APPENDIX A

1 - LITERATURE REVIEW--ARCHEOLOGY, ETHNOLOGY, AND HISTORY

1.1 - Previous Archeological Research

Scientific archeological investigation of the upper Susitna River Valley began over 27 years ago; however, research during the intervening years has been sporadic. In 1953, Ivar Skarland conducted an aerial reconnaissance of the region in preparation for a survey conducted by William Irving in that same year. This work was done under contract to the National Park Service. Irving's survey was designed to investigate impoundment areas of dams proposed for the Susitna River (Irving 1957:37). His efforts were focused on the proposed Devil Canyon Dam, and near Lakes Susitna, Louise, and Tyone. The lakes were investigated because the proposed Vee and Denali dams were to be located above the present Watana dam site and expected to inundate these areas (Irving 1957).

Eleven sites were found on the lakes and a twelfth site was discovered approximately three miles above the confluence of Tyone Creek and the Tyone River (Irving 1957). Five of the sites contained remains of semi-subterranean houses which Irving thought resembled houses that Rainey (1939) found along tributaries of the upper Copper River. Both post-contact and early pre-contact sites were reported by Irving. A multicomponent site, site 9, was found north of the outlet of Lake Susitna and was reported to contain late prehistoric Athapaskan, Arctic Small Tool Tradition, Northern Archaic Tradition, and Denali Complex components (Irving 1957).

Frederick Hadleigh-West conducted a brief survey in the study area during the summer of 1971 and located five sites adjacent to Stephan Lake (West 1971). Survey for the proposed Denali State Park was the reason for this survey and consequently the report contains little data on the Stephan Lake sites. The files of the Alaska State Archeologist contain information which indicate that one site (TLM-007) is multicomponent and has been radiocarbon dated to 4,000 B.C.

A recent study, Bacon (1975a), utilized an aerial reconnaissance of the study area to delineate several locales of high archeological potential along the upper Susitna utilizing an ecotone model to predict probable site locations. Most recently, Bacon (1978a; 1978b) conducted surveys near the Devil Canyon and the Watana Dam sites. No sites were found at the proposed Devil Canyon Dam site but in the vicinity of the Watana Dam site prehistoric sites were discovered. Site TLM-016 was radiocarbon dated to 3,675 ± 160 B.P.: ca. 1,725 B.C. Bacon (1978a:23) suggests occupation as early as 8,000 to 10,000 years ago at site TLM-015 and a possible Norton influence at site TLM-018.

Fifteen historic and prehistoric archeological sites are known from surveys in the study area conducted prior to the present study. Preliminary geologic analysis of the study area suggests that it has been ice free for approximately the last 13,000-11,000 years. Archeological sites dating from late Pleistocene to historic times have been found within the project area. The earliest C14 dates from the immediate project area document human occupation as early as 4,000 B.C.

1.2 - Regional Prehistory

Data available from the study area prior to 1980 and 1981 was inadequate to accurately define the cultural historical sequence. Consequently, it was necessary to draw on data from adjacent areas to construct a speculative prehistory for the upper Susitna River. Past studies of this type have proven to be fairly reliable indicators of cultural periods within a given area (Dixon, Smith, and Plaskett 1980a). The following regions adjacent to the study area will be considered: the Tanana Valley, Nenana River, the areas near Lakes Susitna, Louise, Tyone, and Tangle Lakes, the upper Copper River Valley, and the upper Cook Inlet region.

It is not necessary to discuss all sites within each area to project a probable cultural chronology for the upper Susitna because many sites within each area represent similar temporal and cultural periods and others lack diagnostic artifacts or have not been subject to absolute or relative dating techniques.

(a) Central Alaska Range

(i) Dry Creek

The Dry Creek site is located 10 miles north of Mt. McKinley National Park. It is a multicomponent site representing exploitation of a shrub tundra environment prior to 9,000 B.C. (Powers and Hamilton 1978:72). The latest component dates between 2,400 and 1,400 B.C. and may provide the best known temporal documentation for a notched projectile point horizon in Interior Alaska (Dixon, Smith and Plaskett 1980b). The projectile points together with end scraper forms, and time of occupation are suggestive of the Northern Archaic Tradition. This and other notched point sites in the Interior support Workman's (1978) hypothesis that Northern Archaic groups spread through the Yukon Territory and northward along the Brooks Range to the Onion Portage site by 4,000 B.C. and later spread into southern Interior Alaska. These data suggest that notched points and Northern Archaic Tradition artifact material could be found within the Susitna study area. Several sites representing this period were located during the first half of the 1980 field season.

An older component at Dry Creek dates to ca. 8,600 B.C. and contains a microblade core and microblade industry which is comparable to the Denali Complex of Interior Alaska (West 1967) and the Akmak level at Onion Portage on the Kobuk River (Anderson 1968a). The similarity of these assemblages with the late Pleistocene Diuktai culture of northeastern Siberia has been noted by Powers and Hamilton (1978:76).

(ii) Carlo Creek

The Carlo Creek site is just east of Mt. McKinley National Park, and dates to ca. 8,500 years ago (Bowers 1978a:14). The oldest of two components produced percussion-flaked elongate bifaces, biface fragments, retouched flakes, several thousand waste flakes and a possible bone awl (Bowers 1978a:1). Component II consists of a few rhyolite waste flakes and is older than ca. 3,700 B.C.

Granulometric analysis of Component I sediment "indicates that human occupation occurred on a former sandbar/levee of the Nenana River, during a period of early postglacial downcutting and terrace formation" (Bowers 1978a:16). Analysis of Component I faunal remains suggests that this site may have been a fall/winter hunting camp. Component I may contain evidence of heat-treatment of lithic material to improve flaking (Bowers 1978a:6).

Although Component I tools are nondiagnostic and the sample size small, Bowers (1978a) compared this material with assemblages from other sites. He suggests that Component I at Carlo Creek may have some affinity with Component II at the Dry Creek site (ca. 8,600 B.C.) (Powers and Hamilton 1978:74), and the McKinley Park Teklanika River sites (West 1965) on the basis of similar morphology of bifacial industries (Bowers 1978a:14). General similarities were also noted with the "early horizon" at Healy Lake (Cook 1969), various Denali Complex sites (West 1965, 1967) and possibly with the Akmak assemblage from Onion Portage (Anderson 1970; Bowers 1978a:14).

(iii) Teklanika Sites

Sites, Teklanika 1 and 2, were excavated by Frederick Hadleigh-West in Mt. McKinley National Park in 1961, and are located within a half mile of each other. Teklanika 1 occupies a knob overlooking the Teklanika River and is west-northwest of Teklanika 2, which is on a nearby ridge. They produced sufficient cultural material to support the supposition that these were habitation sites (West 1965:5). It appears that they functioned as game lookouts and flaking stations, a point confirmed by Traganza (1964). Teklanika 1 and 2 contain projectile points (mainly tips), leaf-shaped knives, end scrapers, side scrapers, tabular blade cores, microblade cores (similar to Campus cores), microblades (prismatic blades), burins, scrapers or end blade tools, one polished adze blade (Teklanika 2) and a pebble hammer (Teklanika 2).

West interprets this material as coeval with Anangula (ca. 8,500 B.C.) or slightly earlier than the Campus site (West 1971:73). He suggests that they date between 8,000 and 10,000 B.C. In light of recent work and the cultural chronology suggested by this report, it would appear that these dates are not unreasonable, although, the oldest known site in Alaska, Moose Creek, is 9,700 years B.C. (Hoeffecker 1979). The dating of the Moose Creek site is based on a single C14 determination and may be subject to reinterpretation as additional dates become available. Moose Creek appears to lack microblade and blade or microblade core technology and these are associated with both Teklanika sites. These forms indicate affiliation with the Denali Complex which dates as early as 8,600 B.C. at Dry Creek. The Teklanika sites may be closer in age to West's 8,000 B.C. projection than 10,000 B.C. However, microblade sites may extend into the Christian era from 500 A.D. to 1,000 A.D. (Cook 1969; Holmes 1976) and the Teklanika sites could be quite recent in age, as may possibly be suggested by the polished adze blade.

(iv) <u>Nenana River Gorge Site</u>

The Nenana River Gorge Site is located at the northwest boundary of Mt. McKinley National Park. The prehistoric component at the site represents a seasonal hunting campsite of Athapaskan Indians and has been radiocarbon dated to approximately 1,600 A.D. (Plaskett 1977). It is not certain which Athapaskan subgroup occupied the site. Prehistoric archeological material found includes obsidian and pottery thought to have originated north of the Alaska Range and copper and chalcedony from south of the Alaska Range; suggesting that trade and communication among different Athapaskan groups occurred prehistorically.

(b) Tanana Valley

(i) Lake Minchumina

Several sites on the shores of Lake Minchumina in the western Tanana Valley document human occupation spanning approximately the past 2,500 years (Holmes 1976, Hosley 1967, West 1978). The oldest site known is MMK-004 where a lower level was dated to ca. 500 B.C. and an upper level dated to ca. 1,000 A.D. (Holmes 1976:2). The site is thought to represent a continuous sequence between these dates (Holmes 1976:2). Noteworthy is an apparent late persistence of microblade core and burin technology which dates to between 800 A.D. to 1,000 A.D. Notched points were recovered in addition to microblades in Holmes' level one, but the exact association of these artifacts is not clear and late persistence of microcore technology and affiliations with the earlier Denali Complex of Interior Alaska are unresolved questions. Until further research is conducted it may be prudent to consider that two traditions, i.e., Northern Archaic and Late Denali, may have coexisted during this time.

Holmes (1978) presents some comparative data on the assemblage from MMK-004. Point/knives from the lowest level resemble Choris points, and have been equated with the Norton period (Holmes 1976:5). A relationship between MMK-004 and forest adapted Ipiutak/Norton cultures similar to those from Onion Portage and Hahanudan Lake has also been suggested (Holmes 1976:8; Dumond 1978:14).

The majority of obsidian from MMK-004 is from the Batza Tena source near the Koyukuk River to the north and indicates trade over considerable distance in Interior Alaska. The obsidian is also present at Gulkana in the Copper River Valley and suggests widespread trade in that direction as well. Several other sites, the Birches site with a date of ca. 520 A.D. (West 1978), and MMK-012 dating to ca. 50 A.D. (Holmes 1976:8), demonstrate more recent occupations at Lake Minchumina.

(ii) Campus Site

The Campus site on the Fairbanks campus of the University of Alaska appears to contain a Denali Complex component of microblades, microblade cores and burins. Also present are notched points and other materials characteristic of the Northern Archaic Tradition. Stratigraphic control at the site is poor and dating has not been established.

(iii) Healy Lake

The Village site at Healy Lake has yielded evidence for human occupation of Interior Alaska by ca. 9,000 B.C. (Cook 1969). Five components have been identified at the site. The upper level, just below the sod, contained stemmed and notched points, and microblades, a situation similar to the Minchumina site MMK-004 and suggestive of both the Northern Archaic and Denali peoples. Below this level are two components similar to the Denali Complex defined by West (1967). The lowest level named the Chindadn complex was characterized by triangular projectile points, tear-dropped shaped knives, and possibly an absence of microblades.

(iv) Dixthada

The Dixthada site on Mansfield Lake consists of nine housepits, an associated midden, several storage pits, and 11 tent rings. The site was originally excavated by Rainey (1939:364-371) who interpreted the site as an Athapaskan settlement of the last few hundred years, although, based on presence of a microblade industry, he suggested a relationship with the Campus Site. In 1953 Rainey amended his original evaluation of site age by assigning the microcores and microblades to an earlier component based on comparison with sites of known age (Rainey 1953). Additional excavations by Cook and McKennan in 1970 indicate that a yellow silt horizon located under the middens at Dixthada contained the core and microblade industry (Shinkwin 1975:149-150). These excavations supported the conclusion that the site was multicomponent, as suspected by Rainey.

Shinkwin (1975) studied materials from both components at Dixthada. The upper component, although mixed, contains an array of copper implements, bone and antler artifacts, bifacial knives, scrapers, whetstones, hammerstones, grinding stones, an adze and two axes (Shinkwin 1975:151-152) and represents a late prehistoric/early historic Athapaskan group as suggested by Rainey (Shinkwin 1974:153). Shinkwin notes similarity of the upper level lithic and bone industries to the Klo-kut site in the Yukon Territory. The lower component contains a microcore and microblade industry dating 470 ± 60 B.C.

(v) Donnelly Ridge

The Donnelly Ridge site is located over 2,600 feet above sea level in the northern foothills of the Alaska Range. The site is situated on one of the highest points in the area and provides an excellent view of the myriad of lakes and ponds which surround it (West 1967:15). A total of 1,512 stone artifacts were recovered, of which 533 show various degrees of use (West 1967:15). Stone artifacts recovered include bifacial biconvex knives, end scrapers, large blades and blade-like flakes, prepared cores, core tablets, microblades, burins, burin spalls, and worked flakes (West 1967: 17-25)

West interprets the site as a seasonal hunting camp used for a short period of time, possibly only one season (West 1967:27). The age of the site is uncertain although two radiocarbon dates (1,830 ± 200 B.P. (120 A.D. ± 200) (B-649) and 1,790 ± 300 B.P. (160 A.D. ± 300) (B-650) have been recorded. However, West feels that these actually date a later tundra fire and not the cultural material (1967:32). Based on comparison of the Donnelly Ridge material with other Denali Complex sites, West suggests an age of at least 10,000 B.C. The Minchumina site, the Village site at Healy Lake, and Dixthada have produced Denali Complex components with dates much more recent than West's projections.

(vi) Ft. Wainwright

A 1979 archeological survey of Ft. Wainwright Reservation in the Tanana Valley led to the discovery of 48 prehistoric and four historic sites (Dixon, Smith, and Plaskett 1980a). Sampling areas for this project, delineated by the research design, corresponded to most of the major elevations within the military reservation. Site locations included: lake shores (Blair Lakes), outlets of streams draining lakes, knolls near streams and rivers, and high bluffs and buttes. Several of the sites were more than 300 m above the Tanana flats and provided excellent views of the surrounding area.

Three sites on the north shore of Blair Lake South were systematically tested: FAI-044, FAI-045, and FAI-048. Site FAI-044 contained historic, late prehistoric Athapaskan, Northern Archaic and possible Denali components. Site FAI-045 contained the same recent historic component documented at FAI-044, and possible Denali component. Samples of radiometric dating were not recovered but the Denali component was inferred from the recovery of microblades and microcores. Only one of four squares tested produced Denali material and two occupations are suggested. In addition to these sites, 10 Denali, 10 Northern Archaic, and 3 historic period sites were documented on the military reservation (Dixon, Smith, and Plaskett 1980a).

(c) Denali Highway Area

(i) Tangle Lakes

The Tangle Lakes are 80 km northeast of the study area and accessible from the Susitna via the McLaren River. Over 220 sites spanning the past 12,000 years have been documented in this area (West 1973). The sites represent several periods including late Athapaskan belonging to the last 3,000 years and an early period which West divides into groups. Denali Complex sites are located on or near old lake shorelines which are about 100 feet above present lake levels (West 1975:79). The Denali occupation at Tangle Lakes may have occurred as early as 10,000 B.C. but radiocarbon dates suggest a more recent date of 8,200 B.C. with the occupation ending about ca. 6,200 B.C. Denali hunters appear to have abandoned the area after that time. There is a hiatus in the Tangle Lakes archeological record until the appearance of the Northern Archaic Tradition (West 1973). The Northern Archaic Tradition was originally defined as a boreal forest adapted culture (Anderson 1968a); however, it may have thrived along the forest edge or even within the tundra forest ecotone (Hickey 1976). Appearance of the Northern Archaic peoples may be associated with a warming trend ca. 5,000 years ago (Anderson 1968b) and raised tree line elevation (Hopkins 1967). The most recent cultural period represented at Tangle Lakes was that of protohistoric Athapaskans (West 1975:20).

(ii) Ratekin Site

The Ratekin site, near the Denali Highway, is located about 75 miles west of Paxson Lake. Although few artifacts have been recovered in situ, several surface collections have been made. Based on the collections by Skarland and Keim (1958), it is difficult to assess the significance of the site. Notched points suggestive of the Northern Archaic Tradition are present. Based on the type of notching and comparison with the notched point sequence developed by Anderson (1968a), an age of ca. 2,900 to 2,600 B.C. seems a reasonable inference since side notched, stemmed, and lanceolate forms are present.

The site appears to consist of a number of flaking stations and Skarland and Keim (1958:80) suggest that it functioned as a kill site rather than a camp because of the large number of unbroken arrowheads which they think were lost during the hunt. They also suggest that caribou were funnelled through a narrow corridor near the site created by muskeg to the south and steep hills to the north. Photographs on file at the University of Alaska Museum show a low rock wall at or near the site which may have functioned as a hunting blind. Age of this structure and its association with the Ratekin site have not been determined.

(d) Talkeetna Mountains - Long Lake

The Long Lake site is in the Southern Talkeetna Mountains and contains a microblade and microcore industry which is similar to that of the Denali Complex. Bacon suggests that the site represents "a displacement of the Denali technology to the southern highlands of southern Interior Alaska", a region which "represented a sort of tundra refugium that was pushed southward (but higher in elevation) by invading Taiga Forests" (1975b:4).

(e) Copper River Valley

Archeological investigations in the Copper River Valley began with Rainey's survey of the region in 1936. Most recently a number of historic and prehistoric sites have been located and several excavated (VanStone 1955; Shinkwin 1974; Workman 1976; Clark 1974; Arndt 1977; and others). Workman (1976:8) has synthesized the available data into a four period sequence for the area: historic (1850-present), proto-historic (1770-1850), late prehistoric (1000 A.D.-1770 A.D.), and early prehistoric (? to 1000 A.D.).

The following sites, some which were previously discussed in this report, can be placed within Workman's (1977:9-30) categories, Historic Period: Taral (VanStone 1955), site on Taral Creek (VanStone 1955:121), Susitna site 3A and 6C (Irving 1957:40), village near Batzulnetas (Rainey 1939:362). Protohistoric Period: Dakah D'nin's Village (Shinkwin 1974), VAL 146 (State of Alaska, Division of Parks), feature 77-3-4 at the BUL 077 site (Workman 1976:26-28), Paxson Lake site (Workman 1976:14), Gakona Airstrip Site (Rainey 1939:350), Slana Site (Rainey 1939:361). Late Prehistoric Period: GUL 077 (Workman 1976), MS 23-0 (Clark 1974, 1976), Gulkana River site (Rainey 1939:360), Susitna 3A (Irving 1957:41), Susitna 3B and 3C (Irving 1957:41), Susitna 3D (Irving 1957:41-42), Susitna 6A (Irving 1957:42), Susitna 6B (Irving 1957:42), caches near Batzulnetas (Rainey 1939:361-362), Tangle Lakes caches (Workman 1976:28), Portage site upper component (Workman 1976:28). Early Prehistoric Period: no sites representing this time period have been positively documented in the Copper River Valley, although the Copper River Basin would have been free of ice dammed lakes and available for human occupation by ca. 9,000 years ago (Workman 1976:31). Workman suggests that, when documented, the prehistory of the Coppr River Basin will probably span most of the Holocene times (1976:31). At present, however, there are only traces of occupations predating 1,000 A.D. (Workman 1976:31).

(f) Cook Inlet

(i) Beluga Point

Beluga Point is a multicomponent site composed of two localities on the northern shore of Turnagain Arm in upper Cook Inlet. Beluga Point North contains three components. Component I includes a microblade and core industry associated with the Denali Complex. Comparative data from Denali sites in Interior Alaska and the Alaska Peninsula suggest a tentative date between 4,500 and 7,000 years B.C. for this component (Reger 1977). Component II contains stemmed points and points with tapering bases (Reger 1977). An estimated age is 1,000 to 2,000 years B.C. based on typological comparisons (Reger 1977:9). Components IIIa and IIIb from Beluga Point North are similar to the third period of the Kachemak Bay Sequence as evidenced by ground slate points and stone ringed hearths filled with gravel (Reger 1977). A radiocarbon date for IIIa indicates an age of 790 ± 120 B.P. (960 ± 120 A.D.) while IIIb is estimated to be 1,000 years older (Reger 1977).

Beluga Point South, Component I, includes a few nondiagnostic specimens and dates to 4,155 ± 160 B.P. (2,205 ± 160 B.C.). Reger notes similarities between Beluga Point South Component II and Norton collections from the Iyatayet site. Similarities include steeply retouched end-scrapers, end blades, burin-like scrapers and ground slate points (Reger 1977).

(ii) Kachemak Bay Sequence

Little is known about prehistory of Cook Inlet during the late Pleistocene, ca. 10,000 years ago. The Kachemak Bay Sequence provides an organized data base which can be applied to this study.

The Kachemak Bay tradition first appears in the second millenium B.C. and continues until just before historic contact. Kachemak settlements were usually along rugged coasts with deep water offshore and mountains inland (Reger 1977). Houses were semi-subterranean and made of whalebone, stone, or wood. Economic exploitation concentrated on sea resources, although inland resources were also utilized.

Kachemak I is a poorly defind phase (Workman 1977:35) and absence of reliable dates makes it difficult to place it in a specific time frame. However, relationships with Alaskan Peninsula material and the Takli Beach Phase places it in the second millenium B.C. (Workman 1977:35). Manifestations are known only on Yukon Island and are characterized by a predominance of flaked stone tools, grooved stone weights, and both toggle and dart harpoon heads.

Kachemak II dates from 400 B.C. to as late as 1200 A.D. Typically the assemblage contains large notched stones, grooved stone weights, primarily a flaked stone industry, houses of wood and whalebone and the possible beginnings of grave goods (Workman 1977:35).

A transitional phase called Kachemak Sub III (Workman 1977:35) existed from approximately 400 B.C. to A.D. 0 and flaking was still the primary lithic technology. Stone saws appeared and there was a continuation of elaborate burial practices with the embellishments in later periods. This phase is known from Chugachik Island (SEL-033) and Yukon Island in Kachemak Bay.

Kachemak II began about 800 A.D. (Workman 1977:35). Considering the climax of the tradition, this phase is characterized by an elaborate burial cult indicating dismemberment of the dead, a predominance of ground slate and a florescence of artists' skills. This phase is found at Cottonwood Creek and the Great Midden on Yukon Island.

The Kachemak sequence terminated in a poorly understood Kachemak IV phase during the second millenium A.D. and what is known comes from the upper level of the Great Midden on Yukon Island and the upper component at Cottonwood Creek (Workman 1977:33). Some pottery and native copper has been recovered from Yukon Island, while from Cottonwood Creek (KEN-029) come triangular stemless slate end-blades, an intricate bone knife handle, a barbed bone point and evidence of cannibalism (Workman 1977:33).

The Merrill site, KEN-029, near the Kenai River about 25 miles from the present river channel is on a former meander channel (Reger 1977:37). The lowest level dates to 2,245 ± 115 radiocarbon years or 295 B.C. Reger (1977:50) notes similarities of adze blades, straight based lanceolate points, and stemmed points to the Norton component at the Iyatayet site. Applicable to this study is the fact that the site conforms to locational data from other Norton period sites, i.e., riverine (Reger 1977:51). The riverine adaptation is suggested by evidence for fishing in nearly every Norton period site reported (Reger 1977:51).

1.3 - Ethnographic Information

Ethnographic data suggest that the study area was inhabited by bands of Northern Athapaskan Indians during late prehistoric, protohistoric and historic times. Several subgroups speaking variant dialects of the Athapaskan language may have been present in the area at various times. The immediate study area falls within known historical geographic limits of the region exploited by Tanaina Athapaskans; however, the present area is near other regions occupied by the Ahtna and Tanana Athapaskan groups. Since the known geographic and linguistic distribution of these groups at the time of historic contact cannot be inferred to extend very far backward in time, ethnographic information relevant to all three groups will be included here.

Of importance in developing the research design is ethnographic information concerning subsistence activities of Athapaskans, and how they affect site location and distribution.

For most non-coastal Athapaskan groups, the annual subsistence cycle largely depended on the availability of resources. Major animal resources available throughout the yearly cycle to the groups considered here were moose, caribou, sheep, fish, and waterfowl (McKennan 1959; Guedon 1975; Andrews 1975). During the summer months, fishing was the most important economic activity. Villages would move to fish camps, generally located on clear water tributaries, to catch and dry salmon, much of which was cached for winter use (VanStone 1974; McKennan 1959; Helm 1975; Guedon 1975). Moose and sheep were also hunted in upland and alpine regions during summer months. Spring activities involved muskrat, beaver, and waterfowl hunting and trapping from camps usually located along lake margins or slow-moving streams (McKennan 1959). Small hunting parties also pursued large game during the winter months (Guedon 1975).

Caribou drives took place mainly in the fall or early winter. During this time, long "caribou fences" were constructed to guide them to enclosures where they were snared and killed. Smaller game such as hares were taken throughout the year (VanStone 1974; Nelson 1973). The annual subsistence cycle kept populations mobile within a given territory or range, while focusing them at specific geographic locales at specific points in time to harvest seasonally abundant animal resources. The seasonal round thus created a variety of settlement locales of varying size, function, and duration.

A number of accounts have described interior Athapaskan material culture (McKennan 1959; Guedon 1975; Nelson 1973; Pitts 1972; Vitt 1973). House construction, as it applies to both permanent and temporary structures, would indicate the location of winter settlements. Several types of houses have been described for the early historic period (McKennan 1959; Pitts 1972; Guedon 1975; Shinkwin 1974). One type of winter house was a dome-shaped structure covered with moose or caribou skins. Another form was a rectangular, semi-subterranean log structure covered with bark and sod. Temporary structures consisted of simple brush shelters or lean-tos. The caches used for storing food were of two types--underground, and elevated with logs. Many of these features should be identifiable archeologically, if present in the project area.

The upper Susitna drainage was occupied by Western Ahtna at the time of historic contact. Their subsistence pattern differed in important respects from that of the Ahtna groups whose seasonal round was centered more to the east where fishing on the Copper River and its major tributaries was a primary subsistence activity and winter villages were located at the river (Workman 1976). The absence of the salmon resource base in the upper Susitna drainage resulted in a greater emphasis on hunting of caribou and moose (Irving 1957). Mid-summer through December was primarily devoted to fishing from lakes, their outlets or larger rivers. In late summer and early fall caribou and moose were hunted using fences, snares and surrounds. At mid-winter extensive hunting of moose, bear, and beaver occurred and was possibly accompanied by dispersal into family units from larger multi-family fall villages (Irving 1957). In spring, hunting moved into the hill country south as far as the Talkeetna Mountains where caribou were hunted until mid-summer when fishing resumed. Contacts between the upper Susitna/Lake Louise Ahtna and villages on the Tanana side of the Alaska Range were frequent but the nature of contacts is unknown (Irving 1957). The seasonal round and subsistence strategy of the Western Ahtna appears to have more closely resembled that of interior Tanana Athapaskans then that for most Ahtna centered on the central Copper River.

The Tanaina Athapaskans may have been the first Athapaskan group to come in contact with Europeans and Russians who began to heavily influence their culture by the late eighteenth century (Osgood 1937). Tanaina groups were concentrated on or near the shores of Cook Inlet and in the Iliamna-Lake Clark area as well as inland and are known to have occupied permanant villages containing semi-subterranean houses (Smith and Shields 1977), an atypical settlement pattern for Northern Athapaskans. Richness of salmon runs in the area probably had much to do with the unusual subsistence and settlement pattern (Osgood 1937; VanStone 1974). Some Tanaina groups were also heavily dependent upon coastal, tidal and sea mammal resources for their subsistence, a pattern more closely resembling Eskimo rather than other Athapaskan groups (Townsend 1973).

The Tanaina are known to have traveled widely throughout their territory and trade, as well as warfare, resulted in contact with other Interior Alaskan Athapaskan groups (Townsend 1973; Hosley 1966; Plaskett 1977). However, little is known concerning aboriginal Tanaina exploitation of the more interior portions of their territory which included the upper Susitna, Talkeetna Mountains and the Alaska Range. It is probable that at certain times of the year, i.e., fall and spring/early summer, hunting parties moved into these regions to hunt sheep, caribou and bear. Moose would appear to have been rarely present, at least in the mid-nineteenth century (Osgood 1937; VanStone 1973). Camps of hunting parties would probably have consisted of temporary shelters of skins over a wood frame, simple brush shelters or lean-tos.

During the early historic period, it appears that a gradual shift in subsistence activity occurred as a result of increased contact with non-Natives, and led to a general shift in the settlement pattern (VanStone 1970; Townsend 1973). Therefore, site locations which reflect late prehistoric subsistence activities may differ significantly from those activity-related sites of the historic period. Settlements and camps of late prehistoric and protohistoric times often were located near the mouths of clear water streams and rivers, as well as along lake margins and locations strategically suited for resource exploitation (McKennan 1959; Andrews 1975; VanStone 1974; Workman 1976; Irving 1957). Early historic Tanaina settlements were reported at several locations near the study area including Talkeetna (Townsend 1973), Valdez Creek (McKennan 1959), and on the shores of Lakes Susitna, Louise, Tyone and Grayling (Irving 1957).

1.4 - History

It is probable that late prehistoric and historic sites in the upper Susitna area date to as early as 1770 and may contain evidence of Western trade materials and influences. Historic, ethnohistoric and archeological data suggest that a widespread network of Native trade routes existed prior to Western contact. Western trade goods doubtless penetrated the upper Susitna region soon after the first exchanges occurred in coastal areas. Following 1900, gold discoveries in the region produced a flurry of exploration and mining activity which probably resulted in historic sites containing associated material in the upper Susitna study area. The chronology of Western man's exploration and penetration into the study area is summarized below.

Shortly after Bering's 1741 voyage, Russian fur traders began exchanging Western goods for pelts. Glass beads and iron were traded for fox and sea otter pelts by Glattov on Kodiak Island as early as 1762 (Bancroft 1886) and although such trade occurred far from the study area, Native trade networks soon dispersed such goods widely to Natives who had no direct contact with Europeans. The first explorer in Cook Inlet, Captain James Cook, observed metal and glass beads among the Tanaina during his visit in 1778 (Cook 1785). By 1786 a Russian trading settlement had been established at St. George (Kasilof) in Tanaina territory and trade contacts soon expanded rapidly with the Tanaina.

Increased dependence upon trade and the wealth provided by Western luxury goods resulted in changes in the aboriginal settlement and hunting patterns (Townsend 1970). The Tanaina began to be drawn more intensively into the Russian fur trade, occasionally as hunters but also as middlemen in the fur trade with peoples in the interior of Alaska. There was increased hunting of certain desirable fur bearers and modification of the subsistence cycle to accomodate such hunting and subsequent travel to trade for Western goods. Thus, it is probable that the location of hunting and trapping sites as well as times of seasonal movements known from the ethnographic present differ from those of slightly older late prehistoric times.

The first explorations of the Susitna River country did not occur until 1834 when Malakoff ascended the river. It is believed that he also explored the Susitna in 1843 but little is known of his work (Bacon 1975a). In any event, it is certain that by 1845 the Russians had better knowledge of the upper Susitna region than could have been obtained via Native informants (Brooks 1973). During the next 50 years very little exploration or other activity by Westerners appears to have occurred in the upper Susitna River country which was virtually unexplored until nearly 1900 (Cole 1979). During this time one exploration of note occurred to the east of the study area. In 1885, Lt. Henry Allen and his party ascended the Copper River, crossed the Alaska Range and descended the Tanana River to the Yukon. Allen's observations of Native lifeways, villages and their locations provide data regarding Ahtna and Tanana Athapaskans at the time of early direct contact with White men (Allen 1887).

The discovery of gold in Cook Inlet in 1895 precipitated the first extensive and lasting movements of White men into the upper Susitna study area. In the summer of 1896, over 2,000 prospectors swarmed the shores of Cook Inlet and over 100 parties entered the Susitna River but only five continued any distance up the river (Cole 1979). William Dickey and Allen Monks ascended the river as far as Devil Canyon in 1886 and encountered Natives at a fish camp at the mouth of Portage Creek. W.A. Jack and eight others ascended the Susitna to the "head of boating" on the upper Susitna in 1897 and became the first recorded party to explore nearly the entire river. The Jack party avoided Devil Canyon by ascending Portage Creek, crossing a divide to Devil Creek, and descending the latter to the Susitna (Cole 1979). Jack guided George Eldridge of the USGS, up the Susitna, over Broad Pass and down the Nenana River in 1898 but their route avoided the upper Susitna area (Eldridge 1900). In 1901, H. Jack Pamo and Al Campbell tried to make an overland trip from the mouth of the Tanana River to Valdez. They descended the Susitna from its "headwaters" and Campbell apparently starved to death at an Indian hunting cabin some 50 miles above Devil Canyon (Valdez News, 7/20/01). On the south side of the Susitna other overland routes which by-passed Devil Canyon existed. One route went up the Talkeetna River to Prairie Creek, past Stephen Lake to the Susitna, while another crossed low passes at the headwaters of Kosina Creek and descended the latter to the Susitna (Cole 1979).

The difficult passage around Devil Canyon greatly reduced gold prospector traffic on the upper Susitna River and it was not until 1903 that a more feasible route from the Copper River drainage was pioneered. In that year, Pete Monahan and four others from Valdez reached the upper Susitna headwaters area. Their route took them over Valdez Glacier, down Klutina River, across Klutina Lake, along St. Anne River and thence up the Susitna. They prospected for gold along several creeks in the upper Susitna drainage and struck pay gravel on a small stream the Indians called "Galina" and later renamed Valdez Creek (Moffit 1912). The next year numerous claims were staked along this creek and its tributaries. These diggings in later years had as many as 150 men (Bacon 1975a) and continued to attract miners until the 1930's. Other, later routes, to these gold fields roughly paralleled the modern Denali Highway from Cantwell in the west and Paxson on the east. Another route followed the West Fork of the Gulkana from the Copper River to the MacLaren and thence up the Susitna (Cole 1979).

Mining equipment and supplies utilized all of these routes to the gold fields on Valdez Creek. It is possible that historic structures and features related to these gold mining activities may be present along any or all of the routes used by miners during prospecting and subsequent mining in the Valdez Creek area. Additionally, Indian hunting cabins were reported at several localities on the upper Susitna drainage by the first gold prospectors and explorers, i.e., Jack, Eldridge, Pamo, and others. It is possible that remains of these log structures may be encountered during cultural resource survey of the study area as well.

APPENDIX B

1 - LITERATURE REVIEW, GEOARCHEOLOGY

1.1 - Glacial-Climatic History

During the last glaciation, southcentral and central Alaska were inundated with glacier ice (Karlstrom 1964; Wahrhaftig 1958; Coulter et al. 1965) in response to climatic cooling and a drop in snowline on the order of 250-300 m (Pewe and Reger 1972). Snowline in the vicinity of the western Talkeetna Mountains probably lay at about 1050-1200 m (Pewe and Reger 1972) or about 600 feet near the east flank of the Susitna lowland (Karlstrom 1964). All flat upland surfaces above that altitude, which includes much of the Talkeetna Mountains, was probably glacier covered. Below that altitude cirque and valley glaciers coalesced to form a broad inland ice sheet which drained southward via the Susitna Valley when it merged with other south-flowing trunk glaciers. Ice extended southward to the vicinity of Montana Creek, forming a prominent terminal moraine which became confluent with an east-flowing and northeast-flowing ice lobe draining the Matanuska and Knik Valleys. The southward gradient of the last glacial snowline and the progressively less extensive glaciation northward strongly suggests a southern moisture source (Karlstrom 1964; Pewe 1975). Glaciation apparently was caused by a decrease in mean summer temperatures, and an increase in summer cloudiness (Pewe 1975). Pewe (1975) estimates that, in the vicinity of Anchorage, the mean annual temperature dropped to 12.1°C in comparison to the present mean annual temperature of 13.8°C. Following expansion of glaciers to their maximum limits, they stagnated over a broad area of the Susitna lowland, then apparently retreated more rapidly. Climates warmed to a postglacial thermal maximum, then re-expanded intermittently within the past several thousand years (Williams and Ferrians 1961).

1.2 - Late Wisconsinan Time

(a) Initiation

The globally significant change from interstadial mid-Wisconsinan conditions to full glacial late Wisconsinan conditions is dated at about 32,000 yr BP in the marine isotope record (Shackleton and Opdyke 1973) and at about 32,000 yr. B.P. in the Camp Century Ice Core (Langway et al. 1973). Glaciers in south central Alaska expanded in response to the climate change. The date of 29,600 ± 460 from organic material beneath till of the last glaciation near the inferred mid-Wisconsinan terminal position in the White River Valley, provides the youngest maximum limiting dates in Alaska for late Wisconsinan glacier expansion. Maximum limiting dates from identical stratigraphic position in the nearby Klutlan Glacier are all beyond the range of radiocarbon dating (Rampton 1971). Karlstrom (1964) reports that late Wisconsinan glaciation began sometime after about 37,000 yr BP in the Kenai lowland. The Copper River Basin began filling with glaciolacustrine deposits sometime after a date of 38,000 yr BP (Ferrians and Schmoll 1957). Maximum dates for initial late Wisconsinan time from the southern Brooks Range are more closely limiting, ranging from 28,500-31,000 ^{14}C yr BP, closely corresponding to the global climates changes (Hamilton 1976). The youngest dates on mid-Wisconsinan muck near Fairbanks range up to about 30,700 to 33,700 yr BP (Sellman 1967).

(b) Termination

A pronounced global climate change around 13,000-14,000 yr BP which, from a climatological standpoint ended the Wisconsinan Stage, was accompanied by rapid warming (Shackleton and Opdyke 1973; Langway et al 1973; Denton 1974). Evidence for rapid response of Alaskan glaciers and vegetation to this climate change is widespread and surprisingly uniform in age. An abrupt change in vegetation from tundra steppe to shrub tundra occurred about 13,500-14,000 years ago in the Tanana lowland (Ager 1975). Similarly, a rapid change from a dominance of nonarboreal pollen to arboreal pollen occurred shortly after 13,960 ± 360 yr BP in the Ogilvie Mountains, Yukon Territory (Terasmae and Hughes 1966). Heusser (1965) and Terasmae (1974) recognized a major vegetation change indicating warming sometime between 13,000 and 14,000 yr BP, respectively.

Glacier response to terminal Wisconsinan climate change was also rapid. Glaciers began rapid wastage about 14,000 BP in the White River-Skolai Pass area (Denton 1974). The abrupt halt in loess deposition about 13,500 ± 300 yr BP in Antifreeze Pond is interpreted by Rampton (1971) as having formed immediately after moraine formation. Retransported bone material in the Fairbanks area that dates 13,470 ± 420 yr BP and 14,280 ± 230 yr BP directly overlies a late Wisconsinan unconformity (Sellman 1967) and may suggest thawing at about this time.

Other minimum age dates for the late Wisconsinan time in Alaska are less closely limiting than dates from the St. Elias Range. Glaciers began a fluctuating retreat in the Kenai lowland sometime after 12,900-13,500 yr BP (Karlstrom, 1964). Moraine formation and rapid retreat of glaciers from the Anchorage area probably occurred shortly after 14,160 ± 1400 yr BP (Schmoll et al. 1972). Basal peat dates in the Susitna lowland extend back to about 12,500 yr BP (Richard Reger, personal communication). Late Wisconsinan glaciers began receding from their maximum positions sometime prior to 10,565 ± 225 yr BP and 10,560 ± 200 yr BP in the Amphitheater Moutains (Pewe 1964) and the Nenana Valley 10,560 ± 200 yr BP (Wahrhaftig 1958), respectively. Wisconsinan age dunes began stabilizing in the Tanana lowland sometime prior to 12,400 ± 450 yr BP (Fernald, 1965). Glaciolacustrine sedimentation in the Copper River Basin ceased sometime prior to 9400 yr BP.

(c) Maximum Extent of Ice

Full glacier conditions affected the entire globe about 17,000-22,000 yr BP, culminating in full glacial conditions in the northern hemisphere at about 18,000 yr BP (CLIMAP 1976). At this time the southern sectors of the Laurentide, Scandinavian, and Cordilleran ice sheets had reached their maximum extents (Denton 1974). Following a period of ice recession these ice sheets all readvanced to nearly their maximum positions between about 15,000 and 14,000 years ago and then underwent rapid retreat.

Dates from glacier sequences in Alaska are incomplete, but generally support the concept of a two-fold late Wisconsinan Stade. Intervals of alluviation in the Southern Brooks Range between about 16,000-25,000 yr BP (Kobuk Valley) and 17,000-29,000 yr BP (Koyukuk Valley) may correspond to the earliest advances (Hamilton et al. 1980). A maximum limiting date from the McKinley River (Thorson unpub. ms.) suggests that glaciers in north Alaska Range had not yet reached their maximum extents by about 20,000 yr BP.

Support for the younger advance is more common. Late Wisconsinan glaciers readvanced in the Alaska Range sometime after 15,000 yr BP (Hamilton 1976). Glaciers in the upper Cook Inlet advanced to their terminal late Wisconsinan positions sometime shortly after 14,160 ± 400 yr BP (Schmoll et al. 1972; Kachadoorian et al. 1977). The Russell and Kaskawulsh glaciers advanced to near their maximum extents in the White River Valley and Shakwak Valley just prior to about 14,000 yr BP (Denton 1974). In the southern Brooks Range, glaciers readvanced between about 13,000 and 12,500 yr BP (Hamilton et al. 1979).

(d) Rates of Deglaciation

The rapid and nearly synchronous climate change about 13,000-14,000 yr BP can well be documented for most parts of Alaska. Subsequent rates of glacier retreat were generally rapid, with valleys largely ice free by 10,000 yr BP. The Kaskawulsh glacier (Yukon Territory) retreated to within 17 km of its present terminus by 12,500 ± 200 yr BP, suggesting extremely rapid deglaciation for this large glacier (Denton and Stuiver 1967). In the White River Valley, ice had receded to a position within 2 km of its terminus by 11,270 ± 200 yr BP (Denton 1974). The nearby Klutlan Glacier retreated to a position upstream from the present terminus by 9780 ± 80 yr BP (Rampton 1971). The Muldrow Glacier retreated to a position upstream from its Neoglacial limit by 9580 ± 100 yr BP (Thorson unpub. ms.).

Valleys elsewhere in Alaska and the Yukon Territory were largely deglaciated by 11,500-12,000 yr BP (Hamilton 1976; Denton 1974). The valley bottom of the Susitna River near Willow Creek was deglaciated prior to 11,930 ± 250 yr BP (Karlstrom 1964). The nearby Matanuska Valley was also rapidly deglaciated following a period of initial ice stagnation (Williams and Ferrians 1961; Miller and Dobrovolny 1959). Dates of 11,250 ± 160 yr BP and 12,120 ± 140 yr BP from the North Fork Pass and Hart Lake areas in the Olgilvie Mountains, Yukon Territory, respectively, indicate nearly complete deglaciation by this time (Hughes et al. 1969). On the south flank of the Alaska Range, the Tangle Lakes area was deglaciated 11,800 ± 740 yr BP (Schweger 1973) and the Nenana Glacier had retreated well upstream from the Carlo Creek archeologic site by 9000-10,000 yr BP (Bowers 1979). The Nelchina Glacier, in the North Chugach Mountains, retreated to a position within 8-15 mi of the terminus by 8,400 ± 200 yr BP (Olson and Broecker 1959). Adams Inlet in Glacier Bay was largely deglaciated by about 11,000 yr BP (McKenzie and Goldthwait 1971). Dunes are largely stabilized on the floor of the Tanana lowland by about 11,250 yr BP (Fernald 1965).

1.3 - Holocene Time

(a) Early Holocene Readvance

Evidence for an early Holocene glacier readvance which lasted between about 8500 and 9500 yr BP and culminated about 9000 yr BP, is widespread in south coastal Alaska. Cirque glaciers advanced in the lower Copper River Valley and built moraines about 8800 yr BP (Sirkin and Tuthill 1971). On Prince of Wales Island, two moraines were formed by advancing glaciers between 8000 and 9510 yr BP (Swanston 1969). Goldthwait (1966) interprets the stratigraphy in Muir Inlet to indicate a prominent readvance between 9100 and 10,000 yr BP. Till near Cold Bay is bracketed between dates of 6700 and 9700 yr BP (Funk 1973). Glacier advances and stillstands and a pronounced cooling suggested by pollen trends occurred in the Boundary ranges of Canada between 9000 and 10,000 yr BP (Miller and Anderson 1974). Pollen data from south coastal Alaska (Heusser 1965) also suggest an early Holocene cooling between 8500 and 9000 yr BP. An earlier possible readvance sometime between 10,500-13,000 yr BP may have occurred in the large coastal glaciers (Terasmae 1974; Miller and Anderson 1974; Goldthwait 1966).

Evidence for glacial readvances in interior south central Alaska is conspicuously absent, perhaps suggesting that most glaciers had retreated upvalley from their Neoglacial limits prior to about 9000 yr BP. The Matanuska glacier, which experienced a prominent early Holocene readvance sometime prior to 8000 ± 300 yr BP (Williams and Ferrians 1961), is the only well documented occurrence of this readvance away from Alaska's southern coast. A pronounced unconformity in the permafrost tunnel near Fairbanks (Sellman 1967), which occurs between 8400 and 11,000 yr BP, may represent an interval of greatly reduced muck deposition.

(b) Hypsithermal

Postglacial Holocene warming culminated during Hypsithermal time, an interval of increased warmth (and possible dryness) and glacier contraction. Glacier contraction and inferred warming occurred in south Alaska during the interval between 4500-6800 yr BP in Cool Inlet (Karlstrom 1964), 4700-9100 yr BP in Muir Inlet (Goldthwait 1966), 3200-5500 yr BP in Boundary Ranges (Miller and Anderson 1974), 4150-7050 yr BP in Glacier Bay (McKenzie and Goldthwait 1971), and 4500-6500 yr BP in the north Pacific (Huesser 1960). Inland from the coast, pollen and treeline data suggest that the thermal maximum occurred between 5000 and 8400 yr BP (Terasmae 1974; Ager 1975), peaking at about 5200 yr BP (Denton and Karlen 1976).

(c) Neoglaciation

Following Hypsithermal warmth and dryness, climates cooled and possibly moistened during the last several thousand years, causing renewed glacier expansions during Neoglacial time. The Neoglaciation probably began between about 3500-3700 yr BP in interior Alaska and Yukon Territory (Hamilton 1976; Miller and Anderson 1974), reaching a culmination in the White River Valley area between about 2675 and 2780 yr BP (Denton and Karlen 1973) and terminating by 2000 yr BP (Terasmae 1974) or possibly as early as 2640 yr BP in the Kluane area (Borns and Goldthwait 1966). The Tanana River began actively aggrading by 3000 yr BP (Fernald 1965), presumably in response to Neoglacial conditions.

In coastal southern Alaska, the Neoglaciation may have begun earlier than in areas farther north. McKenzie and Goldthwait (1971) document glacier expansion in Glacier Bay as early as 4150 ^{14}C yr BP, and Huesser (1965) inferred a change to cooler, wetter climates beginning about 4500 yr BP. Karlstrom (1964) dated the earliest of multiple glacier advances into the Kenai lowland at about 4500 yr BP. The termination of Neoglacial time in southern Alaska is inferred from glacial retractions and/or vegetation change beginning 2200 yr BP (Glacier Bay, McKenzie and Goldthwait 1971), 2100-2200 yr BP (Lituya Bay, Post and Streveler 1976), and 2500 yr BP (N. Pacific, Heusser 1965). Though evidence for multiple Neoglacial advances in south central Alaska is present in many areas (Thorson unpub. ms.; Reger and Pewe 1969; Karlstrom 1964; Wahrhaftig and Cox 1959), only in the White River Valley are they firmly bracketed by closely limiting radiocarbon or lichenometric dates. Culminations of glacier advances in the White River Valley occurred between 3000-2675 and 1230-1050 ^{14}C yr BP (Denton and Karlen 1973). An earlier advance, for which there is no direct evidence, may have occurred sometime between 5250 ± 130 and 3600 ^{14}C yr BP (Denton and Karlen 1973).

(d) Little Ice Age

Renewed glacier advances of the "Little Ice Age" (last 1000 yr) brought an end to the interval of warming that followed Neoglacial time. Glaciers throughout central and southern Alaska advanced and retracted intermittently during the Little Ice Age, but no consistent pattern can be easily inferred, especially for central Alaska. Little Ice Age moraines were built sometime after AD 1500 in the White River Valley

(Denton and Karlen 1973). Glaciers in central and southern Alaska have generally retreated during the 20th Century (Denton and Karlen 1973; Goldthwait 1966; Reid 1970).

1.4 - Inferred Regional Chronology of the Susitna Valley

The upper Susitna Valley was largely ice-covered during most of late Wisconsinan time between about 30,000-14,000 ^{14}C yr BP. Coalesced valley glaciers extended from the valley bottoms to altitudes as high as 3500-4000 feet, and the snowline may have dropped to nearly that altitude as well. Glaciers were probably widening and deepening their valleys at this time, probably destroying most pre-Late Wisconsinan deposits. Within the Susitna and Tyone River lowlands, however, considerable pre-Late Wisconsinan stratigraphy may exist.

Advances of Late Wisconsinan time in the Susitna Valley probably remained near, but some distance upvalley from their maximum extents between about 25,000-17,000 yr BP. Following the marine transgression which deposited the Bootlegger Cove Clay about 14,100 yr BP, coalesced glaciers in the Cook Inlet lowland readvanced about 14,000 yr BP reaching their maximum Late Wisconsinan extents. Following a period of inferred stagnation and downwasting in the terminal zone, which may have continued long after retreat began, ice probably receded rapidly northward. Thinning of the ice in the upper Susitna River Valley accompanied northward retreat in the lowland. Glaciers retreated north of Willow Creek by about 12,000 yr BP, and much of the Susitna Canyon area may have been deglaciated by 11,000 yr BP. Rapid ice recession probably continued with the ice tongues receding upvalley from their present terminii by 9000 yr BP. Ice retreat was almost certainly complete by 8000 yr BP. Glaciers may have experienced a minor early Holocene readvance prior to 8500 yr BP, but if so, they probably did not extend more than several km beyond their present termini.

During the Middle Holocene, between about 4000-8000 yr BP, the Susitna Valley may have been slightly warmer and possibly drier than present. Maximum glacier retraction, and the culmination of warmth may have occurred about 5000-6000 yr BP.

Cooler conditions returned during Neoglacial time, which spans the last 3500 years. Glaciers probably expanded slightly at this time reaching terminal positions only several kilometers from their present termini. At least three episodes of cooling and glacier expansion are thought to have occurred since about 3500 yr BP. Present climates occur within the framework of the Little Ice Age. The general ice retreat and warming of the 20th Century may be followed in the future by more severe climates and a return to minor glacier advances.

2 - DESCRIPTIONS FOR GEOARCHEOLOGIC TERRAIN UNITS IN THE MIDDLE SUSITNA RIVER VALLEY*

Age	Geology-terrain character	Relief

Glacial

(Refers to all of those units that were modified during the last glaciation. The highest hills of unit Rh_3 may have stood above the glacial limit, but frost shattering and mass movement during the last glaciation caused their surfaces to be essentially equivalent or younger in age than other glacial units)

R Rock surfaces - modified by erosion by glacier ice. Usually rounded surfaces, but may include some very steep terrain in the highest peaks. Drainage is excellent, soil cover is usually minimal. Surface usually covered by patchy or complete tundra cover, but may be bouldery at high altitudes. Contains rare isolated patches of drift, but not enough to obscure rock surfaces. Bedrock structure is responsible for much of the topography.

*These units were mapped on aerial photographs which are on file at the University of Alaska Museum.

h Hills - rock occurs as part of a hill or complex of hills. Slopes are usually irregular, but continuous.

s Surfaces - rock occurs as a surface of varying relief (rather than as a steadily inclined surface such as a hill). Surfaces can exhibit very high relief.

1 Low local relief
2 Medium local relief
3 High local relief

b Rock valley walls - rock occurs as part of a broad sloping, often gradual surface without secondary relief (walls of glacial valleys). A thin mantle of drift may be present. Drainage is very good in most places.

d Rock with thin or patchy drift - bedrock structure is evident throughout, and surface has most of the character of a bedrock slope. Can be rough in some areas or smooth, depending on the nature of the underlying rock. Typically poorly drained where drift reaches sufficient thickness.

D Drift - dominantly till with some ice contact stratified drift. Generally forms poorly drained slopes because of the clay-rich nature of the till.

t Thick - drift obscures all bedrock structure. Slopes generally gentle and poorly drained. Local relief generally low, but some significant gullying can occur due to the erodable nature of the till.

p Patchy - poorly drained areas interspersed with well drained, usually high relief rocky areas. Similar to unit R_d but more poorly drained areas.

u Undifferentiated - generally includes much till and low relief, poorly drained areas, but also contains boggy areas, irregular ice contact stratified drift areas, and broad open surfaces.

I Ice contact stratified drift - hummocky irregular, commonly gravelly mounds and ridges. Commonly occurs in chaotic pattern, but ridges can be continuous for about 1 km.

o Open hummocks - generally broad swales and mounds in irregular pattern. Surface only moderately well drained, usually very brushy.

t Tightly nested hummocks - very well drained gravelly ridges tightly clustered to provide much well drained areas. Terrain very irregular and discontinuous. Contains numerous small lakes and ponds, commonly with gravelly edges.

p Patchy - mounds and ridges occur thinly over bedrock. Relief generally very low, but sharp.

O Outwash - broad, extremely low gradient, surface without relief.

p Outwash plain - broad open area of continuous outwash - shows some primary relief as surface channels.

v Valley train - flat outwash surface in valley bottom. Surfaces flat, but commonly terraced.

f Fan - occurs downstream from tributary mouths in some localities. Forms flat well drained sloping bench.

L Lacustrine - surfaces generally low relief, and extremely poorly drained. Underlain by silts and clays. Earthflows common where water is available and slopes are sufficiently steep. Can occur as thin mantle over broad areas.

m Mantle - lacustrine deposits subdue, but not obscure the underlying topography. Very poorly drained, with widespread solifluction.

s Surface - lake plain. Deposits thick enough to obscure the underlying topography. Very poorly drained, with silts and clays to surface.

Holocene

(Deposits and features formed since deglaciation. In some places a steep valley wall, which is either modified by Holocene erosion or covered by Holocene deposits, may have been largely formed during glaciation.)

V Valley slide slopes - steep slopes which represent Holocene erosion or modification. Slopes generally provide good exposures of bedrock, with till and other surficial units at the surface. Much of the valley walls may have formed prior to Holocene time, but there is enough modern or recently past activity to justify use of this age category.

g Gullied - either deep rocky gullies in tributaries, or badlands-like dissection on the valley sides. Extremely difficult terrain to traverse.

s Smooth - valley walls are not highly gullied, but still quite steep. May contain a great degree of colluvium in some places.

A Alluvium - coarse gravel surfaces which are generally of low relief. Can occur in the upper reaches of tributaries, but generally occurs in the Susitna Valley bottom. Surfaces are generally well drained, thickly forested, and slightly sloping. Recent alluvium (as island in the river) not mapped separately.

s Susitna Valley bottom alluvium - occurs a gravelly alluvium derived from and deposited by the Susitna River. Often has numerous drainage channels which are parallel to the river, and may have small terraces.

t Tributary floor and fan alluvium - sloping surfaces which occur at the mouth and within tributary valleys. Generally well drained, but steep fans may show poorly drained surfaces.

S Slope deposits - nonsorted, poorly drained, often steeply sloping mixed deposits.

c Colluvium - poorly drained, steeply sloping irregular surfaces which commonly parallel the steep valley walls.

s Solifluction - broad, open areas of slope deposits. Rubbly and silty deposits. Surfaces poorly drained.

M Bog sediments - highly organic and presently wet.

APPENDIX C

FORMS - 1. SITE FORM

2. SURVEY LOCALE EVALUATION FORM

3. ALASKA HERITAGE RESOURCES SITE SURVEY FORM

ARCHEOLOGY
UNIVERSITY MUSEUM
UNIVERSITY OF ALASKA

FIELD SITE NO.: ______
SURVEY LOCALE NO.: ______
AHRS NO.: ______

SUSITNA HYDROPOWER PROJECT

I. SITE LOCATION
   A. USGS QUAD: Talkeetna Mountains ______ Scale: 1:63,360
   B. AIR PHOTO REFERENCE: Roll ______ Frames ______
   C. TWP ______, RNG ______, Seward Meridian
      ______ ¼ of the ______ ½ of the ______ of Section ______
   D. UTM: Zone 6 Easting ______ Northing ______
   E. LATITUDE: ______ ° ' " LONGITUDE: ______ ° ' "
   F. GEOLOGICAL UNIT: ______ No. ______
   G. REGION: Devil Canyon ______ Watana ______ Other: ______

II. ENVIRONMENT:
   A. Site morphology. (See back of form for information required.)

______
______
______
______
______
______
______
______
______
______
______
______
______
______
______

   B. Surrounding terrain morphology. (See back of form for information required.)

______
______
______
______
______
______
______

FIELD SITE NO.:____________

C. Ecosystem. (See back of sheet for descriptions.)

1. _______ Moist Tundra _______ High Brush _______ Other: ____________

_______ Lowland spruce-hardwood _______ Upland spruce-hardwood

2. Site vegetation and surface description:

3. Vegetation in surrounding area and surface description:

FIELD SITE NO.:__________

III. SITE:

A. Description:

1. Characteristics. (lithic scatter, stratified site, cabin, etc.)

number of shovel tests

number of test pits

(indicate on map)

2. Number, size and spatial relationship of features, etc.

3. Stratigraphy (if relevant):

FIELD SITE NO.:________________

B. Artifact inventory.

1. Surface:

a. Artifacts collected:

____

____

____

b. Artifacts observed but not collected:

____

____

____

____

2. Systematically excavated artifacts:

____

____

____

____

C. Period: _____ Unknown _____ Precontact

_____ Historic: Native _____ Non-Native _____

D. Size:

1. Observed Size: _____ x _____ meters

Justification for boundaries:

____

____

____

2. Estimated Size: _____ x _____ meters

Justification for boundaries:

____

____

____

E. Site disturbance (current and anticipated). Indicate expected effect of the hydroelectric project on the site.

1. Natural:____

____

____

____

2. Human:____

____

____

____

FIELD SITE NO.________________

F. What prompted you to survey this location?

____

____

____

____

G. Draw and attach map(s) of site with location of tests and surface features; soil profile(s); and general location and vegetation map.

IV. PHOTOGRAPHIC RECORD:

Frame #	Direction	Content
		Site ID with date and Crew

V. CREW: (include relevant pages in fieldbook)

A. Names: ____________, ____________, ____________

____________, ____________, ____________

____________, ____________, ____________

B. Date(s) visited: ____

VI. Field Recommendation for further testing:

____

____

____

____

II. A. Site morphology.

1. What terrain feature is the site on: flat plain, sloping plain, continuous ridge, hill, point, shoreline, terrace, valley, etc.
2. What is the topographic context:
   a. no topographic relief relative to surrounding terrain, higher topographic relief than surrounding terrain, lower topographic relief than surrounding terrain.
   b. give elevation: 1) above sea level; 2) Relative to surrounding terrain.
3. Is the terrain feature continuous or discrete?
4. What is the size, shape and direction of this feature?
5. What is the relative position of the site on this feature?
6. Field of view:
   a. direction and range of view;
   b. what is in view?
   c. would a change in the present vegetation increase or decrease view? How?
7. Describe any special attributes that make this site location unique.
8. Are there other settings similar to that of this site in the unit? Where?

II. B. Surrounding terrain morphology.

Describe surrounding landforms and water features in relation to the site. What is the direction, distance and difference in elevation of surrounding features? The following characteristics should provide a guide:

1. Streams and rivers:
   a. proximity to site
   b. access from site
   c. are any in view from site?
   d. has downcutting created valley wall constriction in this area?
   e. is stream or river (1) shallow with rapids and sandbars, or (2) deep and smooth in this vicinity, etc.
   f. is water clear or turbid?
   g. what is the general width in this vicinity?
   h. is terracing present?
   i. in this area is the river course:
      1. straight;
      2. bending;
      3. serpentine.
   j. are confluences with other streams or rivers nearby? How far?
   k. what kind of terrain does this stream or river drain? (lakes, hills, marsh)

2. Lakes:
   a. size in hectares using template.
   b. inlet present? outlet present?
   c. single lake or part of lake system?
   d. characterize terrain surrounding lake (low, wet, steep, etc.)
   e. is there any evidence that lake size is changing (vegetation overgrowth, old shorelines, etc.)
   f. characteristics of shoreline. Old shorelines present?

ECOSYSTEMS LIKELY TO BE ENCOUNTERED IN PROJECT AREA

MOIST TUNDRA: Moist tundra ecosystems usually form a complete ground cover and are extremely productive during the growing season. They vary from almost continuous and uniformly developed cottongrass tussocks with sparse growth of other sedges and dwarf shrubs to stands where tussocks are scarce or lacking and dwarf shrubs are dominant. Associated species are arctagrostis, bluejoint, tufted hairgrass, mosses, alpine azalea, wood rush, mountain-avens, bistort, low-growing willows, dwarf birch, Labrador tea, green alder, Lapland rosebay, blueberry and mountain cranberry.

HIGH BRUSH: These are dense to open deciduous brush systems. Floodplain thickets: The subsystem is similar from the rivers of the southern coastal areas to the broad-braided rivers north of the Brooks Range. It develops quickly on newly exposed alluvial deposits that are periodically flooded. The dominant shrubs are willows and alders. Associated shrubs are dogwood, prickly rose, raspberry, buffaloberry and high bush cranberry. Birch-alder-willow thickets: This subsystem is found near timberline in interior Alaska. It consists of resin birch, American green alder, thinleaf alder and several willow species. Thickets may be extremely dense, or open and interspersed with reindeer lichens, low heath type shrubs, or patches of alpine tundra ecosystems. Other associated species are Sitka alder, bearberry, crowberry, Labrador tea, spirea, blueberry and mountain cranberry.

UPLAND SPRUCE-HARDWOOD FOREST: This ecosystem is a fairly dense interior forest composed of white spruce, birch, aspen and poplar. Black spruce typically grows on north slopes and poorly drained flat areas. Root depths are shallow. Fire scars are common. White spruce averaging 40 to 80 feet in height and up to 16 inches in diameter occurs in mixed stands on south facing slopes and well drained soils; forms pure stands near streams. Aspen and birch average 50 feet in height. Poplar averaging 80 feet in height and 24 inches in diameter occurs in scattered stands along streams. Undergrowth consists of mosses with grasses on drier sites and with brush on moist slopes. Typical plants are willow, alder, ferns, rose, high and low bush cranberry, raspberry, current and horsetail.

LOWLAND SPRUCE-HARDWOOD FOREST: This ecosystem is a dense to open interior lowland forest of evergreen and deciduous trees, including extensive pure stands of black spruce. Black spruce are slow growing and seldom exceed 8 inches in diameter or 50 feet in height. Cones of this tree open after fire and spread abundant seed, enabling black spruce to quickly invade burned areas. The slow-growing stunted tamarack is associated with black spruce in the wet lowlands. It seldom reaches a diameter of more than 6 inches. Rolling basins and knolls in the lowlands have a varied mixture of white spruce, black spruce, paper birch, aspen and poplar. Small bogs and muskegs are found in the depressions. Undergrowth species include willow, dwarf birch, low bush cranberry, blueberry, Labrador tea, crowberry, bearberry, cottongrass, ferns, horsetail, lichens and a thick cover of sphagnum and other mosses. Large areas burned since 1900 are covered by willow brush and very dense black spruce sapling stands.

AFTER: Major Ecosystems of Alaska. Joint Federal-State Land Use Planning Commission for Alaska. July 1973.

SURVEY LOCALE: ____________________

Museum Archeology
University of Alaska
Fairbanks, Alaska 99701

SUSITNA HYDROPOWER PROJECT
SURVEY LOCALE EVALUATION FORM

This form is intended to insure that three kinds of data for each locale are recorded. These data will guide additional survey, evaluation of areas that may need no further work, and document areas surveyed and tested on-the-ground. If supplementary information to this form is included in fieldnotes, please note this on the form along with your name(s) and field book page number(s).

I. A field description of the locale is needed. The field description of the locale should include the uniformity and variability of surface morphology. The information which you record will be used to compare this locale with other locales to determine similarity and aid in future locale selection and testing.

a. Describe the surface morphology noting topographic features, drainage, soils, variation in surface slope, etc.

b. What, if any, are the discrepancies between the definition of the geological unit (based on air photo interpretation) and the field observation of the unit? Would you characterize the total area as a single unit based on the homogeneity of surface morphology?

II. Identify areas within the locale that potentially may be eliminated from further archeological survey. Please provide <u>objective</u> criteria in your evaluation such as: 1) areas where testing is not feasible using standard archeological field techniques (areas of standing water, talus rubble); 2) areas where the substrata have been removed by natural erosion (indicate whether these areas have been surface examined for archeological materials); and 3) overly steep slopes. This would include slopes of greater than 15° to horizontal which you deem unlikely for site occurrence (describe and measure slope angle).

III. Identify areas within the locale which may have high archeological potential, based on known site locales from other areas and your field experience, including overlooks, river terrace and bluff edges, lake and stream margins, etc. Describe the location, extent, salient features, and tests (if applicable) for these locales, record these locations on USGS maps.

High archeological potential areas that should be investigated --

IV. Locate on maps where the survey team actually went on-the-ground, and location, number, size, and depth of test pits excavated and natural exposures examined. Describe the topographic setting, and relation to other physical features, such as lakes, streams, rivers, bluff, edges, nearby hills, elevation, etc., for sterile test pits.

Number of shovel tests --

NAMES OF FIELD TEAM: (include relevant pages in fieldbook)

	Date		Date
	Date		Date
	Date		Date
	Date		Date
	Date		Date
	Date		Date

DEFINITIONS OF GEOLOGICAL UNITS

G=Glacial L=Late Glacial R=Recent M=Modern

b. Surfaces mapped as "b" are sloping bedrock surfaces that formed the valley walls of glacial troughs. In most cases slopes are very steep, and usually bedrock is exposed directly underneath the thin recent soil mantle. In some places patchy thin drift may be present within the boundaries of areas mapped with the subscript "b". This unit commonly grades both upward and downward in elevation to rock slopes above the glacial trough (r) or to drift mantle slopes (d, d/b). Minor windblown sedimentation and solifluction processes have occurred, but in most cases the glacial trough is relatively unmodified.

d. Surfaces mapped as "d" include those areas thickly mantled with glacial drift. Relief is generally very low and the unit can have a monotonous gradually sloping undulating expression. Drainage is typically poor, with small ponds forming in a few places. The surface character is controlled largely by the varying thickness and composition of the till mantle. Most of the sediment underlying the surfaces mapped "d" is probably stony, clayey, dense till, which may be overlain by a thin gravel cap.

d/b. Surfaces mapped as "d/b" are underlain by thin or patchy drift which overlies bedrock. Both ice-scoured bedrock and a mantle of poorly drained drift can occur locally. The topographic relief is usually lower than "r" surfaces because the drift fills in the original depressions. It is higher than "d" surfaces because the surface irregularities are not completely masked by a drift mantle. Locally, this unit can be well drained (as in the gravelly areas), but usually well drained bedrock areas are randomly interspersed with poorly drained drift areas. Minor areas of subdued morainal topography can be present locally.

m. Surfaces mapped as "m" are underlain by hummocky irregular, commonly gravelly drift which extends to some depth. The surface expression is morainal. Topographic relief is generally less than 100 feet, but numerous chaotic small ridges (morainal) or isolated mounds (kames) typically less than 100' relief may be present. In most areas, the surfaces mapped as "m" are well drained and gravelly. Small lakes are commonly present, and large irregular poorly drained areas may be present as well. Very little morainal topography is present west of the Watana Dam Site. Extensive areas near the Tyone River, although morainal in form (m), are more subdued and poorly drained, possibly because they are partly buried by eolian sediments.

m2. Surfaces mapped as "m2" are similar to "m" surfaces and grade directly into them. They are, however, more irregular in form, with more prominent ridges, and better drained topography. In the vicinity of Tsisi Creek and the Oshetna River, "m2" surfaces include some prominent valley lateral moraines.

v. Surfaces mapped as "v" include all bedrock surfaces that were formed by recent incision of tributaries and the Susitna River. The surfaces are very steep, commonly gullied, and are still commonly in the process of being eroded. The country between "v" surfaces and the next higher surface is usually sharp. "v" surface also includes some colluvium, small talus cones, and a few possible landslides.

a. Surfaces mapped as "a" include all alluvium of modern or relatively recent age. The alluvium is generally well drained and vegetation covered, especially in the Susitna Canyon. Alluvium in the tributaries may contain minor colluvial debris and some fine material, but along the Susitna and Chulitna River "a" is indistinguishable from outwash. The alluvium is derived largely from reworked outwash, hence the similarity. The contact between alluvium (a) and steep gullied slopes (v) is usually abrupt, but difficult to map because of the narrow outcrop pattern.

ALASKA HERITAGE RESOURCES SITE SURVEY FORM (ARCHEOLOGY) OH&A 5/76 Page 1
(Attach continuation sheets as needed.)

RECORDER:

1. Name(s) ______________________ 2. Date ____________
3. Address ______________________
4. Project ______________________ 5. Permit Number ________

SITE REFERENCE/LOCATION:

1. Field Designation ____________ 2. (AHRS) Designation ____________
3. Name(s) of Site ______________________
4. Map Name ______________________, Map Scale ____________
5. Latitude ____ Deg. ____ Min. ____ Sec. / Longitude ____ Deg. ____ Min. ____ Sec. ____
6. Legal Description ______________________
7. Aerial Photo Reference ______________, Photo Scale ____________
8. UTM Grid Reference ______________________
9. Bibliographic References (manuscripts, etc.) ______________________

____

LAND USE CONDITIONS:

1. Present Land Use ______________________
2. Recent Surface Modifications ______________________
3. Natural Erosion: Kind ______________ Extent ____________
4. Vandalism: No _____ Yes _____; Heavy _____ Medium _____ Light _____
5. Past Surface Modifications ______________________
6. Future Surface Modifications ______________________
7. Property Owner/Manager ______________________

ENVIRONMENTAL DESCRIPTION:

1. Vegetation at Site ______________________
2. Surrounding Vegetation ______________________
3. Topography at Site ______________________
4. Surrounding Topography ______________________
5. Geology (surface/bedrock) ______________________
6. Nearest Water to Site: Distance __________ Direction __________ Type __________

(Attach continuation sheets as needed.)

Site Reference ____________

From Page 1

SOIL MATRIX:

1. Thickness (sod) ____________, (soil) ____________, Description ____________

3. Samples Taken: No _____ Yes _____; Number/Description ____________

1. Field Book(s) ____________ Pages ____________
2. Photographs Taken: B&W _____ Color Slides _____ Color Prints _____, Description of Subject(s) ____________

ARCHAEOLOGICAL OBSERVATIONS/DATA COLLECTED:

1. Estimated Extent of Site (use sketch map) ____________
2. Number of Cultural Components ____________
3. Stratigraphy: No _____ Yes _____ (attach profile)
4. Number of Test Pits Dug _____ (indicate their relative positions on sketch map)
5. Organic Preservation: No _____ Yes _____; Good _____ Moderate _____ Poor _____
6. Faunal: No _____ Yes _____; Description ____________
7. Human Remains: No _____ Yes _____; Description ____________
8. Charcoal: No _____ Yes _____ Collected _____; Description/Provenience ____________
9. Other Features ____________
10. Artifacts: No _____ Yes _____ Collected _____; Description ____________
11. Repository ____________

SKETCH MAP ATTACHED:

1. Indicate North, give scale, provide appropriate labels, and include landmarks.

APPENDIX D

CORRESPONDENCE

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS

JAY S. HAMMOND, GOVERNOR

274-4676

619 Warehouse Dr., Suite 210
Anchorage, Alaska 99501

May 15, 1980

Re: 3420-1980

Dr. E. James Dixon, Jr.
Curator of Archaeology
University of Alaska Museum
University of Alaska
College, Alaska 99701

Dear Jim:

Please find enclosed your approved State of Alaska Field Archaeology Permit. Please note that your permit expires on 30 September 1980. We will appreciate receiving two copies of the final report.

We wish you the best of luck in your upcoming fieldwork.

Sincerely,

Chip Dennerlein
Director

By: Ty L. Dilliplane
Archaeologist

enclosure

TLL:clk

0-J11LH

United States Dep..rtment of the Interior

HERITAGE CONSERVATION AND RECREATION SERVICE
WASHINGTON, D. C. 20243

IN REPLY REFER TO: W510

Control No: 114-AK/79-002
Permit No: 80-AK-023

FEB 8 1980

Dr. John Bligh
Division of Life Sciences
University of Alaska
Fairbanks, Alaska 99701

Dear Dr. Bligh:

Enclosed is a Federal Antiquities permi which authorizes the University of Alaska (Division of Life Sciences) to conduct archeological investigations (professional consultation services/ including limited testing) on certain public lands owned and controlled by the Department of the Interior and administered by the Bureau of Land Management in the State of Alaska.

Please note the special conditions and stipulations appended to this permit. Note also that the permit number must appear on the title page of any report prepared under this authority.

Should you have any questions regarding the permit, please refer to the permit number indicated in the upper right hand corner of the form and address correspondence to:

Departmental Consulting Archeologist
Heritage Conservation and Recreation Service
Department of the Interior
440 G. Street, N.W.
Washington, D.C. 20243

This permit is issued under the authority of the Archaeological Resources Protection Act of 1979 (Public Law 96-95; 93 Stat. 721).

Sincerely,

/s/ Charles M. McKinney
Charles M. McKinney
Departmental Consulting
Archeologist

United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:

29

Mr. George S. Smith
Research Associate
University of Alaska
College, Alaska 99701

Dear Mr. Smith:

This will acknowledge receipt and acceptance of a preliminary report entitled, "Preliminary Report on the Archeological Survey of the Upper Susitna River Valley, Alaska in connection with the Susitna Hydropower Project, 1980" by E. James Dixon, George S. Smith and Robert M. Thorson, submitted in accordance with the terms and conditions of Federal Antiquities permit 80-AK-023.

This permit was issued on February 8, 1980, to the University of Alaska (Division of Life Science) for archeological investigations on public lands controlled by the Department of the Interior and administered by the Bureau of Land Management in the State of Alaska.

Sincerely,

Charles M. McKinney
Manager, Federal Antiquities
Program

United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO: 720

JUN 24 1981

Control #065-AK/81-002
Permit #81-AK-209

Dr. E. James Dixon, Jr.
University of Alaska Museum
Division of Life Sciences
Fairbanks, AK 99701

Dear Dr. Dixon:

Enclosed is a Federal Antiquities permit which authorizes the University of Alaska Museum to conduct archeological investigations (consultation services/limited testing) on certain public lands owned and controlled by the Department of the Interior and administered by the Bureau of Land Management and the U.S. Fish and Wildlife Service in the State of Alaska.

Please note the special conditions and stipulations appended to this permit. Note also that the permit number must appear on the title page of any report prepared under this authority.

Should you have any questions regarding the permit, please refer to the permit number indicated in the upper right hand corner of the form and address correspondence to:

Departmental Consulting Archeologist
National Park Service
Department of the Interior
440 G Street, N.W.
Washington, D.C. 20240

This permit is issued under the authority of the Archaeological Resources Protection Act of 1979 (Public Law 96-95, 93 Stat 721).

Sincerely,

Bennie C. Keel

Bennie C. Keel
Departmental Consulting
Archeologist

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS

JAY S. HAMMOND, GOVERNOR

619 WAREHOUSE DR., SUITE 21
ANCHORAGE, ALASKA 99501

PHONE: 274-4676

December 4, 1981

Re: 1130-13

John D. Lawrence
Project Manager
Acres American, Inc.
The Liberty Bank Building, Main at Court
Buffalo, New York 14202

Dear Mr. Lawrence:

We have reviewed the 1980 reports by the University of Alaska Museum dealing with the cultural resources of the Susitna Hydroelectric project area. The report documents the survey activities conducted during 1980 which adequately accomplish the tasks outlined in the proposed work plan. The sampling plan designed on the basis of geomorphic features and known use areas seems to have surpassed our expectations of site incidence in the area. The report shows that the first level inventory was very competently conducted and recorded. The second year activities as outlined in the procedures manual was accomplished in the 1981 field season according to information gained through verbal communication with the principle archaeological investigators. We understand that the field research strategy was changed slightly from that expected due to information gained during 1980. These changes appear to have more directly addressed problems which surfaced during the course of analysis of the 1980 data. A final review of the 1981 results and reports will have to await receipt of that document.

We feel that the steps taken thus far in the cultural resource management of the project have been excellent and one of the few instances of adequate lead time. We would like to make the observation that the work thus far is only preliminary to the work yet needed for the Susitna Hydroelectric project. Reconnaissance and testing of yet to be examined areas should continue. The clearances of specific areas of disturbance provided as additional survey by the Museum should indicate the continued need for clearances of ancillary projects which could affect cultural resources. Also, a formal mitigation plan for those sites to be affected by the project must be formulated. Once definite decisions on the route of access to the project area from existing road systems are made, those access routes and material sites must be examined for conflicts and needs for mitigation. Issuance of a permit by the Federal Energy Regulatory Commission should and probably will include provisions specifying under federal law the need for such protection.

John D. Lawrence
December 4, 1981
Page 2 -

If you have any questions regarding our comments contained here, please call us. We look forward to receiving the report on 1981 field work.

Sincerely,

Chip Dennelein
Director

By: for Douglas Reger
Robert D. Shaw
State Historic Preservation Officer

cc: Dr. E. James Dixon
Curator of Archaeology
University of Alaska Museum
University of Alaska
Fairbanks, Alaska 99701

Eric Yould
Executive Director
Alaska Power Authority
333 W. 4th Avenue
Anchorage, Alaska 99501

DR:clk

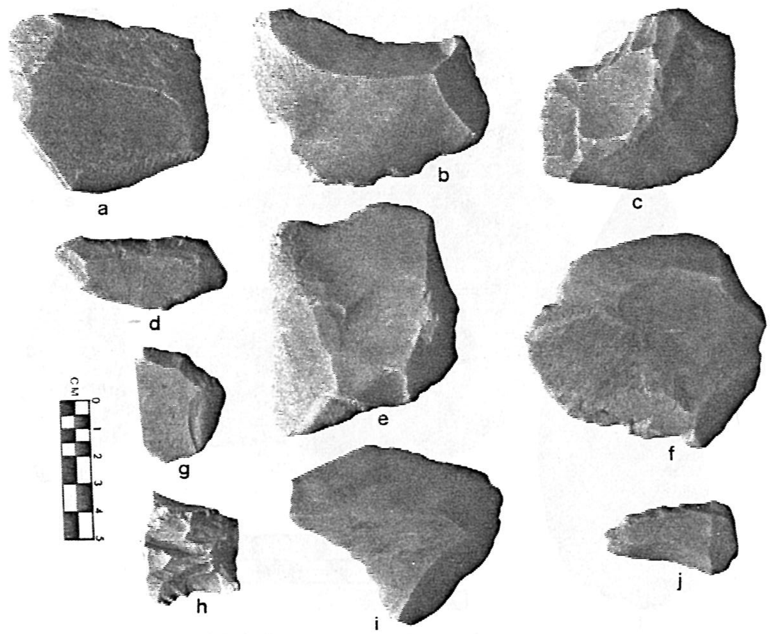


Figure A. Site TLM 027.

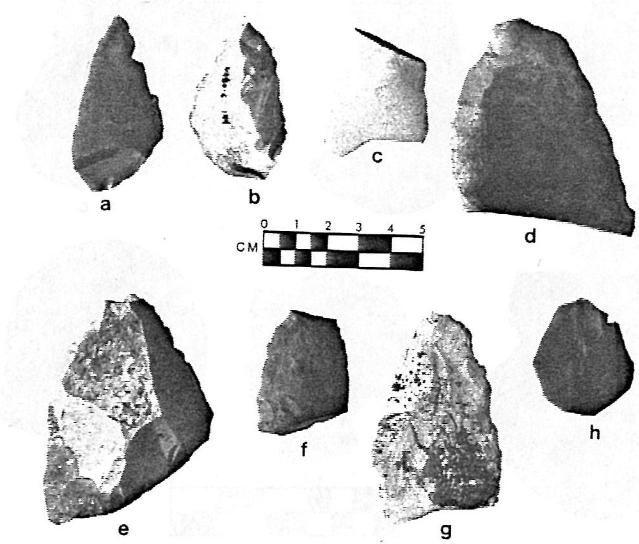


Figure B. Sites TLM 026, TLM 021, TLM 025.

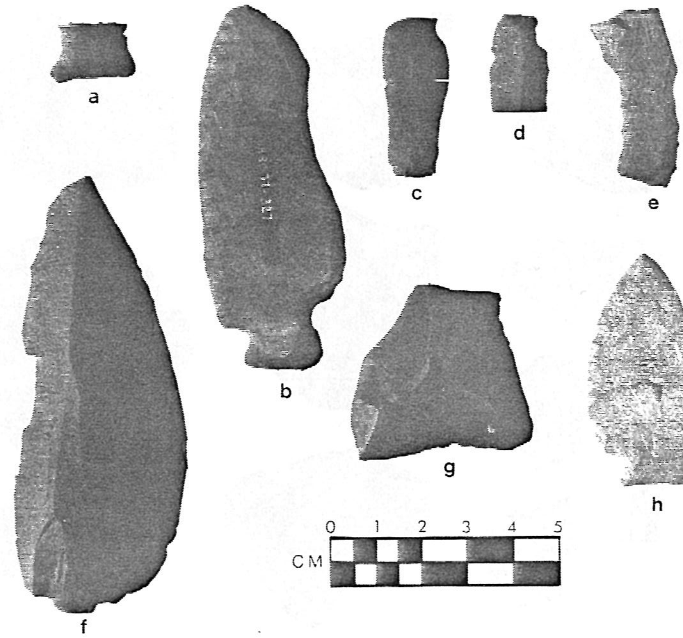


Figure C. Site TLM 030.

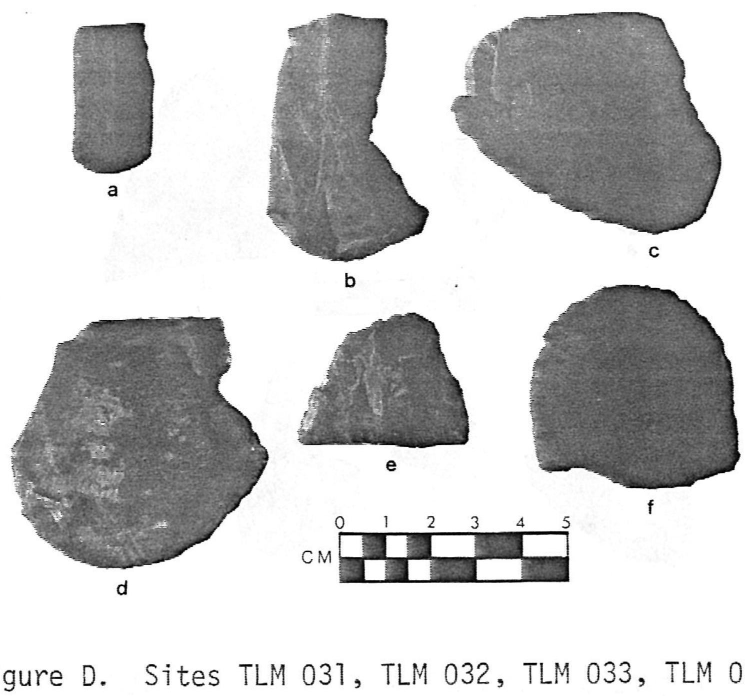


Figure D. Sites TLM 031, TLM 032, TLM 033, TLM 036.

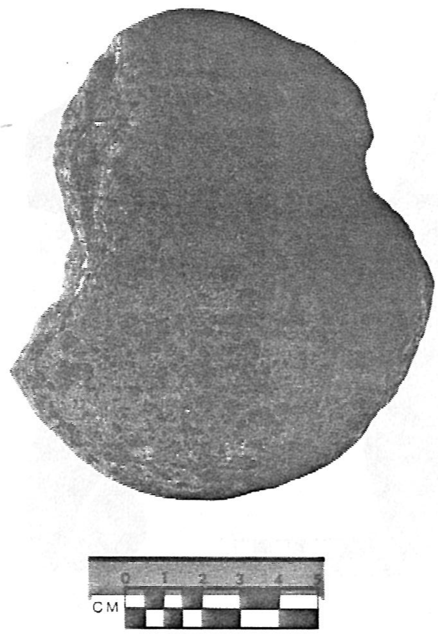


Figure E. Site TLM 032.

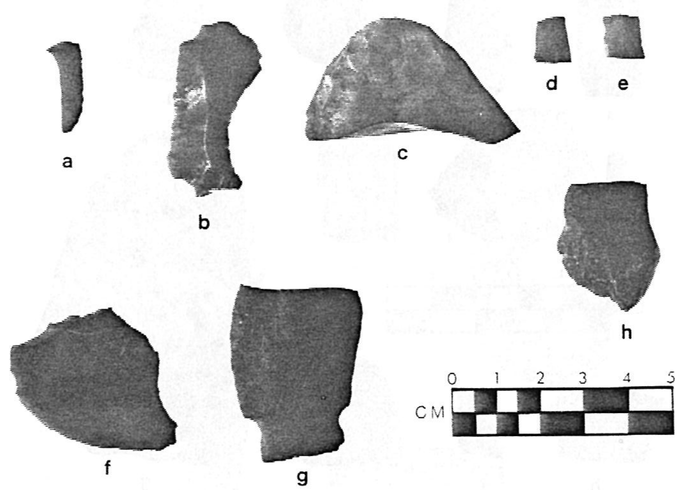


Figure F. Sites TLM 039, TLM 040, TLM 042.

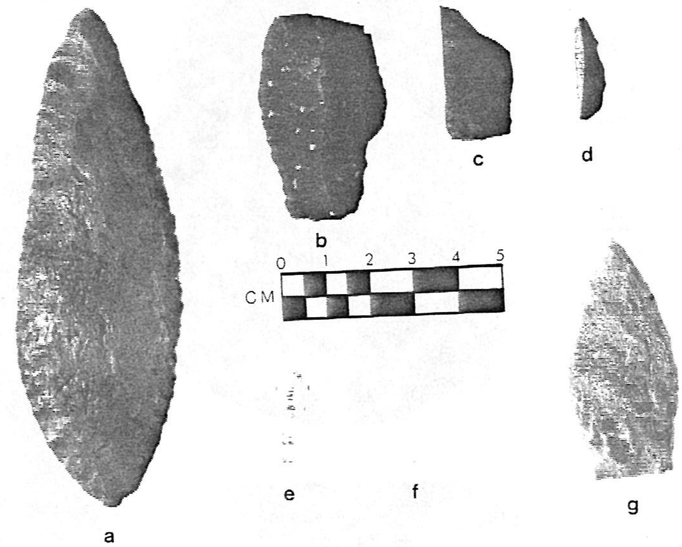


Figure G. Sites TLM 044, TLM 045

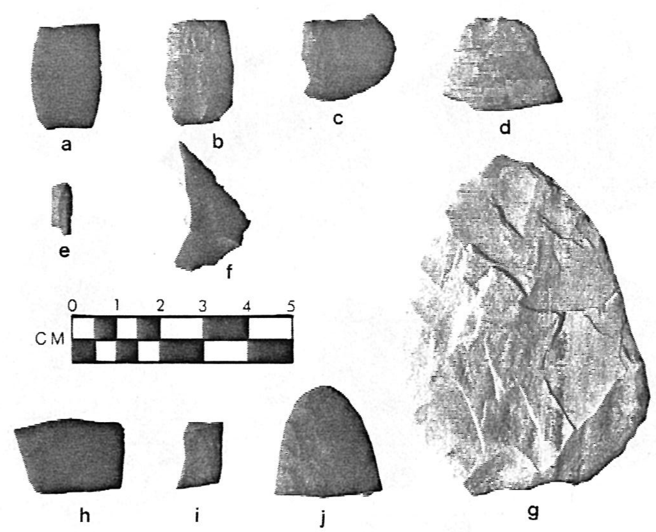


Figure H. Sites TLM 046, TLM 047, TLM 048, TLM 052.

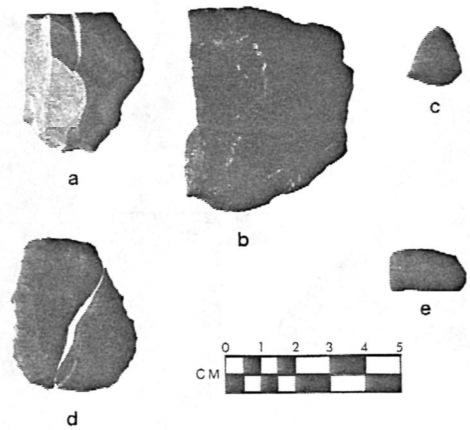


Figure I. Sites TLM 055, TLM 060, TLM 058, TLM 062, TLM 064.

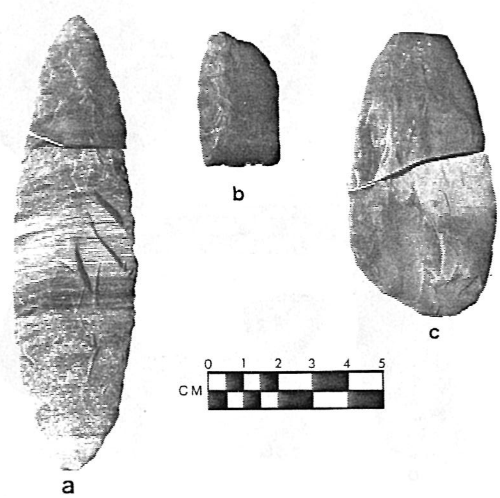


Figure J. Site TLM 066

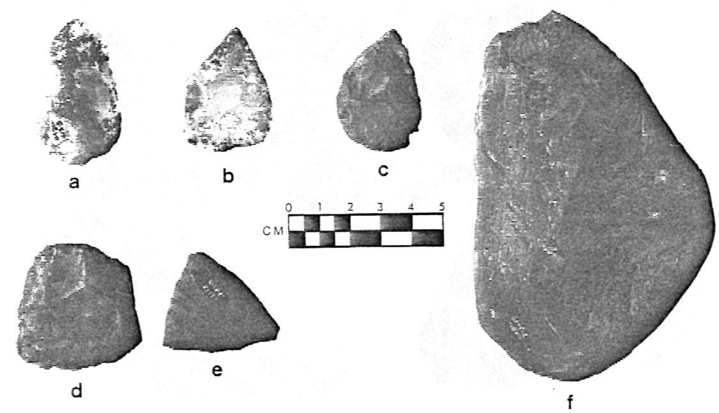


Figure K. Site TLM 067.

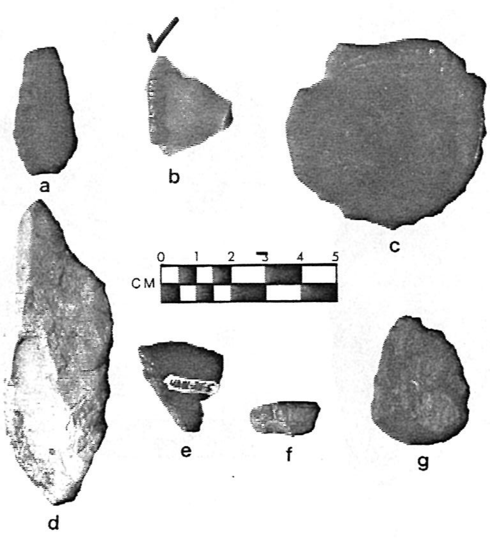


Figure L. Sites TLM 068, TLM 069, TLM 070.

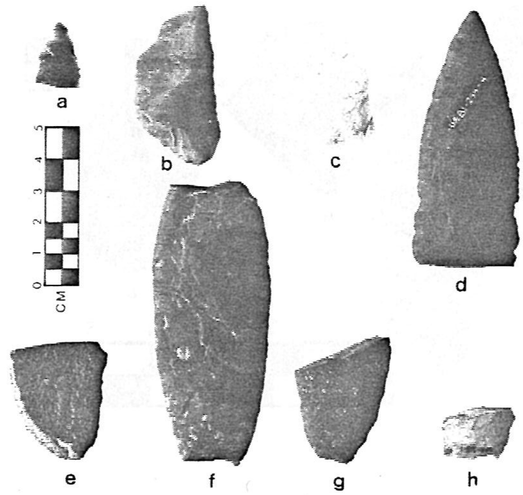


Figure M. Sites TLM 076, TLM 082, TLM 089, TLM 091, TLM 093, TLM 097, TLM 103, TLM 106.

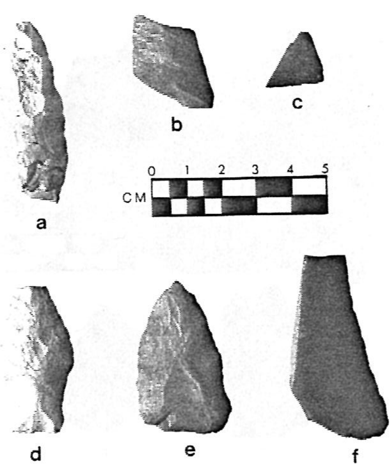


Figure N. Sites TLM 107, TLM 113.

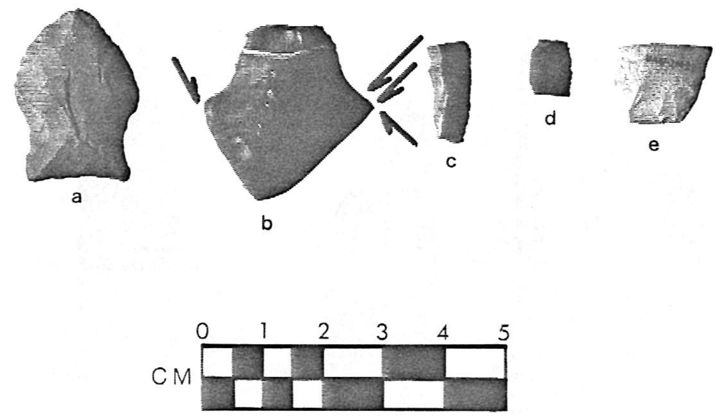


Figure O. Site HEA 174.

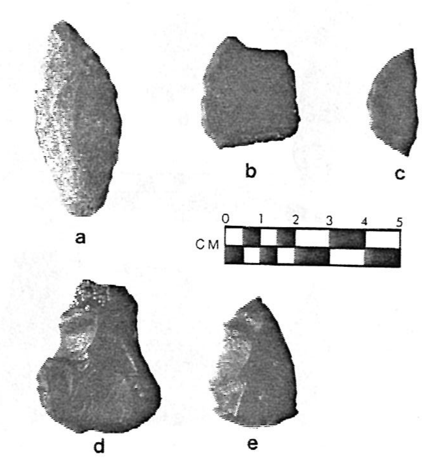


Figure P. Site HEA 175.

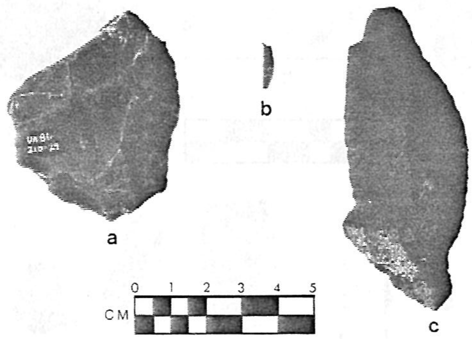


Figure Q. Sites HEA 177, HEA 178.

Figure R. Site HEA 178.

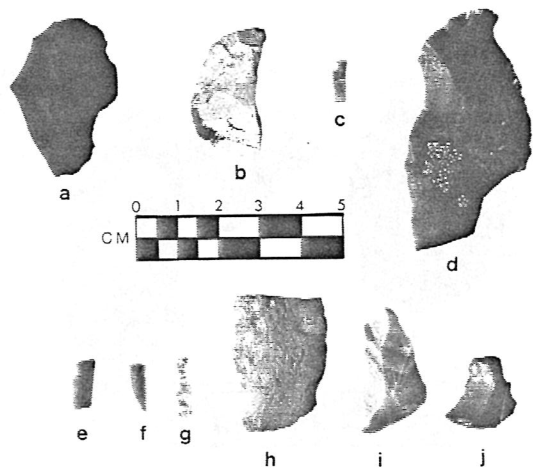


Figure S. Sites HEA 180, HEA 182, HEA 185.

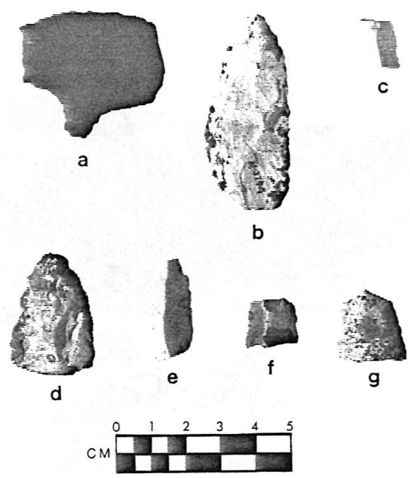


Figure T. Site HEA 186.

TABLE 1

ACCESSION NUMBERS, AHRS NUMBERS, TESTING LEVEL, AND SITE LOCATIONS FOR SITES DISCUSSED

Museum Accession Number	AHRS Number	Reconnaissance Testing	Systematic Testing	Locale	Map Reference
UA78-65	TLM 015	X		OS*	Tal. D-4
UA78-66	TLM 016	X		OS	Tal. D-3
UA78-67	TLM 017	X		OS	Tal. D-4
UA80-164					
UA78-60	TLM 018		X	OS	Tal. D-4
UA81-283					
UA80-165					
UA80-68	TLM 021	X		OS	Tal. C-2
UA80-69	TLM 022	X	X	OS	Tal. D-4
UA81-238					
UA80-70	TLM 023	X		Borrow E	Tal. D-4
UA80-71	TLM 024	X		Borrow E	Tal. D-4
UA80-72	TLM 025	X		OS	Tal. D-3
UA81-225					
UA80-73	TLM 026	X		45	Tal. C-1
UA81-218					
UA80-74	TLM 027	X	X	14	Tal. D-4
UA81-243					
UA80-75	TLM 028	X		OS	Tal. C-1
UA80-76	TLM 029	X		14	Tal. D-4
UA80-77	TLM 030	X		13	Tal. D-4
UA81-217					
UA80-78	TLM 031	X		30	Tal. D-3
UA80-79	TLM 032	X		30	Tal. D-3
UA80-80	TLM 033	X	X	31	Tal. D-3
UA81-223					
UA80-141	TLM 034	X		11	Tal. D-4
UA80-142	TLM 035	X		Borrow E	Tal. D-4
UA80-143	TLM 036	X		30	Tal. D-2
UA80-144	TLM 037	X		30	Tal. D-3
UA80-145	TLM 038	X	X	26	Tal. D-3
UA81-224					
UA80-146	TLM 039	X	X	27	Tal. D-3
UA81-277					
UA80-147	TLM 040	X	X	29	Tal. D-3
UA81-226					
UA80-148	TLM 041	X		OS	Tal. D-4
UA80-149	TLM 042	X	X	45	Tal. C-1
UA81-230					
UA80-150	TLM 043	X	X	21	Tal. D-3
UA81-221					
UA80-151	TLM 044	X		30	Tal. D-2
UA80-152	TLM 045	X		30	Tal. D-2

TABLE 1 (Continued)

Museum Accession Number	AHRS Number	Reconnaissance Testing	Systematic Testing	Locale	Map Reference
UA80-153	TLM 046	X	X	30	Tal. D-2
UA81-263					
UA80-154	TLM 047	X		34	Tal. C-2
UA80-155	TLM 048	X	X	27	Tal. D-3
UA81-278					
UA80-156	TLM 049	X		8	Tal. C-1
UA80-157	TLM 050	X	X	29a	Tal. D-3
UA81-229					
UA80-158	TLM 051	X		Borrow F	Tal. D-4
UA80-159	TLM 052	X		51	Tal. D-2
UA80-160	TLM 053	X		51	Tal. D-2
UA81-200	HEA 175	X	X	#B**	Hea. A-2
UA80-253					
UA81-201	HEA 174	X		#B	Hea. A-3
UA80-252					
UA81-202	HEA 176	X		#B	Hea. A-3
UA80-254					
UA81-203	TLM 057	X		#B	Tal. D-3
UA80-255					
UA81-204	TLM 058	X		70	Tal. D-3
UA81-205	TLM 059	X	X	69	Tal. D-3
UA81-206	TLM 060	X		68	Tal. D-3
UA81-207	TLM 061	X		68	Tal. D-3
UA81-208	TLM 062	X	X	78	Tal. D-3
UA81-209	TLM 063	X		55	Tal. D-3
UA81-210	HEA 177	X		OS	Hea. A-2
UA81-211	HEA 178	X		OS	Hea. A-2
UA81-212	TLM 066	X			Tal. D-3
UA81-213	TLM 067	X		OS	Tal. B-1
UA81-214	TLM 068	X		OS	Tal. C-4
UA81-215	TLM 069	X	X	91	Tal. D-2
UA81-216	TLM 070	X			Tal. C-4
UA81-217	(See UA80-77)			13	Tal. D-4
UA81-218	(See UA80-73)			45	Tal. C-1
UA81-219	HEA 179	X		OS	Hea. A-2
UA81-220	TLM 064	X		72	Tal. D-3
UA81-221	(See UA80-150)			21	Tal. D-3
UA81-222	TLM 065	X	X	85	Tal. D-2
UA81-223	(See UA80-80)			31	Tal. D-3
UA81-224	(See UA80-145)			26	Tal. D-3
UA81-225	(See UA80-72)			OS	Tal. D-3
UA81-226	(See UA80-147)			29	Tal. D-3
UA81-227	TLM 073	X		103	Tal. C-1
UA81-228	TLM 074	X		107	Tal. C-1
UA81-229	(See UA80-57)			29a	Tal. D-3

TABLE 1 (Continued)

Museum Accession Number	AHRS Number	Reconnaissance Testing	Systematic Testing	Locale	Map Reference
UA81-230	(See UA80-149)			45	Tal. C-1
UA81-231	TLM 075	X		89	Tal. D-2
UA81-232	TLM 076	X		107	Tal. C-1
UA81-233	TLM 072	X		88	Tal. D-2
UA81-234	TLM 077	X		84	Tal. D-2
UA81-235	TLM 078	X		Borrow C+	Tal. D-4
UA81-236	TLM 084	X		Borrow C	Tal. D-4
UA81-237	TLM 083	X		Borrow C	Tal. D-4
UA81-238	(See UA80-69)			15	Tal. D-4
UA81-239	TLM 082	X		OS	Tal. B-2
UA81-240	TLM 085	X		Borrow C	Tal. D-4
UA81-241	TLM 086	X		Borrow C	Tal. D-4
UA81-242	TLM 087	X		Borrow C	Tal. D-4
UA81-243	(See UA80-74)			14	Tal. D-4
UA81-244	TLM 081	X		Borrow C	Tal. D-4
UA81-245	TLM 054	X		Borrow C	Tal. D-4
UA81-246	TLM 055	X		Borrow C	Tal. D-4
UA81-247	TLM 089	X		Borrow C	Tal. D-4
UA81-248	TLM 088	X		Borrow C	Tal. D-4
UA81-249	TLM 095	X		Borrow C	Tal. D-4
UA81-250	TLM 096	X		Borrow C	Tal. D-4
UA81-251	TLM 094	X		Borrow C	Tal. D-4
UA81-252	TLM 097	X	X	Borrow C	Tal. D-4
UA81-253	TLM 090	X		OS	Tal. D-4
UA81-254	TLM 091	X		OS	Tal. D-4
UA81-255	TLM 092	X		OS	Tal. D-4
UA81-256	TLM 093	X		OS	Tal. D-4
UA81-257	HEA 180	X		#B	Hea. A-3
UA81-258	HEA 181	X		#B	Hea. A-3
UA81-259	HEA 182	X		#B	Hea. A-3
UA81-260	TLM 102	X		77	Tal. D-3
UA81-261	TLM 098	X		#B	Tal. D-3
UA81-263	(See UA80-153)			30	Tal. D-2
UA81-264	TLM 099	X		#B	Tal. D-3
UA81-265	TLM 106	X		#A	Tal. D-4
UA81-266	TLM 107	X		#A	Tal. D-4
UA81-267	TLM 108	X		#A	Tal. D-4
UA81-268	TLM 109	X		#A	Tal. D-4
UA81-269	TLM 110	X		#A	Tal. D-4
UA81-270	TLM 101	X		#A	Tal. D-4
UA81-271	TLM 103	X		#A	Tal. D-4
UA81-272	TLM 113	X		#A	Tal. D-5
UA81-273	TLM 114	X		#A	Tal. D-5
UA81-274	TLM 104	X		22	Tal. D-3
UA81-275	TLM 117	X		#B	Tal. D-3

TABLE 1 (Continued)

Museum Accession Number	AHRS Number	Reconnaissance Testing	Systematic Testing	Locale	Map Reference
UA81-276	TLM 105	X		OS	Tal. C-2
UA81-277	(See UA80-146)			27	Tal. D-3
UA81-278	(See UA80-155)			27	Tal. D-3
UA81-279	HEA 186	X		#B	Hea. A-3
UA81-280	HEA 184	X		#B	Hea. A-3
UA81-281	HEA 183	X		#B	Hea. A-3
UA81-283	HEA 185	X		#B	Hea. A-3
UA81-283	(See UA78-60)			OS	Tal. D-4
<u>1981 Sites without accession numbers (no cultural material collected):</u>					
	TLM 007	Recorded in State Files		OS	Tal. C-4
	TLM 020	X		OS	Tal. D-5
	TLM 071	X		OS	Tal. C-2
	TLM 079	X		33	Tal. D-2
	TLM 080	X		55	Tal. D-3
	TLM 056	X		Borrow C	Tal. D-4
	TLM 100	X		OS	Tal. C-2
	TLM 111	X		#A	Tal. D-4
	TLM 112	X		#A	Tal. D-4
	TLM 116	X		OS	Tal. D-3

*OS - Outside preselected survey locale, but within study area.

**#A & #B - Proposed access routes; #A is the proposed route north of the Susitna River from the Watana Dam site to the Parks Highway; #B is the proposed route from the Watana Dam site north to the Denali Highway. Portions of access corridors C, which runs from Devil Canyon to the Parks Highway on the south side of the Susitna River, & A have been selected for further study.

+Proposed Borrow Area C has been eliminated from consideration.

TABLE 2

SURVEY LOCALE MASTER SITE LIST

Locale Number	1980	1981	Site(s)
1	X		
2	X		
3	0*		
4	X		
4a	X		
5	X		
6	X		
7	0		
8	X		
9	X		
10	X		
11	X		TLM 034 (UA80-141)
12	X		
13	X		TLM 030 (UA80-77, UA81-217)
14	X		TLM 027 (UA80-74, UA81-243) TLM 029 (UA80-76)
15	X		TLM 022 (UA80-69)
16	X		
17	X		
18	X		
19	X		
20	X		
20a	X		
21	X		TLM 043 (UA80-150)
22	X		
23	X		
24	X		
25	X		
26	X		TLM 038 (UA80-145, UA81-224)
27	X		TLM 039 (UA80-146, UA81-277) TLM 048 (UA80-155, UA81-278)
28	X		
29	X		TLM 040 (UA80-147, UA81-226)
29a	X		TLM 050 (UA80-157, UA81-229)
30	X		TLM 031 (UA80-78) TLM 032 (UA80-79) TLM 036 (UA80-143) TLM 037 (UA80-144) TLM 044 (UA80-151) TLM 045 (UA80-152) TLM 046 (UA80-153, UA81-263)
31	X		TLM 033 (UA80-80, UA81-223)

TABLE 2 (Continued)

Locale Number	1980	1981	Site(s)
31a	X		
32	X		
33	X		TLM 072 (UA81-233) TLM 079
34	X		TLM 047 (UA80-154)
35	X		
36	X		
37	X		
38	X		
39	X		
40	X		
41	X		
41a	X		
42	0		
43	X		
44	X		
45	X		TLM 026 (UA80-73, UA81-218) TLM 042 (UA80-149, UA81-230)
46	X		
47	X		
48	X		TLM 049 (UA80-156)
49	X		
50	X		
51	X		TLM 052 (UA80-159) TLM 053 (UA80-160)
52	X		
53	X		
54	X		
55	X		TLM 063 (UA81-209)
56		0	
57		X	
58		0	
59		X	
60		X	
61		X	
62		0	
63		X	
64		X	
65		X	
66		X	
66a		X	
66b		X	
66c		X	

TABLE 2 (Continued)

Locale Number	1980	1981	Site(s)
66d		X	
67		X	
68		X	TLM 060 (UA81-206) TLM 061 (UA81-207)
69		X	TLM 059 (UA81-205)
70		X	
71		X	
72		X	
73		X	
74		X	
75		X	
76		X	
77		X	TLM 102 (UA81-260)
78		X	TLM 062 (UA81-208)
79		X	
80		X	
81		X	
82		X	
83		X	
84		X	TLM 077 (UA81-234)
85		X	TLM 065 (UA81-222)
86		X	
87		X	
88		X	TLM 072 (UA81-233)
89		X	TLM 075 (UA81-231)
90		X	
91		X	TLM 069 (UA81-215)
92		X	
93		X	
94		X	
95		X	
96		X	
97		X	
97a		X	
98		0	
99		X	
100		X	
101		X	
102		X	
103		X	TLM 073 (UA81-227)
104		X	
105		0	
106		X	

TABLE 2 (Continued)

Locale Number	1980	1981	Site(s)
107		X	TLM 074 (UA81-228) TLM 076 (UA81-232)
108		X	
109		X	

*0 - Not surveyed due to either inaccessibility or the fact that it was selected by the Chichaloon Native Association. All project personnel were instructed to avoid Native selections in the project area until the matter was settled.

TABLE 3

PROPOSED BORROW AREAS MASTER SITE LIST

Proposed Borrow Area	1980	1981	Site(s)
A	X		None
B	X		None
C*		X	TLM 054 (UA81-245)
			TLM 055 (UA81-246)
			TLM 078 (UA81-235)
			TLM 081 (UA81-244)
			TLM 083 (UA81-237)
			TLM 084 (UA81-236)
			TLM 085 (UA81-240)
			TLM 086 (UA81-241)
			TLM 087 (UA81-242)
			TLM 088 (UA81-248)
			TLM 094 (UA81-251)
			TLM 095 (UA81-249)
			TLM 096 (UA81-250)
			TLM 097 (UA81-252)
D	X		None
E	X		TLM 022 (UA80-69, UA81-238)
			TLM 023 (UA80-70)
			TLM 024 (UA80-71)
F	X		TLM 051 (UA80-158)
G	X		None
H		X	None

*Eliminated from consideration as a potential borrow source.

TABLE 4

LAND STATUS OF ARCHEOLOGICAL AND HISTORIC SITES LOCATED IN PROJECT AREA AS OF AUGUST 31, 1981

AHRS #	State Selected	State Selection Suspended	State Patented or TA'd	Village Selection	Village Selected	Federal		Private
						D-1	D-2	
-TLM 007								X(?)
-TLM 020					Kn			
+TLM 015	x							
+TLM 016	x							
+TLM 017	x							
+TLM 018					Kn			
-TLM 021			x					
=TLM 022					Ty			
=TLM 023					Ty			
=TLM 024					Ty			
-TLM 025				x				
+TLM 026		x						
=TLM 027					Kn			
-TLM 028						x		
=TLM 029					Kn			
=TLM 030					Kn			
-TLM 031				x				
-TLM 032				x				
+TLM 033				x				
=TLM 034					Kn			
°TLM 035				x				
-TLM 036		x						
-TLM 037				x				
-TLM 038	x							
+TLM 039	x							
+TLM 040				x				
-TLM 041				x				

TABLE 4 (Continued)

AHRS #	State Selected	State Selection Suspended	State Patented or TA'd	Village Selection	Village Selected	Federal D-1	Federal D-2	Private
+TLM 042		X						
+TLM 043				X				
-TLM 044		X						
-TLM 045			X					
-TLM 046			X					
-TLM 047		X						
+TLM 048	X							
-TLM 049		X						
+TLM 050				X				
°TLM 051	X							
-TLM 052		X						
-TLM 053		X						
-TLM 054	X							
-TLM 055	X							
-TLM 056	X							
-TLM 057	X							
+TLM 058				X				
+TLM 059	X							
+TLM 060	X							
+TLM 061	X							
+TLM 062				X				
+TLM 063				X				
+TLM 064				X				
+TLM 065		X						
-TLM 066	X							
-TLM 067				X				

TABLE 4 (Continued)

AHRS #	State Selected	State Selection Suspended	State Patented or TA'd	Village Selection	Village Selected	Federal D-1	Federal D-2	Private
°TLM 068	x							
-TLM 069		x						
°TLM 070	x							
-TLM 071		x						
+TLM 072		x						
+TLM 073		x						
-TLM 074		x						
+TLM 075		x						
-TLM 076		x						
+TLM 077		x						
-TLM 078			x					
+TLM 079		x						
+TLM 080				x				
-TLM 081	x							
°TLM 082	x							
-TLM 083			x					
-TLM 084			x					
-TLM 085			x					
-TLM 086	x							
-TLM 087			x					
-TLM 088	x							
-TLM 089	x							
-TLM 090	x							
-TLM 091	x							
-TLM 092	x							
-TLM 093	x(?)							x(?)

TABLE 4 (Continued)

AHRS #	State Selected	State Selection Suspended	State Patented or TA'd	Village Selection	Village Selected	Federal		Private
						D-1	D-2	
-TLM 094	x							
-TLM 095	x							
-TLM 096	x							
-TLM 097	x							
-TLM 098			x					
-TLM 099			x					
-TLM 100		x						
.TLM 101	x							
+TLM 102				x				
.TLM 103	x							
+TLM 104				x				
-TLM 105	x							
.TLM 106	x							
.TLM 107	x							
.TLM 108	x							
.TLM 109	x							
.TLM 110	x							
.TLM 111	x							
.TLM 112	x							
.TLM 113	x							
.TLM 114	x							
(Site # TLM 115 not used)								
-TLM 116	x							
-TLM 117			x					

TABLE 4 (Continued)

AHRS #	State Selected	State Selection Suspended	State Patented or TA'd	Village Selection	Village Selected	Federal D-1	Federal D-2	Private
-HEA 174						x		
-HEA 175							x	
-HEA 176						x		
°HEA 177							x	
°HEA 178							x	
°HEA 179							x	
-HEA 180						x		
-HEA 181						x		
-HEA 182						x		
-HEA 183						x		
-HEA 184						x		
-HEA 185						x		
-HEA 186						x		

=Devil Canyon Dam and Impoundment (7)
+Watana Dam and Impoundment (28)
°Borrow Areas, etc. (8)*
.Access Route Selected (11)
-Other Areas (61)

*Proposed Borrow Area C has been eliminated from consideration as a borrow source.

Vilage Selections: Ch - Chickaloon
Kn - Knik
Ty Tyonek

3.8 - Proposed Watana Runway - Archeological Survey

Proposed borrow areas, parking apron, and runway for the Watana airstrip were surveyed during the 1980 field season. Surface reconnaissance and subsurface testing were conducted along the entire length (6000 feet) and width (500 feet) of the airstrip. Five transects, one directly on the centerline and two on each side and paralleling the centerline, were examined (Figure 108). Subsurface tests were placed every 200 feet along each transect. Prior to archeological investigation survey markers were placed along the centerline as well as along the outer perimeter clearly delineating the airstrip. A total of 155 subsurface tests were excavated to a depth of 50 cm where possible. However, in most cases water or gravel was encountered before reaching 50 cm. In addition to the transect tests, 11 tests were placed in areas that provided some topographic relief from the surrounding low marshy terrain. Five other tests were made on the proposed runway in connection with transect testing in Borrow Area D which crosses the airstrip.

No cultural material was observed on the surface or in any of the subsurface tests. Therefore, archeological clearance is recommended. However, in the event that cultural resources, missed by the above sampling method, are uncovered during construction or use of the airstrip, TES and the project archeologist should be contacted so that the necessary action can be taken in a timely manner and unnecessary delays avoided.

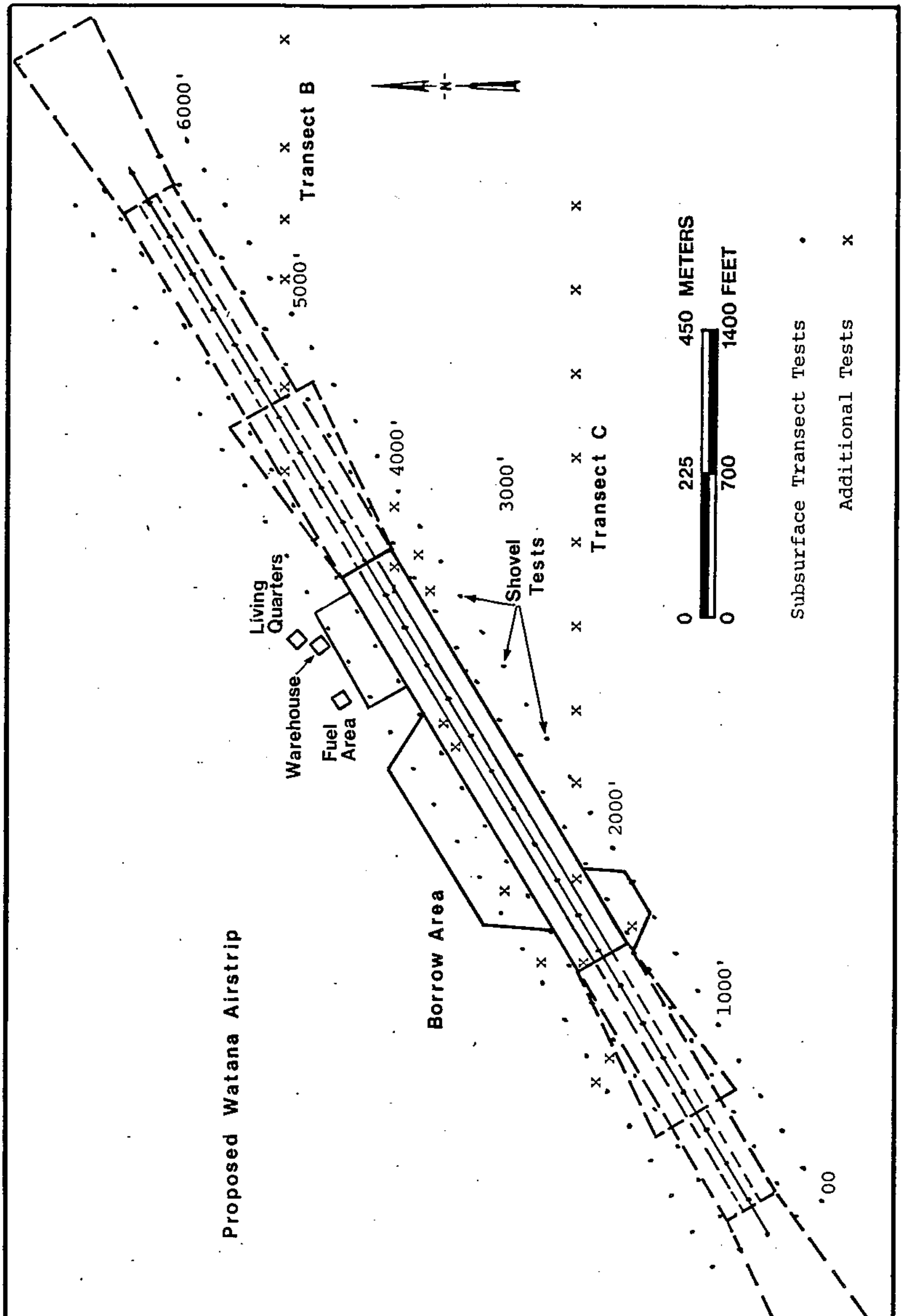


Figure 108. Surface reconnaissance and subsurface testing at the proposed Watana airstrip.

4 - SYSTEMATIC TESTING DISCUSSION AND EVALUATION

4.1 - Introduction

In addition to reconnaissance level testing, systematic testing was implemented as part of the cultural resource studies program in order to collect sufficient data to address site significance and impact in order to develop mitigation measures and a general mitigation plan. In addition to this function, systematic testing was important in terms of generating information that is essential to estimating the cost of mitigating adverse effect to sites, should this become necessary. Without systematic testing it would be difficult, based on reconnaissance level data only, to evaluate the significance of most sites or estimate the cost of mitigation.

(a) Selection of Sites for Systematic Testing

Due to the large project area, number of sites located (115), available field time, and fiscal constraints, it was possible to systematically test only 18 of the 115 sites investigated. Because of the poor knowledge regarding the culture history of south central Alaska and the Susitna River region in particular, the primary objective of systematic testing was to define the cultural chronological sequence for this portion of Alaska and establish time stratigraphic markers for the project. Not only is this the first essential objective of archeology, but it efficiently and cost effectively provides a broad data base applicable to evaluating sites not subject to systematic testing. This is essential for assessing significance and formulating management recommendations within the temporal and fiscal limitations of the project.

The data obtained from reconnaissance survey and testing enabled the delineation of archeological sites which best held potential for delineating the cultural chronological sequence for the Upper Susitna

River area. The recognition and subsequent definition of three distinct tephra during field studies provided objective criteria by which the relative age of archeological components could be ordered. Although approximately half of the 115 sites failed to yield evidence of tephra during reconnaissance testing (four were historic cabins and the rest were surface sites), the remaining half contained tephra and held potential for defining a relative cultural chronology. The objective was to optimize field resources to produce the most data from the sites that could be tested.

Multicomponent sites (those containing more than one period of occupation) yield more data per excavation unit relevant to defining cultural chronology than do single component sites. Additionally, through recognition of cultural components in relation to the tephra, it was possible to develop a matrix for the sites depicting the location of cultural components in relation to the tephra. While the criteria for selecting sites for systematic testing are basic, the actual implementation was somewhat complex. For example, many sites did not contain all three tephra and consequently the only stratigraphic criterion which could be implemented was that of a maximum or minimum limiting age, i.e., older than or younger than the specific tephra. The relative chronological placement of a cultural component from a site of this nature is not as precise as that of a cultural component "sandwiched" between two tephra. Although the stratigraphic relationship of cultural components to the three tephra was used to select sites for systematic testing, several other factors were also incorporated into the selection process. These were: 1) preference was given to sites anticipated to be directly or indirectly impacted by the project, 2) preference was sometimes given to sites with preserved faunal remains, 3) the potential of a particular site to yield organics suitable for radiometric dating, and 4) ecological settings which might provide a broad array of information pertinent to understanding prehistoric subsistance patterns. The sites were prioritized based on the above criteria, and during the 1981 field season it was possible to systematically test 18 sites. The sites systematically tested are discussed in section 4.2.

(b) Mapping and Gridding Systematically Tested Sites

Prior to systematic testing, a mapping crew established horizontal and vertical site datums, topographically mapped each site and superimposed a horizontal grid on each site. To facilitate recording data, the datum was located, when possible, so that the entire site area would fall north and east of the datum point. A 12-inch spike was placed at the datum location with an aluminum tag containing site information including the state AHRS number, the date and "University of Alaska Museum". Two methods were used to establish a site datum elevation. Where it was possible to tie the datum into the elevation of the Susitna River, the datum elevation was determined by its elevation above the Susitna at the closest point of the river to the site. If this was not practical due to the distance from, or elevation above, the river, half the elevation between the contour line above and below the site was added to the lower contour elevation and this elevation used to establish elevation.

A Sokkisha BT 20 transit, 50 m tape and metric stadia rod were used to establish a base line oriented to conform to local site topography in an effort to facilitate excavation. The northern end of this baseline was established as "Grid North"; all subsequent horizontal measurements referenced to grid north. A survey notebook was kept by the mapping crew with all mapping information which included magnetic declination, angles between grid north and true north, and triangulation data necessary to relocate datums in the event of disturbance. Wherever topographic considerations allowed, True North was used as Grid North, however in most cases this was not possible.

Working from the baseline, the mapping crew used the transit and tape to establish a site grid, placing wooden stakes at 5 m or 10 m intervals. An east west project baseline was established along a line at right angles to the baseline at the datum location. At larger sites additional east west placed lines at right angles to the baseline were established. All stakes were placed directly at intersecting points of the grid system with the exception of a stake to insure relocation of site datum which was offset 10 cm from the datum spike. Grid coordinates north and east of datum were written on all wooden stakes and elevations in relation to datum recorded for the top of the stake and the ground elevation at the stake location. Additional elevation measurements off the grid were recorded using a stadia rod so that a topographic map with 50 cm or 1 m contour intervals could be drawn.

The mapping crew provided the systematic testing crew with a topographic map of the site vicinity, a grid layout diagram and elevation of all stakes prior to testing of the site. Placement of test squares was determined by the crew leader in charge in consultation with the project supervisor and principal investigator and was based on the results of preliminary reconnaissance testing, site topography, surface cultural and noncultural features, and additional shovel testing. Coordinates of test squares located off the initial grid system were determined by triangulation from the nearest two grid stakes. Individual test square elevations were established from the closest grid stake elevation by use of a string and line level. After completion of systematic testing, all reconnaissance level test pits, systematic test squares, and shovel test locations were recorded on the site map.

(c) Systematic Testing

After the site was mapped and gridded a three-person crew began systematic testing. Frequently systematic testing was initiated adjacent to the test which produced cultural material during reconnaissance level testing. Subsequent 1 m squares were laid out to assist in determining the spacial extent of the site and to collect information for evaluating and dating the site. Systematic testing was designed to efficiently collect enough data with which to address site significance. Weighted against this consideration was the question of how much testing is necessary to adequately address this problem. An attempt was made to excavate the minimum number of tests needed to address this problem.

The average number of tests placed on a site was four. However, in a few cases, additional tests were necessary because of the low frequency, or in some cases the lack of, cultural material in the initial tests.

Excavation of 1 m squares was conducted by natural stratigraphic levels when possible. However, in a few cases soil stratigraphy was not conducive to this method and excavation by arbitrary levels was employed. Careful attention was paid to the identification of tephras in relation to cultural remains because their relationship provided relative dating and intersite correlation. Test squares were excavated with trowels and all dirt was screened through ¼-inch screen unless the soil was too wet, in which case it was examined by hand. Artifacts were measured from the south and east walls of each test and vertical measurements were made with string and line level tied to the square datum. When possible, tephra samples and organic material for C14 dating were collected. C14 samples were wrapped in two layers of alluminum foil, placed in plastic bags, and oven dried at the University Museum's archeology lab as soon as possible.

Soil profiles for test squares, that produced cultural material were drawn. Soil colors were determined using a Munsell color chart on dry samples. Composite soil profiles were also drawn summarizing soil stratigraphy at the site. Composite soil profiles are included with each individual systematic test report. All artifacts collected were cataloged and accessioned into the University of Alaska Museum. All test squares were backfilled upon completion of testing, and each site was restored as much as possible to the condition in which it was originally found.

(d) Soil Profiles

During systematic testing, soil profiles were drawn to scale for all four walls of 1 m test squares which produced cultural material. These profiles are on file at the University of Alaska Museum. For the purpose of this report, however, only a single composite soil profile is included for each site, or site locus, systematically tested. The composite soil profile is schematic and does not necessarily represent any individual test square at the site. Its intent is to graphically represent the sequence of all soil/sediment units which occur at the site because individual tests often do not contain the full range of soil units at a given site.

No standard technique for drawing a composite soil profile was used because test pit placement and soil deposition at each site varied considerably. The method most often utilized to abstract individual test square soil profiles into a composite site profile was to draw a diagram correlating profiles from all individual test squares. This was usually done by selecting the profile from each test square which revealed the greatest number of distinct soil units, which were drawn to scale with similar sections from profiles of all other test squares. Correlations of soil units between test squares were then matched and a composite site profile drawn by determining the average thickness of each soil unit which occurred at the site and drawing all soil units in their correct stratigraphic sequence.

The thickness of soil units sometimes varies greatly even between adjacent squares, as does occasionally the presence or absence of specific soil units. The composite soil profile is a generalized profile. Elevation above or below datum and provenience of artifacts from individual test squares cannot be directly correlated with the composite site profiles. However, in a broad sense, associated soil unit and contact between soil units are accurate for each site.

(e) Tephra Units

Three distinct tephra have been identified in the study area. These units were given regional names for purposes of field identification and nomenclature. The names given the tephra in order of increasing age are as follows: Devil (1800-2300 B.P., A.D. 150-350 B.C.), Watana (2300-3200 B.P., 350 B.C.-1250 B.C.) and Oshetna (greater than 4700 B.P., 2750 B.C. and possibly as old as 5000-7000 B.P., 3050 B.C.-5050 B.C.). These ash falls have not yet been correlated to tephra from other regions known to date to the last 7000 years. Munsell color designations were used to describe tephra color. Whenever possible color matching was done using dry samples. For a more detailed discussion of tephra see Chapter 5.

The relationship of cultural components to the tephra are indicated in Chapter 7. The relationship of cultural components to tephra at sites receiving only reconnaissance level testing is preliminary while correlations at systematically tested sites are more precise. Approximately one-half of the sites found have cultural components that can be stratigraphically correlated to one or more tephra. This relative dating method provides a unique opportunity to formulate the first cultural chronology in this region of Alaska; a region which is critical to interpreting the prehistory of the adjacent regions of interior Alaska and Cook Inlet.

4.2 - Systematic Testing 1981

(a) Systematic Testing TLM 018--Corps Trailer Site

Location: See section 3.2 (a-iv).

Testing: Three 1 m test squares were excavated at the site. In addition, surface material was systematically collected in 1 m square units (Figure 109).

Discussion:

The surface of the site can be categorized into two types: vegetated and non-vegetated. The distribution of the surface artifacts tends to correspond to the non-vegetated actively deflating portion of the knoll (Figure 109). This distribution of surface specimens may be somewhat spurious because in certain squares (e.g., N100/E97) it was found that the surface material extended into shallow subsurface areas immediately below the lichen cover.

Three tephra units were present at the site, but only the most recent tephra (Devil) was well defined. The middle (Watana) and lower (Oshetna) tephras were discontinuous with the drift (Figure 110, Table 6). Erosional surfaces in test square N98/E104 indicate that the O-A horizons and most recent tephra (Devil) lie unconformably on drift in the eastern parts of the site indicating erosion during pre-Devil times. In test square N95/E94 the upper three soil units were intact but the lower stratigraphy consisted of drift intermixed with tephra (units 4 and 5, Figure 110). The preservation of the three tephra near the modern erosional area may be the result of stabalizing vegetation and conversely, this suggests that the northern area was vegetated and consequently more stable in the past, which may explain the better preservation of tephra units in this portion of the site.

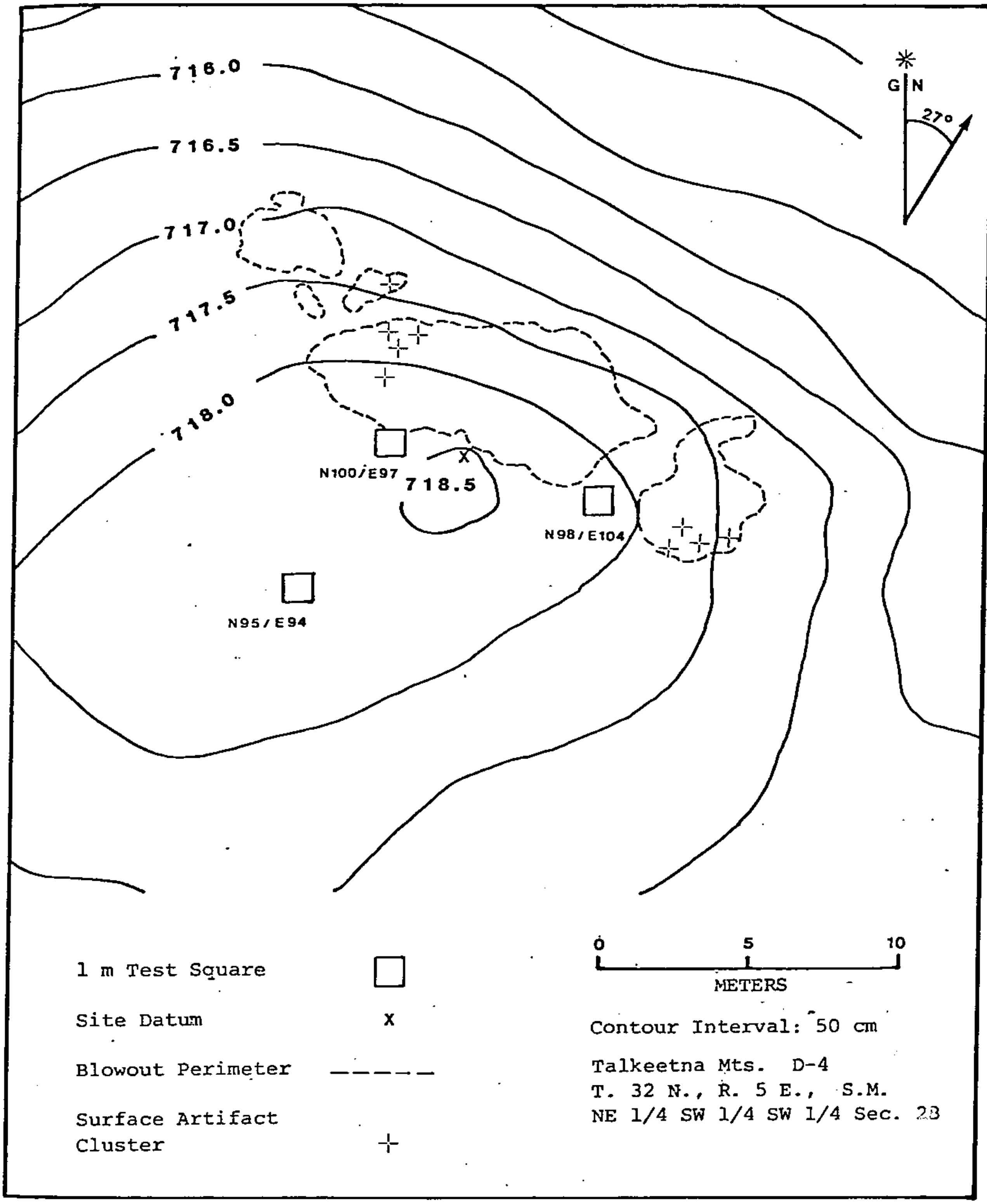


Figure 109. Site Map TLM 018.

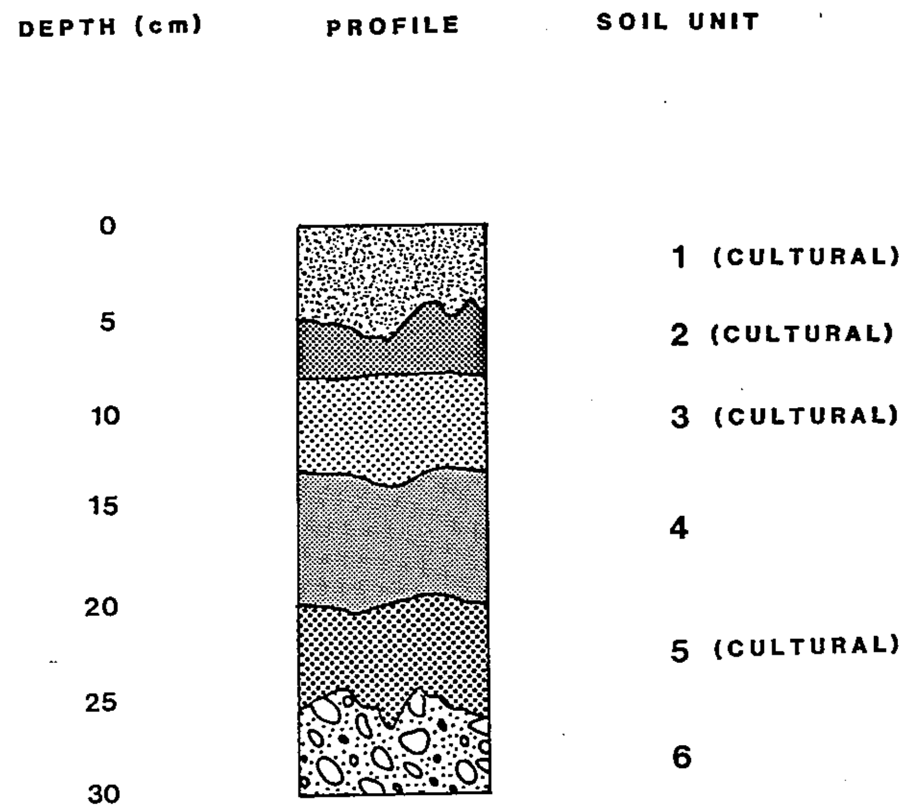


Figure 110. Composite Soil Profile TLM 018.

TABLE 6

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 018

Soil Unit	Description
1	Organic zone, mat of variable thickness moss, lichen, heaths
2	Finely sorted organics with many rootlets, lower contact clear and irregular, upper contact gradational
3	Tephra (Devil); discontinuous across site (eroded out to east), generally sharp and irregular upper and lower contacts
4	Tephra (Watana); discontinuous in east part of site, variable in thickness, well sorted, oxidized layer not found exclusively in upper part of unit but rather are random oxidized zones throughout giving a patchy appearance, lower contact sharp to gradational, upper contact sharp
5	Mixed tephra (Oshetna) and draft; poorly sorted with tephra, silt and sand and pebbles; irregular and discontinuous unit, undulating contacts that vary from clear to gradational
6	Oxidized sand pebbles and granules, poorly sorted, oxidized, maximum pebble size c 12 cm

A cautionary note must be interjected concerning the distribution of surface artifacts. The vegetational cover at the site varies from a thin layer of lichen--decomposed organic material (found in and surrounding the blowout area) to a thick, more well developed, O-A horizon (in the shrub area south and west of the blowout). The patchy distribution of this lichen cover appears to obscure some of the surface artifacts. For example, in surface collection unit N100/E97 the surface material extended under the lichen--organic cover. It is possible that this vegetation mat is covering what have been recorded as surface artifacts in other areas, especially in the eastern portion of the site.

Although the soil units present what appears to be the common stratigraphy for this area (i.e., O-A, Devil, Watana, Oshetna, Drift) this knoll has undergone a more complicated depositional-erosional history than the single composite soil profile (Figure 110) would indicate. Because of this, it is difficult to discuss the number and location of archeological components in the site and the stratigraphic relationship of surface to subsurface artifacts. It is likely, however, that a broad differentiation can be made between an upper "component" (soil units 1-3, Figure 110) post Devil tephra and a lower "component" (soil units 4-6, Figure 110) pre-Devil tephra. The two "components" are separated by the Devil tephra which is dated to between 2300 and 1800 years B.P. (unit 3, Figure 110).

Although approximately 2000 artifacts were collected during systematic testing, the interpretation of the archeological material and nature of the site remains questionable. Cultural material can be summarized, however, because of the dominance of a single artifact type (flake) and two distinct lithologies (basalt and chert) (Table 7).

The nature of the stratigraphy at the site makes it difficult to discuss in any great detail or with any certainty the delineation of specific surface artifactual deposition, i.e., number and nature of archeological components, the stratigraphic relationship of subsurface to surface artifacts, and the relationship of the various artifacts to time.

TABLE 7

ARTIFACT SUMMARY, TLM 018

Artifact	Subsurface	Surface	Site Total
Flakes, chert	12	1061	1073
Flakes, basalt	503	330	833
Flakes, red-brown chert	43	0	43
Flakes, other chert	7	16	23
Flakes, rhyolite	0	2	2
Flakes, unknown material	0	1	1
Blade-like flake, chert	1	0	1
Flakes, obsidian	3	0	3
Core fragment (?), obsidian	1	0	1
Flake core, chert	0	1	1
Tci-tho	0	1	1
Biface fragments, basalt	2	0	2
TOTAL	570	1414	1984

Artifacts were found in association with both upper and lower contacts of soil unit 5 (Figure 110). Given the degree of turbation in the lower stratigraphy at this site, it is premature to discuss or define an upper and lower "component" associated with the lowermost tephra (Oshetna). A simalar argument can be made for artifacts found in association with soil units 1 through 3 (Figure 110). Although stratigraphic control is better in these units, the differentiation of two "components" may also be premature, based on current data, although it is suggested.

The northwest quadrant of the site contained the greatest amount of surface material. Basalt and chert were the dominant lithologic types present in the surface collection. Basalt artifacts were found primarily in the southeastern quadrant of the site, while weathered chert was primarily limited to the northwestern quadrant of the site. The surface collection, with the exception of one boulder-chip scraper and one flake core, was comprised totally of flakes.

The subsurface artifacts, found in two of the three test squares (N98/E104 and N100/E97) consisted almost exclusively of flakes made from basalt, weathered chert, and obsidian. A single blade-like flake and a possible fragment of an obsidian flake core are the only subsurface artifacts that have not been categorized as flakes.

Surface material from an area of approximately 100 m^2 was collected in 1 m x 1 m units. Initial observations made by Bacon (1978) concerning a differential surface distribution of chert and basalt artifacts were varified by distributional maps made from the 1981 collection. A total of 1414 specimens were recorded with the greatest number being located in the northwest quadrant of the site. Basalt flakes were found primarily in the southwestern quadrant of the site, while weathered chert flakes were recovered primarily from surface units in the northwestern site quadrant. The surface collection, with the exception of a boulder-chip scraper and a flake core of weathered chert, is composed totally of flakes.

A total of 570 subsurface artifacts were found in two of the three 1 m test squares (N98/E104 and N100/E97) excavated at the site (Table 8). No diagnostic artifacts were found, and, like the surface collection, the subsurface materials were predominantly flakes. A single piece of obsidian found in test square N100/E97, may be part of a core fragment and represents the only non-flake artifact collected during systematic testing.

Evaluation:

The site is situated on a glacial kame which has a panoramic view to the north. The environmental position of the site suggests that it may have served as a lookout from which hunters waited for the appearance of large mammals to the north. The northern view may suggest human use of the site during the fall when migrating caribou are most likely to be approaching the site from that direction. Preliminary testing strongly suggests that this site may have served this function during at least two times during the past; sometime prior to and after the interval of Devil tephra deposition (probably sometime about ca. 1800-2300 B.P.). The lithologic composition of the debetage tends to support this hypothesis because weathered chert dominates the surface collection while basalt is the major rock type associated with the subsurface assemblage. Obsidian also occurs only in a subsurface context.

The collection consists almost entirely of waste flakes which suggests that hunters were actively engaged in the manufacture of tools and weapons, possibly in anticipation of the fall caribou migration. The boulder spall scraper found in the subsurface test may suggest that the locale may have served as a brief camp, and the sheer quantity of detrital material may also support this hypothesis. While the results of the systematic testing are not conclusive, they do imply: 1) the site was occupied on at least two occasions, once prior to and once after the Devil ash fall, (2) that the site may have been occupied during the fall, and 3) that the duration of the occupation(s) may have been for several days. Further systematic testing is warranted at this

TABLE 8

ARTIFACT SUMMARY BY SOIL UNIT AND TEST SQUARE, TLM 018

Soil Unit	Test Square N98/E104	N100/E97	N95/E94
1 and 2		3 flakes, chert	
Total	0	3	0
2 and 3 contact	437 flakes, basalt 1 flake, chert 1 flake, gray chert		
Total	439	0	0
5 (either within or contacts with 4 or 6)	19 flakes, basalt 3 flakes, obsidian 1 flake, brown chert 1 flake, gray chert	47 flakes, basalt 1 core fragment (?), obsidian 3 flakes, dark chert 1 flake, dark chert 8 flakes, chert 1 blade-like flake, chert 43 flakes, red-brown chert	
Total	24	107	0

site in an effort to address these problems and assess placement of this site in the larger framework of the cultural chronology and prehistoric human use of the Upper Susitna River region.

(b) Systematic Testing TLM 022 - Tsusena Creek Site

Location: See section 3.3 (a-i).

Testing: Five 1 m test squares and five shovel tests were excavated during systematic testing (Figure 111).

Discussion:

Testing at TLM 022 produced fire cracked rock and faunal material. No lithic material other than fire cracked rock was recovered in the 1 m test squares or in the shovel tests. Testing suggests that the site contains two, and possibly three, components, all of which are represented by hearth features and/or faunal material found in association with soil units 1, 4 and 6 (Figure 112, Table 9). No cultural material was recovered from any of the shovel tests.

Test 1 and shovel test 4, excavated in 1980 (Figure 111), revealed faunal remains and fire cracked rock in two areas of the site. During systematic testing in 1981, two 1 m test squares were placed near the 1980 test 1, and shovel test 4 (N101/E94 and N103/E93 respectively) in order to define the site. A slight depression located approximately 8 m north of the Susitna River was proposed in 1980 as a potential house pit. Test square N104/E99 was excavated in the center of the "depression" with negative results. It appears that the depression is natural in origin. When N101/E94 uncovered a hearth feature, test square N100/E96 and N104/E95 were excavated to determine the extent of the cultural material (faunal material and fire cracked rock) noted in N101/E94.

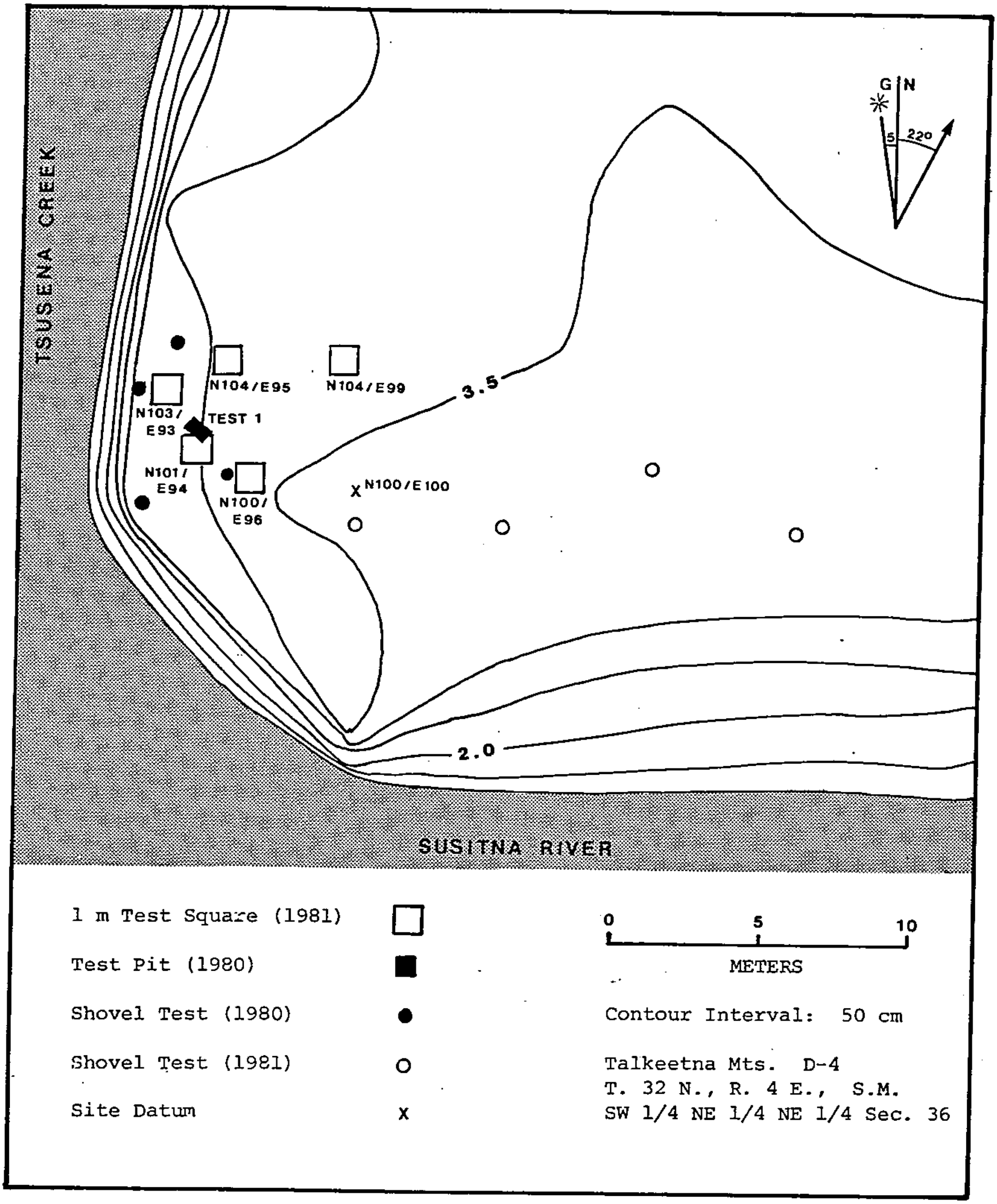


Figure 111. Site Map TLM 022.

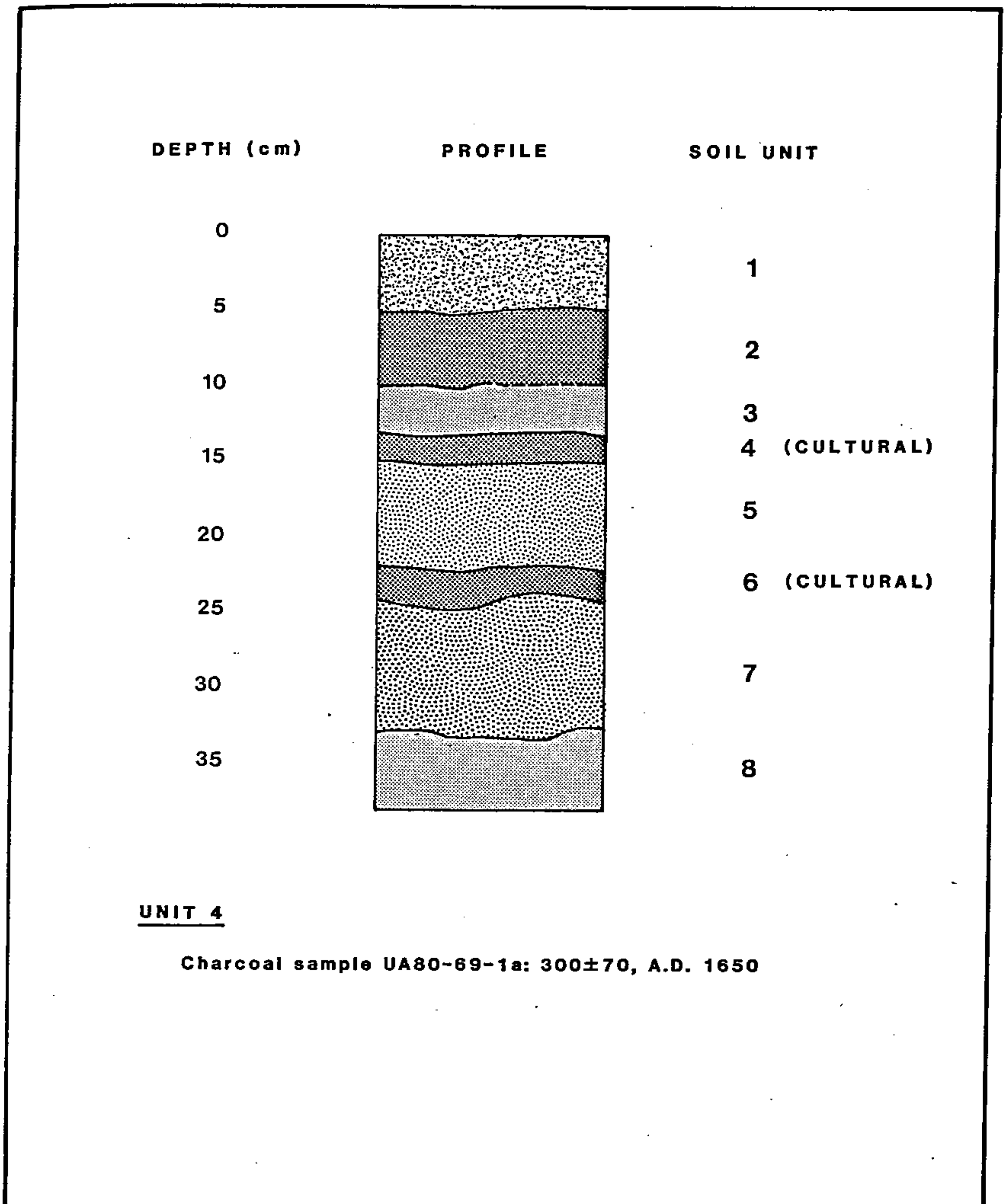


Figure 112. Composite Soil Profile TLM 022.

TABLE 9

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 022

Soil Unit	Description
1	Duff; variable in thickness, O horizon (cultural material)
2	Finely divided organic matter (10 YR 2/2 very dark brown); sharp upper contact, at times with gradational lower boundary; A horizon
3	Silt to sandy silt (10 YR 4/2 to 2.5 Y 6/Z dark grayish brown to light brownish gray); generally sharp contacts but variable in thickness; leached zone E horizon
4	Finely divided organic matter (7.5 YR 3/Z dark brown); thin layer with greasy feel; continuous across site with clear upper and lower boundaries; A horizon (cultural material)
5	Intermixed sand and silt (10 YR 5/6 to 7.5 YR 4/4 yellowish brown to brown); horizon that is generally found as mixed sand/silt stratum, however at times the two sediment types appear as distinct lens; continuous across site; fluvial deposit
6	Finely divided organic matter (10 YR 2/1 very dark brown); thin layer with greasy feel; generally sharp contacts; continuous across site; A horizon (cultural material)

TABLE 9 (Continued)

Soil Unit	Description
7	Sand (10 YR 6/4 yellowish brown); medium grain size; well sorted; sharp contacts; continuous deposit except where truncated by cultural features; fluvial deposit
8	Silt (10 YR 5/3 brown); well sorted to moderately well sorted with inclusion of medium grained sand; sharp contacts; continuous across site; fluvial deposit

Note: 11 more soil units were defined in test square N103/E92. These represent 5 larger units of sandy silt capped by a buried A horizon. These units are not described here for two reasons: no cultural material was associated with these soil units and only 1 test square was excavated to this depth.

A single test square (N103/E93) was excavated down to the cobble level as an extended test to delineate the stratigraphy for the site area and to see if there was any cultural material associated with the buried A horizons noted in other test squares.

Stratigraphy at the site is characterized by alternating sequences of sand-silt-organic horizons. A total of 21 soil units were defined, however, only eight are of interest in terms of the cultural material (Figure 112). The bulk of the stratigraphic section is fluvial in origin (sand and silt) with buried A horizons interspersed between the fluvial sediments (Table 9), a situation not unexpected given the location of the site at the confluence of Tsusena Creek and the Susitna River. The general sequence of soil and sediment units was fairly uniform from test square to test square. Variability did exist, however, in the thickness of each unit and the coloration of some of the units. The cultural material is associated with three A horizons (soil units 3, 4, and 6), horizons that are stratigraphically separated from each other by sand or silt. Features 1A and 1B are associated with the contact between soil units 3 and 4, as is feature 2. Features 3, 4, and 5 are associated with soil unit 6 (Figure 112).

Fire cracked rock (62 pieces) and faunal material (487 fragments) were the only cultural material recovered (Table 10). Two components, both probably recent, are suggested by a modern radiocarbon date on charcoal collected during reconnaissance testing in 1980 (DIC 1878) and another radiocarbon date of 300 ± 70 years: A.D. 1650 (DIC 2252) on charcoal collected during systematic testing in 1981. Both components are represented by hearth features and/or faunal material found in soil units 4 and 5 (Figure 112). A possible third component, associated with soil unit 1, may be present but further testing is needed to confirm its existence.

Faunal material was recovered in three of the five 1 m test squares--N101/E94, N100/E96 and N103/E93 (Table 11) and fire cracked rock was

TABLE 10

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 022

Test Square	Maximum Depth Excavation*	Cultural Material	Comments
N101/E94	50	404 unidentifiable bone fragments 2 phalanges 36 fire cracked rocks	All cultural material in N100/E94 was associated with either Feature 1A or 1B (soil units 4 and 6 respectively).
N103/E92	70	9 unidentifiable bone fragments 10 fire cracked rocks 8 fractured rocks	The bone fragments and fire cracked rocks were associated with Feature 2 (soil unit 3 and 4). The fractured rock, arranged in a semicircle, was not collected. It was unclear whether the fracturing was frost cracking or fire cracking. These rocks (Feature 3) were associated with soil unit 6.
N100/E96	55	1 mandible fragment 1 rib 3 phalanges 7 unidentifiable bone fragments 8 fire cracked rocks	The faunal material was found in soil units 1 and 2 while the fire cracked rock was associated with Feature 4, soil unit 6.
N104/E95	40	3 fire cracked rocks	The fire cracked rocks were associated with soil unit 6. They did not appear to be part of a hearth.
N104/E99	20	Sterile	

*cm below square datum

recovered from four of the five tests--N101/E94, N100/E96, N103/E93 and N104/E95 (Figure 111). Species identified from the faunal material include caribou (Rangifer tarandus), Arctic ground squirrel (Citellus parryi) and possibly moose (Alces alces) (Table 11). Test square N104/E99 was the only square that did not contain cultural material. This, however, may be a function of the limited excavation in this square. Heavy rains and thawed frost flooded the square and prevented excavation beyond soil unit 3.

Features 1A and 1B, consisted of 36 thermally altered rocks and pebbles which were scattered through test square N101/E94. It became apparent that two hearths were present when the southern and western walls were seen in cross section. Because of the closeness of the two hearths, it is difficult to distinguish which rocks belong to which hearth. However, it is clear that the two hearths are superimposed but stratigraphically distinct as indicated in the south wall of the test.

The combined hearth area extends beyond the N101/E94 in all directions. The hearth depression from feature 1A is approximately 12 cm at its deepest point while feature 1B is approximately 10 cm deep at its deepest point. Both hearths seem to be linear, i.e., longer than wide, but more complete excavation is needed to define their exact configuration. As previously mentioned, both hearths are associated with the contact of units 3 and 4 (Figure 112). A radiocarbon date on charcoal from hearth 1B produced a date of 300 ± 70 years: A.D. 1650 (DIC 2252). Feature 1A, being stratigraphically above 1B, would therefore be more recent.

Feature 2 contained seven fire cracked rocks ringing a slight depression that intersected the western wall of N103/E93. This feature is associated with soil unit 4 (Figure 112). It extends approximately 60 cm from north to south and approximately 25 cm out from the western wall. No bones or artifacts were found in direct association with this feature. It is possible that three bone fragments found between soil

TABLE 11

FAUNAL MATERIAL, TLM 022

Soil Unit	Description
	N101/E94
Contact 3 and 4 associated with hearth features 1A and 1B	574 long bone fragments, calcined, medium-large mammal 1 mandible fragment, calcined, Arctic ground squirrel (*Citellus parryi*) 1 tooth fragment, unburned, large mammal 3 phalanx fragments, 3rd, calcined, moose (*Alces alces*) or caribou (*Rangifer tarandus*)
	N100/E96
Contact 1 and 2	1 mandible fragment, unburned, caribou (*Rangifer tarandus*) 2 long bone fragments, unburned, medium-large mammal
	N103/E92
Contact 3 and 4	7 long bone fragments, unburned, medium-large mammal 4 long bone fragments, heavily burned, medium-large mammal
	N104/E96
1	1 phalanx fragment, 3rd, unburned, large mammal 2 phalanx fragments, 3rd, unburned, moose (*Alces alces*) or caribou (*Rangifer tarandus*) 1 phalanx fragment, unburned, moose (*Alces alces*) or caribou (*Rangifer tarandus*) 1 flat bone fragment, unburned, medium-large mammal

units 3 and 4 are part of the cultural horizon. Two additional fire cracked rocks were uncovered at the bottom of feature 2.

Feature 3 is located in soil unit 6 and contained a group of rounded cobbles in the southwest quadrant of test square N103/E93. These rocks did not appear to be altered by thermal processes and no cultural material was found in association with the feature. It is possible that this rock configuration is the result of natural and not cultural processes.

Feature 4 is a hearth-like feature and was found in soil unit 6 of test square N100/E96 stratigraphically below a charred log. A total of eight pieces of fire cracked rock or burned rock were found in the square and were located primarily in the northwest quadrant. A large depression (ca. 70 cm deep) covers the eastern section of the square. It intersects the north, south, and east walls so that the full extent of this feature is unknown.

Although no bone or artifactual material was found in this stratigraphic level, it appears that this large depression is cultural in origin. The strata are truncated, as seen in the soil profile, and the sand unit that the rocks intersect is absent from both the large depression and also from a smaller depression located in the southwest quadrant. The soil profile of the east wall shows a sharp boundary between the depression and a disturbed sand/silt area. A charcoal lens and a wood-rich stratum parallel the lines of this boundary. These strata are capped by a well developed, more recent soil. The smaller depression that intersects the south wall is less clearly of cultural origin.

Wood, both charred and rotten, commonly occurs through the test area. Test square N104/E99 and N100/E96 showed the greatest density of wood. It is difficult, with the limited testing of the site, to differentiate between natural deadfall and wood that may have been utilized in construction, hearths, etc. In test square N104/E99, for example, it seems likely that the wood represents natural deadfall. Recent deadfall and deadfall in various states of decomposition are clearly visible over most of the site.

In test square N100/E96, almost the entire square was covered by charred logs. Feature 4 was found immediately below these logs. Associated with feature 4 was another log (rotten, not charred) that lay in an east-west direction at an angle to the other logs which were oriented northeast-southwest. Unlike the wood in N104/E99, no branches were apparent on these charred logs.

A possible third component is represented at the site by faunal debris found in soil units 1 and 2 of test square N100/E96 (Table 11). This material was more complete and better preserved than other bones found at the site. Its major association is with rotten wood found in the O horizon. Some pieces were found at the O-A contact (Table 11).

Evaluation:

Two, and possibly three, periods of cultural occupation have been documented at this site, and several loci and possible cultural features have been noted. The Devil tephra was not encountered in the test excavations and this further supports the radiocarbon determinations which suggest the site was occupied several times, possibly slightly before and after ca. 1500 A.D. The lack of trade goods may suggest that the occupations of the site occurred during pre-contact times, either before trade goods had been introduced or before they were very abundant. This could however, be a spurious result of the small sample.

The site is situated in the sheltered forested valley bottom at the junction of the Susitna River and Tsusena Creek. Based on its physical setting and the occurrance of hearths and possibly other features, this site appears to represent a favored campsite which was reoccupied several times. The hearths appear to be linear features characterized by firecracked rock, probably used for stone boiling, and caribou bone. This type of feature is commonly associated with Athapaskan sites in the Alaskan interior, and this pattern suggests that the site documents late prehistoric Athapaskan occupation of the region, probably spanning the period between approximately 1500 A.D. and 1800 A.D.

The relatively rapid rate of soil deposition and the preservation of organic remains indicate that this site will prove to be a key site in defining the cultural chronology and elucidating the activities associated with this type of site spanning this interval in the Upper Susitna Valley. It is quite probable that additional periods of occupation will be discovered at this site and that it will provide tight chronological control for this period of cultural development. Additionally, the preservation of organic material at the site presents the possibility that tools made of bone and antler may be recovered. Any such discoveries would be significant because the organic component of the Athapaskan tool kit during this period is poorly documented and understood.

(c) Systematic Testing TLM 027--Tuff Creek North Site

Location: See section 3.3 (a-iii)

Testing: Three 1 m test squares were excavated at the site (Figure 113).

Discussion:

All three 1 m test squares produced cultural material and 6 soil units were identified (Figure 114, Table 12). A total of 482 artifacts were recovered during systematic testing. Three components associated with three tephra units are represented at the site. The upper component was found in only one test square and was represented by three artifacts.

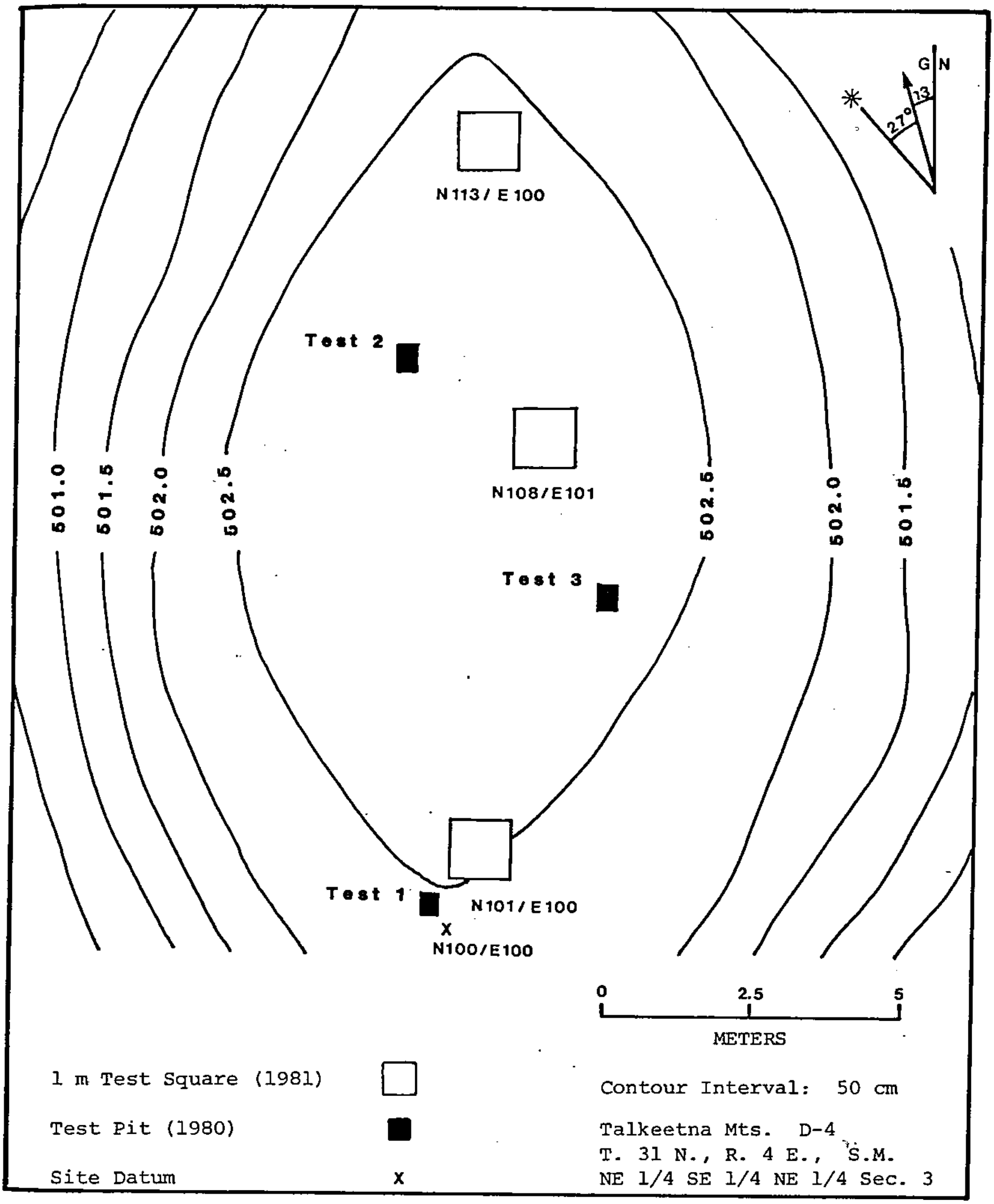
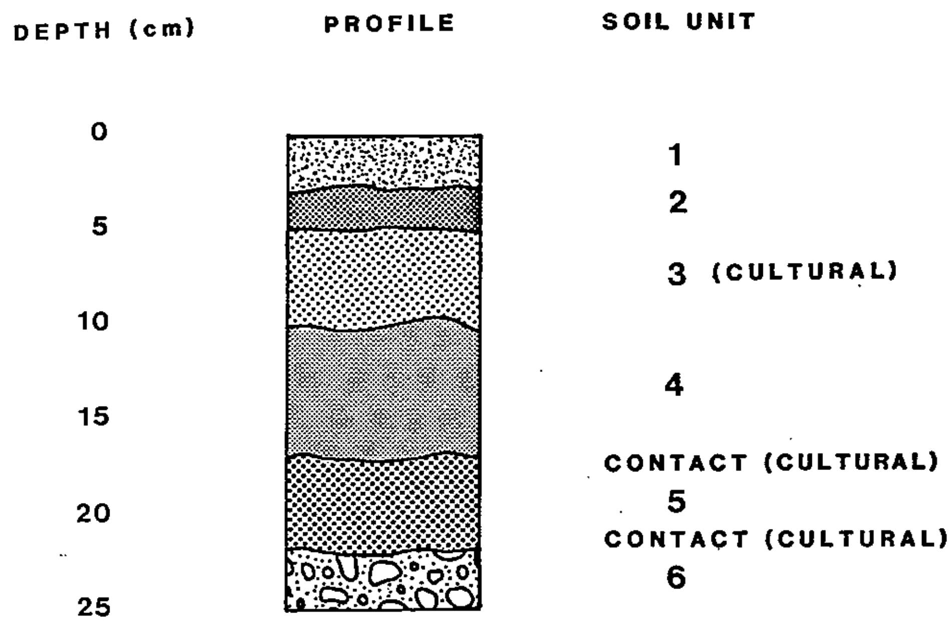


Figure 113. Site Map TLM 027.



UNIT 2/3 CONTACT

Charcoal sample UA81-243-2: 1800 ± 55, A.D. 150

Charcoal sample UA81-243-3: 140 ± 45, A.D. 1810

UNIT 4/5 CONTACT

Charcoal sample UA81-243-490: 3210 ± 80, 1260 B.C.

Figure 114. Composite Soil Profile TLM 027.

TABLE 12

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 027

Soil Unit	Description
1	Organic layer; roots, moss, lichen and decomposed plant fragments; continuous across site though variable in thickness.
2	Very finely divided organics mixed with silt (5YR 2.5/2 dark reddish brown); variable in thickness and continuity; both gradational and sharp contacts with unit 3.
3	A horizon/tephra (Devil); variable in color depending on degree of alteration (unaltered tephra 7.5 YR 7/2 pinkish gray; altered tephra 2.5 Y 6/2 light brownish gray); sharp lower boundary; thickness variable throughout site.
4	Tephra (Watana); variable in color depending on degree of oxidation; upper subzone (5 YR 3/4 dark reddish brown) highly oxidized with sand-sized concretions, forms sharp upper contact with unit 3; highly oxidized zone grades into less oxidized zone (7.5 YR 4/6 strong brown) that in turn grades into unaltered tephra (10 YR 6/6 brownish yellow). Unit 4 mixed with unit 5 in test squares N108/E101 and N113/E100 while in test square N101/E100 the contact between units 4 and 5 is sharp

TABLE 12 (Continued)

Soil Unit	Description
5	Tephra (Oshetna); variable in color upper portions are brownish gray (10 YR 5/3) that grade into a gray (10 YR 5/1) tephra; units 4 and 5 are separated by a thin charcoal layer in square N101/E100; unit 5 is continuous across site although in squares N108/E101 and N113/E100 is mixed with unit 4; pebbles and granules from unit 6 are mixed with unit 5 in these two test squares; in square N100/E101 the contact between 5 and 6 is sharp but wavy.
6	Intermixed sand, pebbles and granules (7.5 YR 5/8, strong brown, to 5 YR 4/6, yellowish red), in square N101/E100 sandy layer between unit 5 and underlying granules and pebbles.

Two lower components associated with two tephra units are also represented at the site. The two lower components can be distinguished by their characteristic lithologies (basalt and weathered chert) and apparent differences in lithic technology (bifacial vs. unifacial, respectively). The stratigraphic differentiation of these two components, both of which are located in the lowermost tephra unit, was clear only in test square N101/E100 where the soil units were minimally disturbed. The bifacial, basalt industry was discovered in association with an organic level located at the contact of soil units 4 and 5, while the weathered chert uniface industry was associated with the contact of units 5 and 6 (Figure 114).

The collection of artifacts from this site is summarized in Tables 13 and 14. Two features were delineated at the site, both of which contained weathered chert only and were characterized by large flakes, blades, and blade-like flakes. Because of the high degree of weathering on this material it is difficult to assess the extent of retouch or utilization of these artifacts.

Feature 1, located in the southeast corner of test square N101/E100 consisted of a flake scatter surrounding a rounded cobble. The largest flake was 10 cm long while the remaining flakes varied between 3-7 cm in length. Some retouch was apparent on four specimens (UA81-243-64, UA81-243-58, UA81-243-65, and UA81-243-63). A single blade (UA81-243-61), snapped at both ends, was associated with this flake scatter. These artifacts ringed a rounded cobble which appears to be the same, but unweathered, material as the flakes. There is little evidence of wear on the cobble or other indication of its use as a hammerstone or anvil. Its association with the cultural material and its presence in a soil unit devoid of other cobbles suggest its presence is a result of cultural and not natural activity.

Feature 2, located in the northeast quadrant of N108/E101, was comprised of 22 pieces of weathered chert (15 flakes, 5 blades, 1 core, and 1

TABLE 13

ARTIFACT SUMMARY BY TEST SQUARE AND BY SOIL UNIT, TLM 027

Soil Unit	Test Squares N101/E100	N113/E100	N108/E101
3 (Devil Tephra)	1 flake, chert 2 flakes, unknown material		
Total	3 artifacts	0	0
Contact of 4 and 5 (Watana and Oshetna tephra)	28 flakes, basalt 1 flake, basalt, with cortex	7 flakes, basalt	138 flakes, basalt 3 flakes, basalt, with cortex
Note: in test squares N113/E100 and N108/E101 this contact is not abrupt but mixed through solufluction	2 flakes, chert 1 biface, basalt 1 fragment, basalt 1 retouched flake, basalt	10 flakes, chert 12 flakes, weathered chert 11 flakes, unknown material	28 flakes, chert 1 biface, basalt 75 flakes, weathered chert

TABLE 13 (Continued)

Soil Unit	Test Squares N101/E100	N113/E100	N108/E101
			5 blade-like fragments, weathered chert 4 blade-like fragments (?), weathered chert 1 microblade, weathered chert 1 flake, obsidian
Total	34	49	256
5 (Oshetna) or contact of 5 and 6 (Oshetna-drift contact)	3 flakes, basalt 63 flakes weathered chert		23 flakes, basalt 1 flake, basalt with cortex 37 flakes, weathered chert 2 blade-like fragments, weathered chert 1 blade (?), weathered chert 4 microblades, weathered chert 2 uniface fragments, weathered chert

TABLE 13 (Continued)

Soil Unit	Test Squares N101/E100	N113/E100	N108/E101
			1 core, weathered chert 1 core tablet (?), weathered chert
	1 retouched flake, basalt 1 rounded cobble, unknown material		
Total	69	0	72

TABLE 14

ARTIFACT SUMMARY, TLM 027

199	basalt flakes
5	basalt flakes with cortex
2	bifaces, basalt
1	retouched flake, basalt
1	fragment, basalt
196	flakes, weathered chert
7	blades, weathered chert
5	blades ?, weathered chert
5	microblades, weathered chert
3	unifaces, weathered chert
1	core, weathered chert
1	core tablet (?), weathered chert
40	flakes, chert
1	flake, obsidian
12	flakes, unknown material
1	cobble

probable core tablet). Four of these artifacts (UA81-243-232, UA81-243-234, UA81-243-239 and UA81-243-231) showed questionable signs of use. Also present was a polyhedral blade core. The core is blocky in appearance with the platform preparation apparently limited to the immediate area of blade removal. Artifact UA81-243-230 is either part of a core tablet or a large rejuvenation flake struck off the faceted end of a core. If it is a core tablet, the distal end shows a retouched platform area similar to that seen in UA81-243-229. If it is a rejuvenation of the faceted edge (or an aborted attempt to remove a blade) it indicates that flakes and blades were removed from several directions.

The spacial distribution of the artifacts indicates that most of the knoll top probably contains both weathered chert and basalt artifacts while the most recent component is more sporadic in horizontal distribution. The stratigraphy appears more disturbed from grid north to grid south.

Three radiocarbon determinations on charcoal are available from this site. Sample UA81-243-3, collected from directly above the upper tephra (Devil) produced a date of 140 ± 45 years: A.D. 1850 (DIC-2244). Another sample from the contact of units 2 and 3 (Figure 114) yielded a date of 1800 ± 55 years: A.D. 150 (DIC-2284). These two dates suggest that the upper component at the site is older than 1800 years. A third radiocarbon date collected from the contact of the middle (Watana) and lower (Oshetna) tephras (units 4 and 5, Figure 114) produced a date of 3210 ± 80 years: 1260 B.C. (DIC-2286) suggesting that the component, which is actually below the lower tephra, which is actually older than 4700.

The fact that the artifacts are directly on the glacial drift and below the lower tephra (Oshetna) suggests that the site is much older than 3200 years. If the artifacts were actually deposited on the glacial drift and the valley floor was free of ice by 11,000 to 12,000 years ago (which appears to be the case) then the site could represent human occupation of the Upper Susitna River Valley shortly after the ice receded some 11,000-12,000 years ago. Another possibility is that the artifacts were deposited on a ground surface which was removed sometime prior to the deposition of the lowest tephra (which may be as old as 5,000-7,000 years), leaving the artifacts directly in contact with the glacial drift. The amount of weathering suggests that the artifacts were exposed for a long period of time, suggesting that the artifacts could be much older than the lower tephra which as previously mentioned could be as old as 5000-7000 years.

Evaluation:

The site commands a panoramic view to the south down and across the Susitna Valley. This may suggest that it was an overlook from which hunters manufactured tools while waiting for the appearance of large mammals below. The restricted nature of the topographic feature upon which the site is situated strongly implies that it did not serve as a large camp or village site. The site was occupied at least three times during the past, the last time sometime slightly prior to 200 A.D. The radiocarbon determinations which provide the minimum limiting dates for the Devil tephra are from the contact of units 2 and 3 of this site and may actually date the latest period of occupation at this site. The sparse nature of the artifactual material recovered from this occupation and lack of diagnostic specimens recovered from this occupation, make it difficult to further evaluate this site use during this time period. However, it is anticipated that future excavation will provide sufficient artifactual material to accomplish this goal.

The second occupation probably occurred about 1260 B.C. and is characterized primarily by basalt debetage. While a few waste flakes are somewhat "blade-like" in character, evidence of a pronounced blade and blade-core technology is lacking. A single, rather amorphous, biface was also recovered from this component.

The oldest component at the site did not yield charcoal or other organic material suitable for radiometric dating. However, its occurrence below the Oshetna tephra firmly establishes its age as greater than 4700 B.P., which is the minimum limiting date for the Oshetna ash. The lithics recovered from this component exhibit considerable weathering which suggests their exposure on the surface for a long period prior to the deposition of the Oshetna tephra. The assemblage is characterized by blades and blade cores which bear a strong resemblance to similar specimens of the Ugashik Narrows Phase, documented from the Alaska Penninsula (Dumond 1977).

Based on typological comparison of the assemblage with the Ugashik Narrows material, the pronounced degree of weathering on the specimens, and the occurrence of the component below the Oshetna tephra, it is not unreasonable to postulate an age of approximately 7000 B.P. for this component. Further work at this site is required to firmly document the age of this component by radiocarbon, or other chronometric dating techniques. Based on the foregoing discussion, this component appears to be the oldest archeological assemblage discovered during the course of the archeological reconnaissance for the Susitna Hydropower facility.

This site is potentially one of the most important sites in the project area and holds the key to defining the cultural chronology for three distinct periods. These are: 1) a cultural occupation which occurred approximately 200 A.D., 2) a period defined by radiocarbon dating at ca. 1260 B.C., and 3) what appears to be, based on stratigraphic and other evidence, the oldest occupation yet discovered in the project area, possibly dating to about 5000 B.C. It is anticipated that this site will play a major role in defining the cultural chronology and provide significant data regarding human behavior at this particular type of site for each of the above defined temporal periods.

(d) Systematic Testing TLM 033--Lake Outlet Site

Location: See section 3.2 (a-vi)

Testing: Six 1 m test squares and five shovel tests were excavated at the site (Figure 115).

Discussion:

Reconnaissance testing in 1980 uncovered a single brown chert retouched flake. The first three test squares excavated during systematic testing were placed such that one square (N500/E496) intersected the 1980 shovel test and two other squares were placed at 2 m distance, to test the areal extent of the proposed site. All three test squares were located on a northwest facing slope. No cultural material was found in any of these test squares, but soil stratigraphy in them indicated solufluction of surface material down slope.

Because no cultural material was recovered from the first three squares, three additional test squares were excavated. Due to the amount of solifluction towards the slope of the ridge, these test squares were placed in a flat area near the ridge top. Although a greater distance from the 1980 shovel test, it was felt that these squares provided a better opportunity to find relatively undisturbed cultural material. Test square N502/E501 was located on a small flat surface that overlooked the outlet creek. Square N487/E502 was located in a flat area bordering a draw and provided a view of the Susitna River. The last test square was placed near the high point of the ridge.

A depression located ca. 15 m to the east of the main excavation was also tested with three shovel tests. Two additional shovel tests were placed along the northern ridge paralleling the outlet creek. These shovel tests were excavated in an attempt to find other cultural

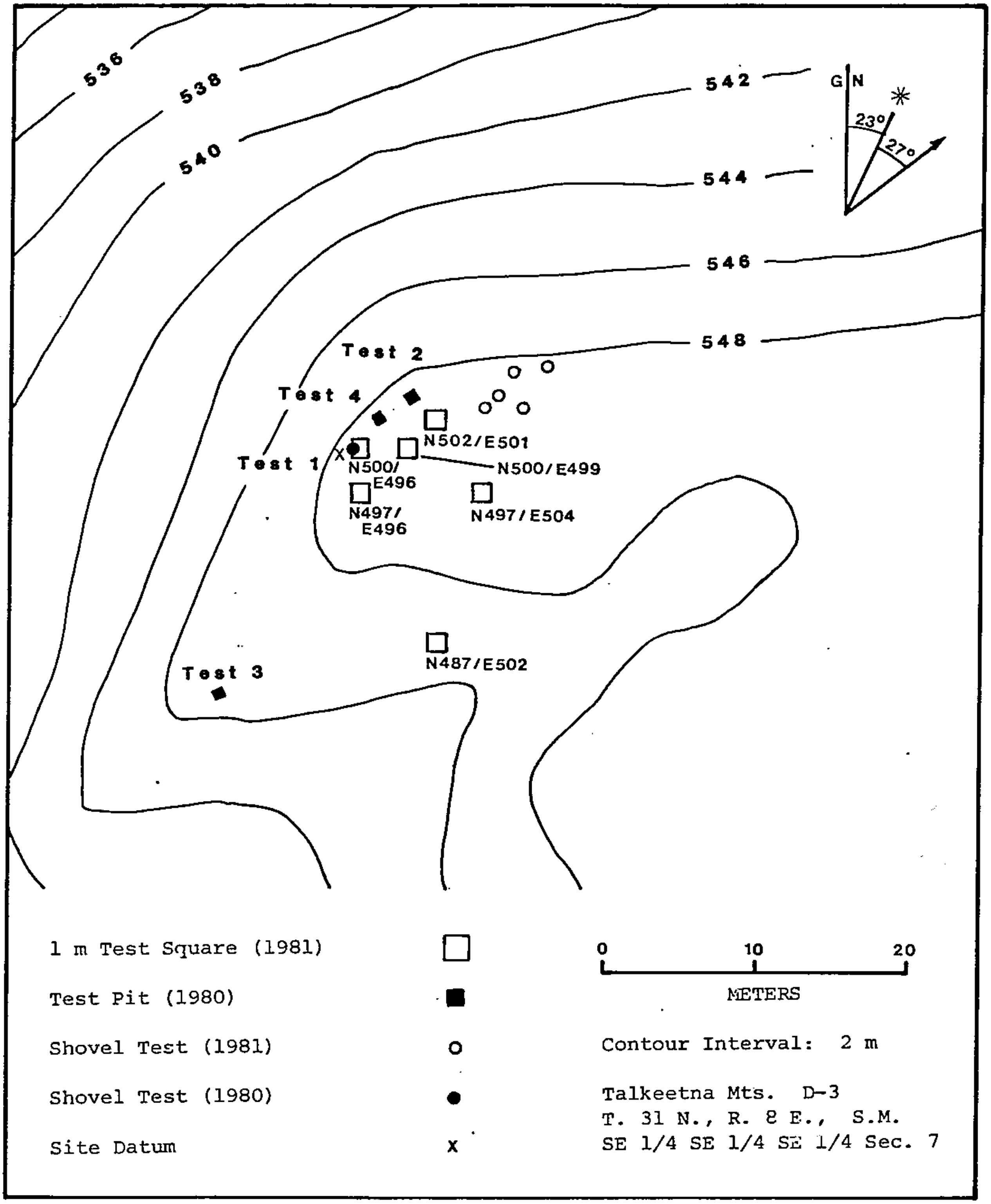


Figure 115. Site Map TLM 033.

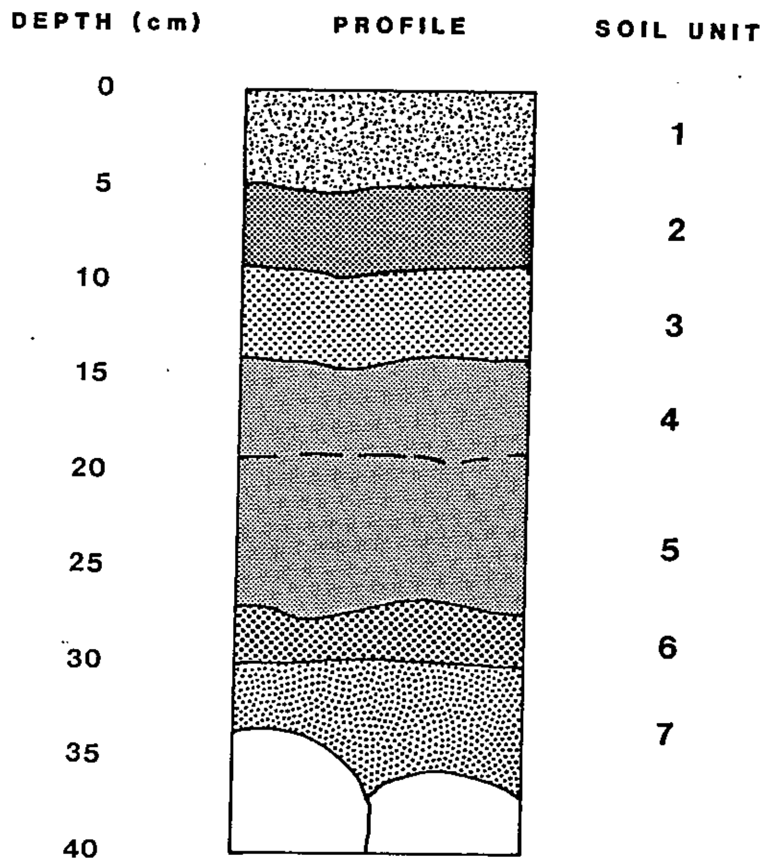


Figure 116. Composite Soil Profile TLM 033.

TABLE 15

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 033

Soil Unit	Description
1	Duff; 10 YR 2/2 (very dark brown). Sharp contact with unit 2.0 horizon.
2	Finely sorted organics with some charcoal flecks; 10 YR 2/1 (black). Sharp contact on lower boundary. A horizon.
3	Tephra (Devil); variable in color 10 YR 3/1 (very dark gray) and 10 YR 5/2 (grayish brown). Irregular and undulating contacts. Discontinuous in extent, often obscured by intermixed organic material. Very fine grain size. E horizon.
4	Tephra (Watana); 5 YR 2.5/2 (dark reddish brown). Well sorted. Continuous but variable in thickness. Gradational contact with unit 5. Well sorted B horizon.
5	Tephra (Oshetna); 10 YR 4/6 (dark yellowish brown). Similar to unit 4 except unoxidized. Lower contact tends to be sharp but at times is intermixed with sand C horizon.
6	Mixed sand-tephra; 10 YR 5/2 (grayish brown). Poorly sorted. Discontinuous across areas. Upper contact at times distinct but mostly seen as gradation. Mixing may be function of cryoturbation.

TABLE 15 (Continued)

Soil Unit	Description
7	Sand; 10 YR 3/4 (dark yellowish brown. Upward fining from coarse sand with pebbles to medium sand. There appears to be a thin oxidized zone in the upper portion of the sand zone.

material on the ridge top. Several bedrock outcrops, visible on the opposite side of the outlet creek, were also examined with negative results.

Eight soil units were delineated at the site (Figure 116, Table 15). These units are similar to the "type section" at TLM 040 with two exceptions: 1) greater mixing of soil units due to solifluction and 2) the presence in the south wall of test square N500/E496 of a thin lens of ash. The mixing of the soil units is particularly evident in soil unit 6 where the lower tephra (Oshetna) has been churned up and mixed with the basal sand unit. The lack of two separate A horizons suggests erosional episodes in the upper units or mixture of these units.

Only a single test square was profiled because no cultural material was discovered in any of the test squares of shovel tests.

<u>Evaluation</u>:

Because systematic testing failed to produce additional cultural material, this site appears to hold little potential to yield additional data pertinent to the prehistory of the project area. Additional work at this site does not appear to be warranted.

(e) Systematic Testing TLM 038--Upper Watana Creek Site

<u>Location</u>: See section 3.7 (a-x)

<u>Testing</u>: Five 1 m test squares and one shovel test were excavated at the site (Figure 117).

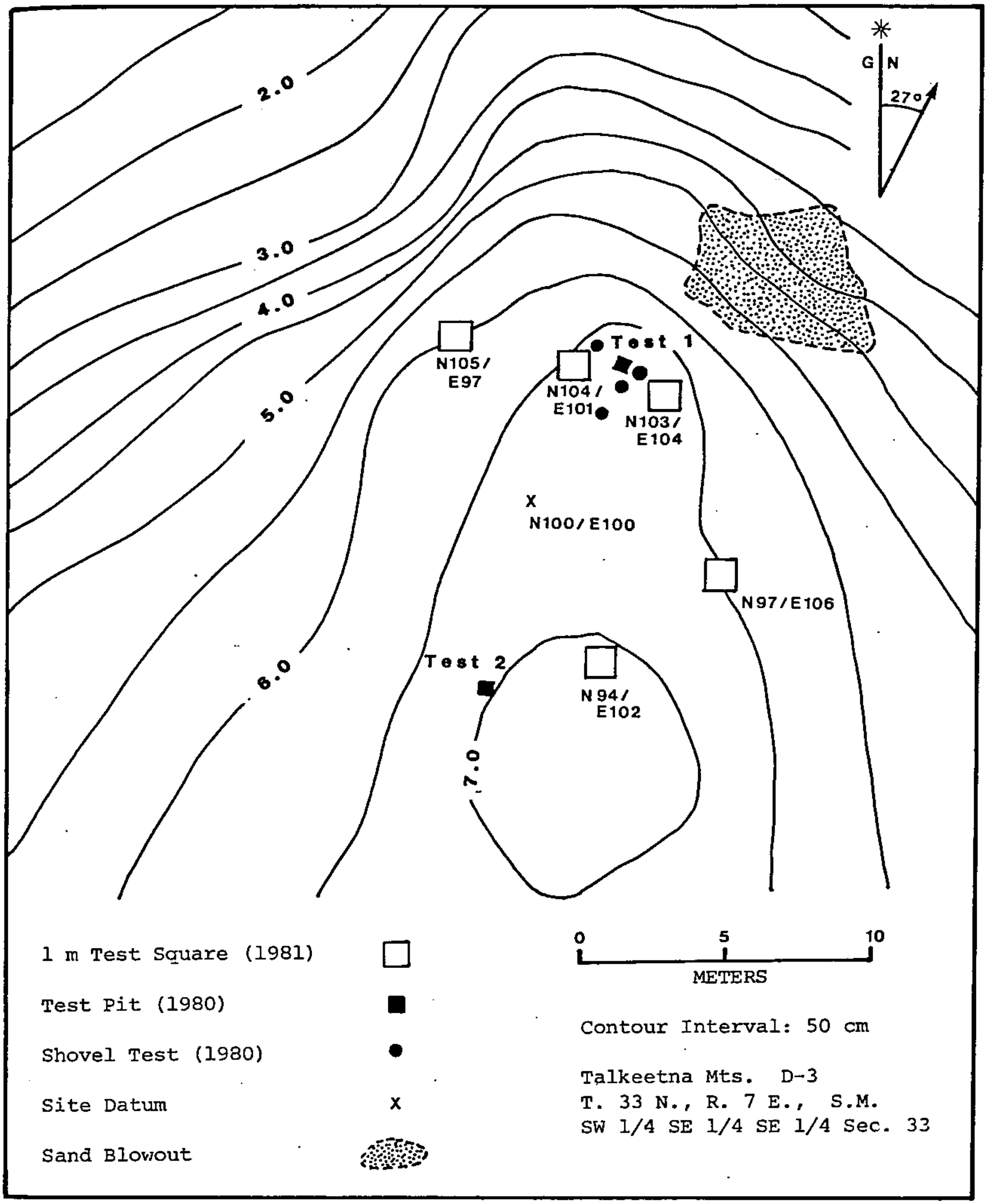


Figure 117. Site Map TLM 038.

Discussion:

No lithic debetage or tools were recovered at the site with the exception of fire cracked rock. All but one test square produced burned bone and/or fire cracked rock. All the faunal material from the test squares that produced faunal material (N104/E101, N103/E104 and N97/E106) appears to be associated with a buried A horizon directly above the middle tephra (Watana; Figure 118 unit 4a and Table 16) although some material was found in with the middle tephra (Figure 118 unit 4c). Species identified include caribou (Rangifer tarandus), vole (Microtus sp.) and a possible moose (Alces alces) (Table 17).

Test square N105/E97 was excavated to test the western extent of the cultural material. Cultural material was not observed in this test, but extensive cryoturbation was evident by the displacement of soil units. Test square N104/E101 was excavated 1 m west of the reconnaissance test which revealed cultural material in 1980 (Figure 117). The very fragmented bone recovered from the 1981 test square was far less concentrated than that noted in the 1980 test. Six fire cracked rocks were also recovered from this test (Table 18). Test square N103/E104 was excavated 1 m southwest of th 1980 test in order to further define the extent of cultural material at the site. An 8 cm thick, wind blown sand unit overlaid the cultural material in this test which consisted of one fire cracked rock and four burned bone fragments. Test N97/E106 also contained cultural material consisting of one fire cracked rock and one bone fragment. Test square N94/E102 was excavated in what appeared to be a more geographically stable zone of the site based on the character of the surface vegetation, thicker organic mat, and distance from the bluff edge. One fire cracked rock was recovered from this test. Test square N75/E100 was excavated to provide a look at soil deposition away from the bluff edge. No cultural material was located in the 40 cm x 40 cm test.

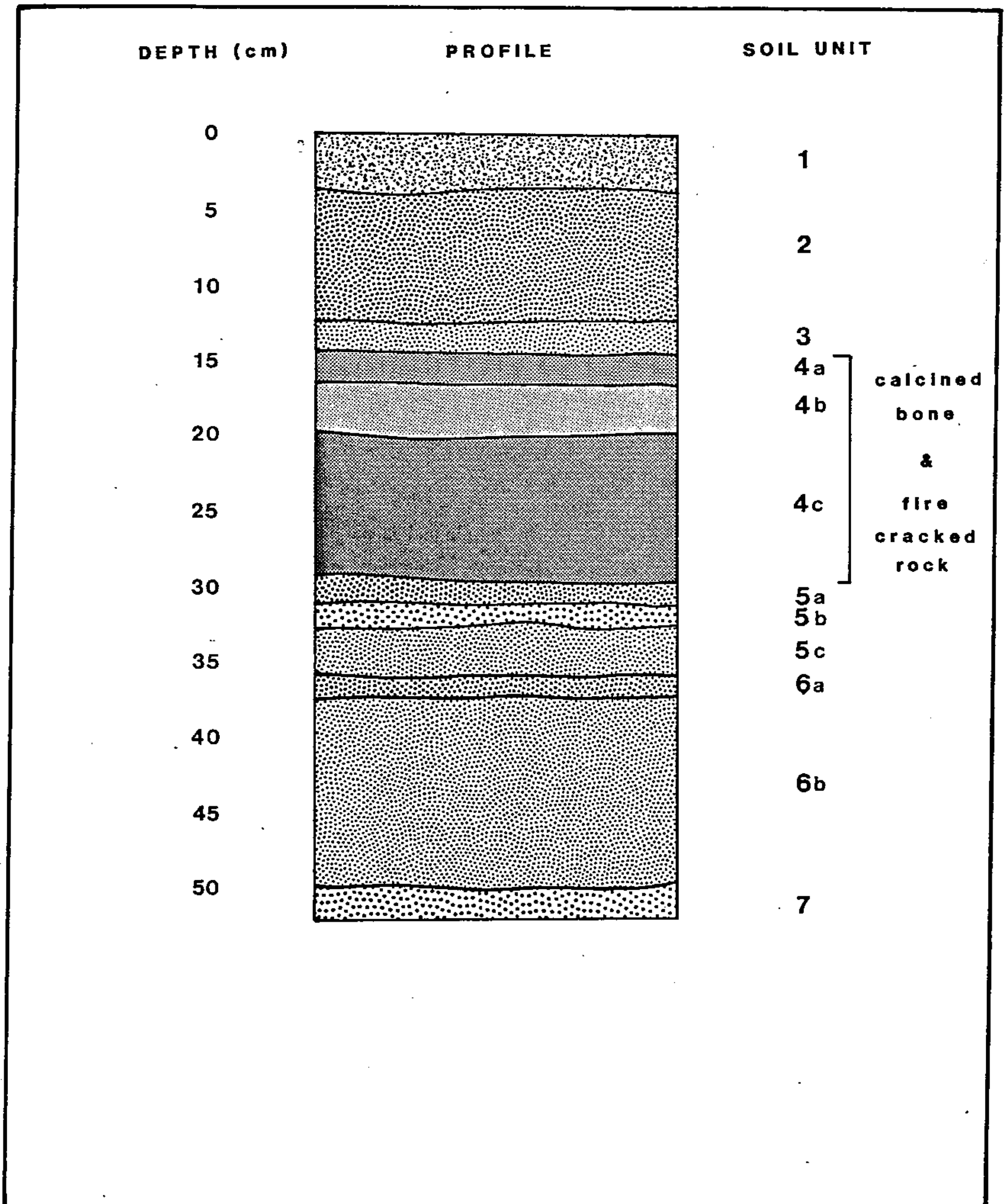


Figure 118. Composite Soil Profile TLM 038.

TABLE 16

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 038

Soil Unit	Description
1	Humus mixed with sand, organics not divided. 2-8 cm thick.
2	Poorly sorted unaltered wind blown sand. Some non-divided organics present, grayish brown (2.54 5/2). Lower boundary sharp.
3	Light gray (10 YR 6/1) silty fine sand possibly mixed with tephra.
4	Silt (tephra or mixed with tephra), dries to a light powder, 5 to 25 cm thick, occurs in four subunits.
4a	Very dark gray (10 YR 2.5/1)
4b	Grayish brown (2.54 5/2)
4c	Dark reddish brown (5 YR 3/3) to dark yellowish brown (10 YR 4/4)
4c	Brownish yellow (10 YR 6/6)
5	Unsorted medium fine wind flown sand, occurs throughout site in a 3 to 15 cm thick unit, lower boundary sharp, consists of three subunits.
5a	Very dark grayish brown (10 YR 3/2)
5b	Grayish brown (7.5 YR 4/3) to dark yellowish brown (10 YR 3/4)

TABLE 16 (Continued)

Soil Unit	Description
6	Unsorted medium to fine wind blown sand, occurs throughout site, thickness up to 40 cm, lower boundary very abrupt, consists of three subunits.
6a	Very dark grayish brown, dark grayish brown (2.54 4/2)
6b	Dark yellowish brown (10 YR 3.5/4)
7	Well sorted medium sand, no soil development evident, olive (54 4/3) possible lacustrine deposit.

TABLE 17

FAUNAL MATERIAL, TLM 038

Soil Unit	Description
	N97/E106
4a	1 long bone fragment, unburned, medium-large mammal
	N103/E104
4a	2 long bone fragments, unburned, medium-large mammal
4a	5 long bone fragments, unburned, small mammal
4a	1 rib fragment, unburned, large mammal
	N104/E100
4a	1 phalanx fragment, 2nd, calcined, caribou (*Rangifer tarandus*)
4a	1 metapodial fragment, heavily burned, caribou (*Rangifer tarandus*)
4a	1 mandible fragment, right, vole (*Microtus* sp.)
4a	1 maxilla fragment, vole (*Microtus* sp.)
4a	1 vertabra, thoracic, calcined, caribou (*Rangifer tarandus*) or moose (*Alces alces*)
4a	58 long bone fragments, calcined, medium-large mammal
4a	2 long bone fragments, calcined, large mammal
4a	12 long bone fragments, heavily burned, medium-large mammal

TABLE 18

ARTIFACT SUMMARY BY TEST SQUARE, TLM 038

N105/E97		No cultural material
N104/E101	20-41 cm	17 Bone fragments
		6 Fire cracked rocks
N103/E104	10 cm	1 Rib
	26-39 cm	3 Bone fragments
		1 Fire cracked rock
N97/E106	39 cm	1 Bone fragment
		1 Fire cracked rock
N94/E102	48-53 cm	1 Fire cracked rock

Evaluation:

This site is situated on a high, well drained overlook adjacent to Watana Creek and was probably used briefly as a hunting camp. This tentative conclusion is supported by the presence of fire cracked rock and the bones of caribou and possibly moose. No large cultural features such as house depressions were noted and the site lacks major ecological features (such as convenient access to fresh water) suggests that it is not suitable for use as a more permanent type of camp.

Although no radiocarbon determinations are available from the site, the stratigraphic placement of the cultural material recovered indicates that the site was occupied after the deposition of the Devil tephra. Based on the results of systematic testing, the cultural occupation appears to be derived from a buried A horizon immediately below the Devil tephra and above the Watana tephra, although cryoturbation has resulted in some of the specimens intruding into the lower tephra. The cultural occupation is certainly older than 200 A.D. and quite probably postdates component 2 at Tuff Creek North, thus filling another critical gap in the cultural chronology of the Upper Susitna.

Additionally, the preservation of faunal material at this site not only provides the possibility of assessing this particular aspect of the subsistance cycle during this time period, but also the opportunity to recover tools made of bone or antler, which are unknown from archeological sites of this age in this region of Alaska. The above factors combine to make TLM 038 another key site which warrants further research in the project area.

(f) Systematic Testing TLM 039--Duck Embryo Lake, South

Location: See section 3.2 (a-vii)

Testing:

Systematic testing consisted of three 1 m test squares placed along the east-west trending summit of a kame (Figure 119). Test squares were placed in the immediate vicinity of reconnaissance shovel tests in order to further define the eastern and western extent of the site and to obtain additional cultural material and datable organics.

Discussion:

Lithic material was recovered from all three test squares. No faunal material was recovered at the site. Lithic material consisted of a single possible fire cracked rock, 43 waste flakes and two microblades.

Site stratigraphy consists of less than 10 cm of organic and humic horizons above approximately 10 cm of volcanic tephra deposits which overlay glacial drift (Figure 120, Table 19). Three distinct tephra have been identified at the site based on color, texture and weathering characteristics (Table 19). Stratigraphy at the site is clear but compressed into approximately 20 cm of vertical development. All test squares show essentially the same stratigraphy with the exception of N47/E49 in which a silty loam (unit 2) is present. This unit is not found in either of the other two tests and is interpreted as redeposited slope wash.

Artifacts were recovered from three of seven stratigraphic units identified at the site (Figure 120). Cultural material occurs within the Devil tephra (unit 4) and in all stratigraphic units and contacts between the Devil tephra and glacial drift (unit 7). Cryoturbation has probably been the cause of the mixing of artifacts and there is no clear

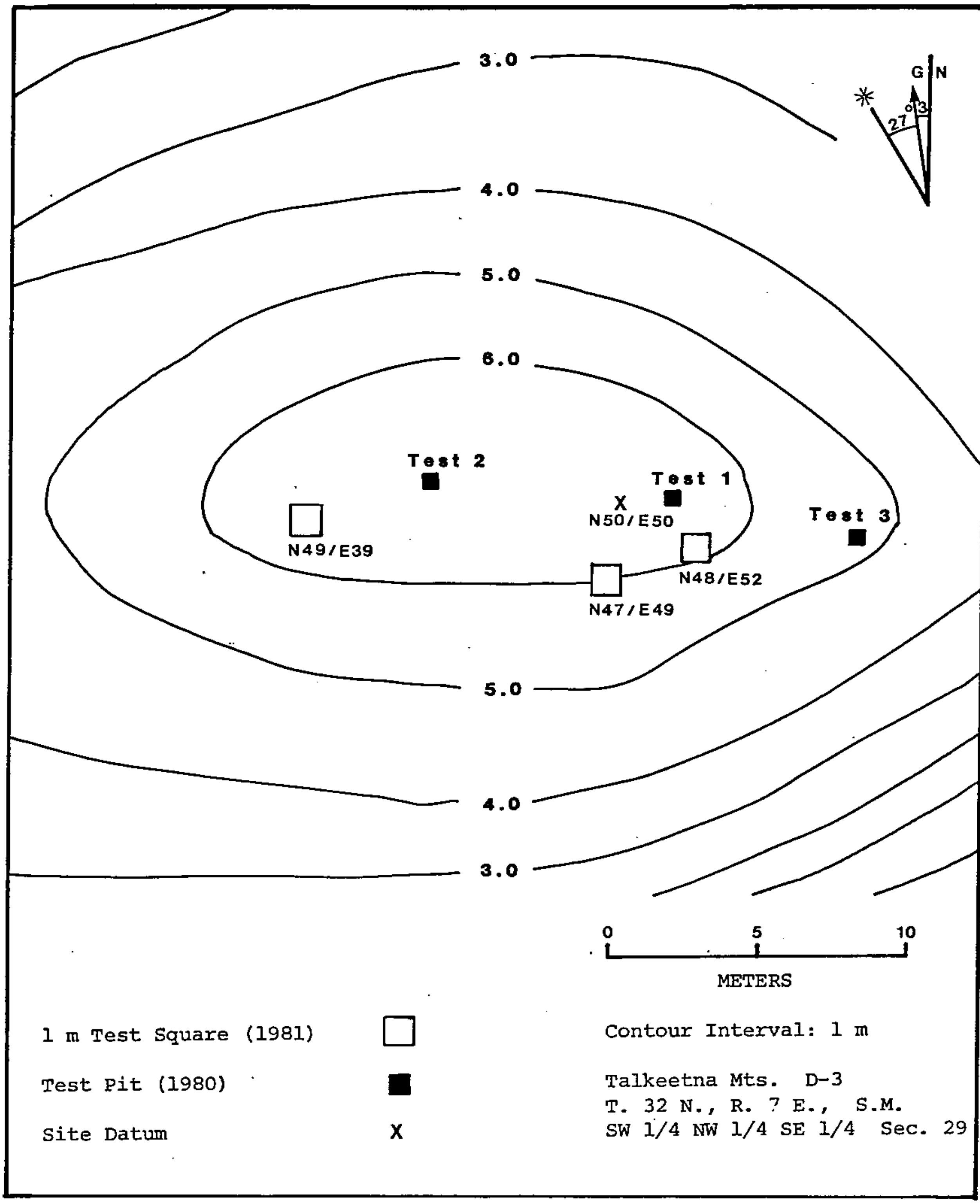


Figure 119. Site Map TLM 039.

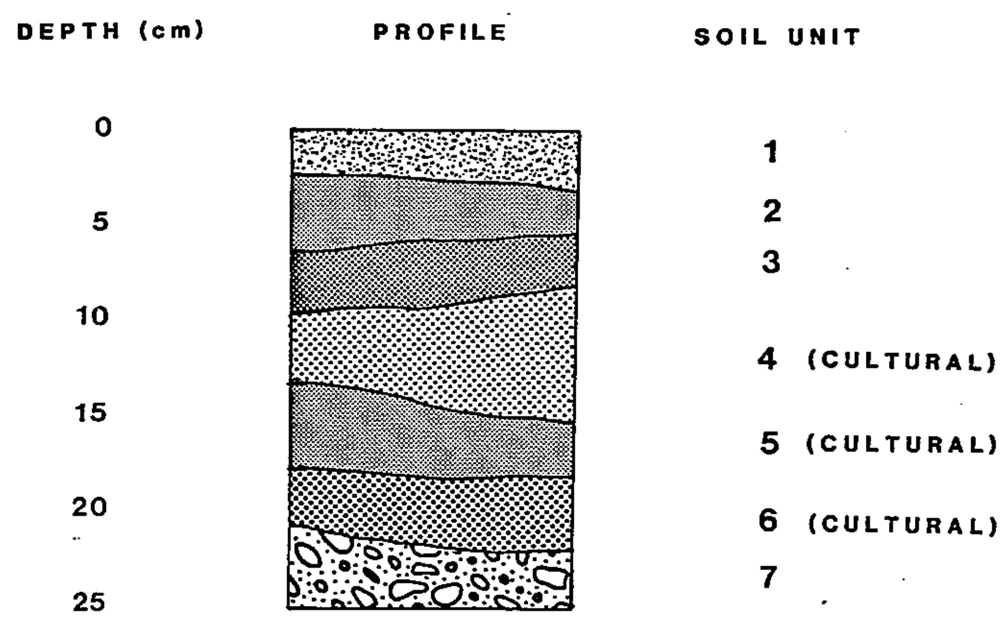


Figure 120. Composite Soil Profile TLM 039.

TABLE 19

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 039

Soil Unit	Description
1	Organic mat. Roots, moss, and leaves. Occurs over site in a layer 1 cm to 5 cm thick. (O-horizon)
2	Silty loam. Dark brown (10 YR 3/4). Occurs only in test square N47/E49. Interpreted as redeposited slope wash.
3	Finely divided organics with silt. Very dark gray (10 YR 2.5/1). Occurs in a 3 cm to 8 cm layer with abrupt lower boundary. (Tephra)
4	Silt. Light brownish gray (10 YR 6/2). Occurs in a thin and discontinuous layer. (Tephra)
5	Silt. Light brownish gray (10 YR 6/2). Heavily oxidized in the upper portion of the unit with the lower contact abrupt and smooth and marked by charcoal fragments. (Tephra)
6	Sandy silt. Grayish brown (2.5 Y 5/2). Silt component dries to a fine white powder. Some mixing in places with underlying unit 7. Lower boundary with unit 7 clear and smooth. (Tephra)
7	Silty, poorly sorted sand mixed with sub-rounded pebbles and cobbles. Upper portion dark yellowish brown (10 YR 4/6), lower portion olive brown (2.5 YR 4/4). (Glacial drift)

evidence for more than one component (Table 19). The greatest number of artifacts were excavated from within the Oshetna tephra (unit 6) and at its upper contact with the Watana tephra (unit 5). The presence of artifacts in other stratigraphic positions at the site may be a result of freeze-thaw activity. This is supported by the apparent random distribution of waste flake lithology in the cultural units (Table 20). Waste flake lithologies include chert, rhyolite, basalt and quartzite. None of the waste flakes show subsequent retouch.

Diagnostic artifacts recovered during systematic testing were excavated from test square N48/E52 and consist of two microblades, one of which is represented by two articulating fragments. One black chert microblade fragment (UA81-277-20) was recovered from the contact between the Watana and Oshetna tephra (units 5/6). This fragment articulates with a second black chert microblade fragment (UA81-277-30) recovered from within the Oshetna tephra (unit 6). This broken microblade is 2.35 cm long and .7 cm wide and shows retouch (possible backing) along one margin and light retouch (possible use wear) along the opposite margin. The second microblade (UA81-277-29) recovered from this test square was excavated from within the Oshetna tephra (unit 6) and is a complete clear obsidian microblade measuring 2.1 cm long and .5 cm wide. This microblade shows continuous abrasion and crushing along one of two parallel aires which could have resulted from hafting. Moderate discontinuous retouch (possible use wear) occurs along the opposite margin and supports the conclusion that this microblade may have served as a projectile point inset. Very minor discontinuous retouch on the opposite margin may have occurred during hafting or use. Curved, paralleled striations (within the obsidian itself) are visible microscopically and indicate percussion rather than pressure flaking which would not leave striations in the lithic material. The only other diagnostic artifact recovered from TLM 039 was a black chert burin spall (UA80-146-1) struck from a biface. This artifact was recovered from Test 1 during reconnaissance testing and was excavated from 12 cmbs associated with Watana Tephra.

TABLE 20

ARTIFACT SUMMARY BY SOIL UNIT, TLM 039

Soil Unit	Description
4	2 Flakes, brown chert
	3 Flakes, gray rhyolite
	3 Flakes, gray speckled chert
4/5 Contact	1 Flake, gray speckled chert
5	2 Flakes, gray rhyolite
	2 Flakes, yellow rhyolite
	1 Flake, brown chert
	3 Flakes, gray basalt
5/6 Contact	1 Microblade fragment, black chert
	1 Flake, redish brown chert
	2 Flakes, quartzite
	1 Flake, yellow rhyolite
	5 Flakes, gray speckled chert
	1 Flake, gray rhyolite
	1 Flake, gray basalt
6	1 Microblade fragment, black chert
	1 Microblade, clear obsidian
	2 Flakes, brown chert
	1 Flake, reddish brown chert
	2 Flakes, green rhyolite
	1 Core fragment, green rhyolite
	1 Flake, yellow rhyolite
	4 Flakes, gray speckled chert
6/7 Contact	4 Flakes, green rhyolite
	1 Flake, gray chert

Evaluation:

The geomorphology of TLM 039 suggests that the site was probably used as a hunting overlook where tool resharpening or limited tool manufacture occurred. As previously mentioned, the site location offers a panoramic view encompassing a large lake and would and does afford excellent visibility of easily accessible terrain. Lack of well defined hearths and diverse artifact types implies that TLM 039 was probably not used as a major campsite. The site is exposed and probably would not have been an attractive camping area. Although there were several deflated areas, no surface artifacts or features were observed. The spacial extent of the site is probably restricted by topography to an area of approximately 20 m by 5 m in the immediate vicinity of the highest part of the knoll (Figure 119).

A total of five charcoal samples was collected, however, no radiocarbon dates are available. The site can be roughly placed chronologically on the basis of the stratigraphic position of the artifacts in relation to the Devil tephra and is certainly older than 1800 yrs. B.P. If the site is single-component and the occupation occurred between the deposition of the Oshetna and Watana tephras, then the site can be relatively dated to between 2300 yrs. B.P. and approximately 4700 yrs. B.P. This assessment is necessarily tentative, and further systematic testing is required before the chronological placement of the site can be ascertained with certainty.

(g) Systematic Testing TLM 040--Tephra Site

Location: See section 3.2 (a-viii)

Testing: Five 1 m test squares and ten shovel tests were excavated at the site (Figure 121).

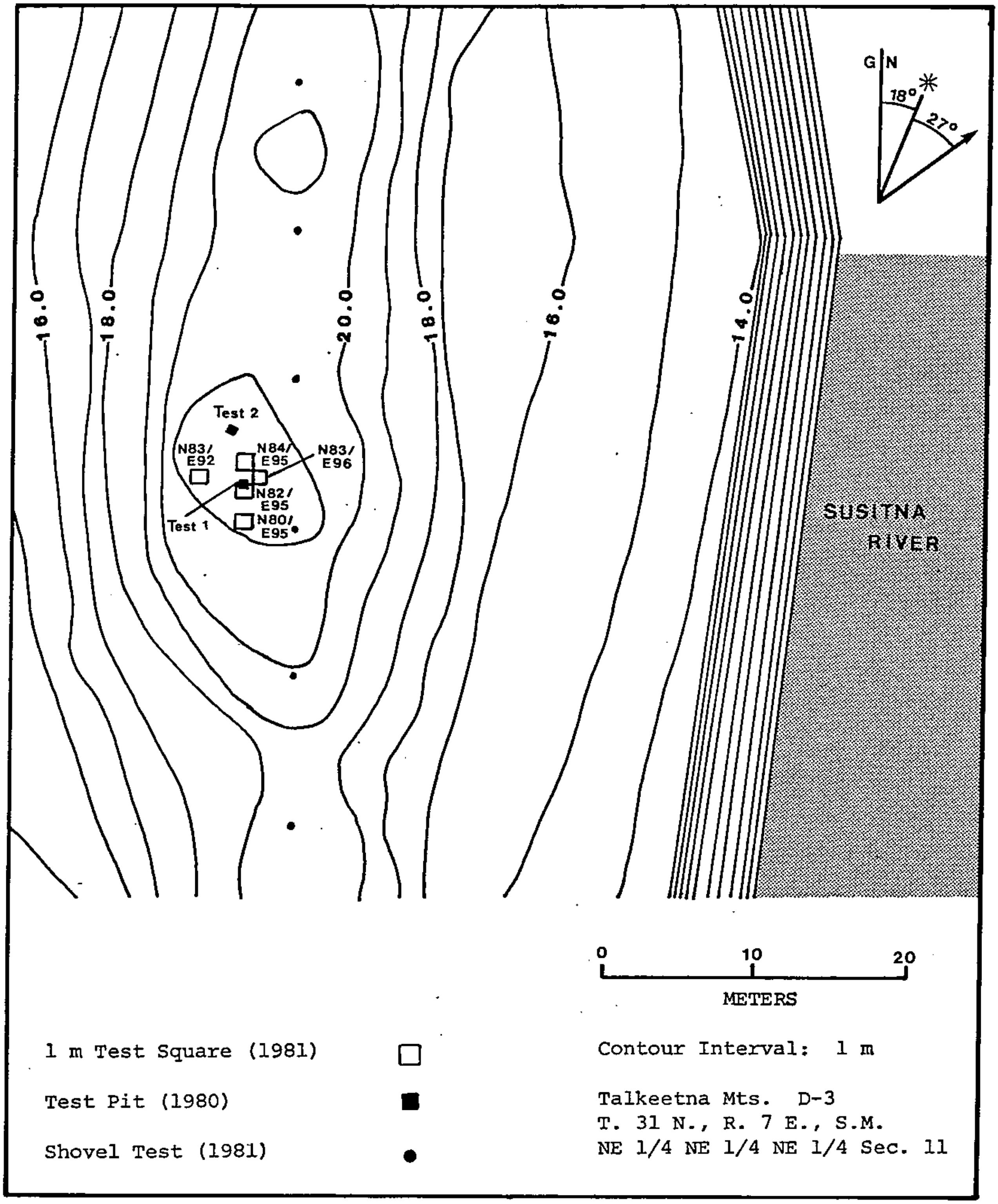


Figure 121. Site Map TLM 040.

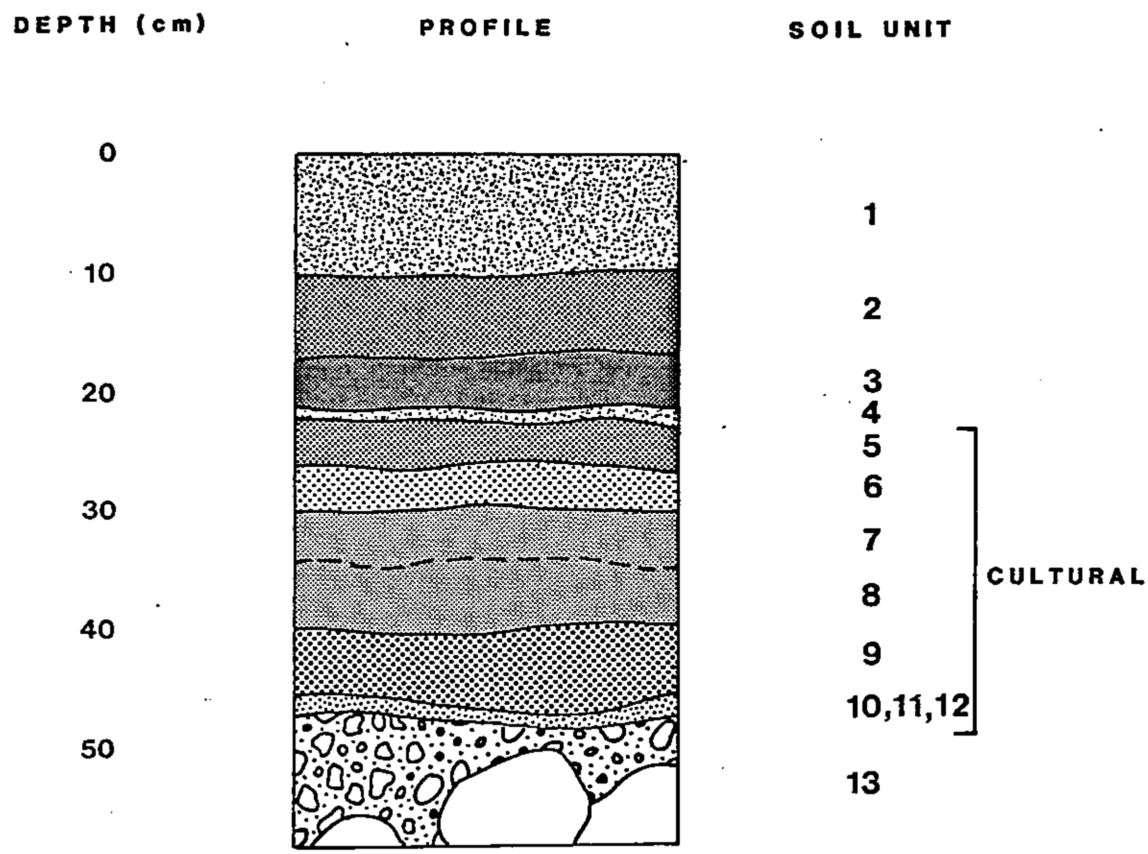
Discussion:

Cultural material made from obsidian, basalt, chert and rhyolite was recovered from three of the five test squares. Subsurface testing in 1980 uncovered a retouched blade-like flake and a rhyolite flake. Three 1 m squares were opened initially during systematic testing. Two of these squares were located at 2 m distance from the 1980 test (N80/E95 and N83/E92) and one square was placed a 1-m distance from the 1980 test (N84/E95). Excavation by natural units was hampered by extensive annual frost. The sediments, once thawed, were too wet to screen so they were carefully troweled and thoroughly examined by hand. An additional two test squares (N83/E96 and N82/E95) were excavated because of the sterility of the upper strata and the slowness of excavation caused by the annual frost. Types of artifacts recovered include microblades and microblade fragments, scrapers, blade fragments, a core fragment, a possible graver and waste flakes.

Ten shovel tests were excavated paralleling the grid datum line (Figure 121). These tests were excavated to determine the extent of cultural material on the site, but all produced negative results.

Thirteen soil and sediment units were delineated at the site, although all units were not present in every test (Figure 122, Table 21). All three tephra were present at the site. Soil units 4 through 8 represent paleosol development of a mixed ash and silt deposit. Soil units 1 through 3 represent more recent soil developments. The lower tephra (unit 9, Oshetna) contained a thin, discontinuous layer of charcoal at its uppermost boundary, but did not exhibit the soil development seen in the other tephra units. The effects of frost activity were visible in all test squares, solifluction, upward movement of cobbles, and probable movement of cultural material was noted.

The distinction of the lowest tephra (unit 9, Oshetna) was not continuous in the excavated squares. This discontinuity was particularly



UNIT 4/5 CONTACT

Charcoal sample UA81-226-122: 1320±110, A.D. 630

Figure 122. Composite Soil Profile TLM 040.

TABLE 21

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 040

Soil Unit	Description
1	Duff; with roots; 10 YR 3/3 (dark brown). Grades into unit 2. O horizon.
2	Finely divided organic material in fine grained matrix; 10 YR 2/2 (very dark brown). Lower contact of unit 2 also gradational. A horizon.
3	Fine grained silt mixed with organic material; 10 Y 4/3 (brown). Horizon is often not visible because of intermixture with organics. R horizon.
4	Layer of highly decomposed plant material; 10 YR 2/1 (black). Thin layer often missing. O horizon.
5	Finely divided organic matter; 10 YR 2/2 (very dark brown). Some charcoal present in pockets. A horizon.
6	Thin mineral unit (Devil tephra?), fine grained; 10 YR 5/4 (yellowish brown). Sharp upper contact, gradational lower contact. E horizon.
7	Intensely oxidized zone of tephra (Watana); 5 YR 3/3 (dark red-brown). Dark brown concretions present. Gradational lower contact. B horizon.

TABLE 21 (Continued)

Soil Unit	Description
8	Tephra (Watana); 10 YR 5/6 (yellowish brown). Sharp lower contact. Powdery (C horizon).
9	Tephra (Oshetna); 10 YR 6/1 (gray). Fine tephra with fine sand size particles. In some cases this tephra is overlain by a thin charcoal horizon and/or bits of charcoal are found throughout unit. Both upper and lower contacts are sharp. Discontinuous in extent. R horizon.
10	Sand; 2.5 Y 5/4 (light olive brown). Fine to medium grain sized and moderately well sorted. In some cases small cobbles present in lower part of unit.
11	Sand; 10 YR 5/2 (grayish brown). Medium grained. Found only in SW corner of N82/E95 in area where unit 9 was absent.
12	Sand; 2.5 Y 5/4 (light olive brown). Coarse grained. Gradational contact both top and bottom.
13	Boulder-coarse sand. Maximum boulder size (66 cm). Frost shattering seen in some rocks but is not extensive. No apparent polish or aeolian scouring.

important in test square N82/E95 where a medium-grained gray sand (unit 11) containing cultural material occurred in an area where the lower gray tephra was absent. The stratigraphic relationships of cultural material to both tephra units is difficult to assess at this level of testing because microblades were distributed throughout seven soil units while the gray-banded chert material from square N83/E92 appears to occur stratigraphically within or below the lower gray ash (unit 9, Oshetna).

A total of 182 lithic artifacts were recovered from the site (Tables 22, 23). This material was dominated by flakes and other debitage made of obsidian, gray-banded chert and basalt (Table 22), and primarily occurred in squares N83/E92 and N82/E95. Most of the obsidian and basalt material was found in test square N82/E95 while square N83/E92 contained most of the gray banded chert material.

The cultural material from test square N83/E92 was concentrated in the northwest quadrant and may represent a workshop area. Additional cultural material was noted in the northern and western walls of this quadrant indicating that this flake scatter continues in areal extent to squares north and south of this test. Numerous small banded gray-chert fragments formed a "pavement" under the larger flakes and flake fragments of this flake scatter. This small sized debitage was not collected. A bifacially flaked tool (UA81-226-117; core chopper) and a utilized flake (UA81-226-27; graver) were also associated with this flake scatter.

A unifacially retouched flake (UA81-226-4; scraper) from test square N83/E96 was made from similar material as that found in the flake scatter. It, too, was found in association with the lower gray ash (unit 9, Oshetna) brown sand (unit 10) stratigraphic level and could be associated with the artifacts from square N83/E92.

TABLE 22

ARTIFACT SUMMARY, TLM 040

1	Blade fragment, gray-banded chert
1	Graver?, gray-banded chert
1	Scraper, gray-banded chert
1	Boulder chip scraper, rhyolite
1	Core fragment, gray-banded chert
1	Core/chopper, gray-banded chert
22	Microblade/microblade fragments, obsidian
19	Flakes, obsidian
4	Blade-like flakes, obsidian
36	Flakes, basalt
94	Flakes, blade-like flakes and fragments, gray-banded chert
1	Flake fragment, red obsidian

Total Artifacts = 182

TABLE 23

ARTIFACT SUMMARY BY TEST SQUARE, TLM 040

Test Square	Maximum Depth of Excavation*	Cultural Material	Comments
N82/E95	c. 80 cm	22 Gray obsidian microblade and microblade fragments 4 Gray obsidian blade-like flakes 1 Gray-banded chert flake 34 Basalt flakes	Lithic material distributed throughout all four quadrants of the test square. Vertical distribution of the artifacts spanned the area from the upper zone of the brown tephra (Watana) to the basal, brown sand. It is likely that the vertical location of the artifacts has been disturbed through cryoturbation because of the similarity of artifact type and lithology in all soil units.
Total = 80 artifacts			
N83/E92	c. 70 cm	1 Gray-banded chert blade fragment (proximal end) 1 Gray-banded chert graver (?) 1 Boulder chip scraper, rhyolite 1 Gray-banded chert core fragment 1 Core/chopper, gray-banded chert 93 Gray banded chert flakes, blade-like flakes and fragments 2 Basalt flakes	A flake scatter, located in the northwest corner of this test square, accounted for 84 of the gray-banded chert flakes, blade-like flakes and fragments. Lithic material was present in the square walls indicating that the scatter continues to grid north, northwest and west of N83/E92. Material found in square was from gray ash or brown sand.
Total = 100 artifacts			

TABLE 23 (Continued)

Test Square	Maximum Depth of Excavation*	Cultural Material	Comments
N83/E96	c. 70 cm	1 Gray-banded chert scraper 1 Red obsidian flake fragment	
Total = 2 artifacts			
N80/E95	c. 45 cm	None	This square was excavated only to the upper contact of the lower gray tephra (Oshetna). The square was backfilled prior to the discovery of cultural material in the gray tephra and brown soil units. Thus, it is possible that artifactual material may be found in the two basal units.
N84/E95	c. 70 cm	None	

*Measured in cm below square datum.

The cultural material in test square N82/E95 was not as well controlled stratigraphically as in square N83/E92. The lithic material from square N83/E95 consisted of obsidian (45 artifacts) and basalt (34 artifacts) and was distributed through seven of the thirteen defined soil units. Given the similarity in type of artifact and lithology, it is likely that frost action has mixed the material stratigraphically.

Evaluation:

Preliminary systematic testing at this site was unable to accurately define the age and number of occupations at this site. This is due to two factors: 1) annual frost inhibited the excavations and 2) cryoturbation had disturbed the stratigraphic placement of the cultural material. However, the preliminary testing does suggest two and possibly three periods of human utilization at the site based on the apparent in situ nature of some of the specimens (the banded gray-chert flake distribution) and the occurrence of different lithologic and artifact types in horizontally separated locales. The occurrence of numerous obsidian microblades, and microblade fragments, at the site create the opportunty to answer numerous questions regarding the age and function of these intriguing specimens. Additionally, the obsidian presents possibilities for trace element analysis, which can link the obsidian to its source and thus elucidate prehistoric patterns of trade and contact.

The function of the site appears to be that of an overlook located on a prominant point projecting northward into the Susitna River, from which hunters scanned the valley bottom for prey while engaged in the manufacture of stone tools. While systematic testing at the site has not provided conclusive results, it has provided sufficient data which suggests that additional excavation at this potentially significant site will provide the data necessary to understand the complex stratigraphy and place the cultural occupation(s) in their proper chronological framework. Additional controlled excavation is essential if these questions are to be answered.

(h) Systematic Testing TLM 042 loci A and B - Goose Creek Site

Location: See section 3.2 (a-ix).

Testing: Locus A - Five 1-m test squares and four shovel tests were excavated at this locus (Figure 123).
Locus B - Six 1-m test squares and one shovel test were excavated at this locus (Figure 124).

Discussion:

Locus A:

A total of 151 lithic artifacts and three bone fragments were collected during surface and subsurface testing. The soil stratigraphy was dominated by soluflection features and the bulk of the artifacts were collected from the eroding bluff face. The extensive presence of soluflection lobes throughout the site indicated that most, if not all, of the artifacts are displaced from their original place of deposition.

Reconnaissance level testing at this site in 1980 revealed surface and subsurface cultural material. The area available for deep subsurface testing was limited because of extensive erosion of the soil from most of the ridge top. Two test squares initially were excavated to define the western (N99/E100) and northern (N100/E102) extent of subsurface material. Both squares contained subsurface artifacts and anomalous soil configurations. Test square N103/E103 located on the ridge top in an area with a more gradual slope, was excavated both to test the spatial extent of the site and to expose a soil profile that was less affected by solifluction. Test square N99/E105 was opened to define the eastern limits of the artifact distribution. Further testing was not conducted in a westward direction because of the predominance at the

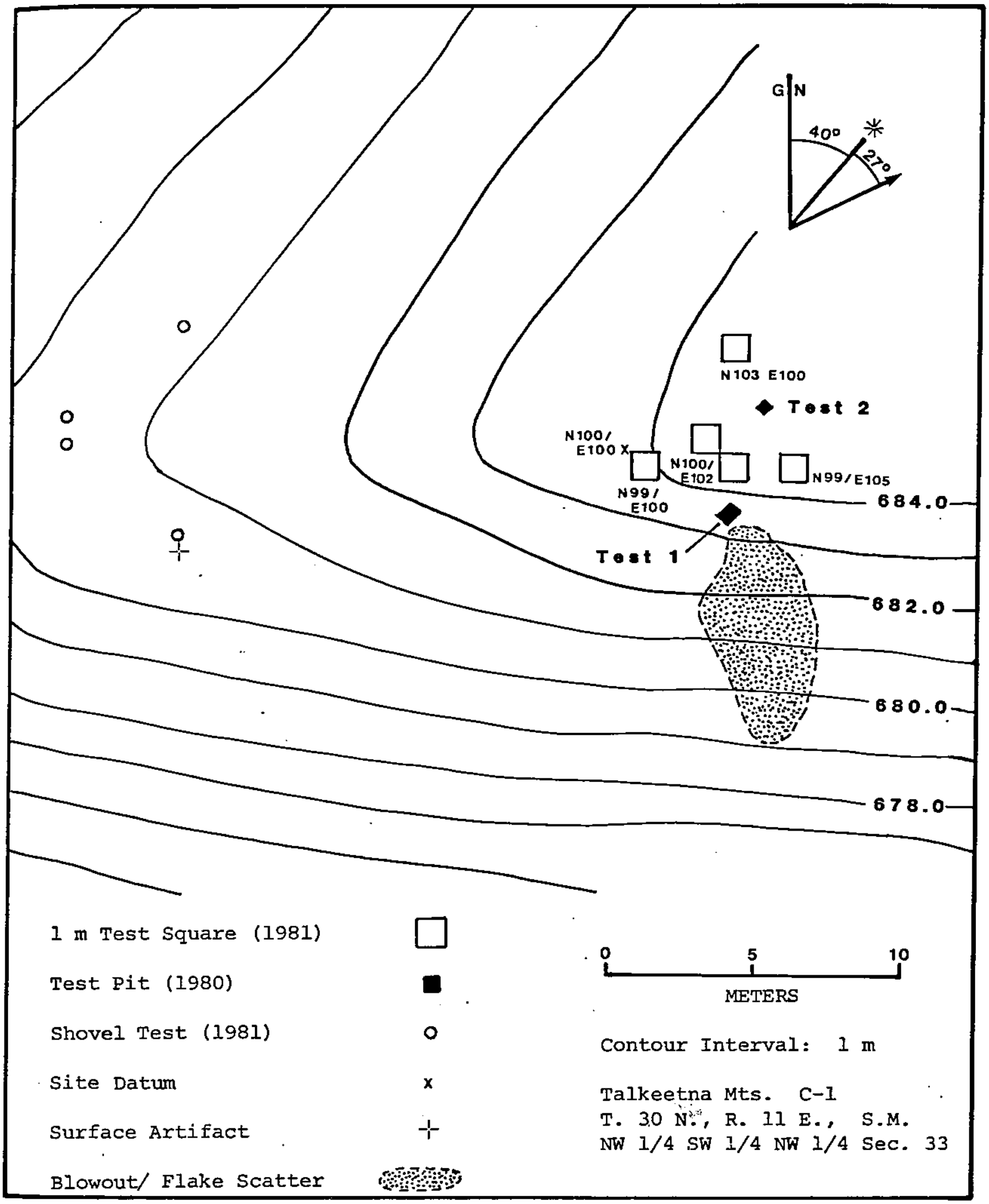


Figure 123. Site Map Locus A TLM 042.

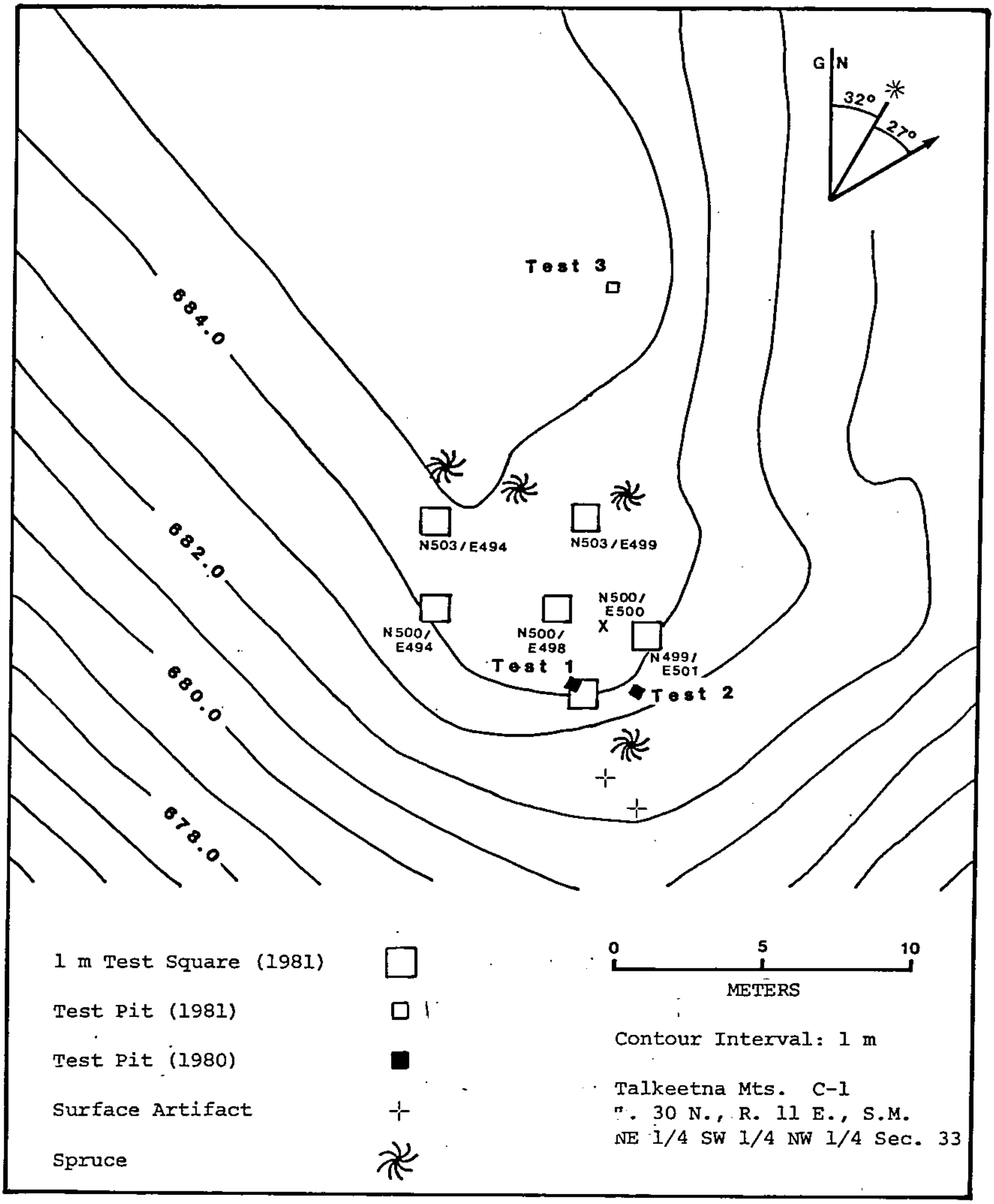


Figure 124. Site Map Locus B TLM 042.

surface of glacial drift. The sterility of square N103/E103 and 1980 shovel test 2 suggests that the limits of the major artifactual concentration are defined by test squares N99/E100, N100/E102, N99/E103 and the slope flake scatter found in 1980.

When a single flake was discovered on the surface ca. 15 m to the west of the main artifact concentration at this locus, four shovel tests were excavated to define the density of artifacts in this area. The placement of the shovel tests were affected by the shallowness of the soil and predominance of drift at the surface. One flake was found.

Sixteen separate soil/sediment units were described at locus A (Table 24). Five of these units were present in all test squares, while the remaining eleven units were present only locally. It appears as if the ridge has been in a long-term process of erosion based on the thinness of the O-horizon, absence of an A-horizon, discontinuity of the tephra units and the presence of numerous disturbed areas. Although artifactual material was found in surface testing, it is likely that most of the material is not in situ. The cultural material, both in the test squares and in the surface flake scatter was uncovered in the upper organic-rich layers or was associated with an underlying dark yellow-brown oxidized zone (Figure 125, unit 9). The oxidized sand unit is visible on the exposed slope suggesting that this unit is more resistant to erosion and, thus, forms a relatively stable surface on which artifacts rest.

A series of depressions and/or "hearth-like" features were discovered in each of the test squares. In some cases, e.g., N100/E102, the depression contained the only artifactual material recovered from the test square. Stratigraphies from test squares N100/E102, N103/E103, and N99/E105 were ambiguous in their definition of these features as cultural or natural. Excavation of test square N99/E103 however, solved the problem and showed these anomalies to be solifluction features.

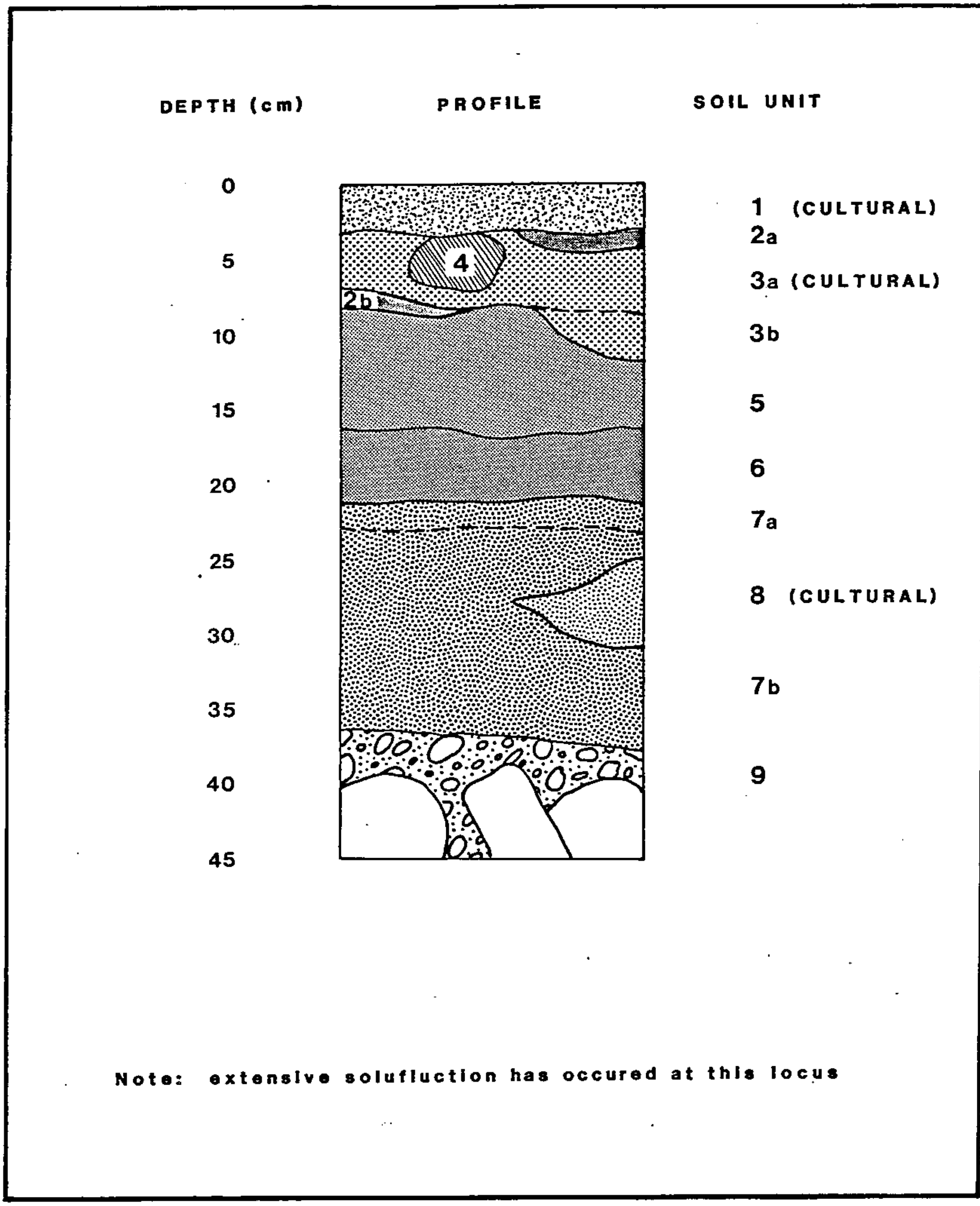


Figure 125. Composite Soil Profile Locus A TLM 042.

TABLE 24

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 042, LOCUS A

Soil/Sediment Unit	Description
1	Duff; (7.5 YR 6/4 light brown); variable thickness, often times less than 1 cm, continuous with clear lower boundary.
2a	Thin charcoal mat associated with unit 3a.
2b	Thin charcoal mat associated with unit 3a.
3a	Tephra; (10 YR 8/2 white); sporadic in occurrence, well sorted, clear contact with both upper and lower units.
3a	Fine silt with intermixed tephra (?); (2.5 Y 3/2 very dark grayish brown); discontinuous distribution, where present contacts are sharp; fairly well sorted, at times thin discontinuous charcoal lens are present (soil unit 1a).
3a	Fine silt with intermixed tephra; (10 YR 7/2 light gray); discontinuous in extent, fairly well sorted, clear upper and lower boundaries. Perhaps differential leaching seen in units 3a and 4 and could be classified as single unit.
3b	Tephra with intermixed fine sand; (10 YR 7/2 light gray), localized in appearance, sharp contacts.

TABLE 24 (Continued)

Soil/Sediment Unit	Description
3b	Fine sand intermixed with tephra; (7.5 YR 5/6 strong brown); localized in appearance, sharp contacts.
4	Medium grained sand (2.5 Y 6/4 light yellowish brown); disturbed area localized appearance, sharp lower contact upper contact intermixed with units 3a and 5.
4	Mixed tephra and silt - mixed zone of unit 3a, localized in appearance, gradational contacts.
5	Fine silt with intermixed tephra; (10 YR 6/6 brownigh yellow), discontinuous in extent but found in all test squares. Contacts vary from clear to gradational. This unit is probably a mixture of silt and middle, golden tephra.
5	Silt intermixed with tephra, oxidized portion of unit 5, localized appearance.
6	Silty sand intermixed with tephra; (2.5 YR 5/2 grayish brown) discontinuous in extent but with sharp boundaries where present.
7a	Fine to medium grained sand, oxidized; (10 YR 5/6 yellowish brown); irregular zone of oxidized sand, probably oxidized horizon associated with soil unit 7b localized in appearance; sharp upper boundary, gradational lower boundary.

TABLE 24 (Continued)

Soil/Sediment Unit	Description
7b	Medium sized sand; (2.5 Y 4/4 olive brown); generally is well sorted gradational boundaries with an upper oxidized sand (unit 7a) and coarser material below (unit 9).
8 Cultural	Fine-grained sand, oxidized; (10 YR 4/6 dark yellowish brown); localized in appearance, sharp contacts.
9	Mixed cobble/boulder/sand; variable in nature from square to square--at times poorly sorted (e.g., N100/E102) and in other cases a fining-upward cycle is evident (e.g., N99/E100). Maximum boulder size is c. 50 cm. Boulders are both rounded and angular (angular probably a function of frost cracking). There is a slight orientation of rocks in NE-SW line that parallels current slope.

Three of the five test squares yielded artifactual material at locus A (Table 25). A total of 151 lithic pieces and three bone fragments were collected at the site. Most of this material was collected from a flake scatter on the slope surface below the site. No diagnostic artifacts were found and the recovered faunal remains were too fragmentary for identification.

The lithic flakes and fragments were composed of minimally three rock types; siltstone, basalt and rhyolite. The material classified as siltstone shows variability in texture and color that is probably due to differential weathering of this material. Much of the lithic debetage shows evidence of frost shattering.

Artifactual material was associated with the upper organic soil units, oxidized sand and depressions filled with tephra and organic material. As discussed under soil stratigraphy, most of the sediments in the test area were disturbed; thus, it is doubtful that any of the artifacts were found in situ. It seems likely that the artifacts were originally deposited in upper organic rich zones and subsequently soluflucted or eroded out to their current positions.

The limited extent of flat surface on the ridge top coupled with the sterility of the test square N103/E103 and 1980 shovel test 2 indicated that there is little chance of finding cultural material in place and that it is probable that most or all of the original site has been or is in the process of being eroded.

Four shovel tests were dug ca. 15 m to the west of the main locus of testing (Figure 123). A single basalt flake was found in the back dirt of one of the tests located 60 cm north of an isolated surface flake. The other three shovel tests were sterile.

TABLE 25

ARTIFACT SUMMARY, TLM 042 LOCUS A

TOTAL = 154

124	Flakes and flake fragments, siltstone
15	Flakes and flake fragments, basalt
2	Prismatic flakes, siltstone
3	Biface edge reduction flakes, siltstone
3	Retouched flake fragment, siltstone
1	Blade-like flake, siltstone
1	Graver? siltstone
3	Bone fragments (unidentified)
2	Flake fragment, rhyolite

Surface		Subsurface
105	Flakes and fragments, siltstone	19
4	Flakes and fragments, basalt	11
1	Prismatic flakes, siltstone	1
3	Reduction flakes, siltstone	
3	Retouched flake, siltstone	
1	Blade-like flake, siltstone	
1	Graver? siltstone	
	Bone fragments	3
	Flake fragments, rhyolite	2
TOTAL = 118		35

Evaluation:

Systematic testing at locus A has provided sufficient data to document that virtually all of this site has been destroyed through erosion. The vast majority of artifactual material recovered was derived from the exposed and actively eroding southern slope, which suggests that the site was once located in this direction. While the composite soil profile suggests the site may have been multicomponent, the data are too inconclusive to assertain this with certainty. However the weathered silt stone (or chert) which comprise the majority of the specimens recovered from the errosional surface bear some resemblance to the lithologic type used to manufacture the artifacts from the lowest component at Tuff Creek North. The morphology of many of these specimens also suggest a blade and blade core industry, which may be comparable to the same component. The superficial similarity of the specimens and the fact that a considerable period of time was required for the bluff edge upon which the site was located to erode to its present position, may suggest that this site may have been roughly the same age as the lowest component at Tuff Creek North and may have predated the Oshetna tephra. Further excavation at this locus does not appear to be warranted.

Locus B:

Location: See section 3.2 (ix).

Testing: Systematic testing of locus B included the excavation of six 1 m test squares (Figure 124). Test squares N503/E494 and N503/E499 were placed north of the reconnaissance tests where less disturbance of the soil units from solifluction and erosion was expected. The remaining four test squares were placed closer to the reconnaissance tests to further define the spacial extent of the site.

Discussion:

Cultural material was recovered from five of the six text squares. Only one test square (N497/E499) produced faunal material and N503/E499 was culturally sterile. A total of 108 waste flakes, one retouched flake, a quartzite spall, 4 possible fire cracked rocks and a side-notched projectile point base were recovered during systematic teting, in addition to 23 calcined bone fragments.

Stratigraphy at TLM 042 locus B consisted of approximately 35 cm of deposition overlying glacial drift (Figure 126 and Table 26). Stratigraphic units in test squares N500/E494 and N497/E499 showed a great deal of disturbance as a result of soil creep and solifluction. Test squares placed on more level portions of the site showed less post depositional disturbance but very little cultural material was recovered from these tests.

A total of five stratigraphic units was identified above glacial drift (Figure 126, Table 26). A silty sand (unit 5) overlies unsorted drift (unit 6). Above the sand unit is a discontinuous paleosol (unit 4) consisting of peat and charcoal fragments associated with cultural material. A mixed silt and tephra (unit 3) overlies this paleosol, or unit 5, where the paleosol is not present. Unit 3, the Watana tephra, was the only volcanic ash recognized at locus B. A fine sandy loam (unit 2) overlies the mixed silt and Watana tephra. A radiocarbon determination on charcoal sample UA81-230-121 from unit 2 in test square N499/E105 yielded a modern date (DIC-2282). No cultural material was directly associated with this charcoal. The uppermost stratigraphic unit at locus B consists of an organic root and leaf horizon (unit 1) which is continuous over most of the site.

Cultural material at locus B occurred in all stratigraphic units above glacial drift. Faunal material in test square N497/E499 was associated primarily with the paleosol (unit 4) below the mixed Watana tephra but

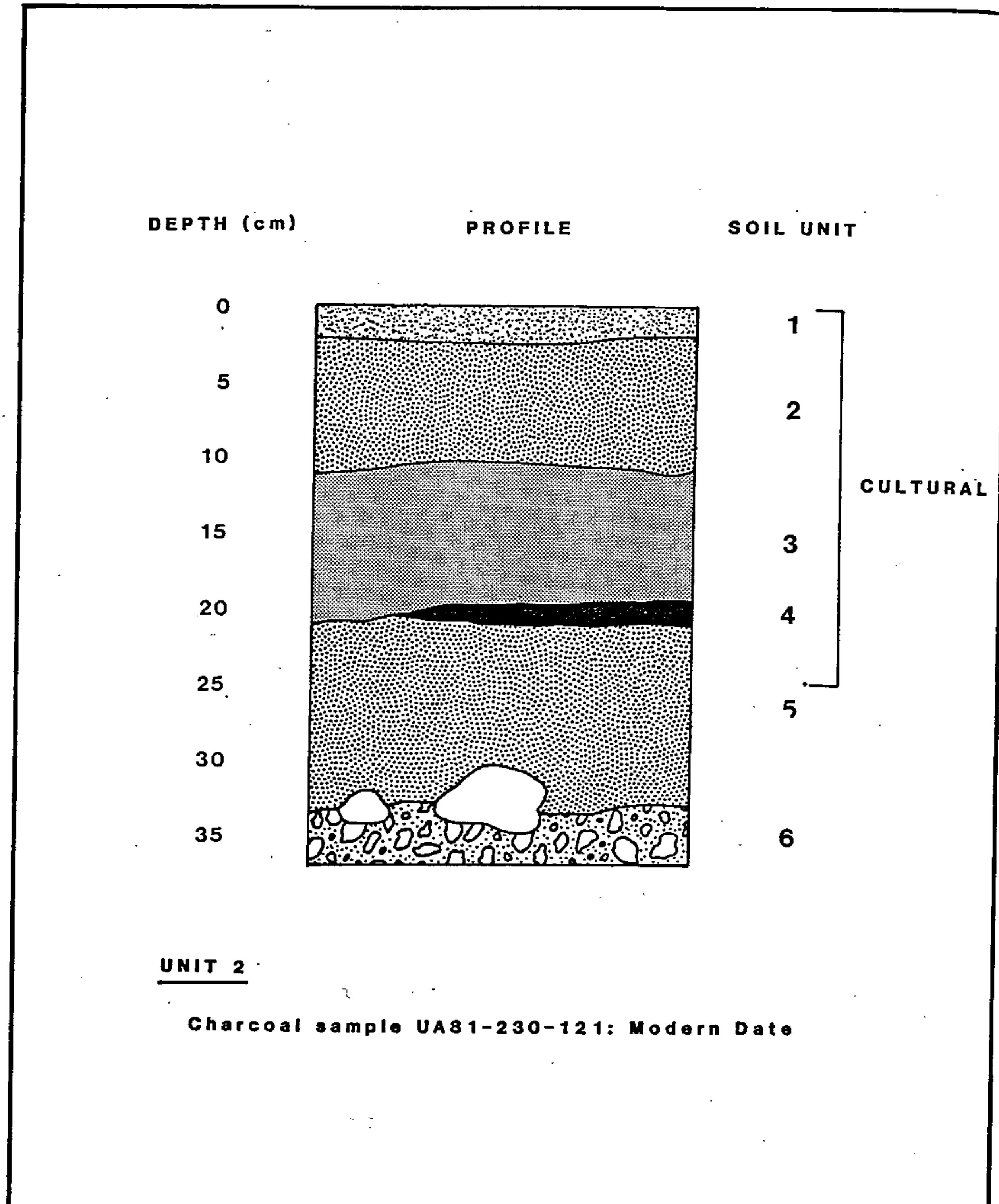


Figure 126. Composite Soil Profile Locus B TLM 042.

TABLE 26

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 042, LOCUS B

Soil Unit	Description
1	Organic, roots and leaf litter. Thickness varies from 1 cm to 3 cm. Continuous over most but not all of site. Lower boundary abrupt and smooth.
2	Fine sandy loam. Yellow brown (10 YR 5/5). Thickness varies from 2 cm to 6 cm. Lower boundary abrupt where it overlies unit 3, clear where it overlies unit 4.
3	Mixed silt and tephra. Occurs in three subunits varying in color from very dark gray (10 YR 3/1) to light grayish brown (10 YR 6/2) to yellowish brown (10 YR 6/2). Dries to a light powder. Present throughout most of site. Lower boundary abrupt. (Watana Tephra)
4	Peat with charcoal fragments. Discontinuous. Buried A horizon. (Paleosol)
5	Silty very fine sand. Occurs in four subunits varying in color from very dark grayish brown (2.5 3/2) to grayish brown (2.5 5/2) to dark yellowish brown (10 YR 4/6) to olive (5 Y 4.5/3). This unit grades coarser with depth and occurs throughout site. Lower boundary very abrupt.
6	Gravel, well rounded boulders, cobbles, pebbles and coarse sand. Maximum boulder size observed ca. 60 cm diameter.

also occurred in units 2 and 5 (Figure 126, Table 26). Faunal material consisted entirely of unidentifiable calcined small to medium sized mammal long bone fragments (Table 27).

Lithic material consisting of basalt, chert, rhyolite and obsidian artifacts was recovered from five test squares and occurred in all stratigraphic units above glacial drift (Table 28). The largest concentration of lithic material (87 flakes and a point base) occurred in test square N497/E499. In this test a rhyolite side-notched point base (UA81-230-27) was excavated from the organic horizon (unit 1). The largest concentration of lithic material (57 rhyolite waste flakes) in this test occurred in the silt and sand horizon (unit 5) below the paleosol (unit 4) containing calcined bone. It appears that the cultural material at locus B is primarily associated with a former ground surface represented by the paleosol (unit 4) in this test. The occurrance of cultural material above and below unit 4 is probably a result of post depositional disturbances which have resulted in a mixing of artifacts and sediments. Because of these disturbances it is difficult to determine good stratigraphic provenience for the cultural material at locus B. It is also unclear whether more than a single component is present at this locus because of this mixing as a result of natural processes.

Artifacts from other test squares do not help to clarify the question of a second component because of extensive post depositional disturbance and because few artifacts were recovered in situ. A retouched black chert flake (UA81-230-18) was excavated from the lower silt and sand horizon (unit 5) in test square N500/E498. This flake shows a possible burin facet on one margin and dorsal polish which may suggest hafting. This artifact and the point base from the organic horizon in N497/E499 were the only diagnostic specimens recovered during systematic testing at locus B. Diagnostic artifacts recovered during earlier reconnaissance testing at this locus include an edge-ground basalt side-notched biface (UA80-149-31), a retouched chert flake (UA80-149-30) which were

TABLE 27

FAUNAL MATERIAL LOCUS B, TLM 042

Soil Unit	Description
	Locus B N497/E499
2	1 Long bone fragment, calcined, small-medium mammal
4	21 Long bone fragments, calcined, small-medium mammal
5	1 Long bone fragment, calcined, small-medium mammal

TABLE 28

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 042, LOCUS B

Soil Unit	Description
	<u>N503/E494</u>
2	1 Flake
	<u>N499/E501</u>
Screen (backdirt)	1 Flake, black obsidian
	<u>N500/E498</u>
Top of 4	4 Flakes, light gray chert
	1 Flake, black obsidian
	<u>N500/E498</u>
1	Rock fragments, possibly fire cracked
4	5 Flakes, gray basalt
5	4 Flakes, gray basalt
	1 Flake, black chert, retouched and possibly burinated, dorsal polishing
Screen (backdirt)	2 Flakes, gray basalt
	1 Flake, gray chert
	1 Flake, black chert

TABLE 28 (Continued)

Soil Unit	Description
	<u>N497/E499</u>
1	1 Projectile point base, gray rhyolite, asymetric side-notching, concave base 2 Flakes, gray basalt 1 Flake, gray rhyolite
2	8 Flakes, dark gray rhyolite 5 Flakes, light gray rhyolite 1 Flake, black obsidian
3	3 Flakes, dark gray rhyolite 3 Flakes, light gray rhyolite 1 Flake, black obsidian
3/4 Contact	1 Quartzite spall, with cortex
4	1 Flake, light gray rhyolite 1 Flake, gray chert
5	57 Flakes, dark gray rhyolite
Screen (backdirt)	2 Flakes, dark gray rhyolite 1 Flake, light gray rhyolite

surface collected at locus B and a basalt endscraper fragment (UA80-149-34) excavated 15 cm to 16 cm below the ground surface in test 1.

It appears that the original context of most of the site at locus B has been lost as a result of erosion and solifluction. Cryoturbation has mixed cultural material and no clear cultural horizons are discernable other than the paleosol horizon (unit 4) below the Watana tephra. Test squares placed back from the eroding bluff edge lacked faunal remains and were either sterile or produced little artifactual material. It appears that most of the site has been lost to erosion. Locus B appears to occupy an area of approximately 8 m by 10 m in extent (Figure 124).

Evaluation:

Lack of well defined features and the limited assemblage of artifacts make it difficult to assess the function of TLM 042, locus B. The presence of two point bases, an endscraper fragment, waste flakes, and calcined bone suggest locus B was probably a temporary campsite. Its position at the edge of a bluff overlooking a lower alluvial terrace and the Susitna River suggest that locus B functioned as a briefly occupied hunting camp from which large mammals moving in the surrounding area could be observed. The 1.5 km long peninsula on which the two loci of TLM 042, as well as site TLM 026, occur is the easiest and most direct access to the Susitna River from the uplands on the north side of the Susitna. It is likely that this peninsula was used to travel between the Susitna River and the uplands to the north. Both loci of TLM 042 are situated on the southeastern facing edge of this peninsula overlooking a lower terrace, rather than on the northeastern edge which drops steeply at an angle of 30 to 40 degrees all the way to the Susitna River, which may support the additional inference that locus B, as well as locus A, was probably a hunting overlook.

The diverse lithologies and some of the artifact types, such as the side notched projectile point and the burin spall, commonly associated with different cultural traditions (e.g., Northern Archaic and Denali Complex, respectively) may indicate that the site is multicomponent. However, because of soil creep, cryoturbation, and erosion this cannot be documented, based on the results of systematic testing. Although further work at TLM 042 Locus B may possibly resolve some of these problems, the active and apparently extensive erosion of this site may render such efforts fruitless.

(i) Systematic Testing TLM 043--No Name Creek Site

Location: See section 3.2 (a-x)

Testing: Six 1 m test squares and eleven shovel tests were excavated at this site (Figure 127).

Discussion:

Faunal material, fire cracked rock and chert flakes were recovered from this site, all of which are attributed to a single cultural component, located in soil units 1 and 2 (Figure 128).

Test square N53/E50 was excavated to test the northern extent of the cultural material distribution. Cultural remains were limited to three small bone fragments recovered from unit 2a (Figure 128, Table 29). Test square N46/E49 was excavated to test the southern extent of the site. Cultural remains were limited to six pieces of fire cracked rock and a single bone fragment, all from unit 2. Test square N49/E42 was excavated to test the western extent of the site. No cultural material was recovered from this test. Test square N49/E48 was excavated to yield information on the cultural material first encountered in the reconnaissance level test.

Cultural material was restricted to unit 2 and consisted of nine chert flakes and three bone fragments. Five chert flakes exhibiting thermal

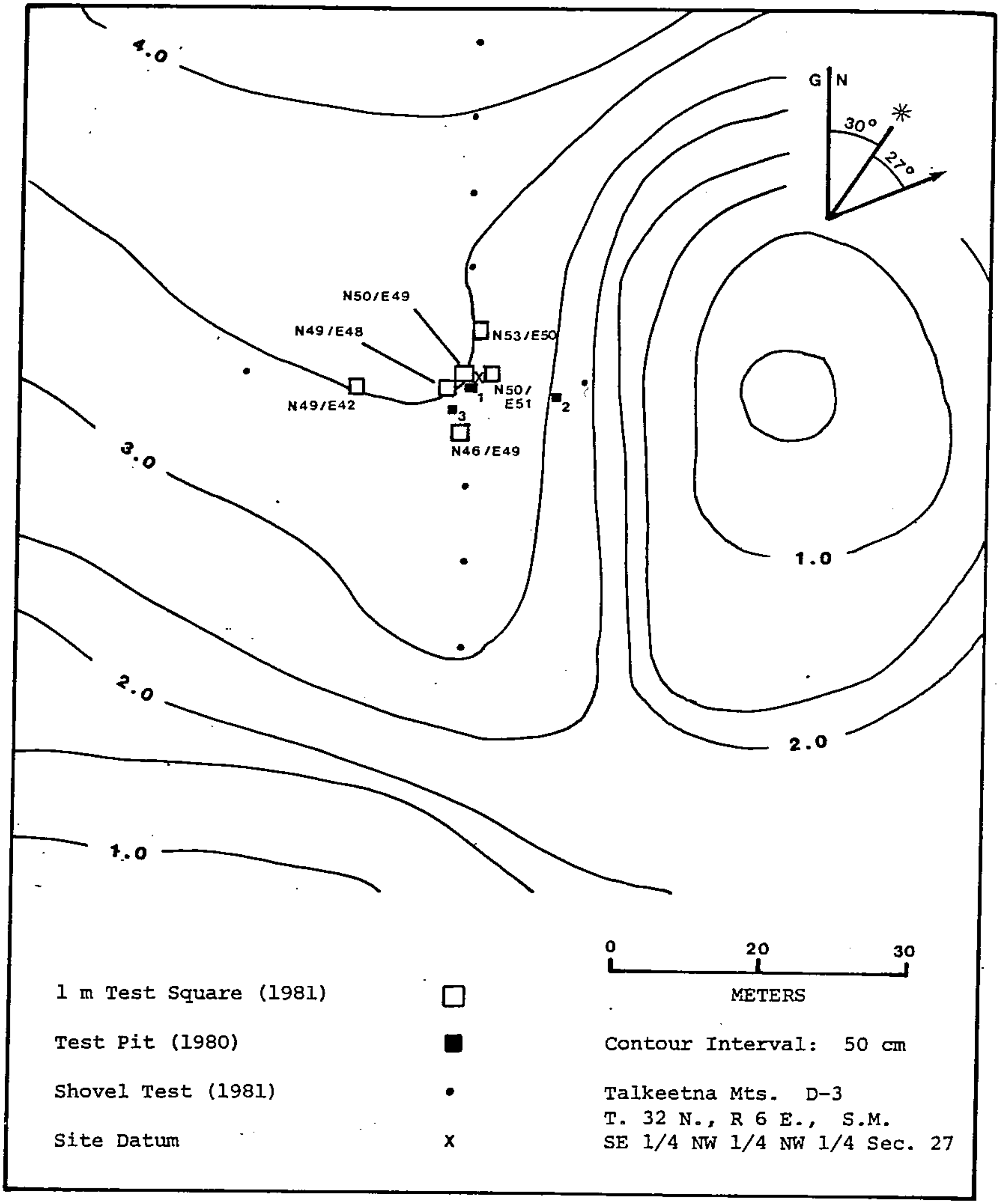


Figure 127. Site Map TLM 043.

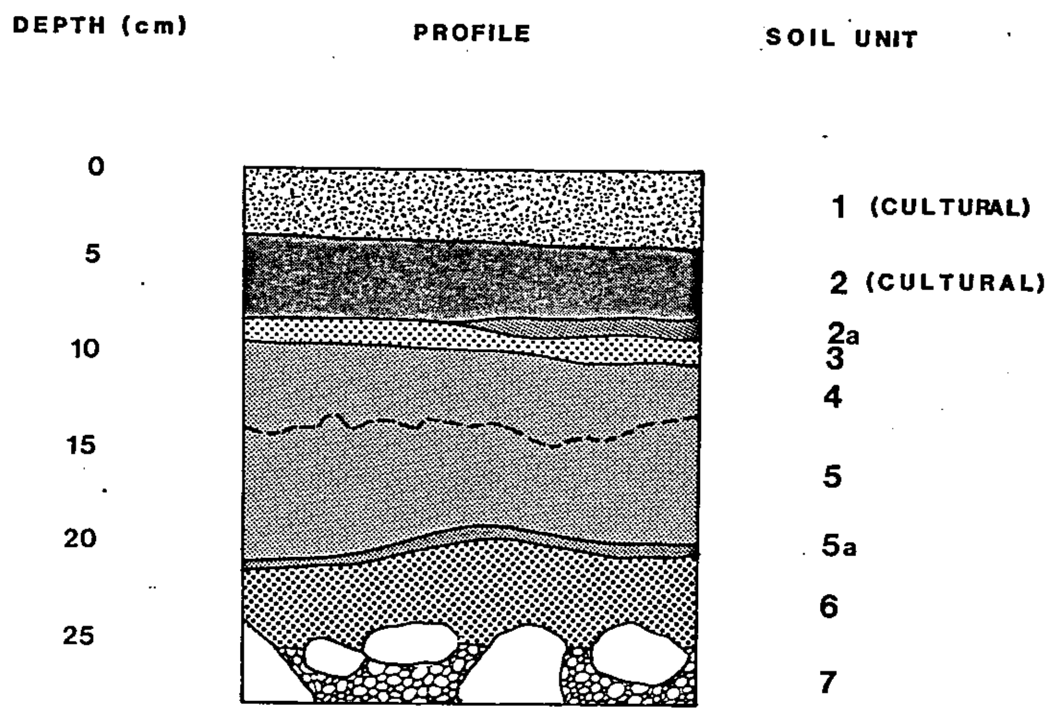


Figure 128. Composite Soil Profile TLM 043.

TABLE 29

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 043

Soil Unit	Description
1	Highly organic dark reddish brown sandy loam with root pack, burned and unburned wood. Thickness varies as a function of surface vegetation, indiscrete boundary to unit below, continuous occurrence throughout site.
2	Highly organic silt loam with roots, charcoal, and unburned wood present; very dark gray (10 YR 3/1 moist). At its lower boundary and limited in extent is a thin (1-2 cm) black (2.5Y 2.75/0 moist silt loam (designated as unit 2a), lower boundary discrete and irregular.
3	Upper tephra (Devil). Light grayish brown (10 YR 6/2 moist) silt loam, occurrence varies but present throughout site, boundary to next unit below discrete.
4	Mottled dark redish brown (5 YR 3/2.5 moist) tephra (Watana), occurrence mixed with unit 5, lower boundary to unit 5 indiscrete.
5	Yellowish brown (10 YR 5/4 moist) tephra (Watana), occurrence mixed with unit 4, lower boundary discrete and in places, marked by a thin black (5Y 2.5/2 moist) band of loam (designated 5a).
6	Lower tephra deposit (Oshetna). Grayish brown (10 YR 5/2 moist), occurrence throughout site, irregular and conforms to top surface of boulders and cobbles of underlying unit.

TABLE 29 (Continued)

Soil Unit	Description
7	Coarse sandy loam with over 50% (by volume) rounded pebbles, cobbles, and boulders. Matrix strong brown (7.5 YR 4/5 moist) occurs throughout site, depth unknown.

spalling, and potlidding, are derived from one chert flake (UA81-221-45). All thermal spalls from the flake were found within this single square. Three other chert flakes, representing three different chert varieties, were also recovered. Test square N50/E49 revealed a dense concentration of faunal remains in the southeast quadrant. In addition to the faunal remains, six chert flakes and one chert nodule were also recovered. The chert flakes exhibit thermal spalling and a glossy surface sheen, indicative of exposure to high temperatures. Test square N50/E51 was excavated to test the eastern limits of the site. This test yielded one chert flake, six bone fragments, and 30 fire cracked rocks (Table 30).

Faunal material from this site was restricted to units 1 and 2. Over 10,000 bone fragments were recovered from the soil/bone matrix, most of which were burned. Species represented include caribou (Rangifer tarandus) and possibly moose (Alces alces, 1 tooth fragment) (Table 31).

In addition to the excavation of six 1 m test squares, 11 shovel tests were excavated at the site along the north-south and east-west axis of the grid. Annual frost impeded progress on six of the eleven tests. However, none of the shovel tests produced cultural material. Soil profiles revealed the stratigraphy in the shovel tests to be consistent with the 1 m test squares.

Seven soil units were identified at this site. Cultural material was recovered from the upper two units only (units 1 and 2, Figure 128). Underlying the cultural units were three units (units 3, 4/5 and 6), identified as tephra units, Devil, Watana and Oshetna, respectively (Figure 128, Table 29).

Evaluation:

The site occurs on a comparatively minor terrace near the junction of a small clear water tributary to the Susitna in the valley bottom. It

TABLE 30

ARTIFACT SUMMARY BY TEST SQUARE, TLM 043

N53/E50	3 Bone fragments
N46/E49	1 Bone fragment 6 Fire cracked rocks
N49/E48	9 Chert flakes 3 Bone fragments
N50/E49	1 Sample of feature matrix (bone and flakes) 6 Chert flakes 1 Chert Nodule
N50/E51	1 Chert flake 6 Bone fragments 30 Fire cracked rocks
N49/E12	No cultural material recovered.

TABLE 31

FAUNAL MATERIAL, TLM 043

Soil Unit	Description
	N50/E94
2	Ca. 10,000 long bone fragments, calcined, medium-large mammal
	7 Long bone fragments, heavily burned, medium-large mammal
	3 Medapodial fragments, heavily burned, caribou (Rangifer tarandus)
	1 Medapodial fragment, shaft, lightly burned, caribou (Rangifer tarandus)
	1 Rib fragment, unburned, large mammal
	1 Phalanx fragment, unburned, large mammal
	1 Phalanx fragment, heavily burned, caribou (Rangifer tarandus)
	3 Tooth fragments, unburned, caribou (Rangifer tarandus) or moose (Alces alces)
	N50/E51
2	10 Long bone fragments, calcined, medium-large mammal
	N49/E48
1	27 Long bone fragments, calcined, madium-large mammal
2	12 Long bone fragments, calcined, small-large mammal
	N46/E49
2?	1 Long bone fragment, calcined, medium-large mammal
2?	3 Long bone fragments, calcined, medium-large mammal

probably represents the remains of a hunting camp occupied for a relatively short period of time. The distribution of fire cracked rock, caribou and possibly moose remains, and the ecological situation of the site is strikingly similar to that of the Tsusena Creek site (TLM 022). Both sites could well represent late prehistoric Athapaskan occupation of the Susitna valley. A striking dissimilarity between the sites is the apparent occurrence of lithic debetage at TLM 043 which indicates that stone was heat treated to alter its crystaline structure to render it more suitable for flaking. This is discernable by the "vitrious" surface of the debetage and the several thermal spalls recovered.

Although no radiocarbon determinations are available from this site, the occupation clearly occurred following deposition of the Devil tephra and quite probably sometime within the last 1000 years. The possibility for obtaining datable organic material from this site is high, and further excavation should enable more accurate dating of the occupation. Further excavation at this site is certainly warrented because it may yield tools of bone or antler, provide further documentation of this aspect of the prehistoric subsistance cycle and settlement pattern, and will provide new insights into prehistoric heat treating of lithics.

(j) Systematic Testing at TLM 046--Windy Knoll Site

Location: See section 3.7 (a-xiv).

Testing:

Systematic testing consisted of additional surface reconnaissance and the excavation of five 1 m test squares (Figure 129). Test squares were excavated adjacent to surface flake and bone scatters to determine whether subsurface cultural material was present and, if so, to ascertain its stratigraphic position. Test square N239/E198 was excavated at scatter 1 to test the possible continuation of subsurface cultural material first encountered in nearby reconnaissance test 2.

Discussion:

In addition to the four flake scatters identified during reconnaissance testing, two additional surface clusters were identified and field designated 5, between scatters 3 and 4, and scatter 6, on the west side of the knoll summit (Figure 129). Surface material was collected from two of the six lithic surface loci at the site. A red chert point base (UA81-263-73) was surface collected from scatter 6. This bifacially chipped, oblanceolate, straight-based point is similar to two other point bases (UA80-153-50, 53) previously surface collected from scatter 2. Additional surface collection at scatter 3 yielded 75 flakes and 9 bone fragments (Table 34).

Subsurface cultural material was recovered from three of the five test squares. The two sterile test squares were N226/E191, excavated at the northern limit of scatter 2, and N130/E227, placed directly upslope from flake scatter 4.

Stratigraphy at TLM 046 is characterized by very localized processes of erosion and reworking of stratigraphic units so that each test square

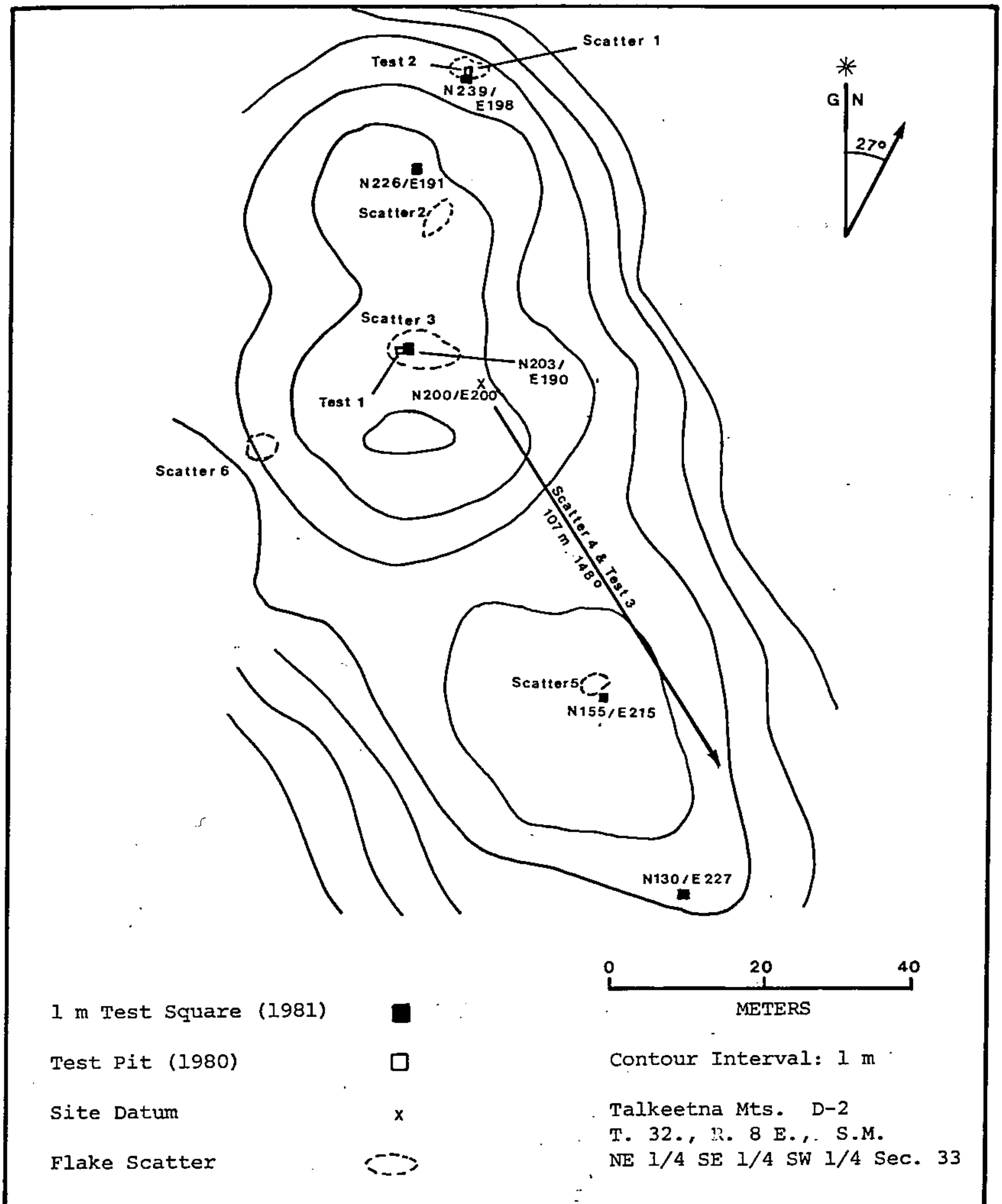


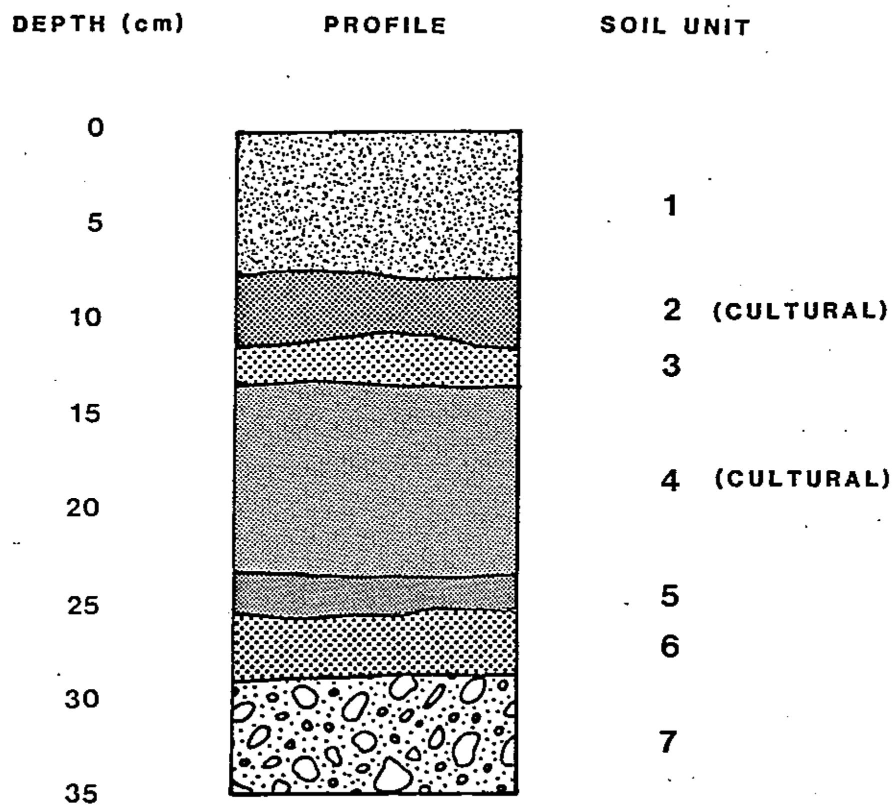
Figure 129. Site Map TLM 046.

revealed a unique stratigraphy. In addition, considerable cryoturbation is evident at the site adding further difficulty to correlation between test squares. Test square N130/E227 was the only test which revealed the full stratigraphic sequence present at the site (Figure 130, Table 32). The stratigraphy, as revealed in this test, is comprised of approximately 20 cm of deposition overlying glacial drift and fractured bedrock. The organic horizon, 5 cm to 7 cm thick in this test, is absent or very thin over most of the site and much of the surface of the site is deflated.

Three tephra horizons were identified at TLM 046 and all three occur in N130/E227. Both lithic and faunal material were recovered during subsurface testing. Cultural material occurred primarily in the middle (Watana) tephra (unit 4), below the Watana tephra associated with a cultural horizon containing charcoal and humic material (unit 5), and the lower (Oshetna) tephra (unit 6). Because of the localized stratigraphy, each test square which produced cultural material will be discussed separately.

N155/E215

This test square was excavated near a surface concentration of burned bone at flake scatter 5. Due to time limitations only the west half of this test was excavated. A total of 43 subsurface flakes and 332+ calcined long bone fragments, the majority of which were surface finds, were recovered from this test (Tables 33 and 34). Some lithic and faunal material was found in the upper cryoturbated stratigraphic units (unit 1 and 2) but the concentration of cultural material occurred in a grayish brown silt horizon (unit 6) interpreted as Oshetna tephra mixed with glacial drift (unit 7). This cultural horizon contained finely divided organic material and charcoal and may represent an old living surface at the upper contact of the Oshetna and Watana tephra. Devil tephra is not present in this test and unit 5 (a possible paleosol) is not well defined. Deflation has eroded the ground surface so that the Oshetna



UNIT 2

Charcoal sample UA80-153-38a: 2340±145, 390 B.C.

Note: This radiocarbon determination is associated with a hearth feature from reconnaissance Test 2 in which unit 3 is not present

Figure 130. Composite Soil Profile TLM 046.

TABLE 32

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 046

Soil Unit	Description
1	Organic silt. Brown (10 YR 4/3). Includes silt, fine roots, very small amount of humus. Generally from 5 cm to 7 cm thick but discontinuous in places. (O horizon)
2	Finely divided organics with silt and charcoal fragments. Very dark gray (5 YR 3/1). Discontinuous and generally thin varying from 2 cm to 3 cm in thickness. Lower contact with unit 3 gradational. (A horizon)
3	Fine silt. (Tephra) Gray (7.5 YR 7/2). Discontinuous with charcoal fragments occasionally present. Sharp to gradational lower contact with unit 4. (Devil tephra)
4	Silt. (Tephra) Varies in color from oxidized strong brown (7.5 YR 5/6) to unoxidized light yellowish brown (10 YR 6/4). Generally 10 cm thick. Evidence of frost action and solufluction where oxidized bands are perpendicular to ground surface. Sharp lower contact with units 5 and 6. (Watana tephra)
5	Silt/Charcoal. Very dark gray (10 Yr 3/1). Thin discontinuous layer comprised of silt, charcoal and some humic material. Occasional pebbles present. Lower gradational contact with unit 6. (Paleosol)
6	Fine silt. (Tephra) Light brownish gray (2.5 Y 6/2). Discontinuous and in places mixed with unit 5. Generally 2 cm to 3 cm thick. Sharp lower contact with unit 7. (Oshetna tephra)
7	Unsorted silt, pebbles, gravels, cobbles and boulders. Varies in color from oxidized yellowish red (5 YR 4/6) to unoxidized olive (5 Y 5/3). Mixing with unit 6 occurs in some places. (Glacial Drift)

TABLE 33

FAUNAL MATERIAL, TLM 046

Soil Unit	Description
	N203/E190
Surface	25 Long bone fragments, calcined, medium-large mammal
Surface	129 Long bone fragments, calcined, medium-large mammal
Mixing 4 and 5	11,000+ Long bone fragments, calcined, small-large mammal
Surface	3 Long bone fragments, calcined, small-large mammal
Surface	2 Long bone fragments, calcined, small-large mammal
Surface	7 Long bone fragments, calcined, small-large mammal
	N239/E198
4	100+ Long bone fragments, calcined, small-large mammal
	N155/E215
Surface	300+ Long bone fragments, calcined, medium-large mammal
Contact 1 and 2	32 Long bone fragments, calcined, small-large mammal

TABLE 34

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 046

Soil Unit	Description
	Scatter #1
	N239/E198
4 (tephra)	89 Flakes, gray rhyolte
	2 Flakes, white rhyolite
	5 Flakes, basalt
	10 Flakes, gray chert
	2 Flakes, black chert
	1 Flake, dark gray chert
5	1 Flake, white rhyolite
	2 Flakes, basalt
	1 Flake, gray chert
7	10 Flakes, gray rhyolite
	1 Flake, basalt
	Scatter #3
Surface	61 Flakes, gray rhyolite
	14 Flakes, basalt
	N203/E190
4, 5	16 Flakes, white rhyolite
	3 Flakes, gray rhyolite
	17 Flakes, basalt
	1 Flake, dark gray chert
	1 Flake, brown chert

TABLE 34 (Continued)

Soil Unit	Description
	<u>Scatter #5</u>
	N155/E215
1	2 Flakes, dark gray chert
	25 Flakes, light gray rhyolite
	2 Flakes, basalt
	4 Flakes, light gray chert
	3 Flakes, brown-gray chert
	1 Flake, dark gray chert
	1 Flake, gray and brown banded chert
4 and 5	2 Flakes, light gray rhyolite
	1 Flake, gray rhyolite
	1 Flake, basalt
	1 Flake, brownish gray chert
	<u>Scatter #6</u>
	1 Projectile point base, red chert

tephra (unit 6) is exposed at the surface in the north wall of this test and consequently cultural material from this unit appears as a surface scatter. It is likely that the origin of cultural material at surface locus 5 is from this mixed Oshetna/Drift horizon (unit 6). Faunal material was too fragmentary for identification and no diagnostic lithic artifacts were recovered.

N203/E190

This test square was excavated at scatter 3 adjacent to reconnaissance test 1 which was sterile despite hundreds of bone fragments on the surface nearby. Surface collection at scatter 3 during reconnaissance testing produced 28 flakes and a gray chert endscraper (UA80-153-55) in addition to ca. 100 bone fragments. Because of time limitations, only the north half of this test square was excavated.

Excavation of N203/E190 revealed a probable hearth, 5 cm to 10 cm below the surface, which consisted of black silty sand mixed with calcined bone fragments, flakes and charcoal (Figure 130, unit 5). This cultural horizon was below a yellowish brown silt interpreted as Watana tephra (Figure 130, unit 4) which contained some calcined bone fragments. This was the only tephra present in the test. Both Devil and Oshetna tephra were missing. The cultural material in the Watana tephra is interpreted as having originated in unit 5 which had subsequently been mixed with the Watana tephra by cryoturbation. The possible hearth overlies a reddish brown silty coarse sand mixed with fractured and weathered bedrock.

Faunal material recovered from this test included 32 calcined long bone fragments collected from the surface of the test square and more than 11,000 calcined long bone fragments excavated from units 4 and 5 (Table 33). Thirty-eight basalt, chert and rhyolite waste flakes (Table 34) were recovered from the possible hearth (unit 5). Faunal material from this test was too fragmentary for identification and no diagnostic artifacts were recovered.

N239/E198

This test square was excavated at scatter 1, adjacent to reconnaissance test 2, which revealed charcoal associated with calcined bone and flakes 5 cm to 16 cm below the surface. A radiocarbon determination of 2340 ± 145 years: 390 B.C. (DIC-1903) was obtained on charcoal from test 2. N239/E198 was excavated to ascertain the extent and stratigraphic location of the cultural horizon revealed by test 2.

The stratigraphy of N239/E198 was extremely cryoturbated and ranged from very poor to none. Because of this, excavation in this test was done in arbitrary 10 cm levels. A brown silt interpreted as Watana tephra (unit 4) directly underlay a thin organic mat. Devil tephra was not present. Below the Watana tephra, which showed evidence of extensive mixing by solifluction, was a humic horizon (unit 5) consisting of black silt. Below unit 5 was a discontinuous, very dark brown silt lense, also containing humic material and mixed with glacial drift and fractured bedrock (unit 7). The organic buildup in soil units 5 and 7 is attributed to natural water collection in a small depression centered 2 m southwest of the test square. Due to the poor stratigraphy and mixing of stratigraphic units in N239/E198, no correlation can be made between the cultural material from this test square and the cultural material and radiocarbon date in test 2.

The cultural material in N239/E198 was mixed by cryoturbation but appeared to occur in association with the Watana tephra (unit 4). Both faunal material and lithic artifacts were recovered from this test. Faunal material excavated from the Watana tephra included ca. 100 calcined long bone fragments (Table 33). Lithic artifacts included 109 waste flakes of basalt, rhyolite and chert excavated from the Watana tephra (unit 4) and 15 flakes of the same lithologies excavated from the black silt humic horizon (unit 5) and the top of the glacial drift (Table 34).

Evaluation:

Extensive deflation has exposed six lithic concentrations at the summit of this knoll. Based on observed surface artifact distribution (Figure 129), the entire summit, comprising an area of approximately 40 m by 150 m appears to have been utilized as a site. Both the geomorphic setting and the nature of the artifacts suggests the use of TLM 046 as a hunting overlook and campsite. The surface collection of calcined bone in association with charcoal concentrations, surface finds of three projectile point bases and two endscrapers (and the lack of projectile point tips), suggests the site functioned as a campsite and overlook, and possibly a kill site. The commanding panoramic view, especially to the north overlooking a broad valley with several lakes makes this locale an excellent overlook site. Two other sites (TLM 044, TLM 045) are located on nearby knolls overlooking the same terrain and further demonstrates the excellent advantages of this locality for hunting.

Three probable hearth features were located during reconnaissance and systematic testing. The extremely poor stratigraphy and localized erosion at the site make correlation of subsurface cultural material between tests extremely difficult. The C^{14} determination of 2340 ± 145 B.P. on charcoal from the hearth in test 2 was the only date obtained, although charcoal from the other hearths was collected. This date cannot be correlated with other hearth features because of the lack of uniform stratigraphy at the site.

Cultural material from what are probably hearths in test squares N155/E215 and N203/E190 both occur below Watana tephra. In N155/E215, the only test in which Oshetna tephra occurs, the cultural material appears to be associated with the upper contact of the Oshetna and Watana tephras. In test square N239/E198 cultural material appears to be associated with the Watana tephra but both Devil and Oshetna tephra are absent in this test and solifluction has mixed stratigraphic units and artifacts. Association of cultural material with specific soil units is uncertain.

Evidence for more than a single component is inconclusive because of the extensive cryoturbation at this site. Horizontal distribution of lithic artifacts does not reveal difference between surface loci which might imply different occupations. Of 342 surface and subsurface artifacts, rhyolite is the most common lithology (68%) followed by basalt (21%), chert (10%) and obsidian (1%). Artifacts of all these lithologies (except obsidian) occur in approximately these ratios at all scatters with a sufficient number of artifacts to represent a valid sample (loci 1, 3, 5). Obsidian occurs only at locus 1 (Table 34).

Based on the above data, there appears to be at least one occupation of the site earlier than the deposition of the Watana tephra which is presently understood to have occurred 2300 to 3200 B.P. The date of 2340 ± 145 B.P. from test 2 may date this component but stratigraphic correlation is uncertain and a later component may be present at the site. Further detailed work at this site is essential if these problems are to be adequately addressed.

(k) Systematic Testing TLM 048, Duck Embryo North Site

Location: See section 3.2 (a-xi).

Testing: Five 1 m test squares were excavated at the site (Figure 131).

Discussion:

Four of the five test squares contained cultural material. All three tephra were present at the site, but in certain areas the contacts of the stratigraphic units were unclear or the tephras were mixed with other sediments. In spite of this ambiguity in stratigraphy, two components were clearly in evidence at this site.

Component I occurred stratigraphically above the Devil tephra (soil unit 3, Figure 132) and was defined in test squares, N34/E25 and

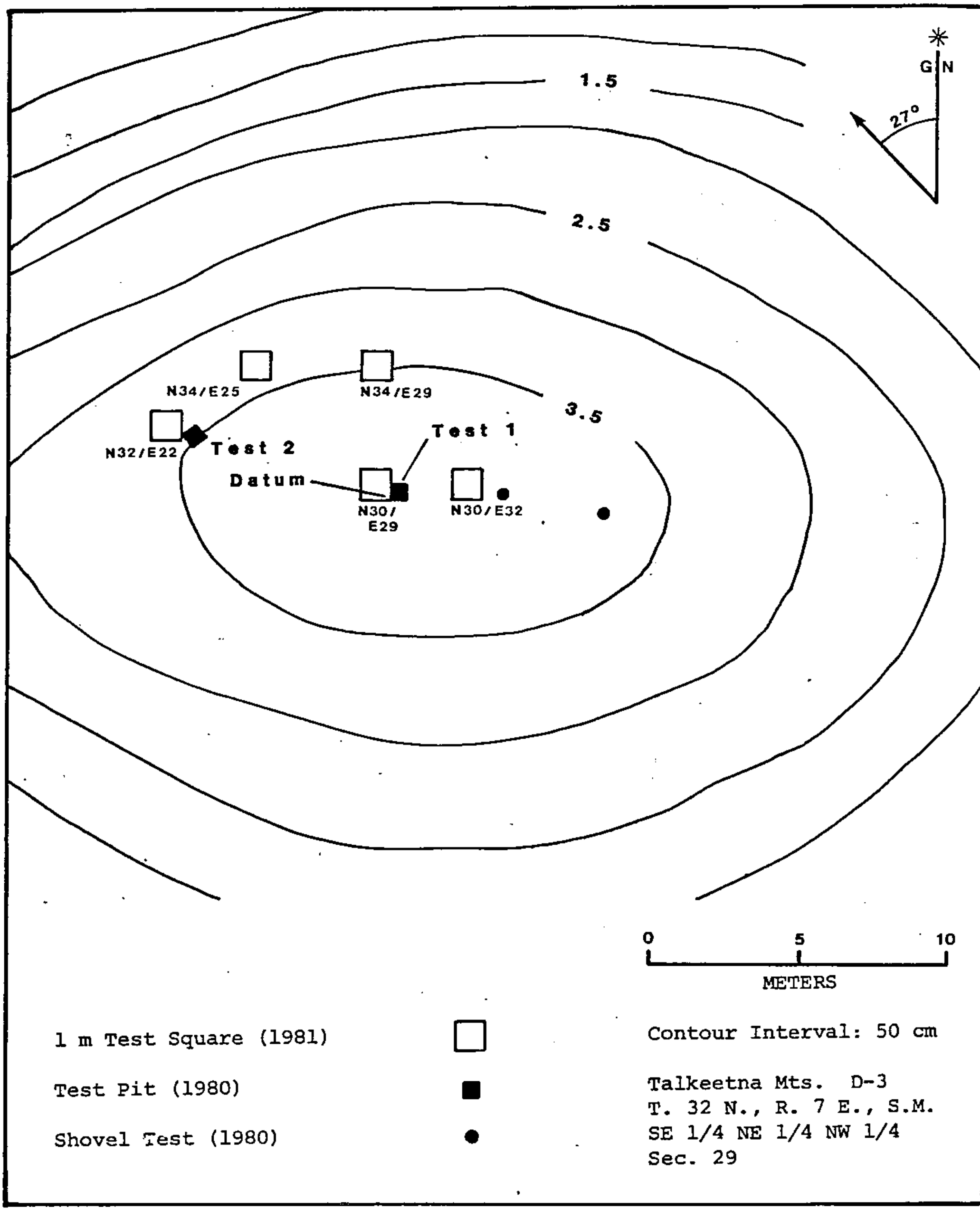


Figure 131. Site Map TLM 048.

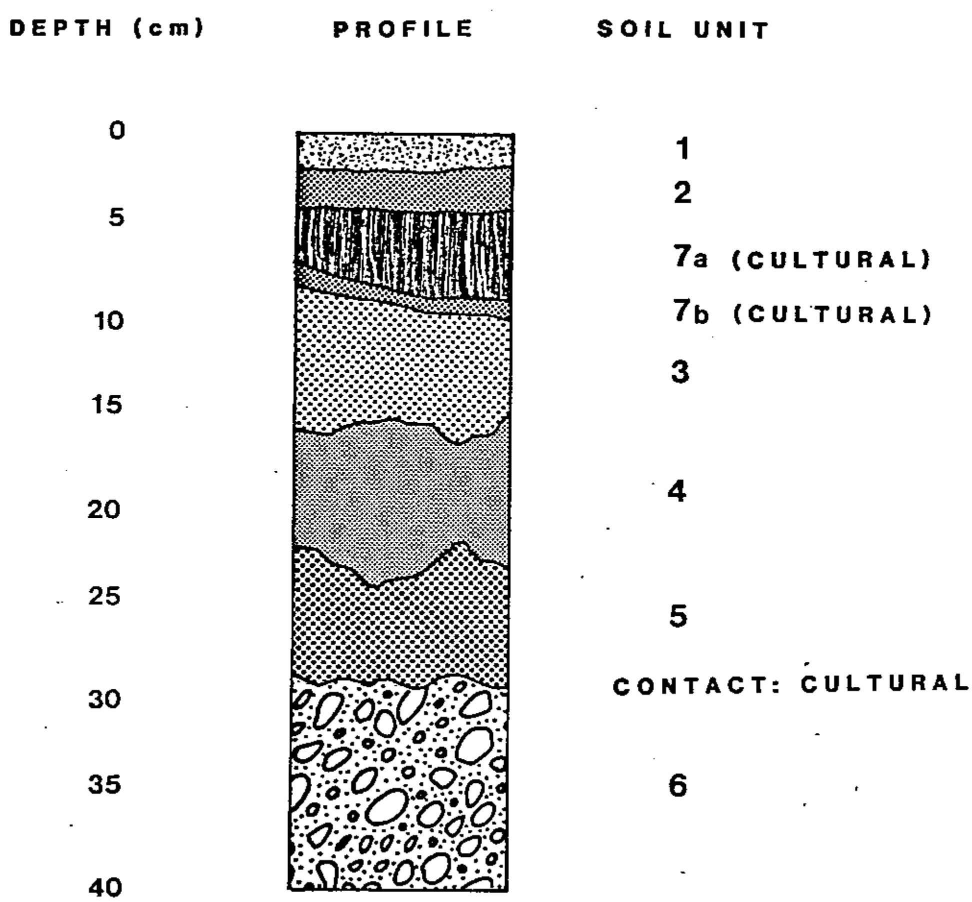


Figure 132. Composite Soil Profile TLM 048.

N32/E22. Component II was associated with soil units 5 and 6 (Figure 132, Table 35) in three test squares, N30/E29, N34/E29 and N34/E25. Component I was best represented in test square N32/E22 by a hearth that contained over 1000 pieces of burned bone and 300+ fire cracked rocks. Several of the specimens were identified as caribou (Rangifer tarandus) (Table 36). In addition, nine flakes and one flake core were located in this hearth (soil unit 7a; Figure 132), and the lithics show signs of being exposed to heat.

Component II is poorly represented in the tests and lies in the contact between the Oshetna ash and the glacial drift. Twelve flakes and one microblade fragment comprise the total artifact inventory for this component.

Artifacts that form this component are summarized in Tables 37 and 38. A portion of the hearth (Feature 1) was uncovered in test square N34/E22. A single fire cracked rock found in N34/E25 is the only other specimen from Component I that post dates the most recent tephra (Devil, soil unit 3, Figure 132).

The bone and rock concentration of Feature 1 was limited to the northern half of the test square. A thin layer of ash, however, did extend 15 cm to 50 cm beyond this concentration into the southeast and southwest quadrants respectively. A few isolated bone fragments and fire cracked rock were found in these two quadrants, but these represent only a fraction of the total collected from the entire feature. Over 300+ pieces of fire cracked rock were excavated from the hearth, ranging in size from ca. 20 cm to less than 1 cm. The matrix between the fire cracked rocks consisted of a combination of ash, bone fragments, and bone meal. Thousands of pieces of bone were present in the hearth with approximately 1000 pieces, representing the larger pieces, collected.

Nine flakes and one flake core were also present in Feature 1. Three flakes (2 quartzite and 1 basalt) are questionable. These flakes may be

TABLE 35

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 048

Soil Unit	Description
1	Organic layer; thick root mat in some squares; in other parts of site limited to a sparse lichen cover; variable in thickness; O-horizon.
2	Finely divided organic matter; (5 YR 2.5/2 dark reddish brown); irregular in extent sometimes absent; in some areas unit 2 contains many rootlets and small pieces of charcoal.
3	Tephra; variable in color (10 YR 6/1, gray, to 7.5 YR 6/2 pinkish gray); also variable in thickness, continuous in some units while discontinuous in others; contacts irregular and sharp; fine grained and well sorted.
4	Tephra; variable in color depending on degree of oxidation (5 YR 3/3 dark reddish brown to 10 YR 3/3 dark reddish brown to 10 YR 6/6 brownish yellow); unit discontinuous in occurrence; in places is mixed with other units (e.g., unit 5); generally no distinct oxidized band within unit as occurs commonly in area; instead oxidized areas are distributed throughout unit; contacts vary from gradational to sharp, well sorted to moderately well sorted with some sand, irregular contacts.

TABLE 35 (Continued)

Soil Unit	Description
5	Tephra; (10 YR 5/1 gray); unit rarely occurs in "pure" form but rather is intermixed with underlying drift (unit 6); discontinuous in extent and variable in thickness where present; upper and lower contacts (especially the latter) tend to be gradational; thin (c. 1 cm or less) band of organics is present sporadically at the upper contact of the unit, very irregular contacts.
6	Mixed sand, granules, and cobbles (7.5 YR 4/6 strong brown); oxidized throughout; cobbles generally rounded but occasional angular rock fragment; poorly sorted; maximum cobble size c. 15 cm; upper contact irregular and gradational.
Feature 1	
7A	Ash of cultural origin (10 YR 5/2 grayish brown); intermixed with rootlets, fire cracked rocks, bone, bone meal; present only in northern portion of N32/E22, in some areas may be mixed with unit 3 otherwise sharp contacts.
7B	Organic rich lens in ash (unit 7A) (7.5 YR 2/0 black); irregular in extent and thickness, sharp contacts where present.

TABLE 36

FAUNAL MATERIAL, TLM 048

Soil Unit	Description
	N32/E22
7A Associated with Feature 1	1 Metapodial fragment, heavily burned, caribou (<u>Rangifer tarandus</u>)
7A Associated with Feature 1	3 Phalanx fragments, calcined, caribou (<u>Rangifer tarandus</u>)
7A Associated with Feature 1	2 Phalanx fragments, 1st, calcined, caribou (<u>Rangifer tarandus</u>)
7A Associated with Feature 1	2 Metapodial fragments, possible burning, possible caribou (<u>Rangifer tarandus</u>)
7A Associated with Feature 1	1 Phalanx fragment, 3rd, calcined, caribou (<u>Rangifer tarandus</u>)
7A Associated with Feature 1	1104+ Long bone fragments, calcined, medium-large mammal
7A Associated with Feature 1	8 Long bone fragments, heavily burned, large mammal
7A Associated with Feature 1	1 Long bone fragment, calcined, medium-large mammal

TABLE 37

ARTIFACT SUMMARY, TLM 048

11	Flakes, chert
3	Flakes, rhyolite
1	Flake (?), basalt
2	Flakes (?), quartzite
4	Flakes, tuffaceous material
TOTAL - 21 Flakes	
1	Microblade fragment, tuffaceous material (?)
1	Flake core, chert
316+	Fire cracked rock
1178+	Bone fragments

TABLE 38

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 048

Soil Unit	Test Squares			
	N32/E22	N30/E29	N34/E25	N34/E29
1-2 Contact			1 Fire cracked rock	
Total =	0	0	1	0
7A and 7B	6 Flakes, chert 1 Flake(?) basalt 2 Flakes(?) quartzite 1 Flake core, chert 1178+ Bone fragments 315+ fire cracked rocks			
Total =	1503+	0	0	0
4-5 Contact (?)				2 Flakes, chert
Total =	0	0	0	2
5-6 Contact		2 Flakes, tuff 3 Flakes, rhyolite 2 Fragments, tuff	1 Flake, chert	2 Flakes, chert
Total =	0	8	1	2
TOTAL	1503+	8	2	4

the result of heat spalling from rocks and may not be cultural in origin. The remaining 6 flakes and the core are made of a brown chert and show evidence of exposure to heat.

Evaluation:

Component II, although present in a greater number of test squares, is more poorly defined stratigraphically than is the upper component. Because of the irregular and gradational contacts in the lower stratigraphic units at the site, the precise delineation of an original, depositional surface for the twelve flakes and 1 microblade fragment is difficult to address at this time. The 13 artifacts are definitely associated with the lowermost tephra (soil unit 5; Figure 132), but whether they lie on the contact of soil units 5 and 6, on the soil unit 4-5 contact, or on both contacts is not clear at this time.

This site is situated beside an 18 hectare lake at the top of a 20 m high discrete knoll and probably functioned as a brief camp during both periods of occupation. Proximity to the lake and its outlet may suggest exploitation of freshwater aquatic resources such as fish and waterfowl.

Component I shows evidence of activity centered around a hearth in association with caribou bone and fire cracked rock. It is underlain by the Devil tephra, thus giving this component a maximum limiting date of ca. A.D. 200.

(1) Systematic Testing at TLM 050--Permafrost Creek Site

Location: See section 3.2 (a-xii).

Testing:

Systematic testing of TLM 050 included the excavation of six 1 m test squares and five shovel tests (Figure 133). Four 1 m test squares were concentrated in the immediate vicinity of Test Pit 2 which produced cultural material from a possible hearth feature during reconnaissance testing. The two additional test squares and five shovel tests were placed to help define the southern extent of the site.

Discussion:

Cultural material was recovered from all six test squares from what appear to be two occupational horizons at the site. The two northernmost shovel tests produced three fire cracked rock fragments but no other cultural material (Figure 133). Lithic material, faunal material and fire cracked rock were recovered from test squares during systematic testing.

Stratigraphy throughout the site consisted of approximately 55 cm of fluvial deposits overlying glacial drift (Figure 134, Table 39). Eight major stratigraphic units were recognized. The upper organic mat with roots and decaying wood (unit 1) overlies a humic A horizon consisting of finely divided organics mixed with silt and sand (unit 2). Unit 3 consisted of sand and fine-grained gravel probably resulting from overbank deposits from flooding of the Susitna River. This unit was continuous throughout the site. Underlying unit 3 was a very dark brown silt and sand deposit (unit 4) which contained lighter colored silt and sand lenses. Unit 5 consisted of a mixed silt and tephra deposit which exhibited a distinctive E-B-C soil horizon indicating a prolonged period of weathering. The upper part of this unit is reworked and mixed, as

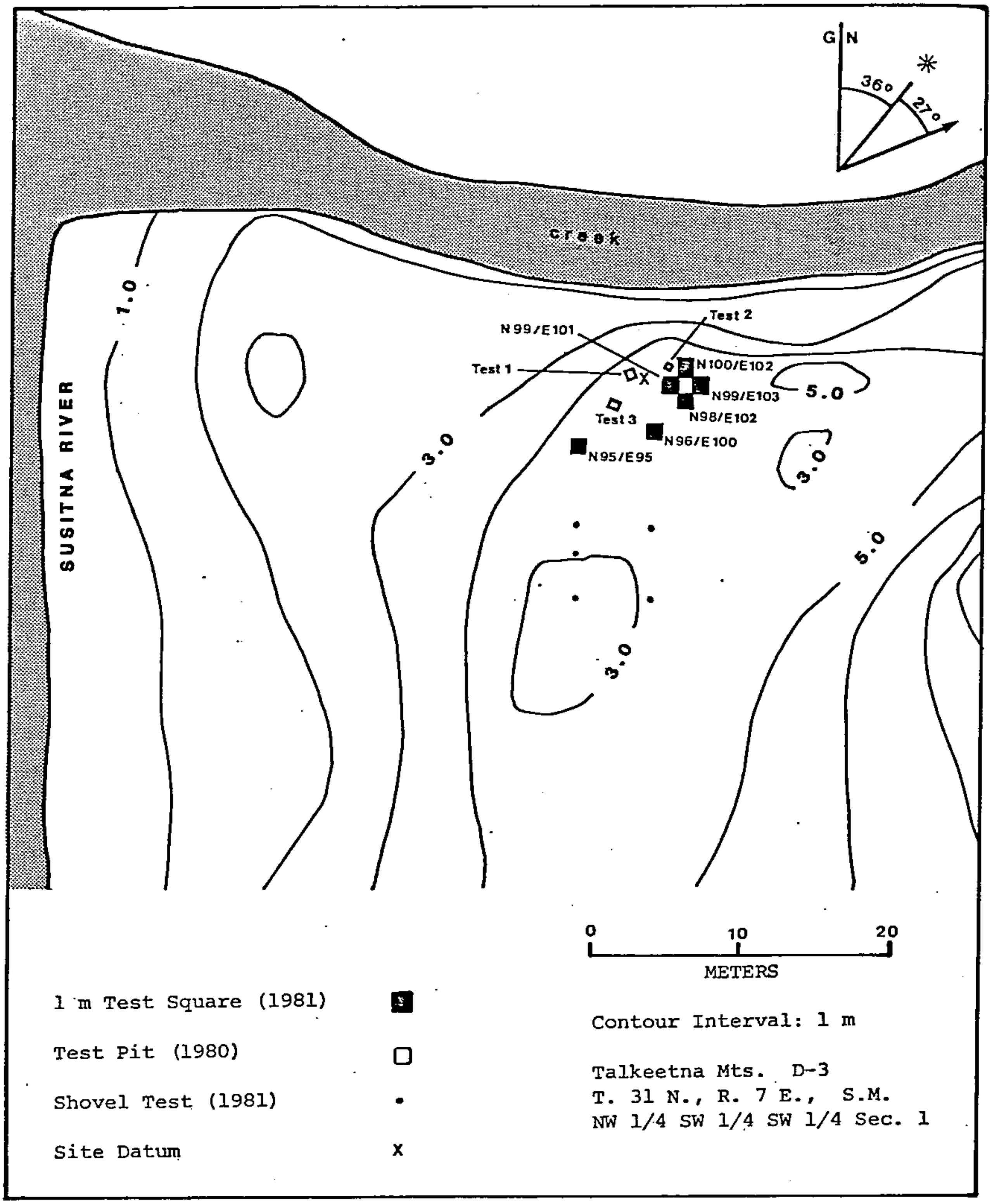


Figure 133. Site Map TLM 050.

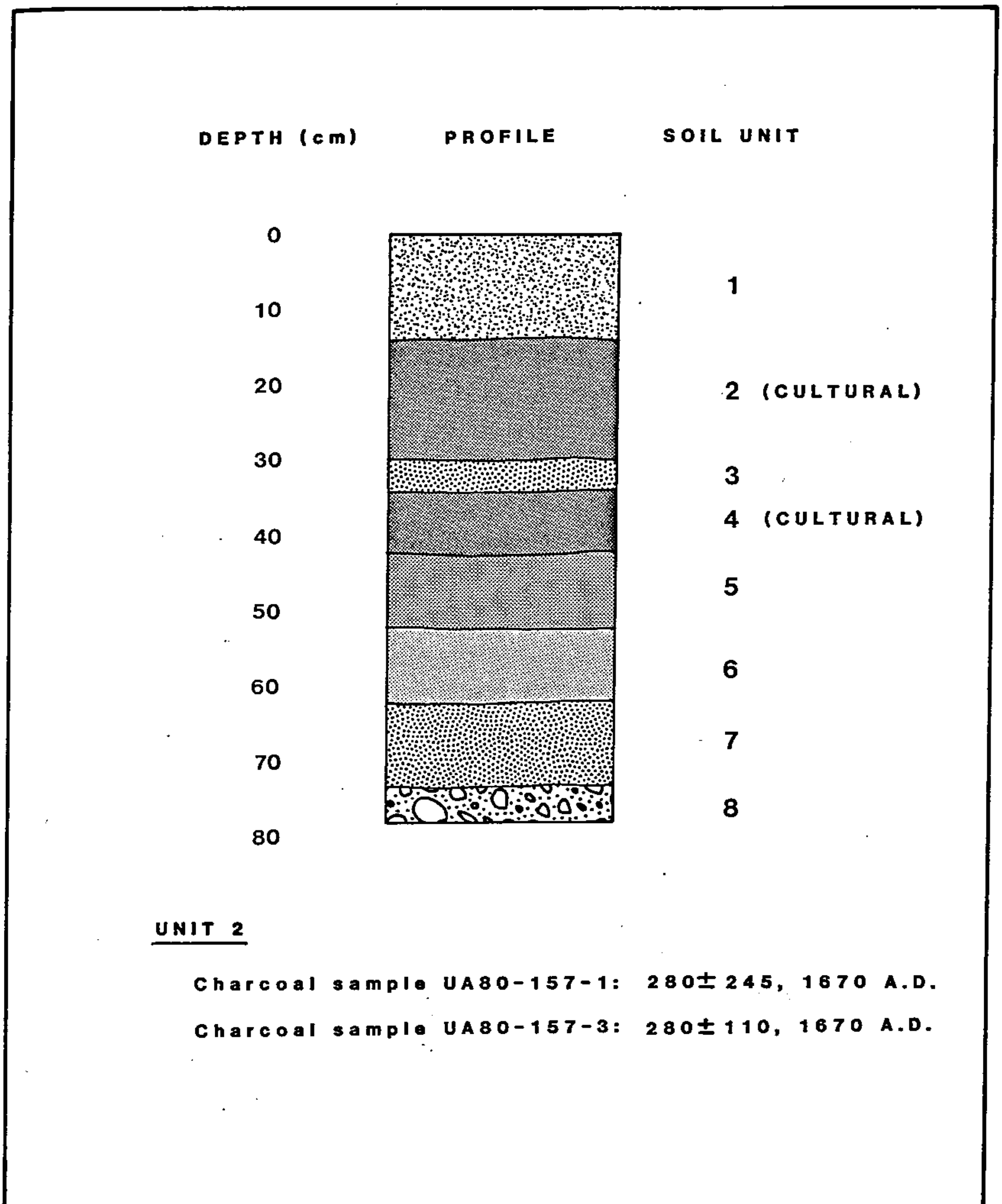


Figure 134. Composite Soil Profile TLM 050.

TABLE 39

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 050

Soil Unit	Description
1	Organic mat, roots up to 20 cm in diameter. Lower boundary sharp.
2	Silt. Very dark brown (10 YR 3/2). Varies in thickness from 15 cm to 20 cm, occurs over entire site. Dark brown and grayish brown lenses present along with decayed wood. Lower boundary abrupt. (Cultural material present.)
3	Sand. Dark grayish brown (10 YR 4/2). Poorly sorted, varies from medium to very coarse throughout site. Lower boundary abrupt.
4	Silt. Very dark brown (10 YR 3/2). Varies in thickness from 10 cm to 15 cm and is present over entire site. Dark brown and grayish brown color variation in discontinuous lenses. Possibly mixed with tephra. Lower boundary clear but involuted. (Cultural material present.)
5	Silt. Yellowish brown (10 YR 5/3). Unit varies in thickness from 8 cm to 14 cm. Possibly a tephra. Occurs throughout entire site. Lower boundary abrupt.
6	Silty loam. Olive gray (5 Y 4/2). Sand and clay percentage varies. Thin dark brown silt subunit occurs discontinuously at upper contact. Lower contact clear and involuted or mixed with unit 7.
7	Sandy loam. Olive gray (5 Y 4/2). Approximately 10% cobbles. Lower boundary diffuse.
8	Poorly sorted silty coarse sand with pebbles, cobbles and boulders. Very dark brown.

evidenced by small sand lenses found within it. Below unit 5 a silty loam (unit 6) overlays another sand and fine to coarse gravel deposit (unit 7) interpreted as overbank flooding deposits from the nearby creek west of the site. Below this, glacial drift (unit 8) was encountered consisting of unsorted coarse sand, gravel and cobbles.

Cultural material at TLM 050 was associated with two stratigraphic units 2 and 4 (Figure 134) and the site appears to represent two periods of occupation.

Component I

The uppermost component is associated with the humic A horizon (unit 2) and consists of lithic and faunal material associated with a probable hearth. A dense concentration of charcoal in this unit and the recovery of 91 fragments of fire cracked rock associated with this charcoal and the lithic and faunal material supports this interpretation.

Cultural material associated with component I was recovered from five test squares and was associated with this hearth. A total of 327 calcined and two unburned long bone fragments associated with the hearth were too fragmentary for identification (Table 42). The bone fragments were recovered from three adjacent squares (N100/E102, N99/E101 and N98/E102) associated with the charcoal and fire cracked rock. The majority of the calcined faunal remains represent medium-large size mammals.

Lithic artifacts associated with this component were excavated from a single test square (N96/E100) 3 m southwest of the main concentration. Six waste flakes of white chalcedony, chert, jasper and basalt were recovered from unit 2 (Tables 40 and 41). None of the flakes exhibit cortex. The flakes appear to be products of pressure retouch resulting from resharpening of tools rather than detritus from primary tool manufacture.

TABLE 40

ARTIFACT SUMMARY BY SOIL UNIT, TLM 050

Soil Unit	Description
2	2 Flakes, white chalcedony
	1 Flake, basalt
	1 Flake, gray chert
	1 Flake, brown chert
	1 Flake, dark red chert or jasper
	1 Rock, quartzite
	91 Rock fragments, thermally fractured
3	1 Flake, gray-green banded chert
4	2 Flakes, gray-green banded chert
	2 Flakes, yellow brown jasper or chert
	1 Flake, unifacially retouched, gray-green banded chert
	2 Rock fragments, thermally fractured

TABLE 41

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 050

Test Square	Material Collected	Comments
N100/E102	24 Fire cracked rocks 2 Bone fragments	Square excavated to test limit on apparent hearth feature. Dug 60 cm depth, into soil unit 6. Cultural material from upper dark brown silt, unit 2.
N99/E101	4 Flakes 12 Fire cracked rocks 10 Bone fragments	Square excavated to provide correlation with reconnaissance level test. Dug 70 cm depth, into soil Unit 8. Cultural material came from both units 2 and 4.
N99/E103	1 Flake 5 Fire cracked rocks	Square excavated to provide correlation with reconnaissance level test. Dug 40 cm depth, into soil unit 4. Cultural material came from both units 2 and 4.
N98/E102	48 Fire cracked rocks 4 Bone fragments	Square excavated to test limit on apparent hearth feature. Dug 35 cm depth, into soil unit 3. Cultural material from unit 2.

TABLE 41 (Continued)

Test Square	Material Collected	Comments
N96/E100	6 Flakes 4 Bone fragments 1 Fire cracked rock	Square excavated to test presence of cultural material in close proximity to other squares. Dug 50 cm depth, into soil unit 6. Cultural material from both units 2 and 4.
N95/E95	1 Flake 18 Fire cracked rocks	Square excavated to test extent of cultural material at distance to other squares and observe continuation of soil units throughout site. Dug 75 cm depth, into soil unit 8. Cultural material from units 2 and 4.

TABLE 42

FAUNAL MATERIAL, TLM 050

Soil Unit	Description
	N99/E101
2	188 Long bone fragments, calcined, medium-large mammal
	1 Long bone fragment, heavily burned, medium-large mammal
	N96/E100
3	2 Long bone fragments, unburned, large mammal
	1 Long bone fragment, calcined, small-large mammal
	N98/E102
2	29 Long bone fragments, calcined, medium-large mammal
	5 Long bone fragments, heavily burned, small-large mammal
	N100/E102
2	2 Long bone fragments, calcined, small-large mammal
	1 Long bone fragment, unburned, medium-large mammal

Two radiocarbon determinations on separate charcoal samples collected from this stratigraphic unit in Test 2 during reconnaissance testing yielded almost identical dates of 280 ± 245 years: A.D. 1670 (DIC 1904) and 280 ± 110 years: A.D. 1670 (DIC 1905). These two dates suggest latest occupation of TLM 050 took place in the late pre-historic period.

Component II

Component II is separated from component I by a sand deposit (Figure 134, unit 3) which does contain some cultural material. Three bone fragments were found in unit 3 in test N96/E100 (Table 42) and a single gray-green banded chert flake was recovered from this unit in test N99/E101. Because the chert flake is similar in lithology to lithic artifacts primarily associated with unit 4, the chert flake found in unit 3 is interpreted as intrusive from unit 4. The faunal material in unit 3 is interpreted as intrusive from unit 2.

Cultural material recovered from unit 4, a dark brown silt and sand deposit underlying the well-sorted sand in unit 3, consists of lithic material only. Lithic artifacts associated with this component were excavated from three test squares (N99/E101, N95/E95 and N99/E103). Two large waste flakes of gray-green banded chert similar to the flake from unit 3 were excavated from unit 4 in test N99/E100. The only diagnostic tool recovered from TLM 050, a large unifacially retouched flake of this same lithic material (UA81-229-2), was also recovered from unit 4 in test N99/E100. This retouched flake has continuous dorsal retouch along the distal margin. It is large enough so that it fits easily in the hand and may have been used without hafting. Two yellow-brown jasper or chert waste flakes were also recovered from unit 4 in tests N95/E95 and N99/E103. In addition, two fire cracked rock fragments were recovered from this unit in test N95/E95.

Evaluation:

TLM 050 appears to be a temporary campsite which shows evidence of two periods of occupation, the most recent of which was in late prehistoric or early historic times. The sheltered location of the site and the close proximity to water would make this location an attractive campsite. The lack of extensive detritus from tool manufacture and resharpening and the presence of only one tool suggests that TLM 050 was not occupied for a very long time during the two periods of occupation.

The older (component II) occupation of the site is not dated by radiocarbon but occurs in a unit which was interpreted in the field as a mixed silt/tephra deposit (unit 4) overlying a yellowish brown tephra which shows evidence of considerable weathering (unit 5). If unit 5 is interpreted as Watana tephra and the tephra in unit 4 is Devil tephra, then component II would not be earlier than 2300 years B.P., the minimum limiting date on the Watana tephra. Thus the time of occupation for component II probably occurred between the late 1600's A.D. and 2300 B.P.

The size of the site is probably not much greater than 10 square meters. Topography restricts the extent of the site to the north, west and east. If the shovel tests to the south of the site are representative of the artifact distribution, the site is probably limited to the immediate vicinity of the area excavated during reconnaissance and systematic testing. Component I is strikingly similar to the Tsusena Creek site (TLM 022) and the No Name Creek site (TLM 043), which coupled with data from TLM 050 will greatly enhance our understanding of Late Prehistoric Athapaskan subsistance cycle in this aspect of the Upper Susitna River area. Component II could provide critical data pertinent to understanding cultural developments and transitions prior to or during the early phases of Late Prehistoric Athapaskan times.

(m) Systematic Testing TLM 059--Little Bones Ridge Site

Location: See section 3.2 (a-xiv)

Testing: Three 1 m test squares were excavated at the site (Figure 135).

Discussion:

Test squares at this site were excavated to define the extent and nature of the rectangular depression found at the site during reconnaissance testing. Lenses of drift were found in all three test squares between the upper organic units and the Devil tephra (Figure 136). All three tephra are present at the site. The presence of this material suggests that it originally had been dug from the area of the depression and tossed a distance of approximately 3 m. Although cultural material was found in all three 1 m test squares (N103/E102, 5 fire cracked rocks; N101/E103, 1 basalt flake, contact of units 4 and 5; N104/E99, 1 bone fragment, contact units 4 and 5), the concentration of material suggests that activity at the site appears to have centered around the depression.

Stratigraphy in all test squares at this site, while containing all three tephra units, shows considerable reworking of the tephra (Figure 136, Table 43). Other disturbance in the "normal" regional stratigraphic sequence (i.e., unit 3) is probably the result of human activity at the site associated with the excavation of the depression. The conformity of the three tephra units to the current topography of the depression is difficult to explain. Initially it was postulated that the depression was natural and was altered later by human activity. However, if the depression were natural, variability in tephra thickness would be expected (e.g., thicker tephra deposits towards the center of the depression where more tephra would tend to collect). The degree to which the depression is totally cultural in origin or partially natural in origin is unclear at this time.

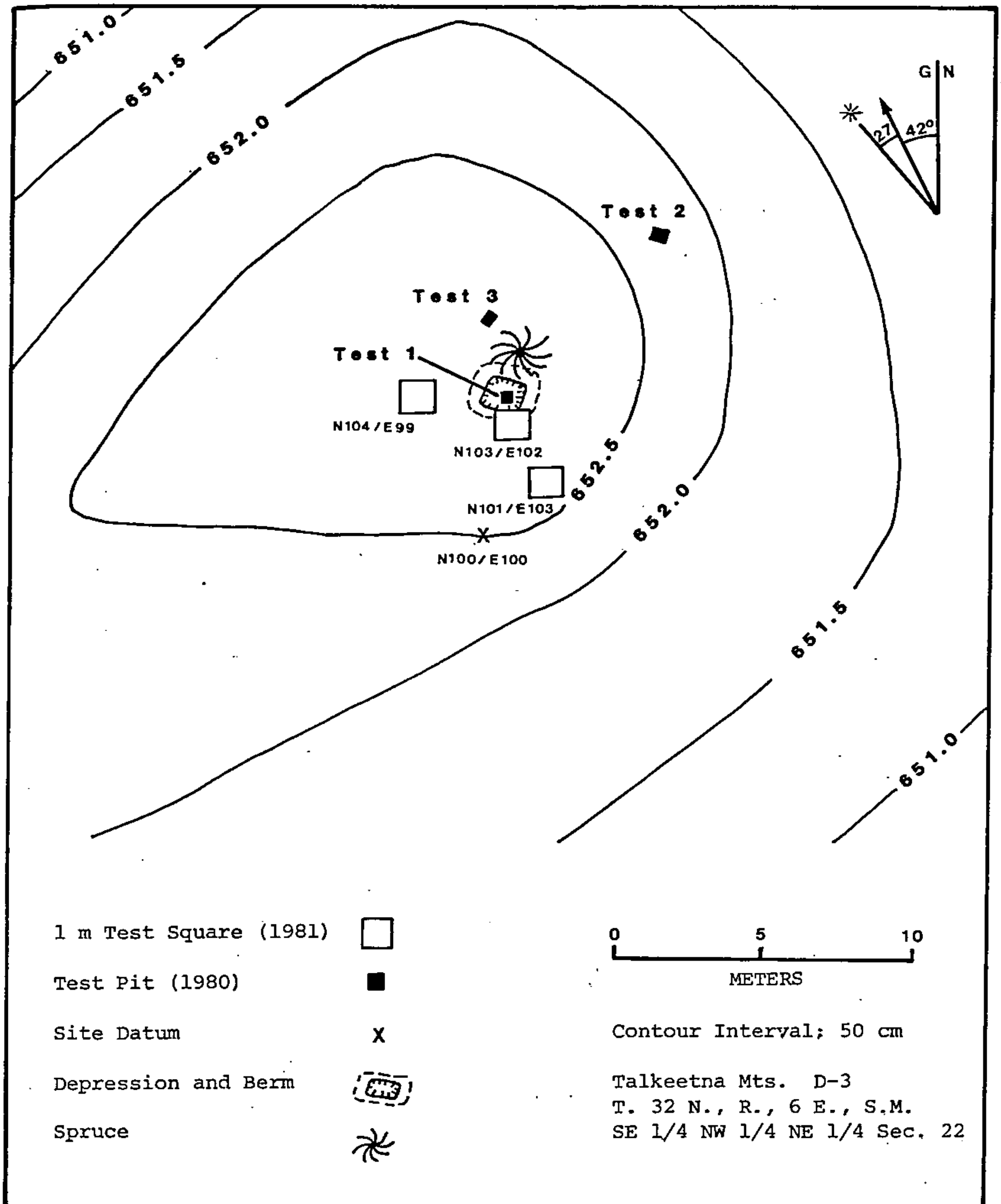


Figure 135. Site Map TLM 059.

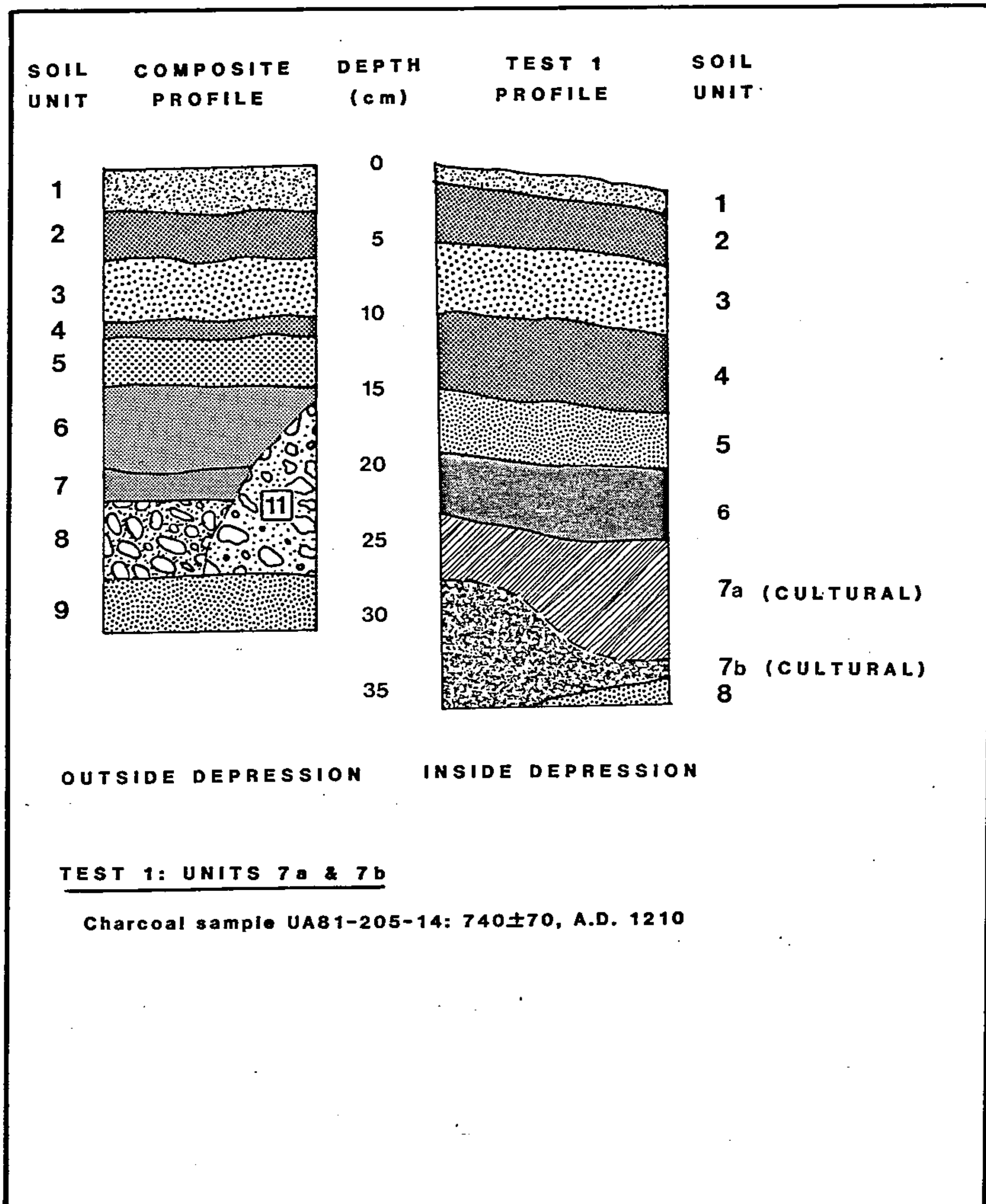


Figure 136. Composite Soil Profile TLM 059.

TABLE 43

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 059--OUTSIDE DEPRESSION

Soil Unit	Description
1	Organic material, roots, lichens; variable in extent and thickness. O horizon.
2	Finely divided organic material (10 YR 2/2 very dark brown); variable in thickness. A horizon.
3	Poorly sorted sand, granules and cobbles (2.5 Y 4/4 olive brown); discontinuous in occurrence but present in all 3 test squares; material probably from depression.
4	Organic-rich lens (10 YR 2/1 black) finely sorted; discontinuous in occurrence but present in all 3 test squares; irregular and gradational upper and lower contacts; at times overlies unit 5 and at times found within unit 5.
5	Tephra (Devil) (10 YR 4/1 dark gray to 10 YR 6/2 light brownish gray). Variable in color; discontinuous in extent with gradational upper contacts and sharp to gradational lower contacts.
6	Tephra (Watana); or tephra mixed with sand; variable in color depending on degree of oxidation (10 YR 4/6 dark yellowish brown to 10 YR 5/6 yellowish brown) discontinuous in appearance and variable in thickness; contacts, especially lower one, often gradational.

TABLE 43 (Continued)

Soil Unit	Description
7	Mixed sand-tephra (Oshetna); variable in color depending on amount of mixing (10 YR 5/1 gray to 10 YR 5/3 brown); some pebbles present in unit; discontinuous in appearance; both upper and lower contacts tend to be gradational; generally not a well defined unit at this site.
8	Poorly sorted sand, granules and large cobbles (10 YR 5/6 yellowish brown) oxidized; both rounded and angular cobbles are present; continuous across site; gradational upper and lower contacts.
9	Medium to coarse grained sand; variable in color (5 Y 4/2 olive gray to 2.5 Y 4/2 dark grayish brown), moderately well sorted, upper contact gradational.
10	Disturbed area found in N103/E102 containing numerous roots; appears to be related to excavation of depression.
11	Mixed drift with 2 or 3 tephra units (10 YR 4/6 dark yellowish brown); gradational boundaries (both vertical and horizontal) with a sandy texture; occurs locally in N101/E103.

A summary of cultural material is given in tables 44 and 45. The minimal amount of material in test square N103/E102, N101/E103, and N104/E99 suggests that the site is essentially limited to the 1.8 m x 1.5 m depression itself. The lack of structural feature in N103/E102, which bisected the southern corner of the depression, suggests that the depression is not a house pit, but might instead represent a cache or some other type of feature. It is probable that only full excavation will reveal the true nature of the site.

The depression is younger than ca. 1800 years because it truncates all three tephra. One radiocarbon date is available for this site. This date, taken on charcoal from within the depression, is 740 ± 70 years: A.D. 1210 (DIC 2253). The stratigraphy in the depression suggests that the feature may have a complex history of reuse.

The presence of fire cracked rock in soil unit 3 of test square N103/E102 could be used as evidence for multiple use of the depression (i.e., the redigging of a previous hearth area, throwing the earlier hearth material onto the burm surrounding the depression). The stratified nature of test pit 1 would also argue for multiple events within the depression. Additional excavation in test pit 1 produced faunal material in soil unit 7b (Table 46) similar to the faunal material collected in this test during reconnaissance testing. Identifiable faunal remains represent one species--caribou (_Rangifer tarandus_) although it is possible that other species are present but, due to the fragmentary nature of the bones, not identifiable (Table 46). One unidentified bone fragment was found in soil unit 3 of test square N104/E99.

Evaluation:

This site is unique among those found during the course of the archeological survey of the project area. It is obviously the remains of a structure which may represent a series of activities which did not occur

TABLE 44

ARTIFACT SUMMARY, TLM 059

5	Fire cracked rocks
1	Basalt flake
1	Bone fragment

TABLE 45

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 059

Soil Unit	Test Squares		
	N103/E102	N101/E103	N104/E99
3	5 Fire cracked rocks		
Contact 4 and 5		1 Basalt flake	1 Bone fragment

Note: Further excavation of test 1 removed 17 pieces of bone from 66-70 cmbs (Table 45).

TABLE 46

FAUNAL MATERIAL, TLM 059

Soil Unit	Description
	Test #1
7b (inside depression)	1 Pelvis fragment, acetabulum, heavily burned, caribou (Rangifer tarandus) 1 Phalanx fragment, 2nd, heavily burned, caribou (Rangifer tarandus) 1 Tibia fragment, heavily burned, caribou (Rangifer tarandus) 1 Phalanx fragment, heavily burned, possible caribou (Rangifer tarandus) 1 Vertebra fragment, calcined, medium-large mammal 2 Phalanx fragments, heavily burned, large mammal 1 Vertebra fragment, heavily burned, medium-large mammal 1 Rib fragment, calcined, medium-large mammal 2 Vertebrae fragments, calcined, medium-large mammal 1 Vertebra fragment, cervical, calcined, medium-large mammal
	N104/E99
3 (outside depression)	1 Long bone fragment, heavily burned, small-large mammal

at the same time, but within a relatively brief interval of time. Although it has been suggested that it functioned as a cache, this explanation is tenuous at best and is offered only because no better rationale for its occurrence has been postulated. The site is located in an elevated region above Watana Creek, but does not offer a panoramic view of the surrounding area. The feature can be quite firmly dated to approximately 740 A.D. by radiocarbon and its stratigraphic superposition above the Devil tephra. Further work at this site is certainly warrented because it presents the only example of this type of archeological site within the project area and will undoubtedly contribute new insights to our understanding of human behavior in a firmly documented temporal context.

(n) Systematic Testing TLM 062--Red Scraper Site

Location: See section 3.2 (a-xvii).

Testing: Six 1 m test squares and 49 shovel tests were excavated during systematic testing (Figure 137). Five test squares were placed near the eastern edge of the terrace where reconnaissanc testing had shown cultural material to be present. These tests were placed to define the extent and continuity of the site along the terrace edge and to obtain additional diagnostic artifacts and charcoal if possible. Shovel testing was conducted along east-west transects at 5 m intervals to define the western extent and boundary of the site.

Discussion:

Testing at TLM 062 produced both lithic and faunal material. Five of the six test squares produced cultural material from a minimum of two components. Only one shovel test (N90/E96) produced cultural material. This shovel test was enlarged to test square N90/E95.5 which was the only test square excavated away from the terrace edge (Figure 137).

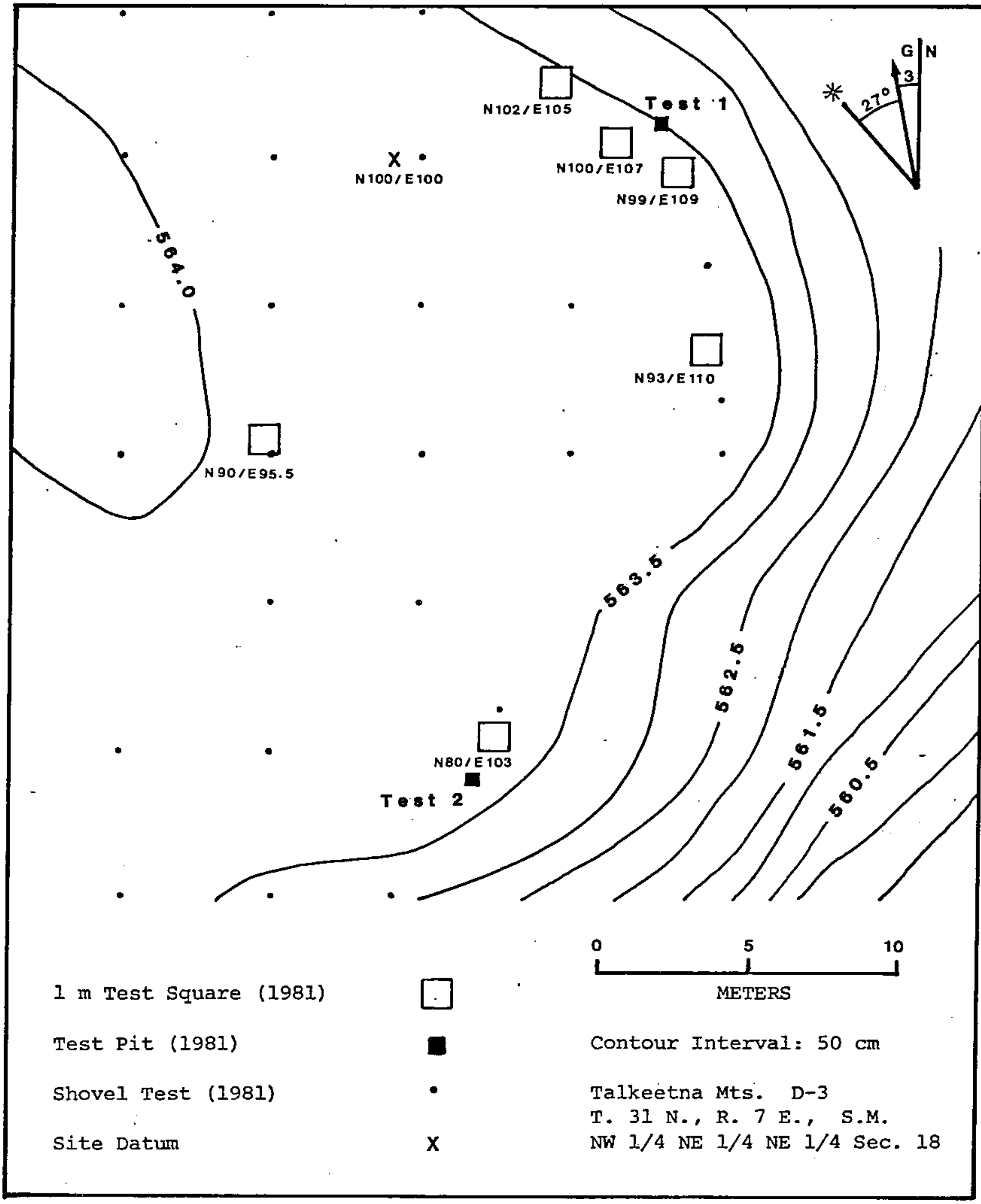


Figure 137. Site Map TLM 062.

The upper cultural component at the site is associated with the uppermost of three tephra deposits (Figure 138, unit 3, Table 47) and is represented by chert and basalt flakes and calcined bone fragments. This component was present in all five test squares which produced cultural material. It also occurred in test 1, excavated during initial reconnaissance which produced a red chert endscraper (UA81-208-2, 3) found in two fragments. Cultural material from this component was primarily associated with the contact between the A horizon and the uppermost tephra (Figure 138, units 2, 3) but also occurred within the upper (Devil) tephra and at its lower contact with the middle (Watana) tephra. Feature 1, a concentration of ca. 4,000 calcined bone fragments associated with 28 basalt flakes occurred in test N100/E107 at the gradational contact between the A horizon (unit 2) and the Devil tephra (unit 3) with some lithic and faunal material recovered from within the Devil tephra. Devil tephra (unit 3) was not present directly below feature 1 in test N100/E107, indicating a possible cultural mixing or modification of this surface. A radiocarbon determination on charcoal recovered from within the Devil tephra (unit 3) and in association with the red chert endscraper from test 1 yielded a date of 1380 ± 155 years: A.D. 570.

The lower component at the site was present only in test square N90/E95.5 and was associated with the lowest of the three tephra present at the site (Figure 138, unit 5). Cultural material includes basalt waste flakes and calcined bone fragments. A concentration of 177 basalt flakes (Feature 2) was associated with the lower (Oshetna) tephra and a zone of apparent mixing between the Oshetna tephra and the middle (Watana) tephra in the northern half of the test (Figure 138, units 5, 5a). A concentration of ca. 400 calcined bone fragments and two basalt flakes (Feature 3) occurred in the zone of mixing (unit 5a) between the Oshetna and Watana tephra in the southern half of the test. In addition, six basalt flakes and 76 calcined bone fragments, one with possible butchering marks (UA81-208-95), were recovered from the Watana tephra and appeared to be associated with Feature 3.

Unfortunately N90/E95.5 was the only test square containing artifacts from both the upper and lower components at the site and cryoturbation has mixed cultural material through several stratigraphic units and no sterile horizon separates the two components. Calcined bone and/or flakes occurred within the middle (Watana) tephra in four test squares bur further testing is necessary to determine if this represents a third component or is due to the mixing of cultural material by cryoturbation.

Stratigraphy at the site is characterized by 15 cm to 30 cm of deposits overlying unsorted glacial drift (Figure 138, Table 47). Much of the deposition at the site appears to be of volcanic origin with 20 cm to 25 cm of tephra directly overlying the drift and capped by modern organic and humic horizons. Three volcanic tephra horizons have been distinguished on the basis of color, weathering and contacts (Table 47). Contacts between these tephra units are in some cases extremely involuted and often gradational so that artifact provenience at the contact zone between tephra units could frequently not be assigned to a single tephra and was instead assigned to a contact transition zone. In general, the stratigraphy was fairly uniform at the site and correlation of tephra and soil units between test squares was possible. Test N80/E103 contained a buried humic horizon (Figure 138, unit 2a) and a Devil tephra lense (unit 3a) within the Watana tephra (unit 4). These were interpreted as a localized disturbance of the stratigraphy probably as a result of an uprooted tree. In test square N90/E95.5 a lense of charcoal (Figure 138, unit 6) was associated with flakes and calcined bone at the contact between the middle (Watana) tephra and the lower (Oshetna) tephra.

Approximately 4500 calcined bone fragments were recovered from three of the five test squares (Table 48). Only two of these fragments were identifiable. A sesamoid bone from a caribou (Rangifer tarandus) was recovered from the contact between the A horizon and the Devil tephra (units 2, 3) in test N100/E107 and a phalanx fragment, also from a caribou (Rangifer tarandus), was recovered from the Oshetna tephra (unit 5) in test N90/E95.5.

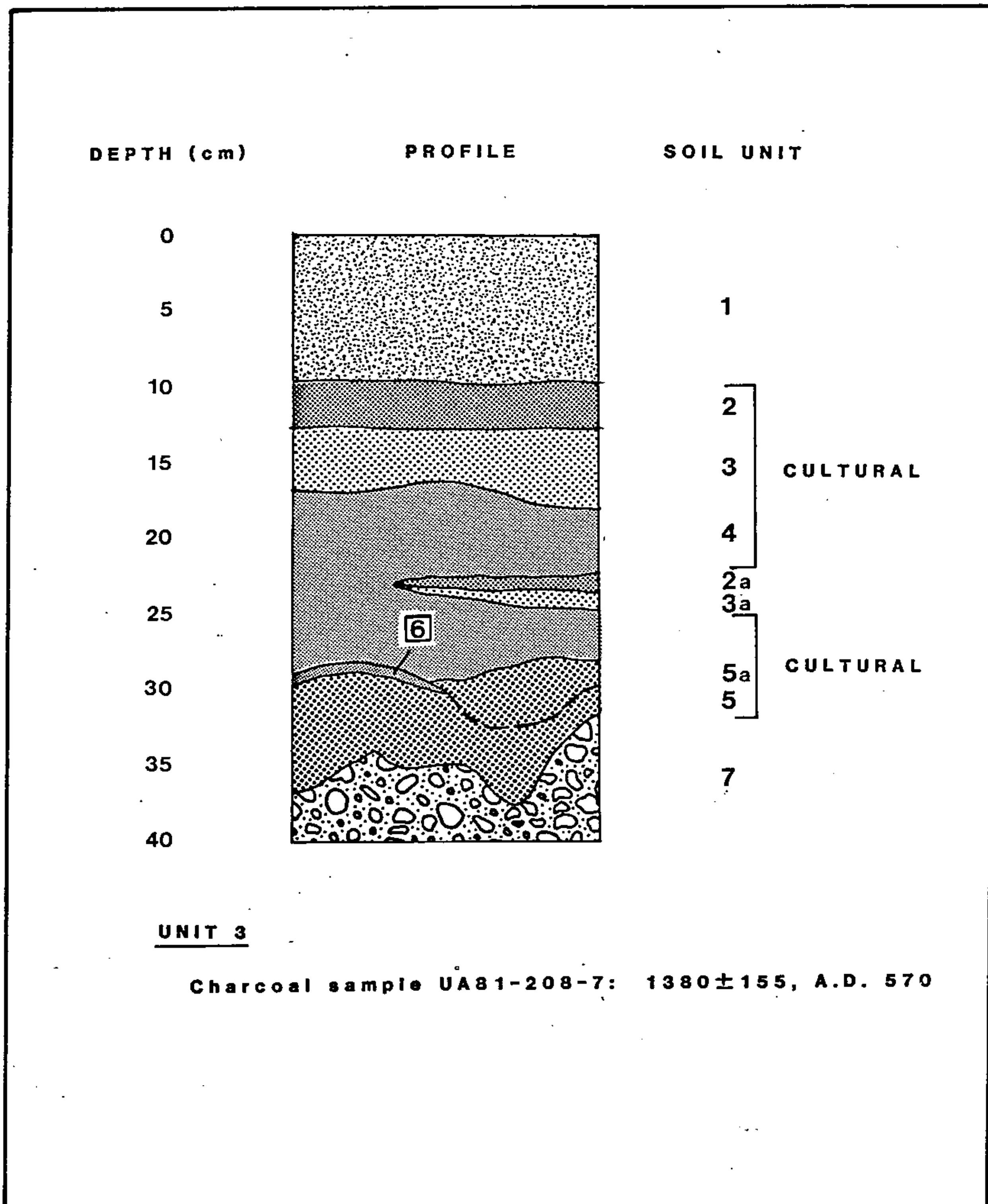


Figure 138. Composite Soil Profile TLM 062.

TABLE 47

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 062

Soil Unit	Description
1	Organic with roots and rootlets. Varies in color from very dusty red (10 YR 2.5/2) to dark reddish brown (10 YR 2/2). Varies in thickness from 2 cm to 17 cm. Small pieces of charcoal are occasionally present. Contact with unit 2 is gradational (O-horizon).
2	(Cultural) Finely divided organics. Black (5 YR 2.5/1 to 10 YR 2/1). Charcoal present in all tests and shovel tests with greatest concentration at contact with unit 3. Thickness varies from 2 cm to 9 cm. Lower contact with unit 3 gradational with some mixing. Greasy texture. (A-horizon)
2a	Finely divided organics. Black (5 YR 2.5/1). Occurs only in test square N80/E103. Interpreted as buried unit 2.
3	(Cultural) Very fine silt (Tephra). Ranges from light brownish gray (10 YR 5/2) to light gray (10 YR 7/1) with dark gray mottles (10 YR 3/1) at upper gradational contact with unit 2 where mixing occurs and charcoal flecks are present. Varies in thickness from 1 cm to 8 cm and is occasionally discontinuous. Sharp lower contact with unit 4. Occasional charcoal flecks present. Dries to a fine white powder. (Devil tephra).

TABLE 47 (Continued)

Soil Unit	Description
3a	Very fine silt (tephra). Lt. brownish gray (10 YR 6/2). Occurs only in test square N80/E103. Interpreted as buried unit 3.
4	(Cultural) Very fine silt (tephra). Ranges in color from dark reddish brown (2.5 YR 2.5/4 in strongly oxidized upper contact with unit 3 to yellowish brown (10 YR 5/6) or pale yellow (2.5 Y 7/2) in lower portion of unit. Strongly oxidized zone discontinuous and mottled with granular texture. Oxidation gradational within unit. Thickness varies from 4 cm to 28 cm. Lower contact with unit 5 sharp and involuted. (Watana tephra).
5	(Cultural) Medium silt to sandy silt (tephra). Varies in color from dark grayish brown (10 YR 4/2) to gray (10 YR 6/1). Pebbles present, probably due to mixing with unit 6. Often overlain by thin discontinuous charcoal lense. Sharp but very involuted contact with unit 6. (Oshetna tephra).
5a	(Cultural) Fine silt. Brown (10 YR 5/3). Contains many charcoal flecks. Involuted and gradational contacts with units 4 and 5. Contains flakes and calcined bone fragments. Occurs only in test square N90/E95.5. Interpreted as mixing of units 4 and 5.

TABLE 47 (Continued)

Soil Unit	Description
6	Charcoal lense.
7	Oxidized coarse sand, pebbles, gravel and cobbles. Ranges in color from strong brown (7.5 YR 4/6) to yellowish brown (10 YR 5/6). Unsorted. (glacial drift)

TABLE 48

FAUNAL MATERIAL, TLM 062

Soil Unit	Description
	N99/E109
4	170 Long bone fragments, calcined, medium-large mammal
	N90/E95.5
4	75 Long bone fragments, calcined, medium-large mammal 1 Phalanx fragment, 2nd, calcined, caribou (*Rangifer tarandus*)
5	331 Long bone fragments, calcined, medium-large mammal
	N100/E107
Contact 2 and 3	1 Sesamoid bone, calcined, caribou, (*Rangifer tarandus*)
Contact 2 and 3 (Feature 1)	4000+ Long bone fragments, calcined, medium-large mammal

TABLE 49

ARTIFACT SUMMARY BY TEST SQUARE, TLM 062

<u>N99/E109</u>

4 Flakes, gray to black basalt

<u>N80/E103</u>

1 Flake, light gray chert
1 Flake, gray basalt

<u>N93/E110</u>

18 Flakes, light gray chert
6 Flakes, dark gray chert

<u>N100/E107</u>

23 Flakes, dark gray basalt
5 Flakes, gray basalt
1 Biface fragment, dark gray basalt

<u>N90/E95.5</u>

149 Flakes, dark gray basalt
1 Flake, retouched, black basalt (possible endscraper)
1 Flake, retouched, black basalt (possible endscraper fragment)

Lithic material was recovered during both reconnaissance and systematic testing at the site. Reconnaissance testing produced a unifacially retouched red chert endscraper (UA81-208-2, 3) in two fragments and a gray chert flake core fragment (UA81-208-1) associated with Devil tephra (unit 3) in test 1. A single basalt flake of uncertain provenience was recovered from test 2.

Systematic testing produced a biface fragment, two unifacially retouched flakes, 182 basalt flakes and 25 chert flakes (Table 49). The basalt biface fragment (UA81-208-75) was recovered from within the Devil tephra (unit 3) in test N100/E107. It shows continuous retouch along two adjacent margins and hinge fractures on two margins. Both retouched flakes (UA81-208-85, 174) appear to be of the same lithology (fine grained black basalt) and were recovered from test N90/E95.5. Each shows unifacial retouch, probably use wear, along one (distal) margin only. UA81-208-85 was excavated from the lower portion of the Devil tephra (unit 3) and may be an endscraper fragment. UA81-208-174 was excavated from the Oshetna tephra (unit 5) and may be a complete endscraper. Table 49 lists artifacts by test square and lithology and Table 50 lists all cultural material recovered by test square and soil unit.

The two types of chert (light gray and very fine grained dark gray) are associated with the Devil tephra (unit 3) and do not occur below its lower contact with Watana tephra (unit 4). Basalt flakes are concentrated in the Oshetna tephra (unit 5, 5a) and at its upper contact with unit 4. They also occur in the Watana and Devil tephra with less frequency. There appears to be a striking difference in the lithology of artifacts between the upper and lower components. The chert flakes from component I lack cortex while many of the basalt flakes from the lower component show cortex. This would suggest that local basalt sources were being utilized for raw material while chert was being imported in either a blank or preform state with finishing work or resharpening occurring at the site during the component I occupation.

TABLE 50

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 062

Test Square	Cultural Material by Soil Units	Comments
N102/E105	No cultural units.	Profile not drawn.
N100/E107	<u>Unit 2-3 Contact</u>: 27 Flakes, basalt. 1 Flake, basalt; retouch (?), UA81-208-56, 16-25 cmbd. 1000 Burned bone fragments, 18-25 cmbd associated with Feature One in the west half of test square. <u>Unit 3</u>: 1 Biface fragment, basalt (UA81-208-75), 28 cmbd.	-Cultural horizon appears to be associated with top of unit 3 (Devils tephra), with some mixing of materials in units 2 and 4. -Charcoal sample taken at 20 cmbd from unit 3 associated with Feature One.
N99/E109	<u>Unit 2-3 Contact</u>: 1 Flake, basalt, 24 cmbd. <u>Unit 3</u>: 3 Flakes, basalt. <u>Unit 4</u>: 150 ca., burned bone fragments, 21-23 cmbd.	-Possible 2-component square: Component 1: -Basalt flakes in unit 3 (Devil tephra). Component 2: -Burned bone in unit 4 (Watana tephra). No unit 3 atop unit 4 here. -Flakes from SW¼ -Bone fron NE¼ and NW¼
N93/E110	<u>Unit 3</u>: 23 Flakes chert 18-28 cmbd. Materials associated with unit 3 at contacts with units 2 and 4.	-Flakes concentrate at top of unit 3 (Devil tephra). They occur in the NE, SE, and SW¼. 21 of 23 flakes in the S½. Charcoal sample taken at cmbd from unit 5 (Oshetna tephra).

TABLE 50 (Continued)

Test Square	Cultural Material by Soil Units	Comments
	TWO LITHOLOGIES PRESENT 14 Flakes, light gray chert 9 Flakes, dark gray chert	
N80/E103	<u>Unit 3</u>: 1 Flake, chert, 35 cmbd. 1 Flake, basalt, 25 cmbd.	
N90/E955	<u>Unit 2</u>: 8 Flakes, basalt <u>Unit 3</u>: 10 Flakes, basalt 1 Flake, basalt retouch UA81-208-85, 33 cmbd. <u>Unit 4</u>: 6 Flakes, basalt 76 Burned bone fragments, one with possible cut marks (?). <u>Unit 5a</u>: 52 Flakes basalt 400 ca. Burned bone fragments <u>Unit 5a-5 Contact</u>: 64 Flakes, basalt <u>Unit 5</u>: 11 Flakes, basalt 1 Endscraper (?), basalt (UA81-208-174) 31 Burned bone fragments	-Concentration of flakes and bone in unit 5a (transition zone) and at top of unit 5 (Oshetna tephra). -Charcoal sample taken at 42-45 cmbd, top of unit 5. -Four tephra samples taken. -Cortex flakes present.

The light gray chert differs from the darker gray chert both in texture and in luster, which may suggest that this material was heat treated prior to flaking. This evidence is uncertain because of the small number of artifacts exhibiting this characteristic. The possibility of natural heating of artifacts by forest fire should also be considered. The chert flakes are of small size characteristic of pressure flaking which would support the hypothesis that chert was imported to the site in semi-finished form. The one larger chert flake core fragment found during reconnaissance testing is unique in that it is the only chert artifact that suggests percussion flaking in component I. Many of the basalt flakes are biface reduction flakes and are generally larger and thicker and probably result from pressure and percussion flaking. This would be consistent with the hypothesis that the basalt source is local.

Evaluation:

No evidence of permanent or semi-permanent structures was observed during testing and the site probably functioned as a temporary campsite and hunting overlook at which tool manufacture occurred. The negative evidence of 48 sterile shovel tests suggests that the site is limited in spacial extent with the utilized area in vicinity of the terrace edge approximately 15 m by 20 m in size. There appears to be a spacial separation horizontally between the two components with the most recent occupation concentrated near the edge of the terrace and the earlier occupation well back (19 m) from the edge. With the limited amount of testing it is too early to look for patterns relating to activity areas at the site but there does seem to be some preliminary evidence of differential use of the site at different time periods.

While the results of systematic testing were not entirely conclusive, they do demonstrate TLM 062 to be a multicomponent site. Component I probably documents the site's use as a hunting camp approximately A.D. 570. This component is critical to understanding the culture history of the Upper Susitna, because it occurs immediately prior to the time Athapaskans are believed to have occupied the area. Thus component I may delineate the cultural affiliation of the peoples who occupied the Susitna prior to Athapaskans or through the direct historic approach, which will be possible through the excavation of adjacent sites, may extend the Athapaskan continuum temporally further in the region. Further work is needed to define and date component 2 at the site. TLM 062 warrents further investigation.

(o) Systematic Testing at TLM 065--Kosina Depression Site

Location: See section 3.2 (a-xx).

Testing: Four 1 m test squares were excavated at the site (Figure 139).

Discussion:

Surface features observed at TLM 065 include two shallow rectangular depressions (Features 1 and 4) and two circular depressions (Features 2 and 3) located on a relatively level terrace overlooking the confluence of Kosina Creek and the Susitna River (Figure 139).

Test squares were located at three of the surface depressions recorded during reconnaissance level testing which were located near test 1 (Figure 139). Test square N90/E103 bisected Feature 2 (Figure 139), a spherical depression approximately 1 m in diameter. Six bone fragments, 1 piece of wood, 1 glass bead, 3 fire cracked rocks and a piece of birch bark were recovered in this test. Test N93/E104 was positioned to transect the wall of the larger rectangular depression (Feature 1) located 3 m north of Feature 2. Excavation of Feature 1 revealed heavily decayed logs running parallel to the berm forming the margin of the depression. Artifacts collected from this test include 8 beads and 4 fire cracked rocks. N99/E105 was placed 1 m south of reconnaissance test 1. A shallow concentration of faunal material was encountered directly below the organic mat. Material collected included 1 gray

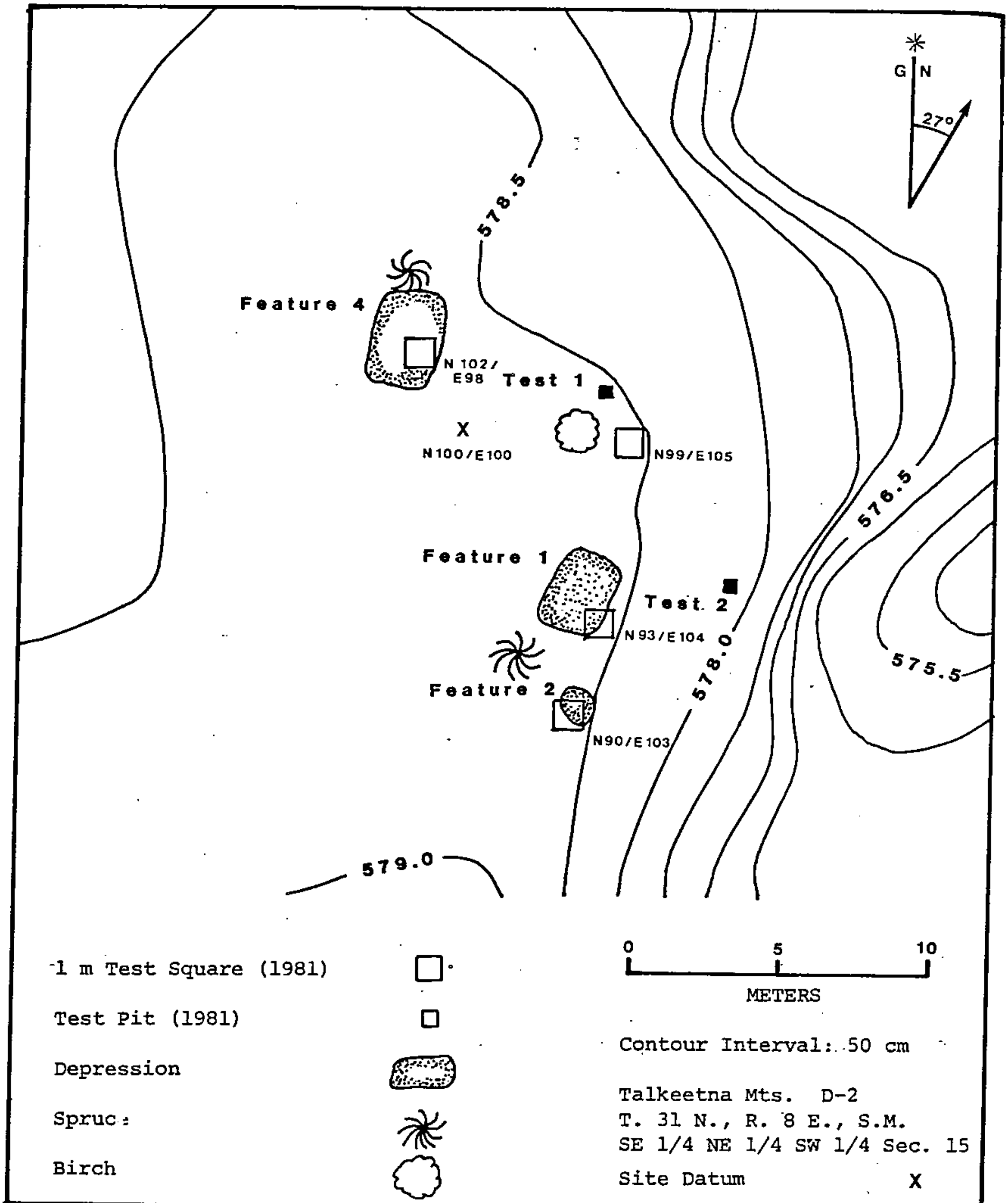


Figure 139. Site Map TLM 065.

chert flake, a fragment of weathered glass, 1 bead and ca. 100 burned bone fragments, many of which were identified as caribou (Rangifer tarandus). Test square N102/E98 was excavated to test the nature of a very shallow depression at the northern end of the site (Feature 4). Bone, fire cracked rock and faunal material was encountered and testing was immediately discontinued without collecting any cultural material so as not to disturb this feature prior to systematic excavation of the entire site.

Feature 3, a small circular depression similar to Feature 2, is located approximately 60 m southwest of test 1 and is not shown on the site map (Figure 139). This feature was not tested.

Faunal material occurred in tests N90/E103 and N99/E105. In both tests burned and unburned bones were recovered from the contact between the organic horizon (unit 1) and the culturally disturbed sandy loam (unit 2) and from within unit 2. The majority of this faunal material was unburned (Table 53). Identifiable faunal remains represent caribou (Rangifer tarandus).

Lithic material was limited to 7 fire cracked rocks and a single gray chert waste flake (Table 52). Most of this material was associated with the culturally disturbed sandy loam (unit 2). Ten beads and 10 rolls of birch bark, some of which shows evidence of sewn seams also associated with unit 2, attest to the relatively late occupation of TLM 065. In addition to the trade beads, a fragment of glass, found in test square N99/E105 within the culturally disturbed unit 2, demonstrates either direct or indirect contact with Europeans.

Evaluation:

This site is extremely important to the prehistory of the Susitna region because it clearly documents early historic occupation of the area at a time when Athapaskan culture was beginning to undergo rapid, dramatic,

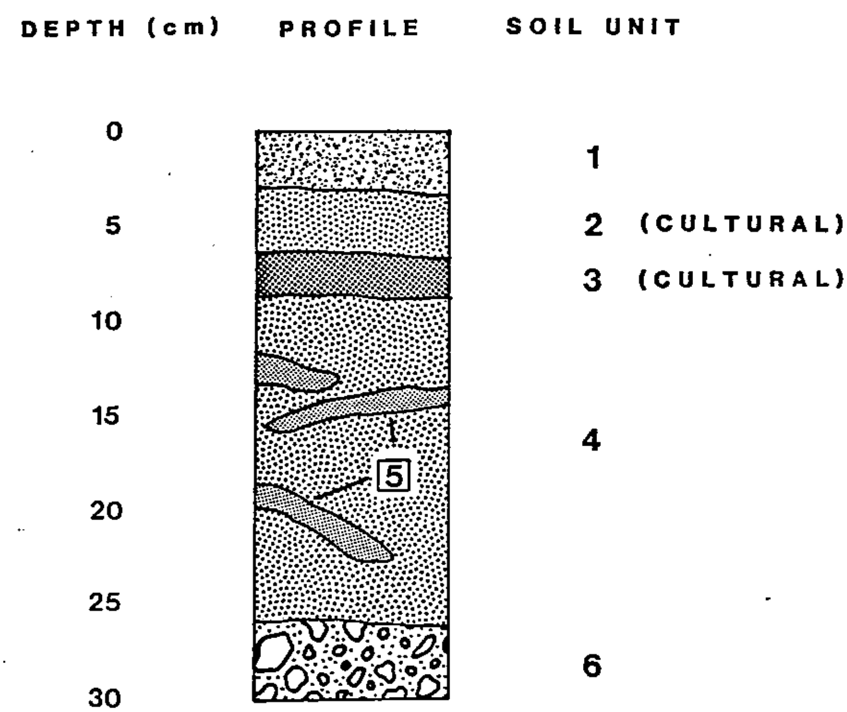


Figure 140. Composite Soil Profile TLM 065.

TABLE 51

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 065

Soil Unit	Description
1	Organic duff. Mat of undivided organics, roots and leaves. Lower boundary abrupt.
2	Sandy loam. Very dark brown (10 YR 2/1). Lies directly below the organic mat. This is a culturally disturbed unit with cultural material mixed with disturbed soil horizon.
3	Sandy silt. Black (5 YR 2/0). Occurs in a 1 cm to 4 cm thick unit throughout entire site.
4	Coarse sand and gravel. Gray (5 Y 5/1). Pebbles angular and rounded range in size from 1 cm to 4 cm in diameter. Grades to gravel with depth. Contains lenses of fine silt (tephra: unit 5) mixed within this unit by soil disturbance.
5	Fine silt (tephra). Light yellow (2.5 Y 7/2). Discontinuous over site. Considerable mixing of units 4 and 5 has occurred and unit 5 occurs as lenses within unit 4. Watana tephra.
6	Coarse sand and pebbles. Olive (5 Y 5/4) Continuous over square. Poorly sorted. Upper contact with unit 5 is sharp. Glacial drift.

TABLE 52

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 065

Soil Unit	Description
	N99/E105
2	1 Flake, gray chert
	1 Glass fragment
	1 Bead fragment
	N93/E104
1	1 Organic sample of seeds(?)
2	1 Fire cracked rock
	2 Wood samples (?)
	4 Trade beads
4	3 Fire cracked rocks
	4 Trade beads
	N90/E103
2	1 Wood sample
	1 Trade bead
	3 Fire cracked rocks
	10 Sheets of birch bark

TABLE 53

FAUNAL MATERIAL, TLM 065

Soil Unit	Description
	N99/E105
2	2 Mandible fragments, unburned, caribou (Rangifer tarandus)
2	1 Vertebra fragment, thoracic, unburned, possibly caribou (Rangifer tarandus)
2	1 Tibia shaft fragment, unburned, possible caribou (Rangifer tarandus)
2	1 Astragalus, right, unburned, caribou (Rangifer tarandus)
2	1 Metatarsal fragment, unburned, caribou (Rangifer tarandus)
2	1 Mandible fragment, unburned, caribou (Rangifer tarandus)
2	2 Tooth fragments, molar, unburned, possible caribou (Rangifer tarandus)
2	1 Carpal, unburned, caribou (Rangifer tarandus)
2	4 Tooth fragments, molar, unburned, caribou (Rangifer tarandus)

TABLE 53 (Continued)

Soil Unit	Description
2	1 Tooth, premolar, unburned, caribou (<u>Rangifer tarandus</u>)
2	1 Phalanx fragment, calcined, caribou (<u>Rangifer tarandus</u>)
2	1 Phalanx fragment, 1st, unburned, caribou (<u>Rangifer tarandus</u>
2	1 Phalanx fragment, 2nd, unburned, caribou (<u>Rangifer tarandus</u>
2	1 Parietal fragment, unburned, large mammal
2	1 Rib fragment, unburned, medium-large mammal
2	9 Long bone fragments, calcined, medium-large mammal
2	63 Long bone fragments, unburned, large mammal
2	13 Long bone fragments, unburned, large mammal
2	1 Flat bone fragment, unburned, large mammal
	<u>N99/E103</u>
2	1 Tooth fragment, crown, molar, unburned, caribou (<u>Rangifer tarandus</u>)

TABLE 53 (Continued)

Soil Unit	Description
2	1 Tooth fragment, root, unburned, possibly caribou (*Rangifer tarandus*)
2	1 Tooth fragment, unburned, possibly caribou (*Rangifer tarandus*)
2	2 Mandible fragments, unburned, caribou (*Rangifer tarandus*)
2	1 Tooth fragment, molar, unburned, caribou (*Rangifer tarandus*)
Feature 2	1 Pelvis fragment, right, acetabulum, unburned, caribou (*Rangifer tarandus*)
Feature 2	1 Pelvis fragment, left, acetabulum, unburned, caribou (*Rangifer tarandus*)
Feature 2	1 Radius fragment, right, unburned, caribou (*Rangifer tarandus*)
Feature 2	1 Vertebra fragment, atlas, unburned, caribou (*Rangifer tarandus*)
Feature 2	2 Long bone fragments, unburned, medium-large mammal 102 Long bone fragments, unburned, medium-large mammal 8 Long bone fragments, unburned, large mammal

and irrevocable cultural change. The nature of the site is equally significant, because it represents the only major living structure(s) that was systematically tested in the project area which suggests year round occupation of the region. The site probably dates to the late 1800's based on the rather clear definition of the surface features at the site and the discovery of trade beads and glass. There is little doubt that future excavation at this site will provide new and significant insights into the nature of Athapaskan culture during the contact with western European culture. TLM 065 provides the essential physical link which will enable future research to apply the direct historical approach to delineate cultural development through time.

(p) Systematic Testing TLM 069--Left Fork Site

<u>Location</u>: See section 3.7 (a-xxiv).

<u>Testing</u>:

Three 1 m test squares and three 50 cm x 50 cm tests were excavated at TLM 069 during systematic testing (Figure 141). Test square N99/E101 was excavated near reconnaissance test 3 at the highest point of the knoll on which the site is located. Test square N99/E112 was placed at the eastern end of the knoll to test the extent of subsurface cultural material east of reconnaissance test 1. Test square N100/E108 was excavated near reconnaissance test 1 at the north edge of the knoll. The three smaller 50 cm x 50 cm test pits were excavated on the eastern flank of the knoll to define the limit of subsurface cultural material where the topography of the site was more subdued and the site boundary in relation to the landform was less clearly defined.

<u>Discussion</u>:

All three 1 m test squares placed at the summit of the knoll revealed subsurface cultural material consisting of both lithic and faunal

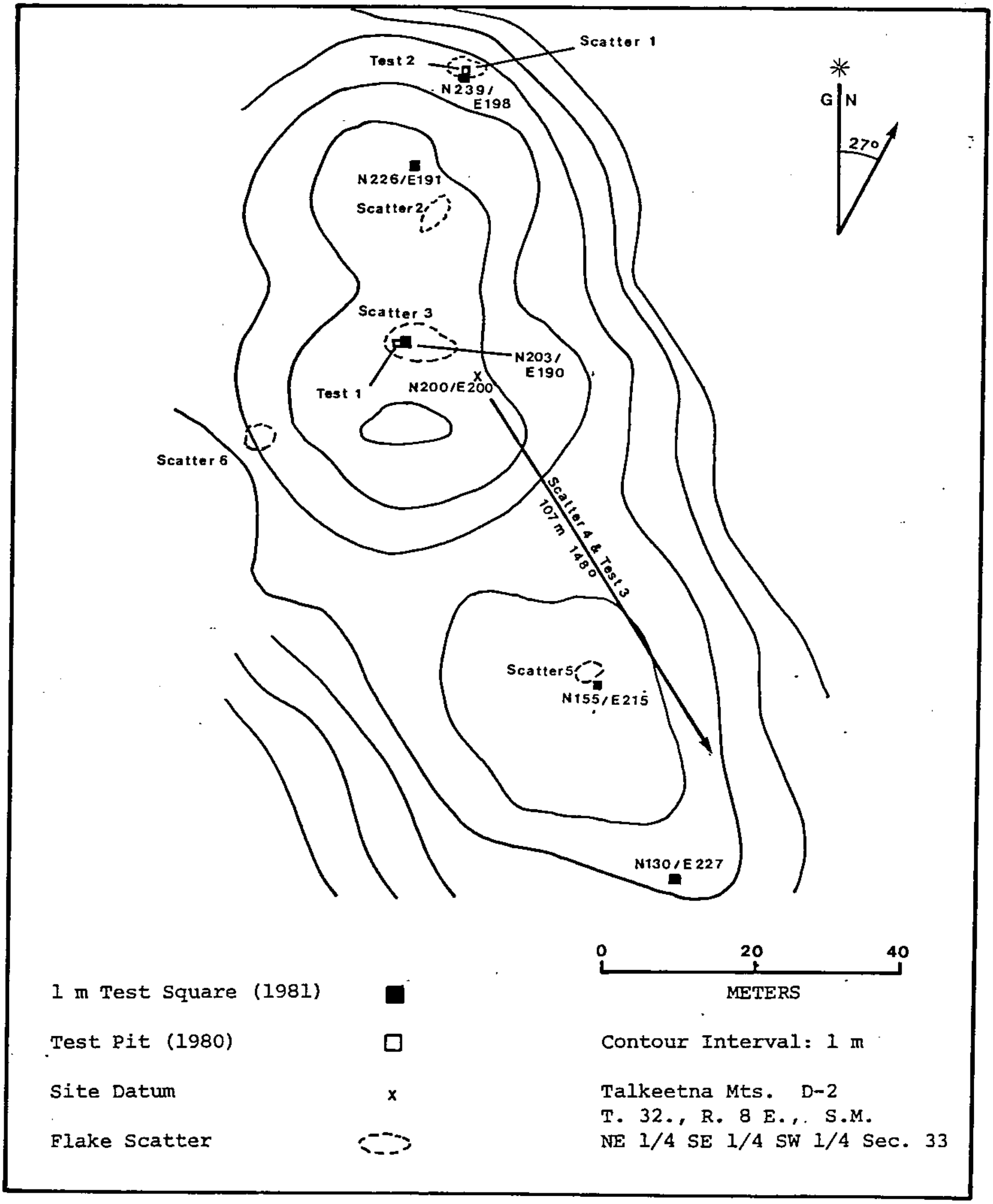


Figure 141. Site Map TLM 069.

material. Only one of the 50 cm x 50 cm test pits, excavated to the east of the knoll summit (N94/E123) produced cultural material. Both lithic and faunal material occurred in dense concentration during systematic testing. Lithic material recovered included eight diagonistic artifacts, a flake core and 1067 waste flakes (Table 55). Faunal material was found in all subsurface tests which produced lithic material and consisted of more than 900 calcined bone fragments (Table 56).

The stratigraphy at TLM 069 was limited to less than 15 cm of deposition overlying glacial drift (Figure 142, Table 54). All three tephra deposits were identified, however the lowest (Oshetna) tephra (unit 5) was present only in test square N100/E108 and in this test it appeared to be mixed with the underlying drift deposit. Watana tephra (unit 4) was identified in all test squares either overlying the drift directly where the Oshetna tephra was absent, or as in N100/E108, overlying the mixed Oshetna/Drift horizon. Devil tephra (unit 3) overlay Watana tephra in all test squares and was capped by the modern humic (unit 2) and organic (unit 1) horizons.

Cultural material was recovered from all stratigraphic units at TLM 069 except the organic horizon. Table 55 lists the provenience of artifact and faunal material by test square and stratigraphic unit. The majority of cultural material recovered at TLM 069 was associated with the lower Watana tephra contact with either glacial drift (unit 6) or the Oshetna tephra (unit 5) where it was present. A total of 820 waste flakes (77%) were associated with this contact. It appears that in all test squares except N100/E108 the Oshetna tephra has been eroded away leaving the cultural material as a lag deposit at the contact between the drift and the Watana tephra. The concentration of cultural material at the Oshetna/Watana contact in test square N100/E108 strongly indicates that this is the original context for the lithic and faunal material found at the Watana/Drift contact where the Oshetna tephra is missing. Considerable mixing of stratigraphic units and cultural

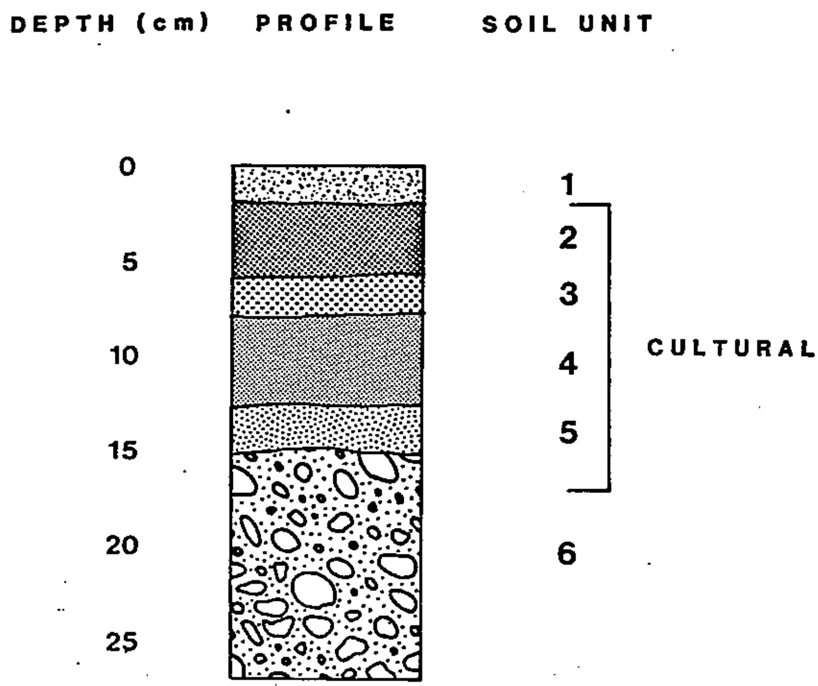


Figure 142. Composite Soil Profile TLM 069.

TABLE 54

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 069

Soil Unit	Description
1	Organic, very thin and varies as a function of surface vegetation.
2	(Cultural) Silt [believed to be tephra], very dark brown to black (7.5 YR 2/2 to 10 YR 2/1), finely divided organics, present throughout site.
3	(Cultural) Light brownish gray (10 YR 6/2 silt [believed to be tephra], very thin if not discontinuous.
4	(Cultural) Silt [believed to be tephra], color varies from dark reddish brown (5 YR 3/3) to yellowish brown (10 YR 5/6) to light yellowish brown (10 YR 6/4, cultural material present but believed to have been mixed from below, lower boundary abrupt.
5	Silty sand mixed with cobbles and pebbles [believed to be tephra mixed with other units], light gray (5 Y 7/1), unit found only in test N100/E108, lower boundary clear.
6	(Cultural) Silty very coarse sand with pebbles cobbles and boulders, pebbles-boulders rounded and subrounded positioned with horizontal axis greater than vertical axis ("lying flat"), upper portion of unit oxidized and light olive brown (2.5 Y 5/6) in color, grades to olive (5 Y 5/3) with depth.

TABLE 55

ARTIFACT SUMMARY BY TEST SQUARE AND SOIL UNIT, TLM 069

Soil Unit	Description			
	N99/E112			
	NE Quad	SE Quad	SW Quad	NW Quad
3 and 4	10 Flakes bone fragments	3 Flakes	3 Flakes	10 Flakes bone fragments
Contact between 4 and 6	1 Biface fragment 1 Tool fragment 219 Flakes bone fragments	1 Scraper 1 Tool fragment 60 Flakes bone fragments	1 Core 81 Flakes bone fragments	1 Obsidian scraper 1 Projectile point 1 Obsidian tool fragment 101 Flakes bone fragments
6		67 Flakes bone fragments	18 Flakes bone fragments	2 Flakes bone fragments
	N99/E101			
	NE Quad	SE Quad	SW Quad	NW Quad
2				4 Flakes bone fragments
3 and 4	11 Flakes		5 Flakes	2 Flakes bone fragments

TABLE 55 (Continued)

Soil Unit	Description			
Contact between 4 and 6		46 Flakes	15 Flakes bone fragments	1 Tool fragment 16 Flakes
6	18 Flakes bone fragments	Bone fragments		
	N100/E108			
	NE Quad	SE Quad	SW Quad	NW Quad
2			4 Flakes	10 Flakes
2 and 3	1 Flake			9 Fakes
3			5 Flakes bone fragments 4 Flakes from float sample	1 Flake
4	1 Flake	41 Flakes bone fragments	35 Flakes bone fragments 13 Flakes from float sample	1 End scraper 22 Flakes bone fragments

TABLE 55 (Continued)

Soil Unit	Description			
4 and 5	19 Flakes bone fragments	1 Biface 10 Flakes	48 Flakes bone fragments 151 Flakes from float sample	54 Flakes
6	1 Flake bone fragment		22 Flakes bone fragments 13 Flakes from float sample	4 Flakes
	N94 E123 SE Quad Only			
3	3 Flakes			
4	1 Flake			
5 and 6	15 Flakes bone fragments			

TABLE 56

FAUNAL MATERIAL, TLM 069

Soil Unit	Description
Contact 3 and 4	1 Long bone fragment, calcined, small-large mammal 2 Long bone fragments, calcined, medium-large mammal
Contact 4 and 6	450+ Long bone fragments, calcined, medium-large mammal (note unit 5 not present in this square)
6	11 Long bone fragments, calcined, medium-large mammal
	N99/E101
2	1 Long bone fragment, calcined, medium-large mammal
3	2 Long bone fragments, calcined, medium-large mammal
4 and 6	(note unit 5 not present in this square)
6	140+ Long bone fragments, calcined, medium-large mammal
	N11/E108
3	1 Long bone fragment, calcined, medium-large mammal
4	125+ Long bone fragments, calcined, medium-large mammal
Contact 4 and 5	200+ Long bone fragments, calcined, medium-large mammal
5 and 6	
6	19 Long bone fragments, calcined, medium-large mammal

material is evident at TLM 069. Lithic material consisting of 145 waste flakes (13%) was recovered from within the glacial drift (unit 6) in all three 1 m test squares. Faunal material was also recovered from within the drift in these tests. Although both lithic and faunal material was recovered from within the Watana tephra in all three 1 m test squares and from the Devil tephra in one test square (N100/E108), it appears that only one component is present at TLM 069 at the contact between the Watana and Oshetna tephra. Cultural material recovered from other units has probably been mixed by cryoturbation.

Diagnostic artifacts were recovered entirely from the Watana/Drift contact except for a gray chert biface (UA81-215-290) excavated from the Oshetna tephra in test square N100/E108. Diagnostic artifacts recovered from the Watana/Drift contact include a pentagonal rhyolite projectile point (UA81-215-49), an obsidian endscraper (UA80-215-47), a basalt flake core (UA81-215-46), a retouched basalt flake (UA81-215-51), two basalt biface fragments (UA81-215-50, 127), a rhyolite biface fragment (UA81-215-203) and an obsidian biface fragment (UA81-215-48).

Faunal material was also recovered from all stratigraphic units below the organic horizon but, like the lithic material, was concentrated at the lower contact of the Watana tephra with either the Oshetna tephra where it was present or with the drift where the Oshetna was absent. All faunal material was calcined and consisted of bone fragments from small to large mammals. The faunal material recovered was too fragmentary for identification.

Evaluation:

TLM 069 appears to be a single component site utilized as a temporary campsite at which tool manufacture occurred. Its position on a well drained low knoll offers a panoramic view of the surrounding terrain and suggests that the site also functioned as a game lookout. A nearby pond shows evidence of having been a larger lake at one time and this lake would have provided an easily accessible water source and may have also attracted game to the vicinity of the site. The topography of the site location, as well as the results of systematic testing, indicates the site is primarily limited to the immediate vicinity of the top of the knoll upon which it is situated. The spacial extent of TLM 069 appears to be approximately 10 m by 30 m in size. The high concentration of lithic and faunal material and the presence of diagnostic artifacts make TLM 069 a site at which future excavation is warranted. The presence of cultural material below the Watana tephra also adds important data to the temporal chronology of the prehistory of the Susitna Valley.

Typological comparison of the bifacial artifacts and the pentagonal projectile point may suggest a Choris/Norton period occupation of the site. This interpretation is supported, but not conclusively documented, by stratigraphic data which suggests that the cultural component occurs immediately below the Watana and stratigraphically above the Oshetna tephras. This may prove to be a critical site in defining the cultural chronology in the project area and further work at this site is warranted.

(q) Systematic Testing of TLM 097--Borrow C Site

Location: See section 3.7 (a-xliii).

Testing:

Five 1 m test squares and 24 shovel tests were excavated during systematic testing (Figure 143). Three 1 m test squares were placed initially near the edge of the bluff where reconnaissance test 1 had produced subsurface cultural material. A test square was placed ca. 6 m from the bluff edge adjacent to reconnaissance test 2 which had produced a single flake. One test square (N92.5/E80.5) was also placed ca. 30 m from the bluff edge between two shovel tests which produced cultural material. Shovel tests were dug at 5 m intervals on east-west transects

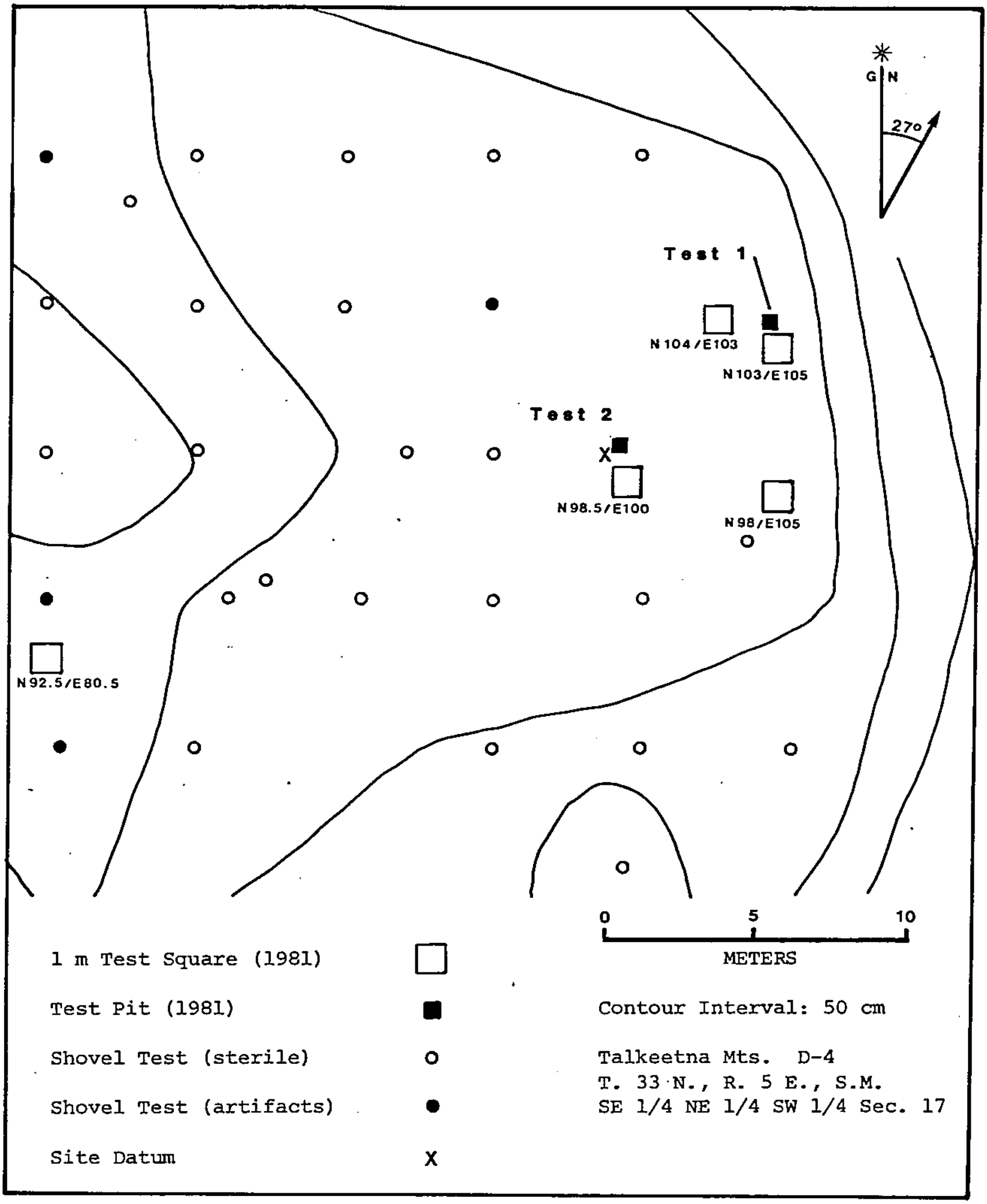


Figure 143. Site Map TLM 097.

in order to guide the placement of test squares and to help define the spacial extent and eastern boundary of the site.

Discussion:

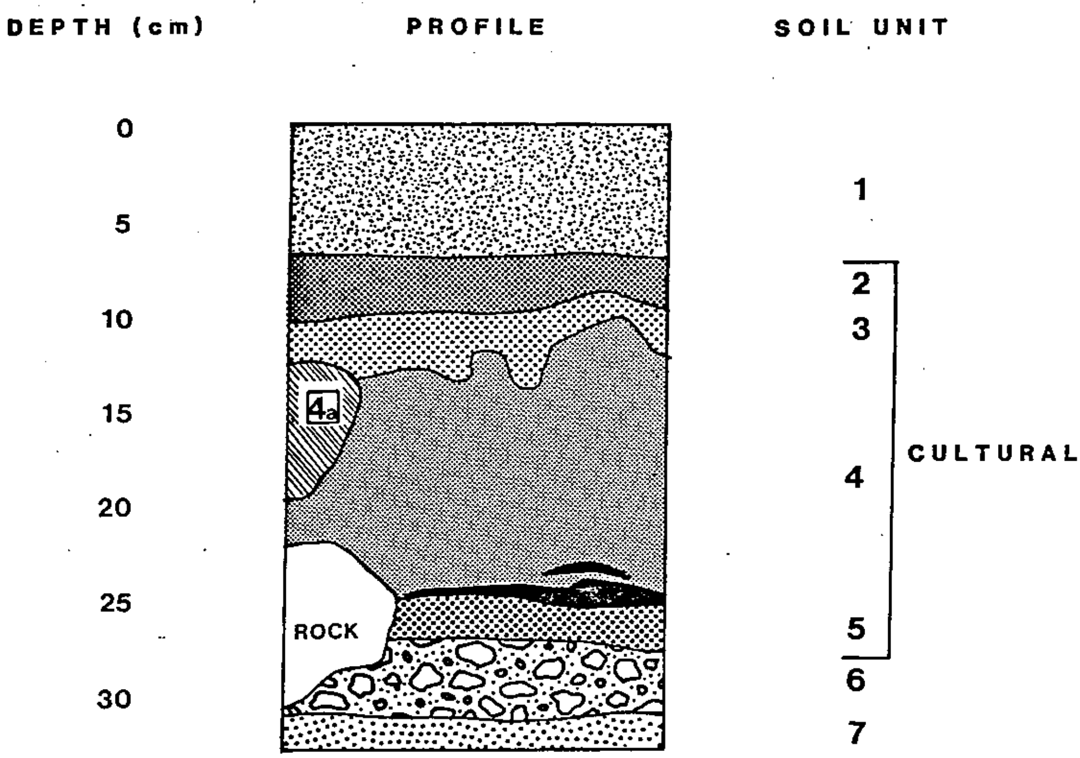
Testing at TLM 097 produced lithic and faunal material in addition to fire cracked rock and charcoal. All five test squares and four of the shovel tests produced cultural material from what appear to be four components (Table 58).

Component I

This component is present in three test squares at the contact between the A horizon and the uppermost of three volcanic tephra (Devil) present at the site (Figure 144, units 2, 3). This component is best represented in two of these tests by a dense concentration of 296 basalt flakes associated with charcoal and burned soil in test N103/E105, and by more than 400 calcined bone fragments, 118 fire cracked rocks, 33 rhyolite and siltstone flakes and a basalt endscraper (UA81-252-115) associated with charcoal in test N104/E103. A radiocarbon determination of 1400 ± 55 years: A.D. 550 (DIC-2245) was obtained on charcoal at the contact between the A horizon (unit 2) and the uppermost (Devil) tephra and should date this uppermost component.

Component II

This component is associated with the uppermost (Devil) tephra (Figure 144, unit 3) and is present in all five test squares although it is less well defined than the other components at the site because it is represented by fewer artifacts and is not associated with concentrations of charcoal. Artifacts associated with this component are found within the Devil tephra and in close proximity to its lower contact with the Watana tephra (unit 4). Two brown chert flakes and a brown chert endscraper (UA81-252-360) are from this component. Brown chert is not found in any



UNIT 2/3 CONTACT

Charcoal sample UA81-252-51: 1400±55, A.D. 550

UNIT 4/5 CONTACT

Charcoal sample UA81-252-427:±4020 65, 2070 B.C.

Figure 144. Composite Soil Profile TLM 097.

TABLE 57

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, TLM 097

Soil Unit	Description
1	Organic mat of sphagnum moss, lichens and roots. Dark reddish brown (5 YR 3/2 to 5 YR 3/4). Thickness varies from 1 cm to 19 cm. Lower contact with unit 2 is gradational. Occasionally fine silt (loess) mixed with organics. (O-horizon)
2	(Cultural) Finely divided organics with charcoal present at lower contact with unit 3. Black (7.5 YR 2.0). Sharp lower textural and color contact with unit 3. Thickness varies from 1 cm to 3 cm. (A-horizon)
3	(Cultural) Very fine silt (tephra). Light brownish gray (10 YR 6/2) to dark brown (7.5 YR 3/2). Black staining and charcoal flecks are present in upper portion due to mixing with unit 2. Thickness varies from 2 cm to 6 cm. Sharp lower textural and color contact with unit 4. Dries to fine white powder. (Devil tephra)
4	(Cultural) Fine silt (tephra). Upper portion heavily oxidized with granular concretions and rootlets. Dark reddish brown (5 YR 3/3) grading downward to light yellow brown (10 YR 6/4). Thickness generally varies from 3 cm to 30 cm but unit is occasionally discontinuous in small areas where unit 3 rests directly on unit 5. Dries to fine powder. (Watana tephra)

TABLE 57 (Continued)

Soil Unit	Description
4a	(Cultural) Rodent Burrows. Disturbance due to ground squirrel activity resulting in mixing of coarse sand, pebble and gravels with units 3, 4 and 5 is occasionally present. Filled burrows are evident in the profiles of several test squares. Rodent activity accounts for some mixing of soil units, movement of artifacts between soil units and occasional discontinuity of soil units.
5	(Cultural) Silty sand (tephra) with occasional small pebbles and gravel. Grayish brown (2.5 Y 5/2). Often capped by charcoal. Lower contact with unit 6 is gradational with some mixing but upper and lower contacts are distinct. Matrix appears to be a mixture of tephra and drift. (Oshetna tephra)
6	Unsorted oxidized coarse sand with pebbles, gravel and cobbles with heavily oxidized compacted zones. Dark reddish brown (5 YR 2.5/2) in heavily oxidized portions to strong brown (7.5 YR 4/6) in less oxidized portions. Lower contact with unit 7 sharp. (Glacial drift)
7	Loosely consolidated coarse to medium sand with occasional pebbles. Strong brown (7.5 YR 4/6) to yellowish brown (10 YR 5/4). Not present in all tests. (Fluvial)

of the other components at the site. Other flake lithologies associated with component II include a speckled whitish gray quartzite (although one flake of this lithology was found in the Watana tephra (unit 4), gray chert, basalt, a whitish tuff and a light green tuff. There is a possibility that the artifacts found within the Devil tephra are a result of mixing due to processes of cryoturbation and that artifacts assigned to component II may have originated from the contacts above and below the Devil tephra. Artifacts within the Devil tephra probably represent a separate component because the brown chert apparently occurs only in this stratigraphic position.

Component III

This component was present in two of the test squares and is associated with the contact between the Devil tephra (unit 3) and the Watana tephra (unit 4). It is best represented by 65 light green tuffacious flakes and 9 fire cracked rocks associated with charcoal and burned soil from the contact between unit 3 and unit 4 in N98/E105. Many of these flakes and the larger fire cracked rocks were lying flat directly on top of the Watana tephra (unit 4) and do not appear to have been affected by post depositional disturbances. Component III is also represented in test square N98.5/E100 at the unit 3/4 contact by 15 very small flakes of rhyolite and tuff.

Component IV

Component IV, the earliest site component, is present in all five test squares at the contact between the Watana and Oshetna tephras (Figure 144, units 4, 5). It is represented by dense concentrations of basalt flakes in three of the test squares. In N92.5/E80.5 115 basalt flakes were recovered from the Watana/Oshetna contact in association with charcoal. In N98.5/E100 145 basalt flakes, a fine grained black siltstone flake core (UA81-252-160), 10 rhyolite flakes and a basalt side-notched point base (UA81-252-159) were associated with this contact. In test square N103/E105 47 basalt flakes, 4 rhyolite flakes and 4 tuff flakes also associated with a concentration of charcoal occurred at the unit 4/5 contact. A radiocarbon determination on charcoal at the Watana/Oshetna (unit 4/5) contact from test N103/E105 yielded a date of 4020 ± 65 years; 2070 B.C. (DIC-2283). This date should date the side-notched point base (UA81-252-159) found in a similar stratigraphic position in test N98.5/E100 and also provides a minimum limiting date on the Oshetna tephra. The remaining two test squares produced only a few flakes from the Watana/Oshetna contact. N98/E105 yielded two speckled whitish gray rhyolite flakes and N104/E103 produced five basalt flakes from this component.

Stratigraphy at the site is characterized by 25 cm to 30 cm of deposits overlying unsorted glacial drift. Much of the deposition at the site appears to be of volcanic origin with ca. 20 cm of tephra directly overlying glacial drift deposits and capped by modern organic and humic horizons. Three tephra horizons have been distinguished on the basis of color, weathering and contacts (Table 57). Contacts between these tephra units are in some cases extremely involuted and often gradational. This involution is often apparent at the lower contact of the Oshetna tephra (unit 5) with the glacial drift (unit 6) where considerable mixing of the two units frequently occurs. Stratigraphy was generally uniform at the site and correlation of tephra and soil units between test squares was possible.

In some tests, especially N98/E105 and N92.5/E80.5, the stratigraphy was disturbed by extensive rodent activity. Artifacts from rodent burrows and disturbed areas were bagged separately and not assigned to soil or tephra units. Charcoal which occurred within the A horizon (unit 2) near the lower contact with the Devil tephra (unit 3) was present in practically all test squares and shovel tests and was attributed to noncultural causes. The charcoal sample dated to 1400 ± 55 years: A.D. 550, from the contact between unit 2 and unit 3 which was associated with artifacts in test N103/E105 was, however, interpreted to be

TABLE 58

ARTIFACT SUMMARY, TLM 097

1	Point base, side-notched, basalt
1	Endscraper, basalt
1	Endscraper, brown chert
1	Scraper, backed, pale green tuff
1	Core fragment, siltstone
1	Flake, retouched, gray basalt
1	Flake, retouched, black basalt
1	Flake, retouched, gray chert
1	Flake, retouched, translucent chalcedony
5	Flakes, blade-like, basalt
1	Core fragment, light brown tuff
646	Flakes, gray basalt
13	Flakes, black basalt
2	Flakes, brown chert
5	Flakes, gray chert
53	Flakes, light gray rhyolite
3	Flakes, speckled gray rhyolite
78	Flakes, pale green tuff
39	Flakes, light green siltstone
31	Flakes, unknown lithology
12	Flakes, white chert
1	Flake, clear chalcedony
1	Flake, clear obsidian
127	Fire cracked rocks

cultural in origin because of the associated calcined bone fragments and dense flake concentration. Charcoal occurring at the lower Watana (unit 4) Oshetna (unit 5) contact which was associated with dense concentrations of basalt flakes, but lacking faunal material, is probably cultural in origin.

Faunal material was present in only one test (N104/E105) associated with Feature 1, and occurred above the Watana tephra (unit 4), in the A horizon (unit 2) and at the contact of the Devil tephra (unit 3) with the A horizon. Approximately 400 heavily calcined long bone fragments from a medium to large mammal (or mammals) were recovered (Table 59). None of these fragments were large enough for identification.

Lithic material at the site included artifacts of basalt, chert, rhyolite and tuff. Preliminary testing of the site and the surface find of a lancolate point of gray chert (UA81-252-1) are discussed under reconnaissance testing. Systematic testing of TLM 097 produced cultural material in all stratigraphic units with the exception of the organic horizon (unit 1), glacial drift (unit 6) and oxidized sand within the drift (unit 7).

Basalt (666 flakes) was by far the most common lithology at the site and was associated primarily with component I (351 flakes) at the base of the A-horizon and with component IV (224 flakes) at the Watana/Oshetna contact. Chert (20 flakes) was primarily associated with component II (14 flakes) in the Devil tephra (unit 3). Rhyolite (56 flakes) occurred primarily within the Devil tephra (unit 3) and at its lower contact with the Watana tephra (49 flakes). Pale green tuff (78 flakes) was associated primarily with the contact between the Devil and Watana tephra (65 flakes). Fire cracked rock (127 fragments) was recovered from two test squares. 118 fragments of fire cracked rock in the A-horizon (unit 2) were associated with Feature 1 in test square N104/E103 and nine fragments were recovered from the Devil/Watana (unit 3/4) contact in test square N98/E105.

TABLE 59

FAUNAL MATERIAL, TLM 097

Soil Unit	Description
	N104/E105
2	400+ Long bone fragments, heavily burned-calcined, medium-large mammal
Contact 2 and 3	30 Long bone fragments, heavily burned-calcined, medium-large mammal

Diagnostic artifacts recovered during systematic testing include the following:

<u>Component I</u>	(contact between A-horizon and Devil tephra (units 2/3)
UA81-252-115	basalt endscraper with unifacial retouch along one convex margin
<u>Component II</u>	Devil tephra (unit 3)
UA81-252-360	brown chert "thumb nail" endscraper with steep unifacial retouch on the distal convex margin
UA81-252-128	gray chert flake with continuous unifacial retouch along one margin (probably a fragment of a larger tool)
<u>Component IV</u>	(contact between Watana and Oshetna tephra (units 4/5)
UA81-252-159	basalt projectile point base, side-notched with concave base and basal grinding
UA81-252-160	fine grained black siltstone flake core
UA81-252-253	light yellow tuff blade-like flake, retouched along one margin (probably use wear)
<u>Component IV</u>	Oshetna tephra (unit 5)
UA81-252-65	black basalt decortication flake with unifacial retouch on two margins

Shovel Test N105/E96 (no provenience)

UA81-252-264 gray basalt retouched flake, possible backing

Rodent Disturbed Area N92.5/E80.5

UA81-252-363 translucent chalcedony flake, continuous retouch along one margin, possible backing (distal tip missing)

Evaluation:

The bluff overlooking Tsusena Creek, on which TLM 097 is situated, provides an excellent view to the north and south through a major valley and suggests the site functioned as a hunting camp from which game moving in the valley could be observed. The site is located at the narrowest constriction at the southern terminus of the valley where game moving either northward or southward is concentrated into an area only a few hundred meters wide. Three caribou moving north through the valley passed within 50 m of the field crew conducting testing at the site. The discovery of 14 prehistoric sites located along a 6 km stretch of Tsusena Creek in this valley attests to the intensity of the prehistoric use of concentrated game resources.

That TLM 097 functioned as more than a hunting overlook is attested to by the presence of endscrapers and by the large amount of lithic detritus indicating tool manufacture, repair, and possibly sharpening, occurred at the site. Charcoal concentrations with fire cracked rock (possibly indicative of stone boiling) and calcined bone provide further indication that the site was used as a camp. The presence of at least three and possibly four components demonstrates repeated use during the past 4000 years. Many of the basalt flakes are decortication flakes indicating that basalt was locally obtained, probably as cobbles from the nearby stream.

No evidence of permanent or semi-permanent structures was observed during testing and the site probably functioned as a seasonal hunting camp. Shovel testing indicates the site is approximately 20 m by 25 m in size and extends back at least 25 m from the bluff edge (Figure 143). It is unlikely the site extends further than 25 m from the bluff because the terrain becomes poorly drained and marshy beyond this distance.

TLM 097 is one of the most significant sites discovered and tested during the 1981 field season. It is multicomponent and stratigraphic correlations between excavation units are relatively easy to interpret. Furthermore, the preservation of charcoal in the components demonstrates the potential for dating. The oldest component not only yielded a side notched projectile point, which is the hallmark of the northern Archaic Tradition, but a radiocarbon determination which temporarily places the tradition to 2070 ± 65 B.C. This provides the first documented age for the Northern Archaic Tradition in this region of Alaska. Two, and quite probably three, subsequent occupations of the site hold critical data which may explain the transition (or lack there of) between Northern Archaic Tradition peoples and precontact Athapaskan culture, which may be represented by the material cultural remains recovered from Component I and dated to A.D. 550. Further work at this site is certainly warranted.

(r) Systematic Testing of HEA 175, Butte Lake Outlet Site

Location: See section 3.7 (a-ii).

Testing: Five 1 m test squares were excavated at locus A of the site (Figures 145, 146).

Discussion:

All test squares at the site yielded cultural material although the number of artifacts per square varied greatly. Surface material was

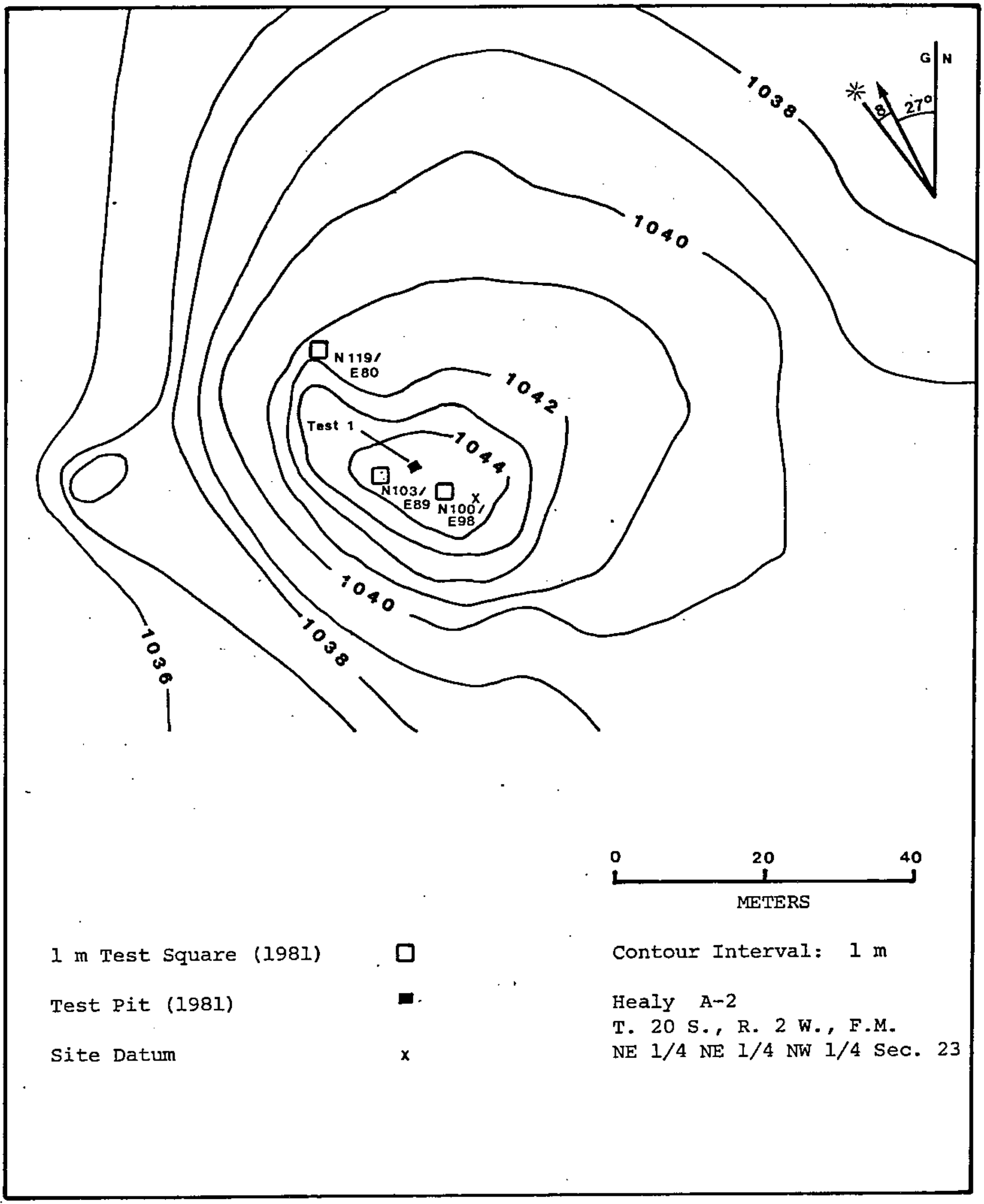


Figure 145. Site Map Locus A HEA 175.

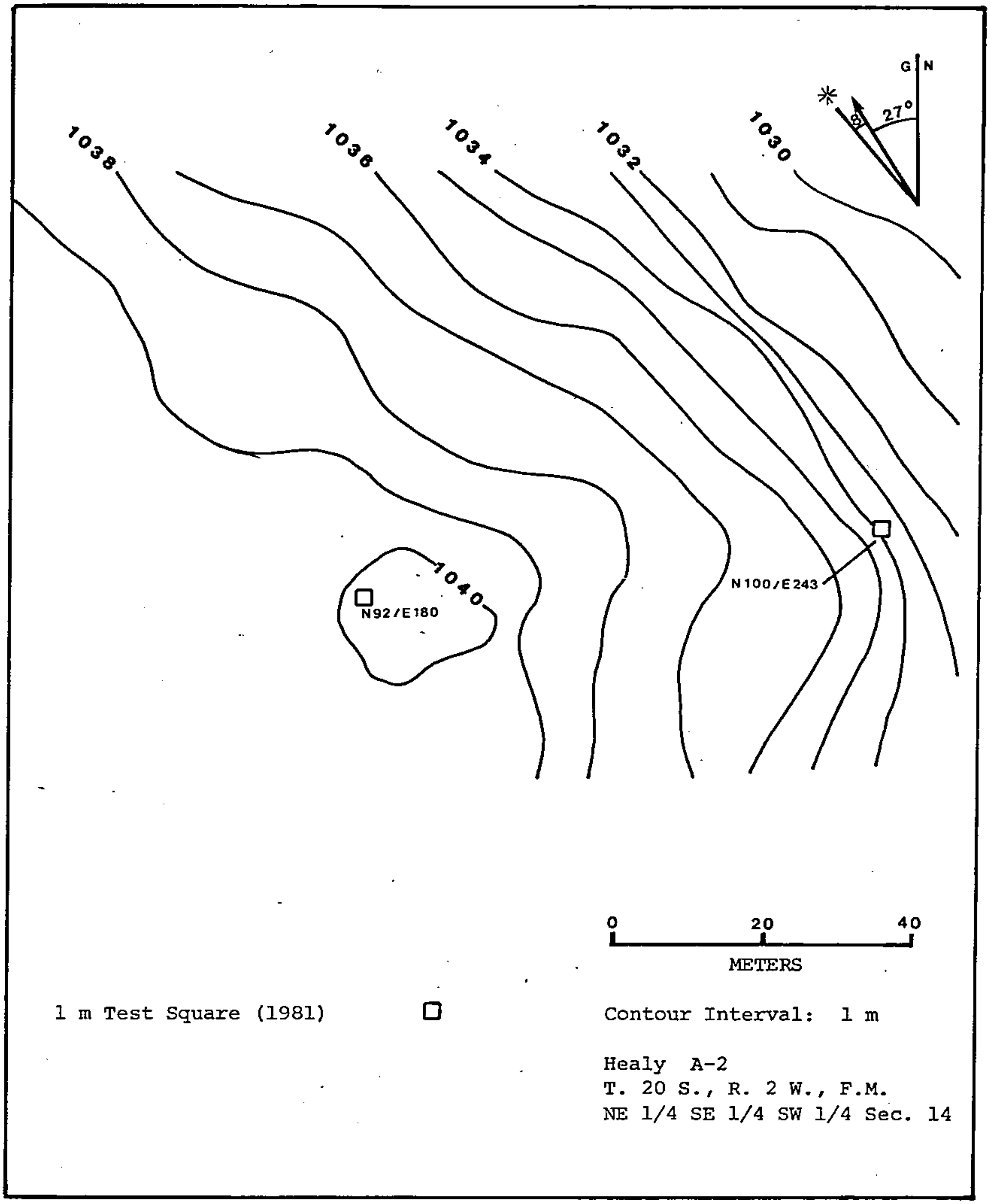


Figure 146. Site Map Locus A (continued) HEA 175.

plentiful and waste flakes of varying lithologies were the predominant artifact type. Thirteen surface artifacts were collected during the systematic testing phase: 1 lanceolate projectile point base, 1 burinated flake, 1 notched, serrated flake, 1 biface fragment, 2 fragments of a retouched blade, 3 microblade fragments, 1 flake core, and 1 questionable flake core.

A total of 336 subsurface artifacts was recovered at locus A, the only locus tested. Like the surface material, the subsurface assemblage consisted primarily of flakes. However, there were 13 artifacts that were not flakes, including 1 side-notched projectile point or knife, 1 side-notched projectile point or knife base, 1 biface fragment, 1 blade, 6 microblade fragments, 1 blade core tablet, and 1 retouched flake. Four bone fragments, one of which could be identified as a caribou metapodial (Rangifer tarandus), were also recovered.

Two types of stratigraphic profiles were evident at the site. Characteristically, in locales of higher topographic relief the stratigraphy was dominated by sand and gravel, probably fluvial in origin, while in locales of lower topographic relief the stratigraphy was characterized by what appear to be lacustrine sands and silts (Figure 147, Table 60).

Cultural material was found in most of the soil units from squares excavated in locales of higher relief. Artifacts seem to be limited to the upper disturbed zones in areas of lower relief. Of special note is the occurrence in glaciofluvial deposits of a large retouched flake and a blade. These two artifacts show evidence of transport and it is possible that they were redeposited in these lower levels through rodent activity or by ice action along the lake margin.

Locus B was not tested due to the lack of time and the meger results during reconnaissance testing. Because of the homogeneity in soil units, at locus A, the test squares could not be excavated by nature levels and consequently arbitrary 5 cm levels were excavated within soil

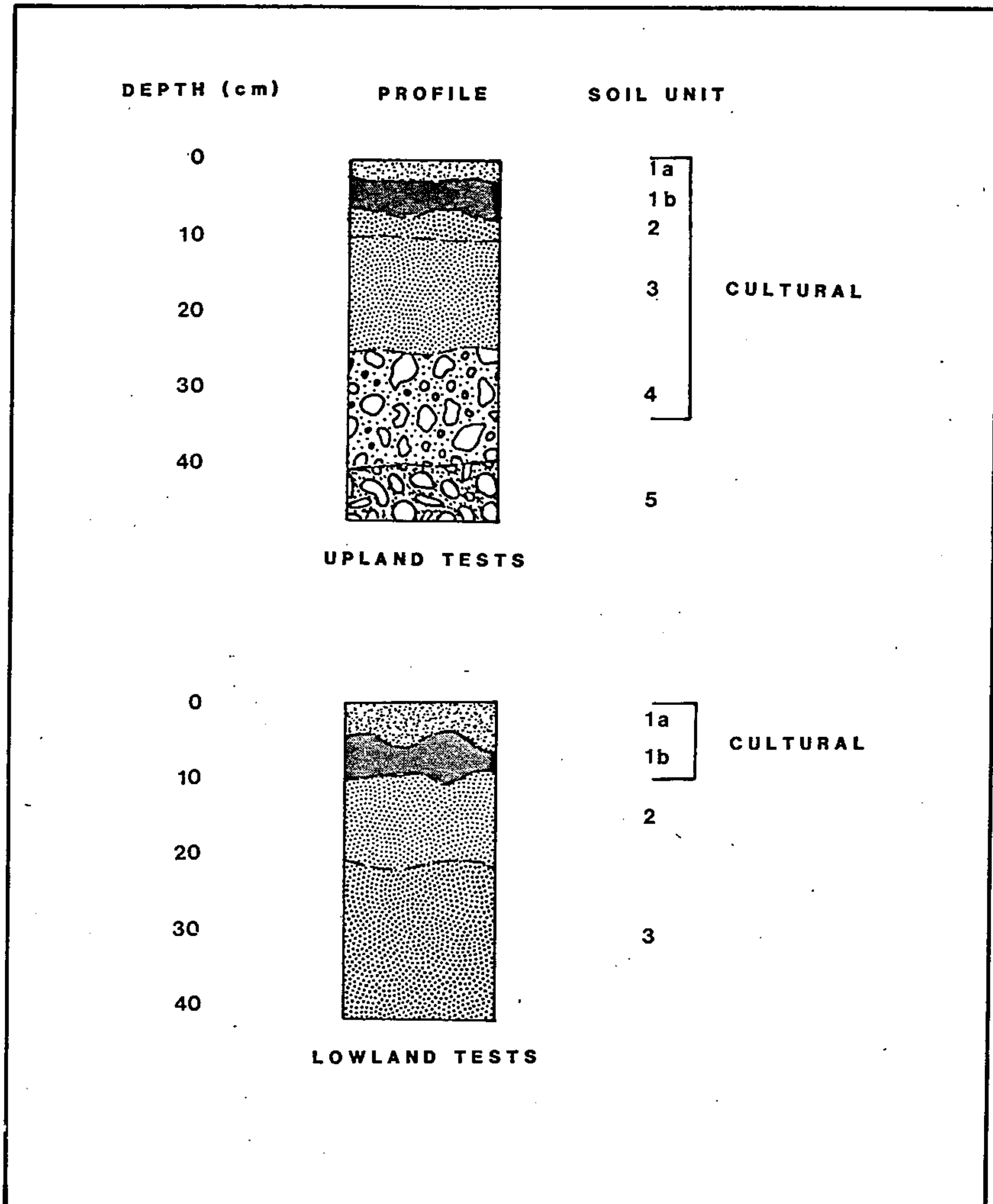


Figure 147. Composite Soil Profile HEA 175.

TABLE 60

SOIL DESCRIPTIONS FOR COMPOSITE SOIL PROFILE, HEA 175

Soil Unit	Description
Upland Profile:	
1A	Organic mat, variable in thickness though continuous in extent; include lichens, roots, and finely divided organics (i.e., both A- and O-horizons).
1B	Mixed organics, sand and silt; gradational with 1A; fairly clear but irregular contacts with unit 2; mixture of sediments probably a function of rodent activity (7.5 YR 5/2 brown).
2	Sand; discontinuous with contacts that vary from clear to indistinct; poorly sorted, medium to fine grain size, at times with significant organic content (10 YR 3/2 very dark grayish brown; if organic content 10 YR 2/2 very dark brown).
3	Sand, medium grain size; poorly sorted with granules and gravels; gradational contacts; rodent disturbance continuous to this depth (5 YR 3/3 dark reddish brown).
4	Sand, medium to coarse grain size with grains, pebbles and cobbles; gradational contacts (10 YR 3/3 dark brown).
5	Sand, coarse grain size with pebbles and cobbles (10 YR 6/4 light yellowish brown).

TABLE 60 (Continued)

Soil Unit	Description
Lowland Profile:	
IA	Organic roots, lichen and finely divided organic material; variable in thickness and often grades into unit IB, includes both A- and O-horizons.
IB	Organic layer intermixed with sand and silt apparently old, collapsed, infilled rodent holes, variable in thickness often gradational with unit II, solifluction evident in N100/E243.
II	Silty sand (5 Y 6/3 pale olive), fairly well sorted, some bedding may be in evidence in N100/E243, some pebbles present, contacts clear and undulating.
II	Sand; grades from fine to medium grained sand, homogeneous in color; no bedding apparent, some lenses of coarse sand within it.

units. Test squares were excavated to greater depths than was usual during the field season for two reasons: 1) the unexpected appearance of artifacts in glacial deposits and 2) to obtain a complete stratigraphic profile of post glacial deposits to aid in interpretation of the sediments.

The stratigraphy at locus A is unlike that found in other sites tested in 1981. It is anomolous for three reasons: 1) apparent lack of tephra deposits, 2) presence in a single site of lacustrine and fluvial soil/sediment units and 3) extensive disturbance by ground squirrels. Two composite profiles were drawn for the site (Figure 147). One profile summarizes the soil units found on the knoll in locales of higher relief while the other illustrates the units found in the lower elevation test squares.

The ridge on which the major portion of the site is located appears to be comprised of glacial outwash deposits. The origin of the deposits in test square N119/E80 and N100/E243 is less obvious from the soil profiles. An area near N100/E243 that had been excavated by a bear provides better information on the nature of these sandy sediments. A series of parallel bedded sands and silts was exposed in the cross section of this cut and these units grade into a well sorted basal sand. It is probable that these sediments are lacustrine and of clay-rich lacustrine sediments that occur near locus B. Both these data suggest that Butte Lake may have been more extensive in the past.

The upper portion of all stratigraphic sections is disturbed by bioturbation and/or cryoturbation. In the lower sections, especially N100/E243, this disturbance is seen as a homogeneous upper sand layer that has a rather abrupt contact with lower, less disturbed, silty and sandy sediments. The sections on the knoll tops are extensively disturbed by rodent activity.

Evaluation

Located in a constricted valley which forms a major north-south corridor, HEA 175 occupies a strategic location for harvesting caribou and other animals concentrated by natural topographic constrictions. The site location also may suggest fishing and exploitation of waterfowl. The types of artifacts found indicate repeated use of this area through an extensive period of time because artifact types characteristic of a number of culture periods are represented (i.e., blades, microblades, burins and notched projectile points). Unfortunately the degree of disturbance, and relative homogeneity of most of the sediments at the site, make it extremely difficult to correlate stratigraphy from one test square to another or even to accurately define artifact association within any particular square.

No material was found suitable for radiocarbon dating and the stratigraphy appears to be so disturbed that definition of archeological components and the relative ages is problematic. Table 61 summarizes the cultural material recovered by test square. Extensive excavation is required to adequately resolve the stratigraphic problems associated with this site.

In addition to the cultural material summarized in Table 61, artifactual material was present on many surface areas of locus A. This material was comprised mostly of flakes of varying lithologies. It was decided to collect potentially diagonostic artifacts from the surface because of the amount of rodent activity that could potentially rebury this material. Table 62 summarizes this material.

The disturbed nature of the sediments, coupled with the limited testing over a large area, makes it difficult at this time to separate associated artifacts in time and/or in space. The data from this site, however, are sufficient to structure several questions concerning the prehistory of the Susitna drainage: 1) the relationship of notched

TABLE 61

ARTIFACT SUMMARY BY TEST SQUARE, HEA 175

N119/E80:	Microblade fragment (UA81-20-411) proximal end, material unknown. Flake with unifacial retouch along one edge (UA81-200-364), basalt, retouch heaviest in notched area of flake, similar to UA81-200-313 from N103/E89.
N100/E98:	Core tablet (UA81-200-253), basalt, rectangular in shape, tablet removed by blow from side. Notched point (UA81-200-348), material unknown, asymetrical, basally thinned ground notches, side notched. Notched point (UA81-200-340), chert?, resharpened, side notched, basally thinned, ground in notches.
N100/E243:	Retouched flake (UA81-200-134) siltstone minor retouch on part of one edge. Retouched flake (UA81-200-61) chert?, minor retouch on part of one edge. Microblade fragment (UA81-200-128), basalt midsection, weathered, 1 axis indistinct but clearer in cross section. Biface fragment UA81-200-373) scraper, basalt or metabasalt, bifacial retouch on flake fragment, low angle edge, wear evident with hand lens. Possible core tablet (UA81-200-363), basalt, very small (c. 1 cm), 3 potential remnant facets from microblade removal somewhat doubtful.

TABLE 61 (Continued)

N103/E89:	Flake (UA81-200-313), basalt, large and irregular with retouch along one edge, in particular on squarish protrusion of edge similar to UA81-200-364 from N119/E80. Blade fragment (UA81-200-406) unknown material, proximal end, highly battered and weathered. Microblade fragment (UA81-200-332), distal end, material unknown. Flake (UA81-200-319), unknown material possible burination on one edge.
N92/E180:	Biface fragment (UA81-200-305), gray chert. Core/uniface (UA81-200-200), unknown material but granular (igneous origin?), extremely weathered, appears that large flake was attempted to be removed from a core and fractured poorly; some retouch (?) along edges. Core/chopper (?) (UA81-200-281), unknown material similar to UA81-200-200, blocky in appearance tapering to wedge shape, interesting in terms of its rough resemblance to Tuff Creek (TLM 027) cores, if flat edge is a platform not much involved in platform preparation, flakes coming off from several directions, could be a "geofact" but other cobbles in this square were not this angular or blocky (note: N100/E98 had more angular drift material).

TABLE 62

ARTIFACT SUMMARY, SURFACE MATERIAL, HEA 175

Core (?) (UA81-200-371) N98/E103
Cryptocrystalline material, large and small flakes removed from rock to give wedge-shaped appearance in cross section.

Flake (UA81-200-370) N99/E103
Rhyolite, large fragment, hinge fractures and battering along portions of two edges.

Flake core (UA81-200-368) N133/E114
Chert

Biface fragment (UA81-200-373) N93/E179
Bifacially retouched flake unknown material.

Projectile point base (UA81-200-372) N98/E103
Banded rock, bifacially retouched, basally thinned base looks like elongated tang with point flaring at point of breakage.

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points and microblades, 2) the occurrence of retouched irregular shaped flakes that are similar to finds at Blair Lake (central Tanana Valley), 3) the appearance of what appears to be a crude uniface and chore/chopper in glacial deposits, and 4) the possible association of a blade with the uniface and chopper. Unfortunately the data is too limited to draw any conclusions about the archeological stratigraphy, or assemblages at this site.

5 - GEOARCHEOLOGY

5.1 - Geoarcheologic Terrain Unit Mapping

After regional reconnaissance mapping, the geoarcheologic units were revised and remapped twice to assist in selecting and evaluating survey locales, and archeological site unit descriptions are included as Appendix B. Unit descriptions are included as Appendix B. Units were crudely divided by age (Glacial and Holocene) into two first order categories. Second order categories include rock surfaces (R), drift (D), ice contact terrain (I), outwash (O), lacustrine (L), valley wall features (V), alluvium (A), slope deposits (S), and marshy bog areas (M). Geological units and subunits, as described in this section and in Appendix B, were mapped directly on aerial photographs. These photographs are on file at the University of Alaska Museum.

Units mapped as glacial (G) in age include all erosional or depositional surfaces modified by ice during glaciation. The highest peaks in the study area, many of which stood above the limit, are also included as glacial units because their surfaces were intensely effected by frost shattering and mass movement at that time. Units mapped as Holocene (H), include all those of non-glacial origin that clearly post-date final ice wastage in the valley bottoms.

Rock surfaces (R) include all those modified by glacier erosion. Surfaces are commonly rounded, but include some open flat areas, and some very steep slopes. Drainage is usually excellent, and soil cover minimal. Tundra vegetation is usually thin and patchy. Unit R is divided into four subunits: hills (h), surfaces (s), valley walls (b), and drift covered (d). Subunit h indicates that the rock unit described occurs as part of an isolated hill or complex of hills. Subunit s indicates where horizontal or sloping bedrock exists in varying relief from S_1 (low local relief) to S_3 (high local relief). Subunit b is used where rock occurs as part of a broadly sloping valley wall, most commonly that of an abandoned glacial trough. Subunit d indicates where patchy drift occurs on rock surfaces, but where the bedrock structure still controls the local relief.

Drift surfaces (D) are those areas of low local relief thickly mantled with glacial till. Because the till is commonly dense, silt rich, and impermeable slopes are typically poorly drained and tussock covered. Subunit t indicates where the drift is thick, obscuring all bedrock structures. Local relief is very low, but gullying is common. Subunit p refers to patchy drift. Poorly drained areas dominate, but they are interspersed with well drained, usually high relief bedrock areas. Subunit u refers to undifferentiated drift. Surfaces generally are nearly flat and poorly drained, but commonly contain irregular zones of hummocky ice contact stratified drift (icsd) that are locally well drained.

Unit (I) indicates concentrations of ice contact stratified drift, which formed over broad areas by deposition associated with stagnant ice. Surfaces are generally gravelly, windswept, free of dense vegetation, and very well drained. Ridges and mounds of irregular pattern are the most common, but elongate features such as individual glacial moraines and eskers are also included within this group because all features grade one into another. Subunit o refers to open hummocky areas where the icsd has subdued local relief. Broad swales and mounds form the dominant pattern. Surfaces are only moderately well drained and generally brush-covered. Subunit t indicates areas of tightly nested ridges and swales in a dense well-drained chaotic pattern. Subunit p refers to patchy areas of well drained gravelly icsd overlying bedrock. Relief is generally low, but sharp.

Glacial outwash (O) mantles areas of low gradient with little surface relief. Surfaces are generally well-drained and forest- or brush-covered. Subunit p indicates broad areas of continuous outwash plains. Subunit v indicates valley train deposits consisting of low flat valley-bottom outwash. Subunit f indicates fans of outwash, commonly at the mouths of tributaries that carried glacial meltwater.

Lacustrine (L) surfaces are generally low, very poorly drained areas mantled with fine grained lake deposits. Earthflows typically occur where slopes are greater than several degrees, but generally the surfaces are stable, and tussock-covered. The subunit m is used where lacustrine deposits mantle the underlying land forms, but not obscure them. Subunit s is used where the deposits are thick enough to obscure the underlying land forms completely.

Areas mapped as (V) indicate those steep slopes which resulted from either Holocene downcutting or from Holocene modification of existing steep slopes by colluviation. These areas are typically cut into bedrock, but thick deposits of drift form the upper parts of the valley walls in many areas. Subunit g is used where the valley walls along the Susitna River or in tributaries are densely dissected by gullies. Terrain is very steep and irregular. Subunit s indicates where steep valley walls are not greatly dissected. These areas often contain a thick mantle of colluvium at the bases of slopes.

Alluvium (A) indicates coarse gravel surfaces of low relief that formed from fluvial deposition. Surfaces are generally well drained, thickly sloping, and exhibit gentle gradients. Subunit s refers to alluvial terraces along the Susitna River. These terraces commonly exhibit well defined overflow drainage channels. Recent alluvium that forms the forested gravel bars of the Susitna River was not mapped separately. Subunit t refers to tributary floor and fan alluvium. These terraces discontinuously mantle the floors of many tributaries.

Slope deposits (S) indicate those large areas thickly mantled by or modified by slope deposits or processes, respectively. These areas are invariably poorly drained, and are mantled by non-sorted mixed deposits. Subunit c indicates colluvial slopes, commonly near the base of steep valley walls. Subunit s indicates areas overlain by solifluction deposits.

Areas mantled by organic accumulations which occur in expansive bogs are indicated by Unit (M). These areas are still essentially undrained, and contain numerous small ponds.

5.2 - Stratigraphic Framework

River bluff exposures provided an excellent opportunity to partially interpret the evolution of the Susitna Valley. A brief description of the sediments exposed in the region is followed by a more detailed discussion of those exposures that have been radiocarbon-dated.

Portage Creek was the farthest west tributary studied. The creek exposes little sediment more than 20 km upstream, but sediments were common between 5 and 15 km upstream. They consisted of dense silty till, clay-rich lacustrine sediments, and coarse outwash, and suggest that Portage Creek was at one time covered by a proglacial lake.

Between Portage and Devil Creeks the valley walls are composed almost entirely of bedrock, but significant thicknesses of glacial sediment mantle the valley bottom and are exposed at river level. Just downstream from Devil Creek 5-20 m of coarse bouldery gravel overlies glacial till and oxidized fluvial sediments. Eskers are common at the surface. Just upstream from the proposed Devil Canyon damsite 30-40 m of silty icsd and possibly till occur to river level. These sediments collectively indicate that Devil Canyon was carved some time before glaciers left the area, and that much of the valley may have been carved prior to glaciation. The valley here carried glacial meltwater westward during subsequent ice stagnation.

Between Devil Creek and Fog Creek morainal deposits and till mantle the broadened valley floor. Eskers and ice contact drift are common, but exposures are generally poor. Between Fog and Tsusena Creeks exposures are better, but generally exhibit only lacustrine and morainal icsd over a dense till and bedrock substrata. Good exposures of glacial sediment become even more rare between Tsusena and Watana Creeks, as the valley walls steepen and bedrock occurs at the surface. Near and upstream in Watana Creek significant thick masses of surficial sediment are present and excellently exposed. Lacustrine deposits typically occur above till throughout this area but large masses of icsd are also present. Between Watana Creek and the drainage of Clarence Lake, the valley is very broad, hence exposures are generally low. They exhibit lacustrine and morainal icsd, till, and outwash, and become better exposed to the east. Between the Clarence Lake drainage and the steep V-shaped canyon (Vee-Canyon) exposures of deltaic and ice contact sediments extend nearly the full height of the valley in some areas. Clearly the receding glaciers deposited much material here, much of it in proglacially ponded lakes.

Between Vee-Canyon and Goose Creek, sediments are exposed only near the base of the valley walls. There they exhibit interlayered till, lacustrine, and gravel units that suggest a complicated glacial history for this area. In the area of intense meandering of the Susitna River near the Oshetna River a number of excellent exposures are present. They contain lacustrine deposits, outwash, icsd, and till and indicate a prolonged glacial history in which outwash deposition was dominant. Deposition has been the rule here, rather than glacial erosion. East of the meander zone the valley opens up into a broad basin floored with glacial moraines and lacustrine deposits. Sandy deltaic and silty glaciolacustrine deposits are widely exposed.

Four exposures contained organic horizons that have been radiocarbon-dated (Table 5). These dated sediments provide a chronologic framework to which undated sediments and inferred events can be correlated.

Tyone Bluff is a 200 m long river bluff that exposes 53 m of deposits of variable origin (Figure 148). The oldest layer (Unit 1) is layered with rhythmically bedded silt and fine sand which is interpreted to be glaciolacustrine. Unit 2 is 13 m of ripple marked, cross bedded, and interbedded fine sand and silt that gradationally overlies Unit 1 and is interpreted as basin-margin lacustrine sediment. Detrital wood fragments from an allochthonous peat horizon in a fluvial lens near its top yielded a date of $31{,}070^{+860}_{-960}$ ^{14}C yr BP. Fine gravels of Unit 3 may represent continued fluvial deposition in the basin after it filled or possibly after it drained. The collagen fraction from a mammoth (?) limb bone from near the top of Unit 3 yielded a radiocarbon date of 29,450 ± 610 ^{14}C yr BP. Unit 3 grades upward into the cross-bedded sand

TABLE 5. RADIOCARBON DATES PERTAINING TO REGIONAL STRATIGRAPHY - SUSITNA VALLEY

^{14}C yr BP	MATERIAL	LOCATION	SIGNIFICANCE
2210 ± 70 (DIC-1858)	Compressed Wood	Earthflow Bluff (2 km South Fog Creek)	Minimum age for valley-floor drift.
3200 ± 195 (DIC-1860)	Woody Peat	Tyone Bluff (1 km up Tyone River)	Close minimum age for tephra.
11,535 ± 140 (BETA-1821)	Peaty Silt	Thaw Bluff (2 km upstream from Tyone River)	Close minimum age for last glaciation.
21,730 ± 390 (DIC-1861)	Woody Peat	Tyone Bluff	Maximum age for last glaciation.
24,900 ± 325 (BETA-1822)	Large Wood Fragment	Oshetna Mouth (0.5 km west Oshetna River)	Recessional ice contact stratified drift.
29,450 ± 610 (BETA-1819)	Collagen from Mammoth(?) bone	Tyone Bluff	Interstadial gravel deposition.

TABLE 5. continued

30,700 +260 -1230 (DIC-1859)	Large Wood Fragments	Earthflow Bluff	Maximum age for last glaciation.
31,070 +860 -960 (DIC-1862)	Detrital Wood Fragments	Tyone Bluff	Fluvial reworking of basin-margin glaciolacustrine sediments.
32,000 ± 2735 (BETA-1820)	Detrital Wood Fragments	Thaw Bluff	Fluvial reworking of basin-margin glaciolacustrine sediments.

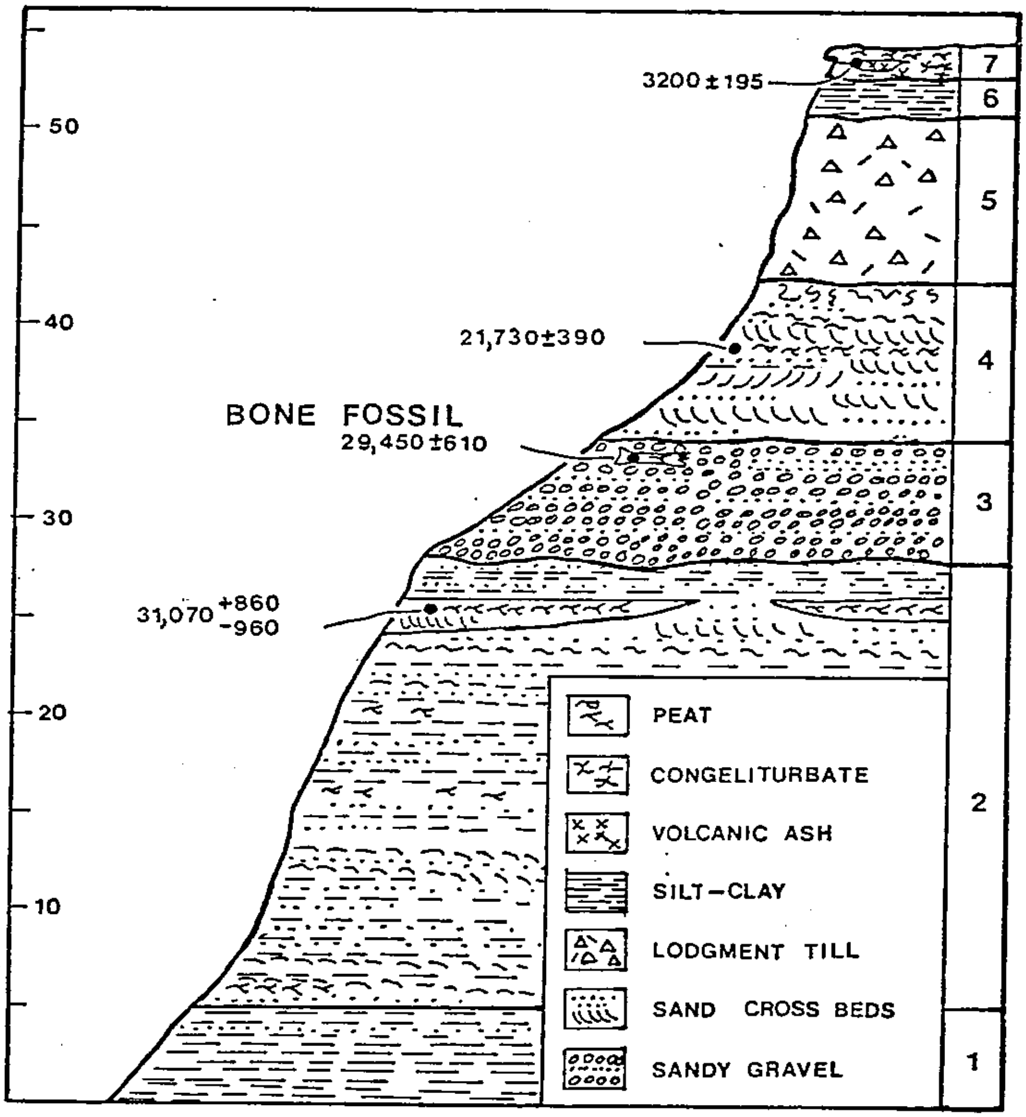

Figure 148. Generalized Stratigraphic Section of Tyone Bluff.

of Unit 4. The upper 2 m of Unit 4 is silty possibly reflecting glaciolacustrine deposition. A date of 21,730 ± 390 ^{14}C yr BP was obtained from a peat horizon in Unit 4. Unit 5 is a 9 m-thick massive dense lodgment till. Unit 6 is laminated silt and clay with dropstones, indicating a glaciolacustrine origin. Unit 7 consists of silty organic colluvium that contains a white vitric volcanic ash layer near its top. The ash is overlain by a dense surface peat which yielded a basal radiocarbon date of 3200 ± 195 ^{14}C yr BP.

These deposits are interpreted to indicate the progressive filling or draining of a large proglacial lake followed by fluvial deposition and overriding of the area by glacial ice. During deglaciation the area was submerged below a vast proglacial lake. Reworking of the older sediments and ash deposition characterized Holocene time. The four radiocarbon dates indicate that glaciation may have been initiated sometime before about 31,000 yr BP but that the Tyone lowland was not ice covered until sometime after about 21,700 yr BP. Glaciers probably occupied the area for a long time, but clearly retreated prior to 3200 yr BP.

Thaw Bluff lies along the Susitna River about 1 km north of Tyone Bluff (Figure 149). It exposes a lower massive unit of varved glaciolacustrine sediments (Unit 1), the top of which was slightly reworked and contained small wood fragments that yielded a date of 32,000 ± 2735 ^{14}C yr BP. The cross-bedded fluvial sand of Unit 2 overlies the lacustrine deposits in sharp angular unconformity. The upper unit (3) is interpreted to be thaw lake sediments or organic fluvial silt that was deposited after glaciation of the region. It yielded a date of 11,535 ± 140 ^{14}C yr BP.

The lower lacustrine sediments of Thaw Bluff are clearly correlative to similar deposits in Tyone Bluff, and indicate glaciolacustrine conditions as early as 32,000 yr BP. The fluvial sand unit probably represents reworking of the bluff area during deglaciation. The date of about 11,500 yr BP indicates that this broad area, which was covered by at least several hundred meters of ice was completely deglaciated prior to Holocene time.

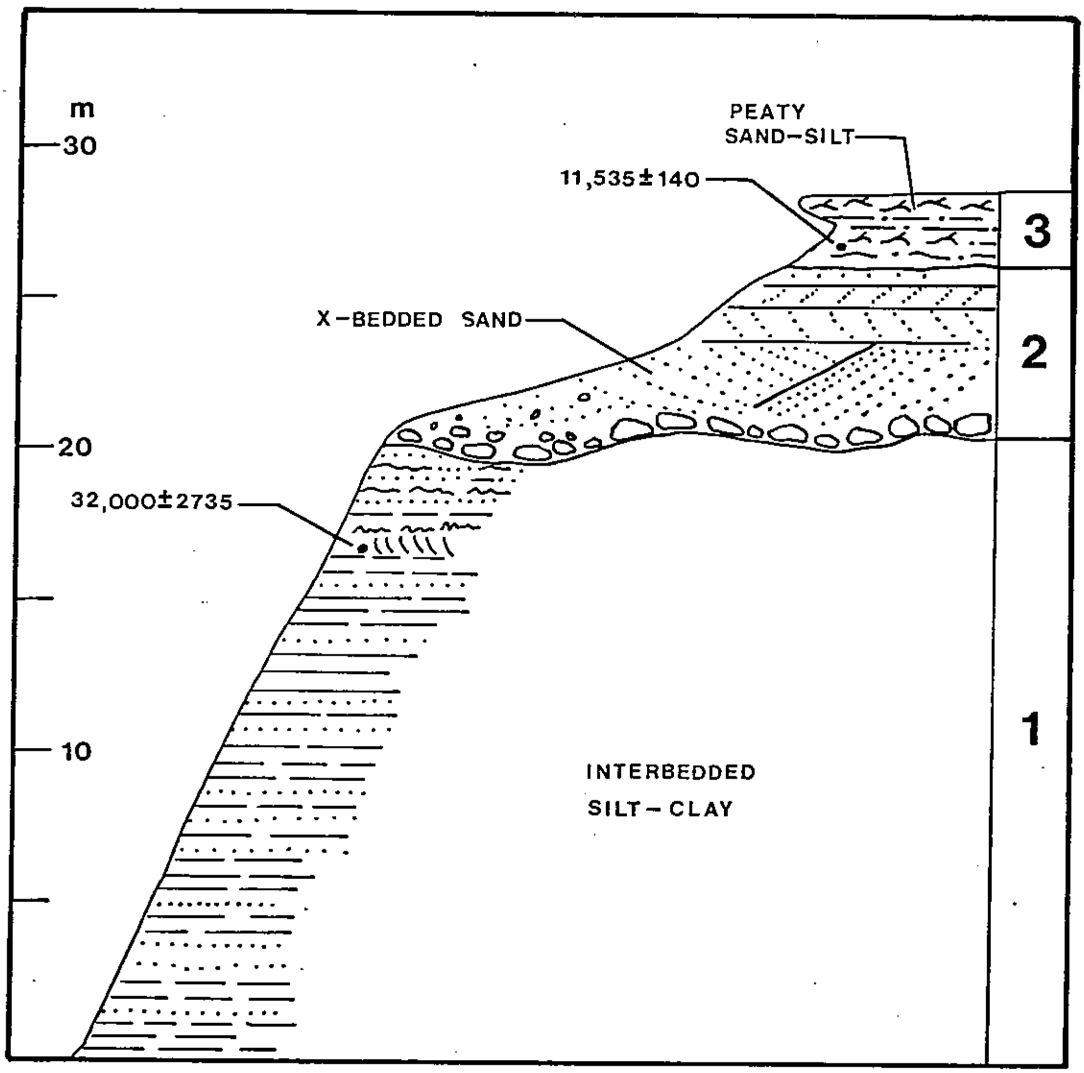

Figure 149. Generalized Stratigraphic Section of Thaw Bluff.

Oshetna-mouth Bluff, which lies along the southern Susitna Valley wall just downstream from the Oshetna River, is an enigmatic exposure (Figure 150). The bulk of the sediments to the upstream side are poorly sorted and bouldery, and are interpreted as ice contact drift deposited in a northerly direction from an active glacier. Discrete organic layers in the drift contained several large wood fragments which yielded a date of 24,900 ± 325 ^{14}C yr BP. These deposits grade downslope into sandy well washed, faulted deposits interpreted as ice-contact deltaic in origin. These sediments are underlain by a till layer interpreted as lodgment in origin, which in turn overlies clearly varved deformed glaciolacustrine deposits. A thin and poorly defined till layer occurs near the top of the bluff, but it cannot be determined whether this is a lodgment till or flow till layer. A large cut-and-fill wedge of coarse bouldery gravel to the north end of the exposure is interpreted as outwash that was deposited during deglaciation.

The drift containing the dated wood sample is interpreted as recessional in origin, yet it indicates active glaciation at a time in which non-glacial conditions were present at Tyone Bluff. It is possible that the Oshetna Valley glacier acted as a separate and out of phase glacier system with respect to glaciation of the lowland to the east. The till at the top of the exposure may be all that remains of a once more extensive till layer that may have formed when glacier ice inundated the entire area some time after 21,000 yr BP.

Earthflow Bluff is located 2 km south of the mouth of Fog Creek, about 70 km west of the other dated exposures (Figure 151). Oxidized sandy fine fluvial gravel near the base of the exposure contains abundant pieces of large wood, and is interpreted as interstadial in character. A date of 30,700 $^{+260}_{-1230}$ ^{14}C yr BP was obtained from near the base of this unit. The interstadial sediments are overlain by thin horizons of well washed medium sand and laminated clay which are interpreted as separate recessional ice contact facies. The bulk of the sediments at Earthflow Bluff are poorly sorted, bouldery and poorly washed sediments with a slight westerly dip. They are interpreted as a massive accumulation of

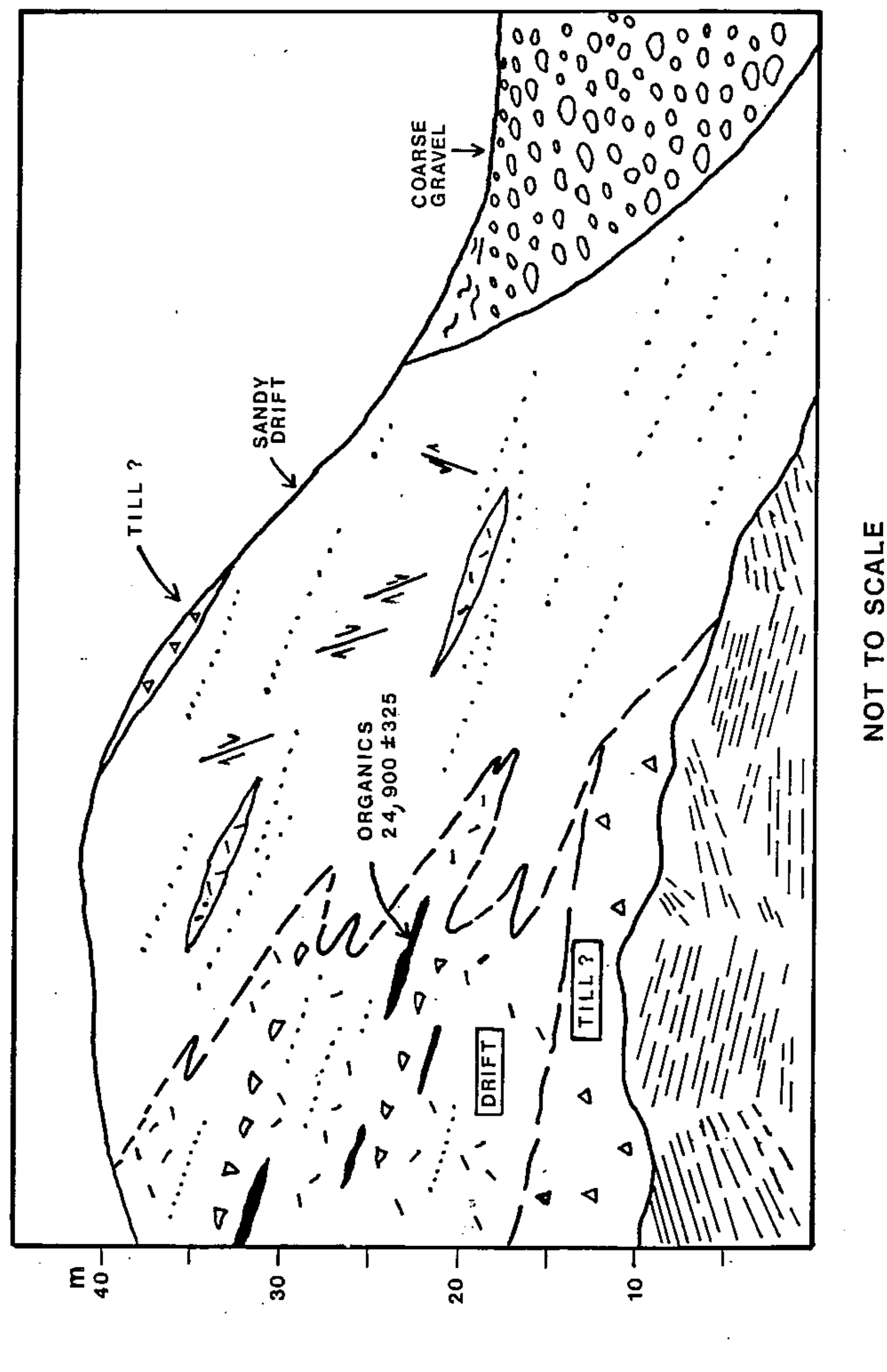

Figure 150. Generalized Stratigraphic Section of Oshetna-Mouth Bluff.

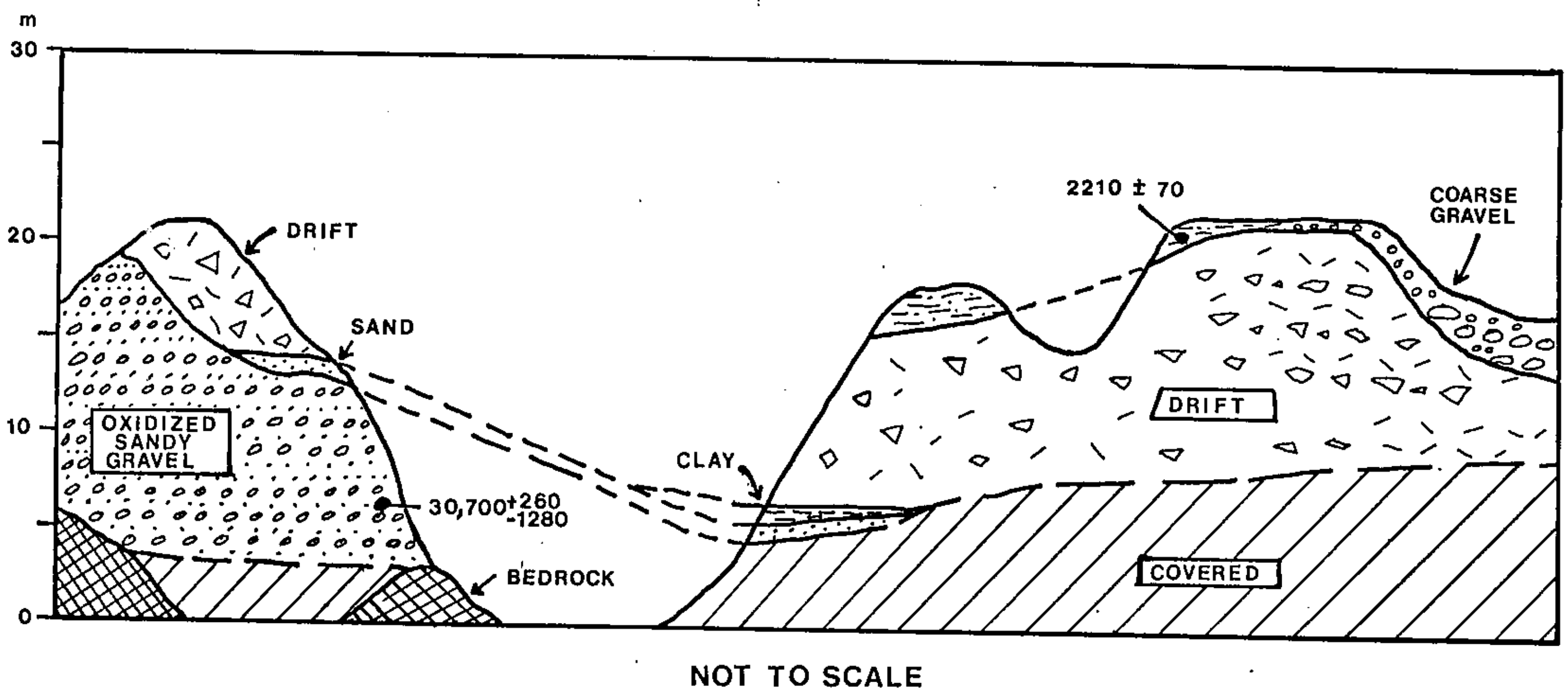

Figure 151. Generalized Stratigraphic Section of Earthflow Bluff.

ice contact drift deposited in the valley bottom during eastward glacier recession. Cut into and overlying the massive drift is an outwash terrace composed of bouldery gravel, which is interpreted to have been deposited during the final phases of glacial retreat from the valley. Overlying the gravel is a lens of organic-rich silty sand which is interpreted as pond sediments. A radiocarbon date of 2210 ± 70 ^{14}C yr BP from this horizon indicates that these sediments are late Holocene in age.

The oldest date from Earthflow Bluff indicates that nonglacial conditions there continued more recently than in the areas near the Tyone and Oshetna Rivers. Glacial conditions were not evident there until some time well after 30,700 yr BP. Glaciers advanced from the east, covering much of the valley free of interstadial sediments and depositing till on the higher slopes. Eastward glacial retreat which occurred some time prior to 2200 yr BP was probably slow, as suggested by the large volume of morainal material in the valley bottom.

5.3 - Preliminary Glacial-Geomorphologic Mapping General Comments

The location, orientation, altitude, and state of development of glacial moraines, ice marginal meltwater channels, lake shorelines, kame-deltas, eskers, and ice flow indicators can all be used to reconstruct the glacial history of the region. These features are now being mapped on the U-2 images and transferred to a 1:250,000 scale base, but the map is not yet ready to be included in this report. A complete description of all glacial-morphologic features studied is beyond the scope of this report but a brief summary of them will be presented.

Deposits of at least two and possibly four major ice advances are recorded on hills which projected above all glacial limits. In areas where slopes are not too steep, such as near the headwaters of Jay Creek, these features are particularly well preserved.

Valley floor gradients, moraines, meltwater channels, and directional indicators resulting from the last major glaciation indicate that the pattern of glacial flow was very complex. Each major valley contained its own glacier system, and these merged to form large coalesced lobes in the broad floor of the Susitna Valley between Stephan Lake and Watana Creek. A major lobe of ice which advanced southward and eastward from the headwaters of the Susitna and MacLaren Rivers, respectively, inundated the lowland near the Tyone and Oshetna Rivers. This lobe of ice built upward until it spilled westward as a tongue of ice through the narrow canyon east of Kosina Creek. This tongue of ice may have been joined by an ice tongue which occupied Jay Creek.

Another major ice source was the southeast drainage valleys of Watana, Tsusena, and Deadman Creeks, which carried local valley glaciers as well as overflow ice drainage from the north. The Talkeetna River-Fog Creek area was another major ice source. Glaciers which descended these valleys merged to build a large northeast flowing ice lobe that may have extended across much of the broad valley bottom in this area. A portion of this lobe spilled westward through the Devil Canyon area where it merged with a large southeast-flowing glacier in the valley of Portage Creek. Glaciers in the valleys of the Oshetna River and Kosina-Tsisi Creeks may not have advanced to join the main ice stream, but ice drainage from these valleys spilled over low divides to join other systems.

The pattern of deglaciation was different for each separate system and very complicated. Several readvances have been recognized for some valley glacier systems. The great bulk of recessional ice contact drift and the large number of recessional moraines indicates that retreat in many areas was progressive and systematic. In other valleys, particularly in the smaller systems, retreat must have been relatively rapid.

The widespread occurrence of eskers and other ice stagnation features over broad areas indicates that the ice may have stagnated over large areas during retreat. The gradient of eskers is commonly reverse relative to modern drainage, indicating that glaciers controlled drainage during retreat. Widespread lake deposits, particularly in the Fog Lakes-Watana Creek and Tyone-Oshetna River areas, indicate that these areas were covered by large proglacial lakes during deglaciation.

Examination of moraines fronting cirques in the Kosina Creek-Black River areas indicate that Neoglacial advances were very small, not extending more than several km beyond the present glacier margins.

5.4 - The Last Glaciation

The last major glaciation (late Wisconsin time) occurred over much of Alaska between 32,000 and 13,000 years BP. Deposits in the Susitna Canyon area can be correlated to this interval as the basis of topographic "freshness", stratigraphic relationships, and radiocarbon dating.

Glaciers are interpreted to have covered much of the lowland regions of the study area during late Wisconsinan time. At the maximum extent of glaciers the Susitna Canyon area was covered by a complex glacier system that resulted from confluent ice tongues and lobes which behaved as individual units.

During initial glaciation, major ice masses began building up in three separate locations; the southern Alaska Range, and the northern and southern Talkeetna Mountains. The largest accumulation occurred along the southern flank of the Alaska Range and the Clearwater Mountains. As ice built up vertically it advanced southward down the upper Susitna and Mclaren River valleys, forming large lobes that extended up the valley of Coal Creek and in the Tyone River region. The lobe did not extend beyond the mouth of Tyone River until about 22,000 years BP. During the southward advance of glaciers generated from the southern Alaska Range, ice also accumulated in the central Talkeetna Mountains in the headwater regions of Kosina and Tsisi Creeks and the Black and Oshetna Rivers. Following initial valley glaciation of these regions a large ice cap, centered over the southern Talkeetna Mountains formed. Large lobes in the valleys mentioned earlier advanced northward toward the Susitna Canyon. A third accumulation loci was the northwestern portion of the Talkeetna Mountains north of Devil Canyon. Major valley glaciers in this area drained down the valleys of Deadman, Tsusena and Portage Creeks from a localized ice cap.

As ice from the southern Alaska Range built up above altitudes of about 3000 feet, it spilled through the structurally controlled valleys of Coal, Jay and Butte creeks and then advanced southwest to the Susitna Canyon. The southernmost part of this ice mass built a large lobe near the Tyone lowland which was deflected west-northwest down Susitna Canyon by lobes advancing northward down the Oshetna River Valley. Ice derived from the northwest Talkeetna Mountains advanced southwest where it merged with northeast flowing ice derived from the ice cap which existed near the present upper Talkeetna River Valley, north flowing ice generated from the southern Talkeetna Mountains flowing down the valleys of Tsisi and Kosina Creeks, and west-northwest flowing ice extending down the Susitna Canyon from the Oshetna and Tyone lowland lobes. Thus, glacial drainage during the late Wisconsin glacial maximum was centripetal toward the Fog Creek--Watana Creek lowland. Ice did not cover this area until some time after 31,000 years BP.

The distribution of moraines in this area indicate that following the glacial maximum the lobes withdrew at different rates. Glaciers advanced northeast across the Fog Creek--Watana Creek lowland to a terminal position near Big Lake after the south flowing transection glaciers withdrew. Following withdrawal of this secondary lobe, west-flowing glaciers in the Susitna Canyon, fed largely by north flowing tributary glaciers, advanced to terminal positions near the mouth of Tsusena Creek. Valley glaciers draining Tsusena Creek also experienced readvance at this time.

Following these dynamically controlled readvances, glaciers may have disappeared rapidly over much of the region. The great number of convex westward recessional moraines in the Susitna Canyon between Fog Lakes and the Oshetna River indicate that active recession of "live" ice persisted in this area. Prominent moraines of nearly identical surface morphology throughout the region indicate that two final readvances or still stands occurred. The uniform distribution of moraines in various settings suggest that they were climatically controlled. Prominent outer moraines from the oldest of these two readvances are recognized in: the small unnamed valleys south of Fog Lakes, near the confluence of Tsisi and Kosina Creeks east of Watana Lake, in the Oshetna Valley west of Lone Butte, near the confluence of the Susitna and Oshetna Rivers, and in the valleys of Coal and Butte creeks.

Evidence for the younger readvance consists of a prominent moraine crossing the Susitna Valley floor near the Denali Highway, and similar moraines in many smaller valleys up valley from the most prominent moraines attributed to the early readvance. Deglaciation of the Tyone lowland region, which was covered during the second to last readvance occurred prior to 11,500 years BP. Large areas of stagnant ice were present in most of the broad lowland regions during deglaciation. These may have influenced human movements as late as 8-10,000 years BP, on the basis of studies in analagous regions.

5.5 - Archeological Stratigraphy

The numerous archeological test pits and excavation walls throughout the study area revealed a remarkably uniform sequence of sediments and soils. Sixteen major stratigraphic units can be recognized throughout the project area. No individual site contains all recognized units but many have at least ten.

Stratigraphic unit designations and cultural horizons discussed in this section (Figure 152) do not necessarily correspond to soil units and cultural horizons depicted in the text or on soil profiles in Chapters 3 & 4. The stratigraphic and cultural units discussed in this section were developed based on an evaluation of field data and were not available until after the 1981 field season. However, these units are used in the cultural chronology of the Upper Susitna River Valley as discussed in Chapter 7.

In general the stratigraphy consists of glacially scoured bedrock overlain by a discontinuous cover of weathered glacial sediments which is overlain by a series of volcanic tephra horizons interbedded with weathering horizons and buried soils. A surface organic mat overlies the older sediments. Non-volcanic eolian sediments occur both as part

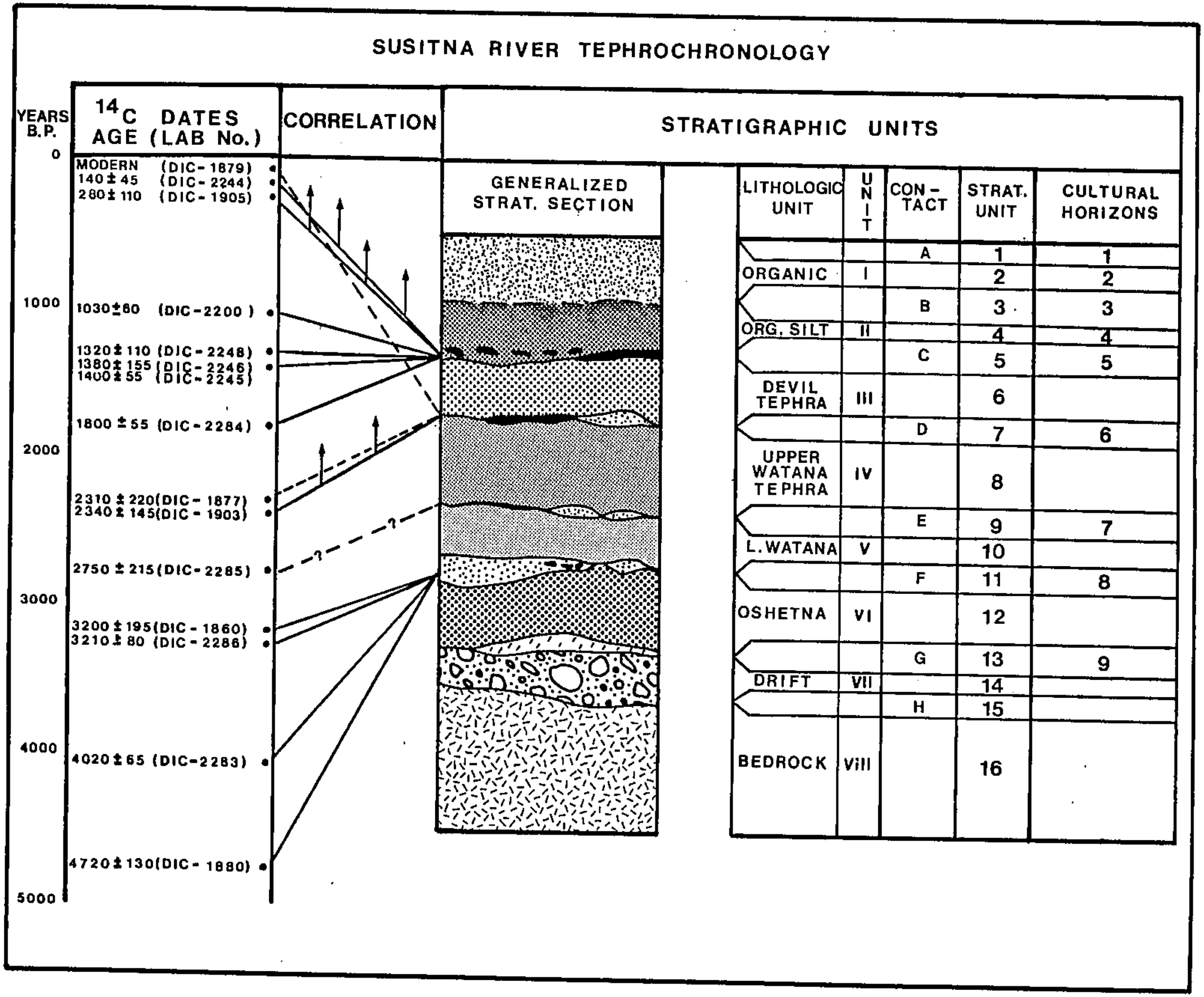

Figure 152. Upper Susitna River Tephrochronology.

of the tephra units and as separate subunits between tephra and organic horizons. Three major types of stratigraphic units are identified; lithologic units, contact units, which commonly represent modification of lithologic units, and cultural horizons; each contains one or more subunits. Each type of unit will be discussed separately in the following subsections, and within each subsection units will be discussed from oldest to youngest.

(a) Lithologic Units

The eight sediment units, designated by Roman numerals in Figure 152, represent different intervals of sediment deposition, which for our purposes, span discrete time intervals that can be correlated throughout the project.

(i) <u>Unit VIII</u> (Bedrock)

Consists of bedrock which varies in composition throughout the project area and is not considered further in this report. Bedrock is exposed at less than half of identified sites.

(ii) <u>Unit VII (Drift)</u>

Consists of glaciofluvial, glaciolacustrine, and undifferentiated glacial sediments which overlie the bedrock. Its thickness varies from a few centimeters to an unknown amount greater than 50 m. Where a significant thickness of drift is exposed at the surface, bedrock is rarely exposed. At most sites the drift consists of clearly washed sandy gravel and gravelly sand which is commonly mixed with the overlying sediments near the contact.

(iii) <u>Unit VI (Oshetna tephra)</u>

Consists of a uniform layer of dark gray sandy silt, typically 3-5 cm thick. Field relations and petrographic analyses indicated that this unit (and units III, IV and V) consists largely of volcanic tephra in the "ash" size range. Although typically 3-5 cm thick, maximum thicknesses of 8 cm were observed. No significant variations in thickness could be related to latitude, longitude, or local setting. Oxidation or staining of this unit was generally absent.

(iv) Unit V (Lower Watana Tephra)

Consists of light brownish gray volcanic ash, with almost no other eolian material. When field moist, the tephra exhibited a pale pink or buff color. Thicknesses ranged from 1 cm to 10 cm thick, but owing to the commonly gradational relation to overlying units, thicknesses were difficult to assess.

(v) Unit IV (Upper Watana Tephra)

Consists of volcanic tephra that is commonly strongly oxidized to a dark reddish-brown color. When unoxidized, the unit is similar to Unit V. Oxidation ranges from pale brown stain to a durable cemented layer, but most commonly consists of small granular concretions in the sand size range. Unit IV which is typically 5-10 cm thick, most commonly overlies Unit V in an apparently gradational relationship that can be recognized by the textural and color change from dark reddish-brown granules to light grayish-brown silt. In many instances however, stratigraphic arguments require their separation into different units.

(vi) Unit III (Devil Tephra)

Consists of a light gray to pinkish-gray volcanic ash which lies near the top of the stratigraphic column in the project area. On the basis of color and stratigraphic position it is the most easily recognized. It typically ranged from 3-5 cm thickness, but commonly reaches thicknesses of 8 cm.

(vii) Unit II (Organic Sandy Silt)

Consists of a relatively uniform thickness (2-8 cm) of organic sandy silt which is riddled with modern roots. The unit consists of approximately subequal amounts of fine windblown sandy silt and finely divided organic material. Delicate interbedding of mineral rich and organic rich layers in many areas indicate that this can be considered a sediment unit separate from the overlying organic unit. Much of the organic component in this unit may have been illuviated into this unit from above, and thus can be considered an "A-horizon" in typical soil nomenclature. Thus, although in part contemporaneous with the existing surface soil, the bulk of the mineral portion of this unit apparently was deposited under conditions different from those of the present.

(viii) Unit I (Surface Organics)

Consists of a dense fibrous mat of roots and decayed vegetation that constitutes the present organic duff of the modern vegetation. Though typically thicker and denser in forested settings (to 20 cm) it is remarkably similar to the surface organic layer under the modern shrub tundra.

(b) Contact Units

The units described above represent major intervals of sediment deposition which can be recognized throughout the project area. The interval between deposition of sediment units, which may span most of the time represented in the soil stratigraphy, can be treated as separate stratigraphic units. Thus, although contact units are defined by the contacts between sediment units, they are characterized largely by the soil forming processes which acted to alter the sediment units. Eolian, organic, and cultural subunits occur at the contacts. Within any given site or site loci subunits can be arranged in stratigraphic order but such correlations cannot be extended throughout the area. For example, an eolian sand subunit between Lithologic Units VI and VII in one area may not be exactly correlative with a similar deposit in the same position elsewhere. All that can be inferred in this case is that both were deposited some time during the interval between Lithologic Units VI and VII. Contact units, which are designated by capital letters A-H are described below in order of decreasing age.

(i) <u>Unit H</u>

Unit H represents the contact between the bedrock and the overlying drift. In all cases the bedrock is not appreciably weathered, indicating that no great time interval separates the two lithologic units. In many cases, the exposed bedrock shows evidence for glacial scour. Because the drift in nearly all cases was deposited during late Wisconsin time (32,000-12,000 years BP), the scouring must have occurred during the same interval.

(ii) <u>Unit G</u>

Unit G represents the contact between the undifferentiated glacial drift and the lowest volcanic ash layer (Unit VI). Weathering of the drift typically consists of shallow oxidation of the surface to a depth of 10-50 cm, depending on local conditions. Evidence for deflation, which consists of wind polished stones or a cobble-pebble pavement is present in only a few localities, thus eolian erosion at the contact has probably been negligible. In several localities evidence for cryoturbation is present. This consisted of sorted zones of sandy versus gravelly areas and of stones with a vertical orientation. Frost-cracked stones at the contact are the exception, rather than the rule.

The most common subunit at the contact is a discontinuous layer of eolian sand which indicates some degree of localized eolian deposition and erosion prior to ash deposition. In one site (TLM 065) several different silty and sandy subunits are present, indicating that an earlier interval of eolian (and possibly volcanic) activity may have occurred throughout the region, and was followed by an interval of erosian. Contact subunits and the upper part of the drift are commonly mixed with the lower portions of the Oshetna tephra, indicating that cryoturbation and/or downslope reworking postdated the first regionally recognizable tephra.

(iii) Unit F

Unit F consists of a recognized stratigraphic break between the lowermost tephra (Unit VI) and the Watana tephra (Unit V). In many areas the contact can be recognized only on the basis of a color change downward in the tephra from brown to gray. Most commonly, however, a thin zone of charcoal flecks and clumps separate the two lithologic units, sometimes thickening into a discrete charcoal layer. Occasionally a thick zone of finely divided organic matter, representing a probable immature paleosol is present. In several localities thin lenses of eolian sand lie between the tephra, suggesting partial deflation.

The absence of pronounced weathering along this contact, when combined with the typical occurrence of resistant charcoal flecks suggests that this contact is erosional. Thus the time interval represented by Contact Unit F probably includes additional sedimentation and weathering which was removed prior to subsequent deposition.

(iv) Contact E

Contace E is one of the most poorly represented. In nearly all cases the Watana tephra can be observed as an upper intensely oxidized zone (Unit IV) that gradationally overlies an unoxidized or slightly oxidized tephra (Unit V). In at least six localities however, there is good evidence for separating these tephra units into two major units; thus Contact Unit E is well expressed, but only at a few localities. Because of the nature of the units in question, being derived from some distant volcanic source, the contact must be real even where it is recognized only on the basis of weathering differences.

The best evidence for Contact Unit E is thin organic layers which clearly resulted from soil accumulation at the surface. These layers are commonly discontinuous and suggestive of downslope reworking. Other evidence consists of distinct cultural areas with associated activity areas that lie stratigraphically at two sites between the upper and lower Watana tephra (Units IV and V, respectively). Charcoal layers of possible cultural origin also separate Units IV and V at several localities. A zone of coarse-medium sand which represents local eolian activity also separate the units in a few places. Finally, in one locality Unit IV lies in an angular unconformable relationship with Unit V.

The lack of widespread evidence for this contact suggests that the time interval it represents may have been short lived.

(v) Unit D

Unit D is most commonly represented by a sharp color and textural contrast between the unweathered pinkish-white Devil tephra (Unit VI) which directly overlies the strongly oxidized concretionary upper Watana tephra (Unit IV). In many respects this contact appears as that of a leached layer (E-horizon) over a more oxidized lower layer (B-horizon). However, no independently verifiable evidence for leaching was observed anywhere in the upper soil layers within the study area. Furthermore, there appears to be no evidence for gradation above and below the Devil tephra (Unit III) which would be expected if the color horizons were geochemically controlled.

The best evidence for Contact Unit D is the infrequent, but not rare occurrence of a charcoal layer with or without associated cultural material. In some cases finely divided organic matter occurs as evidence for a paleosol separating the Devil from the Watana tephra. Thin eolian sand zones are sometimes present at the contact. Finally, Devil tephra lies unconformably over cryoturbated Unit IV.

Owing to the extent of weathering of the upper Watana tephra, this contact appears to represent an interval of weathering, more than one of deposition or erosion. It is likely, however, that the strong oxidation of the upper Watana tephra may be controlled by its lithology; it may be exceptionally reactive (or weatherable) because of its chemical composition.

(vi) Unit C

Unit C is exceptionally well defined. It is most commonly represented by a dense black layer of finely divided organic material which is discontinuous. Charcoal within this layer is common, but more commonly the charcoal has been reworked as clasts into the lowermost part of Unit II. Thus the charcoal in Unit II is a contact phenomenon, even though it is included within a lithologic unit. Minor oxidation which is commonly expressed as brownish stained tephra, typically lies within 1-2 cm below the contact.

This contact is interpreted to represent the initial organic accumulation on a stable substrata that immediately followed the final episode of volcanic ash deposition in the study area. Prior to the slow deposition of eolian dust and the coeval accumulation of finely divided organic matter that characterize Unit II, conditions must have been more stable. Limited erosion apparently occurred prior to the accumulation of Unit II.

(vii) Unit B

Unit B is commonly gradational, but represents a significant difference in the style of sedimentation that postdated the last volcanic ash. The contact is expressed as the change from a mixed mineral-finely divided organic accumulation to one characterized by the accumulation of partly decomposed macroscopic organic matter. The contact could be interpreted as pedological, representing the differing activities in the O and A soil horizons. Units I (surface organic) and II (organic sandy silt) are separated partly because they are easily observed stratigraphic units, but more so because there is evidence to suggest that some uniform change has occurred in the character of soil development within the last several hundred years. In many cases the surface organic appears to be accreting faster than organic decay can break it down suggesting that the Contact Unit B is not an equilibrium pedologic feature. In addition the interbedded mineral matter in Unit II and its absence in Unit I further supports the separation of units or lithologic grounds. Clearly, both processes are occurring. These units (I and II) are separated largely because they are workable stratigraphic units in which cultural materials are found.

(viii) Unit A

Unit A represents the present ground surface. It is assigned as a stratigraphic unit because within the time we are studying the project area it can be considered as a discrete unit of time, younger than the surface organic accumulation.

5.6 - Stratigraphic Units

As was described in the previous section, the contact units are just as, if not more, important in the archeological stratigraphy of the project area as the lithologic units. In order to conveniently describe both in the same chronology, both types have been combined into stratigraphic units. Thus, we can isolate and correlate sixteen significant intervals of time throughout the project area. Any contact unit can be subdivided at a given site, but it cannot be correlated throughout the area. The stratigraphic units, designated by arabic numbers 1-16 provide the basis for the archeological stratigraphy.

5.7 - Discussion

From the above discussion it is apparent that individual volcanic ash layers and the unconformities/soil horizons between them form the basis for the archeological stratigraphy. Four key factors regarding the ash layers are: 1) geographic extent, 2) its source or sources, 3) time necessary to accumulate, 4) post depositional history, and 5) the age of each. The first four factors discussed in this section are followed by a discussion of chronology.

Tephra is not distributed uniformly within the project area. It is nearly ubiqtuous on lowland areas of gentle to moderate slopes, but is absent on steeper slopes and in windy passes. It was not observed above an altitude of 3500 feet. Ash seemed to be more common in the central and western portions of the project area.

The thickness of each ash layer across the project area was plotted to form isopach maps. Although these derivative maps have not been examined in detail, there is no apparent significant variability in thickness for any of the four recognized tephra in the Susitna Canyon area. This indicates that the volcanic sources were all distant, probably from either the Lower Cook Inlet Aleutian Range volcanic area or from the Wrangell Mountains. No thickness variations could be used to infer the direction from which the tephra were derived.

The composition of individual tephra could hold great promise for assessing the vent responsible for tephra deposition, but this assessment requires laboratory work far exceeding the scope of this project. Index of refraction, size, morphology and shape of glass shards, the mineralogy of phenocrysts, and bulk and trace element geochemistry could allow a provenance for each tephra to be established. Each tephra was examined through a polarizing microscope. The tephra vary in composition, however no detailed studies were done to differentiate them. Collectively all tephra consist almost completely of unweathered glass shards. Prominent phenocrysts in order of decreasing abundance included plogioclase feldspar, quartz, pyroxenes, and amphiboles. Detailed studies should permit the approximate source for each tephra to be determined.

The duration of each ash fall is presently unknown, but can be inferred from the geologic relationships. The absence of internal bedding, internal textural variability, and organic material suggests that tephra deposition intervals were short lived, or nearly instantaneous from a geologic reference. Where modern ash falls have been observed, the deposition intervals are frequently on the order of hours to days, with the controlling factors being distance from the vent, how explosive the eruption, and the contemporaneous atmospheric setting.

It is possible that one or more of the identified tephra layers are the product of several separate eruptions which were spaced over the interval of days, weeks, or even years. Owing to the geologic constraints which govern explosive volcanic activity; however, this is a less common phenomenon. In addition, the absence of bedding variations within all tephra suggests that each resulted from one eruption.

Once deposited surficial variables greatly influence the preservation of tephra. Tephra deposited on deep snow (common for most of the year), may be quickly reworked into the drainage system. Although four tephra layers are presently identified, others may have occurred which have been redeposited by this mechanism. The thickness of ash preserved for observation is only a residual thickness. How much compaction and erosion occurred, by either wind or sheetwash, can be assessed only on a site-by-site basis.

The relationship between the abundant charcoal layers which are interbedded with tephra is poorly understood. Some are clearly cultural in origin, some may represent natural forest or tundra fires, but some may be related to the tephra itself, perhaps indirectly. It is possible that a thick tephra may cause plant mortality which could lead to plant dessication and ultimately to more frequent brush and forest fires. This hypothesis, however, is strictly conjectural.

Evidence for downslope reworking of tephra by sheetwash and creep is present in some localities. This may not be common on the well drained knolls and ridge crests where archeologic test pits were commonly placed. Although tephra may be eroded on ridge crests, it is unlikely that it is redeposited there.

5.8 - Cultural Horizons

Nine discrete cultural horizons can be identified at the present time from the regional archeological stratigraphy. These can all be correlated throughout the region. Each horizon can be dated within limits, but the time span represented by components varies from a few hundred years to as much as 7-8000 years. Although a horizon can be identified and correlated and can be dated within limits, there is no proof that cultural materials from the same horizon at different sites are exactly equivalent in age. The volcanic ash/soil sequence provides the framework for this relatively excellent chronology.

Cultural horizons were assigned only where there was demonstrable evidence of human occupation that can be related to the regional stratigraphy. Although artifacts were found in all of the units except bedrock, only nine horizons could be firmly documented. Downslope reworking, cryoturbation, human alteration and root disturbances all serve collectively to displace artifacts from their original contexts.

Evidence for human occupation in subunits associated with the contact units are present. Within any given site these can be arranged in stratigraphic succession, but they were not isolated as horizons, or even formal subhorizons because they cannot be correlated regionally. It is probable that many more than nine cultural horizons exist. No one site contains more than four regional cultural horizons, but site TLM 030 contains five horizons, one of which occurs in a subunit. Most sites contain one or two regional archeologic horizons. Discussion of the age of the cultural horizons is combined with a general stratigraphic chronology in the following section.

5.9 - Chronology and History

The evolution of the stratigraphic record presented in Figure 152 can be broken into four major intervals which have different implications for archeology: (1) the time prior to the last glaciation, represented by Unit 15, (2) the time during the last glaciation, represented by Unit 14, (3) the time following deglaciation but prior to deposition of the first recognized tephra, represented by Unit 13, and (4) the time representing recurrent volcanic ash deposition and soil formation, represented by Units 1-12. Eight radiocarbon dates from regional stratigraphic studies and twelve dates associated with the volcanic ash stratigraphy permit the establishment of a reasonably good chronology for the depositional history of the project area.

Interstadial dates below drift of the last glaciation range in age from 21,730 ± 390 at Tyone Bluff to 32,000 ± 2735 years BP at Thaw Bluff. During this interval glaciers were restricted and human occupation of the study area and peripheral regions may have been possible. Although interstadial conditions may have prevailed for some time earlier, the maximum age for such conditions is not known. Clearly human occupation could not have occurred during early Wisconsin time, because glaciation was even more extensive then than during late Wisconsin time and covered virtually the entire study area.

The last glaciation in the Susitna Canyon is bracketed by maximum age dates of 30,700 +260/-1230 years BP near Fog Lakes, 24,900 ± 390 years BP near Tyone Bluff and by a minimum date of 11,535 ± 140 near the Tyone Rivers. Based on these 14C determinations the last glaciation probably spanned the interval from about 25,000 years BP to about 12,000 years BP in the study area. These data correlate with those from other regions which also document the age and duration of the mid-Wisconsin interval. Owing to the extent of ice, human occupation was probably impossible or severely restricted. Furthermore, in most areas, evidence for possible interstadial human occupation would have been destroyed by advancing late Wisconsin ice. Although final deglaciation of the Susitna Canyon area probably occurred about 12,000-13,000 years BP, large areas of unstable ground underlain by stagnant ice may have persisted for several thousand years following deglaciation. Melting ice may have partly controlled human movements into Holocene time.

No dates are presently available for Unit 13, which represents the time interval between deglaciation and the first recognized tephra deposit. The oldest date associated with tephra is 4720 ± 130 years BP from the Fog Creek site (TLM 030). This indicates that Unit 13 probably represents part of late Pleistocene and most of early Holocene time which was characterized by weathering, erosion and deposition of subunits which are undated, and which cannot be correlated throughout the region. Artifactual material from this time range (Horizon 9) are therefore likely to be disturbed from their original context by as much as 7-8000 years of exposure and/or erosion and deposition. This long time span may account for the prevalence of this component in the study area.

Deposition of the tephra sequence probably occurred within the last 5000-7000 years. Four dates of 4720 ± 130, 4020 ± 65, 3210 ± 80, and 3200 ± 195 years BP were obtained from the contact of the Oshetna tephra (Unit 12) and the overlying lower subdivision of the Watana tephra (Unit 10). These dates indicate that the Oshetna tephra was deposited some time prior to 4700 years BP. The lack of weathering on the Oshetna tephra indicates that it was not deposited much earlier than 6-7000 years BP, but based on the 14C dates it may have been deposited as recently as 4700 years BP. A 14C date, with questionable association, suggests the Oshetna tephra was likely exposed for at least 1500 years prior to the subsequent Watana ash fall. Archeological horizon 8, which occurred during this interval, falls somewhere within this time range.

Two consistent minimum limiting dates on the upper Watana tephra of 2340 ± 145 and 2310 ± 130, when combined with the maximum limiting dates of the lower Watana tephra of 3200 ± 195 and 3210 ± 80 indicate that deposition of both the upper and lower Watana tephra, and the intervening Contact Unit E occurred sometime between 2300 and 3200 years. A date of 2750 +210/-220 years BP which is probably from Contact E suggests that the Watana sequence can be further subdivided by bracketing dates; 3200-2700 years BP, and 2700-2300 years BP for the lower and upper Watana tephra respectively. Cultural horizon 7 thus probably dates to about 2700 years BP and was probably short lived, accounting for its apparent rarity in the project area.

Cultural horizon 6 occurs above the Watana tephra, is not widespread, and probably dates to about 2300 years BP. Horizon 6 may predate 2300 years BP, but it cannot be older than 2700 years BP. The limited geographic distribution of Component 6 and the close coincidence between its limiting dates is puzzling because evidence of weathering at this contact is very evident. Viewed within these constraints, it is likely that the upper Watana tephra was particularly susceptible to oxidation because of its chemical constituents.

Four good minimum dates on charcoal of 1800 ± 35, 1400 ± 55, 1380 ± 55 and 1320 ± 110 indicate that Contact Unit C (Cultural Horizon 5) spans the interval between 1800 and 1300 years BP. A date of 1030 ± 60, obtained from a nonarcheological setting and related indirectly to the tephra sequence, may provide an even younger date for Horizon 5, extending its range by about 2000 years. These dates, when combined with those from Horizon 6, indicate that the Devil tephra, the youngest recognized volcanic ash layer, was deposited sometime between 1800 and 2300 years BP. As discussed in the preceeding paragraphs, the wide span of dates from 1800 to possibly 1030 years BP, an interval of 800 years, may account for the high frequency of archeological sites found within this regional stratigraphic unit.

Three dates of 280 ± 110 years BP, 140 ± 45 years BP, and modern from near the base of Unit 4 (organic sandy silt) indicate that it spans most of the last milleneum. Owing to redeposition, contamination by modern roots, and influx of modern humic material, it may not be possible to date this layer more closely. Cultural Horizon 4 thus cannot be closely dated on stratigraphic grounds. Direct dating of cultural material provides the only reliable means of dating human occupation during this inteval.

No attempt was made to date the surface organic mat (Unit 2) because of its obviously young age. Cultural Horizons 1-3 thus are quite young and differentiable in a relative sense only. Direct dating of cultural materials in this time range by the radiocarbon method may not be possible because of the contamination problems discussed earlier, and because it is near the younger limit of the method.

5.10 - Mammoth/Mastodon Fossil Discovery

One of the most exciting finds of the 1980 field season was the discovery of a mammoth/mastodon fossil found in situ in fluvial gravels at Tyone Bluff (Figure 87). The fossil, representing the shaft portion of a right femur, was identified by R.D. Guthrie and George S. Smith of the University of Alaska, and is the first documented occurrence for any terrestrial Pleistocene mammals in southern Alaska. It yielded a radiocarbon date of 29,450 ± 610 ^{14}C yr BP, and clearly implies nonglacial conditions at that time (Thorson et al. in press). This discovery indicates that the range of mammoth should be extended about 200 km south of its present limit. It also suggests that mountain passes in the Alaska Range may have been deglaciated during mid-Wisconsinan time, and that portions of southern Alaska may have been suitable for human habitation during this time.

5.11 - Summary of Geologic History

(a) The Susitna Valley has been repeatedly inundated with extensive valley glacier systems that coalesced to form a minor mountain ice sheet. One or more pre-Wisconsinan glaciations have been recognized.

(b) Much of the present valley was carved to the present river level prior to middle Wisconsinan time (31,000 yr BP). The direction of drainage at that time is presently unknown.

(c) The valley bottom was extensively modified during the last glaciation which began some time after about 31,000 yr BP in the Fog Creek area, and some time after about 22,000 yr BP in the Tyone River region.

(d) During deglaciation large areas were covered with stagnant ice, and meltwater drained freely below the surface, forming complex esker systems. The direction of meltwater flow, and the presence of till at river level suggests that Devil Canyon was carved prior to Holocene time. Glaciers retreated systematically over many areas leaving a number of periodically spaced massive recessional moraines.

(e) Deglaciation of the Tyone River region was complete by at least 11,500 yr BP. Because this area was covered by a large piedmont ice lobe, other areas may have been ice free even earlier. Thus, much of the Susitna Valley may have been deglaciated prior to about 12,000 yr BP. Stagnant ice may have persisted for several thousand years over much of the valley floor.

(f) During Holocene time the Susitna River has not greatly deepened its valley in most areas; rather it has widened the valley bottom slightly by lateral planation. Low-level alluvial terraces and tributary mouth alluvial fans have formed in widened portions of the valley. Many small streams tributary to the Susitna have greatly incised their channels during Holocene time, resulting in steep irregular profiles characterized by waterfalls and rapids.

(g) During the last half of Holocene time, intervals of volcanic ash deposition from distant sources alternated with intervals of weathering, soil formation and erosion.

6 - PALEONTOLOGY

6.1 - Introduction

Both federal and state of Alaska cultural resource legislation mandate that paleontological specimens found in an archeological context receive the same consideration as other cultural resources (The Archeological Resources Protection Act of 1979, 16 U.S.C. 470aa, sec. 3(1), and The Alaska Preservation Act of 1975, sec. 41.35.230(4). Paleontological studies were implemented as part of the cultural resource program in order to identify the types of paleontological specimens that might occur in association with archeological and/or historic sites therefore, assisting in recognizing them should they occur at a site. Because paleontological specimens representing animal bones (particularly Pleistocene megafauna) are readily recognizable, emphasis for paleontological investigations were centered on fossil plants and pollen.

A preliminary aerial reconnaissance of the study area and a review of the literature indicated that the area within the project study area that had the greatest potential for revealing plant fossils was the Watana Creek area. The information provided by this baseline study was incorporated into cultural resource investigations. Although no paleontological specimens, either plant or animal, were found in association with any of the 115 sites recorded for the area, a mammoth/mastodon femur was found in a non-archeological setting. This specimen is discussed in Chapter 5. The results of the plant fossil and pollen studies are discussed in the following sections.

6.2 - Plant Fossils

The assemblage of fossil leaves collected from the deposits along Watana Creek were chiefly in calcareous concretionary horizons of siltstone to fine sandstone. Outcrop locations within the section are noted on Figure 153. Plant material was characteristic of units at all locations through the section.

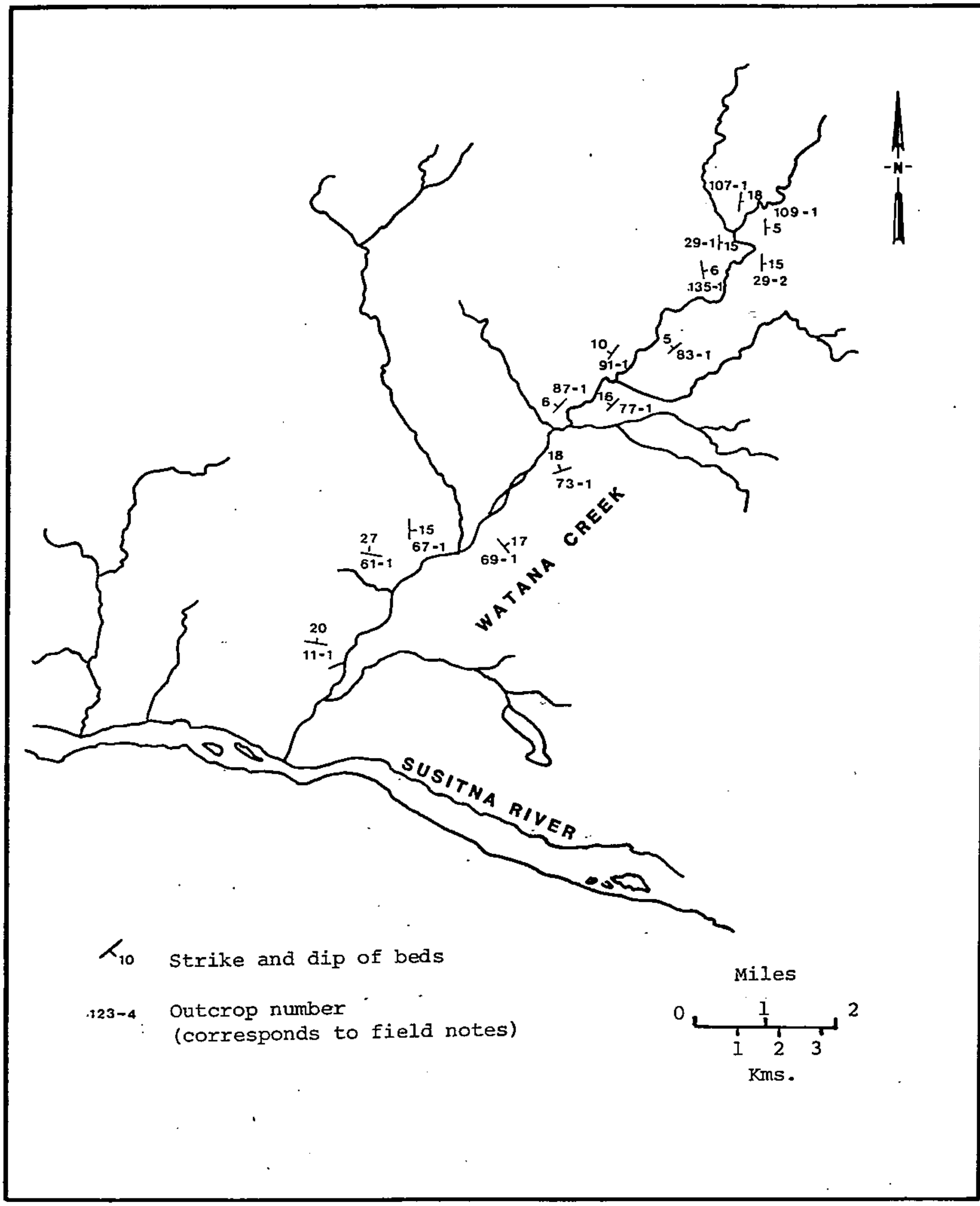

Figure 153. Location of Outcrops.

The assemblage from the sequence is extensive, but is characterized by an extremely low species diversity. The flora from the Watana Creek deposits include: Metasequoia sp., Alnus evidens (Holl.) Wolfe, Salis sp.

On the basis of the predominance of Alnus evidens and the depauperate nature of the assemblage, the plant-bearing rocks of Watana Creek are considered representative of the Angoonian Stage (Wolfe, personal communication, 1981). The type section for the Angoonian Stage is in the Kootznahoo Formation near the town of Angoon on Admiralty Island.

An Angoonian assemblage on Sitkinak Island is within beds conformably overlain by marine rocks of late Blakely (earliest Miocene) age (Wolfe, 1966), and the type Angoonian overlies an assemblage of an unnamed stage of known younger age than the Kumerian (lower Oligocene). An assemblage of Seldovian age (early and middle Miocene) is stratigraphically above the type section for the Angoonian. The Angoonian Stage is most probably of late Oligocene age (Wolfe, 1977).

Flora assemblages of Angoonian age are common in Alaska found at St. Lawrence Island, the Alaska Range, the Copper River Basin, the Matanuska Valley, the Cook Inlet Basin, and other locations (Wolfe, 1977). Rocks containing assemblages of this type were originally included within the lower Seldovian, but later excluded (Warhaftig, et al. 1969) and are now considered Angoonian (Wolfe, 1977).

Formations including assemblages of Angoonian age include the lower portion of the Healy Creek Formation in the Nenana Coal Field, the lower portion of the Tyonek Formation and probably the Hemlock Conglomerate in the Cook Inlet area, and the Tsadake Formation in the Matanuska Valley. Figure 154 depicts the stratigraphic relationship of the Watana Creek deposits with some correlative Alaskan deposits.

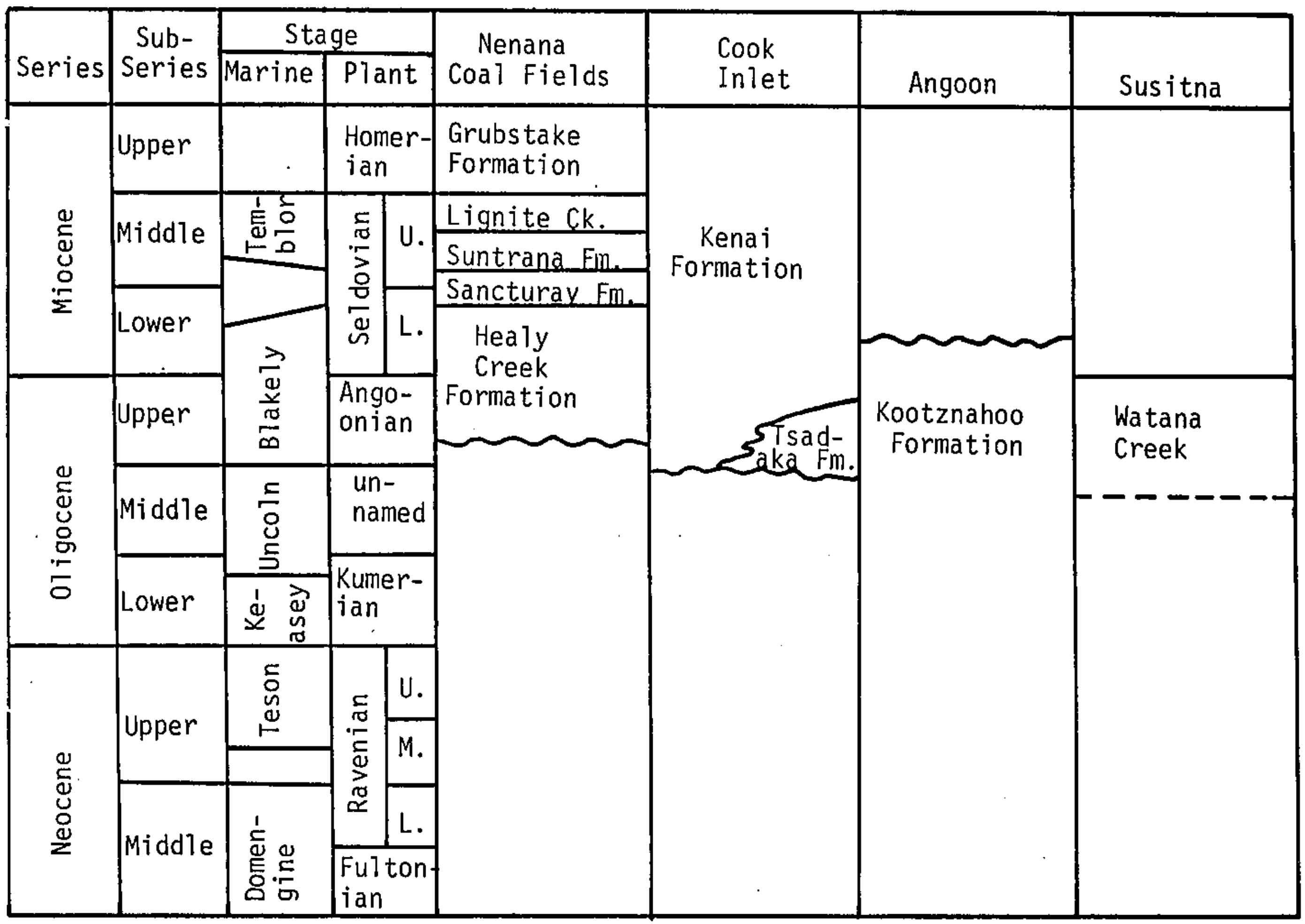

Figure 154. Correlation of the Watana Creek Sequence with Some Alaskan Tertiary Formations.

6.3 - Pollen

Pollen grains were extremely depauperate in both quantity and species. Many slides prepared for pollen analysis were found to be totally lacking in grains. A point counting technique was not considered justified to characterize the pollen assemblage of the deposits. The predominant pollen are Betula, conifer-type grains, and trilete spores.

6.4 - Paleoenvironment

Extensive reconstructions of the environment and climate in Alaska during the Tertiary, particularly Paleogene, on the basis of floristic (botanical systematics) and physiognomic (physical features) chracteristics have been done by Wolfe (1977, 1978, 1980). These studies indicate Angoonian assemblages represent a broad-leaved deciduous forest. Marginally warm temperate climates characterized the latest Oligocene; the result of a warming trend from the cooler earlier Oligocene. Latitudinal zonation of vegetation was considerable in the Angoonian in contrast to the Ravnian and Kumerian during which there was little zonation (Wolfe, 1977).

Eocene and Early and Middle Oligocene assemblages differ markedly with that of the Angoonian. The middle Ravenian (early upper Eocene) assemblage is most closely related to a notophyllous borad-leaved evergreen forest. The upper Ravenian (late upper Eocene) contains only five of the fifteen genera of the early and middle Ravenian, and probably represents a mixed broad-leaved deciduous forest ranging to a mixed mesophytic forest. The Kumerian (lower Oligocene) is indicative of a subtropical forest, persisting into middle Oligocene (see Wolfe, 1977).

The mixed broad-leaved deciduous forest of the upper Ravenian and Angoonian had temperatures of 1° to 18°C (Wolfe, 1977). Mean annual temperature dropped through the Oligocene at high latitudes (Wolfe, 1978), and the early Miocene Seldovia Point assemblages represents a mixed northern hardwood forest of cool temperate climate (Wolfe and Tanai, 1980).

7 - THE PREHISTORY AND HISTORY OF THE UPPER SUSITNA RIVER REGION

7.1 - Introduction

Based on the results of this survey, it is probable that no single archeological site in the Upper Susitna River area will provide the basis for defining the Holocene cultural chronology for the region. Because no single site preserves the cultural spectra since late Wisconsin deglaciation, it is necessary to base the culture chronology on a series of individual sites and site components throughout the study area. The 115 archeological sites discovered during the course of this survey are primarily single component sites. For the purposes of this presentation, only those sites in which the age of the site, or a component, can be documented with certainty will be used for analysis. The chronological documentation of sites and components are primarily based in two methods: 1) Radiocarbon determinations and 2) relative stratigraphic placement in relationship to the three tephra. Typological considerations relating to the chronology (not site function) have been considered secondarily, because of the uncertainty associated with this kind of dating and the differing age determinations proposed by many archeologists.

The sites discussed in this report provide only brief glimpses of prehistoric cultural development in what are, in many cases, very diverse ecological settings. In all probability the sites and their various components represent different facets of the prehistoric subsistence cycle. Consequently, what are presented as "type" sites and components for particular cultural periods, may in fact not "typify" the material cultural remains during specific cultural historical periods. While these limitations are recognized, it is still possible to begin to define the basic cultural chronological skeleton while realizing that during some periods it may contain a considerable amounts of "flesh" and during others major "anatomical" elements are missing.

7.2 - Contemporary Sites: 1945 to Present

A number of contemporary cabins are scattered throughout the study area representing modern recreational use of the project area, primarily for sports hunting and fishing. Because of the contemporary nature of these structures, they have not been included, discussed, or analyzed in this report. Suffice it to say that contemporary use of the area will ultimately be documented in the archeological record.

7.3 - Trapping Period: 1920 - 1945

Four cabins which have been documented as trapper's cabins have been reported in the project area. These cultural remains document economic use of the area for fur trapping during the 1930's and in this respect the Susitna area reflects many other areas of rural Alaska in that this was a time of relatively high fur prices during a period of international depression. The remains of four cabins dating to this period were located in the project area. However, the cabin of Elmer Simko on Kosina Creek (TLM 071) may be one of the best remaining examples from this period, because most of the household and trapping equipment are preserved intact.

7.4 - Goldrush: 1900 - 1920

Gold was discovered in the Cook Inlet region in 1895 shortly after which the first major western population expansion into the Upper Susitna occurred. No historic sites were discovered dating to the gold rush to the Upper Susitna have been discovered in the project area to date. Because Devil Canyon is not navigable, early prospectors may have been discouraged in their attempts to prospect the upper Susitna. However, an inscription near the mouth of Portage Creek documents that William Dickey and three other travelers ascended the river as far as Devil Canyon in 1897.

7.5 - Athapaskan Tradition: A.D. 1900 - A.D. 500

The Upper Susitna drainage was ocupied by Western Ahtna Athapaskans at the time of historic contact. Through implementation of the direct historic approach, it is possible to trace through time Athapaskan occupation of the study area. As Figure 155 demonstrates, several sites in addition to those discussed below may document various periods of cultural historical development throughout this period. However, the subsequent discussion only includes sites subject to systematic testing from which age determinations can be made with certainty.

The Kosina Depression Site (TLM 065) was systematically tested and best exemplifies the later phase of this period. The site consisted of the remains of at least one house and several associated cache pits. Stratigraphic profiles from this site clearly indicate that the house postdates the Devil tephra, and the glass trade beads and bottle glass fragments clearly document the structure's comparatively recent age. While precise dating of the structure is not possible at this time, western trade goods may have penetrated the area as early as the late 1700's and the site may be reasonably estimated to range in age between the late 1700's and 1900.

A pronounced material cultural trait which occurs at TLM 065 is the high frequency of fire cracked rock and fractured and burned caribou bone. The rock is characteristically uniform in that it originates from fist and slightly smaller sized smooth water worn cobbles. It is most probably that these cobbles were deliberately selected for stone boiling; a technique commonly employed by Native North Americans in the absence of ceramic cooking vessels. This material cultural trait coupled with abundant fractured long bone fregments suggests preparation of marrow "soup" and possible bone grease in birch bark cooking containers. These site attributes are commonly associated with archeological sites throughout the Alaskan Interior and through the direct historic approach have been identified as the remains of prehistoric Athapaskan culture (Plaskett, 1977).

This common association is characteristic of a number of sites located throughout the course of the archeological survey. All sites and site components which exhibit this association in a clear stratigraphic context occur above the Devil tephra and consequently are younger than A.D. 200. In addition to the Kosina Depression Site (TLM 065) discussed above, these sites are: 1) Component I, Permafrost Creek (TLM 050) ca. A.D. 1670, 2) two and possibly three components at the Tsusena Creek Site (TLM 022) which date slightly prior to and subsequent to A.D. 1500, 3) a feature at the Little Bones Ridge Site (TLM 059) ca. A.D. 740, 4) Component I at the Red Scraper Site (TLM 062) ca. A.D. 570, and 5) Component I at the Tsusena Borrow C sites (TLM 097) ca. A.D. 550. Three additional sites which have not been subject to radiometric dating but which exhibit the pronounced association of fire cracked cobbles and fractured mammal bone, all occur stratigraphically above the Devil tephra. These are: 1) the upper Watana Creek Site (TLM 038), 2) the No Name Creek site (TLM 043), and 3) Component I at the Duck Embryo North Site (TLM 048). At two of these sites, No Name Creek and Duck Embryo North, evidence for heat treatment of lithics has been recognized based on the vitrious character of the lithic debetage.

While it may appear dubious to define a cultural period primarily on the basis of the association of only two cultural traits, these sites are strikingly similar when viewed collectively and all are restricted temporally. Another striking similarity shared by these sites is the lack of diagonistic artifact types. However, this may partially reflect the comparatively small samples recovered during testing. The sites suggest intensive reliance on caribou hunting, occasionally moose hunting, intensive use of stone boiling for food preparation, and heat treatment of lithics used for tool manufacture.

The sites occur in a variety of ecological locales. Permafrost Creek, Tsusena Creek and No Name Creek all occur adjacent to the junction of clear water tributaries to the Susitna and are situated in the valley bottom. The Upper Watana Creek site occupies an overlook with a panoramic view to the north suggestive of fall caribou hunting. Duck Embryo North is situated adjacent to a lake outlet possibly indicating exploitation of fish and waterfowl. Tsusena Borrow C is adjacent to Tsusena Creek where constricting topographic features funnel large mammal movements past the site. Sites which contain structural remains are Little Bones Ridge, Kosina Depression, and probably Jay Creek (although this site was not subject to systematic testing) are located in elevated areas which seem to lack attractive ecological factors (such as proximity to significant bodies of fresh water, panoramic views, constricting land forms, etc.). It is possible that these more substantial sites containing features may reflect prehistoric distribution of caribou rather than other ecological variables traditionally associated with site occurrence. Such obscure site locales may also reflect social variables such as defense, or ostracism.

Testing and surface features suggest that all sites dating to this time period are comparatively small and probably represent groups of not more than one or two nuclear families or a few hunters. Collectively these sites represent a variety of functions and seasonal occupations, which cannot be accurately defined based on the limited results derived from the systematic testing conducted to date. It is important to reemphasize that this discussion has been limited to only those sites which can be firmly dated, and undoubtedly numerous other sites dating to the Prehistoric Athapaskan Period exist in the project area (see Figure 155 for sites and components occurring above the Devil tephra).

All the sites dating to this period contain faunal remains, and thus present the possibility for documenting the organic component of prehistoric Athapaskan material culture, which is currently poorly understood and represented at only a few archeological sites. The diverse types of sites situated in a variety of ecological locales may enable further research to document shifting subsistence and settlement patterns through time. Collectively these sites are extremely significant, for they hold the potential to define Athapaskan cultural development during the past 1500 years. This has not been accomplished in Alaska or the Yukon and Northwest Territories, largely because previous research programs have not been able to locate sites conducive to answering these questions, and have lacked the chronological controls essential for defining cultural development through time. The sites dating to this culture period in the Upper Susitna River represent the first and best opportunity in more than 50 years of archeological research in the subarctic to address these problems.

7.6 - Choris/Norton Tradition: ca. A.D. 500 - ca. 1500 B.C.

Three archeological sites have yielded artifactual material from stratigraphic contexts which suggest that they may be ascribed to the Choris/Norton tradition. These are Component III at Tsusena Borrow C and the upper component at the Fog Creek site which has been radiocarbon dated to 360 B.C. ± 220 (DIC-1877), and the Left Fork Site (TLM 069) which was probably occupied immediately prior to deposition of the Watana tephra. The flakes from the upper component at Fog Creek were unfortunately bagged in the field with those from the lower component, thus rendering definition of the lithicologic types associated with this component impossible. However, fine grained silicous rock types are represented in this sample, and were probably derived from the upper component, while the remainder of the sample is basalt and is probably derived from the lower, Northern Archaic, component. No diagonistic artifacts were recovered from Component I.

Component III at Tsusena Borrow C (TLM 097) was not subject to radiometric dating, but is clearly associated with the contact between the Watana and Devil tephras. This component contained 9 fire cracked rock fragments, 15 waste flakes of rhyolite and tuff, and 65 tuffacious flakes. Although the assemblage does not provide sufficient data to define the Choris/Norton tradition within the project area, it does, when coupled with data from a number of other sites, provide data which strongly indicate the occurrence of this tradition within the Upper Susitna region between ca. A.D. 500 and ca. 1500 B.C.

The period of occupation of the Left Fork Site (TLM 069) remains problematic, but the preliminary data suggest that it probably occurred immediately prior to the deposition of the Watana tephra. Several artifact types suggest that the material cultural remains from this site are similar to artifacts typologically associated with Choris/Norton period in other regions of Alaska. Bone preservation at this site suggests that it was occupied shortly before deposition of the Watana tephra, because bone preservation is comparatively rare in archeological components predating the Devil tephra in the Upper Susitna region.

Three additional sites (TLM 033, 034, and 053), which have only been subject to reconnaissance testing, indicate cultural components between the Watana and Devil tephras and this suggests that these sites may also be ascribed to this temporal period. In all three sites, no diagonistic artifacts were recovered, and the cultural components were defined on the basis of lithic debetage alone. It is important to note that the debetage in all three cases is fine grained cherts or rhyolite, which may be an indicator of this tradition in the Upper Susitna region.

While it has not yet been possible to unquestionably document diagnostic artifacts dating to this period, several sites in addition to the Left Fork site (TLM 069) in the project area have yielded artifacts characteristic of this tradition. Bacon (1978a:32) suggested possible Norton influence at TLM 018, based on the occurrence of a triangular trending to pentagonal end blade. Irving (1957:43, 47) reported the discovery of three obliquely pressure flaked side blades on an overlook near the Tyone River. The artifacts reported by Irving still represent the best typological indication of the Norton/Choris tradition in the Upper Susitna.

This critical interval in non-coastal Alaskan prehistory is poorly understood, and the Upper Susitna River holds excellent potential for resolving the myriad of problems associated with it. Extensive field investigation of archeological components dating to this interval is essential to: 1) document the material cultural remains dating to this period, 2) elucidate settlement and subsistence patterns, and 3) resolve the problems associated with the postulated late Denali complex.

7.7 - Northern Archaic Tradition: ca. 1500 B.C. - ca. 3000 B.C.

Component IV at the Tsusena Borrow C site best documents the stratigraphic placement of the Northern Archaic Tradition within the project area. The stratigraphic position of this component is clear and is supported by a radiocarbon determination of 2070 ± 65 B.C. (DIC-2283). This component contained the base of a black basalt side notched projectile point and black siltstone flake core along with 312 flakes of basalt and 16 of rhyolite and tuff. Because side notched projectile points are the hallmark of the Northern Archaic Tradition, it is reasonable to ascribe it to the Northern Archaic Tradition in spite of the small sample size.

The Fog Creek Site (TLM 030) was not subject to systematic testing, but did yield reliable data pertinent to defining the Northern Archaic Tradition in the project area. Two components were recognized during reconnaissance testing of the site. The lower component contained a side notched projectile point along with lithic debitage consisting primarily of black basalt. A radiocarbon determination for this component, which also occurs between the Watana and Oshetna tephra, is 2770 ± 130 B.C. (DIC-1880). While systematic testing is required to further define and clarify this site, the preliminary data is strikingly similar to that recovered from Component IV at the Tsusena Borrow C site. The Fog Creek site is significant because it not only confirms the stratigraphic placement of the Northern Archaic Tradition in the project area, but further defines the temporal span of the tradition.

Component II, which occurs between the Watana and Oshetna tephras, at Tuff Creek North (TLM 027), probably reflects a Northern Archaic use of this site. Although no diagnostic artifacts were recovered, the lithic debetage is black basalt, the most common lithologic type associated with the Northern Archaic occupation at both Fog Creek and Tsusena Borrow C. The stratigraphic placement of this component between the Watana and Oshetna tephra strongly supports this interpretation.

Although a number of sites in the project area have yielded side notched projectile points and other artifact types commonly associated with the Northern Archaic Tradition, only Fog Creek, Tsusena Borrow C and Tuff Creek North have yielded cultural horizons that can be dated with a high degree of certainty. It is probable that Component IV at Tsusena Borrow C is not the latest occurrence of this tradition within the project area and that the lowest component at Fog Creek is probably not the earliest. Additionally, no artifacts characteristic of the Northern Archaic Tradition have been found either above the Watana or below the Oshetna tephra. These data suggest a temporal span between 1500 - 3000 B.C. for this tradition in the Upper Susitna region.

These data concur with archeological data from other Alaskan archeological sites. The upper Northern Archaic component at the Dry Creek Site located near Healy, Alaska ranges in age between 2400 and 1400 B.C. (Powers and Hamilton, 1978) and data from the Tangle Lakes area suggests a similar temporal span for this tradition (West 1975). These and other sites in the Alaskan interior support Workman's (1978) hypothesis that Northern Archaic Tradition spread through the Yukon Territory and northward along the Brooks Range to the Onion Portage site by 4000 B.C. and later spread into southern Interior Alaska.

As demonstrated by the Fog Creek and Tsusena Borrow C sites, the study area holds high potential for addressing critical questions pertinent to understanding the Northern Archaic Tradition. These are: 1) closely bracketing the temporal span during which the Upper Susitna was occupied by peoples bearing this tradition, 2) the subsistence strategies and settlement patterns implemented by Northern Archaic Peoples, 3) the nature of house forms and other structures associated with this tradition, and most importantly, 4) data essential to explain the rather dramatic appearance and disappearance of this technological tradition in the archeological record. The Upper Susitna is an extremely critical region for addressing these problems, because various manifestations of this tradition, which may lack diagnostic artifacts (such as side notched projectile points) can be recognized with clarity based on their expected occurrence between the Watana and Oshetna tephras.

7.8 - American Paleoarctic Tradition: ca. 3000 B.C.? - ca. 9000 B.C.?

The lowest component at Tuff Creek North (TLM 027) best documents the stratigraphic placement of this tradition in the project area. At this site, Component III clearly rests on top of glacial drift and is capped by the Oshetna tephra. The Oshetna tephra was deposited prior to approximately 2700 B.C. and probably during the interval between 3000 - 5000 B.C. Although no organic material suitable for radiometric dating was recovered from this component, the artifactual material is considerably older than the Oshetna tephra. The lithics rest on and are intermixed with the upper portion of the glacial drift, and exhibit considerable weathering. Both these factors suggest that they were exposed on the surface for an extended period, possibly several thousand years, prior to the deposition of the Oshetna tephra.

The assemblage contains several blocky cores which result from the manufacture of blades, microblades and blade-like flakes. Core rotation is common, and no "type" core has been identified in the assemblage. In addition to the cores, the assemblage contains blade-like flakes, blades, microblades, and waste flakes. Some of the blades and flakes exhibit edge retouch along their margins, which is generally restricted to one surface of the specimens. No bifacial stone tools were recovered from Component III. Admittedly, the sample is small when compared to the estimated spacial extent of the site, but it does suggest striking technological similarities to the Ugashik Narrows Phase (Dumond 1977) on the Alaska Peninsula, Locality 1 at the Gallagher Flint Station (Dixon 1975), and possibly the Anangula site located on an islet (Ananuliak Is.) off Umnak Island in the Aleutians (Aigner, 1978). Although radiocarbon determinations are not available from this component, it is not unreasonable to estimate the period of occupation between approximately 4000 - 5000 B.C. based on its stratigraphic occurrence below the Oshetna tephra, the advanced degree of weathering exhibited by the lithics, and typological comparison with other Alaskan archeological sites which exhibit similar technological characteristics.

Two additional sites (TLM 040 and TLM 048) appear to contain microblade components which occur below the Oshetna tephra, but the results of systematic testing at these sites are not conclusive. It appears a microblade component is represented in Component II at the Duck Embryo North site (TLM 048) which is probably derived from the contact of the glacial drift and the Oshetna tephra. However, only a single microblade was recovered along with the lithic debetage, and further work is required to clarify the age, nature and extent of this component. At TLM 040, the Tephra Site, numerous obsidian microblades and microblade fragments were recovered. Although their stratigraphic position could not be defined with certainty, there is some indication that they may have been deposited below the Oshetna tephra. Although no radiocarbon determinations are available from either of these sites, future work will probably succeed in defining their stratigraphic position and hopefully provide organics suitable for radiometric dating.

The microblades from the Duck Embryo North and Tephra sites appear to be struck from prepared cores and exhibit a uniformity not reflected in the specimens from Component III at Tuff Creek. The morphological characteristics of these microblades (from TLM 040 and 048) suggest greater technological similarity with specimens commonly associated with the Denali Complex and may probably be of the same age. It is not unreasonable to postulate that all these components may be ascribed to the American Paleoarctic Tradition and probably date to the interval between 3000 and 9000 B.C. It is probable that the blockier rotated blade/microblade cores postdate the prepared cores of the Denali complex, and both assemblages appear to deemphasize the manufacture of bifacial stone tools, particularly projectile points.

The potential of the project area to yield data essential to unraveling many of the complex problems associated with the American Paleoarctic Tradition is excellent. Figure 155 lists those sites which based on limited reconnaissance testing indicate cultural occupation prior to deposition of the Oshetna tephra and which probably contain components which may be ascribed to this tradition. The potential of the Upper Susitna Basin to yield data essential to understanding the complex cultural developments associated with this tradition between the time of deglaciation (12,000 - 9000 B.C.) and ca. 3000 B.C. is excellent.

7.9 - Early Period: ca. 30,000 B.C. - ca. 20,000 B.C.

The midsection, or shaft, of the right femur of a proboscidean (probably Mammuthus sp.) was recovered from an exposure near the junction of the Tyone and Susitna Rivers. A single radiocarbon date run on bone collagen from the femur yielded a date of 27,500 ± 610 B.C. (DIC-1819). This age determination coupled with additional dates from the same stratigraphic section demonstrate that at least some portions of the Upper Susitna were deglaciated during mid Wisconsin times. The occurrence of the proboscidean fossil also documents that at least one of the passes through the Alaska Range was deglaciated during this time. These data indicate potential for the discovery of archeological sites in the study area, dating to mid Wisconsin times, however, no indications of cultural remains dating to this period have been recognized in the project area.

7.10 - Summary

Five major cultural traditions have been documented within the study area which span the past 11,000 years. These are: 1) Historic 1900 - present, 2) the Athapaskan Tradition ca. 500 A.D. - 1900 A.D., 3) Choris/Norton Tradition A.D. 500 - 1500 B.C., 3) Northern Archaic Tradition ca. 1500 B.C. - ca. 3000 B.C., and 4) the American Paleoarctic Tradition ca. 3000 B.C. - 9000 B.C.? The project area was glaciated between approximately 9000 B.C. to 20,000 B.C. and at least partially deglaciated between 30,000 - 20,000 B.C.

Based on the results of the reconnaissance survey and the limited systematic testing of the select archeological sites, the project area holds excellent potential for addressing many long standing anthropological questions. Three tephras permit stratigraphic correlation between many sites and site components. This presents a uniquely significant opportunity to define the development of these archeological traditions which has not been possible elsewhere in interior or south-central Alaska. No single archeological site has been found which preserves the cultural chronology from deglaciation to historic times, but the tephra enable cultural development to be traced through time based on comparisons of a series of sites which can be clearly documented to be temporally discrete.

Because the first goal of archeology is to define cultural chronology, the work conducted thus far has been focused primarily toward this objective. Substantial progress has been made, but clearly considerable additional work is essential if this goal is to be fully realized; particularly during the Choris/Norton and American Paleoarctic Tradition periods. Systematic excavation will not only resolve many of the problems relevant to defining cultural chronology, but concurrently will provide extremely valuable data essential to interpreting the past lifeways of the cultural groups which occupied the region prior to historic contact. Better understanding of subsistence, settlement patterns, and social/cultural phenomena will result as a complementary product of developing the cultural chronology, and future research strategies should attempt to address these problems.

It is already possible to glimpse some of the larger questions which may be addressed as mitigation of adverse impact to cultural resources progresses throughout the project area. Some are: 1) defining and explaining the interrelationship between cultural succession, vulcanism and environmental change, 2) resolution of as yet unresolved questions relevant to firmly documenting, or rejecting, the occurrence of a Late Denali phase, and 3) definition and interpretation of the nature of cultural contacts, or rapid technological change, which occurred during the periods of transition between cultural traditions. Future mitigation of adverse impact to cultural resources must address these and other problems. The legal requirements mandating the preservation of sites is founded in the knowledge that they hold data which may enable potential explanation of such problems. The Upper Susitna River region may be one of the best locales known in Alaska to preserve such information and address these significant scientific and humanistic questions.

Figure 155 Archeological Components in Relation to Stratigraphic Units

AHRS Number	In Drift	Contact Oshetna & Drift	In Oshetna	Contact Oshetna & Watana	In Lower Watana	Contact Upper & Lower Watana	In Upper Watana	Contact Watana & Devil	In Devil	Finely Divided Organics-	Organic Silt	Decomposing Macroscopic Organics	Surface Organics	Ground Surface	Comments
Stratigraphic Units	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
TLM 007															No soil profile
TLM 015															Undetermined
TLM 016															Undetermined
TLM 017					X--------	--------X									
TLM 018+		X?	X							X		X		X	Contact of the Watana and drift
TLM 020															Dickey inscription
TLM 021															Surface
TLM 022+										X		X			
TLM 023															Cabin
TLM 024		X--------	--------X												
TLM 025															No tephra noted
TLM 026										X--------	--------X--------	--------X			
TLM 027+		X		X					X						Cultural material on drift
TLM 028															Surface
TLM 029						X									
TLM 030		X		X		X				X					
TLM 031															Surface
TLM 032															Surface

	In Drift	Contact Oshetna & Drift	In Oshetna	Contact Oshetna & Watana	In Lower Watana	Contact Upper & Lower Watana	In Upper Watana	Contact Watana & Devil	In Devil	Finely Divided Organics	Organic Silt	Decomposing Macroscopic Organics	Surface Organics	Ground Surface	
	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Stratigraphic Units
AHRS Number															Comments
TLM 033+								X							Only one artifact recovered
TLM 034					X------	X									
TLM 035										X					
TLM 036															Surface
TLM 037															Surface
TLM 038+									X?						Mixed silt and tephra
TLM 039+		X	X	X	X------	X-------	X	X	X						
TLM 040+			X	X	X	X	X	X	X	X					Cryoturbation
TLM 041															Surface
TLM 042+					X------	X-------	X								
TLM 043+											X----------	X----------	X		Solifluction
TLM 044										X-------	X----------	X			
TLM 045							X-------	X--------	X-------	X					
TLM 046+			X		X------	X-------	X			X					
TLM 047															Surface
TLM 048+										X- - - -	X- - - -	X			
TLM 049												X			

Figure 155 Continued

	In Drift	Contact Oshetna & Drift	In Oshetna	Contact Oshetna & Watana	In Lower Watana	Contact Upper & Lower Watana	In Upper Watana	Contact Watana & Devil	In Devil	Finely Divided Organics	Organic Silt	Decomposing Macroscopic Organics	Surface Organics	Ground Surface	
	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Stratigraphic Units
AHRS Number															Comments
TLM 050+										X					Possible mixed tephra
TLM 051				X											Could be older
TLM 052										X					
TLM 053								X							Mixing
TLM 054								X	X	X	X				
TLM 055										X	X				
TLM 056															Surface
TLM 057															Surface
TLM 058										X					
TLM 059+										X					
TLM 060										X					
TLM 061										X					
TLM 062+			X	X	X	X	X		X	X					
TLM 063															No tephra noted
TLM 064										X					
TLM 065+										X					
TLM 066															Surface
TLM 067										X	X	X			
TLM 068															Surface

Figure 155 Continued

AHRS Number	In Drift 14	Contact Oshetna & Drift 13	In Oshetna 12	Contact Oshetna & Watana 11	In Lower Watana 10	Contact Upper & Lower Watana 9	In Upper Watana 8	Contact Watana & Devil 7	In Devil 6	Finely Divided Organics 5	Organic Silt 4	Decomposing Macroscopic Organics 3	Surface Organics 2	Ground Surface 1	Stratigraphic Units* / Comments
TLM 069+	X				X	X	X		X	X	X				Tephra units mixed
TLM 070															Surface
TLM 071															Cabin
TLM 072										X	X				
TLM 073		X	X	X	X	X				X	X	X			
TLM 074								X	X	X					
TLM 075										X					
TLM 076															Surface
TLM 077		X													
TLM 078					X	X	X								
TLM 079															Cabin
TLM 080															Cabin
TLM 081					X										
TLM 082															Surface
TLM 083															Undetermined
TLM 084										X					
TLM 085					X	X	X	X	X	X					
TLM 086															Surface
TLM 087										X					Solifluction
TLM 088		X	X	X						X					

Figure 155 Continued

	In Drift	Contact Oshetna & Drift	In Oshetna	Contact Oshetna & Watana	In Lower Watana	Contact Upper & Lower Watana	In Upper Watana	Contact Watana & Devil	In Devil	Finely Divided Organics	Organic Silt	Decomposing Macroscopic Organics	Surface Organics	Ground Surface	
	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Stratigraphic Units*
AHRS Number															Comments
TLM 089															
TLM 090										X		X	X	X	
TLM 091															Surface
TLM 092															Surface
TLM 093				X						X	X	X			Surface
TLM 094				X	X	X	X	X	X	X	X				
TLM 095		X	X	X	X	X	X	X							Poor stratigraphy
TLM 096									X	X	X				
TLM 097				X				X	X	X					
TLM 098															
TLM 099															Surface
TLM 100															Surface
TLM 101															No testing
TLM 102						X				X					Surface
TLM 103															
TLM 104										X					Surface
TLM 105		X	X	X											
TLM 106															
TLM 107															Surface
TLM 108															Surface
TLM 109															Surface
															Surface

Figure 155 Continued

AHRS Number	In Drift	Contact Oshetna & Drift	In Oshetna	Contact Oshetna & Watana	In Lower Watana	Contact Upper & Lower Watana	In Upper Watana	Contact Watana & Devil	In Devil	Finely Divided Organics	Organic Silt	Decomposing Macroscopic Organics	Surface Organics	Ground Surface	
	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Stratigraphic Units
															Comments
TLM 110					X	X	X	X	X	X	X	X	X	X	Mixing
TLM 111															Surface
TLM 112															Surface
TLM 113															Surface
TLM 114															Surface
TLM 116															Rock carin
TLM 117															Surface
HEA 174															Surface
HEA 175+	X														Stratigraphy dominated by silt, sand and gravel. No tephra noted. Cryoturbation
HEA 176		X	X	X											No Oshetna. Present contact of Watana and Drift
HEA 177															No tephra noted
HEA 178															Surface
HEA 179															Surface
HEA 180															Surface

Figure 155 Continued

	In Drift	Contact Oshetna & Drift	In Oshetna	Contact Oshetna & Watana	In Lower Watana	Contact Upper & Lower Watana	In Upper Watana	Contact Watana & Devil	In Devil	Finely Divided Organics	Organic Silt	Decomposing Macroscopic Organics	Surface Organics	Ground Surface	
	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Stratigraphic Units•
AHRS Number															Comments
HEA 181		X--------	X---------	X--------	X------	X-------	X								
HEA 182															
HEA 183															Surface
HEA 184															Surface
HEA 185															Surface
HEA 186															No testing
															No tephra noted

*Three tephra units have been identified in the study area:
Oshetna (greater than 4700 B.P.), Watana (2300-3200 B.P.) and Devil (1800-2300 B.P.)
These are regional names. The correlation of these ash falls to known ash falls remains to be determined. Association of cultural components with tephra units for sites receiving only reconnaissance testing is preliminary.

+Systematically tested site (1981).

•Correspond to stratigraphic units on Figure 152, Chapter 5.

--- indicates that cultural material could not be attributed to a specific unit.

Figure 155 Continued

8 - IMPACT ON HISTORIC AND ARCHEOLOGICAL SITES

8.1 - Introduction

The level of impact the Susitna Hydroelectric Project will have on specific sites or groups of sites depends on the location of these cultural resources in relation to areas affected by construction, operation, maintenance, overall land modification, and ancillary development of the Susitna Hydroelectric Project and the type of activities which will occur in these areas. Sites directly impacted are those sites which are immediately affected by ground disturbing activities associated with preconstruction, construction or operation of the project. These include, but are not limited to, dam construction, access roads, borrow areas, camps, transmission lines, staging areas, airstrips, and reservoirs behind the Devil Canyon and Watana dams. Indirect impact will result from adverse effects that are secondary but clearly brought about by the project and which would not occur if the project were not undertaken. Indirect impact will occur on sites affected by altered drainage patterns (erosion) associated with filling of the reservoirs, secondary land modifications such as altered drainage and accelerated erosional processes associated with dam and spillway construction, greater access to remote areas, increased number of project personnel in the area during and after construction, and impacts related to project maintenance. Potential impact is connected with ancillary development which can be predicted to occur as a result of the project, but which depend on other variables which are not known at this time, including possible engineering changes in the project. Although the specific impact agent or specific sites that would be impacted are not presently known, impact to sites or groups of sites can be predicted to occur as a result of expected recreational use of the area and increased development associated with this activity. Potential impact could become direct impact, indirect impact or no impact depending on how these activities affect the areas containing cultural resources. For the FERC license application the location of all project facilities and recreational development will likely be known. It will then be possible to identify sites in the potential category that will receive direct, indirect, or no impact.

8.2 - Significance

To comply with FERC regulations, impact analysis of cultural resource sites need only be conducted on those sites "either listed in, or recommended as eligible for, the National Register of Historic Places." Therefore, prior to determining whether the Susitna Hydroelectric Project will have any adverse effect on a site or group of sites it is first necessary to determine if the site or group of sites is significant. Determination of significance is based on the application of National Register of Historic Places criteria which define significance "in American history, architecture, archeology, and culture present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association and/or that are associated with events that have made significant contributions to the broad patterns of history; or are associated with the lives of persons significant in our past; or that embody the distinctive characteristics of a type, period, or method of construction, or that represents the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or have yielded or may likely yield information important in prehistory and history" (36 CFR 60).

A determination of significance must be based on adequate information, otherwise it is premature. For this project a program of reconnaissance level testing was implemented to locate and document sites. In order to generate sufficient data on which to base an evaluation of significance, systematic testing was employed. In most cases (a notable exception being historic cabins), systematic testing is necessary to assess significance. The 18 sites systematically tested all provided sufficient data to address the question of significance.

On one level all sites are significant because each one represents a portion of the thread of human prehistory in the Upper Susitna River region. Regardless of the yardstick applied, significance implies a frame of reference, problem orientation, geographic, temporal, or other context against which significance is evaluated. Sites can be significant on several levels of interpretation. Through application of National Register Criteria, a site may be evaluated as a single entity or in terms of its relationship to a group of sites (relative significance). If all of the sites within a drainage system such as the Upper Susitna were known and the region itself well studied (which it is not), relative significance of sites or group of sites could be established with some degree of confidence. However, when a site or group of sites are located in an area such as the Susitna Valley that is relatively unknown archeologically, it is difficult to establish relative significance.

Significance itself is a relative term which is used in an historic context dependent on the current state of knowledge, method and theory employed, and research questions asked. New techniques and methods have enabled archeologists to collect new and different types of data which allow new questions to be formulated and addressed. Although National Register Criteria are subject to ongoing modification, significance pertaining to archeological sites generally emphasize research potential, site integrity and/or public appreciation.

Although all sites located as a result of this study are related geographically, and many no doubt temporally, the exact relationships await further study. Many of the sites were found associated with one or more of three tephras which provide limiting dates in a restricted geographic context and provide a unique and scientifically important opportunity to construct the first cultural chronology for the Upper Susitna River Valley. Armed with all this information it is possible to state that all sites found to date in the study area are likely significant and could collectively hold the potential for defining the prehistory for this region of Alaska and, therefore, may be eligible for inclusion in the National Register of Historic Places. Based on all data collected to date, a preliminary cultural chronology has been developed (see Chapter 7).

Significance must be assessed on adequate data. Only 18 of the sites located and documented during the two field seasons have been systematically tested (due to time and budgetary constraints) and adequate data are available from these 18. Evaluation of specific site significance for the remaining sites must await systematic testing. However, because many of the sites occur in relation to three tephras it is possible to consider the collective significance of all sites for delineating the prehistory and history of the Upper Susitna River Valley. From this perspective all sites located to date appear to qualify for the National Register of Historic Places.

Given this level of significance it may be appropriate to nominate these sites to the National Register as an archeological district because of the unique opportunity the known sites in this area (as well as yet undiscovered sites) have for addressing questions concerning the prehistory of a large portion of Interior Alaska which is presently not well defined. If a nomination of this type is made, it should be done in concert with the State Historic Preservation Officer.

8.3 - Watana Dam and Impoundment

Two historic sites and 26 archeological sites were located and documented in areas to be impacted by the Watana Dam and its impoundment. The two historic sites (TLM 079, TLM 080) will be directly impacted. Twenty-four of the archeological sites will be directly impacted (TLM 017, TLM 018, TLM 026, TLM 033, TLM 039, TLM 040, TLM 042, TLM 043, TLM 048, TLM 050, TLM 058, TLM 059, TLM 060, TLM 061, TLM 062, TLM 063, TLM 064, TLM 065, TLM 072, TLM 073, TLM 075, TLM 077, TLM 102, TLM 104) and two indirectly impacted (TLM 015, TLM 016).

8.4 - Devil Canyon Dam and Impoundment

One historic site and six archeological sites are presently known in areas to be impacted by the Devil Canyon Dam and its impoundment. The one known historic site (TLM 023) and the six archeological sites (TLM 022, TLM 024, TLM 027, TLM 029, TLM 030, TLM 034) will all be directly impacted.

8.5 - Proposed Borrow Areas, Associated Facilities, and Areas Disturbed by Geotechnical Testing

Proposed borrow area C, which was examined during the 1981 field season, has been eliminated from consideration as a potential borrow source. The sixteen sites located in this area are not included under this heading, but are included in section 8.8.

Eight archeological sites are presently known in the portions of the proposed borrow areas examined to date (A, B, D, E, F, G), and areas disturbed by geo-technical testing. Two sites will be directly impacted (TLM 035, TLM 051), and six sites have the potential of being impacted (TLM 068, TLM 070, TLM 082, HEA 177, HEA 178, HEA 179). Additional potential borrow areas have been identified (H, I, J, K) and another expanded (F) which remain to be examined for cultural resources. Sites that fall within both an impoundment area and a potential borrow source are included under the appropriate impoundment section. Proposed borrow areas I and J are located within expected impoundment areas.

8.6 - Proposed Access Route

Alternative access corridors were examined at the reconnaissance level during the 1981 field season. Since that investigation a proposed corridor from the dam sites west to the Parks Highway has been selected as the access corridor which will receive further investigation. The 14 sites located along the alternative corridor from the Watana dam site to the Denali Highway are not included in this section but are included in Section 8.8.

Eleven archeological sites are presently known along the selected access corridor. Four will be directly impacted (TLM 108, TLM 109, TLM 110, TLM 113), five indirectly impacted (TLM 101, TLM 103, TLM 111, TLM 112, TLM 114) and two have the potential of being impacted (TLM 106, TLM 107).

8.7 - Transmission Lines

The one possible site found during the very cursory four-hour aerial reconnaissance of the transmission lines remains to be documented, therefore it is not possible to evaluate impact at this time. It may be necessary to return to the site and conduct further testing. As previously noted transmission lines were not part of the scope of work for subtask 7.06, Cultural Resource Investigations, it is recommended that more indepth reconnaissance and followup systematic testing along the proposed transmission lines be conducted when the locations of transmission rights-of-way, roads, towers, etc. are being chosen. Then the impact to cultural resources can be evaluated and a mitigation plan developed.

8.8 - Other Areas (areas outside the above categories but within the study area)

Sites previously included in proposed borrow area C and sites along the alternative access corridor from the Watana dam site to the Denali Highway are included in this section along with other sites located during field investigations.

Two historic sites and 59 archeological sites are known in this area. The two historic sites presently known in this area (TLM 056, TLM 071) both have the potential of being impacted by the project. Fifty-two of the archeological sites have the potential of being impacted by the project (TLM 007, TLM 025, TLM 028, TLM 031, TLM 032, TLM 036, TLM 037, TLM 041, TLM 044, TLM 045, TLM 046, TLM 052, TLM 053, TLM 054, TLM 055, TLM 057, TLM 066, TLM 067, TLM 069, TLM 078, TLM 081, TLM 083, TLM 084, TLM 085, TLM 086, TLM 087, TLM 088, TLM 089, TLM 090, TLM 091, TLM 092, TLM 093, TLM 094, TLM 095, TLM 096, TLM 097, TLM 098, TLM 099, TLM 100, TLM 105, TLM 116, TLM 117, HEA 174, HEA 175, HEA 176, HEA 180, HEA 181, HEA 182, HEA 183, HEA 184, HEA 185, HEA 186). The remaining seven archeological sites will be indirectly impacted by the project (TLM 020, TLM 021, TLM 038, TLM 047, TLM 049, TLM 074, TLM 076).

Although 52 sites in this category are presently located outside expected direct and indirect areas, they could be impacted depending on future developments associated with the Susitna Hydroelectric Project. At present, they should be avoided. However, if and when it is determined that these sites will be either directly or indirectly impacted, it will then be necessary to mitigate this impact. When final plans for the project, including recreational activities, are available it may then be possible to determine specific sites which will not be impacted by the Susitna Hydroelectric Project.

9 - MITIGATION OF IMPACT ON HISTORIC AND ARCHEOLOGICAL SITES

9.1 - Mitigation Policy and Approach

It is mandated by federal law that the effect of any federal project or federally licensed project on cultural resources must be assessed and mitigation measures developed to lessen or avoid the impact on these resources. Mitigation is a basic management tool providing options to be considered during the overall decision making process. Although the concept has and is presently undergoing refinement it clearly consists of three options: avoidance, preservation and investigation.

(a) Avoidance

Avoidance consists of any measures that avoid adverse effects of a project on cultural resources. Avoidance in and of itself may not be totally effective if not coupled with a preservation program that will ensure that a historic or archeological site protected from the immediate adverse effect (direct and indirect impact) of the project is not inadvertently damaged in the future as a result of the project (potential impact). For the Susitna Hydroelectric Project, potential damage may result from, but is not limited to, operation of the facilities, increased access to remote areas, recreational activities, private development, and the transfer of lands from federal and state governments to corporate or private parties. Therefore, avoidance must be considered in terms of long range and short range goals aimed at protecting cultural resources beyond the immediate construction phase of the dam and its ancillary facilities.

(b) Preservation

Preservation is any measure that results in the reduction or avoidance of impact on cultural resources through physical maintenance or protection aimed at preventing further deterioration or destruction. Preservation, as with avoidance, implies both short term and long term measures. Preservation may consist of stabilization, reconstruction, as well as

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(b) Preservation

Preservation is any measure that results in the reduction or avoidance of impact on cultural resources through physical maintenance or protection aimed at preventing further deterioration or destruction. Preservation, as with avoidance, implies both short term and long term measures. Preservation may consist of stabilization, reconstruction, as well as preservation of a site by constructing a barrier around the site, patrolling and monitoring the site, public education, or the establishment of an archeological preserve. Of all the preservation options available for the Susitna Project, public education may have the greatest potential for long term preservation of not only a particular site or group of sites but for cultural resources in general.

(c) Investigation

Investigation refers to a problem orientated data recovery program aimed at collecting and conserving archeological data in a scientific manner. A program of this type means that data recovery procedures are developed for each site or group of sites, analysis of materials is undertaken, and the results are disseminated to professional and public audiences. In addition to investigation as a method of avoiding adverse impact, a site(s) could be investigated (excavated), either partially or in whole, if a site(s) appears to fit the research needs of the overall cultural resource management program; if a site(s) may contain information critical to the larger mitigation program; or if a site(s) can not be protected from indirect or potential impact such as increased off the road traffic, increased recreational use, an increase in the number of people in the area or increased site visibility.

9.2 - Mitigation Plan

Any mitigation plan must be based on an evaluation of project impact on the total resource, including known and undiscovered sites. Therefore, because only a portion of the area to be impacted by the Susitna Hydroelectric Project has been surveyed and investigated, any mitigation plan must include a program to examine the entire area and mitigate adverse effects on all sites on or eligible for the National Register of Historic Places.

(a) Details of Plan

For all sites that will be adversely impacted by the Susitna Hydroelectric Project, either directly or indirectly, investigation is recommended. For those sites that could be potentially damaged, avoidance with an accompanying protection plan is recommended. Preliminary analysis of the sites presently known indicates that 7 sites will be directly impacted in the Devil Canyon area. Investigation is recommended for all 7 sites. In the Watana Dam area, 26 sites will be directly impacted and 2 sites indirectly impacted. For these 28 sites investigation is recommended. Within the proposed borrow areas (not including I, J, K, L or the extension of F which were identified after the 1981 field season or C which has been eliminated as a potential borrow source) 2 sites will be directly impacted and should be investigated. The 6 sites that could be potentially damaged should be avoided and a preservation plan developed. To date, the proposed access corridor actually selected after the 1981 field season contains 9 sites that will be directly or indirectly impacted and should be investigated. If realignment of the proposed access route can be accomplished in certain areas, mitigation of direct impact by avoidance may be possible. The 2 sites in this area that could be potentially damaged should be avoided and a protection plan developed. Sixty-one sites fall outside of any of the above mentioned categories but within the study area. Seven sites will be impacted by the project and should be investigated. The remaining 54 sites could potentially be impacted and should be avoided and an accompanying protection plan developed.

It is assumed that once a transmission route is surveyed, a reconnaissance-level survey will be conducted. Since the transmission line right-of-way can, in most cases, be aligned to skirt any cultural resources located, mitigation of known sites can be accomplished primarily by avoidance and preservation. The effects on those sites that cannot be avoided by aligning tower locations and/or access roads could be mitigated by investigation.

Of the sites presently known, 56 archeological sites and 3 historic sites will definitely be adversely effected by the Susitna Hydroelectric Project and should be investigated. Fifty-six sites could potentially be impacted and should be avoided and a protection plan developed.

(b) State and Federal Agency Recommendations and Applicant's Variation from these Recommendations

The recommendations as presented in this report should be submitted to the Alaska State Historic Preservation Officer, as well as the Advisory Council on Historic Preservation, for review and comment. Comments on this report, the Feasibility Report, and draft License Application should be discussed with the SHPO and the final mitigation plan submitted as part of the FERC license application. Prior to the implementation of any mitigation plan, the Advisory Council on Historic Preservation must be afforded the opportunity to comment on the plan. Compliance with (or justification for variation from) recommendations to mitigate the effect of the Susitna Hydroelectric Project on cultural resources is the responsibility of the applicant, the Alaska Power Authority.

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11 - AUTHORITIES CONTACTED

State Agencies

Division of Parks, Anchorage, Alaska

Mr. Doug Reger - State Archeologist
- Letter from E. James Dixon, Jr., January 10, 1980, requesting State of Alaska Antiquities Permit for 1980 field season.

Mr. Doug Reger - State Archeologist
- Letter from E. James Dixon, Jr., requesting State of Alaska Antiquities Permit for 1981 field season.

Mr. Robert Shaw - State Historic Preservation Officer, and
Mr. Ty Dilliplane - acting State Archeologist
- Discussion with E. James Dixon, Jr., George S. Smith, Jim Gill and Bob Krogseng, January 22, 1982, concerning the general mitigation plan and approaches to mitigating adverse impact to cultural resources located and documented during the 1980 and 1981 field seasons.

Federal Agencies

Heritage Conservation and Recreation Service

Mr. Charles McKinney - Departmental Consulting Archeologist
- Letter from E. James Dixon, Jr., December 29, 1979, requesting Federal Antiquities Permit for 1980 field season.

National Park Service

Ms. Gail Russell - Staff, Interagency Service Division
- Letter from E. James Dixon, Jr., November 22, 1980, requesting Federal Antiquities Permit for 1981 field season.

Bureau of Land Management

Dr. Ray Leicht - Archeologist
- Discussion with E. James Dixon and George S. Smith, March 26, 1980, concerning the process necessary to conduct archeological excavations on BLM lands should it become necessary to do so during the 1980 or 1981 field seasons.