L.S. Phillips. 2003. “Big sites-short time: accumulation rates in archaeological sites.” *Journal of Archaeological Science* 30(3):297-316.

Tanana Chiefs Conference, Inc. 1993. *Forest Resources of Bureau of Land Management and Military Lands Within a 100 Mile Radius of Fairbanks, Alaska.* Fairbanks: Prepared for the Bureau of Land Management.

U.S. Army Garrison, Alaska (USARAK). 2007. *Integrated Natural Resources Management Plan 2007-2012, Volume 1.* Fort Wainwright: Environmental Office, Directorate of Public Works.

U.S. Army Garrison, Alaska (USARAK). 2002. *Integrated Natural Resources Management Plan 2002-2006, Volume 1: Fort Greely and Donnelly Training Area.* Fort Wainwright: Environmental Division, Directorate of Public Works.

VanStone, J.W., and I. Goddard. 1981. "Territorial Groups of West-Central Alaska Before 1898." In *Handbook of North American Indians, Volume 6: Subarctic*, by J. Helm, 556-561. Washington D.C.: Smithsonian Institution.

Viereck, L.A., and E.L., Jr. Little. 1972. *Alaska Trees and Shrubs.* Washington, D.C.: Agricultural Handbook 410. U.S. Forest Service.

Washburn, A.L. 1980. *Geocryology.* London: Edward Arnold.

West, F.H. 1975. "Dating the Denali Complex." *Arctic Anthropology 12*: 76-81.

West, F.H. 1996. "Donnelly Ridge." In *American Beginnings: The Prehistory and Palaeoecology of Beringia*, by F.H. West, 302-307. Chicago: University of Chicago Press.

West, F.H. 1996. "Other Sites in the Tangle Lakes." In *American Beginnings: The Prehistory and Palaeoecology of Beringia*, by F.H. West, 403-408. Chicago: University of Chicago Press.

West, F.H.. 1981. *The Archaeology of Beringia.* New York: Columbia Press.

West, F.H. 1967. "The Donnelly Ridge Site and the Definition of an Early Core and Blade Complex in Central Alaska." *American Antiquity 32(2)*: 360-382.

Wilson, FH., Dover, J.H., Bradley, D.C., Weber, F.R., Bundtzen, T.K., and P.J. Haeussler. 1998. *Geologic Map of Central (Interior) Alaska.* Text to accompany United States Geological Survey Open-File Report OF98-133.

Workman, W.B. 1978. *Prehistory of the Aishnik-Kluane Area, Southwest Yukon Territory.* Ottwaw: Mercury Series. Archaeological Survey of Canadad Paper 74, 592pp. Ottawa: National Museum of Canada.

Yarborough, L.F. 1978. *Chena River Lakes Project Cultural Resource Investigation.* Final Report, Fairbanks: Prepared for the U.S. Army Corps of Engineers, Alaska District.

Yesner, D.R. 2001. "Human Dispersal into Interior Alaska: Antecedent Conditions, Mode of Colonization, and Adaptations." *Quaternary Science Reviews*: 315-327.

Yesner, D.R., and G.A. Pearson. 2002. "Microblades and Migrations: Ethnic and Economic Models in the Peopling of the Americas." In *Thinking Small: Global Perspectives on Microlithization*, by R.G. Elston and S.L. Kuhn, 133-161. Arlington: Archaeological Papers of the American Anthropological Association Number 12.

Yesner, D.R., C.E. Holmes, and G. Pearson. 1999. "Recent Excavations at the Broken Mammoth Site, Big Delta, Alaska: Reflections on Activity Patterning and Artifact Assemblages." 64th Annual Meeting of the Society for American Archaeology. Chicago.