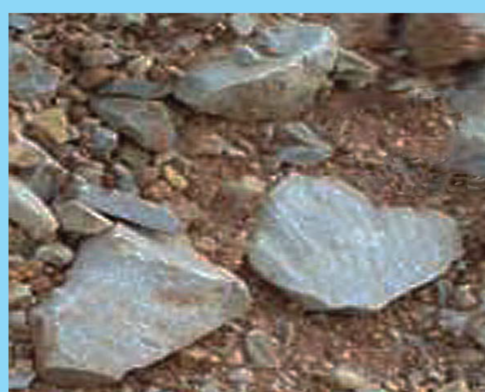
Testing and Data Recovery Plan for Five Archaeological Sites along US 285 South of Tres Piedras, Taos County, New Mexico

James L. Moore



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James L. Moore

with contributions by

Nancy J. Akins
Pamela J. McBride
Jeffrey L. Boyer
Mollie S. Toll
C. Dean Wilson

Robert Dello-Russo, Ph.D.
Principal Investigator

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Administrative Summary

At the request of the New Mexico Department of Transportation, the Office of Archaeological Studies of the Museum of New Mexico has prepared a treatment plan for five archaeological sites along US 285 south of Tres Piedras, Taos County, New Mexico. These sites—LA 74879, LA 144951, LA 160196, LA 160201, and LA 160203—are within a construction zone that will be affected by shoulder widening, culvert installation, and right-of-way fence replacement along a stretch of US 285 between Mileposts 372 and 379.32. All five sites are on land administered by the USDA Carson National Forest. The plan is phased to allow preliminary assessment of the sections of sites that fall within the construction zone to determine whether potentially significant cultural features or deposits are present. If such remains are not found within the construction zone, a more intensive phase of data recovery will not be considered necessary. The presence of potentially significant cultural deposits or features will trigger a more detailed examination of the affected part of a site to recover the data potentially available in that area. In such a case, the archaeological examination will immediately move from testing to data recovery.

MNM Project No. 41.900
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Introduction to the Plan

At the request of the New Mexico Department of Transportation (NMDOT), the Office of Archaeological Studies (OAS) of the Museum of New Mexico has prepared a testing and data recovery plan for five archaeological sites located south of Tres Piedras along US 285 in Taos County, New Mexico. All five sites are situated on land administered by the USDA Carson National Forest (Fig. 1). These sites will be affected by improvements to a section of US 285 between Mileposts 372 and 379.32 including shoulder widening, culvert installation, right-of-way fence installation, and construction of detour that will be used during construction. Before highway construction begins, the parts of these sites that extend into the construction zone will be examined to determine whether they contain intact cultural features and/or deposits that have the potential to provide important information on the prehistoric and historic occupation and use of this part of New Mexico. If such potentially important features or deposits occur within the construction zone, a more extensive phase of study will be used to recover all possible data.

Testing and data recovery phases cannot be conducted separately because of time constraints related to construction needs. Thus, both phases of investigation are included in this plan in order to reduce the amount of time needed to conduct the required archaeological studies at these sites. The potential for the parts of these sites that fall within construction limits to contain important cultural deposits and/or features cannot be adequately assessed by a surface examination alone. Thus, the first phase of investigation will entail limited testing to facilitate examination of subsurface deposits in the affected areas. Should potentially important deposits and/or features be encountered at a site during testing, it will immediately go to the second phase of investigation, which will consist of intensive recovery of those data. Since all of these sites may not go to data recovery, information pertinent to the questions that will be posed in the treatment plan may not be collected from all five sites. Thus, research questions specific to certain sites can only be addressed if potentially important cultural deposits and/or features are present within the zones of investigation.

The sites that will be examined by this study include three prehistoric artifact scatters (LA 74879, LA 160201, and LA 160203), a multicomponent artifact scatter with features that contains both prehistoric and historic materials (LA 160196), and a historic artifact scatter with features (LA 144951). Three of these sites (LA 74879, LA 160196, and LA 160201) occur on both sides of the highway right-of-way. LA 144951 is restricted to the west side of the highway right-of-way, and LA 160203 only occurs on the east side. No residential structures were recorded at any of these sites, and temporal associations should be considered questionable for all but LA 144951. All five sites will be affected by shoulder widening. In addition, LA 144951 will be affected by the installation of a culvert, and LA 160203 will be affected by the construction of a temporary detour route that will be used during construction. Archaeological investigations at these sites will be mostly restricted to the construction zone within the US 285 right-of-way, though the sections of these sites that are within the current right-of-way boundaries but outside the construction zone will be mapped and examined in more detail than was possible during survey.

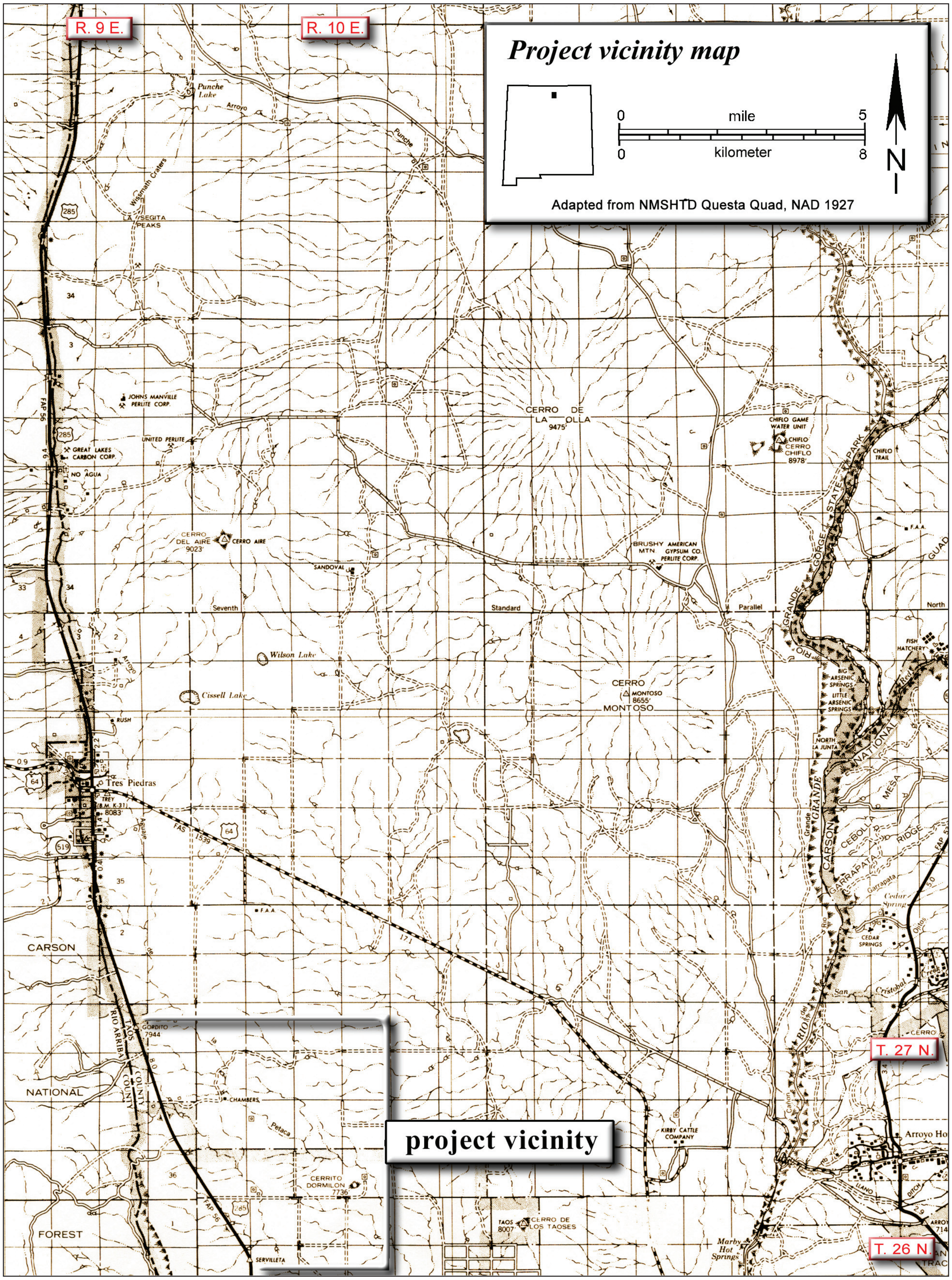

Figure 1. Project vicinity map.

The Natural Environment

Jeffrey L. Boyer

Geomorphology

The project area lies near the western side of the Taos Plateau, which in turn lies within the Rio Grande Depression or Trough. The Rio Grande Depression is a large, flat, block-faulted area bordered on the west by the San Juan Uplift (the Tusas and San Juan Mountains) and on the east by the Sangre de Cristo Mountains. Accumulation in the trough of volcanic and sedimentary materials resulted in the Santa Fe formation, consisting of a variety of gravels, sandstones, volcanic ashes, tuff, and bentonite, breccias, cherts, and clays. Much of the area, particularly on the western side of the trough, is capped by thick volcanic flows.

In New Mexico, the plateau is known as the Taos Valley, while in Colorado it is known as the San Luís Valley. The rolling terrain of the plateau is bisected by the Rio Grande, which has cut a gorge up to 255 m (850 ft) deep through the accumulated materials. To the west of the gorge, the plateau is dotted by volcanos and volcanic flows. To the east, the area is characterized by alluvial fans and terraces from the Sangre de Cristo Mountains, although volcanic features such as Ute Mountain, Guadalupe Mountain, the Questa caldera, and Cerro Negro and their associated basalt flows are present where the features have not been covered by alluvial material.

The major geological features—the Santa Fe formation, the volcanos, and the volcanic flows—are important culturally because they have provided raw lithic materials for the region's prehistoric and historic native inhabitants. Of specific importance are sandstone, chert, and quartzite from the Santa Fe formation and andecite or dacite and obsidian from the volcanic features. Andecite or dacite was obtained from several sources, including Cerro Negro, Guadalupe Mountain, and Cerro Sin Nombre (Boyer et al. 2001). No Agua Mountain provided a poor-quality obsidian (see Michels 1985), whose archaeological distribution is largely limited to the immediate Tres Piedras area.

There are no permanent water sources in or near the project area.

Modern Climate

Gabin and Lesperance (1977) provide climatic information from two weather stations close to the project area. Eight years of precipitation records at the Servilleta station (1920–1928), located near LA 144951 (incorrectly located by Gabin and Lesperance 1977:388), reveal that mean monthly precipitation ranges between .19 inches (5 mm) in January and 2.28 inches (57.9 mm) in July. Mean annual precipitation is 12.62 inches (320.5 mm). Most of that amount (7.08 inches; 179.8 mm; 56.1 percent) comes in the form of rain between June and September. There are no temperature records for the Servilleta station (Gabin and Lesperance 1977:388).

The Tres Piedras weather station (1905–1975), located north of the town of Tres Piedras at an elevation of 8,110 ft (2,491.9 m), receives 14.34 inches (364.2 mm) of mean annual precipitation, most of which (7.29 inches; 185.2 mm; 50.8 percent) comes from rain between July and October (Gabin and Lesperance 1977:391). Mean annual temperature at the Tres Piedras station is 42.1 degrees F (5.6 degrees C); mean monthly temperatures range from 20.6 degrees F (-6.3 degrees C) in January to 63.1 degrees F (17.3 degrees C) in July. Potential evapotranspiration records show that precipitation surpluses are minimal, ranging from .12 inch (3.1 mm) in November to .53 inch (13.5 mm) in December, and occur during the winter between November and March. The months between April and October have precipitation deficits ranging from .12 inch (3.1 mm) in October to 3.60 inches (91.4 mm) in June, with a mean annual precipitation deficit of 13.04 inches (331.2 mm).

Soils and Plant Communities

A single soil type characterizes the project area (Hacker and Carleton 1982:34–35, 88). Montecito loam is a deep, well-drained soil found on terraces and lava-flow plains between about 7,000 and 7,800 ft (2,133.6 to 2,377.4 m). This soil forms in mixed alluvium and basaltic materials. The surface layer (A11–A12 horizons) consists of about 6 inches (15.2 cm) of light yellowish brown and brown loam. The subsoil (B21t, B22t, and B3ca horizons) are brown and light brown clay loam and gravelly clay loam about 24 inches (61 cm) thick. Calcium carbonate amounts increase with depth. The substratum (C1ca and C2ca horizons) is white, very gravelly, sandy loam and light gray, extremely gravelly, sandy loam to depths of 5 feet (1.5 m) or more.

The combination of climatic conditions and Montecito loam soil results in a natural forest community consisting of piñon pine and Rocky Mountain and one-seed junipers, with understory vegetation including blue and sideoats grama, big sagebrush, broom snakeweed, and muttongrass. This community characterizes the project area today.

Overview of the Prehistoric and Historic Periods

James L. Moore

Paleoindian Period (9200–5500 BC)

The Paleoindian period contains three broad temporal divisions for which Holliday (1997:225) provides dates from the southern Plains: Clovis (9200–8900 BC), Folsom (8900–8000 BC), and Late Paleoindian (8000–7000 BC). Dates are probably similar for northern New Mexico, though there the end of the period is usually given as 5500 BC. The Late Paleoindian division groups several complexes distinguished by variations in projectile points and tools that may reflect differences in lifestyle. All Paleoindians were once classified as big-game hunters, but some now feel that the Clovis people were unspecialized hunter-gatherers while Folsom and many later groups specialized in hunting migratory big game, especially bison (Stuart and Gauthier 1981). While some Paleoindians left New Mexico with the migratory big game, those that remained undoubtedly subsisted by hunting and gathering, and the early Archaic inhabitants of the region probably evolved out of this population. Evidence of Paleoindian occupation is rare in the Northern Rio Grande and typically consists of diagnostic projectile points and butchering tools found on the modern ground surface or in deflated settings (Acklen et al. 1990).

Paleoindian sites and isolated occurrences occur in the Northern Rio Grande but are not common. Currently, the only Paleoindian site recorded in the Santa Fe area is LA 112527, located in Diablo Canyon northwest of Santa Fe. This site has yielded Folsom points as well as Late Paleoindian materials, especially Golondrina points (pers. comm., Robert Dello-Russo, 2008). Other Paleoindian finds around Santa Fe are isolated artifacts, which have been recovered from the Tesuque area, the hills northwest of town, outside the community of Agua Fria, in the Santa Fe foothills, and in the Sangre de Cristos (Scheick 1999:2). Two Clovis components are reported from the Jemez Mountains (Evaskovich et al. 1997; Turnbow 1997), and their presence in that setting may suggest a changing subsistence adaptation. Two isolated Late Paleoindian artifacts are reported from the Galisteo Basin (Honea 1971; Lang 1977). Isolated Clovis, Folsom, Agate Basin, Milnesand, and Scottsbluff points have been found on the Pajarito Plateau and in the nearby Cochiti Reservoir District (Chapman and Biella 1979; Powers and Van Zandt 1999; Root and Harro 1993; Steen 1982; Traylor et al. 1990). The paucity of Paleoindian remains in this region may be due to low visibility rather than lack of occupation, with components being masked by deposits from later periods or buried deeply by natural geomorphic processes.

Though no Paleoindian sites have been identified in the Chama–Ojo Caliente valleys to the south of the study area, Anschuetz et al. (1985) note that isolated Clovis and Folsom points have been found in that area, and a secondarily deposited horizon of possible Paleoindian date was identified at Abiquiu Reservoir. Isolated Paleoindian finds have also been made in the Taos area, but no definite sites have been recorded. The isolated finds include a late Paleoindian point from a Pueblo site near the mouth of the Rio Fernando de Taos canyon (Alexander 1964), while the bases of Belen or Plainview points were found on sites with later components at Guadalupe Mountain (Seaman 1983) and south of Carson (Boyer 1985). A reworked obsidian Folsom point was found north of Red Hill on the northwest side of the Taos Valley (Boyer 1988). Isolated late Paleoindian artifacts are reported from the mountains southeast of Taos (Boyer 1987).

Archaic Period (5500 BC–AD 600)

At an early date, archaeologists realized that the Archaic occupation of northern New Mexico was distinct from that of its southern neighbor, the Cochise (Bryan and Toulouse 1943). Irwin-Williams (1973, 1979) defined the northern Archaic as the Oshara Tradition and tentatively formalized its developmental sequence. However, in applying that chronology outside the area in which it originated, one must realize that the specifics of trends might differ, and at least some variation from one region to another should be expected.

The Oshara tradition is divided into five phases: Jay (5500 to 4800 BC), Bajada (4800–3200 BC), San José (3200–1800 BC), Armijo (1800–800 BC), and En Medio (800 BC–AD 400 or 600). Jay and Bajada sites are usually small camps occupied by microbands for short periods of time (Moore 1980; Vierra 1980), and the population was probably grouped into small, mobile nuclear or extended families. San José sites are larger and more common than those of earlier phases, which may signify population growth. Ground stone tools are common at San José sites, suggesting a significant dietary reliance on grass seeds. Macroband base camps appeared by the late Armijo phase, providing the first evidence for a seasonal pattern of aggregation and dispersal. The En Medio phase represents the transition from a nomadic hunter-gatherer pattern to a seasonally sedentary lifestyle combining hunting and gathering with some reliance on corn horticulture. During this phase the population again seems to have increased, and a strongly seasonal pattern of population aggregation and dispersal seems likely. While some corn was grown during this period, the population mostly ate foods obtained by hunting and gathering.

While the Archaic ended around AD 400 in northwest New Mexico, it ended around AD 600 in some parts of the Northern Rio Grande, and even later in others. Thus, the Northern Rio Grande Archaic's relationship to the Oshara Tradition is unclear. Projectile points from the Northern Rio Grande illustrated by Renaud (1942, 1946) resemble those of the Oshara Tradition. However, similar point styles occur over a vast region stretching from California to Texas and northern Mexico to the southern Great Plains, so stylistic resemblance is not always evidence for cultural affinity. Subsequent developments in the Northern Rio Grande suggest that people in that area differed from those in northwest New Mexico. Those differences likely had their basis in the makeup of the Archaic peoples who originally settled those regions. Thus, the similarity in projectile point styles does not imply that the Northern Rio Grande and Four Corner's areas were occupied by groups of common cultural or even linguistic origin. Indeed, they probably were not.

Archaic sites in the Northern Rio Grande run the gamut of phases, though Early and Middle Archaic sites are rare (Moore 2001). Several recent studies have been conducted in the Santa Fe area, where Early and Middle Archaic sites represent brief occupations with an emphasis on hunting, and associated materials are typically mixed with later deposits. Late Archaic sites are more common, and this is consistent with regional data (Acklen et al. 1997). This increase may be due to changes in settlement and subsistence patterns associated with the adoption of corn horticulture during the Armijo phase, including seasonal aggregation, longer periods of occupation, and use of a broader range of environmental settings. However, evidence for corn horticulture is mainly found in sites south of La Bajada, so its effect north of that area is questionable. The paucity of Early and Middle Archaic sites in comparison with those from the Late Archaic may be due to visibility. Earlier sites, along with most of those from the Paleoindian period, may be deeply buried in areas of soil accumulation, especially in river valleys and along the streams tributary to them.

Judging from excavations in the Santa Fe area, Late Archaic sites range from small foraging camps to larger base camps containing shallow structures (Post 1996, 2000; Schmader 1994). En Medio sites are the most common type of Archaic site in the Santa Fe area and are widely distributed across riverine, piedmont, foothill, and montane settings (Acklen et al. 1997; Kennedy 1998; Lang 1993; Miller and Wendorf 1955; Post 1996, 1997, 2000; Scheick 1991; Schmader 1994; Viklund 1988). This phase is represented by isolated occurrences, limited-activity sites, and base camps containing structures and formal features. Increased diversity in settlement pattern and site types suggest population increase, longer site occupations or reduced time between occupations, and truncated foraging range.

In contrast, Middle and Late Archaic sites are common in the lower Rio Chama basin, but most of the Archaic sites investigated in the Chama–Ojo Caliente area are in and around Abiquiu Reservoir. Schaafsma (1976, 1978) completed the first systematic research on the Archaic occupation of that area, identifying 56 Archaic sites of which 13 were excavated. Most were simple scatters of chipped stone artifacts or isolated projectile points, but five were large base camps situated at the mouths of major drainages on the Rio Chama terrace. More recent work in this area was completed by Bertram et al. (1989), who examined Archaic components at eight sites. A Late Archaic occupation was suggested for four sites, all of which were reused at later times (Bertram 1989; Schutt et al. 1989). Middle to Late Archaic occupations were noted at five sites, and in some instances multiple occupations were suggested by the presence of diagnostic projectile points or obsidian hydration dates from varying time periods (Bertram 1989; Schutt et al. 1989).

Anschuetz et al. (1985) note interesting regional variations in the distribution of Archaic sites in the lower Chama Valley. Tools associated with intensive food processing are rare or absent at sites near Abiquiu, but are common at sites near the confluence of the Rio Chama and Rio Grande. They feel this demonstrates a differential pattern of seasonal use and exploitation from one end of the valley to the other. In addition to hunting and gathering activities, the Chama Valley also served as a source for Pedernal chert between the Paleoindian and Proto historic periods. Though this material is abundant in Rio Chama and Rio Grande gravels, Pedernal chert was also quarried around Cerro Pedernal and Abiquiu Reservoir, and quarries in the former location were originally termed the Los Encinos Culture (Bryan 1939).

Pueblo Period (AD 600–1600)

Early Developmental Period (AD 600–900)

Early Developmental–period sites dating before AD 800 are rare in the Northern Rio Grande. While sites dating between AD 800 and 900 are more numerous, they are typically represented by limited-activity areas and small settlements (Wendorf and Reed 1955). Most reported early Developmental-period sites are south of La Bajada Mesa in the Albuquerque area, with a few at higher elevations along the Tesuque, Nambe, and Santa Fe drainages (Lang 1995; McNutt 1969; Peckham 1984; Skinner et al. 1980; Wendorf and Reed 1955). Sites of this period tend to be situated on low terraces overlooking tributaries of the Rio Grande; locations that may have been chosen for their access to water, farmland, and ecozones containing a wide range of resources (Anschuetz et al. 1997; Cordell 1978).

Late Developmental Period (AD 900-1200)

Sites from this period occur from the Taos Valley south to the Albuquerque area. The late Developmental period is marked by an increase in the number and size of residential sites, occupation of a wider range of settings, and the appearance of Kwahe'e Black-on-white pottery (Cordell 1978; Mera 1935; Peckham 1984; Wendorf and Reed 1955; Wetherington 1968). Residential sites expanded into higher elevations along the Rio Grande, Tesuque, Nambe, and Santa Fe drainages during this period (Allen 1972; Ellis 1975; McNutt 1969; Peckham 1984; Skinner et al. 1980; Wendorf and Reed 1955). These sites commonly occur on low terraces above the tributaries of these rivers where water, farmland, and a variety of foraging resources were available (Anschuetz et al. 1997; Cordell 1978). The first residential sites were established in the Taos district toward the middle of this period (Boyer 1997).

Coalition Period (AD 1200-1325)

The Coalition period is marked by three major changes: an increase in the number and size of residential sites, use of surface rooms as domiciles rather than for storage as was common earlier, and a shift from mineral to vegetal paint on pottery (Cordell 1978; Peckham 1984; Stuart and Gauthier 1981; Wendorf and Reed 1955). Areas like the Pajarito Plateau that had previously seen limited use became a focus of occupation during this period, while areas like the Tewa Basin that saw heavy late Developmental period use may have lost some of their population by AD 1200. The apparent increase in number and size of residential sites suggests population increase and an extension of a village-level community organization that began during the late Developmental period. However, this apparent increase may be a function of where archaeologists have mainly looked, and points to the amount of work that has been done on the Pajarito Plateau as opposed to elsewhere in the Northern Rio Grande.

While Coalition-period residence at higher elevations provided reliable water and arable land, innovative methods were needed to produce crops in these cooler settings, including intensification of water management and farming practices (Anschuetz 1998; Anschuetz et al. 1997;

Maxwell and Anschuetz 1992; Moore 1981). In the Santa Fe area, several large villages were established early in the Coalition period. The Coalition period also saw the founding of farming villages on the Pajarito Plateau (Crown et al. 1996; Orcutt 1991), in the Galisteo Basin (Lang 1977), in the Chama–Ojo Caliente region, and in the Taos District.

Classic Period (AD 1325-1600)

Classic-period villages shifted away from the uplands and began to concentrate along the Rio Grande, Chama, Ojo Caliente, and Santa Cruz rivers, as well as in the Galisteo Basin. Large villages containing multiple plazas and roomblocks were built, and regional population peaked. The process of large-village formation and movement to areas along major streams continued through the Classic period. Population levels began to decline on the Pajarito Plateau in the early Classic period, with most villages being abandoned by 1550, though some continued to be occupied until 1550–1600 (Orcutt 1991). This population moved into the Rio Grande Valley, with Keres villages claiming affinity with sites on the southern Pajarito Plateau, and Tewa villages claiming affinity with sites on the northern Pajarito Plateau. Taos and Picuris Pueblos were both occupied during the Classic period in the Taos District, and their occupation continues to the present.

Historic Period

Exploration Period (1539–1598)

Based on information gathered by Alvar Nuñez Cabeza de Vaca and his companions following the disastrous Narváez expedition to Florida (Covey 1990), the Spaniards became interested in lands north of New Spain in the 1530s. Fray Marcos de Niza was dispatched into the Southwest on a scouting mission in 1539, and a major expedition under Francisco Vázquez de Coronado explored the region from 1540 to 1542. No other formal contact between New Spain and New Mexico occurred until 1581, when Father Agustín Rodríguez and Captain Francisco Sánchez Chamuscado led an expedition to the Pueblo country (Hammond and Rey 1966). Antonio de Espejo led the next expedition into New Mexico in 1582, ostensibly to rescue two priests left by Rodríguez-Chamuscado. Gaspar Castaño de Sosa attempted to illegally found a colony in 1590–1591 but was arrested and returned to Mexico (Simmons 1979). A second illegal attempt at colonization was made by Francisco de Legua Bonilla and Antonio Gutiérrez de Humaña in 1593, but their party was nearly destroyed by conflict with Indians (Hammond and Rey 1953).

Early Spanish Colonial Period (1598–1680)

Juan de Oñate established the first legal colony in New Mexico at Okey Owinge (San Juan Pueblo) in 1598. By 1600 the Spaniards had moved into San Gabriel del Yunque, sister village to Okey Owinge, which was abandoned for their use by its residents (Ellis 1987). The lack of wealth in the new province caused unrest among the Spaniards (Espinosa 1988:7), many of whom had accepted the challenge of establishing the colony because they thought they would get rich. This unrest coupled with Oñate's neglect eventually contributed to his loss of the governorship. Oñate was replaced as governor by Pedro de Peralta in 1607, who arrived in New Mexico in 1609 and moved the capital to Santa Fe around 1610 (Simmons 1979).

Oñate's colony was a disappointment because it failed to find the wealth that was expected to exist in New Mexico. Many wanted to abandon the colony, and the government was considering doing just that (Espinosa 1988:8–9). However, the baptism of 7,000 Pueblo Indians in 1608 and reports that many others were ready for conversion provided a viable alternative to an economically autonomous colony (Espinosa 1988:9). New Mexico was allowed to continue as a mission area, with its maintenance underwritten by the royal treasury (Simmons 1979:181). This made the church very powerful and influential, and caused considerable conflict with the secular government (Ellis 1971:30–31).

Rather than furnishing a permanent military garrison for New Mexico, a class of citizen-soldiers responsible for defense was created. As a reward for their services, the citizen-soldiers had the right to collect annual tribute from the pueblos. This was the *encomienda* system, and the number of *encomenderos* was set at 35 (Espinosa

1988). Pueblo Indians were also conscripted to serve as laborers on Spanish farms and haciendas. This was the *repartimiento*, a system of forced labor (Simmons 1979:182).

Since New Mexico was viewed as a mission effort, the secular population received little official support. The church was supplied by a notoriously inefficient caravan system (Moorhead 1958). While caravans were scheduled for every three years, as many as five or six years often passed between deliveries (Moorhead 1958; Scholes 1930). Irregular supply at fairly long intervals led to shortages of important goods and kept costs high. Supplies carried by the caravans were meant to support the missions, though at times goods were also carried north for profit (Hackett 1937; Moorhead 1958). Products shipped out of New Mexico by the missions provided income that enabled them to purchase luxury items that would not otherwise have been available (Ivey 1993:46). The seventeenth-century economy was based on a stable barter system rather than hard cash (Snow 1983:348). Goods like corn, wheat, piñon nuts, hides, and cotton blankets were used in lieu of coinage, but the accumulation and shipment to Mexico of these products by governors and mission personnel seem to have done little to stimulate the local economy (Snow 1983:348).

Trade with the Plains Apaches was also an important source of income. Slaves were an important commodity, and were bought from the Apaches for resale to the mines of northern Mexico. The Spaniards often supplemented this source by raiding Apache villages. These raids antagonized both the Apaches and their Pueblo trading partners, and caused the former to unleash a series of devastating raids in the 1660s and 1670s (Forbes 1960). Apache raiding, in turn, exacerbated Pueblo resentment of the Spanish, sparking several rebellions that finally culminated in the general revolt of 1680.

Pueblo Revolt Period (1680–1693)

Religious intolerance, forced labor, extortion of tribute, and Apache raids led the Pueblo Indians to revolt in 1680, driving the Spaniards from New Mexico. The Pueblos resented attempts to supplant their traditional religion with Christianity, and numerous abuses of the encomienda and repartimiento systems fueled their unrest (Forbes 1960; Simmons 1979). These problems were exacerbated by nomadic Indian attacks, either in retaliation for Spanish slave raids or because of drought-induced famine (Ellis 1971:52; Sando 1979:195). The colonists who survived the revolt retreated to El Paso del Norte, accompanied by the Pueblo Indians who remained loyal to them.

Attempts at reconquest were made by Antonio de Otermín in 1681 and Domingo Jironza Petriz de Cruzate in 1689, but both failed (Ellis 1971). In 1692, Don Diego de Vargas negotiated the Spanish return, exploiting factionalism that had again developed among the Pueblos (Ellis 1971:64; Simmons 1979:186). De Vargas returned to Santa Fe in 1693, and reestablished the colony. Hostilities continued until around 1700, but by the early years of the eighteenth century the Spaniards were firmly in control.

Late Spanish Colonial Period (1693–1821)

Though failing in its attempt to throw off the Spanish yoke, the Pueblo Revolt caused many changes. The hated systems of tribute and forced labor were never reestablished, and the mission system was scaled back (Simmons 1979). The Crown continued to subsidize New Mexico, but it now served as a buffer against the enemies of New Spain, not as a mission field (Bannon 1963). New Mexico continually suffered from a shortage of supplies while shielding the rich inner provinces from Plains Indian raids and the ambitions of the French in Louisiana.

Relations between Spaniards and Pueblos became more cordial during this period. This was partly due to changes in the structure of both groups, as the Spanish population rapidly grew and surpassed that of the Pueblos by the late 1780s (Frank 1992). The increased number of Spaniards created demand for land in the Rio Grande core, and a drop in the Pueblo population caused a shortage of cheap labor. These trends resulted in a shift from large land holdings to smaller grants (Simmons 1969). Much of the earlier economic system was abandoned after the reconquest. The dominance of the church and its supply caravans ended. The military role of the encomenderos was filled by garrisons at Santa Fe and El Paso, and they were replaced as an economic force by families who prospered as merchants and/or by dealing sheep. However, most of the people who reoccupied New Mexico were poor farmers and herders.

By the middle of the eighteenth century considerable trade had developed between New Mexico and Chihuahua (Athearn 1974), mostly to the benefit of the Chihuahuan merchants, who sold goods at inflated prices. This was partly rectified by trading with local Indians for pottery, hides, and food, and some goods were manufactured by cottage industries. Unfortunately, many products had no local substitutes.

Metal, especially iron, was in short supply in New Mexico (Simmons and Turley 1980). While imported iron was relatively cheap in Mexico, by the time it arrived in New Mexico it was quite costly. The availability of tools and weapons was limited by the lack of metal, and those that were produced were expensive. These lacks and the unreliable supply system hurt New Mexico in its role as a defensive buffer. Firearms and other weapons were scarce (Kinnaird 1958; Miller 1975; Reeve 1960; Thomas 1940), and only a few soldiers were stationed at the presidios, forcing local authorities to use militias and other auxiliary troops. Continued conflict with nomadic Indians caused many settlements to adopt a defensive posture, and even individual ranches were built like fortresses.

By the 1730s, attempts were being made to reestablish the sheep industry (Baxter 1987:26). One of the most important developments in this period was the origin of the *partido* system, in which the owners of large numbers of sheep apportioned parts of their flocks out to shepherds, receiving the original animals and a percentage of the increase back at the end of the contract period. Economically, the partido system provided a way to spread the responsibility for the growing flocks and was a substitute for wage payments (Baxter 1987:29). It also was advantageous to merchants, who could accept sheep in exchange for goods (Baxter 1987:29). A few traders managed to manipulate this system and accumulated fortunes. As Baxter (1987:44) notes, this group tended to control the economy and dominate political and religious affairs.

Between 1750 and 1785 New Mexico was hit by a defensive crisis caused by intense Plains Indian and Apache raids (Frank 1992, 2000). This conflict had a long history, with attacks by Utes and Comanches beginning as early as 1716 (Noyes 1993:11). In particular, the Comanches were bent upon driving the Apaches from the Plains and cutting their ties to French colonies in Louisiana, from whom they were indirectly receiving firearms (Noyes 1993). In conjunction with this they raided the Pueblo villages that were closely tied to the Apaches by trade. However, most of the Comanches' fury was directed against the Apaches until 1740.

By 1740 the Apaches were driven off the Plains or south of the Canadian River, and the Comanches were at peace with the Spaniards (Noyes 1993:24–25). The Jicarilla Apaches were among those driven from the Plains, and they reestablished themselves in the mountainous section of north-central New Mexico. Peace was short lived, because by the mid-1740s the Comanches were mounting intensive raids against Pecos and Galisteo Pueblos, culminating in a series of devastating attacks against Spanish settlements east of the Rio Grande that caused the temporary abandonment of villages from Albuquerque northward in the late 1740s (Carrillo 2004; Noyes 1993:25). While Governor Tomás Vélez Cachupín established short-lived periods of peace during his two terms of office (1749–1754 and 1762–1766), most of the years between 1750 and 1780 were marked by war with the Comanches (Noyes 1993).

Apaches also raided sporadically in the 1750s and 1760s, the latter period sparked by a severe drought in 1758 and 1759 (Frank 1992:39). Another drought in the 1770s led to a deterioration in the defensive abilities of the province and the resumption of Navajo raids (Frank 1992:39–40). By the late 1770s, southern New Mexico was under attack by numerous Apache groups (Thomas 1932:1). In alliance with the Navajos, Apaches even raided Zuni, Albuquerque, and nearby settlements (Thomas 1932:1).

The Spanish government began rebuilding its power in New Spain during the early 1770s (Frank 1992, 2000). Solving the problem of Indian raids against the northern provinces was part of this process. The defenses of northern New Spain were reorganized beginning in 1772; by 1776 the Apaches were driven back by vigorous campaigning, and a line of presidios was established (Frank 1992; Thomas 1932). Despite these successes, Indian raids continued to be a major problem. With the reorganization of northern New Spain into the Provincias Internas in 1776 came the development of a plan that eventually proved successful. According to this plan, continual campaigns were to be undertaken against the Apaches by Nueva Vizcaya, Sonora, Coahuila, and New Mexico, and an alliance would be sought with the Comanches against the Apaches (Thomas 1932:18–19). Governor Juan Bautista de Anza concluded a peace treaty with the Comanches in 1786, which included an alliance against the Apaches (Noyes 1993:80; Thomas 1932:75). Later that year, Anza broke up an alliance between the Gila Apaches and Navajos that had been plaguing settlements in southern Arizona and concluded a peace with the Navajos (Thomas 1932:52). These events brought relative peace to New Mexico for the first time since the midcentury (Frank 1992:95), and the alliances lasted until the end of Spanish rule, sparing New Mexicans the relentless attacks that had preceded this period of relative peace.

Frank (1992:166) suggests that this period of peace, combined with demographic trends that saw the Spanish population finally surpassing that of the Pueblos and a devastating smallpox epidemic in 1780–1781, may have concentrated capital as communications with Mexico were freed up, resulting in an economic boom between 1785 and 1815. At the same time the Spaniards were expanding outward and moving into areas that had previously been closed because of the danger of Indian attack (Frank 1992:199). The improving economy undoubtedly fueled this drive, since new lands were required to graze the continually increasing flocks of sheep that were the basis of wealth.

Despite the improving economy, New Mexico still depended on shipments from the south for manufactured goods. Caravans on the Camino Real initially continued to follow an irregular schedule, but by the middle of the eighteenth century they operated almost annually (Connor and Skaggs 1977:21). Since the ox-drawn wagons of the seventeenth century were soon replaced by mule trains, fewer goods were probably carried by these caravans (Connor and Skaggs 1977:21). There were only a few New Mexican merchants, and they were exploited by suppliers in Chihuahua who kept them in almost perpetual debt. Isolation and dependence on Chihuahua caused goods sold in Santa Fe to cost several times their original value (Connor and Skaggs 1977:21–22; Frank 1992:237–239).

Santa Fe Trail Period (1821–1880)

Mexico gained its independence from Spain in 1821, and New Mexico became part of the Mexican nation. This independence brought two major changes to New Mexico: a more lenient land grant policy and expansion of the trade network (Levine et al. 1985). Mexican land law and custom were applied to New Mexico, resulting in conflict over the ownership of Pueblo lands. Trade between Missouri and Santa Fe began soon after independence and dominated the economy for the next quarter century (Connor and Skaggs 1977). This trade brought ample and comparatively inexpensive goods to New Mexico and broke the Chihuahuan monopoly. Trade began in earnest after 1825, when the United States completed a survey of the Santa Fe Trail to mark its route and secure safe passage through Indian Territory. The trade network expanded geographically to Chihuahua and in the volume of consumer goods transported until 1828, when Indian raids, a need for military escorts, and Mexican trade regulations caused notable fluctuations in the flow of commerce (Connor and Skaggs 1977; Pratt and Snow 1988:296).

Trade was again disrupted in the three years preceding the Mexican War of 1846–1847 because of a Mexican embargo against American goods (Connor and Skaggs 1977:203). New Mexico was annexed by the United States in 1846, and the following years were characterized by growing interest in commerce and a market economy that demanded more dependable means of transportation (Pratt and Snow 1988). Trade declined during the Civil War, and a resurgence of trade following the end of the war sealed the Santa Fe Trail's doom (Connor and Skaggs 1977:204). Railroad promoters saw the possibilities of overland routes to the west and began developing their finances and building track. The railroad reached the Santa Fe area by 1880, effectively ending trade over the trail, since it was more cost effective to ship goods by rail.

This period saw profound changes in the economic and ethnic structure of New Mexico. Many goods that were difficult to obtain during the Spanish periods were now available. Initially, there was not enough currency in New Mexico and Chihuahua to support the Santa Fe trade (Connor and Skaggs 1977). However, large amounts of raw materials were bartered in New Mexico and Chihuahua for American goods, and without the barter system it is doubtful that the Santa Fe trade would have long survived (Connor and Skaggs 1977:200). In addition to material goods, the Santa Fe trade also brought people from the United States to New Mexico. Most remained only a short while, but some settled down for good. This trickle became a flood when New Mexico was annexed by the United States.

Railroad Period (1880–Present)

The arrival of the railroad significantly altered supply patterns in New Mexico. Rail lines reached Raton Pass by 1878, Las Vegas by 1879, and Lamy by early 1880 (Glover and McCall 1988). With this link to the eastern United States, New Mexico entered a period of economic growth and development (Pratt and Snow 1988:441). This link also finally ended New Mexico's position as a frontier territory, firmly tying the territory to the economy of the United States as a whole. In addition to increasing ease of supply, the railroad also made New Mexico more accessible to tourism, which soon became an important facet of the economy. Several industries boomed with the availability of rapid and inexpensive transport. As sheep production expanded, cattle ranching was also stimulated and soon dominated the ranching industry. Mining expanded, and coal became an important export. The transformation of the New Mexican economy into its modern form was well under way by the time it became the 47th state in 1912.

Site Descriptions

Site descriptions are summarized from a survey conducted by Parrish et al. (2008), who were requested to examine a 7.32-mile-long (11.78 km) section of the US 285 right-of-way between Mileposts 372 and 379.32 in preparation for this highway construction project. As noted previously, all five sites are situated on land administered by the USDA Carson National Forest. Locational information for these sites is in Appendix 1. All five sites will be affected by shoulder widening and right-of-way fence replacement. In addition, LA 74879 will be affected by the installation of a culvert within site limits, and LA 160203 will be affected by construction of a detour that will be used during construction.

LA 74879 (AR-03-02-06-637)

LA 74879 was originally recorded by Carson National Forest personnel in preparation for the Servilleta fuelwood sale (Parrish et al. 2008:34). This site was described as a nondiagnostic scatter of chipped stone artifacts and occurs on both sides of US 285, suggesting that its center was removed by earlier highway construction (Fig. 2). Parrish et al. (2008:34–36) reexamined LA 74879, providing a detailed description of the site and its environs. Other disturbances that have affected the site include fuelwood gathering and livestock trails. The latter run along the outside of the right-of-way fence on the west side of the highway and have caused erosion to occur, exposing artifacts that presumably originated in subsurface contexts. This suggests that LA 74879 is not entirely surficial and that there is some potential for subsurface cultural deposits. As currently defined, this scatter measures 48 m north-south by 95 m east-west, and an estimated 51 to 75 percent of the site is intact. About 60 percent of the site and 41 percent of the surface artifacts fall within the existing highway right-of-way.

LA 74879 is situated on a north-facing slope of a volcanic ridge that defines the south edge of Servilleta Canyon. Soils are a light brownish-orange consolidated fine silty clay, containing numerous vesicular basalt gravels and cobbles (Parrish et al. 2008:34). Basalt boulders and outcrops are common on the west side of the right-of-way. About 40 percent of the site surface is obscured by vegetation and piñon/juniper duff. The vegetative overstory includes ponderosa pine, juniper, and piñon, while the understory is dominated by sage, various grasses, rabbitbrush, and prickly pear.

One hundred sixty chipped stone artifacts were visible on the surface during the resurvey (Parrish et al. 2008:35), and all were inventoried and analyzed in the field. One concentration of artifacts was noted, which contained 42 items (shown in Fig. 2 as AC-1). The rest of the assemblage was scattered across the surface of the site. No cultural features were identified, though a charcoal stain was noted on the east side of the highway during initial recording, but was not found during the resurvey (Parrish et al. 2008:35). The assemblage mainly consists of debris from core reduction, though Parrish et al. (2008:35) note that 4 biface-thinning flakes and 19 pressure flakes were also identified, suggesting that some tool manufacture may have occurred at this location. Both local and nonlocal materials occur are present, though the only local material noted was a blue-gray rhyolite. Nonlocal materials include Polvadera and generic Jemez obsidians and Pedernal chert. No Agua obsidian also occurs and is listed as a semilocal material type. The only actual tools noted were a Polvadera obsidian scraper and a utilized flake of the same material. While a marine bivalve shell fragment was found, its association with the other materials could not be verified. The lack of temporally diagnostic artifacts at LA 74879 led to its classification as an unspecified prehistoric locale.

LA 144951 (AR-03-02-06-1236)

LA 144951 was originally recorded by Townsend (2005) and was reexamined by Parrish et al. (2008), who provided a detailed description of the site and its environs. This site contains a scat-

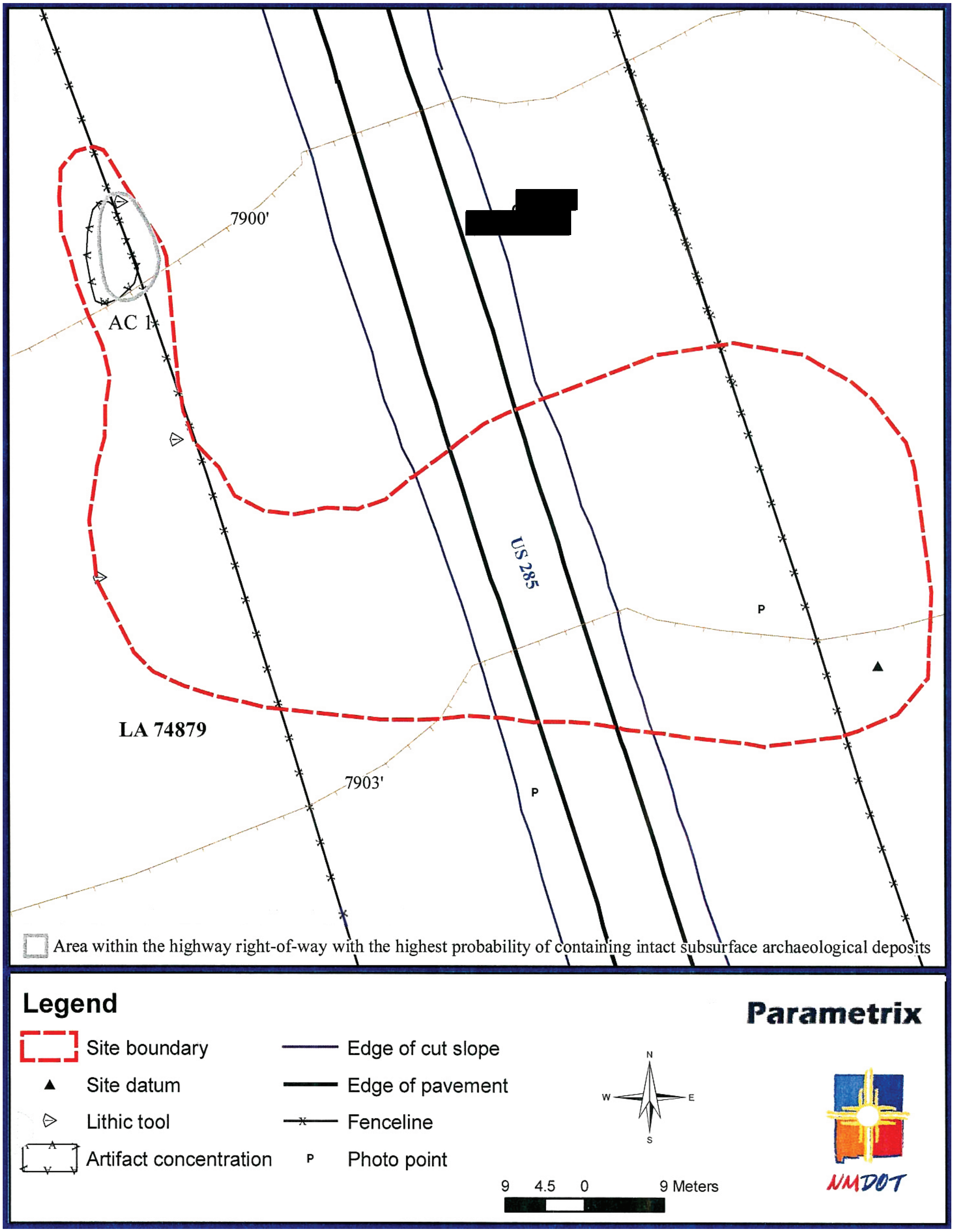

Figure 2. Plan of LA 74879 (AR-03-02-06-637), adapted from Parrish et al. (2008:Fig. A.7).

ter of historic artifacts and associated features and is situated on the west side of US 285 (Fig. 3). As currently defined, LA 144951 measures 80 m north-south by 20 m east-west (Parrish et al. 2008:47). The eastern part of this site was apparently removed during by earlier highway construction, but an estimated 51–75 percent of the site appears to be intact and is considered to be in relatively good condition (Parrish et al. 2008:48). The entire site area is within the current highway right-of-way.

LA 144951 is situated on a gradual, east-facing alluvial slope about 1.6 miles (2.57 km) east of Comanche Canyon. Soils are a light brown consolidated fine silty clay containing occasional basalt and rhyolite gravels and cobbles (Parrish et al. 2008:47). About 30 percent of the site surface is obscured by vegetation and juniper/piñon duff. The vegetative overstory consists of juniper and piñon, with the density of trees varying across the site. The understory is dominated by sage, rabbitbrush, various grasses, and forbs.

Six features were noted during the original survey and were relocated by Parrish et al. (2008:48). Feature 1 is a 2.2 by 2.5 m cluster of about 200 cobbles and gravels. No evidence of burning was noted, but most cobbles exhibit a coating of caliche, indicating they were obtained from subsurface contexts. Feature 2, an ovate cluster of about 300 basalt cobbles and gravels and a single small boulder, measures 3.3 by 2.5 m. Like Feature 1, there is no evidence of thermal alteration on these rocks, and they are also coated with caliche. Feature 3 is an irregularly shaped cluster of about 150 basalt cobbles and gravels that measures 1.7 by 1.3 m. A light charcoal stain was seen at the east edge of this feature, which may indicate use as a hearth.

Feature 4 contains seven basalt cobbles in a 2.1 by 1.3 m area; no evidence of thermal alteration or alignments was noted. Feature 5 is an irregularly shaped cluster of 25 basalt cobbles that is 3.3 m in diameter, about 60 percent of which exhibit caliche adhesions. No evidence of thermal use or alignments was noted. There are 34 basalt cobbles in Feature 6, and they cover a 4.2 by 3.3 m area. Again, no evidence of thermal alteration or alignments was noted, though several cobbles exhibit caliche adhesions.

About 50 artifacts were noted on the surface in association with these features, all of which date to the late historic period. Included in this assemblage are a variety of crank-opened sanitary food cans, crushed Ortega Chile cans, a sardine can lid, a Nehi root beer bottle, a solder seam can, and a square key-wind meat can (Parrish et al. 2008:48). These artifacts are scattered across the site, with the greatest density occurring in the southern sector.

Townsend (2005:48) suggests that LA 144951 may be related to road construction or maintenance activities. Parrish et al. (2008:49) note that this stretch of US 285 has long been known for its abundant piñon nut crop and suggest that LA 144951 could also represent a temporary use-locale associated with piñon harvesting. The latter possibility seems more likely. A date of post-1945 was assigned to LA 144951 based on the associated artifact assemblage, and the proposed cultural affiliation was either Anglo/Euroamerican or Hispanic.

LA 160196 (AR-03-03-06-1307)

LA 160196 was recorded by Parrish et al. (2008) during a survey conducted to prepare for the current highway construction phase. This site was described as a multicomponent scatter of artifacts containing simple features. Since LA 160196 is on both sides of the US 285 right-of-way (Fig. 4), the central part of the site was evidently removed by earlier highway construction. Other disturbances noted during survey included livestock activity, fuelwood collection, and fence construction (Parrish et al. 2008:51). As currently defined, this site measures 110 m northeast-southwest by 75 m northwest-southeast, and between 51 and 75 percent is thought to be intact. About 50 percent of the site area and 41 percent of the artifacts are within the current highway right-of-way.

LA 160196 is situated at the crest of a northwest-trending ridge located about 1.1 miles east of Comanche Canyon (Parrish et al. 2008:51). Soils are described as light brownish-orange consolidated fine silty clay and contain basalt and rhyolite gravels and cobbles. Several basalt outcrops and boulders also occur in the area. About 60 percent of the site surface is obscured by vegetation and juniper-piñon duff, which has stabilized those areas. The vegetative overstory contains mature piñon and juniper trees, and the under-

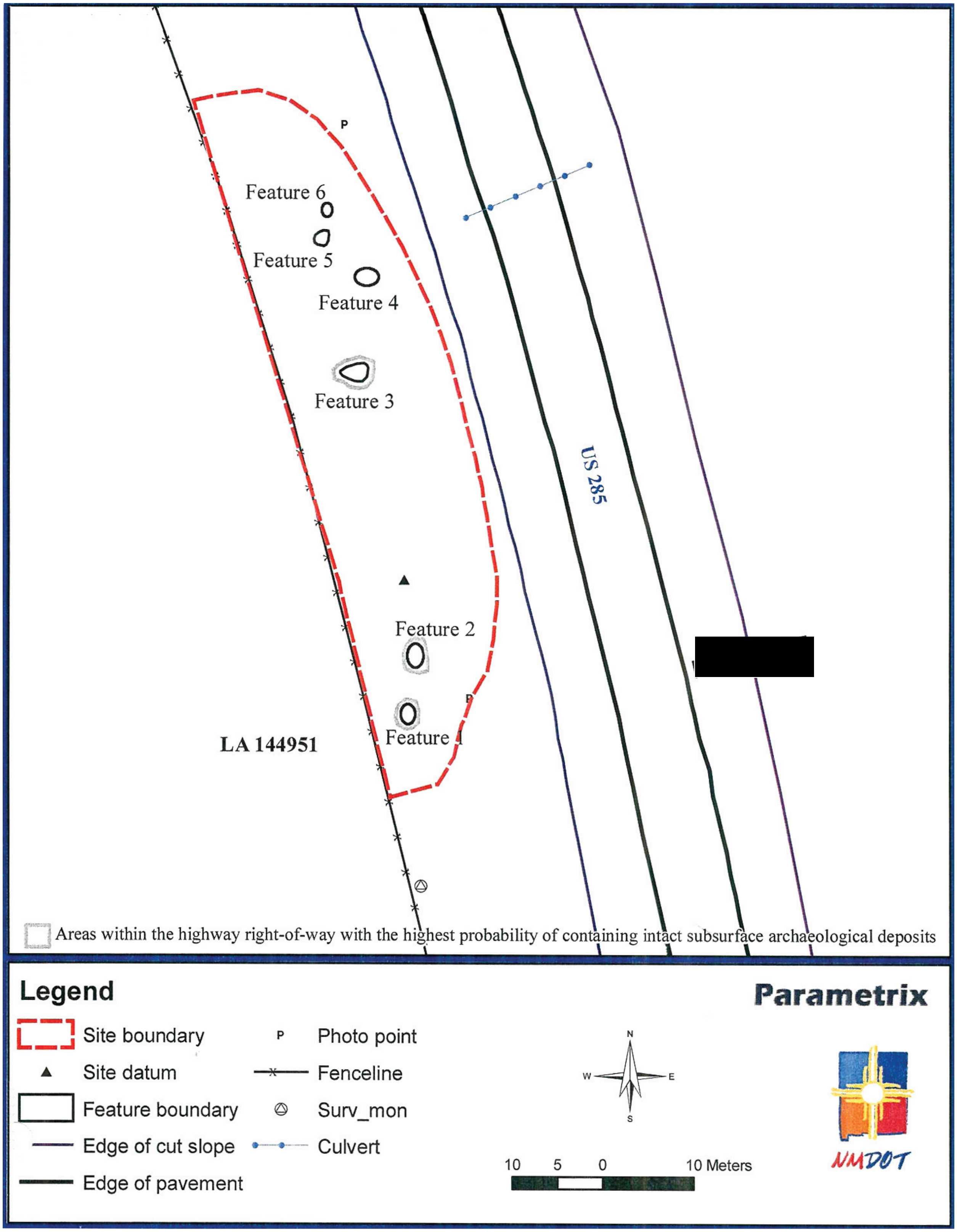

Figure 3. Plan of LA 144951 (AR-03-02-06-1236), adapted from Parrish et al. (2008:Fig. A.14).

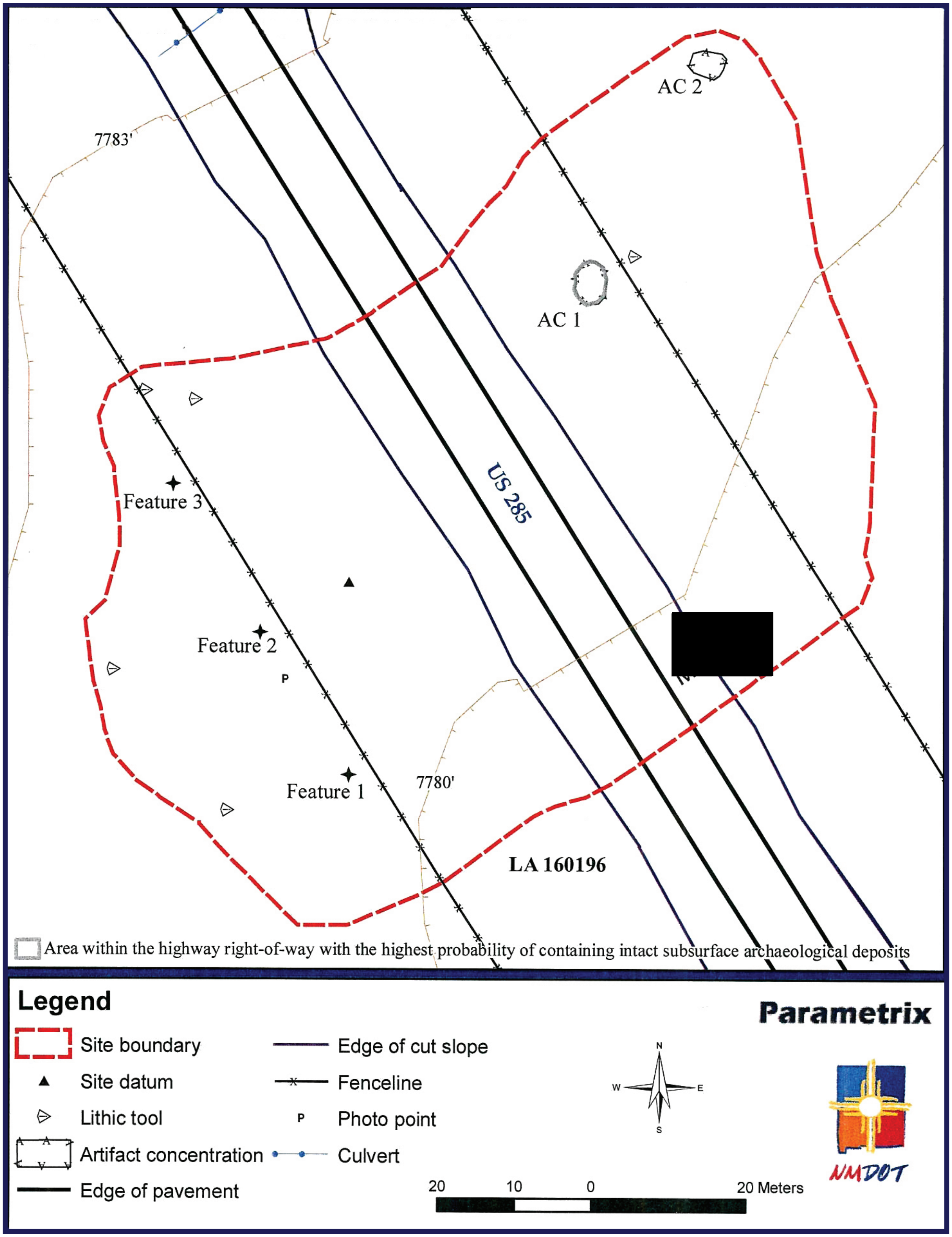

Figure 4. Plan of LA 160196 (AR-03-02-06-1307), adapted from Parrish et al. (2008:Fig. A.16).

story is dominated by sage and grasses.

All three of the features identified at LA 160196 consist of small clusters of cobbles. During survey these cobble clusters were determined to represent the remains of fencepost anchors piled around the base of wooden fenceposts to add stability to an old fenceline located outside and adjacent to the existing right-of-way fence (Parrish et al. 2008:51). The cobble clusters are spaced 15 to 20 m apart and occur in a linear alignment; each contains about 20 basalt cobbles. The wooden fenceposts were removed at some time in the past, and the cobbles are now scattered over areas about 1.3 m in diameter.

A total of 375 chipped stone, ceramic, ground stone, and Euroamerican artifacts were noted at LA 160196, and all were analyzed in the field (Parrish et al 2008:51–52). This assemblage represents materials from three temporal components and occurs in two main concentration areas and as a general scatter across the site. Both artifact concentrations are in the north part of the section of site that lies on the east side of the highway right-of-way (Fig. 4). Artifact Concentration 1 contains 49 surface artifacts in a 4 m diameter area, while Artifact Concentration 2 contains 112 artifacts in a 6 m diameter area. A total of 101 chipped stone artifacts was recorded and includes debris from core reduction and tool manufacture. Both local and nonlocal materials were identified in this assemblage, including Polvadera obsidian and generic obsidian from the Jemez Mountains; Pedernal chert from the Chama Valley and Rio Grande gravels south of Española; No Agua obsidian from the northern Taos Valley; and local basalt, rhyolite, quartzite, and banded gneiss.

Chipped stone tools recorded at the site include a projectile point fragment described as a basal fragment of a Ventana side-notched point, a rhyolite scraper, a Polvadera obsidian biface, an expedient chalcedony scraper, and two pieces of utilized Polvadera and No Agua obsidian debitage. The Ventana point is medium sized and is given a Middle Archaic date of ca. 3500–1800 BC, but it is not a type that is currently recognized in Northern New Mexico. Ventana points illustrated by Justice (2002:155) closely resemble the San Rafael type, so this point may instead represent a fragment of a San Rafael side-notched point. This type is common in the Northern Rio Grande and dates to the late part of the Middle and early part of the Late Archaic periods. However, since Apaches also made side-notched projectile points and there may be a Jicarilla Apache component on the site, this tool could instead be related to that component. If so, only two temporal components may be represented. The only piece of ground stone noted was a unifacial slab metate fragment made from basalt or rhyolite.

Sherds from at least two micaceous vessels were recorded and totaled 134. These vessels may have been wide-mouthed jars with slightly thickened or squared rims and had a mica enriched gray or brown paste with occasional angular sand temper (Parrish et al. 2008:52). These sherds are compared with Jicarilla Apache wares described by Gunnerson (1969) and are thought to be Cimarron Micaceous, which was made between ca. 1750 and 1900 (Parrish et al. 2008:53). While the presence of probable Cimarron Micaceous sherds at LA 160196 is considered to indicate the presence of a probable Jicarilla Apache component, similar types of micaceous pottery were also made at Taos and Picuris Pueblos in the historic period, suggesting that occupations by historic-period Pueblo groups should also be considered.

A later, more modern historic period component is represented by the presence of about 140 metal and glass artifacts (Parrish et al. 2008:52). About 40 of these artifacts are bottles made from brown, green, and clear glass, with maker's marks suggesting deposition sometime in the late part of the first half of the twentieth century. Diagnostic metal artifacts include beer, oil, and sanitary seal cans dating to the first half of the twentieth century, among others. Manufacturing dates for the metal and glass assemblages suggest deposition of this component over a long period of time before 1950.

Though three components were suggested for LA 160196, the possibility that only two components are actually represented should be considered. While an Archaic component is certainly possible, the single artifact representative of that period could have been reused by a later group, or it could instead represent a large Apache projectile point. Both definite components date to the historic period but are widely separated in time and are unrelated.

LA 160201 (AR-03-02-06-1312)

LA 160201 was recorded by Parrish et al. (2008) during a survey conducted to prepare for the current planned phase of highway construction. This site was described as a scatter of Late Archaic artifacts containing no visible cultural features (Parrish et al. 2008:59). Since LA 160201 is on both sides of the US 285 right-of-way (Fig. 5), the central part of the site was evidently removed during an earlier episode of highway construction. Other disturbances noted during survey include livestock and wildlife activity, and fence construction (Parrish et al. 2008:60). As currently defined, LA 160201 measures 130 m northeast-southwest by 74 m northwest-southeast and is thought to be between 26 and 50 percent intact. About 80 percent of the site area and 43 percent of the artifacts are within the current highway right-of-way.

LA 160201 is situated on a broad, east-trending ridge about 1.1 miles northeast of the head of Comanche Canyon. Soils are described as a light brownish-orange consolidated fine silty clay containing infrequent basalt gravels and cobbles (Parrish et al. 2008:60). About 40 percent of the surface is obscured by vegetation and juniper-piñon duff, which have stabilized the sections of site on which they occur. The vegetative overstory is of variable density and consists mainly of piñon and juniper, while the understory is dominated by sage, various grasses, and prickly pear.

A total of 116 chipped stone artifacts were noted during the field inventory, and all were analyzed (Parrish et al. 2008:60). Two artifact concentrations were identified along the east boundary of the highway right-of-way, and both extend outside the right-of-way fence (Fig. 5). Artifact Concentration 1 contains 42 artifacts in a 12 by 6 m area, and Artifact Concentration 2 contains 21 artifacts in a 5 by 3 m area. The remaining artifacts are scattered across the site on both sides of US 285. Most of the assemblage consists of debitage produced during core reduction and tool manufacture. The remaining chipped stone artifacts include the bases of two probable Armijo points that are traditionally dated between 1800 and 800 BC, the base of a probable San José point dated between 3500 and 1800 BC, and a tested basalt cobble. Also noted were a few recent historic cans that represent road trash and are not considered a separate component of the site.

Lithic materials noted at this site include locally available basalt and rhyolite as well as nonlocal Polvadera and generic Jemez obsidian, Pedernal chert, and No Agua obsidian. Though the San José point is usually indicative of a Middle Archaic date, they also can occur in association with Armijo-phase materials (Irwin-Williams 1973). Thus, the combination of these projectile point styles suggest that LA 160201 was occupied during the Armijo phase.

LA 160203 (AR-03-02-06-1314)

LA 160203 was recorded by Parrish et al. (2008) during a survey conducted to prepare for the current planned phase of highway construction. This site was described as a prehistoric artifact scatter of indeterminate temporal or cultural affinity, which contains no visible cultural features. LA 160203 occurs only on the east side of the US 285 right-of-way (Fig. 6). An unknown percentage of the west part of this site appears to have been removed during an earlier episode of highway construction. Recent fuelwood collecting has also occurred but was considered to have had little impact on the site (Parrish et al. 2008:61). As currently defined, this site measures 49 m north-south by 28 m east-west, and between 51 and 75 percent is thought to be intact. An estimated 55 percent of the site area and 63 percent of the artifacts are within the US 285 right-of-way.

LA 160203 is situated on the gradual south-facing slope of a low ridge located 2.3 miles east of Red Mesa (Parrish et al. 2008:62). The soil is described as a light brownish-orange consolidated fine silty clay containing occasional basalt gravel and cobble inclusions (Parrish et al. 2008:62–63). About 45 percent of the surface is obscured by vegetation and juniper-piñon duff, which have stabilized the parts of the site it which they occur. The vegetative overstory consists mainly of small, scattered piñon and juniper trees, and the understory is dominated by sage, various grasses, and snakeweed.

A total of 123 chipped stone artifacts was noted on the surface, and all were analyzed in the field (Parrish et al 2008:63). One artifact concentration was defined and is located entirely within the right-of-way in the southwest quadrant of the site (Fig. 6). This artifact cluster, defined as Arti-

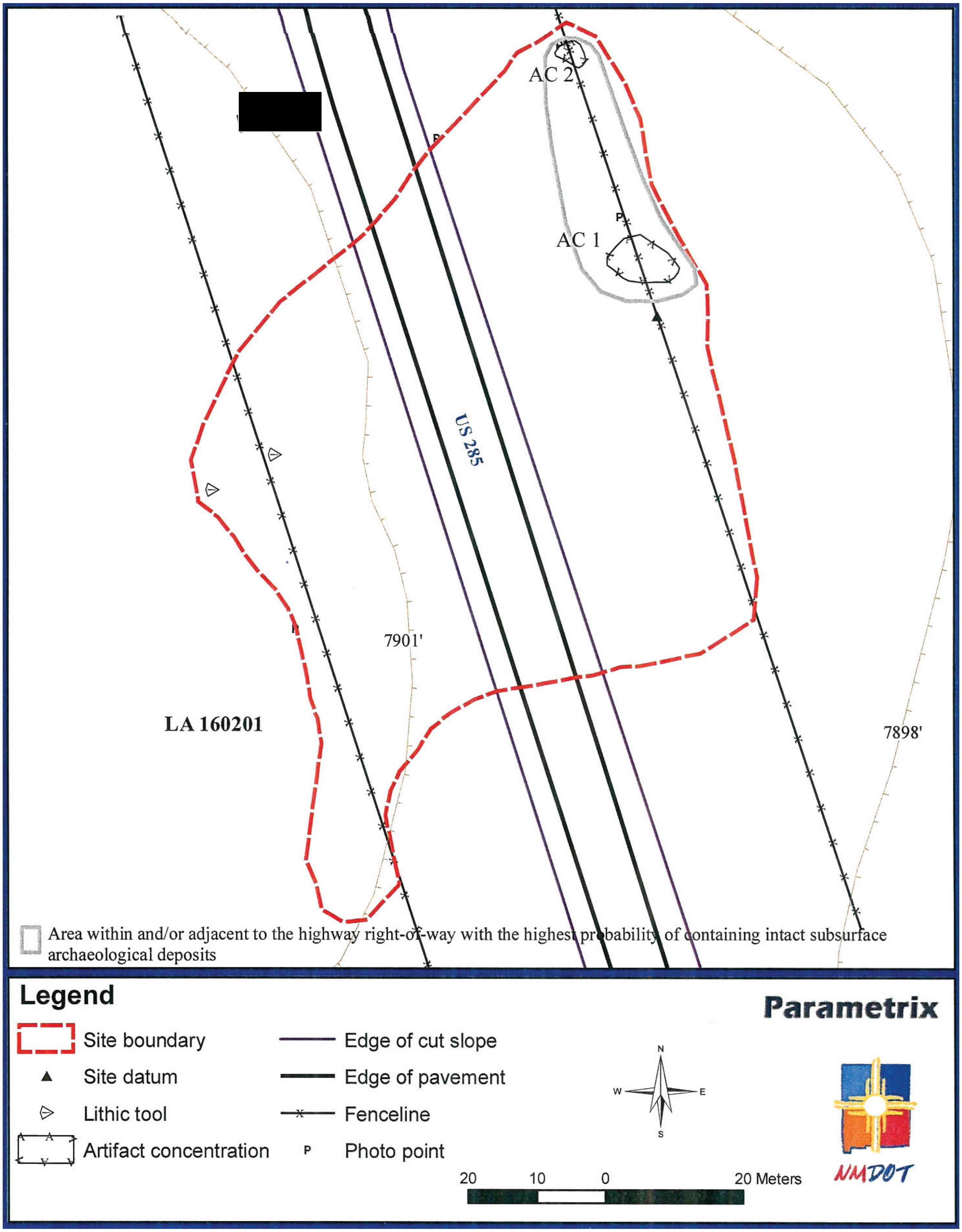

Figure 5. Plan of LA 160201 (AR-03-02-06-1312), adapted from Parrish et al. (2008:Fig. A.21).

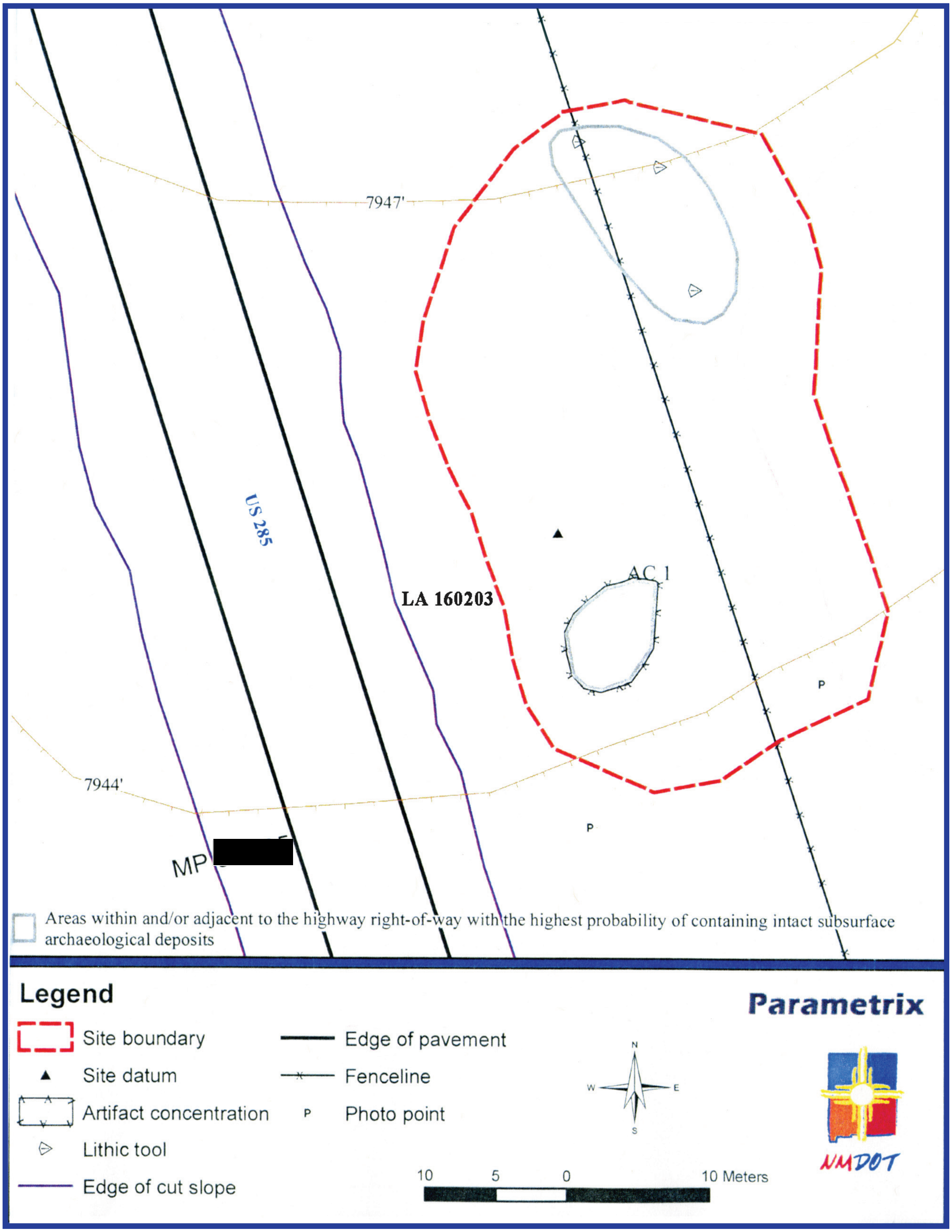

Figure 6. Plan of LA 160203 (AR-03-02-06-1314), adapted from Parrish et al. (2008:Fig. A.23).

fact Concentration 1, contains 52 artifacts in an 8 by 6 m area. Debitage related to core reduction and biface manufacture predominate, and only three tools were noted, including two bifaces and a scraper, all made from local basalt. Other materials noted included Polvadera and generic Jemez obsidians, No Agua obsidian, and a white chert. A few historic artifacts also occur, consisting mainly of a variety of cans representing roadside trash that were not considered to represent a separate site component. Since no temporally diagnostic artifacts were identified during the survey, a general unspecified prehistoric cultural and temporal affiliation was assigned to LA 160203.

Research Orientation and Questions

Only parts of the five sites included in this plan will be studied in any detail, though sections of sites outside the construction zone may be examined to augment the data collected during excavation. This will limit the types of questions that can be asked. This chapter presents the research questions that will be addressed by the data recovered by this study. The following chapter describes the methods that will be used to recover those data.

Research Orientation

Components occupied by hunter-gatherers appear to dominate this small sample of sites, occurring at four of the five sites that will be examined by this study. Thus, the research orientation is mainly aimed at eliciting information from those components. Hunter-gatherers use different site types and occupational strategies to exploit the landscape through which they range. Two basic hunter-gatherer subsistence strategies have been identified, and each probably employed somewhat different types of sites. Binford (1980) defines these two basic hunter-gatherer organizational systems as one in which consumers move to resources (foragers), and a second in which resources are moved to consumers (collectors). Data presented by Irwin-Williams (1973) suggests that early Archaic hunter-gatherers were foragers, with the transition to a collector organized system beginning during the Middle Archaic and becoming fully operational by the Late Archaic. However, neither this sequence nor a division into foragers and collectors are necessarily clear-cut in northern New Mexico. For example, Vierra (1990:63) feels that Southwestern Archaic hunter-gatherers "may have implemented a foraging strategy from spring to fall, and a collector organized strategy during the winter. That is, groups were residentially mobile from spring to fall, mapping onto exploitable resources; while during the winter they utilized stored foods making logistical trips to food caches and for hunting." With this in mind, it is possible that there was a seasonal fluctuation between foraging and collecting, even during the Late Archaic. The structure of an Archaic site, the range of artifacts found there, and the activities reflected by the assemblage can provide information on the type of use pattern represented. If sufficient data are available we may be able to distinguish between forager and collector functions for these sites.

Site types can be broken down into two basic categories, though there may be considerable variety within each category. Base camps tend to be the most common type of Archaic site found and represent locales where a band lived for a period of time ranging from a single night to a season. Resource-extractive locales are places where materials were gathered for transport to a base camp. Since most activities that extract resources from the environment leave few material remains behind, most resource-extractive locales are archaeologically invisible. Exceptions to this include quarries, where debris was generated during the extractive process. Locations where floral or faunal foods were collected may only be marked by a low-density scatter of chipped stone artifacts accumulating over a long period as the area was periodically harvested.

Fuller (1989:18) feels that field camps comprise a third type of site used by hunter-gatherers. Field camps are essentially short-term logistical sites used by task-specific groups while collecting resources that will be returned to the base camp for storage. Resources are sometimes cached at field camps for later recovery and movement to the base camp. However, this type of site may be very difficult or impossible to distinguish from base camps used for short periods by foragers.

In general, foragers inhabit base camps for a short period of time, ranging out from them to exploit resources on an encounter basis. Collectors inhabit base camps for longer time periods, exploiting surrounding resources through day trips and sometimes through the use of field camps. Collectors use storage features to cache resources at their base camp in preparation for seasons of limited food availability, a strategy that is not employed by foragers (who simply move on). Thus, small Archaic sites containing few or no thermal features, no evidence of structural remains, and a small array of chipped and/or ground stone artifacts may be indicative of a foraging focus. More extensive sites containing an array of thermal and storage features, small temporary structures, and a comparatively large amount of debris may be indicative of a collector strategy.

There are exceptions to these very general expectations. For example, the earliest component at LA 65006 near San Ildefonso Pueblo fit several of the characteristics for a collector camp but lacked some of the more critical criteria (Moore 2001). Though that site contained multiple thermal features and thousands of artifacts, there was no evidence of a structure or storage features, and our analysis suggested a short-term, special-purpose use. In some ways this component was logistical in nature, with obsidian obtained in the Jemez Mountains being processed into large bifaces for ease of transport. However, in other ways it was a simple foraging camp, with evidence of some local hunting and gathering but no storage of resources. Thus, each component at a site must be carefully evaluated to determine how it fits or deviates from the model.

Three theoretical forager and collector site types were identified above: base camps, field camps, and resource-extractive locales. The last of these is presumed to be archaeologically invisible except under certain rare circumstances. A foraging base camp should reflect a wide range of maintenance, production, and food-processing activities without a heavy investment in habitation or storage features. Structural remains, if present, should be ephemeral and indicative of short-term use. Collector base camps, on the other hand, should not only contain evidence of a wide range of activities, they should also demonstrate a corresponding investment in habitation and storage structures, indicative of a comparatively lengthy occupation. Field camps (also called logistical sites) associated with a collector adaptation should reflect temporary occupancy by a small group engaged in specialized activities. Therefore, a few specialized activities should be represented, storage features should be absent (unless the site was used as a cache), and structures (if present) should be ephemeral.

A potential problem in applying this model involves separating foraging base camps occupied for short periods from field camps used by collectors. Both should exhibit evidence of short-term occupation; the range of activities visible in the artifact assemblage might be quite limited for both. In many cases, these types of sites may be indistinguishable. This problem can potentially be dealt with through analysis of the chipped stone assemblage.

The manufacture of general purpose bifaces reflects a mobile lifestyle and more commonly occurs at base camps than at field camps or resource-extractive locales. Kelly (1988:731) defines three types of bifaces: those used as cores as well as tools, long use-life tools that can be resharpened, and tools with specific shapes and functions. Each type of biface may be curated, but for different reasons and in different ways. Use of bifaces as cores is conditioned by the type and distribution of raw materials. When suitable raw materials are abundant and tools are used in the same location as the raw materials from which they are made were procured, an expedient flake technology can be expected, with little use of bifaces as cores (Kelly 1988:719). When local raw materials are scarce or of poor quality, bifaces can help overcome the difficulties involved in using materials that are obtained at a distance from the location in which they are used (Kelly 1988:719). When raw material scarcity is extreme, mobility is low, or a specific bifacial tool is required for activities performed away from the base camp, there may be some use of bifaces as cores as well as extensive rejuvenation of bifacial tools (Kelly 1988:720).

Bifaces with long use-lives may be manufactured under a variety of conditions: "In particular, tools designed for use on long search-and-encounter (as opposed to target specific) logistical forays will be under greater pressure to be designed to meet a variety of needs and tasks (e.g., cutting or scraping tools) and thus will need to be bifacial. This requirement can be relaxed for the equipment of target-specific forays" (Kelly 1988:721). Bifaces may also be manufactured as by-products of the shaping process and illustrate the importance of the haft to which the tool was attached (Kelly 1988:721). This type of biface might be more frequently maintained or replaced at base camps rather than logistical sites (Kelly 1988:721).

Using these concepts, Kelly (1988:721–723) developed a model to aid in distinguishing between base camps and logistical or field camp sites (Fig. 7). The model has not been rigorously tested, but it does provide a series of predictions that can be applied to a chipped stone artifact assemblage. When combined with other data sets such as feature type and placement, the number and diversity of activities represented, and the types of resources being exploited, the applicability of the model to a site can be assessed. For example, if residential features are present but chipped stone analysis suggests that the site served as a logistical site or field camp, the model may be incorrect. However, if the residential pattern predicted by both Kelly's model and site structure are in agreement, the model may be tentatively accepted as valid.

Research Questions

The types of research questions are limited by the types of features and artifacts that occur within and adjacent to the proposed construction zone. Thus, these questions are aimed at eliciting very basic information concerning when sites were occupied, the cultural affiliation of site occupants, and the types of use the artifacts and features represent. Depending on whether or not these very basic questions can be answered, more complicated questions might be asked for some components, especially those that represent prehistoric or early historic Native American use.

The main occupations at four of the five sites appear to reflect use by mobile groups of hunter-gatherers. Possible Archaic components were identified at two sites, and one of these also contained a possible Jicarilla Apache component. Two sites contain scatters of chipped stone artifacts that cannot currently be assigned temporal or cultural affiliations. However, the total lack of pottery at these sites suggests that an Archaic affiliation is possible for them as well, especially since biface flakes were commonly defined at each during survey analysis. The fifth site contains recent historic features and artifacts, reflecting a completely different type of use. However, except for the historic site, dates and cultural affiliation for these sites are certainly not well established. Thus, the main questions that will be addressed concern when and how these sites were used.

Research Question 1: Are Potentially Significant Cultural Remains Present?

The first, and most basic, question that must be addressed for all five sites is whether or not the parts of these sites that will be examined in detail contain potentially significant cultural remains. Cultural remains that are potentially significant include intact subsurface cultural deposits, features, or structures. The standard that will be used to determine whether deposits of potentially significant cultural remains are present is the recovery of an average of 50 artifacts per cubic meter of fill within a single unit or stratum. The occurrence of an intact cultural feature or structure, with or without associated artifacts, will also be considered evidence for the presence of potentially significant cultural remains. In both of these cases, the site will immediately go to data recovery following the conclusion of testing activities. If testing within the sections of sites included in this study does not reveal the presence of potentially significant cultural deposits, structures, or features, no further work will be considered necessary within that area following the conclusion of testing activities. Since only small parts of each site will be examined, a lack of potentially significant cultural remains within project limits does not necessarily mean that such do not occur elsewhere at the site. Thus, this study only constitutes an assessment of the sections of sites within project limits, and the results of this study should not necessarily be extended to parts of the sites that were not examined.

Research Question 2: When Were These Sites Used?

Defining the temporal affiliation of the sites in this sample is critical to any attempt to define the cultural affiliation of site occupants and the function of each site in the settlement system to which it belongs. However, dates can only be obtained if relatively or chronometrically datable materials are present and can be recovered. For the sites that will be examined by this study, the types of datable materials that might be encountered will probably be restricted to three categories: radiocarbon samples, archaeomagnetic samples, and

A1. The production and use of bifaces as cores in base camps should result in:

1) a positive correlation between measures of the frequency of bifacial-flaking debris, utilized biface flakes, or biface fragments and measures of the total amount of lithic debris;
2) a high percentage of utilized biface flakes relative to unretouched flake tools;
3) a low incidence of simple percussion cores, especially unprepared or "casual" cores; and
4) evidence of "gearing up" at quarries: a low incidence of flakes with much cortex on their dorsal surfaces in base camps and use of high-quality raw material, such as fine-grained cryptocrystallines, possibly from distant sources.

A2. The production of bifaces in base camps which are then used as cores in logistical sites should result in:

1) a division of sites into two basic categories, one in which there is a high, and another in which there is a low incidence of utilized biface-reduction flakes, the former being logistical and the latter base camps; bifacial tools would be produced and maintained in base camps, whereas they would be used as tools or cores in logistical sites;
2) likewise, base camps should display a higher rate of increase (i.e., a higher slope of a regression curve) than logistical sites between biface fragments and measures of the frequency of biface knapping as a function of tool maintenance and replacement; and
3) base camps should contain a higher frequency of utilized simple flake tools as opposed to utilized flakes removed from a biface.

B. The use of bifaces as long use-life tools should result in:

1) infrequent unifacial examples of the tool type (e.g., projectile points); these rare unifacial examples may be instances of expedient tool production;
2) a pattern of tool production in base camps similar to C (below), with a high correlation between bifacial debris and tool fragments, but these fragments should show evidence of rejuvenation and resharpening;
3) a high frequency of resharpened or recycled instances of the tool type relative to (a) other tool types or (b) the same tool type from other areas or time periods.
4) evidence in logistical sites of the tool having been resharpened, resulting in a low rate of increase in biface fragments relative to biface flaking debris, as in A2.3, but with few of the biface-reduction flakes having been utilized; and
5) possibly evidence of haft manufacture and maintenance in base camps as in C.4 (below).

C. The manufacture of bifaces as a by-product of the shaping process should result in:

1) a concentration of bifacial-flaking debris in base camps, especially very small bifacial-retouch flakes, and a positive correlation between biface fragments and bifacial-flaking debris;
2) a low incidence of the use of biface-reduction flakes as tools;
3) a relatively high incidence of unifacial instances of a normally bifacial tool type (contrast with B.1 above); and
4) an archaeological record at base camps indicating the maintenance of hafted tools, including stone tools used for the manufacture of organic items, e.g., flake tools, burins, gravers, spokeshaves, and scrapers.

Figure 7. Kelly's (1988:721-723) model predicting the hypothetical association between site type and lithic artifact assemblage character.

diagnostic artifacts. Charcoal that can be used for radiocarbon analysis is sometimes ubiquitous in the soil and can be of either cultural or noncultural derivation. A cultural origin for charcoal scattered through a stratigraphic unit cannot always be assumed, because natural brush and forest fires also create charcoal and deposit it on the landscape. The preferred locus of recovery for radiocarbon samples is from within features of distinct cultural affiliation such as hearths, storage pits, and middens. Archaeomagnetic samples will only be available from well-fired thermal features, should any be encountered. Temporally diagnostic artifacts will probably be the best source of dates in this study and will not necessarily occur within project limits. Thus, the surface examination of these sites should be extended to the entire area within the highway right-of-way in order to locate any artifacts that can be used to provide an idea of when the sites were occupied. The types of temporally diagnostic artifacts that might be found include Native pottery, projectile points, and Euroamerican artifacts. However, since several of the sites were initially defined as multicomponent, the distribution of temporally sensitive artifacts in relation to the rest of the assemblage, especially clusters of artifacts, must also be assessed in order to determine whether those components are discrete and definable or are inextricably mixed together.

Research Question 3: How Do These Sites Fit into the Settlement Systems to Which They Belong?

By examining the types of artifacts and features present at a site, it may be possible to determine how that locale functioned within the overall settlement system to which it belonged. Especially critical to this type of examination is the range of tool types present, because they can be clues to the types of activities that were performed there. Thus, an inventory of surface artifacts will be a necessary supplement to any data recovered from subsurface contexts. This is especially true for the prehistoric and early historic components represented by scatters of chipped stone artifacts, with or without pottery, since no associated structures or features have currently been identified at any of them.

Different procedures will be used to help determine how the historic component at LA 144951 was used, because the types of data available there vary from those that we anticipate recovering from other components. Several features at this site fall within project limits, and their excavation may help in determining site function and perhaps date. All of the features recorded at this location consist of concentrations of basalt cobbles and gravels. The presence of caliche adhesions on visible surfaces of many of these rocks indicates that they were moved from their original locations, presumably for use in constructing the features in which they occur. By excavating these features we may be able to determine their original function, which could provide important clues as to how the site was used. This data will be augmented by analysis of associated surface artifacts, which can provide important temporal as well as functional information when combined with other types of data. Should any of the features investigated at LA 144951 turn out to be a hearth, information on seasonality might be available in the types and parts of plants burned as fuel. From surface examination, LA 144951 appears to represent a historic camp site of fairly limited duration, possibly associated with the collection of piñon nuts or firewood. This possibility can be tested with data collected during excavation.

Archaic components are suggested for components at two of the remaining sites, one of which also may contain an early historic period Jicarilla Apache or Pueblo component. Artifacts diagnostic of the period of occupation were not observed at the last two sites, but certain characteristics suggest that they may also represent Archaic occupations. Both of these sites are aceramic, and both contain a number of "biface-thinning flakes" in association with "pressure flakes." Both of these flake categories imply the manufacture of bifacial tools. "Biface-thinning flakes," as the term is used by Parrish et al. (2008), usually indicates the reduction of large, general-purpose bifaces typical of Archaic assemblages. "Pressure flakes" are usually thought to be indicative of small-biface manufacture, but since this type of flake is also habitually removed from large bifaces during final shaping and sharpening, they are actually only indicative of the manufacture of bifaces of all sizes. Thus, we assume that LA 74879 and LA 160203 represent Archaic use locales, as do LA 160201 and part of LA 160196.

The presence of rather thin scatters of chipped stone artifacts coupled with an apparent lack of substantial residential structures suitable for cold-season occupancy at the sites in our sample suggests that all four components either functioned as short-term forager base camps or as collector field camps. If they represent a foraging focus, we would expect to find evidence for warm-season use. This may include ephemeral shelters lacking internal heating features. There should be no evidence of storage features, and a wide range of activities should be reflected in a fairly small assemblage. The types of floral and faunal materials, if any such are recovered, should also reflect warm-season use. If storage features are present and a limited range of activities is represented in the artifact assemblage, we would have to consider the possibility that field camps associated with a collecting strategy are represented.

A possible Jicarilla Apache component was defined at LA 160196, though we note that there is also a high probability that this component actually represents an early historic Pueblo occupation by residents of Taos or Picuris Pueblos. Since the single Archaic projectile point identified at this site might actually be a somewhat large Apache arrow point, the possibility that only a single early historic period occupation is represented must also be considered. Since this component probably represents a short-term forager base camp or a collector field camp, as proposed for the Archaic components, Kelly's model can be applied to it as well. However, the possibility that metal tools were used as replacements for large generalized bifaces may skew the data somewhat and must be taken into consideration. If this is the case, large generalized bifaces may not have been used in the same way as at similar Archaic sites, so the chipped stone assemblage may have quite a different character. Thus, while the archaeological materials at LA 160196 probably represent an occupation that is considerably later than those of the other three sites in this sample, it can be compared to those other sites in order to determine whether or not a similar functional focus is represented.

Summary

Research Questions 1 and 2 can be addressed for all five of the sites in this sample. Indeed, Research Question 1 *must* be addressed for each site. Research Question 2 also can be potentially addressed for each site, depending on whether temporally sensitive materials are encountered during their examination. Even if no potentially significant cultural features or deposits are encountered at a site, the presence of temporally diagnostic artifacts in its surface expression would still allow us to assign a tentative date.

Except for LA 144951, Research Question 3 can only be addressed in any depth if subsurface cultural deposits and/or features are encountered and sites go to the data recovery phase. While some information can be derived from surface artifacts that can be applied to this question, realistically, any detailed discussion of site function is only possible for components that go to data recovery. Thus, Research Question 3 probably cannot be satisfactorily addressed for sites that are only tested.

Field Methods

This chapter provides a general overview of field methods that will be used during data recovery, which are mainly summarized from Boyer and Moore (1999). General methods of excavation that will pertain in most situations are discussed first, followed by more specific applications tailored to the needs of the various types of resources that will be investigated during testing and data recovery efforts.

General Excavation Procedures

Horizontal Proveniencing: The Grid System

A Cartesian grid system will be established for each site, allowing the precise placement of all excavation units and features on site plans, and a 1 by 1 m grid system originating at the main site datum will be imposed over each site to facilitate horizontal referencing. All horizontal referencing will be from a main site datum placed outside the construction zone, which will be assigned an arbitrary designation of 500N/500E. The exact location of each main datum will be determined using a GPS unit and tied to the NAD 27 projection, if possible. Grid lines will be established at even-meter intervals, and individual grid units will be referenced by the grid lines that cross at their southwest corners. Thus, a grid unit whose southwest corner is the intersection of the 501N and 510E grid lines will be labeled 501N/510E.

Grids may not be used for excavation under all circumstances, because they are not always the most efficient unit of excavation. This is particularly true when dealing with structures. Except when on or just above floors, excavation by grids may provide a higher level of horizontal control than is needed or desired. It is also very time consuming, which is an important consideration. When a series of strata reflecting a sequence of depositional episodes over time is present, vertical control is often more important than horizontal control. While it is necessary to know what soil stratum is represented, the grid location may not be as meaningful. Of course, both horizontal and vertical controls are important when deposits reflect specific cultural activities. Thus, excavation units will differ in size and shape depending on the nature of the deposits being investigated.

It must also be remembered that grids are artificially imposed over sites. They are a construct used to provenience cultural materials and features so that their original relationship can be preserved for later study. Rarely do features conform to a grid system. When features are large it may be desirable to excavate by grid to provide detailed information on the placement of materials within them. However, excavation in grids is often awkward in small features, especially when they extend into one or more grids. Thus, features, rather than the grids in which they occur, may be treated as independent excavation units.

Vertical Proveniencing: Strata and Levels

Just as the grid system is tied to a main datum, so are all vertical measurements; thus, the main site datum is also used to reference all vertical measurements. Rather than establishing an exact elevation above sea level for the main datum, it is assigned an arbitrary elevation of 10 m below datum. Since it is often difficult to use one datum to provide vertical control for an entire site, subdatums will be established when needed. Horizontal and vertical coordinates will be measured for each subdatum so that their locations relative to the main datum can be plotted.

The vertical treatment of deposits will vary according to their nature. Cultural deposits will be carefully excavated to preserve as much of the vertical relationship between materials as possible. Such care will not be taken with noncultural deposits, since the relationship between artifacts in deposits that built up naturally or as artificial fill is rarely meaningful. For example, trash can be discarded in one area and used as artificial fill in another, and both deposits will have completely different meanings. Artifacts can be plentiful in both cases, yet they represent different processes. Trash consists of materials that were purposely discarded in a location and can often be separated by strata to determine the sequence of deposition and allow researchers to look for minute changes in artifact assemblages. Artifacts in artificially or nonculturally deposited strata rarely have any similar meaning. Trash deposits require careful excavation to preserve the relationship between artifacts discarded at different times. Noncultural deposits, including artificial fill, tend to be jumbled and mixed, and the relationship between artifacts is almost always obscured because they were moved from their original contexts and redeposited.

Two methods will be used to track vertical excavation units: strata and levels. Soil strata will be assigned unique numeric designations as they are encountered, and descriptions of each will be recorded on individual forms. In order to track the sequence of strata from one area to another, each vertical excavation unit will also be assigned a level number. The first vertical excavation unit to be dug will be labeled Level 1, the second Level 2, and so on. Since stratum and level numbers represent two completely different series, stratum numbers may not be in sequence as excavation proceeds downward, but level numbers will always be in numeric order.

Recording Excavation Units

The excavation of a grid or other unit will begin by filling out a form that provides starting depths and other pertinent data. Ending depths for each succeeding level will be recorded on relevant forms, providing a record of all excavations. Recording forms completed for each level will describe soils and inventory cultural materials recovered and provide other observations considered relevant by the excavator or site supervisor including stratum and level. The description of soil matrix should include information on cultural and rock inclusions, evidence of disturbance, and how artifacts are distributed if variations are noticed.

Recovery of Cultural Materials

Most artifacts will be recovered in two ways: visual inspection of levels as they are excavated and screening though hardware cloth with variably sized mesh. Other materials will be collected in bulk samples that can be processed in the laboratory rather than the field. Regardless of how cultural materials are collected, they will all be inventoried and recorded in the same way. Collected materials will be assigned a field specimen (FS) number, which will be listed in a catalog and noted on all related excavation forms and bags of artifacts. This will allow the relationship between recovered materials and where they were found to be maintained. All materials collected from an excavation unit will receive the same FS number. For example, if metal, ceramic, and bone artifacts are recovered from the same level, they will all be designated by the same FS number, as would be any samples taken from that level. Architectural or other samples that are not associated with specific excavation units will receive unique FS numbers.

Most artifacts will be recovered by systematically screening soil strata. All sediments from excavation units will be passed through screens. Two sizes of screen will be used. Most fill will be passed through 1/4-inch mesh hardware cloth, but 1/8-inch mesh hardware cloth may be used in certain circumstances. While most artifacts are usually large enough to be recovered by 1/4-inch mesh hardware cloth, some that are to small to be retrieved by that size screen can also provide important clues to the activities that occurred at a site. However, there is a trade-off in gaining this additional information. As the size of mesh decreases, the amount of time required to process soil and recover artifacts increases. Sampling is a way to balance these concerns; thus, smaller mesh will only be used under certain circumstances. Rather than establishing specific guidelines for sampling by 1/8-inch mesh screens, it is considered better to leave this up to the discretion of the site supervisor. Artifacts from noncultural strata will usually only be recovered by visual inspection, especially if they appear to be temporally diagnostic, complete, or otherwise have potential to expand the data base in a meaningful way. While this will not be a statistically valid sample, it will expand the number of artifacts recovered and provide more detailed data.

Other cultural materials, primarily botanical, will be recovered from bulk soil samples. Sampling methods for these materials are detailed later. In general, however, sediments for flotation analysis will only be collected from culturally deposited strata and features. Macrobotanical materials like corn cobs, piñon shells, etc. will be collected as individual samples whenever found. Botanical samples will receive the same FS number as other materials recovered from that excavation unit and will be cataloged on pertinent excavation forms.

Mechanical Excavation

Mechanical excavation using a backhoe or blade may be used to provide initial stratigraphic cuts or to demonstrate that noncultural levels have been reached by excavation and that no further hand excavation is necessary at a site. Decisions concerning the applicability of mechanical excavation to a specific site or circumstance will be made by the site supervisor in conference with the project director and/or principal investigator.

Preliminary trenching at a site using a backhoe can speed and augment hand excavation by providing a quick and efficient means of exposing subsurface strata for examination and description. Mechanical excavation allows the rapid opening of a deep trench to expose subsurface deposits, saving much time and labor that would otherwise be expended in hand excavation. The trade-off is that artifact recovery by stratum is not possible using this method. Thus, mechanical trenching will only be used to provide long and deep exposures of subsurface soils to permit the accurate definition and description of individual soil strata as an augment to, rather than replacing, hand-excavated grid units. Mechanically excavated trenches will be limited to depths of 1.30 m before they must be stepped back to allow safe access. Depending on soil conditions, trench walls may be stepped back at shallower depths if they seem unstable. This may be especially necessary of layers of sand are encountered.

Following the completion of hand excavation and at the discretion of the project director and/or principal investigator, parts of sites within project limits may be bladed to ensure that all cultural features within the affected area have been located and excavated. Any cultural features encountered during blading will be excavated using the methods described in this document.

Specific Excavation Procedures

Specific excavation procedures will be tailored to examine and assess the various configurations of topography and cultural features at these sites and to meet the needs of highway construction. The specifics of excavation will vary from site to site, and most can only be defined in the field after details of soils and the locations of potential cultural features and strata are determined through testing. Thus, the only site-specific aspects that are defined in this document involve the areas that will be examined at each site, as defined by construction needs, and the amount of effort that will be expended in testing. Excavation will be limited to the area that will be affected by construction activities, with the addition of a 10 ft (3.05 m) wide buffer zone to the area of direct effect. The buffer zones will be added in order to prevent inadvertent damage to adjacent parts of sites by highway construction activities. This should mitigate in advance any inadvertent damage to areas directly outside the proposed construction zone, provided that construction activities remain restricted to the limits examined by this study.

While we cannot predict in advance the specifics of excavation at the five sites that will be examined, we can discuss the application of the general procedures presented in the last section in more detail. Thus, the rest of this chapter also discusses how these techniques will be applied to any features and structures that might be encountered, and details some of the parameters involved in the selection of areas for testing and data recovery, the collection of certain types of samples, and the scale of effort to be expended in testing to determine whether or not potentially significant cultural deposits or features are present.

Site-Specific Testing Procedures

The section(s) of each site that fall within the current highway right-of-way will be mapped and described, and the locations and types of all related artifacts noted on the surface within that zone will be recorded. All artifacts within project limits as defined below will be collected for analysis. Temporally diagnostic artifacts that occur outside project limits will be analyzed in the field and photographed if appropriate but will not be collected.

LA 74879. Examination of this site suggests that most cultural materials are outside a zone that was affected by earlier highway construction activities, and that zone contains most of the area that will be included in this archaeological effort. The current episode of highway reconstruction will include the addition of an 8 ft (2.44 m) wide shoulder and a 7.1 ft (2.16 m) wide slope to the existing ground level on each side of the highway. With the addition of a buffer zone, the archaeological examination of LA 74879 will be conducted within an 8 m wide strip of the site extending out from the existing pavement on both sides of US 285. Testing will include the hand excavation of two to four test pits on both sides of the highway, and up to 50 m of mechanically excavated trenches may be used to help examine deposits on each side of the right-of-way within this zone. Auger tests may also be used to examine subsurface deposits if needed and soil conditions are appropriate.

LA 144951. Examination of this site suggests that most cultural materials are outside a zone that was affected by earlier highway construction activities, and that zone contains much of the area that will be included in this archaeological effort. The current episode of highway reconstruction will include the addition of an 8 ft (2.44 m) wide shoulder and a 7.1 ft (2.16 m) wide slope to the existing ground surface on each side of the highway, and a culvert that extends across the entire width of the right-of-way (Fig. 3). With the addition of a buffer zone, archaeological examination of the section of LA 144951 that includes the shoulder construction will be conducted within an 8 m wide strip of the site extending out from the existing pavement on the west side of US 285. An area extending 10 m to both the north and south of the centerline of the culvert will also be examined on the west side of US 285. The latter area may contain several of the features identified during survey (Features 3–6), which would necessitate the implementation of data recovery procedures. Testing will include the hand excavation of 4 to 8 test pits, and up to 50 m of mechanically excavated trenches may be used to help examine subsurface deposits on the west side of US 285 in this zone. Auger tests may also be used to examine subsurface deposits if needed and soil conditions are appropriate.

LA 160196. Examination of this site suggests that most cultural materials are outside a zone that was affected by earlier highway construction activities, and that zone contains most of the area that will be included in this archaeological effort. The current episode of highway reconstruction will include the addition of an 8 ft (2.44 m) wide shoulder and a 7.1 ft (2.16 m) wide slope to the existing ground surface on each side of the highway. With the addition of a buffer zone, the archaeological examination of LA 160196 will be conducted within an 8 m wide strip of the site extending out from the existing pavement on both sides of US 285. The outer edge of the buffer zone on the east side of the highway may encounter an intact A soil horizon that has the potential to contain undisturbed cultural materials. Testing will include the hand excavation of two to four test pits on both sides of the highway, and up to 50 m of mechanically excavated trenches may be used to help examine deposits on each side of the right-of-way within this zone. Auger tests may also be used to examine subsurface deposits if needed and soil conditions are appropriate.

LA 160201. Examination of this site suggests that most cultural materials are outside a zone that was affected by earlier highway construction activities, and that zone contains most of the area that will be included in this archaeological effort. The current episode of highway reconstruction will include the addition of an 8 ft (2.44 m) wide shoulder and a 7.1 ft (2.16 m) wide slope to the existing ground surface on each side of the highway. With the addition of a buffer zone, the archaeological examination of LA 160201 will be conducted within an 8 m wide strip of the site extending out from the existing pavement on both sides of US 285. The outer edge of the buffer zone may encounter moderately intact soils on the west side of the right-of-way that could contain undisturbed cultural deposits or features. Similarly, the outer edge of the buffer zone may encounter an undisturbed A soil horizon on the east side of the highway, again with the potential to contain intact subsurface cultural materials. Testing will include the hand excavation of two to four test pits on each side of the highway, and up to 50 m of mechanically excavated trenches may be used to help examine subsurface deposits on each side of the highway right-of-way within this zone. Auger tests may also be used to examine subsurface deposits if needed and soil conditions are appropriate.

LA 160203. Examination of this site suggests that most cultural materials are outside a zone that was affected by earlier highway construction activities, and that zone contains some of the area that will be included in this archaeological effort. Besides the addition of shoulders and slopes to the existing ground surface on both sides of the highway, this episode of highway improvements will include construction of a detour that will extend 50 ft (15.24 m) east of the current edge of pavement into the area occupied by LA 160203. With the addition of a buffer zone, the archaeological examination of this site will be conducted within a 19 m wide strip of the site extending out from the existing pavement on the east side of US 285. The outer edge of this strip may encounter intact soils that could contain undisturbed cultural deposits or features. Testing will include the hand excavation of 5 to 10 test pits on the east side of the highway right-of-way, and up to 50 m of mechanically excavated trenches may be used to help examine deposits within this zone. Auger tests may also be used to examine subsurface deposits if needed and soil conditions are appropriate.

Site Plans

Plans will be produced for all sites, focusing on the areas within the construction/buffer zone, unless the USDA Carson National Forest specifies that entire sites shall be remapped. Mapping will be accomplished using a total station or optical transit and will show all relevant topographic features, cultural features, excavation areas, and point-provenienced surface artifacts. Sufficient detail will be presented to allow plans related to this study to be accurately compared to those created during earlier studies.

Features

Features will constitute individual units of excavation. As they are encountered at a site, features will be assigned a unique number. Small features (less than 2 m in diameter) may be excavated differently than large features (greater than 2 m in diameter). Materials removed from small features will be screened through 1/8-inch mesh hardware cloth. After defining the horizontal extent of small features, they will be divided in half. One half will be excavated in 10 cm arbitrary levels to define internal stratigraphy, and a profile will be drawn showing the exposed layers of fill. The second half will then be removed by strata. Plans showing the locations and sizes of excavation units will be drawn. A second cross section illustrating the feature's vertical form perpendicular to the profile will be drawn, and a form that describes and details its shape, contents, depths at top and bottom, and any other pertinent observations made during excavation will be completed.

Large features, like trash middens, will be excavated by grid unit and screened through 1/4-inch mesh hardware cloth, though 1/8-inch mesh may be more appropriate in some circumstances and can be used at the discretion of the site supervisor. The number of exploratory grids excavated into large features will be kept to a minimum, and as much of these features as possible will be excavated by natural soil strata. At least two perpendicular profiles will be drawn if feasible, and forms and plans that describe and detail the shape and contents of these features will be completed. A series of 35 mm black-and-white, 35 mm color slide, and digital photographs will be taken during and after excavation of all features, when possible. Other photographs showing construction or excavation details may be taken at the discretion of the excavator.

Residential Structures

No residential structures were defined at these sites during their initial recording or rerecording. While we do not anticipate finding any structural remains in the parts of these sites that will be examined, the possibility remains that residential structures could exist in subsurface contexts. For this reason, a set of standard procedures for excavating structural remains is presented.

Unique numeric designations will be assigned to any structures identified at a site, as well as to the rooms they contain. Excavation will begin by placing an exploratory trench from one wall to the center of large rooms, and completely across small rooms. Exploratory trenches will be excavated by grid units to provide a cross section of deposits. When the nature of fill is defined, the rest of the room will be excavated by quadrants.

Quadrant boundaries will be determined by the locations of the grid lines that cross the room; thus, quadrants will rarely be the same size.

A sample of fill from each room will be screened through 1/4-inch mesh hardware cloth. This sample will usually consist of the exploratory trench(es) and at least one quadrant, no matter whether the fill is of cultural or noncultural derivation. The quadrant selected for sampling is left to the discretion of the site supervisor, but in most cases it will be the last quadrant excavated because that will provide two visible profiles for determining the extent of strata. More than one quadrant might be sampled if a structure contains cultural deposits. Fill in the other three quadrants will be removed by stratum without screening, though visible artifacts may be collected for analysis. At least one of each quadrant will be profiled to provide a record of the extent of strata in both north-to-south and east-to-west directions. Standard forms detailing information derived during the excavation of strata within quadrants and referencing any cultural materials recovered will be filled out at the completion of each excavational unit.

Because of safety concerns, exploratory trenches will be excavated no deeper than 1.30 m before they are expanded by removing at least one quadrant (after the exposed wall is profiled). Excavation should halt 5–10 cm above floors to prevent damage to their surfaces, and to permit a more systematic sampling of materials found in contact with or just above floors. Materials from the last 5–10 cm above floors will be removed by grid and screened through 1/8-inch mesh hardware cloth, unless they are determined to be of noncultural origin.

Architectural details will be recorded on a series of forms following the completion of excavation in a structure. When building elements are encountered in fill they will be recorded on the pertinent excavation form. If wooden roof elements are found they will be mapped and described, and samples will be collected for species identification and potential tree-ring dating. Samples of building materials may also be collected for more detailed analysis. Descriptions of individual rooms will include information on wall dimensions, construction materials and techniques, and associated features. Structure descriptions will include information on size and dimensions, a general description, and a sketch plan. In addition to profiles, plans of each structure will be drawn, detailing the locations of rooms and internal features, artifacts found in direct contact with floors, and any other aspects considered important. A series of 35 mm black-and-white and digital photographs will be completed for each structure showing its overall form, individual rooms, construction details, and the relationship of features with other architectural elements.

Selection of Excavation Units

Hand-excavated test grids. Hand-excavated 1 by 1 m test grids will be placed in areas containing clusters of surface artifacts to help determine whether they represent the surface expression of buried cultural deposits. If artifact clusters are lacking within construction/buffer zones, test units will be placed in areas selected by the site supervisor that are thought to have the best potential for providing information on subsurface deposits. Should intact subsurface cultural deposits and/or features be encountered in test units, the site will go to data recovery, though testing in other areas may continue until the part of site within the construction/buffer zone has been fully assessed. Test grids will be excavated in 10 cm arbitrary vertical levels unless distinct stratigraphic breaks are defined. In that case, individual strata will become the vertical units of excavation. Forms detailing pertinent information will be completed for each level in a test grid, as discussed earlier.

Depending on individual site circumstances and scheduling, mechanical excavation may be used to examine subsurface deposits either before or after completion of test grid excavation. However, even in cases where no intact subsurface cultural deposits or features are encountered in mechanically excavated trenches before any hand excavated units are dug, a series of hand-excavated units is still needed to verify conclusions based on the results of mechanical excavation.

Auger tests. Small test units excavated through the use of a soil auger often permit a rapid and accurate assessment of subsurface deposits and can aid in the definition of subsurface cultural deposits and features. However, the utility of this excavation method is severely limited in soils that contain abundant gravel and/or cobble inclusions. Thus, auger tests are only an effective means of assessing subsurface deposits when the rock content is low enough that the ability of this method to penetrate subsurface soils is not hindered. Auger tests will only be used to augment other forms of subsurface investigation when soil conditions permit.

All materials removed from auger tests will be screened through 1/8-inch mesh hardware cloth to recover any cultural materials that might be encountered. Forms describing and detailing subsurface deposits and possible breaks in strata, as well as the approximate depths at which any potential cultural materials were encountered, will be completed. Auger tests will be placed where they have the best potential to help assess the nature of subsurface deposits, at the discretion of the site supervisor.

Extramural excavation areas. The locations of most grid units excavated during data recovery will be determined by the distribution of cultural deposits and features defined during testing. These are considered extramural excavation areas and will consist of series of adjacent grid units used to explore the subsurface distribution of cultural materials in areas containing clusters of artifacts and around cultural features. Extramural excavation units will only be necessary when potentially important subsurface deposits or features were located during the testing phase. For the most part, this will consist of surface stripping the uppermost 10 cm or so of soil away and screening it to recover artifacts buried at shallow depths. However, if cultural materials occur at greater depths, excavation will continue until the sterile preoccupational substrate is reached. The size of extramural excavation areas will be determined by the site supervisor and will be aimed at recovering as large a sample of the materials contained by these zones as is feasible.

Mechanically excavated trenches and blading. Mechanically excavated trenches may be used for subsurface studies. Their placement will depend on site characteristics and the excavational needs of the site supervisor. For example, mechanically excavated trenches might be placed adjacent to cultural features or surface artifact clusters to help define the character of subsurface deposits in those areas and to aid in locating potential cultural strata and/or features. Mechanically excavated trenches can also be used to examine subsurface deposits in more detail when testing fails to locate evidence of potentially significant buried cultural deposits and/or features. Finally, mechanically excavated trenches can be used to provide long exposures of subsurface soils for analysis and determination of age, depositional history, and other characteristics that might be necessary to site interpretation. Blading can be used in situations where the results of testing are considered tentative, or the presence of unlocated cultural deposits or features is suspected but not confirmed.

Mechanical excavation will be restricted to areas within construction/buffer zones. Artifacts noted in backdirt will be collected for analysis and will be referenced to the trench or bladed area in which they originated. Otherwise, no attempt to collect artifacts from mechanical excavation will be attempted. Upon completion of a mechanically excavated trench, a form detailing its location, the strata encountered, and any other pertinent details noted during excavation will be completed. Bladed areas will be fully documented and described. The locations of all mechanically excavated trenches and bladed areas will be plotted on the site plan.

Collection of Botanical Samples

Botanical samples will only be obtained from contexts with the potential to yield information relevant to this study. For the most part, they will consist of 2-liter soil samples collected from cultural strata and features; at least one sample will be taken from each of these contexts that is encountered. Multiple samples from cultural strata may be obtained, but no more than one sample per stratum from each grid. If any residential structures or storage features are encountered, one or more samples will be obtained from floor fill. Noncultural strata will not be sampled for botanical remains. Macrobotanical samples, if observed, will be collected for analysis and identification and will be provenienced according to the stratum and level from which they were removed.

Pollen samples will only be collected from certain contexts. In cultural contexts, pollen samples should be obtained from individual strata or within storage features or structures to aid in determining details of diet and plant use. Single samples will be collected from each cultural stratum, structure, or storage feature unless the site supervisor determines that multiple samples have the ability to provide more detailed and useful information. Pollen samples will not be collected from thermal features, because heat tends to destroy pollen grains. Noncultural strata may be sampled as well in an effort to examine the depositional and environmental history of a particular location. This can be accomplished by collecting a pollen sample from each stratum defined or at standard intervals from a profile wall. The collection of noncultural pollen samples will only be done in consultation with the project director and/or principal investigator, and only when relevant to the archaeological interpretation of a site.

Sensitive Situations

Human remains. Since the sites being examined by this study appear to represent prehistoric and historic temporary use locales that were occupied for very short periods of time, the presence of any formal on-site human burials at any of these sites is considered unlikely. Any finds of human bone or burials while in the field or during laboratory analysis will be completely inadvertent and unexpected. If remains of this type are discovered in the field, standard archaeological excavation techniques will be employed to remove them after all appropriate consultations have been completed. The consultation procedure is discussed in Appendix 2, along with specific excavation techniques and analytic standards and procedures. Consultations will include informing the appropriate law enforcement and review authorities, the Carson National Forest, and the NMDOT. The excavation methods used will include definition of the burial pit, use of hand tools to expose skeletal materials, mapping and photographing of the position of the skeleton and any grave goods, and retrieval of soil for pollen analysis. Field and laboratory treatment of human remains and other sensitive cultural discoveries will be based on the Museum of New Mexico policy adopted March 20, 1986: "Collection and Display of Sensitive Materials" (SRC Rule 11; Appendix 2). If human remains or other sensitive materials are uncovered, no person will be allowed to handle or photograph them except as part of data recovery efforts. Data recovery related photographs of sensitive materials will not be released to the media or the general public.

Unexpected discoveries. There is always a risk of finding unexpected deposits or features during an archaeological excavation. The procedure that will be followed in the event of an unexpected discovery will vary with the nature and extent of the find. Should human remains be found, appropriate consultations will be completed, and they will be treated according to the procedures outlined above and in Appendix 2. Deeply buried or more extensive deposits that will require more excavation than is anticipated by this plan will require consultations with the NMDOT, Carson National Forest, and any other regulatory agencies involved in issuing excavation permits. While we do not anticipate encountering extensive or deeply buried cultural remains, this is always a possibility and may require alterations to this plan or to construction scheduling.

Analytic Methods and Artifact-Specific Inquiries

James L. Moore, Nancy J. Akins, C. Dean Wilson, Mollie S. Toll, and Pamela J. McBride

Laboratory analysis will be conducted by OAS staff and qualified professional consultants. Standardized analysis techniques have been developed by the OAS for chipped stone, ground stone, and Euroamerican artifacts (OAS 1994a, 1994b, and 1994c). Other analyses will be completed in a framework that is comparable to those used by the OAS in previous studies in northern New Mexico. Discussions of general analysis methods are provided in this chapter for all artifact categories that we anticipate will be recovered. Artifact-specific research questions are also detailed, where applicable. Attributes that will be examined are in bold lettering.

It may be necessary to sample certain categories if large numbers of artifacts are recovered. If so, all artifacts in sampled categories will be rough sorted to collect a minimum amount of data including (but not limited to) count and general classification. Full analysis will be completed on artifacts selected for the sample. The selection of samples will vary according to artifact category and will be aimed at deriving data that are directly applicable to the research questions generated in this document. Sample size will vary according to the raw numbers of artifacts in a category and the amount of information needed to address research questions.

While the analysis of individual artifact categories can be used to address Research Questions 2 and 3, the same is not true for Research Question 1. Determination of the presence or absence of potentially significant remains in the parts of these sites within the construction zone and buffer zone will be made during fieldwork by assessing raw numbers of artifacts recovered and determining approximate counts of all categories combined per cubic meter of fill. Thus, the analysis of these materials is not needed to address Research Question 1.

Chipped Stone Artifacts

All chipped stone artifacts will be examined using a standardized analysis format (OAS 1994a). This format includes a series of mandatory attributes that describe material, artifact type and condition, cortex, striking platforms, and dimensions. Several optional attributes have also been developed that are useful for examining specific questions. This analysis will include both mandatory and optional attributes.

The primary areas our analysis format explores are material selection, reduction technology, and tool use. These topics provide information about ties to other regions, mobility, and site function. While material selection studies cannot reveal *how* materials were obtained, they can usually suggest *where* they came from. By studying the reduction strategy employed at a site it is possible to compare how different cultural groups approached the problem of producing usable chipped stone tools from raw materials. The types of tools in an assemblage can be used to help assign a function to a site and to aid in assessing the range of activities that occurred there. Chipped stone tools provide temporal data in some cases but are usually less time sensitive than other materials like pottery and wood.

Chipped Stone Analytic Methods

Each chipped stone artifact will be examined using a binocular microscope to aid in defining morphology and material type, examine platforms, and determine whether it was used as a tool. The level of magnification will vary between 20x and 100x, with higher magnification used for wear pattern analysis and identification of platform modifications. Utilized and modified edge angles will be measured with a goniometer; other dimensions will be measured with a sliding caliper. Analytic results will be entered into a computerized data base to permit more efficient manipulation of the data and to rapid comparison with other data bases on file at the OAS.

Attributes that will be recorded for all chipped stone artifacts include *material type*, *material quality*, *artifact morphology*, *artifact function*, amount of surface covered by *cortex*, *portion*, evidence of *thermal alteration*, *edge damage*, and *dimensions*. Other attributes are aimed specifically at examining the reduction process and can only be obtained from flakes. They include *platform type*, evidence of *platform lipping*, presence or absence of *opposing dorsal scars*, and *distal termination type*.

Research Questions

Data provided by chipped stone analysis can be used to address Research Questions 2 and 3, as well as others pertaining to the use and manufacture of this artifact category. The presence of projectile points or other artifacts that are temporally sensitive can provide information on dates of occupation in the absence of more accurate temporal indicators. For example, the presence of strike-a-light flints in the LA 160196 assemblage would indicate a historic-period occupation and support the presence of a Jicarilla Apache or Pueblo component based on the presence of certain pottery types. Patterns in chipped stone assemblages, while mainly related to such cultural aspects as the type of reduction strategy used, can also provide relative temporal data. Evidence for the manufacture and use of large generalized bifaces often dominates Archaic assemblages and is much less common in Pueblo assemblages. Thus, evidence for the manufacture and use of large generalized bifaces, which is related to a curated reduction strategy, would suggest an Archaic occupation in the absence of other temporal indicators. Unfortunately, the opposite pattern is not necessarily indicative of a Pueblo occupation, because reduction strategy was also dependent on site function and the types and sizes of materials available for reduction in an area.

Knowledge of the proportions of various debitage types and the range of tools represented in an assemblage are of critical importance in addressing Research Question 3. As detailed in the model developed from Kelly (1988), the distribution of debitage and tool types provide information on how a site functioned within the settlement system to which it belonged. By examining debitage and tool assemblages, we will be able to evaluate site function. This evaluation can be enhanced by information derived from the analysis of other artifact classes, if present, including ground stone tools, botanical and faunal remains, and types of features.

Ties to other regions can be explored through a study of the sources of materials used for chipped stone reduction and tool manufacture. For example, both Jemez obsidian (Polvadera Peak and generic types) and Pedernal chert have sources well to the south of the project area, and neither material type could have reached this area through natural processes. Site residents obtained these materials through trade or long-distance travel to their sources. The former is probably more likely, in which case the presence of these exotic materials is indicative of economic ties to distant regions, either directly or through down-the-line exchange. By examining how common these materials are in these assemblages, we may be able to explore the nature of those ties.

Ground Stone Artifacts

Ground stone artifacts will be studied to provide information on material procurement and selection, range of activities, and alterations. Raw material choice, procurement costs, and production costs will be studied by examining material selection parameters, how extensively raw materials were modified, and how tools were shaped. Because ground stone artifacts are large and durable, they may undergo a long life history and be used for a variety of purposes, even after they are broken. Several attributes will be used to monitor artifact life histories by identifying postmanufacture changes in form and treatment including evidence of physical alterations, reuse after breakage, and multiple uses. Relative tool and assemblage age can be measured by examining the cross-section form of manos, and the depth and cross section of metate grinding surfaces.

Ground stone artifact analysis may also provide information about the range of foods consumed by site occupants. Pollen often adheres to plants that are processed with ground stone tools and can be recovered by a washing procedure. The material acquired in this way can be analyzed like other pollen samples. Recovery of pollen that adhered to materials processed by ground stone tools can help determine what those foods were. Of course, our ability to accomplish this depends on whether pollen is preserved in pores in the rock, and the condition of preserved pollen. Like many other analyses, the examination of economic pollen recovered from ground stone tools is a hit or miss proposition. Thus, our study of the use of plants for food will not focus on this analysis, but any information derived from it will be used to expand and amplify other sources of data. Grains of corn starch can also sometimes be identified on ground stone and will be monitored to supplement and amplify pollen information. Since recovery of economic pollen from ground stone tools is not a given, tools that appear to have been buried since discard or abandonment will be the focus of this analysis.

Ground Stone Analytic Methods

Ground stone artifacts will be examined using a standardized methodology (OAS 1994b), which was designed to provide data on material selection, manufacturing technology, and use. Artifacts will be examined macroscopically, and results will be entered into a computerized data base for analysis and interpretation. Several attributes will be recorded for each ground stone artifact, while others will only be recorded for certain tool types. Attributes that will be recorded for all ground stone artifacts include *material type*, *material texture and quality*, *function*, *portion*, *preform morphology*, *production input*, *plan view outline*, *ground surface texture and sharpening*, *shaping*, *number of uses*, *wear patterns*, *evidence of heating*, *presence of residues*, and *dimensions*. Specialized attributes include information on *mano cross-section form* and *ground surface cross section*.

By examining function(s) it is possible to define the range of activities in which ground stone tools were used. Because these tools are usually large and durable, they may undergo a number of different uses during their lifetime, even after being broken. Several attributes are designed to provide information on the life history of ground stone tools, including dimensions, evidence of heating, portion, ground surface sharpening, wear patterns, alterations, and the presence of adhesions. These measures can help identify postmanufacturing changes in artifact shape and function and describe the value of an assemblage by identifying the amount of wear or use. Such attributes as material type, material texture and quality, production input, preform morphology, plan view outline form, and texture provide information on raw material choice and the cost of producing various tools. Mano cross-section form and ground surface cross section are specialized measures aimed at describing aspects of form for manos and metates, since as these tools wear they undergo regular changes in morphology that can be used as relative measures of age.

If ground stone artifacts amenable to the recovery of economic data through pollen washes are recovered, this procedure will be conducted in the laboratory, necessitating certain precautions. Ground stone tools from trash deposits that are considered likely to yield data by undergoing this procedure will be placed in plastic bags after removal from the ground and will be lightly brushed to remove loose soil. Laboratory processing will proceed as follows: The entire surface of tools will be brushed before samples are collected. Using distilled water and a toothbrush, grinding surfaces will be scrubbed to collect embedded materials. The size of the area sampled will be measured and noted. Wash water will be collected in a pan placed under the sample and packaged for storage. Samples selected for analysis will receive a short (ca. 10-minute) acetolysis wash. Under certain circumstances, this may help preserve the cytoplasm in some modern pollen grains, allowing recent contaminants to be distinguished from fossil pollen. Pollen samples from ground stone artifacts will be subjected to full analysis in an attempt to distinguish economically used wild plants as well as cultigens.

Research Questions

Data provided by ground stone analysis, if any such tools are recovered, will be used to address Research Question 3. In general, analysis of ground stone tools may yield both direct and indirect information on subsistence. The types of ground stone tools recovered at a site are clues to the range of activities that occurred there and can help define site function. The morphology of ground stone tools can be used to determine whether they were used in food preparation or for other purposes. Tools that do not have the correct shape for grinding foods will be examined for evidence of residues to help define their use. The presence of such tools may provide subsidiary economic information. Were site occupants making jewelry or grinding pigments for painting in addition to processing foods? The presence of ground stone tools used for food preparation or in other tasks may be indicative of a residential rather than task-specific function for sites, indicating that they represent base camps. A lack of ground stone tools would point toward a shorter-term, perhaps more task-specific site function, but would not be definitive of such a use. This is because ground stone tools are portable and can be transported from base camp to base camp or cached in a concealed location near areas that were repeatedly used as a residential locale. Thus, unless broken and discarded or abandoned for other reasons, ground stone tools may not always be present on hunter-gatherer residential sites.

Local Ceramic Artifacts

This analysis is concerned only with locally produced pottery and does not include Euroamerican wares. Local pottery refers to types made or inspired by the ceramic technology long associated with Pueblo groups in the Northern Rio Grande. While ceramic assemblages from sites in this region are dominated by pottery made by Pueblo potters, types from sites in this region may also include forms that were inspired by Pueblo pottery traditions but made by Jicarilla Apache, Navajo, Genízaro, or Hispanic potters. Since the recovery of locally manufactured pottery is not a given for any of the sites in this sample, we detail the methods used in a detailed ceramic analysis while keeping in mind the fact that the ceramic assemblage may be quite limited in size and scope, which in turn will severely limit the types of information that might be derived from this analysis.

Analytic Procedures

Detailed and systematic examination of various attributes is needed to fully determine the timing and nature of the occupations at a site. Ceramic studies may contribute to this by using distributions of pottery types and attribute classes from dated contexts to examine patterns related to cultural affiliation, place of origin, form, and use of ceramic vessels. In order to examine these issues, it is necessary to record a variety of data in the form of both attribute classes and ceramic type categories.

Attribute categories used in this study are similar to those employed in recent OAS projects in the Northern Rio Grande. Attribute categories include *temper type*, *paint type*, *surface manipulation*, *modification*, and *vessel form*. Other studies that might occur involve more detailed characterizations of selected subsamples of sherds. Such studies might include analysis of refired paste color, petrographic characterizations, design style, and construction methods.

Many trends can be examined using ceramic type categories. Ceramic types, as used here, refer to groupings identified by various combinations of paste and surface characteristics with known temporal, spatial, and functional significance. Sherds are initially assigned to specific traditions based on probable region of origin as indicated by paste and temper. They are then placed in a ware group on the basis of general surface manipulation and form. Finally they are assigned to temporally distinctive types previously defined within various tradition and ware groups. Examination of very basic ceramic patterns may be most efficiently served by creating a small number of ceramic ware groups by lumping types that share characteristics. The use of these basic broad categories allows determination of coarse-grained patterning in ceramic assemblages, as opposed to the more basic patterning available from type distributions.

Functional trends may be documented through the use of basic ware categories and ceramic groups, as well as categories that reflect the shape and portion of a vessel from which a sherd derived. Vessel form identification is based on rim shape, the presence and location of polish and painted decorations, and other traits indicative of form. It is often easy to identify the basic form (bowl versus jar) of body sherds for many Southwestern regions by the presence and location of *polishing*. Examinations of rim sherds will provide more specific information about vessel form. *Rim diameters* of sherds and vessels will provide information concerning the overall size of vessels reflected by various forms.

Research Questions

Local pottery is only expected to be recovered from LA 160196 and will be used to address Research Questions 2 and 3 for that site. Identifying the type(s) of pottery present will aid in identifying the date of the component of which those artifacts are part and may be useful in determining the cultural affiliation of site occupants. The presence of Cimarron Micaceous may be indicative of a Jicarilla Apache occupation, while the presence of micaceous wares manufactured by the Northern Tiwa may be indicative of occupation by groups from Taos or Picuris Pueblos. Unfortunately, the makers and users of pottery were not necessarily always the same people. Thus, other site characteristics must also be factored into any discussion of cultural affinity.

Examination of vessel form characteristics may provide information useful in helping to define site function. Storage vessels, cooking vessels, and bowls used for consumption all represent different activities. The presence of storage vessels might indicate that food was transported from a more permanently occupied locale to a temporarily occupied site for consumption, while the presence of vessels used for cooking and consumption suggest that food was prepared and/or consumed at a location. These are all residential activities and can suggest that a site was used as a base camp of unknown temporal duration. However, ceramic data will provide few data that can be used to define the type of base camp represented and must be supplemented with other types of information in order to make that determination.

Faunal Artifacts

Specimens will be identified using the OAS comparative collection supplemented by those at the Museum of Southwest Biology, when necessary. Recording will follow an established OAS computer-coded format that identifies the animal and body part represented, how and if the animal and part was processed for consumption or other use, and how taphonomic and environmental conditions have affected the specimen. Each data line will be assigned a *lot number* that identifies a specimen or group of specimens that fit the description recorded in that line. Lot numbers also allow for retrieving an individual specimen if questions arise concerning coding or for additional study. A *count* will also be included to identify how many specimens are described in a data line.

Taxonomic identifications will be made as specific as possible. When an identification is less than certain, this will be indicated in the *certainty* variable. Specimens that cannot be identified to species, family, or order will be assigned to a range of indeterminate categories based on the size of the animal and whether it is a mammal, bird, other animal, or cannot be determined. Unidentifiable fragments often constitute the bulk of a faunal assemblage. By identifying these as precisely as possible, information from the identified taxa is supplemented.

Each bone (specimen) will be counted only once, even when broken into a number of pieces during excavation. If the break occurred before excavation, the pieces will be counted separately and their articulation noted in a variable that identifies *conjoinable pieces*, parts that were articulated when found, and pieces that appear to be from the same individual. Animal skeletons will be considered single specimens so as not to inflate the counts for accidentally and intentionally buried taxa.

The *skeletal element* will be identified by *side*, *age*, and *portion* recovered. Side will be recorded for the element itself or for the portion recovered when it is axial, such as the left transverse process of a lumbar vertebra. Age will be recorded at a general level: fetal or neonate, immature, young adult, and mature. Further refinements based on dental eruption or wear will be noted as comments. The *criteria used for assigning an age* will also be recorded. This will generally be based on size, epiphysis closure, or texture of the bone. The portion of the skeletal element represented in a particular specimen will be recorded in detail to allow determination of how many individuals are present and to investigate aspects of selection and preservation.

Completeness refers to how much of that skeletal element is represented by a specimen and will be used in conjunction with portion to determine the number of individuals present. This variable will also provide information on whether a species is intrusive and will inform on processing, environmental deterioration, animal activity, and thermal fragmentation.

Taphonomy is the study of preservation processes and how they affect the information obtained by identifying some of the nonhuman processes that affect the condition or frequencies found in an assemblage (Lyman 1994:1). *Environmental alteration* includes degree of pitting or corrosion from soil conditions, sun bleaching from extended exposure, checking or exfoliation from exposure, root etching from the acids excreted by roots, and polish or rounding from sediment movement, when applicable. *Animal alteration* will be recorded by source or probable source and where it occurs.

Burning, when it occurs after burial, is also a taphonomic process. Burning can occur as part of the cooking process, part of the disposal process when bone is used as fuel, or after it is buried. Here, the color, location, and presence of crackling or exfoliation will be recorded. Burn color is a gauge of burn intensity. A light tan color or scorch is superficial burning, while bone becomes charred or blackened as the collagen is carbonized. When the carbon is completely oxidized, it becomes white or calcined (Lyman 1994:385, 388). Burns can be graded over a specimen, reflecting the thickness of the flesh covering portions of the bone when burned. Dry, burned bone is light on the exterior and black at the core or has been burned from the interior. Graded burns can indicate roasting. Completely charred or calcined bone and dry burns do not occur as part of the cooking process. Uniform degrees of burning are possible only after the flesh has been removed and generally indicate a disposal practice (Buikstra and Swegle 1989:256). *Evidence of butchering* will be recorded as various orientations of cuts, grooves, chops, abrasions, saw cuts, scrapes, peels, and intentional breaks. The location of butchering will also be recorded. Additional detail will be obtained by indicating the location on diagrams of body parts.

Fauna recovered from historic sites is typically so fragmented that few attempts have been made to collect measurement data. Yet this information has the potential to differentiate varieties of sheep and goat, perhaps distinguish beef from draft cattle, and differentiate species of equids, along with the social and economic consequences thereof. Because these data have such potential, all possible *measurements* will be taken on domestic fauna from historic contexts. Measurements will be taken following von den Driesch (1976), who provides a comprehensive list of measurements for virtually every element.

Research Questions

Faunal remains, if present at any of the sites in this sample, will be used to address Research Questions 2 and 3. While bone will not necessarily be used to obtain direct dates, this material is amenable to radiometric dating and may be used for this purpose if better materials are not available. Bones from certain species can also provide relative dates for sites. For example, should bone from historic domestic species like sheep or cattle occur in undisturbed contexts on sites assumed to be of Archaic affinity, that affiliation must be reconsidered and occupation by Jicarilla Apache or Pueblo groups during the Historic period must be considered as an alternative. Faunal remains can also provide data on food consumption patterns, seasonality, and site function.

Site structure is reflected in disposal practices. Trash distribution is seldom a random process. Initial butchering refuse might be deposited in areas distinct from household garbage. The former and other noxious refuse might be burned or taken farther from a residence than material generated by household sweeping or cleaning hearths. Household and community size, spatial arrangement, and local topography will also influence disposal practices. Looking at distributions of taxa, body parts, fragmentation, and the length and type of exposure can help distinguish where different activities took place at a site.

Patterns in the distribution of faunal remains can also be a clue to occupational longevity. Sites occupied for relatively long periods should have distinct refuse areas, while those that represent short-term use may not. The size of a faunal assemblage may also be indicative of occupational longevity. The presence of numerous pieces of bone from a wide variety of species could suggest a fairly long period of occupation, while a total absence of bone or the occurrence of only a few pieces from very few species may indicate a short occupation. Unfortunately, preservation must also be factored into this type of analysis, since the former could be the result of excellent preservation conditions while the latter may only mean that bone did not preserve well at a location.

Euroamerican Artifacts

Euroamerican artifacts will be examined using a standardized analysis format (OAS 1994c). The main emphasis of this analysis is the identification of artifact function. One of the major benefits of this type of analysis is that "the various functional categories reflect a wide range of human activities, allowing insight into the behavioral context in which the artifacts were used, maintained, and discarded" (Hannaford and Oakes 1983:70). It also avoids some of the pitfalls of an analytic framework that focuses on categorizing artifacts by material type. Material-based analyses frequently include attributes that are appropriate for only some of the functional categories that might be included in a single material class. For instance, variables that are often selected for the analysis of glass artifacts are usually appropriate for glass containers but may be inappropriate for flat glass, decorative glass, or items like vehicle headlights. This analytic framework was designed to be flexible, which hopefully enables it to avoid these and other problems. The function of each artifact is described by a hierarchy of attributes that classifies it by functional category, type, and specific function. These attributes are closely related and provide a chain of variables that specify the exact function of an artifact, if known.

Analysis Methods

A series of *functional categories* is used in this analysis, each of which encompasses a series of *types*, and includes *classes* of items whose specific functions may be different but are related. An example is a pickle jar and a meat tin, both of which would be included in the food category, but which are made from different materials and had different specific functions. The exact use to which an artifact was put is recorded as a specific function within a type. In essence, this attribute represents a laundry list of different kinds of artifacts that may be familiar to most analysts and is the lowest level of the identification hierarchy. Other variables are recorded to amplify the hierarchy of functional variables and to provide a more detailed description of each artifact that warrants such treatment. Included in this array of attributes are those that provide information on *material type*, *date*, *manufacturer*, and the *part(s) represented*.

Chronological information is available from a variety of descriptive and manufacturing attributes, and especially from the latter. If the array of available variables provide enough information to assign beginning and ending dates to an artifact, it is recorded as date. Manufacturer is the name of the company that made an artifact, when known. This attribute can be critical in assigning a specific date to an artifact, because dates for the opening and demise of most manufacturing companies are available. A related attribute is the *brand name* associated with a product. Many brand names also have known temporal spans. At times, the manufacturer or brand name can be determined from the *labeling/lettering* present on an artifact, which was used to advertise the brand name or describe its contents or use.

The *technique* used to manufacture an artifact will be recorded, when it can be determined. Since manufacturing techniques have changed through time, this attribute can provide a relative idea of when an artifact was made. A related attribute is *seams*, which records the way in which sections of an artifact were joined during manufacture. Like manufacturing techniques, the types of seams used to construct an artifact are often temporally sensitive. The type of *finish/seal* will be recorded to describe the shape of the opening in a container and the means of sealing it. Many finishes and seal types have known date spans of limited duration. Related to this attribute is *opening/closure*, which records the method of retaining or extracting the contents of a container.

In some instances, attributes such as *color*, *ware*, and *dimensions* can provide information on artifact dating. Thus, the current color of an artifact will be recorded if considered to be of diagnostic value. A good example of where this attribute applies is glass, where the various colors present at a site can be used to provide some idea of date. *Ware* refers to pottery and categorizes the specific type represented, when known. Since dates exist for most major ware types, this attribute can provide critical temporal information. Dimensions can also be of chronologic value, especially when examining artifacts like nails or window glass, where lengths or thicknesses varied through time.

A few attributes will be used to provide information on the manufacturing process. In some instances these attributes also have descriptive value and can be used to verify functional information. *Material* records the material(s) from which an artifact was made. *Paste* describes the texture of clay used to make ceramic objects and is differentiated by porosity, hardness, vitrification, and opacity. *Decoration* describes the technique used to decorate an artifact, including pottery. A simple description of decoration on an artifact is recorded as *design*.

In addition to most of the attributes already discussed, several others are used to provide more comprehensive descriptions. *Fragment/part* describes the section of an object that is represented. Whole or fragmentary artifacts within a single excavation unit whose functions and descriptions are identical are recorded together, and the number of specimens present is listed under *count*.

Cultural and environmental changes will also be recorded. *Reuse* describes evidence of a secondary function, and any physical modifications associated with that use are described as *condition/modification*. If environmental conditions have had any effect on the surface of an artifact, it is recorded as *aging*.

Other variables are used to describe the appearance of an artifact. *Shape* describes physical contours and is generally only recorded if an artifact is whole. Several different measurements are taken to complete descriptions including *volume*, *length/height*, *width/diameter*, *thickness*, and *weight*. Measurements are taken using industry standards, where appropriate. The entire range of measurements are rarely applicable to a single artifact, and only those deemed appropriate are taken.

Research Questions

Data derived from the Euroamerican artifact assemblage will be used to address Research Questions 2 and 3 for LA 144951. Since it is questionable whether any materials suitable for dating will be obtained from the two features recorded as hearths at LA 144951, the best dates for this site will most likely be derived through analysis of the associated Euroamerican artifact assemblage. The types of associated artifacts can also be used to help define site function. The presence of a variety of food and beverage containers, as recorded by Townsend (2005:48) and Parrish et al. (2008:48), suggests that LA 144951 served as a temporary camp, in many ways similar to the function proposed for the prehistoric and early historic sites in the sample. Whether this use was related to construction/maintenance activities along US 285 as Townsend (2005:48) originally suggested, or was perhaps related to exploitation of the local piñon crop as Parrish et al. (2008:49) suggest as an alternative, might be explored through analysis of the related Euroamerican artifact assemblage.

Botanical Artifacts

Botanical studies will include flotation analysis of soil samples, species identification and (where appropriate) morphometric measurement of macrobotanical specimens, and species identification of wood specimens from both flotation and macrobotanical samples. Flotation is a widely used technique for the separation of floral materials from soil. This type of analysis takes advantage of the simple principle that organic materials (especially those that are nonviable or carbonized) tend to be less dense than water and will float or hang in suspension in a water solution. The processing of flotation samples entails immersion of the sample material in a bucket of water. After a short interval allows heavier particles to settle out, the solution is poured through a screen lined with fabric (approximately 0.35 mm mesh). The floating and suspended materials are dried indoors, then separated by particle size using nested geological screens (4, 2, 1, and 0.5 mm mesh), before sorting under a binocular microscope at 7–45x.

Seed attributes such as *charring*, *color*, and aspects of *damage or deterioration* are recorded to help determine cultural use versus postoccupational contamination. *Relative abundance of insect parts, bones, rodent and insect feces, and roots* help isolate sources of biological disturbance in the ethnobotanical record.

All macrobotanical samples are examined individually, identified, repackaged, and cataloged. *Condition* (carbonization, deflation, swelling, erosion, and damage) is noted as a clue to cultural alteration or modification of original size dimensions. When less than half of an item is present it will be counted as a fragment; more intact specimens are measured as well as counted. Corn remains (if present) are treated in greater detail.

Width and *thickness* of kernels, *cob length* and *mid-cob diameter*, *number of kernel rows*, and several *cupule dimensions* are measured following Toll and Huckell (1996). In addition, the following attributes are noted: *overall cob shape*, *configuration of rows*, *presence of irregular or undeveloped rows*, and *postdiscard effects*.

Research Questions

Except for LA 144951, where two possible hearths are among the features that will be examined within project limits, the probability of recovering botanical materials is considered very low, since no evidence of features or distinct cultural soil strata is visible from surface examination at any of the other sites. However, should botanical materials be recovered, they will help address Research Questions 2 and 3. Analysis of charcoal from hearths provides important information for site dating and interpretation. The presence of only wood charcoal in a sample obtained for radiocarbon analysis will indicate the likelihood that the date will probably be earlier than the actual period of occupation, because of the old wood problem (as discussed in the next section). Conversely, the presence of charcoal from annuals or woody shrubs would suggest that a greater degree of confidence could be placed in the results of radiocarbon analysis. Other plant types and parts are useful in defining the season of occupation for a site and can provide important information on diet and plant use. Botanical information may also show how sites fit into their respective settlement systems. For instance, the recovery of processed materials like charred piñon shells may indicate piñon collection and processing, suggesting a possible use as a field camp.

Chronometric Samples

Accurate dates are needed in every archaeological study to place site components in the proper context, both locally and regionally. This study is no exception, and chronometric data are important to the research design. Inaccuracies are built into many chronometric techniques, or perhaps more properly phrased, some methods may not actually reflect the event they are being used to date. In order to assign accurate occupational dates to a site, it is usually desirable to obtain as many types of chronometric data as possible. That way they can be used to cross-check one another and permit the identification and elimination of faulty dates.

Datable Artifacts

At least three categories of artifacts have the potential to provide dates: Euroamerican artifacts, projectile points, and Native ceramics. Euroamerican artifacts can often provide fairly precise dates for a site. Some types of glass and metal artifacts can also be useful in providing dates, but these types of artifacts also often had very long production ranges that only allow the derivation of relative dates. A range of possible occupational dates is usually available from Euroamerican artifact assemblages, but can rarely provide exact dates of use for a site. Projectile points can be used to assign relative dates to sites but can rarely provide potential date ranges smaller than several hundred years, and in some cases the date ranges that can be derived are over a thousand years long. Native ceramics can also be used to provide temporal information, but again, types often have very long temporal ranges that only allow the derivation of relative dates. While specific types do not appear to have a great degree of temporal sensitivity, changing patterns of ware use through time seem to provide good relative information that can be used to augment other sources of temporal data.

Radiocarbon Dating

Since the 1950s, radiocarbon (or ^{14}C) analysis has been used to date archaeological sites. While this process was initially thought to provide accurate absolute dates, several problems have cropped up over the years that must now be taken into account. The three most pervasive problems have to do with the ways in which wood grows and is preserved. Both animals and plants absorb a radioactive isotope of carbon (^{14}C) while they are alive. Immediately following death, ^{14}C begins decaying into ^{13}C at a known rate. Ideally, by simply measuring the proportion of each carbon isotope, it should be possible to determine how long ago that entity stopped absorbing radioactive carbon. Since plant materials are often available on sites, this technique is usually applied to those types of materials. However, research has tossed a few bugs into the system. For example, some plants use carbon in different ways. This variation can be taken into account by determining the type of plant being dated.

A more serious problem is encountered when wood or wood charcoal is submitted for dating (Smiley 1985). Only the outer parts of trees continue to grow through their lives; hence, only the outer rings and bark absorb carbon. Samples of wood submitted for dating may contain numerous rings, each representing growth in a different year. Thus, rather than measuring a single event (when the tree died or was cut down), the dates of a series of growth years are averaged. This often tends to overestimate the age of the material. Smiley (1985:385) notes that a large error in age estimation can occur in arid or high altitude situations, where tree ring density may be high and dead wood can preserve for very long periods of time. This disparity was greater when fuelwood rather than construction wood was used for dating (Smiley 1985:372). This is because wood can be preserved for a long time in the Southwest, even when it is not in a protected location. Thus, wood used for fuel could have been lying on the surface for several hundred years before it was burned. Again, the event being measured is the death of the plant, not when it was used for fuel. This problem is referred to as "the old wood problem."

Another problem is caused by solar activity. Sunspots cause fluctuations in atmospheric ^{14}C levels, and thus in the amount of radioactive carbon absorbed by living entities. This introduces error into the calculations, which is currently corrected by using a calibration based on decadal fluctuations in atmospheric ^{14}C as measured from tree-ring sequences (Suess 1986). While this problem may no longer be as significant as the others mentioned, it shows that we are still learning how this isotope is absorbed and decays, and that it is affected in many ways that were not originally taken into consideration.

Even considering these problems, radiocarbon analysis can provide relatively sensitive dates when properly applied. For example, annuals or twigs from perennials represent short periods of growth and can often be confidently used. Construction wood can also be sampled in a way that measures the approximate cutting date rather than a series of growth years. This can be accomplished by obtaining only bark and outer rings from construction wood instead of sending in a large lump of charcoal. This is often difficult and time consuming, but should provide dates that are much more reliable.

Archaeomagnetic Dating

Archaeomagnetic dating analyzes the remanent magnetization in materials that have been fired. Those materials must contain particles with magnetic properties (ferromagnetic minerals), usually iron compounds like magnetite and hematite. Ferromagnetic minerals retain a remanent, or permanent, magnetization, which remains even after the magnetic field that caused it is removed (Sternberg 1990:13–14). When ferromagnetic materials are heated above a certain point (which varies by the type of compound), the remanent magnetization is erased and particles are remagnetized (Sternberg 1990:15). Samples of that material can be analyzed to determine the direction of magnetic north at the time of firing. Since magnetic north moves over time and its pattern of movement has been plotted for about the last 1,500 years in the Southwest, comparison of a sample with the archaeomagnetic plot can provide a reasonably accurate date. However, it should be remembered that only the last event in which the material was heated to the point where remagnetization could occur is dated. Thus, a feature could have been used over a span of decades, but this method will only date the last time it was fired to the proper temperature.

Tree-Ring Dating

This method is based on the tendency of growth rings in certain types of trees to reflect the amount of moisture available during a growing season. In general, tree-rings are wide in years of abundant rainfall and narrow when precipitation levels are low. These tendencies have been plotted back in time from the present, in some cases extending over several thousand years. By matching sequences of tree-rings from archaeological samples to master plots, an absolute date can be obtained. This is the most accurate dating technique available because it can determine the exact year in which a tree was cut down. However, once again it is necessary to determine what event is being dated.

Because the reuse of wooden roof beams was common in the Southwest, it is not always possible to determine whether a date derived from a beam is related to construction of the structure within which it was found, or a previous use. Clusters of similar dates in roofing materials are usually, but not always, a good indication that the approximate date of construction is represented. Isolated dates may provide some information, but are often of questionable validity. Another problem associated with tree-ring dating concerns the condition of the sample being analyzed. In order to apply an accurate date to a specific event (in this case, the year in which a tree stopped growing), the outer surface of the tree is needed. An exact date can only be obtained when the outer part of a sample includes the bark covering of the tree or rings that were at or near the tree's surface. In addition, enough rings must be present to allow an accurate match with the master sequence. Samples can often be dated when they contain only inner rings, but this does not provide a cutting date.

Research Questions

The collection and analysis of chromometric samples are directly related to addressing Research Question 2. While possible that samples amenable to radiocarbon dating will be obtained from at least some of the sites, this cannot be assumed. Few opportunities to obtain archaeomagnetic samples are expected to be available. Only if thermal features were fired to a high enough temperature will this type of sample be available, and considering the types of sites in our sample, this is unlikely to be the case. Similarly, no tree-ring samples are expected to be available, because no structures or substantial features that might contain such materials have been identified at any of these sites, either inside or outside project limits. However, if chronometric samples are available, they will be obtained and used to provide more accurate dates for the periods of occupation represented by these sites.

Architectural Materials

If any residential structures or substantial storage features are encountered during data recovery, we will collect a series of standard samples and observations to enable us to analyze construction methods and structure use; samples will mainly consist of adobe construction materials (when available).Wooden architectural elements will be sampled and described, if any examples are found. Diameter measurements will be taken for all wooden building elements, focusing on those with relatively intact cross sections. If suitable specimens are available, we will collect samples. Analysis of these specimens will be aimed at identifying the types of woods used for building, and collection of chronometric data. The latter will consist of cross sections of tree rings and suitable radiocarbon samples, as discussed in the section on chronometrics.

Research Questions

Since no evidence of residential structures or substantial features were noted during survey, this type of sample will probably not be available for collection on any of the sites in our sample. However, should these types of materials become available, they will be used to help address Research Questions 2 and 3. Knowledge of how structures and substantial features were built and used can provide information on site function and duration. These types of information can include whether a site was used during the warm or cold season, whether it served as a primary residence, a logistical base camp, or a foraging base camp, and approximately how long those occupations might have lasted. In turn, these data can be combined with other forms of information to create a clearer picture of site use and occupational type.

Human Remains

As discussed earlier, the probability of locating and recovering human remains during this study is very low. If any human remains are recovered, the sample should be extremely limited. Under such circumstances, it may not be possible to establish that they are representative of the human biological populations that created the site. The main goal of skeletal analysis will therefore be a nondestructive study of the remains in order to add to our general knowledge of Southwestern human populations rather than to address specific questions raised in the research design. This nondestructive approach will include standard metric studies, aging and sexing of the remains, and documentation of pathologies.

Research Results

The final data recovery and analysis report will be published in the OAS Archaeology Notes series. The report will present all important excavation, analysis, and interpretive results and will include relevant photographs, site and feature plans, and data summaries. Field notes, maps, analytic notes, and photographs will be deposited with the Archaeological Records Management Section (ARMS) of the New Mexico Historic Preservation Division, located at the Laboratory of Anthropology in Santa Fe. The artifact collection recovered during the course of this project will be curated in perpetuity at the repository operated by the Museum of New Mexico. If human remains are recovered, their disposition will be based on consultations carried out in accordance with state regulations.

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Appendix 2: Consultation Procedures

Nancy J. Akins

On state and private land, state law (NMSA § 18-6-11.2, 1989 and HPD Rule 4 NMAC 10.11) requires a permit for excavation of unmarked burials. Human remains on state or private land will be excavated under the year 2009 annual burial permit issued to the Office of Archaeological Studies. Following the permit provisions, the intent to use the annual permit (including a legal description of the location of the burial, the written authorization to remove the burial from the landowner, a description of the procedures to be implemented to identify and notify living relatives of the burials, certification that the law enforcement agency having jurisdiction in the area has been notified, a list of personnel supervising and conducting excavations of the human burial, and the NMCRIS LA Project/Activity Number for the permitted excavation) will be submitted in writing to the State Historic Preservation Officer (SHPO) before excavation of the burials begins. The local law enforcement agency with jurisdiction over the area will be notified to contact the state medical investigator who will determine if the burial is of mediolegal significance. Within 45 days of completing the permitted excavation, recommendations for the disposition of human remains and funerary objects will be made to the SHPO. These recommendations will take into consideration the comments of living persons who may be related to the burial and the wishes of the landowner. The plan will provide a proposed location for reburial or approved curatorial facilities and an inventory of funerary objects and other artifacts found in association or collected in the course of excavation. The SHPO, after consulting with the State Office of Indian Affairs, will determine the appropriate disposition of the human remains and associated funerary objects. If a final report cannot be completed with a year of the completion of fieldwork, an interim report will be submitted along with an estimated completion date for a final report.

Excavation Procedures

Excavation of human burials will be consistent with current professional archaeological standards. This generally includes the identification of a burial pit and careful removal of fill within the pit. When possible, half the fill will be removed to provide a profile of the fill in relation to the pit and the burial. The pit, pit fill, burial goods, and burial will be examined and recorded in detail on an OAS burial form with special attention paid to any disturbance that may have taken place. Plans and profiles and photographs will further document the burial and associated objects. Flotation and pollen samples will be taken from all burials. Disarticulated or scattered remains will be located horizontally and vertically and photographed. Any association materials and the potential cause of disturbance or evidence of deliberate placement will be recorded in detail.

Analysis Methods

The human analysis will follow the procedures set out in *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994). This comprehensive system collects the maximum amount of comparable information by recording the same attributes using the same standards. A series of 29 attachments and documentation on how these should be recorded include the following information.

1. An inventory sheet codes each element that makes up a skeleton. Diagrams of infant, child, and adult skeletons and anatomical parts allow for the location of observations concerning these parts. Another form codes commingled or incomplete remains.

2. Adult sex is determined by examining aspects of the pelvis and cranium. Age changes are documented on the pubic symphysis using two sets of standards, on the auricular surface of the ilium, and through cranial suture closure.

3. For immature remains, the age-at-death is determined by scoring epiphyseal union, union of primary ossification centers, and measurements of elements.

4. Recording of dental information includes an inventory, pathologies, and cultural modifications. Each tooth is coded and visually indicated for presence and whether it is in place, unobservable, damaged, congenitally absent, or lost premortem or postmortem. Tooth development is assessed, occlusal surface wear is scored, caries are located and described, abscesses are located, and dental hypolasisas and opacities are described and located with respect to the cemento-enamel junction. Any premortem modifications are described and located.

5. The secondary dentition is measured and dental morphology scored for a number of traits.

6. Measurements are recorded for the cranium (n = 35), clavicle, scapula, humerus, radius, ulna, sacrum, innominate, femur, tibia, , fibula, and calcaneus (n = 46 postcranial measurements).

7. Nonmetric traits are recorded for the cranium (n = 21), atlas vertebra, seventh cervical vertebra, and humerus.

8. Postmortem changes or taphonomy are recorded when appropriate. These include color, surface changes, rodent and carnivore damage, and cultural modification.

9. The paleopathology section groups observations into nine categories: abnormalities of shape, abnormalities of size, bone loss, abnormal bone formation, fractures and dislocations, porotic hyperostosis/cribra orbitalia, vertebral pathology, arthritis, and miscellaneous conditions. The element, location, and other pertinent information is recorded under each category.

10. Cultural modifications such as trepanation and artificial cranial deformation are recorded in another set of forms.

Buikstra and Ubelaker (1994:174) recommends curating the following samples for future analysis on burials that will be repatriated. The middle portion of a femur midshaft (at least 100 g) that can be used for radiocarbon dating, trace element analysis (diet), stable isotope ratios (climate and diet), strontium (population movement), bone geometry (activity patterns), histomorphometry (age and health), and aspartic acid analysis (age and health). Several teeth (the upper central incisor, lower canines and premolars, and lower second molar) for histomorphometric analysis, cementum annulation (root), aspartic acid (dentin), isotope studies (enamel), and future studies of linear hypoplaisas and enamel microwear patterning. Five grams of trabecular bone for DNA extraction, the middle third of a clavicle and rib six for age-at-death, health studies, and morphological age assessments. Finally, two sections of the right femur and one section each of the humerus or CT scans of both to assess the level and type of behavior. No samples will be collected without the express permission of the SHPO and the landowner.

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