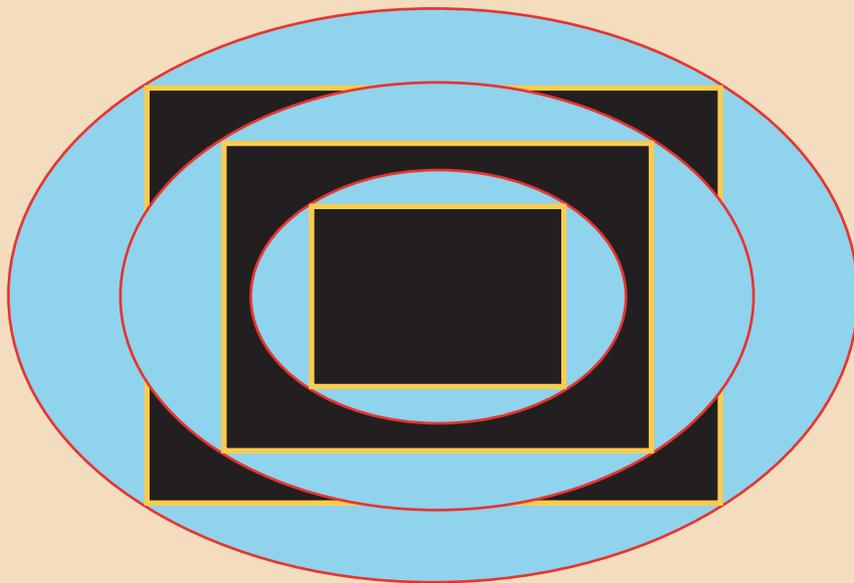


**THE I-40, EXIT 102 ACOMITA INTERCHANGE STUDY:
Research Design and Data Recovery Plan
for Six Archaeological Sites
(LA 54902, LA 89019, LA 89020, LA 108511, LA 145685,
and LA 149868), Cibola County, New Mexico**

Stephen S. Post and Charles A. Hannaford



Office of Archaeological Studies



Museum of New Mexico

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OFFICE OF ARCHAEOLOGICAL STUDIES

DEPARTMENT OF CULTURAL AFFAIRS

The I-40, Exit 102 Acomita Interchange Study:
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ARCHAEOLOGY NOTES 371

ADMINISTRATIVE SUMMARY

This data recovery plan was prepared by the Museum of New Mexico, Office of Archaeological Studies (OAS), at the request of the New Mexico Department of Transportation (NMDOT). It provides a cultural-historical, theoretical, and methodological context for the archaeological investigation of portions of six archaeological sites, LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868, which occur within two proposed design alternatives for the proposed I-40 Exit 102 improvement project (Alternative 3—Single Point Urban Interchange, and Alternative 5—Compressed Diamond Interchange Shifted West). The project is located between I-40 Mile Posts (MP) 101.34 and 102.83 in the eastern portion of the Pueblo of Acoma, Cibola County, New Mexico. The project will be funded by the Federal Highway Administration (FHWA), NMDOT, and the Pueblo of Acoma. Initial field surveys were conducted in two phases by archaeologists from Marron and Associates, Inc. of Albuquerque, New Mexico, and OAS gratefully recognizes Kenneth Brown, Marron and Associates, Inc., for supplying electronic copies of much of the introductory sections and site descriptions that are included in the data recovery plan (M. E. Brown and K. L. Brown 2005). This data recovery plan conforms with the requirements of the New Mexico and federal statutes as they may apply to archaeological investigations conducted on state, Indian, and private lands with federal, state, and Acoma Tribe funding.

LA 54902 is a small site consisting of a Pueblo II period artifact scatter and linear configuration of sandstone slabs that may represent the remains of a fieldhouse or seasonally occupied structure foundation. A field check, combined with interpretation of aerial and spatial imagery, indicates that only the Alternative 5 construction may affect the southern portion of the site, which is characterized by a very light surface artifact scatter. Limited hand excavation with a spatially extensive backhoe excavation program is recommended to determine if deeply buried cultural deposits underlie the surface archi-

tectural remains and artifact scatter. Excavation may yield information on the organization of agricultural-based subsistence behaviors between A.D. 1000 and 1150 in the Acoma Province and the periphery of the San Jose drainage basin.

LA 89019 is multicomponent with an artifact scatter dating from late Paleoindian to Pueblo II period and a Territorial period foundation with a light scatter of artifacts located within an undulating and intermittently deflated and stable dune/bedrock setting. Alternative 3 will affect a narrow strip of the prehistoric component along the existing I-40 right-of-way. Alternative 5 will affect 66 percent of the site area including Paleoindian, Early and Middle Archaic, Pueblo II, and late Territorial period components. Excavation may yield information on changing hunting and gathering practices and organization on the margins of a large mammal migratory route along the Rio San Jose, and Acoma Province Anasazi seasonal subsistence patterns centered on agriculture and foraging. The late Territorial period component reflects pastoral subsistence pattern within the shifting sociopolitical boundaries of Acoma Pueblo and the community of Cubero.

LA 89020 is an elongated sherd and lithic artifact scatter with Late Archaic and Pueblo III (Kowina phase) components. Less than 5 percent of the site will be affected by Alternative 3 construction. Most of the potential site area within the I-40 eastbound on-ramp is covered or removed by water run-off and modern alluviation from highway drainage patterns. Small-scale excavation may yield artifact assemblages that can be compared with technological characteristics of contemporaneous assemblages from other sites, if temporally diagnostic artifacts are recovered.

LA 108511 is a spatially extensive, low density sherd and lithic artifact scatter within an ancient floodplain. The dispersed artifact scatter dating from the Pueblo II period (Pilares phase) appears to result from berm construction, underground utility installation, and borrow pit activities that have

brought buried cultural resources to the surface. These surface artifacts may not directly reflect prehistoric activities and behaviors, however, they indicate the presence of subsurface cultural deposits. Pueblo II farmers practiced a land-extensive settlement pattern that provided access to farmlands distant from permanent villages. Construction of an Alternative 5 access road does not affect the surface artifact scatter. However, the potential for subsurface deposits and features from fieldhouse occupations or other seasonal activities may be encountered both within and outside the existing site boundary. A program of subsurface backhoe excavation and subsequent hand excavations of features in the vicinity of LA 108511 may yield data on Pueblo II subsistence technology, settlement, and organization.

LA 145685 is a small site located along the south side of the I-40 eastbound on-ramp. It is described as a Pueblo I sherd and lithic artifact scatter of which only a small portion may be affected by Alternative 3 construction. A site visit revealed a small stabilized dune area within a modern, highway-related drainage swale that may have contextual integrity. Excavation may yield limited information in the organization of Pueblo I subsistence and ceramic technology.

LA 149868 is a multicomponent Pueblo II fieldhouse with a sherd and lithic artifact scatter and three historic era features probably dating from the late Territorial period and associated with activities at LA 89019, which was located only 60 m to the east. Alternative 5 construction would affect the north portion of the site, which is primarily a dispersed prehistoric artifact scatter in intermittently stable and deflated dune and sandstone bedrock settings. Cultural deposit depth should be variable and the contextual integrity of the cultural deposits is unknown. Some artifacts may be contemporaneous with the main prehistoric component, while others remain from low intensity, short duration activities. Excavations may yield data on intermittent, low intensity use of this area for farming and diurnal foraging by Anasazi farmers.

The following research design and data recovery plan provides cultural-historical and environmental context, site descriptions, an assessment of data potential of site areas within proposed Alternatives 3 and 5 construction and research questions with a site-specific and regional scales. Field data recovery and laboratory analysis methods link the archaeological site data potential to the appropriate research questions and scales of analysis and interpretation.

MNM Project No. 41.808
NMDOT Project No. IM-040-2(58)102 (I-40/Exit 102 Interchange Project)
CN 2763
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INTRODUCTION

This data recovery plan was prepared by the Museum of New Mexico, Office of Archaeological Studies (OAS), at the request of the New Mexico Department of Transportation (NMDOT). It provides a cultural-historical, theoretical, and methodological context for the archaeological investigation of portions of six archaeological sites, LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868, which occur within two proposed design alternatives for the proposed I-40 Exit 102 improvement project (Alternative 3—Single Point Urban Interchange, and Alternative 5—Compressed Diamond Interchange Shifted West). The project will be funded by the Federal Highway Administration (FHWA), NMDOT, and the Pueblo of Acoma.

The proposed project is in the [REDACTED] of Section 22 and the [REDACTED] of Section 23 and the [REDACTED] of Section 27 within T 10N, R 7W, NMPM, Cibola County; [REDACTED] (UTM center point NAD 27) (USGS Cubero 7.5' quadrangle 35107-A5, 1957/1971). The project is located between I-40 Mile Posts (MP) 101.34 and 102.83 in the eastern portion of the Pueblo of Acoma, Cibola County, New Mexico (Fig. 1). Proposed design Alternatives 3 and 5 are shown on Figures 2 and 3.

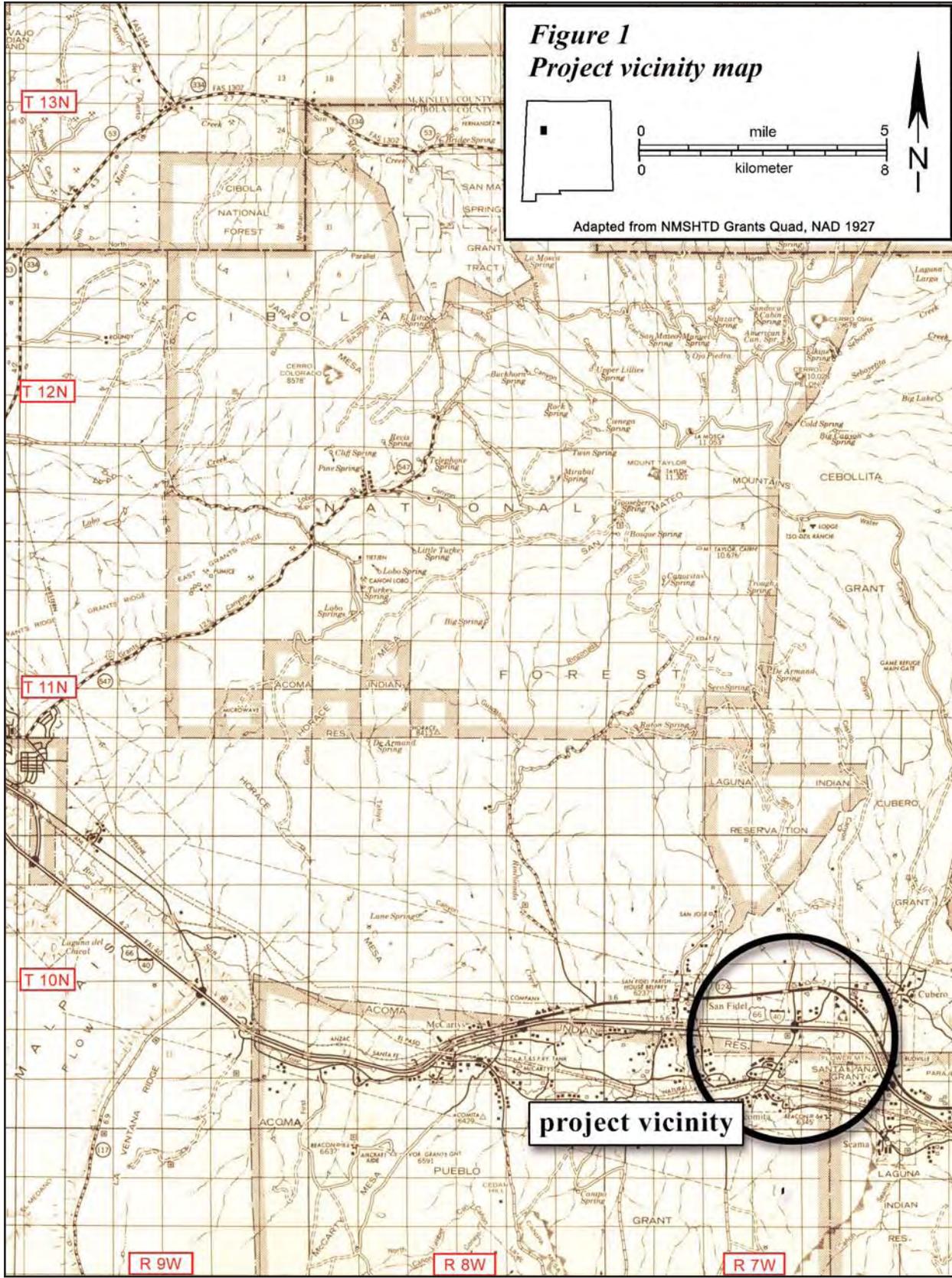
Land ownership in the project area is complicated and can be briefly summarized for Alternatives 3 and 5 (Fig. 4). The Alternative 3 corridor encompasses 9.3 ha (23 acres) of which 0.8 ha (2 acres) is Pueblo of Acoma land, 0.4 ha (1 acre) is Town of Cubero Grant land, and 8.1 ha (20 acres) is NMDOT land acquired from private sources. The Alternative 5 corridor encompasses 11.6 ha (38 acres) of which 1.6 ha (4 acres) is Pueblo of Acoma land, 7.3 ha (18 acres) is Town of Cubero Grant land, 2.4 ha (6 acres) is private land, and 4 ha (10 acres) is NMDOT land acquired from private sources (M. E. Brown and K. L. Brown 2005:2).

The following project descriptions are quoted directly from M. E. Brown and K. L. Brown (2005:3-4).

Alternative 3 includes the reconstruction of the existing interchange as a Single Point Urban Interchange at the existing interchange (Fig. 2). The on and off ramps would be reconstructed in their entirety, but grades would remain close to their existing conditions. Acceleration and deceleration lanes parallel to I-40 would be included to improve vehicle operations with respect to divergence or merge conditions with I-40 traffic. The interchange would be rebuilt as an underpass. To minimize the bridge area and optimize driveway spacing to the north, I-40 would be reconstructed to eliminate the divided median at the bridge. Concrete wall barriers would separate traffic on I-40. SP-30 would be widened and then transitioned back to its existing two-lane sections north and south of the interchange. In the future, the section north of the interchange would be expanded out as a five lane urban section as identified in the master plan. Traffic at the new interchange would be controlled at a single signalized intersection under I-40. Access north of the interchange would require modifications as a result of new access control limits and spacing requirements to conform with the NMDOT standards.

I-40 would be reconstructed in order to reduce median width, hence reducing the size of the bridge deck and right-of-way required for the alternative since the ramps would be pulled in closer to I-40. The driveway to the NMDOT rest area would be reconstructed to the south with SP-130, and minimizing the impact of ingress and egress movements from the facility on interchange operations. Access control along SP-30 will remain limited, and NMDOT would seek to combine or remove driveways in the vicinity of the interchange. A sidewalk or pedestrian path would be constructed on one side of SP-30 to connect the Acoma businesses with the NMDOT rest area.

Alternative 3 would include one new bridge and would not utilize the existing bridges (bridge numbers 6397 and 6398). The new bridge would include the new single point intersection construct-



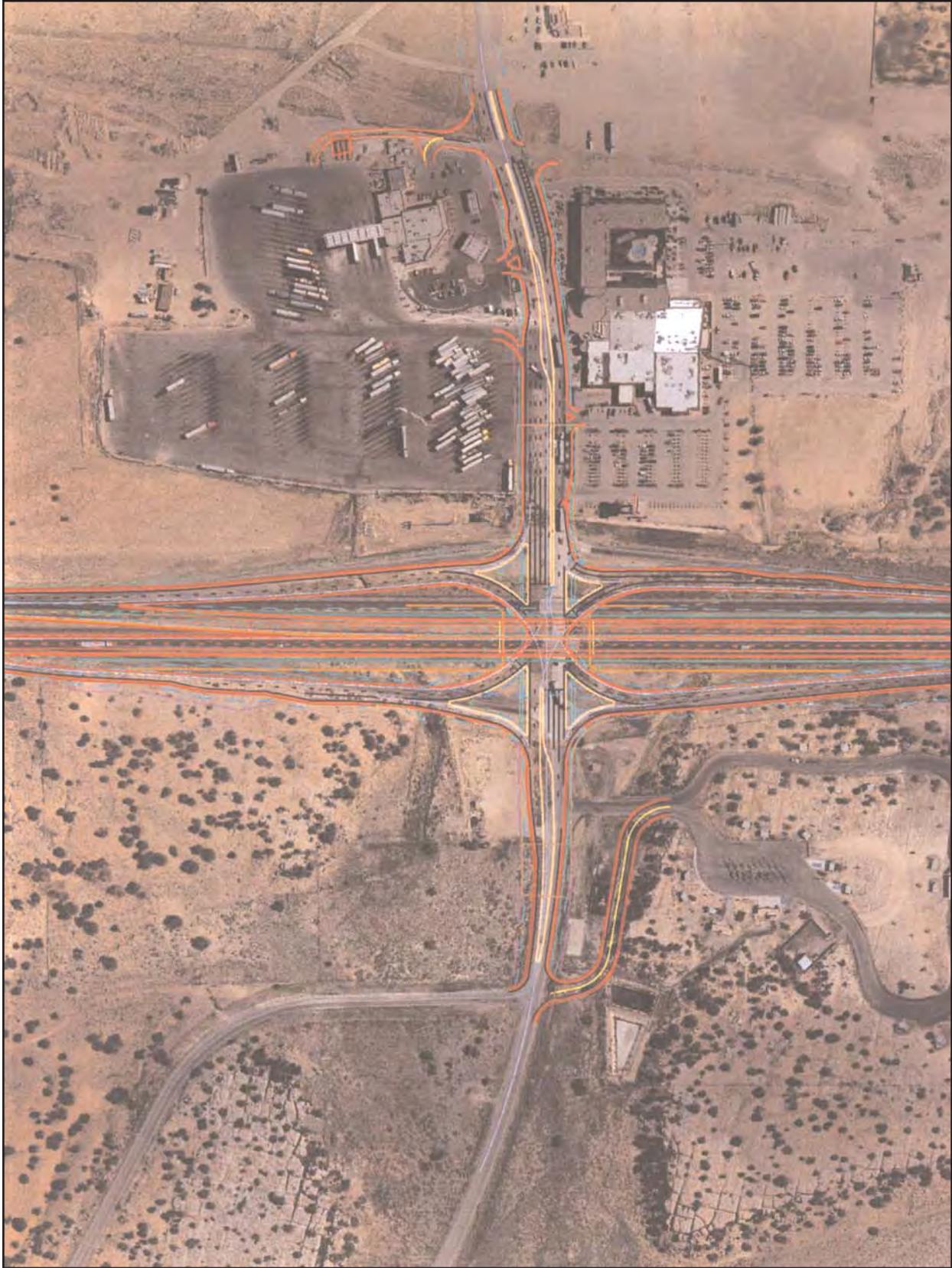


Figure 2. Aerial photograph of Alternative 3.

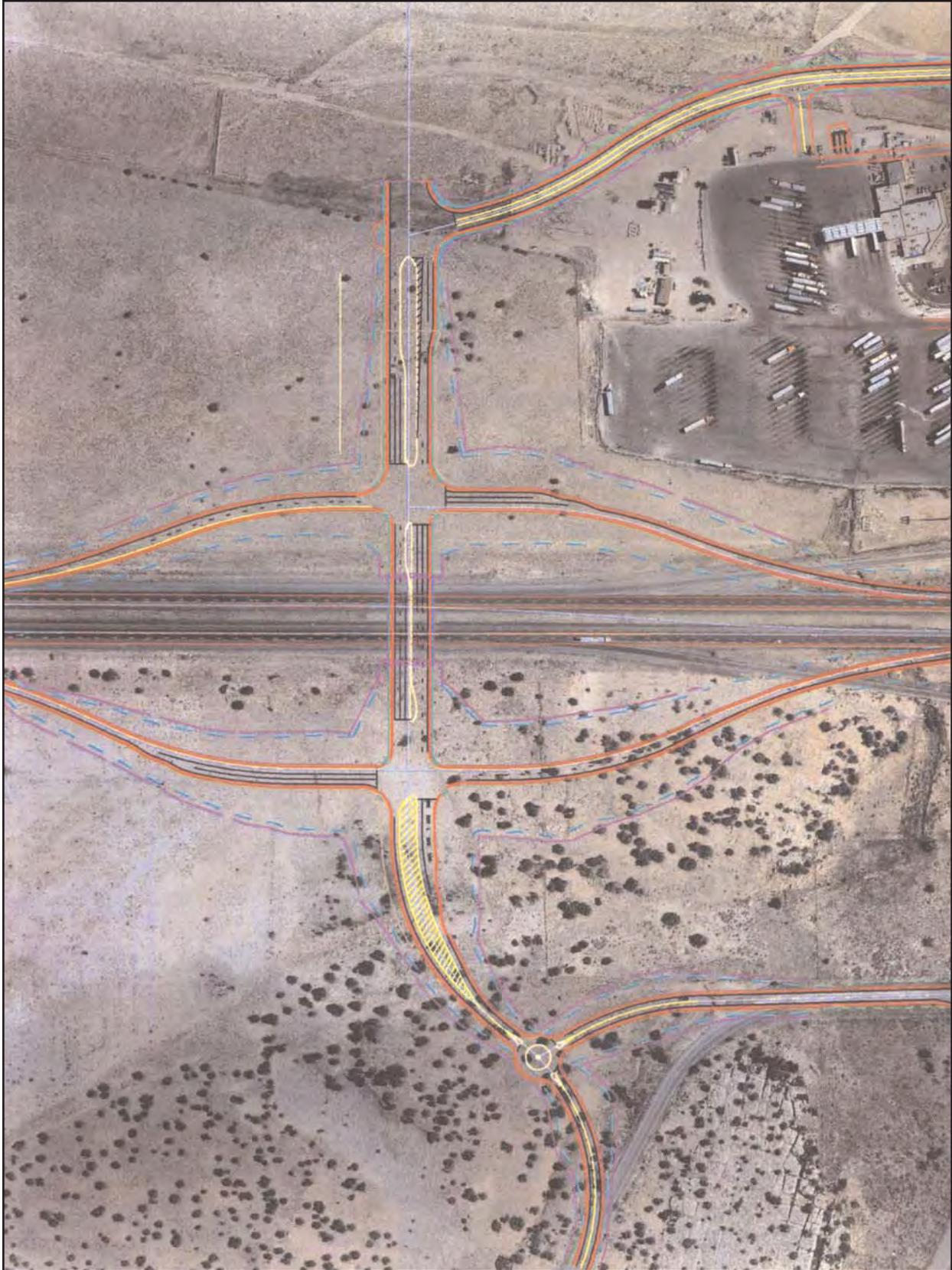


Figure 3. Aerial photograph of Alternative 5.

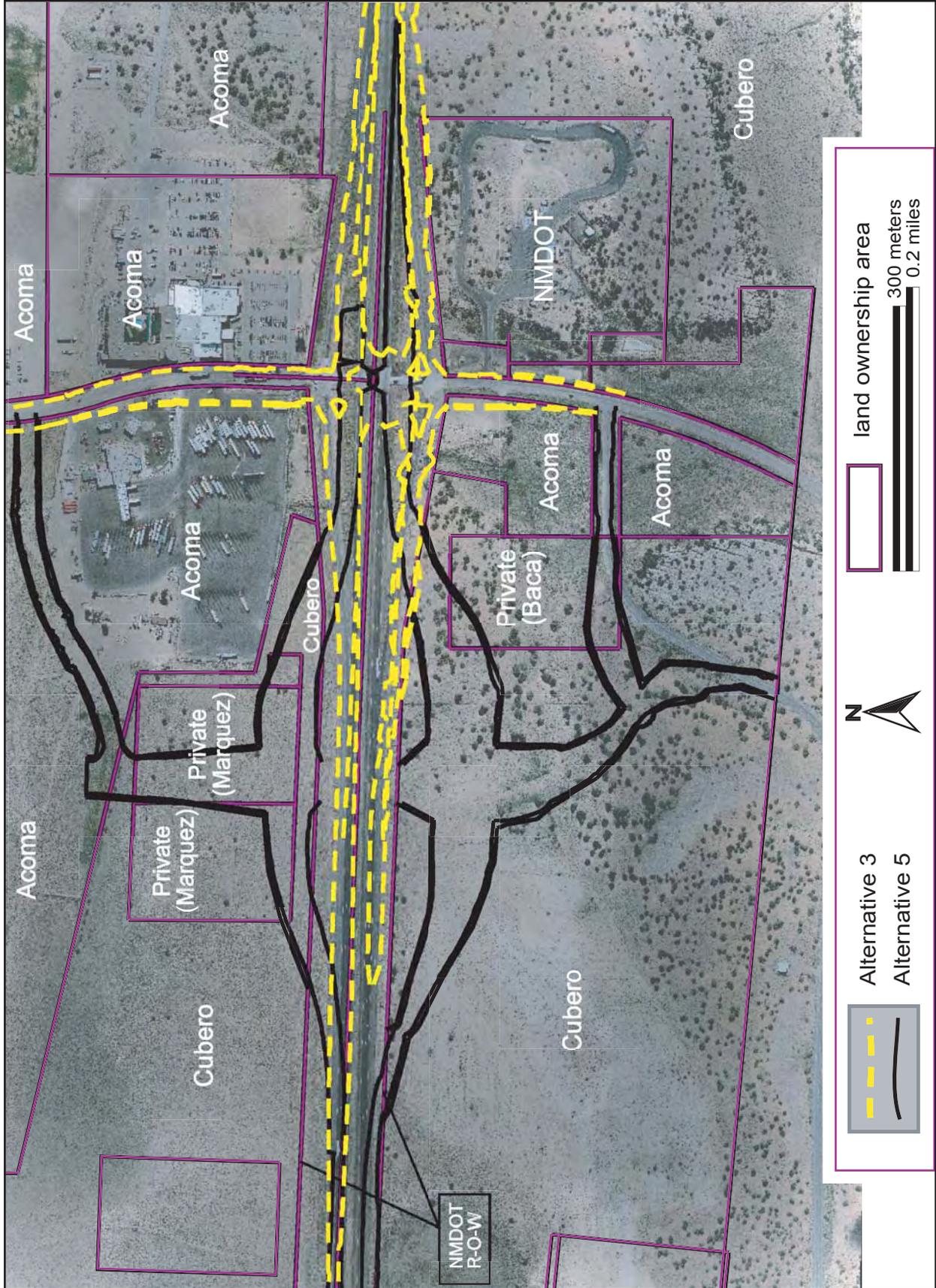


Figure 4. Land status with Alternatives 3 and 5.

ed above I-40 at the existing interchange location. The bridge would have a single span for a total structure length of 195 ft. In addition to the bridge, mechanically stabilized earth (MSE) retaining walls would be required at the abutments. Retaining walls would also be required along the new ramps. Alternative 3 would also include a 38.1 m (125 ft) extension of concrete box culvert sections under the new ramps. Drop inlet structures to the north of the interchange would be realigned to ensure effective conveyance of drainage water from off-site sources. Drainage originating from the proposed interchange and 244 m (800 ft) of proposed roadway for SP-30 would be collected by curb and median drop inlets. The collected flow would be conveyed through a trunk line. The trunk line would have outlet points that would not affect the interchange. Additional drainage improvements would include adding crossing culverts where they are needed along the proposed 244 m (800 ft) of SP-30, building median and curb drop inlets where roadway curb sections apply, and roadway fill/cut slopes to convey localized flows to crossing structures or drop inlets.

Alternative 5, the Compressed Diamond Interchange Shifted West Alternative, would result in the reconstruction of the interchange in a diamond configuration approximately 457 m (1,500 ft) west of the existing location (Fig. 3). The interchange would be constructed as an overpass with new on and off ramps. A new cross road would be aligned closely with Road "A" as shown in the master plan. The new cross road would be built approximately 183 m (600 ft) to the north and then connected with Plan Road "B," which would connect traffic back to the east where it would intersect with SP-30. The alignment of master plan Road "B" would be shifted to the south of the location shown in the master plan in an effort to minimize impacts to cultural resource sites. The connection of the new interchange to the south would be completed by constructing a new three-lane road section to an intersection point with SP-130. SP-130 would be realigned with a reverse "S" curve to the north. At the point of intersection between the two roadways, a roundabout intersection would be constructed. A new leg to the east would be built to provide a connection back to SP-30. There would not be any reconstruction of I-40

required with this alternative. SP-30 would remain in service as a local access road. The existing bridge structures would be widened to accommodate new acceleration and deceleration lanes for the eastbound on-ramps and westbound off-ramps. The existing interchange on and off ramps would be removed after completion of the new interchange.

The off-ramps would have deceleration lanes that extend parallel to I-40 prior to the ramps divergence from the mainline. On-ramps would have acceleration lanes parallel to I-40 to allow for adequate heavy vehicle acceleration onto I-40. The new on and off-ramps would have full access control. The north and south connection roads will have limited access control management, negotiated, and approved by the NMDOT. Road "B" would have its access control designated by the Pueblo of Acoma. Access control along SP-30 will remain limited. Sidewalks would be constructed on both sides of the new cross road. A sidewalk or pedestrian path would be constructed on one side of SP-30 to connect the Acoma businesses with the NMDOT rest area.

Alternative 5 includes one new bridge and utilizes two existing bridges (bridge numbers 6397 and 6398) with one bridge requiring widening. Bridge number 6397 would be widened to accommodate the proposed typical section and alignment in order to carry the transition lane of the new eastbound on-ramp. The new bridge would have two 30 m (100 ft) spans for a total structure length of 61 m (200 ft). It would have MSE retaining walls at the abutments.

The west concrete box culvert would be extended along with construction of a transition structure to collect off-site runoff. An approximate 15 m (50 ft) extension would be needed north of I-40 and an additional 36.6 m (120 ft) extension south of I-40. Realignment of drop inlets would be needed to ensure conveyance of drainage from off-site areas. Drainage across Road "A," Road "B," and the new connection to SP-30 and SP-130 would be achieved with circular metal pipe structures. These circular metal pipe structures would be located at various terminus points along existing flow paths. Flows originating from the future overpass crossing of Road "A" would be managed with deck drains and ground swales. Additional

drainage improvements would include adding crossing culverts at the new connection to SP-30 and SP-130 and building median and curb drop inlets where roadway curb sections are proposed.

Initial field surveys were conducted in two phases by archaeologists from Marron and Associates, Inc. of Albuquerque, New Mexico. Detailed description of project location and scope is provided in M. E. Brown and K. L. Brown (2005) and will not be repeated here. The inventory identified eleven previously documented and five new archaeological sites. Of the 16 sites, two

(LA 89019 and 89020) have Archaic components, four (LA 89019, 104153, 10851 1, and 108512) have Pueblo I components, six (LA 54902, 89019, 99628, 10851 1, 108512, 1 17550, and 145683) have Pueblo II components, six (LA 89019, 89020, 98452, 145143, 145684, and 149868) have Pueblo II–III components, two (LA 145685 and 149867) have unknown Puebloan components, and one (LA 89019) has a historic component. From this site inventory, only LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 146898 require a research design and data recovery plan and project.

ENVIRONMENTAL SETTING

(After M. E. Brown and K. L. Brown 2005)

PHYSIOGRAPHY AND GEOLOGY

The I-40 Exit 102 improvement project, which is on Pueblo of Acoma, Town of Cubero Grant, NMDOT land acquired from private sources, and private lands, lies within the Acoma-Zuni Section of the Colorado Plateau Physiographic Province in northwestern New Mexico (Hawley 1986:24). This section is the southeastern subdivision of the Colorado Plateau and "is characterized by extensive upper Cenozoic volcanics that form a discontinuous cover on erosional and constructional landforms" (Hawley 1986:25). Prominent features of the Acoma-Zuni Section in the general project vicinity include Mount Taylor, basalt-capped mesas, and the Malpais Lava Field. Mount Taylor is "a composite stratovolcano of Pliocene age" (Hawley 1986:25) that was formed by a series of successive lava and ash flows. The older flows are basalt and the younger are dacite and andesite (Chronic 1987:50). Horace Mesa, just north of the project area, is one of four lava-covered mesas forming Mount Taylor's platform (Robinson 1994:110). An obsidian source on Horace Mesa, which is of better quality than that of East Grants Ridge (Shackley 1999:2), may have been the origin of the obsidian artifacts recorded during the present cultural resource survey. The Malpais Lava Field, just west of the project area, was formed by a series of lava flows originating from small volcanoes 32.2 to 48.3 km (20–30 miles) southwest of I-40. The youngest flow—the McCarty Lava Flow—is about 1,000 years old and forms the eastern portion of the Malpais (Chronic 1987:48–49; Hawley 1986:25).

Locally, the project area is bounded on the southeast by Cubero Mountain (Flower Mountain) and on the south by the Rio San Jose. The project area is in a broad valley and low uplands. The terrain within the proposed project corridor varies from flat to rolling. Project elevations range from 1,875 to 1,885 m (6,150–6,185 ft).

SOILS

The soils of the project area are broadly classified as Rock Land-Torriorthents-Argiustolls (Maker et al. 1978, map). This association occurs on gently to strongly sloping mesa tops, steep to very steep mesa side slopes and escarpments, and gently to strongly sloping alluvial fans and narrow valley bottoms. The more extensive soils of this association are residual, developing from weathered sedimentary rocks, primarily sandstone or interbedded sandstone and shale. As a result, these soils are often shallow and gravelly or rocky. Sandstone and shale outcrops occur along mesa rims and on steep canyon walls and escarpments (Maker et al. 1978:93).

Of the various soil units that occur within the proposed project corridor, five—the Dumps-Pits Complex, the Skyvillage-Rock Outcrop-Bond Complex, the Sparank-San Mateo Complex, the Hagerman-Bond Association, and the Penistaja-Oelop Association—are associated with sites recorded during the cultural resource survey. Two of these soil units—the Hagerman-Bond Association and the Penistaja-Oelop Association—are major units within the proposed project area of potential effect (APE). These five soil complexes and associations are described below. Minor soil units in the project APE are not described.

Dumps-Pits Complex (230)

The Dumps-Pits Complex (5 to 90 percent slopes) is on hills and flats. Areas are irregular in shape and are 200 to 1,000 acres in size. They are generally barren of vegetation. Dumps occur as areas of waste rock, mine spoil, and other refuses. Pits consist of open excavations from which soil material and some rocks have been removed (Parham 1993:34).

Skyvillage–Rock Outcrop–Bond Complex, 3 to 40 Percent Slopes (251)

The Skyvillage–Rock Outcrop–Bond Complex is 40 percent Skyvillage sandy loam on 3 to 40 percent slopes, 30 percent Rock Outcrop, and 20 percent Bond sandy loam, 3 to 8 percent slopes. The Skyvillage soil is on benches and the lee side of mesas and edges of mesa tops. The Rock Outcrop is on escarpments and the Bond soil is on benches and the edges of mesas. The Skyvillage soil is shallow and well drained, having formed in eolian material derived mostly from sandstone. Generally, the surface layer is light yellowish brown sandy loam about 10.2 cm (4 inches) thick. The underlying material is dark yellowish brown sandy loam about 20.3 cm (8 inches) thick. Sandstone is at a depth of about 30.5 cm (12 inches). Permeability is moderately rapid and water capacity is very low, with medium runoff and moderate water erosion (Parham 1993:34–35).

The Rock Outcrop is barren or nearly barren areas of exposed sandstone on benches and escarpments. The Bond soil is shallow and well drained, having formed in eolian material derived mostly from sandstone. Generally, the surface layer is brown sandy loam about 10.2 cm (4 inches) thick. The subsoil is reddish brown sandy clay loam about 15.2 cm (6 inches) thick. Sandstone is at a depth of 25.4 cm (10 inches). Permeability is moderate and water capacity is very low. Runoff is medium and water erosion is moderate. Wind erosion can be severe (Parham 1993:35).

Sparank–San Mateo Complex (257)

The Sparank–San Mateo Complex is comprised of 50 percent Sparank loam with 1 to 5 percent slopes and 40 percent San Mateo loam with 1 to 5 percent slopes. Smaller soil units comprise the remainder 10 percent of the complex (Parham 1993:35).

Sparank soil is deep and well drained. It formed in mixed alluvium. Permeability is slow and available water capacity is very high. Runoff is slow and the water erosion hazard is moderate. The wind erosion hazard is severe. The soil is occasionally flooded for brief periods during the summer unless it is protected or gullied. Typically, the

Sparank soil varies with depth from a yellowish brown clay loam (0–5 cm [0–2 inches]) to light yellowish brown and light olive brown silty clay to a depth of 1.52 m (60 inches) (Parham 1993:35).

San Mateo soil is deep and well drained. It formed in mixed alluvium with moderate permeability. Its available water capacity is high. Runoff is medium and the hazard of water erosion is moderate. The hazard of soil blowing is severe. The soil is occasionally flooded for brief periods during the summer unless it is protected or gullied. Typically, the San Mateo soil varies with depth from a light yellowish brown loam (0–5 cm [0–2 inches]) to light olive brown loam and sandy clay loam (5–69 cm [29 inches]) to a light olive brown sandy clay loam that has thin strata of sandy loam to silty clay loam to a depth of 1.52 m (60 inches) (Parham 1993:35). None of the 16 sites in the project APE is on Sparank–San Mateo Complex soils.

Hagerman–Bond Association, 1 to 10 Percent Slopes (625)

The Hagerman–Bond Association (1 to 10 percent slopes) is on hills, ridges, mesa tops, and cuestas. This unit consists of 55 percent Hagerman fine sandy loam and 30 percent Bond sandy loam. The former occurs on hills, ridges, mesa tops, and the lower dip slopes of cuestas. The latter occurs on hilltops, ridges, mesa tops, and the upper dip slopes of cuestas. Small areas of other soils represent 15 percent of the unit (Parham 1993:78).

The Hagerman soil formed in eolian and alluvial material derived primarily from sandstone. This soil is moderately deep and well drained. Runoff is medium and the water erosion hazard is moderate. The wind erosion hazard is severe. Typically, the Hagerman soil varies with depth from a brown sandy loam (0–8 cm [0–3 inches]) to a dark brown fine sandy loam (8–15 cm [3–6 inches]) to a brown sandy clay loam (15–58 cm [6–23 inches]) to a strong brown and light brown sandy clay loam (58–86 cm [23–34 inches]). Sandstone occurs at a depth of 86 cm (34 inches) (Parham 1993:78).

The Bond soil formed in eolian material derived primarily from sandstone. This soil is shallow and well drained. Runoff is medium and the water erosion hazard is moderate. The wind ero-

sion hazard is severe. Typically, the Bond soil varies with depth from a brown sandy loam (0–13 cm [0–5 inches]) to a dark brown sandy clay loam (13–38 cm [5–15 inches]) to a strong brown sandy clay loam (38–46 cm [15–18 inches]). Hard sandstone occurs at a depth of 46 cm (18 inches) (Parham 1993:78–79). Five of six archaeological sites requiring data recovery—LA 54902, LA 89019, LA 89020, LA 145685, and LA 146898—are on the Hagerman-Bond soil association.

Penistaja-Oelop Association, 0 to 5 Percent Slopes (645)

The Penistaja-Oelop Association (0 to 5 percent slopes) is on fan terraces and in swales. This unit consists of 60 percent Penistaja sandy loam and 25 percent Oelop loam. The former occurs on fan terraces. The latter occurs in swales. Small areas of other soils represent 15 percent of the unit (Parham 1993:81).

The Penistaja soil formed in mixed alluvium reworked by wind. This soil is deep and well drained. Permeability is moderate. Runoff is medium and the water erosion hazard is moderate. The wind erosion hazard is severe. Typically, the Penistaja soil varies with depth from a brown sandy loam (0–8 cm [0–3 inches]) to a strong brown sandy clay loam (38 cm [15 inches]) thick to a light brown and strong brown sandy clay loam to a depth of 1.52 m (60 inches) (Parham 1993:81).

The Oelop soil formed in mixed alluvium. This soil is deep and well drained. Permeability is moderately slow with available water capacity very high. Runoff is medium and the water and wind erosion is moderate. Typically, the Oelop soil varies with depth from a yellowish brown loam (0–8 cm [0–3 inches]) to a brown clay loam (33 cm [13 inches]) thick to a yellowish brown clay loam and loam to a depth of 1.52 m (60 inches) (Parham 1993:81–82). One of the six sites, LA 108511, is on the Penistaja-Oelop soil association.

CLIMATE

The project area has a semiarid continental climate characterized by cold winters and warm summers. The average annual precipitation is 229 to 305 mm (9–12 inches). Most of the precipitation falls from

June through October in the form of brief, often heavy, thunderstorms. Occasionally, thunderstorms are accompanied by hail and strong, gusty winds. The Gulf of Mexico is the main source of moisture during this period. During winter, precipitation is provided by eastward-moving Pacific Ocean storms. Most of the moisture, however, is lost in the mountains west of New Mexico. Winter precipitation is usually light. The average annual snowfall ranges from 0.3 to 1.2 m (1–4 ft) and falls from November through March. In general, precipitation varies from month to month and from year to year (Parham 1993:2–3).

The average annual temperature ranges from 54°F (12°C) at lower elevations to 47°F (8°C) at higher elevations. The average annual temperature at Grants is 50°F (10°C). The average number of days with freezing temperatures ranges from 150 to 200. The average frost-free season ranges from 110 days at El Morro National Monument to 156 days at Laguna. Winds are light throughout most of the year, averaging 16 km (10 miles) per hour at Acomita, with March as the windiest month. Winds are primarily from the west (Parham 1993:3, 170).

SURFACE WATER

The project area is east of the Continental Divide, in the upper portion of the Rio San Jose basin. The Rio San Jose, the nearest perennial stream, is 1,524 m (5,000 ft) southwest of the I-40 Exit 102 overpass. The river has its headwaters in the Zuni Mountains and drains much of the Acoma-Zuni Section before emptying into the Rio Puerco. The Rio San Jose is the Rio Puerco's major tributary, but the former itself has few perennial reaches (Hawley 1986:25). "Most narrow, deeply entrenched valleys of the Rio San Jose system are south and east of the Mount Taylor volcanic field" (Hawley 1986:25). Just north of the river, springs and seeps are present along the base of Horace Mesa. The project area itself, however, is dissected by intermittent drainages.

VEGETATION

The project area lies within the Upper Sonoran Zone (Bailey 1913:27). The vegetation of the proj-

ect area is variously classified as Plains–Mesa Grassland and Juniper Savanna (Dick-Peddie 1993a, 1993b:86, 102) and Plains and Great Basin Grassland and Great Basin Conifer Woodland (Brown and Lowe 1994). The Plains–Mesa Grassland is the most extensive grassland community in New Mexico. As a result of grazing, farming, and urbanization, most of the areas in New Mexico historically occupied by this plant community have changed to juniper savanna at the high boundaries and to desert grassland at the low boundaries. In climax condition, Plains–Mesa Grassland consists almost entirely of grasses. Transitional areas from grassland to desert grassland vegetation are subtle and extensive. Grasses include grama (*Bouteloua* spp.), three-awn (*Aristida* spp.), dropseed (*Sporobolus* spp.), muhly (*Muhlenbergia* spp.), buffalograss (*Buchloe dactyloides*), and Indian ricegrass (*Oryzopsis hymenoides*). Major shrubs include fourwing saltbush (*Atriplex canescens*), rabbitbrush (*Chryso-thamnus nauseosus*), broom snakeweed (*Gutierrezia sarothrae*), sagebrush (*Artemisia* spp.), cholla and prickly pear (*Opuntia* spp.), and yucca (*Yucca* spp.). Forbs include prairie clover (*Petalostemum* spp.), prairie coneflower (*Ratibida tagetes*), and globemallow (*Sphaeralcea* spp.) (Dick-Peddie 1993b:104, 113–115). The project area is within the Plains–Mesa Grassland. Vegetation noted in this portion of the project area during the cultural resource survey includes various grasses (e.g., dropseed, grama), rabbitbrush, snakeweed, cholla, prickly pear, fourwing saltbush, widely scattered juniper (*Juniperus*), and an occasional piñon (*Pinus*).

Juniper Savanna, an ecotone between woodland and grassland, is broad and extensive in New Mexico. "The transition from woodland to grassland involves a marked decrease in the density of trees, accompanied by reduction to a single tree species, usually a juniper" (Dick-Peddie 1993b:

91). In New Mexico, the juniper species of the juniper savanna is usually the one-seed juniper (*J. monosperma*). Although most of the Juniper Savanna in the state has little or no shrub component, there are areas in northwestern New Mexico where sagebrush or shadscale (*Atriplex confertifolia*) are dominant shrubs (Dick-Peddie 1993b:91). Shrubs noted within the Juniper Savanna portion of the project area during the cultural resource survey include rabbitbrush, snakeweed, prickly pear, cholla, barrel cactus, narrowleaf yucca, and banana yucca (*Y. baccata*). Juniper is the dominant tree but piñon is also present.

FAUNA

The project area and vicinity contain or formerly contained a variety of vertebrate fauna (e.g., Findley et al. 1975). This includes various mice, rats, hawks, owls, lizards, snakes, and carnivores. The mule deer (*Odocoileus hemionus*), wapiti (*Cervus elaphus*), pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), white-tailed prairie dog (*Cynomys gunnisoni*), cottontail (*Sylvilagus* spp.), black-tailed jackrabbit (*Lepus californicus*), woodrat (*Neotoma* spp.), and turkey (*Meleagris gallopavo*) were important meat resources for the prehistoric and early historic inhabitants of the area. Many animals—bears (*Ursus* sp.), wolves (*Canis lupus*), coyotes (*Canis latrans*), bobcats (*Felis rufus*), striped skunks (*Mephitis mephitis*), gray foxes (*Urocyon cinereoargenteus*), eagles, hawks, ravens (*Corvus corax*), turkeys, and various perching birds—were also procured as raw material sources (e.g., pelts, hides, feathers, bones) for tools, clothing, ornaments, and ceremonial uses. Animals noted in the project area during the present cultural resource survey include cottontail and jackrabbit.

CULTURE HISTORY

(after M. E. Brown and K. L. Brown 2005)

The following brief overview of the culture history of the project area is based in part on Tainter and Gillio (1980) and on Stuart and Gauthier (1984). Reports by Broster and Harrill (1982), Wase et al. (2000), and others are also used. This culture history was adapted from the inventory report by M. E. Brown and K. L. Brown (2005).

PALEOINDIAN PERIOD (10,000–5500 B.C.)

The earliest substantiated cultural manifestation in the Southwest, the Paleoindian period, can be divided into three subperiods or complexes—Clovis (10,000–9000 B.C.), Folsom (9000–8000 B.C.), and Plano (8000–5500 B.C.)—named for different cultural groupings. Stylistically distinct projectile points associated with now-extinct late Pleistocene and early Holocene megafauna characterize these complexes. In addition, Paleoindian sites are typically identified by lithic assemblages that exhibit a very refined and standardized technology. Clovis components are characterized by large lanceolate spear points with a single short basal flute on both faces. The Clovis toolkit also includes spurred endscrapers; large, unifacially flaked side scrapers; keeled scrapers on large blades; flake knives; backed, worked blades; graters; perforators; shaft straighteners; and bone points and foreshafts (Gunnerson 1987:10). Folsom assemblages are characterized by the presence of small, finely made diagnostic lanceolate projectile points with a single flute on each face, extending almost the entire length of the point. Technologically, the Folsom point developed from the preceding Clovis point form. Plano complexes are characterized by a variety of projectile point types that include laterally thinned, indented base, and constricted base series. Plano complex projectile points lack flutes and consist, instead, of large lanceolate forms with basal grinding and large parallel flaking (Wheat 1972; Wormington 1957). The Plainview complex contains laterally thinned points—Midland, Plainview, Meserve, Milnesand, and Frederick—and is generally considered the

earliest Plano complex. The indented base series includes Firstview, Alberta, and Cody complex points, such as Eden and Scottsbluff. Agate Basin and Hell Gap points comprise the constricted base series (Cordell 1979a:21).

The basic adaptive strategy recognized for the Paleoindian period was a subsistence economy that focused on the procurement of a limited number of key resources, especially megafauna (e.g., mammoth, bison). Because the locations of residential camps probably depended on the location and size of game herds, Paleoindian groups were undoubtedly highly mobile. Although most excavated Clovis sites are kill sites in which Clovis points are associated with mammoth bones, the bones of much smaller animals—bison, horse, camel, cervids, canids, pronghorn, jackrabbit, birds—have also been recovered from Clovis processing localities. It has been suggested that Clovis hunters may have been scavengers of mammoth and hunters of bison and other diverse species (Cordell 1979a:19–20). The meat diet was probably supplemented with nuts, berries, tubers, and seeds. Due to climatic change and/or overkill, mammoth became extinct and were replaced by bison as an important meat source for Paleoindian populations. Folsom points have been found in association with a now-extinct form of late Pleistocene bison—*Bison antiquus*. Pronghorn, canid, and rabbit bones have also been recovered from Folsom sites (Frison 1978, 1991). The earliest evidence for communal hunting occurs with Folsom assemblages. These communal hunts required greater social organization and control than that evidenced in Clovis sites (Frison 1978:243–250, 1991:276–288). Folsom assemblages are indicative of a hunting and gathering subsistence economy that focused on the seasonal availability of animal and plant resources. Although many recorded Plano sites in the western United States represent mass bison kills, campsites have also been reported. The earliest Plano complexes were frequently associated with now-extinct forms of bison, but by 7000 B.C., only modern fauna were available

(Cordell 1979a:20, 1997; Judge 1982:48–49).

Paleoindian remains in the general project area are represented primarily by isolated diagnostic projectile points. Folsom points have been found in the Grants area, northwest of the current project area (Mabry et al. 1996:156). Points representing the various Paleoindian complexes have also been reported for Cebolleta Mesa, just southwest of the project area (Broster 1982:74–81). In addition, Judge (1973:28, 63) recorded Paleoindian sites along the Rio San José, 16 to 24 km (10–15 miles) east of Cebolleta Mesa. A basal fragment from a probable Midland point was observed at LA 89019 suggesting that Paleoindian sites are nearby, if LA 89019 lacks a recognizable Plainview component.

The paucity of recorded Paleoindian sites in the region is partly due to low visibility resulting from more recent soil deposition that has covered Pleistocene deposits. This is the case of a site, west of Cebolleta Mesa, that Dittert (1959:516) reported as having a buried Paleoindian component. Many known Paleoindian sites occur in areas of severe erosion (Cordell 1979a:133). In addition, low Paleoindian site recognition has resulted from the difficulty in distinguishing such sites from lithic scatters of other cultural periods. Both Paleoindian and Archaic sites are difficult to identify in the absence of diagnostic artifacts, primarily projectile points. Undoubtedly, some Paleoindian manifestations lacking diagnostic artifacts have been misidentified as Archaic or recorded as "unknown."

ARCHAIC PERIOD (5500 B.C.–A.D. 400)

Paleoenvironmental data suggest the Paleoindian period was marked by fluctuating climatic changes that decreased effective moisture. By 5500 B.C., as a result of the cumulative effect of these changes, the environment of northwestern New Mexico was probably unable to support large herds of herbivores, such as bison. Paleoindian groups, therefore, probably abandoned the area (Irwin-Williams 1973:4; Irwin-Williams and Haynes 1970). Because no generic connection was discerned between the late Paleoindian and Early Archaic occupations of the region, Irwin-Williams (1973:4–5) postulated a hiatus. Judge (1982:49), however, contends Early Archaic phases (e.g., Jay

and Bajada) represent a basically Paleoindian (i.e., focal) hunting adaptation to essentially modern faunal and floral resources. If Judge is correct, the Early Archaic artifact assemblages of northwestern New Mexico may reflect technological adjustments to a changing resource base by Paleoindian groups present in the area, rather than indicating an influx of new peoples (Cordell 1979a:25–26; Stuart and Gauthier 1984:33).

During the Archaic period (5500 B.C.–A.D. 400), the subsistence pattern shifted from a focus on large mammal procurement to the hunting of smaller mammals and to the gathering of wild plant foods. In other words, the main Archaic adaptation was a "diffuse" economy in which a wide variety of plant and animal resources were exploited (Judge 1982:49). Consequently, the Archaic settlement pattern reflects reoccupation of areas where the distribution and density of key plant resources could be predicted on a seasonal basis.

Maize horticulture first appeared in the Southwest between 1500 and 1000 B.C. (Cordell 1997:129). Although maize was not a dominant component of the Late Archaic subsistence strategy, Huckell (1995:15–16) has proposed replacing the term Late Archaic with the name Early Agricultural period. This new designation recognizes the most important cultural development in the Southwest between 1500 B.C. and A.D. 200—the appearance and spread of agriculture.

Archaic sites are usually identified as lithic artifact scatters with fire-cracked rock, hearths, specific projectile point types, and ground stone tools—basin metates, cobble manos. Pottery is absent. The presence of fire-cracked rock and the concomitant absence of pottery are commonly used to identify Archaic sites that lack diagnostic projectile points. The Archaic is also associated with a biface-oriented chipped stone technology and a diversity of lithic raw materials (Lintz et al. 1988:135).

The Oshara Tradition is the most commonly used cultural-temporal framework for the Archaic in the project area. Defined by Irwin-Williams (1973) on the basis of work in the Arroyo Cuervo area, southwest of San Ysidro, between the Rio Puerco and Jemez River, the Oshara Tradition is the hunter-gatherer predecessor of the Puebloan

period. The Oshara is divided into five Archaic phases—Jay (5500–4800 B.C.), Bajada (4800–3200 B.C.), San Jose (3200–1800 B.C.), Armijo (1800–800 B.C.), and En Medio (800 B.C.–A.D. 400). The En Medio phase spans most of the Basketmaker II period (A.D. 1–500), which is considered transitional between the Late Archaic and early Puebloan periods. The Oshara phases are probably indicative of successive adaptations to fluctuating climatic conditions, population size, and subsistence emphasis. "The Jay and Bajada phases may reflect generalized hunting and foraging strategies by small groups; the San Jose, Armijo, and En Medio phases may represent increasingly heavy reliance on plant foods by larger groups in an increasingly crowded landscape" (Wase et al. 2000:1.21). Agriculture was adopted during the Armijo phase.

Although the Oshara sequence is often applied unquestioningly to Archaic manifestations in the region, many Archaic projectile points found in the area are types reflecting another Archaic sequence, the Cochise Tradition, rather than the Oshara (Elyea et al. 1994:7). Of the two Archaic projectile points found during the present survey, one—a Jay-like point (LA 89019) and an En Medio-like point (LA 89020)—are types associated with the Oshara. A third dart point basal fragment (LA 89020) is too small to assign to a type. Except for these points, no other Archaic cultural material was found during the surveys. Based on previous surveys in the project area, LA 89019 has Early and Middle Archaic components, LA 89018 has Middle and Late Archaic components, and LA 89020 has a Late Archaic component.

PUEBLOAN PERIOD (100 B.C.–A.D. 1540)

Although maize and other cultigens were introduced into the Southwest during the Late Archaic, agriculture was not a major subsistence strategy. The Puebloan period, however, was an era of increasing dependence on cultigens—maize, beans, squash—and of concurrent changes in sedentism and residence patterns. The phases described in the following are those of the sequence defined by Dittert (1959) for the Cebolleta Mesa area of the Acoma Cultural Province. Of the 16 sites, four (LA 89019, 104153,

108511, and 108512) have Pueblo I components, six (LA 89019, 99628, 108511, 108512, 117550, and 145683) have Pueblo II components, six (LA 89019, 89020, 98452, 145143, 145684, and 149868) have Pueblo II–III components, and two (LA 145685 and 149867) have unknown Puebloan components.

Basketmaker II (100 B.C.–A.D. 400)

Basketmaker II is considered transitional between the Late Archaic and early Puebloan periods. Several trends originating in the Late Archaic became more pronounced during Basketmaker II. These continuing trends included longer seasonal and probable year-round occupation of various locales, construction of storage units and more permanent habitations, and a greater dependence on cultigens, especially maize and squash. The subsistence economy also included the continued exploitation of wild plants and animals. Archaic technology carried over into Basketmaker II included the spear thrower (i.e., atlatl), cobble manos, basin metates, and basketry. Brown ware pottery appeared from the south late in the period (Reed et al. 2000; Vivian 1990:91; Wilson and Blinman 1994). Late Basketmaker II pottery includes Adamana Brown (Goetze and Mills 1993:89) and Lupton Brown.

Basketmaker III (A.D. 400–700)

Basketmaker III is the earliest Puebloan period. Major cultural changes included greater sedentism, more permanent architecture, an increased reliance on cultigens, production of reduction-fired pottery, and use of the bow and arrow. Local population densities increased during this period. Climatic changes favored greater sedentism and expanded horticulture (Vivian 1990:111–112). "Increased precipitation made zones that were formerly marginal for horticulture more productive, though at the same time areas at higher elevations became more precarious for farming because of colder temperatures and shorter frost-free periods" (Vivian 1990:112). Increased relative moisture, rising water tables, and aggrading alluvium allowed horticultural expansion into non-flood-plain areas. In addition, wild plant foods increased

in habitat area and density. Thus, it was possible to produce larger food surpluses (Vivian 1990:112).

More permanent Basketmaker III architecture in the Acoma area includes pit structures, surface structures, and slab-lined cists. The greater abundance of ground stone tools suggests an increased emphasis on plant food processing. Although the data are limited, the presence of marine shell and nonlocal lithic material is indicative of trade. Characteristic Basketmaker III pottery types include Lino Gray, Fugitive Red, La Plata Black-on-white, White Mound Black-on-white, Alma Plain, and San Marcial Black-on-white (Goetze and Mills 1993:89; Vivian 1990:131).

Dittert's (1959:523–524) White Mound phase (A.D. 700–800) is transitional between Basketmaker III and Pueblo I. Site types range from small villages of circular pithouse structures and slab-lined storage pits to low-density sherd scatters representing special activity sites and agricultural sites (Dittert 1959:523).

Sites are located in a variety of topographic settings, but a definite shift toward arable dunes and valley bottoms is evident as agriculture became increasingly important (Irwin-Williams 1973:15-16; Wozniak 1981:19). Some Basketmaker III sites occur in apparent defensive locations. Some researchers interpret these defensive locations as evidence of competition for resources between Archaic foragers and the emerging farmers (Ruppé 1966:325; Tainter and Gillio 1980:67).

Associated ceramic types consist mainly of Lino Gray and White Mound Black-on-white, with intrusive types including Alma Plain and Alma Neckbanded (Dittert 1959:523–524). San Marcial Black-on-white occurs on the eastern edge of the province. The problem with distinguishing White Mound Black-on-white from similar types induced recent investigators of Cebolleta Mesa (Decker, in Broster and Harrill 1982:119) to group all unpolished gray sherds with typical early designs in mineral paint with La Plata Black-on-white. These researchers proposed that the early end of the phase be modified to correspond with dates associated with La Plata Black-on-white (A.D. 600 to 800). This difference in interpretation between recent investigators and Dittert and Ruppé may reflect temporal range within the White Mound phase. In this way, differentiation between pol-

ished and unpolished varieties of White Mound and San Marcial coincides with Hurst's classification for the Middle Rio Puerco (Irwin-Williams and Baker 1991).

Pueblo I (A.D. 700–900)

The Pueblo I period was characterized by a number of social and technological changes including more permanent architecture, larger storage facilities, population dispersal, greater standardization in pottery production, and increased trade. Deteriorating environmental conditions—decreased regional moisture, a probable temperature increase, lower groundwater levels, and alluvial degradation—triggered adaptational responses by Pueblo I populations. In early Pueblo I, horticulture had expanded into nonfloodplain areas with high water tables, good alluvium, and associated wild plant foods. However, as climatic and environmental conditions began worsening in the mid-eighth century, previously dispersed populations aggregated on floodplains and a major episode of erosion and arroyo cutting forced groups to keep moving ahead of the headward entrenchment of streams. Rapid fluctuation in rainfall made farming more precarious and curtailed the stockpiling of surpluses (Vivian 1990:135–136).

Populations in some areas were more mobile, with a segment leaving seasonally and returning for the winter and/or summer (Schmader 1994). Dispersed settlement occurred near or on alluvial flats. In the Acoma area, there was a move to higher benches and mesa tops after A.D. 800. Pueblo I habitation sites generally consisted of a linear arrangement of four to ten contiguous surface rooms with one to three deep pit structures to the south or southeast. The surface rooms were usually one room deep and rarely curved (Vivian 1990:149). The increased importance of surplus food storage "is reflected in the more frequent use of masonry for above-ground store rooms and essentially equal space being devoted to living and storage in roomblocks" (Vivian 1990:146).

Effective moisture decreased and precipitation oscillated increasingly from year to year during Pueblo I. Although most aggregated settlements were dependent on maize-based agriculture, wild

plant foods and hunting were probably still very important in years when precipitation did not permit excess agricultural production to last through the winter. Food remains from excavated sites indicate mixed reliance on horticulture, gathering, and hunting (Vivian 1990:136, 150, 152).

Changes in pottery technology occurred during Pueblo I. Neck-banding on culinary vessels appeared early in the period and eventually culminated in totally corrugated vessels. The latter treatment increased heat shock resistance while the former decreased incidence of boil over (Pierce 1999). The production of decorated white wares increased (Vivian 1990:146), and regional patterns of scattered specialized production are expected to apply to the Acoma area (Wilson and Blinman 1995). Characteristic early Pueblo I (A.D. 700–800) pottery types include Lino Gray, Fugitive Red, Kana'a Neck-banded, La Plata Black-on-white, and White Mound Black-on-white. Late Pueblo I (A.D. 800–900) pottery types include Kana'a Neckbanded, Narrow Neckbanded, White Mound Black-on-white, Kiatuthlanna Black-on-white, and Red Mesa Black-on-white (Goetze and Mills 1993:89).

Trade with, or an intrusion of, Mogollon peoples to the south fluctuated during the period. There is ample evidence of cultural networks in the early Pueblo I, with a later retraction or decrease in these networks (Vivian 1990:148–149).

The Kiatuthlanna phase (A.D. 800 to 870) is characterized by a continued emphasis on agriculture and nearly full sedentism. Pithouses were the dominant architectural form, with the addition of jacal surface structures arranged in a crescent-shaped plan (Ruppé 1966:326). Sites are found on secondary benches, mesa tops, and sandy slopes of tributary drainages. Associated ceramics consist mostly of Kiatuthlanna Black-on-white, Kana'a Gray, Lino Gray, and intrusive sherds of San Juan Red Ware, Alma Plain, and Alma Neckbanded (Dittert 1959:528). Distinguishing Kiatuthlanna Black-on-white from Red Mesa Black-on-white, the diagnostic type of the next phase, can be difficult and may result in erroneous phase designations (Decker, in Broster and Harrill 1982:120). The transition to above-ground structures during the Kiatuthlanna phase coincides with architectural trends in the Middle Rio Puerco, while the

Albuquerque District still shows an emphasis on subterranean structures.

Pueblo II (A.D. 900–1100)

The Pueblo II period is marked by greater sedentism, increased reliance on cultigens, and the greater dispersion of peoples (Vivian 1990:167). Pueblo II peoples built small, linear, above-ground habitation structures or room blocks but still retained the pit structure form as an auxiliary habitation or religious structure (i.e., kiva). Initially, there was a trend for aggregated settlements to be at higher elevations in riverine settings. By A.D. 1000, in nearly all areas of New Mexico, there was a reversal in this trend. Higher elevation sites were abandoned in favor of lower elevation basin settings (Stuart and Gauthier 1984:412).

The development of Chacoan communities began, marked by the construction of planned, multi-storied "Great Houses" and large "Great Kivas." There was also a continuation of small house sites with linear pueblos associated with subterranean kivas (Vivian 1990:203–206). The population probably increased throughout the period. Subsistence resource shortfalls may have become more common and maize-based farming became more intensive, with water control and conservation features becoming more common (Vivian 1990:214–215). An extensive road system was built, extending in a general radial pattern from Chaco Canyon to the margins of the San Juan Basin (Nials et al. 1983) but also serving local ritual access needs (Roney 1992). Candelaria Ruin (formerly Las Ventanas), just west of the project area, on the eastern edge of the malpais, is a Chacoan outlier. The Dittert site (LA 11723), another Chacoan outlier, is south of the project area (Robinson 1994:80, 82–83).

Red Mesa phase (A.D. 870–950) subsistence focused on agriculture supplemented by hunting and gathering. Jacal architecture continued early into the phase, with the addition of coursed-masonry rooms. Later in the phase, masonry structures appeared; they consisted of straight, double-tiered room blocks and crescentic and L-shaped units (Dittert 1959:534). Occupation of higher topographic settings decreased, and site concentrations are found just above the points where canyons con-

strict. Other site locations include knolls and low benches on the sides of canyons, and open valley floors. Site types include habitation sites ranging from 1 to over 15 rooms and limited artifact scatters suggesting task-specific activities. Ceramic assemblages consist of Red Mesa Black-on-white, Socorro Black-on-white, Kana'a Gray, and exuberant corrugated. Intrusive types include Wingate Black-on-red, Alma Scored, San Francisco Red, Forestdale Smudged, and plain brown (Dittert 1959:536). Pilares Banded, a brown ware, appeared late in the phase.

Socorro Black-on-white makes its appearance during this phase; however, Ruppé (1966:326) feels that the type was derived from Kiatuthlanna Black-on-white rather than Red Mesa Black-on-white. He describes an early variety of Socorro Black-on-white that displays the blue-gray finish and hard, homogeneous paste characteristic of the better known, later variant. The absence of follow-up data for the inception of the Socorro Black-on-white type has kept later investigators from recognizing it earlier than A.D. 1050 in adjacent areas (Burns 1978; Warren 1982; Lang 1982). Decker (Broster and Harrill 1982:120) contends that more up-to-date tree-ring data on the chronological distribution of types make it unlikely that Socorro Black-on-white and Wingate Black-on-red can be considered diagnostic of the Red Mesa phase. Decker argues that the design styles of these types are more typical of phases postdating A.D. 1050.

Ruppé (1966:326) believes that Red Mesa phase sites in the Cebolleta Mesa area are similar to those of the Red Mesa Valley, 74 km to the northwest. He interprets the mixed building forms and influx of brown ware ceramics as evidence for three groups of people: indigenous Lobo Complex populations, immigrant Mogollons, and immigrant northerners (Tainter and Gillio 1980:60). Similarly, but for a later time period, Beal (1976) sees a dichotomy in the Malpais areas west of Cebolleta Mesa between jacal structures with 1 to 15 rooms and masonry structures of over 15 rooms. Jacal structures produced assemblages yielding higher frequencies of southern (Socorro Black-on-white), northwestern (Red Mesa and Gallup black-on-whites), and southern (brown wares) ceramics, while masonry structures yielded assemblages with higher frequencies of southwest-

ern ceramics (Cebolleta and Tularosa Black-on-whites and St. Johns and Wingate Black-on-reds). Beal interprets this pattern as evidence of sociocultural distinctions, while Tainter and Gillio (1980:60) suggest that the ceramic distributions reflect different economic ties of the inhabitants. Another interpretation would be that they are temporally distinct architectural and material cultural expressions.

In the Acoma Province, the Cebolleta phase marks a transition to larger residential sites. Common architecture includes masonry room blocks with the long axis running north and south and a plaza and kivas on the east side (Dittert 1959:541). Jacal structures are sometimes present within a group of contiguous masonry rooms, and specialized grinding rooms have been recorded. Site locations are similar to those of the Red Mesa phase, with a marked increase in the occupation of "mountain meadows" and a slight decline of occupation on flat-topped mesas (Dittert 1959:540).

Late Cebolleta phase ceramic assemblages are composed of Cebolleta Black-on-white, Socorro Black-on-white, Northern Gray Corrugated, and Pilares Banded; intrusive types include Gallup, Escavada, and Puerco varieties of Puerco Black-on-white, Reserve Black-on-white, Kwahe'e Black-on-white, Wingate Black-on-red, and Puerco Black-on-red (Dittert 1959:542-543).

Dittert (1959:543-545) and Ruppé (1966:327) interpret the wide range of intrusive pottery types as evidence of extensive exchange with surrounding areas. An increase in brown wares, especially on the southern portion of Cebolleta Mesa, is viewed by these researchers as a Mogollon intrusion. Ruppé (1966:327) reported assemblages dominated by Socorro Black-on-white, often associated with Los Lunas Smudged and Upper Gila Corrugated, in the Los Veteados area (southern Cebolleta Mesa) throughout the Cebolleta and Pilares phases.

In the northern district, ceramic assemblages contain higher frequencies of sherds from the north (Chaco area) and west (Cibola and eastern Arizona). Dittert (1959:545) suggested that the diffusion of traits from the west along the San José travel route contributed to similarities between the Acoma Province and the Cibola region. Along these lines, Tainter and Gillio (1980:60) argue that

intrusive ceramics may represent processes other than the intrusion of populations, such as changing trade patterns.

To the east along the Middle Rio San José, late Cebolleta phase ceramic assemblages, which could date to A.D. 1140, are composed of a combination of Gallup, Puerco-Escavada, Socorro, and Cebolleta Black-on-whites. This mix of types suggests that the Rio San José was used by groups that maintained contact with people from a variety of pottery-producing areas. Increasing numbers of Socorro Black-on-white and associated banded brown wares suggest increased contact between residents of the Middle Rio San José and the groups of the Socorro District to the south. Presence of southern pottery reflects the position of the Middle Rio San José on the northern border of the "Anasazi-Mogollon" contact zone (Danson 1957; Mera 1935).

Pueblo III (A.D. 1100–1300)

The Pueblo III period was one of great change in the Southwest. As the Chacoan system began disintegrating in the late eleventh century, Puebloan development emerged on the edges of the greater San Juan Basin in several highland areas—Mesa Verde, Zuni-Cibola, and Acoma—by the thirteenth century (Vivian 1990:331). "The twelfth century was, therefore, in many respects a transitional time between two periods of intense population aggregation and concentration of cultural energy in the long sequence of puebloan cultural growth" (Vivian 1990:331).

The period was one of population expansion and growth. The Pueblo III period also witnessed a growth in artistic development and intensive local specialization in artifact production (Dart 1982:43). In the Cebolleta Mesa area, the Early Pueblo III is marked by the first indications of occupation on a year-round basis. Villages occur along major drainages and on mesa tops (Ruppé 1966:328). An increase in site frequency during the Late Pueblo III suggests migration into the area from elsewhere. Sites were generally near good farmland, indicating intensive maize agriculture (Dittert 1959).

Within the Cebolleta Mesa area, the Pueblo III is represented by the Pilares (A.D. 1100–1200) and

Kowina (A.D. 1200–1400) phases. During the Pilares phase, site density in higher topographic settings declined. Sites are concentrated at canyon mouths, above and below canyon constrictions, and on low benches in lower canyons with easy access to arable land. Occupations at higher elevations decreased, and settlement shifted to flat-topped mesas by the end of the phase (Dittert 1959:548). Continued population aggregation resulted in a dichotomy between larger residential communities and small seasonally occupied field-house sites (Wozniak 1981:20; Ruppé 1966:329). Typical residential sites consist of masonry room blocks containing two rows of rooms. Some sites have an east-to-west long axis with a plaza on the south, and other sites have a north-to-south long axis with a plaza and kiva on the east (Dittert 1959:548). Adobe construction appears to be more common in the southern district (Ruppé 1966:329). The village of Acoma was established during the Pilares phase.

Common ceramic types include Cebolleta Black-on-white, Tularosa Black-on-white (Acoma variety), Tularosa Black-on-white (Tularosa variety), Socorro Black-on-white, Northern Gray Corrugated, St. Johns Polychrome, Pilares Banded, Pilares Fine Banded, and Los Lunas Smudged; intrusive types consist of Puerco Black-on-red, Snowflake Black-on-white, and possibly Tularosa Black-on-white (Tularosa variety) and St. Johns Polychrome (Dittert 1959:550). The number of intrusive ceramic types and the number of sites with trade wares drops sharply during the Pilares phase (Ruppé 1966:328). However, the areas of contact are similar to those of the Cebolleta phase.

Looking east between A.D. 1100 and 1150, the middle Rio San José ceramic assemblages are similar to those of the late Cebolleta phase. A dramatic decrease in Chaco series, Cibola White Wares (Windes 1981), and a corresponding increase of Socorro Black-on-white and associated plain and smudged brown wares can be found in assemblages from this period. The type most indicative of the end of the Classic Bonito phase, Chaco-McElmo Black-on-white, is absent from Middle Rio San José sites. Whatever Chacoan influence or contact had previously existed had appreciably waned by this time (Post n.d.), a pattern that occurred in Middle Rio Puerco ceramic assem-

blages as well (Burns 1978; Irwin-Williams and Baker 1991). Sites that are considered to postdate A.D. 1150 have ceramic assemblages dominated by Socorro Black-on-white, Los Lunas Smudged, Pitoche and Pilares Banded, and sherd-tempered gray indented corrugated. Only a very limited range of intrusive types from the middle and northern Rio Grande were present (Post n.d.). Use of the Middle Rio San José by Socorro district populations after A.D. 1150 is suggested. A similar trend, southern populations moving north into the Albuquerque area after A.D. 1100, is suggested by Lang (1982) and Warren (1980).

LA 2639 and LA 2640 are examples of small-scale residential sites that were excavated along Interstate 40, 12 miles west of Cubero. These house blocks lacked associated kivas but had living and storage rooms, suggesting seasonal occupation and social interaction with larger, aggregated villages, which typifies this period. Located only 4 km north of the project area, Cubero Ruin (LA 494) may have been a permanent residential village from which households established seasonal field residences along the Rio San José and its tributaries. An example of such a seasonal structure is present at LA 149867, which was recorded during the Acomita Exit 102 interchange inventory (M. E. Brown and K. L. Brown 2005).

During the Kowina phase, the population aggregated into large sites on high mesas and in wooded areas. Large defensive sites were built. These large villages have 200 or more rooms and they also have Great Kivas. Key pottery types consist of Tularosa Black-on-white, Kowina Black-on-white, St. Johns Polychrome, and other polychromes (Dittert 1959:553–554).

Pueblo IV (A.D. 1300–1540)

“Pueblo IV in the Southwest was characterized by a constriction of the area occupied and a general deterioration from the cultural peak of the Pueblo III” (Dart 1982:43). Within the Cebolleta Mesa area, the Pueblo IV period is characterized by population aggregation into a few large villages and by frequent abandonment of these communities (Cordell 1979b:146). Small sites overlook the confluence of tributaries with the Rio San José. In addition, small shelters were built against low

cliffs along the Rio San José (Dittert 1959:564).

The Pueblo IV period of the Cebolleta Mesa area is represented by the later part of the Kowina phase (A.D. 1200–1400) and by most of the Cubero phase (A.D. 1400–1600). During the early Pueblo IV, there was a general abandonment of the area, with some parts being occupied longer than others (Dittert and Ruppé 1951:121). In general, however, few sites survived the Kowina phase. During the Cubero phase, the population was concentrated at the village of Acoma. Farming sites, however, occurred along the Rio San José. Pottery from the Hopi, Zuni, and Rio Grande areas was introduced at Acoma during the Cubero phase. In addition, local glazewares were produced. Key pottery types consist of Pinnawa and Kwakina glazewares (Dittert 1959:564–566).

HISTORIC PERIOD (A.D. 1540–PRESENT)

The historic period begins with the first mention of Acoma in Spanish documents in 1539. Only LA 89019 and LA 149868 have late Territorial period components reflecting pastoral subsistence patterns within the shifting sociopolitical boundaries of Acoma Pueblo and the community of Cubero.

Pueblo of Acoma

The earliest reference to Acoma in Spanish documents occurred in 1539 when Fray Marcos de Niza returned from his expedition. Although he had not personally visited the “Kingdom of Acus” (Acoma), he had heard of its existence from informants while traveling toward the Seven Cities of Cibola (Zuni). “They [messengers] told me that beyond those seven cities there were other kingdoms named Marata, Acus [Acoma] and Totontec” (Barclay et al. 1994:49). Upon his return to Mexico City, Fray Marcos “declared that I took possession there of all the seven cities and of the kingdoms of Totontec and Acus [Acoma] and Marata, and that I did not go to them, in order that I might return to give an account of what I had done and seen” (Barclay et al. 1994:54).

The first documented Spanish entry into Acoma happened in 1540 during the entrada of Francisco Vázquez de Coronado. Hernando de Alvarado, one of Coronado's captains, was sent

east from Zuni and reached Acuco (Acoma) five days later. Alvarado described Acoma as "one of the strongest places that we have seen, because the city is on a very high rock, . . . The houses have three or four stories; the people are the same sort as those of the province of Cibola; they have plenty of food, of corn and beans and fowls like those of New Spain" (Winship 1933:129). Pedro de Castañeda, another member of Coronado's entrada, provides a fuller description of Acoma.

Captain Alvarado started on this journey & in five days reached a village which was on a rock called Acuco [Acoma], having a population of about 200 men. . . . The village was very strong, because it was up on a rock out of reach, having steep sides in every direction, and so high that it was a very good musket that could throw a ball as high. There was only one entrance by a stairway built by hand, which began at the top of a slope which is around the foot of the rock. There was a broad stairway for about 200 steps, then a stretch of about 100 narrower steps, and at the top they had to go up about three times as high as a man by means of holes in the rock, in which they put the points of their feet, holding on at the same time by their hands. There was a wall of large and small stones at the top, which they could roll down without showing themselves, so that no army could possibly be strong enough to capture the village. On the top they had room to sow and store a large amount of corn, and cisterns to collect snow and water. . . . They made a present of a large number of [turkey] cocks with very big wattles, much bread, tanned deerskins, pine [piñon] nuts, flour [corn meal], and corn. (Winship 1933:24)

The Rodriguez-Chamuscado expedition visited the pueblo in 1581 (Bolton 1921:167). Antonio de Espejo stayed at Acoma for three days in 1582 and noted the presence of irrigated agricultural fields in the Rio San José valley (Bolton 1916:183, 1921:168). "These people have their fields two leagues from the pueblo on a river of medium size whose water they intercept for irrigating purposes, as they water their fields with many partitions of water near this river, in a marsh" (Bolton 1916:183).

After establishing the first Spanish settlement in New Mexico in 1598, Juan de Oñate demanded that the Acoma submit to Spanish rule. Later that

same year, the Acoma revolted and killed several Spanish soldiers, including Oñate's nephew, Juan de Zaldívar. After crushing the revolt in early 1599, Oñate exacted a severe punishment upon the Acoma and their allies, including amputation of feet and hands (Minge 1991:14). Neglecting to mention this punishment in a letter to the viceroy, Oñate did tell of the pueblo's destruction. "As punishment for its crime and its treason against his Majesty, to whom it had already rendered submission by a public instrument, and as a warning to the rest, I razed and burned it completely" (Barclay et al. 1994:141). The Spanish forced the surviving Acoma to settle in the valley below the mesa. The Acoma, however, soon returned to the top of the mesa. The pueblo was rebuilt and repopulated between 1599 and 1620 (Garcia-Mason 1979:457).

As of 1621, the Acoma were still unconverted. Father Gerónimo de Zárate Salmerón reportedly initiated conversion of the Acoma between 1623 and 1626, but these efforts were unsuccessful and had been abandoned by 1629. At that time, Estevan de Perea assigned Fray Juan Ramírez to the Acoma. Ramírez remained at the pueblo for 20 years and either he, or a successor, built a church—San Esteban—which still stands on top of the mesa—between 1629 and 1664 (Kubler 1990:92, 94).

Responding to Spanish suppression of their native religious beliefs and practices, the Acoma joined the Pueblo Revolt of 1680, killing their Franciscan padre, Fray Lucas de Maldonado. Rather than taking an active role in the fighting, however, the Acoma primarily provided asylum to fugitives from other pueblos. In late 1692, Diego de Vargas accepted the peaceful submission of the Acoma. The latter, however, participated in a second revolt in 1696, once again harboring fugitives. Eventually, the Acoma made peace overtures. Governor Pedro Rodriguez Cubero, Vargas's successor, performed the Act of Obedience at Acoma in 1699 (Garcia-Mason 1979:457–458; Minge 1991:23–32).

"After the reconquest, Acoma apparently returned to the old ways. . . . Increasing drought made farming more difficult and the population dwindled as the result of disease" (Minge 1991:32). As indicated by oral history, the Acoma reestablished seasonal farming camps along the Rio San José at McCartys and Acomita. Adobe

dwelling increased in size and were built closer to the fields (Garcia-Mason 1979:458). When Fray Andres Varo visited Acoma as part of a mission inspection in 1749, he reported that “the Ácoma had to go seven leagues from the pueblo to irrigate their fields along the river [the Rio San José]” (Minge 1991:34). The Acoma also had fields, which depended on rain, in the Cañada de la Cruz 4 leagues to the north (Minge 1991:34). In 1776, despite three years of drought, the Acoma had agricultural fields on arable level ground in cañadas to the northwest, north, east, and south of the pueblo. These fields were completely dependent on rain. The Acoma at Cubero, however, irrigated their fields on both sides of the Rio San José with water from the river. As a result, they had a good harvest. In addition, the Acoma had livestock corrals on a chain of mesas—probably the Cebolleta Mesa area—to the west and southwest (Adams and Chavez 1956:189, 194).

In general, the Acoma had peaceful relations with the Spaniards during the late Spanish Colonial period (A.D. 1700–1821). In 1768, the Acoma had numbered 1,114 but by 1776, as reported during an inspection of the mission by Fray Francisco Atanasio Domínguez, the population had fallen to 530 (Adams and Chavez 1956:195).

The reason for this great decrease is that many have died since then [1768], some from natural causes in epidemics or from other diseases, others at the hands of Apaches so insolent that if this pueblo were not by nature defensible, perhaps nothing would now remain of it. The present missionary father also states that still others are wandering about and that some have fled to Moqui for fear of the famines and wars they have suffered in a few years. (Adams and Chavez 1956:195)

After the 1780–1781 smallpox epidemic, the mission headquarters was moved to Laguna because the population of Acoma had decreased tremendously (Garcia-Mason 1979:458).

When ordered by Spanish and later by Mexican authorities, the Acoma participated in official expeditions against Apache and Navajo raiders. The earliest known Spanish campaign with Acoma allies was against the Navajo in 1774. Navajo raids centered on the Rio San José and

along the middle Rio Grande from Bernalillo to Socorro (Minge 1991:37–38). “By joining with the Spanish expeditions, the lines of battle were drawn between Ácoma and her Apache and Navaho neighbors” (Minge 1991:38). Navajo and Apache raids continued through the Mexican (A.D. 1821–1846) and into the U.S. Territorial (A.D. 1846–1912) periods.

During an examination of New Mexico for the U.S. military in 1846–1847, Lieutenant Abert noted the presence of large flocks of sheep, herds of cattle, and droves of horses in the valley below Acoma Pueblo. About 1.2 km (0.75 miles) from the pueblo, where Abert and his party camped for the night, the Acoma had dug holes that provided a constant source of water (Abert 1962:88). By 1850, the Acoma had irrigated and dry-farmed agricultural lands north and south of Grants, eastward along the Rio San José, west of the lava flow, along the northern boundary of the Acoma Grant, and in the Cebolleta Mesa area (Garcia-Mason 1979:459–460). “In 1864 Acoma was described in the same manner as it was in 1540, with houses in parallel rows, ladders used for ingress and egress to the dwellings, low arch formation for doorway passages, and window plates of crystallized gypsum (selenite)” (Garcia-Mason 1979:459). As Navajo raiding decreased, the pueblo began to function primarily as a summer encampment. Smaller settlements were dispersed throughout the Acoma Valley and along the Rio San José (Arany 1982:52).

Land disputes with Laguna Pueblo, officially established in 1699, were an on-going problem. The Acoma and Laguna land boundaries were determined in 1857. At that time, Acoma's territory was to include the area recognized in 1848, when New Mexico was ceded to the United States with the signing of the Treaty of Guadalupe Hidalgo at the end of the Mexico War. Congress confirmed the Acoma land claims in 1858 (Garcia-Mason 1979:459). This, however, did not end the boundary disputes and land claims. The Acoma Reservation was created in 1928. At that time, the size of the original grant was increased. The reservation also increased in size in the 1930s and 1940s with the withdrawal of lands—including portions of Cebolleta Mesa—from the public domain (Arany 1982:54–55).

Since that time, the Acoma have been reacquiring aboriginal lands as they become available. Acoma purchases since 1972 have more than doubled the size of the reservation. The Baca Ranch, of which a portion of the present project corridor is a part, was purchased from Pete Baca, Jr., in 1982 (Minge 1991:139, 142). The old ranch, adjacent to the western side of the reservation, “had two tracts for a total of 291.84 acres and all mineral rights, water rights, a submersible water pump with capacity for 30 gallons per minute, a concrete water storage tank, well, boundary fences, and more” (Minge 1991:142).

At present, the Pueblo of Acoma consists of approximately 966 sq km (600 sq mi), mostly south of I-40, in Cibola County, New Mexico. The 2000 Census indicates the Acoma have 4,712 enrolled tribal members, of which 2,802 reside on the reservation. The principal Acoma communities are Sky City (southern), Acomita (eastern), McCartys (central), and Anzac (western), but several subdivisions and scattered homes are also present. Sky City, the old Pueblo, has few primary residences and is used primarily for cultural activities. The northern portion of Acomita is a commercial area that includes a casino, hotel, and conference center (Indian Health Service 2002:1). The present I-40 Exit 102 improvement project is associated with economic development at Acoma Pueblo.

Navajo

At the time of Coronado's expedition of 1540–1542, Navajo were living along the Chama River and possibly to the southwest in the Mount Taylor area. The Navajo homeland during this early historic period, however, was probably in the upper San Juan drainage, in the vicinity of Canyon Largo and Gobernador Canyon—the Dinetah area (Pratt and Scurlock 1990:39, 43). This area remained the Navajo homeland until 1692, when documentary evidence placed them farther west. Prior to the Pueblo Rebellion, the Navajo raided south to Jemez. After the Rebellion, the Navajo began to raid farther southward and came into increasing contact, friendly or otherwise, with the Apache and various Pueblo groups (Schroeder 1963:6–7). “The Navajo were beginning to emerge from isolation

and establish relations with their neighbors to the south and east” (Schroeder 1963:10). Navajo raiders attacked the Western pueblos, including Acoma, and settlements along the lower Rio Grande.

Navajo raids stopped abruptly in 1713, but not as the result of Spanish actions. In 1713, the Ute had advanced into Navajo territory. Consequently, the Navajo were forced into a defensive attitude resulting in the cessation of raids to the east. Although some Navajo took up fortified positions on mesa tops and among mountain crags, others migrated toward the south. By 1730, the Navajo were within 5 leagues of Jemez (Schroeder 1963:10). “In 1754, the governor of New Mexico reported that the Navajos in large part had abandoned their homes and fled south to Cebolleta, near Laguna, and to the vicinity of Zuni” (Schroeder 1963:10).

Fray Miguel de Menchero reportedly converted more than 500 Navajos to Christianity at Cebolleta (Seboyeta) in 1746. As a result of this success and in an attempt to stop Navajo raiding, Menchero decided to settle the Navajos in villages on Acoma lands. Spanish missions, therefore, were established for the Navajos at Cebolleta and Encinal, northeast of the project area, in 1748 and 1749 (Hackett in Minge 1991:32–33). Unfortunately, disputes arose between the Navajo and Acoma concerning possessions, territories, waters, and pastures. In 1750, the Navajo at Cebolleta and Encinal rebelled and drove out their missionaries. Stating that they did not want to live in settlements like Christians, they returned to their former homes along the eastern slopes of Mount Taylor (Minge 1991:33–34).

By the 1770s, the Navajo range had stabilized. Many Navajos settled in the vicinity of Laguna and Zuni, the southern boundary of the new Navajo homeland. Canyon Largo—formerly in the heart of Navajo territory—formed the northern border and was the dividing line between the Navajo and Ute ranges. For the first time, the Navajo and southern Apache came into direct contact. In 1785, the Rio San José was established as the boundary between the Navajo and Apache (Schroeder 1963:10–11).

By 1772, the Navajo and Apache had formed an alliance. Raiding parties of each or both were aimed at the Rio Grande pueblos and Spanish fron-

tier settlements. As a result, Spanish settlements on the Rio Puerco were abandoned in 1774. Finally, the Spanish broke the alliance in 1785 and formed their own alliance with the Navajo. From 1785 to 1796, the Navajo and Apache were alternately at war and peace. A new alliance between both groups was formed in 1796 and lasted until 1807 or 1808, when hostilities between both the Navajo and Apache resumed (Schroeder 1963:11–12).

In the 1820s and 1830s, after Mexico gained its independence from Spain, New Mexican troops focused on ending Navajo raids. Consequently, the Navajo and Apache were allied once again but before the alliance ended in 1852, the Americans became the new common enemy (Schroeder 1963:12). “In 1852 reports reached Santa Fe that the Navajos had begun to retreat northward toward Ojo Caliente, Canyon de Chelly, and even the San Juan River country. The reason given was fear of Apaches” (Schroeder 1963:12).

The late 1850s and 1860s was a period of great stress and change for the Navajo. They were attacked repeatedly by the Ute. In addition, the U.S. Army—aided by Ute warriors—conducted campaigns against the Navajo in 1858–1859 and 1860–1861. Kit Carson led an invasion of Navajo territory during the winter of 1863–1864. Although there were few direct encounters between the troops and the Navajo, the invasion was very successful because Carson focused on destruction of the Navajo economy—sheep and crops—and on keeping the Navajo constantly on the move. As a result, nearly 10,000 Navajo had surrendered by the end of 1864 and were forced to walk—the “Long Walk”—to Bosque Redondo at Fort Sumner on the Pecos River. Many died along the way and many died at the Bosque. A number of Navajos, however, eluded capture and were joined by escapees from Bosque Redondo (Schroeder 1963:13–14).

The confinement at Fort Sumner was a disaster for a number of reasons—poor management, internal strife between the Navajo and Apache, alkaline soils, and drought resulting in repeated crop failures (Kelley 1982:32–33; Schutt et al. 1997:23). The Treaty of 1868 ended the Bosque Redondo “experiment” and the Navajo were allowed to return to a portion of their former territory. The treaty also established a reservation for the Navajo. Government officials, however, recog-

nized the Navajo need for more land. Over the succeeding years, therefore, the Navajo Reservation expanded several times to its present size. Some Navajos violated the 1868 treaty by returning to their former homes east of Mount Taylor, along the Rio Puerco. Eventually, this group was assigned its own reservation, now known as To'hajiilee (formerly Cañoncito), northeast of the project area.

EUROAMERICAN SETTLEMENT

Although Spanish settlers made repeated attempts to settle west of the Rio Grande in the mid-1700s, the Navajo usually drove back the settlers. After the settlement of Navajos at Cebolleta (Seboyta) failed, Spanish settlers moved into the area, but the settlement was raided frequently. As protection, the Spanish established a military outpost there from 1804 to 1808. The settlement was also protected by a 3-m (10-ft) high wall. By the mid-1800s, the settlement was reportedly a hangout for Mexican traders dealing in whiskey, guns, and slaves (Julyan 1996:329). In 1849, the U.S. military built an outpost at Cebolleta to try to halt the illegal trade, but this effort proved unsuccessful. Consequently, the outpost was abandoned in 1851 and the troops were transferred to Laguna. As with the previous post, the Laguna Post's efforts to control illegal trade failed. The post was abandoned in 1852 and the troops were transferred to Fort Defiance, Arizona (Giese 1995:5).

Eventually, the presence of the U.S. military, which began with seizure of New Mexico in 1846, subdued the Navajo. Prior to the confinement of the Navajo at Bosque Redondo, which ended Navajo raids, the local Spanish population continually shifted back and forth between the Rio Puerco area and the Rio Grande valley. After removal of the Navajo in 1864, Hispanic holdings expanded. In addition, Anglos moved into the area and established ranches and trading posts.

The coming of the railroad to the San José Valley in 1880–1881 brought economic and social changes to the area, tying it to the national economy. In 1880, the Atchison, Topeka, and Santa Fe Railway (A T&SF) and the St. Louis and San Francisco Railway (SL&SF) agreed to build the Atlantic and Pacific Railroad (A&P) from A&P Junction (Isleta) toward the Pacific Coast. When

the route was surveyed in the Laguna Pueblo area, the Laguna found it entertaining to pull up the survey stakes. Later, they hopped trains, coming and going, as part of their firewood gathering routine. By late spring of 1881, the line extended into Arizona and on August 9, 1883, the line—also known as the Thirty-fifth Parallel Trans-Continental Line—was finished. In 1902, the A&P was absorbed by the AT&SF (Myrick 1990:17–20). In 1995, the Burlington Northern Santa Fe Corporation (BNSF) was created “from the merger of Burlington Northern Inc. (parent company of Burlington Northern Railroad) and Santa Fe Pacific Corporation (parent company of the Atchison, Topeka and Santa Fe Railway)” (Burlington Northern Santa Fe 2004).

Historically, the primary economic activity in the project vicinity has been livestock grazing, first of sheep and then of cattle. In the 1890s and early 1900s, some of the largest flocks of sheep on Horace Mesa were maintained by the Acoma. In the 1920s, sheep herding began to give way to cattle raising. The latter was less labor-intensive than the former. In addition, the national taste shifted towards a preference for beef (Wase et al. 2000:1.29). The project area is currently used for cattle grazing.

Village of San Fidel

In about 1868 Baltazar Jaramillo and his family settled at what is now San Fidel. An early name for the locality was La Vega de San José, “the meadow of St. Joseph.” This was a reference to the Rio San José that was just to the south of the community. A tiny residential community about 1.6 km (1 mile) north of present San Fidel still is called San José and may be the community sometimes referred to as Old San José. Another early name for the community was Rinconada, “box canyon, or junction.” The post office took the name Ballejos, a variant of the Spanish family name Vallejos. The post office later changed its name to San Fidel, honoring the saint, a name said to have been suggested by the pastor of the church, Fr. Robert Kalt, O.F.M. (Julyan 1996:312). Today the community is dominated by a church complex (Fugate and Fugate 1989:369).

Village of Cubero

The name of this small community refers to Pero Rodriguez Cubero, who succeeded Diego de Vargas as governor of New Mexico and who served from 1697 to 1703. Cubero passed through the area in 1697 on an expedition to Zuni. It is possible the name originated then, or its also possible the name is from a local family, but no one of that name has lived there in recent memory. The village appears as Cubera on Bernardo Miera y Pacheco's map of the Domínguez-Escalante Expedition of 1776, but as Cubero on most subsequent maps. The village was located on an Indian trail and was a hangout for Mexican traders in slaves, whiskey, and guns. Indian attacks were frequent and in the eighteenth and nineteenth centuries, Cubero was a Spanish military outpost and American troops later were stationed here. Villa de Cubero, 1.6 km (1 mile) west on former U.S. Route 66, is an abandoned outlying community. The Navajo name for Cubero means “water in the crevice,” which refers to a trickling spring here (Julyan 1996:102–103).

Town of Cubero Grant

The Town of Cubero Grant was originally granted by the Mexican government about the year 1834 (Bowden 1969:1515–1522). The grant was made to Juan Chaves and the original grantees, who numbered about 61 heads of family, on condition that they purchase the interest of Francisco Baca, a Navajo Indian living on the premises. The inhabitants of the Town of Cubero Grant petitioned Surveyor General William Pelham on April 2, 1856 seeking possession of the land that had been granted to their ancestors. The petitioners described the grant as a tract of land bounded on the north by the San Mateo Hill, on the east by a long range of hills, on the south by the stone mountains with crosses on them and on the west by the San José Hills. The grantees claimed that in the year 1833 Governor Francisco Sarracino granted the described tract, which contained an estimated 11 square leagues of land. The grant was surveyed in July 1896 by George W. Pradt for 16,490.94 acres and was patented on August 27, 1900, although overlaps were subsequently contested by both Laguna and Acoma Pueblos.

PREVIOUS RESEARCH

Table 1 summarizes archaeological sites listed in the New Mexico Cultural Resources Information System (NMCRIS) files of the Archeological Records Management Section, Historic Preservation Division in Santa Fe. This records search was completed in advance of the Acomita Exit 102 inventory for an area with a radius of 1.6 km (Brown and Brown 2005) to identify previously recorded sites within the vicinity of the proposed project area. Sites LA 54902, LA 89019, LA 89020, and LA 108511 overlap the APE and were documented by one or more previous inventories. Sites LA 145685 and LA 149868 were newly identified by the Acomita Exit 102 inventory.

Table 2 summarizes archaeological site data from the NMCRIS files for the Cubero 7.5' Quadrangle, for which the project area is roughly in the center. These summarized data provide additional settlement context and an understanding of the range of temporal and functional site types that may contribute archaeological material to the project area. Some 63 projects have been conducted within the Cubero Quadrangle beginning with the pipeline archaeology surveys and salvage excavations of the 1950s (Wendorf et al. 1956). The 63 projects have recorded 96 sites that represent 109 temporal components. No Paleoindian manifestations have been previously recorded on the Cubero Quadrangle and the Archaic period is represented by only six (5.5 percent) components. However, diagnostic projectile points found on these sites reflect the entire temporal range of the Archaic period. The sites are mainly special activity sites probably centered around hunting activities, but four components have thermal features in the form of hearths or fire-cracked rock concentrations suggesting a wider range of resource procurement, processing, and consumption activities.

The NMCRIS Anasazi period is represented by the highest frequency of components and the widest range of site types and features. Just over half (n=55) of the recorded components manifest Anasazi occupations probably centered around

farming activities along the Rio San José floodplain and surrounding tributaries. Few Basketmaker III and Pueblo I period sites have been recorded on the Cubero Quadrangle. These earlier occupations usually appear as diagnostic sherds appearing with ceramics from later time periods producing ambiguous long-term Basketmaker III to Pueblo II artifact scatters. Two nearby sites have Pueblo I occupations and are recorded as artifact scatters with features, apparently representing ephemeral shelters. Both sites also have later Pueblo II components. LA 104153 is represented by a wall in a rockshelter situated along the sandstone escarpment about 550 m south of the project area. LA 108511 contains an area of burned sandstone slabs and is located in the flats about 600 m north of the project area.

The majority of the Anasazi settlement and land use dates from the Pueblo II period from A.D. 900 to 1200. The smaller artifact scatters and artifacts scatters with features probably represent short-term resource procurement sites. The single residence sites usually have at least one visible masonry, jacal, or adobe room that indicates more substantial occupations and may be broadly characterized as field-houses. Nine sites have masonry room blocks that may be characterized as full-seasonal multiple household structures. LA 117549, the largest site, has an estimated 12 rooms with an A.D. 1050 to 1100 occupation. This site is located about 800 m north of the project area. Four sites have kivas suggesting the presence of more complicated ceremonial, or social integrative structures. LA 98452 is the nearest recorded site with a kiva. The site is about 400 m south of the project area and has a broad occupation date of A.D. 1100 to 1300. The number of kivas ranges from one to six. LA 110240 has six recorded kivas and dates to A.D. 1050 to 1200. This site is located about 6 km north of the project area. LA 494, the Cubero ruin, is recorded as an Anasazi residential complex/community dating to A.D. 700–1100. The site is about 4 km north of the project area and was originally recorded by Bandelier

Table 1. Summaries of Previously Recorded Sites within 1.6 km (1 mile) of the Project APE.

LA Number	NMCRIS Temporal/Cultural Affiliation Categories	National Register Eligibility	Reference	NMCRIS No.
688	Puebloan AD. 1539-1993		Marshall 1990	31903
873	Anasazi AD. 900-1300			None
1342	Anasazi AD. 1-1600		Marshall 1990	31903
2632	Anasazi AD. 900-1100		Wendorf et al. 1956	36
5593	Unknown Prehistoric 9500 B.C.-A.D. 1100-1300			None
6031	Anasazi AD. 900-1100		Winkler and Davis 1961	37
54902	Anasazi AD. 900-1100	Yes, D	Moore 1986; Marshall 1995	12794; 48418
89018	Archaic 3000 B.C.-A.D. 900	Yes, D	Marshall 1992; Polk 2000	39824; 70890
89019	Archaic 3000-1800 B.C.; Anasazi A.D. 700-1300	Yes, D	Marshall 1992, 1995; Polk 2000	39824; 48418; 70890
89020	Archaic 1800 B.C.- A.D. 200	Yes, D	Marshall 1992; Polk 2000	39824; 70890
98452	Anasazi AD. 1100-1300	Yes, D	Marshall 1995	48418
99628	Anasazi AD. 900-1100	Yes, D	Condie 1993; Marshall 1995; Michalik 1998	41514; 48418; 62831
104151	Puebloan AD. 1950-1994		McKenna 1994; Michalik 1998	45335; 62831
104152	Anasazi AD. 1050–1150; Puebloan AD. 1945-1963		McKenna 1994; Michalik 1998	45335; 62831
104153	Anasazi AD. 700-850; Puebloan A.D. 1950-1963		McKenna 1994; Michalik 1998	45335; 62831
106385	Late Archaic 1500 B.C.-A.D. 500; Historic Pueblo AD. 1945-1970	Yes, D	McKenna 1994	47210
108506	Puebloan AD. 1880-1920		Marshall 1995	48418
108507	Anasazi AD. 950-1000		Marshall 1995	48418
108508	Anasazi AD. 900-1100	Yes, D	Marshall 1995	48418
108509	Anasazi AD. 1000-1100	Yes, D	Marshall 1995	48418
108510	Anasazi AD. 1000-1050	Yes, D	Marshall 1995	48418
108511	Anasazi AD. 800-900; Anasazi A.D. 1000-1100		Marshall 1995	48418
108512	Anasazi AD. 900-950; Anasazi A.D.1050-1100	Yes, D	Marshall 1995	48418
114476	Anasazi AD. 1000-1150		Marshall n.d.; Marshall 1997	53230; 56663
117547	Anasazi AD. 1000-1050		Marshall 1997	56663
117548	Anasazi AD. 1000-1125		Marshall 1997	56663
117549	Anasazi AD. 105-1100		Marshall 1997	56663
117550	Anasazi AD. 900-1100; Euroamerican AD. 1920-1940		Marshall 1997	56663
117551	Archaic 5500 B.C.-A.D. 200		Marshall 1997	56663
117552	Archaic 3000-1800 B.C.		Marshall 1997	56663

LA Number	NMCRIS Temporal/Cultural Affiliation Categories	National Register Eligibility	Reference	NMCRIS No.
117553	Euroamerican AD. 1884-1998		Marshall 1997	56663
131410	Historic Pueblo AD. 1945-1950		McKenna 2001	72380
131411	Historic Pueblo AD. 1945-1950		McKenna 2001	72380
140935	Reserved		Kenward 2003	85306
145143	Anasazi AD. 1-1600; Historic Pueblo AD. 1945-1950		McKenna 2004; Reserved (Marron n.d.)	89778; 94806

Table 2. Recorded Site Components on the Cubero Quadrangle (October 2005).

Component	Number	Percent
ARCHAIC		
Artifact scatter (5500 B.C.-A.D. 200)	1	0.9
Artifact scatter (3000-1800 B.C.)	1	0.9
Artifact scatter (3000 B.C.-A.D. 900)	1	0.9
Features and artifact scatter (5500-3000 B.C.)	1	0.9
Features and artifact scatter (1800 B.C.-A.D. 200)	1	0.9
Features and artifact scatter (1500 B.C.-A.D. 500)	1	0.9
TOTAL	6	5.5
ANASAZI		
Artifact scatter (A.D. 500-1100)	9	8.3
Artifact scatter (A.D. 1300-1500)	1	0.9
Features and artifact scatter (A.D. 700-900)	2	1.8
Features and artifact scatter (A.D. 900-1200)	8	7.3
Features and artifact scatter (A.D. 1325-1430)	2	1.8
Anasazi single residence (A.D. 900-1150)	6	5.5
Anasazi single residence (A.D. 1375-1400)	1	0.9
Anasazi multiple residence (A.D. 900-1200)	8	7.3
Anasazi residential complex/community (A.D. 700-1100)	1	0.9
Anasazi Unknown (A.D. 500-700)	1	0.9
Anasazi Unknown (A.D. 900-1100)	9	8.3
Anasazi Unknown (A.D. 1100-1300)	7	6.4
TOTAL	55	50.5
HISTORIC PUEBLO		
Artifact scatter (A.D. 1935-1979)	3	2.8
Simple features (A.D. 1945-1950)	3	2.8
Features and artifact scatter (A.D. 1870-1970)	7	6.4
Ranching/agricultural (A.D. 1880-1970)	8	7.3
Residential complex/community (A.D. 1880-1960)	1	0.9
Single residence (A.D. 1870-1980)	6	5.5
Unknown (A.D. 1692-1821)	1	0.9
Unknown (A.D. 1539-1993)	2	1.8
TOTAL	31	28.4
NAVAJO		
Unknown (A.D. 1500-1993)	1	0.9

Component	Number	Percent
HISPANIC		
Residential complex/community (A.D. 1821-1940)	1	0.9
Artifact Scatter (A.D. 1917-1920)	1	0.9
TOTAL	2	1.8
ANGLO/EUROAMERICAN		
Simple features (A.D. 1884-1998)	2	1.8
UNKNOWN		
Artifact Scatter (9500 B.C.-1539)	2	1.8
Unknown (9500 B.C.-1993)	9	8.3
Unknown (A.D. 1539-1993)	1	0.9
TOTAL	12	11
GRAND TOTAL	109	100

and later by Mera in the 1930s. The site contains at least one kiva in a room block, an additional L-shaped room block, and adobe rubble. Seven components show P III occupations (A.D. 1000 to 1300), but the components are all coded as Anasazi Unknown. Lastly, four sites including an artifact scatter, two artifact scatters with features, and a single residence show post A.D. 1300 occupations. Two sites have apparent masonry structures, but all of the sites are about 4 km north of the project area.

The high number of sites with historic Pueblo components attests to the close proximity of Acoma Pueblo. A total of 31 (28 percent) components attest to historic Acoma land use and settlement with site types including artifact scatters,

ranching and agricultural features, and single residences. Most of the historic Pueblo components date from around 1880 to the present.

A few Navajo, Hispanic, and Anglo-Euroamerican components have been recorded on the Cubero Quadrangle. LA 55998 is a Hispanic residential complex/community dating from 1821 associated with the Town of Cubero Grant. The site is located near the town of Cubero about 3 km northeast of the project area. LA 117553 is an Anglo-Euroamerican ranch complex dating from 1884 and located about 800 m north of the project area. The remaining sites have unknown temporal affiliations and are represented mainly by chipped stone scatters with no temporal indicators.

TRADITIONAL CULTURAL PROPERTIES

Because this undertaking involves Pueblo of Acoma lands and has NMDOT and FHWA funding, Marron contacted Janet E. Spivey, the NMDOT Native American Coordinator, regarding Traditional Cultural Property (TCP) consultation with concerned tribal entities. The NMDOT has been evaluating and conducting the TCP consultations.

The Pueblo of Acoma Historic Preservation Office (AHPO) conducted a cultural resource survey in early 2005 for cultural resources within the proposed Exit 102 project APE (Pueblo of Acoma Historic Preservation Office 2005). Emphasis was on documenting and establishing areas of potential effect on TCPs. The AHPO identified the presence

of one TCP on the southern end of the project area. No other TCPs were encountered during the survey. The project Alternative 3 will have no effect on the associated TCP since this alternative mainly focuses on the reconstruction of the existing infrastructure with no additional roadways. Alternative 5 has the potential to adversely affect 10 percent of the associated TCP area indirectly through proposed drainage systems and vehicle traffic. The AHPO recommends that the associated TCP be avoided and monitored by AHPO staff during construction on the Exit 102 interchange. No other protective measures will be instituted so as to avoid any unwanted attention (Pueblo of Acoma Historic Preservation Office 2005:1-3).

SITE DESCRIPTIONS

Six archaeological sites, LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868 are within the proposed limits or rights-of-way for I-40 Exit 102, Acomita Interchange alternatives 3 and 5. The amount of affected site area depends on the proposed limits of Alternatives 3 and 5. For most sites, less than 25 percent of the site area occurs within either design. Complete descriptions of each site are provided as context for the research design and data recovery plan that follows. These descriptions were provided by Marron and Associates, Inc. (M. E. Brown and K. L. Brown 2005).

LA 54902

Description: LA 54902 is a rubble mound with a small, medium-density sherd and chipped stone artifact scatter on an open plain. The site was originally recorded in 1986 by Quivira Research Associates (Moore 1986). The site is on Town of Cubero Grant land north of the I-40 north right-of-way, between the north right-of-way fence and a property fence bordering the south side of the paved semi-truck parking lot for the Sky City Casino (Fig. 5). The southern edge of the site is 23 m (75 ft) north of the I-40 north right-of-way fence. The site measures 34 by 22 m (112 by 72 ft). A drainage ditch is to the east and a gentle slope is on the west. A man-made concentration of large sandstone boulders, probably associated with the construction of I-40, is near the southwestern edge of the site. The site is eroded and artifacts are visible in eroded areas. The local plant community includes grasses, snakeweed, prickly pear cactus, and juniper. Ground visibility is 75 percent. The soil, a fine sandy loam, is classified as the Hagerman-Bond Association, 1 to 10 percent slopes (Parham 1993:78–79, Sheet No. 31).

When the site was recorded in 1986, a single-room structure, consisting of a low (10–20-cm [4–8-inches] high) mound and a scatter of rock, was identified in the northern portion of the site. A

fence and a drainage ditch were immediately to the north. A sherd and lithic artifact scatter, primarily to the south and east, was associated with the structure. A small portion of the site extended north of the fence and ditch (Moore 1986:5–6). The site was described as "a small farmstead of limited occupational duration" (Moore 1986:5). Cibola Research Consultants (Marshall 1995) revisited the site in 1995 and declared the site's condition unchanged and the 1986 inventory record accurate. The new site map, however, showed a hearth in the southeast portion of the site but no description was provided (Marshall 1995:11, Fig. 5). No evidence of the hearth was discerned during the present project and no artifacts were found north of the fence.

Disturbances include wind and water erosion, a former drainage ditch, and a paved truck parking lot. Marshall (1995:11) indicated the site was 100 m (328 ft) north of I-40. As recorded during the present project, the northern portion of the site is less than 60 m (197 ft) north of the I-40 north right-of-way fence. In addition, the northern edge of the site corresponds to the property fence along the south side of the truck parking lot. This suggests the portion of the site north of the fence was removed during the construction of the present parking lot. Artifacts are visible in eroded areas. The rubble mound suggests the presence of intact subsurface cultural material, which may extend 40 cm (16 inches) below the surface. An estimated 90 percent of the site remains intact.

Features: A single feature, a low rubble mound representing a single-room structure, was identified when the site was first recorded (Moore 1986:5). The rubble mound, which is immediately south of the property fence, was relocated during the present project. It primarily consists of sandstone but also contains limestone. In addition, rocks are scattered around the immediate area. The mound is 1.7 m (5.6 ft) in diameter and 10 to 20 cm (4–8 inches) high.

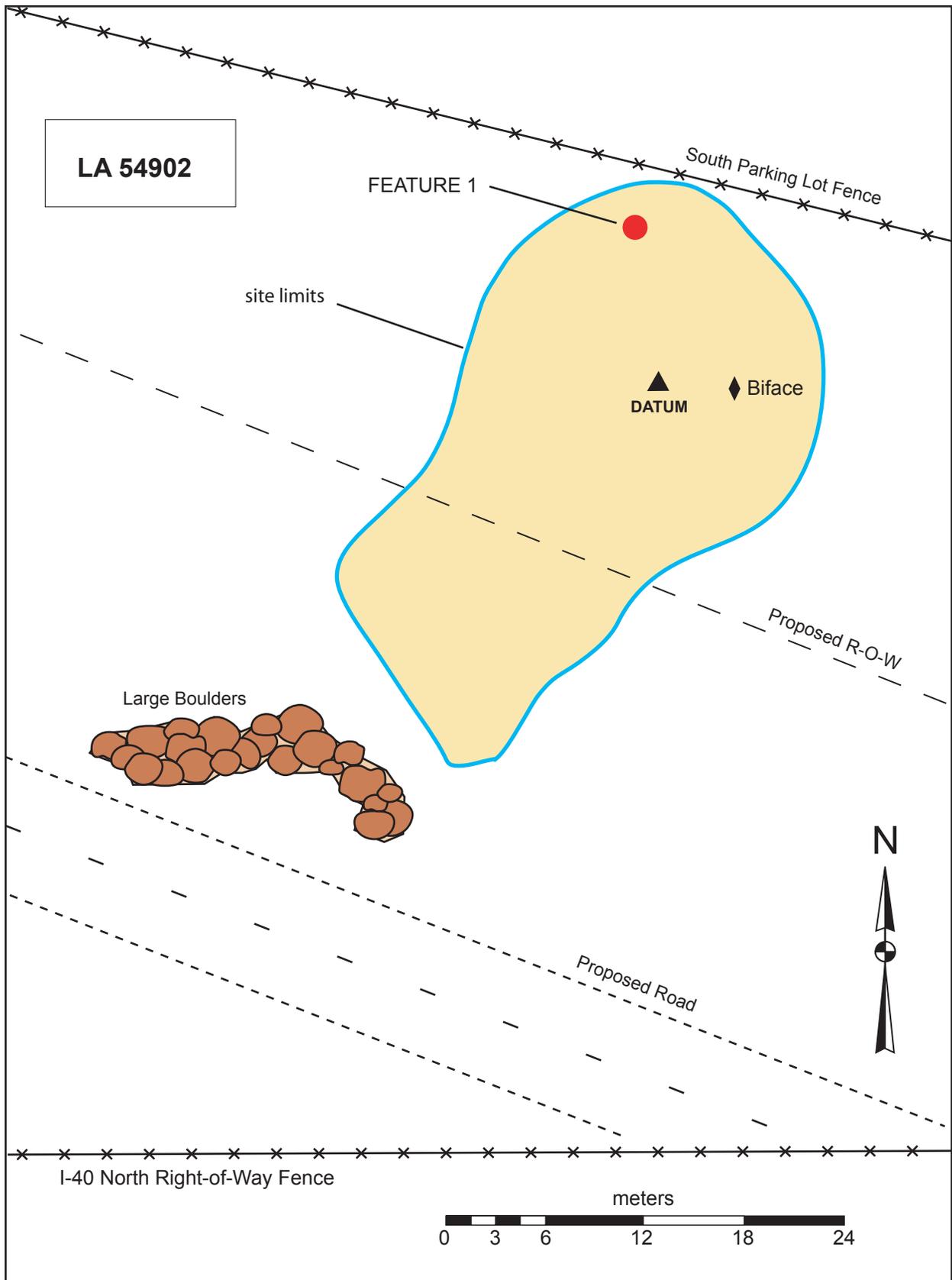


Figure 5. LA 54902 site map.

Artifacts: Chalcedony, basalt, and obsidian chipping debris; plain and corrugated grayware sherds; and probable Gallup Black-on-white sherds were noted when the site was first recorded. Based on the latter, a Pueblo II component, dating from A.D. 900 to 1100, was identified (Moore 1986:5).

LA 54902 contains a small, medium-density sherd and chipped stone artifact scatter. All artifacts observed on the surface of the site (n=79) were recorded during the present project (Table 3). No artifacts were collected. The chipped stone assemblage (n=41) primarily consists of chipping debris (n=38, 92.7 percent) but also contains a biface fragment, a uniface fragment, and a complete multidirectional core. No ground stone or diagnostic chipped stone tools were found. Identified raw material types consist of chalcedony, chert, basalt, and quartzite. All are available locally. The sherd assemblage (n=38) includes Socorro, Cebolleta, and Gallup Black-on-white sherds indicative of a Pueblo II component.

Table 3. Surface Artifact Assemblage, LA 54902.

Description	Total
Chalcedony biface, fragment	1
Chalcedony uniface, fragment	1
Basalt core, multidirectional, complete	1
Chalcedony flakes	15
Basalt flakes	12
Quartzite flakes	7
Chert flakes	2
Chalcedony angular debris	1
Basalt angular debris	1
Socorro Black-on-white body sherds	2
Cebolleta Black-on-white body sherd, bowl	1
Cebolleta Black-on-white body sherd	1
Gallup Black-on-white body sherd, bowl	2
Indeterminate white ware body sherds, bowl	3
Indeterminate white ware body sherds, jar	4
Indeterminate white ware body sherds, plain	5
Indented corrugated gray ware body sherds	15
Plain gray ware body sherds	4
Plain brown ware body sherd	1
Total	79

Preliminary Evaluation: LA 54902 contains a rubble mound and a small, medium-density sherd and chipped stone artifact scatter with pottery

indicative of a Pueblo II occupation. Although the northern portion of the site was removed during the construction of the paved truck parking lot immediately to the north, the rubble mound and most of the associated artifact scatter still remain. The rubble mound suggests intact subsurface cultural material is present. The site, therefore, is likely to provide important information concerning the Pueblo II occupation of the area. LA 54902 has been determined eligible for inclusion on the National Register of Historic Places (NRHP) under Criterion D, information potential (HPD Log 48689).

Project Impact: Alternative 3 will have no effect on LA 54902. Alternative 5, however, will have an adverse effect on the site.

LA 89019

Description: LA 89019, a large, medium-density sherd and lithic artifact scatter on a gentle south-facing slope, was originally recorded in 1992 by the NMDOT (Marshall 1992). The site is within the I-40 south right-of-way and extends south onto Town of Cubero Grant and private land. Most of the site is on Town of Cubero Grant land. The site is bounded on the north by the eastbound exit ramp at Exit 102 and on the south and east by sandstone outcrops (Fig. 6). Large areas of sandstone bedrock occur throughout the site. Low dunal areas are also present. Artifacts occur on the dunes and on the bedrock. A small drainage is on the east, below the sandstone outcrop. The site measures 190 by 110 m (623 by 361 ft). The local plant community includes juniper, grasses, snakeweed, prickly pear cactus, globemallow, narrowleaf yucca, aster, and fleabane. Ground visibility is 95 percent. The soil, a fine sandy loam, is classified as the Hagerman-Bond Association, 1 to 10 percent slopes (Parham 1993:78-79, Sheet No. 31).

Disturbances consist of wind and water erosion, highway construction and maintenance, and grazing livestock. The northern portion of the site was removed during the construction of I-40, and portions may lie under the I-40 eastbound exit ramp at Exit 102. Much of the site is deflated. Although most of the cultural material is surficial due to the presence of sandstone bedrock at or just

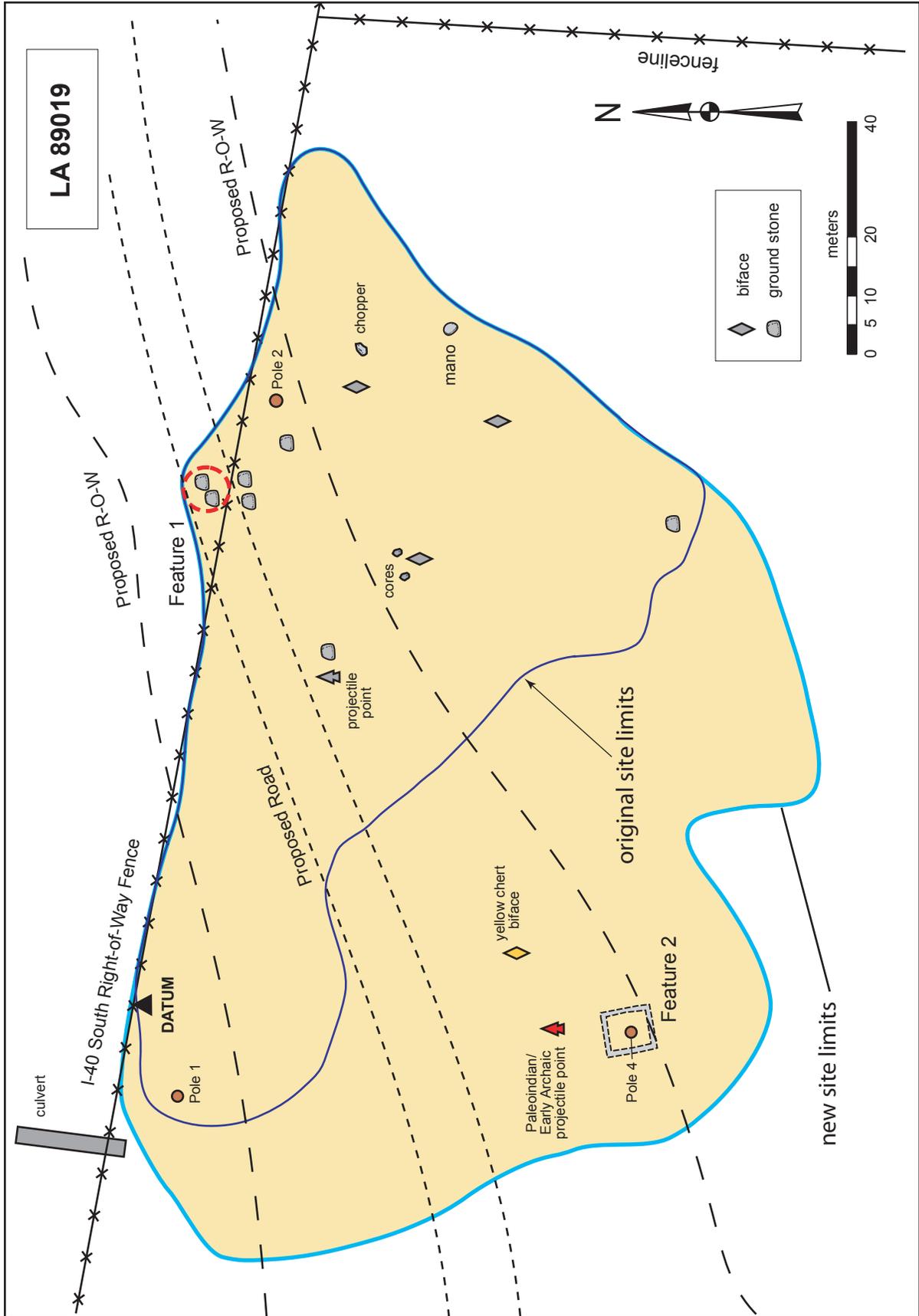


Figure 6. LA 89019 site map.

below the surface, the dunes may retain integrity. Cultural material may extend to a depth of 30 cm (12 inches) in these areas. An estimated 75 percent of the site remains intact.

Features: A previous survey by SWCA (Polk 2000:38) identified one feature, a fire-cracked rock concentration, in the north-central portion of the site. The feature is about 4 m (13 ft) in diameter and was interpreted as a roasting pit. Feature 1 was relocated during the present project.

The original survey identified two artifact concentrations, a lithic concentration in the eastern portion of the site and a sherd concentration in the western (1992 site form). A later site visit by Cibola Research Consultants (Marshall 1995) did not discern any changes. The survey by SWCA identified three artifact concentrations (Polk 2000:38). Concentrations 1 and 3 may correspond to the western and eastern concentrations, respectively, of the 1992 survey. During the present project, because the artifact scatter is continuous across the site, the designation of concentrations was considered subjective, arbitrary, and therefore meaningless. Consequently, no concentrations were identified.

During the reconnaissance of LA 89019 by OAS for this research design, a previously unrecorded historic structure designated Feature 2 was discovered and included as a component of LA 89019 (Fig. 7). The historic component is located at Telephone Pole 4, which has been set essentially in the center of a square masonry structure. The structure was constructed of locally available unshaped sandstone. Some larger stones measure around 50 cm long by 30 cm wide, but most average around 20 by 20 cm. The square or rectangular structure measures 6.80 m (N-S) by 6.50 m (E-W). The stones are probably foundation remnants, since no coursing was evident. Also, no evidence of the superstructure remains. The south wall is more scattered and less intact. A hole-in-top can and a fragment of purple glass suggest a ca. 1880–1900 date. Associated refuse is very sparse suggesting a seasonal farmstead rather than a full-time domestic occupation. The absence of Acoma pottery may suggest a Hispanic occupation related to the town of Cubero. The structure is located on a stabilized dune with some depth at this locality.

The depth of interior fill is unknown, but exposed bedrock in the immediate area suggests a maximum depth no more than 50 cm. The terrain slopes to the south and immediate vegetation consists of snake weed, mixed grasses, and juniper. Low-density chipped stone artifacts from the prehistoric component surrounds the locality and a Paleoindian point base was found about 9 m north of the structure. Alternative 3 would not affect the historic component. However, the entire historic structure is within the planned area of Alternative 5.

Artifacts: Artifacts noted during the original survey consisted of chipping debris; two cores, one of which was subsequently used as a scraper; a mano fragment; and five sherds, of which three were Gallup Black-on-white. Lithic artifact raw material types consisted of obsidian, a variety of cherts, quartzite, and sandstone. Based on the Gallup Black-on-white sherds, LA 89019 was identified as a possible Pueblo III (A.D. 1200s) camp (Marshall 1992:5; 1992 site form). The later site visit by Cibola Research Consultants (Marshall 1995:10) identified the site as a Pueblo II to III cultural manifestation.

The visit by SWCA identified 56 chipped stone artifacts, including a projectile point, a biface, a uniface, a retouched flake, and three utilized flakes. Ground stone artifacts included two sandstone slab metates and a quartzite mano fragment. The recorded pottery assemblage consisted of three Gallup Black-on-white (local style) sherds and five unidentified local white ware sherds. The projectile point, identified as San José Stemmed dating from 3200 to 1800 B.C., suggested the presence of a Middle Archaic component. The sherds were indicative of a late Pueblo II to early Pueblo III, A.D. 1000 to 1125, component (Polk 2000:38).

During the reconnaissance of LA 89019 by OAS for this research design, a 21 mm long by 20 mm wide by 5 mm thick, fine-grained white quartzite Paleoindian point base was observed on the surface of LA 89019, 9 m north of the historic structure in the expanded west-southwest site area. The point base exhibited parallel marginal and basal pressure flake scars. Both of the edges of the point stem were ground flat. The base was slightly concave with rounded ears. The absence of fluting, the convex base, parallel sides, and lateral grinding

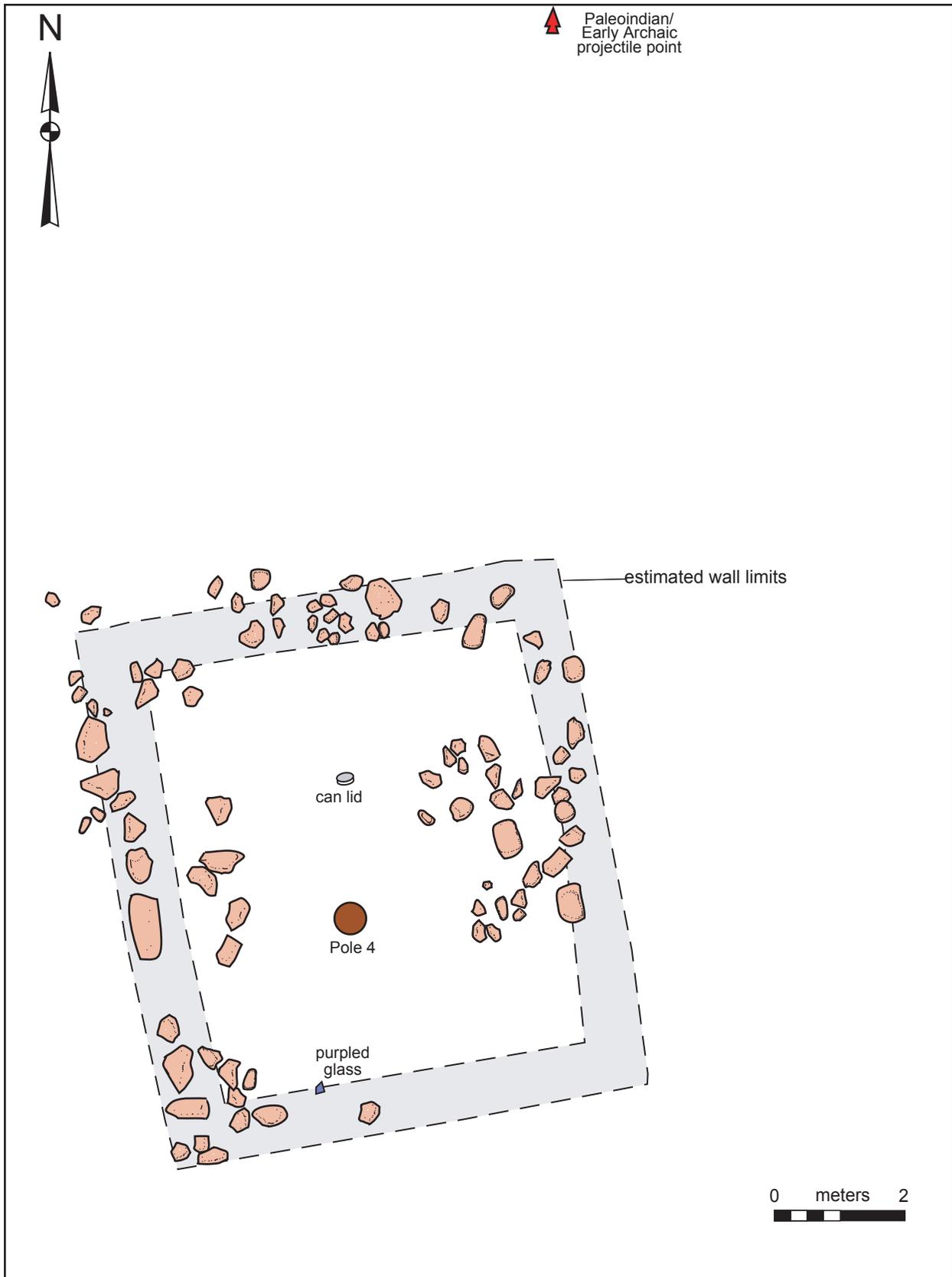


Figure 7. LA 89019 historic structure plan map.

suggest that the base could remain from a Midland or Plainview style point. Generally, these Plainview Complex points are assigned date range of 8300 to 7000 B.C.

LA 89019 contains a large, medium-density prehistoric artifact scatter. Due to the large quantity of surface artifacts, only an arbitrary representative sample (n=283) was recorded during the present project (Table 4). No artifacts were collected. The recorded chipped stone assemblage (n=254) primarily consists of chipping debris (n=245, 96.5 percent) but also contains a projectile point, a complete chopper, three biface fragments, a scraper fragment, a uniface fragment, and two unidirectional cores (Table 4). One of the latter is conical and complete. Many flakes are small, suggestive of the later stages of chipped stone tool production and of tool maintenance. The projectile point is a complete Jay-like dart point (Turnbow 1997:170–172). The specimen, made of Chinle chert, is 53 mm long and 36 mm wide. It has a contracting stem with a convex base and slight shoulders. The blade is triangular with convex edges and has been resharpened. The Jay-like point is suggestive of an Early Archaic, 5500 to 4800 B.C., component. The chipped stone assemblage represents a variety of activities, including stone tool production and maintenance, hunting, animal carcass processing (i.e., butchering), and hide processing.

A variety of raw material types—opaque, smoky, and banded obsidians; chalcedony; Chinle and other cherts; quartzite; basalt; silicified wood; and quartz—are represented in the recorded chipped stone assemblage (Table 4). The smoky obsidian contains fine white and black inclusions that give it a smoky gray or cloudy look. The smoky and banded obsidians and the Chinle chert—a yellow-brown spotted chert (Viera 1993:163)—are exotics. The smoky obsidian is probably from the Polvadera Peak area of the Jemez Mountains and the Chinle chert is from the Lookout Mountain area in the Zuni Mountains. The presence of exotic lithic materials suggests trade networks or seasonal rounds, or both.

The recorded ground stone assemblage (n=7) contains manos and metate fragments (Table 4). Except for a basalt mano fragment, all of the ground stone is sandstone. The complete one-hand mano exhibits a single use surface and the mano

Table 4. Recorded Artifact Sample, LA 89019.

Description	Total
Chinle chert Jay-like dart point, complete	1
Chalcedony chopper, complete	1
Opaque obsidian biface, fragment	1
Chert biface, fragment	1
Chalcedony biface, fragment	1
Chalcedony scraper, fragment	1
Chert uniface, fragment	1
Chert core, unidirectional, conical, complete	1
Chert core, unidirectional, fragment	1
Opaque obsidian biface thinning flake	1
Opaque obsidian flakes	89
Chalcedony flakes	73
Chert flakes	32
Smoky obsidian flakes	12
Quartzite flakes	10
Basalt flakes	8
Chinle chert flakes	2
Banded obsidian flake	1
Silicified wood flake	1
Quartz flake	1
Chert angular debris	3
Chalcedony angular debris	2
Smoky obsidian angular debris	1
Opaque obsidian tested pebbles	2
One-hand sandstone mano, complete, 1 use surface	1
Basalt mano fragment, 2 use surfaces	1
Sandstone metate fragments, 1 use surface	5
Kiatuthlanna Black-on-white rim sherd, bowl	1
Kiatuthlanna Black-on-white body sherds, bowl	4
Red Mesa Black-on-white body sherd, bowl	1
Gallup Black-on-white body sherds	3
Cibola White Ware body sherd, plain	2
Indeterminate black-on-white body sherds, narrow line	2
Indeterminate black-on-white body sherd, solid	1
Indeterminate white ware body sherd, eroded	1
Clapboard corrugated gray ware body sherds	3
Indented corrugated gray ware body sherd	1
Plain gray ware body sherds	10
Total	283

fragment has use-wear on two faces. All of the metate fragments exhibit use-wear on one surface. The metate types were not determinable. The ground stone tools represent plant processing.

The incidence of pottery visible on the surface of the site is low. Compared to the rest of the recorded artifact assemblage, the sherd assemblage is small (n=29, 10.2 percent) (Table 4). The

Kiatuthlanna and Red Mesa sherds represent bowls. The presence of Kiatuthlanna Black-on-white, Red Mesa Black-on-white, and Gallup Black-on-white is suggestive of a Pueblo I to early Pueblo III component.

The reconnaissance of LA 89019 by OAS for this research design noted a single piece of purple glass and a hole-in-top can fragment associated with the historic structure. The artifacts suggest a date of around 1880 to 1900.

In summary, the LA 89019 surface artifact assemblage indicates the presence of late Paleoindian/Early Archaic (Midland/Plainview-like and Jay-like dart points), Middle Archaic (San José Stemmed point), Pueblo I to early Pueblo III (Kiatuthlanna, Red Mesa, and Gallup Black-on-white sherds) components, and late Territorial (1880–1912) components. In addition, previous research in the Acoma area (Prince 1982:99–100) suggests the preponderance of obsidian artifacts, reflecting Archaic occupations. The intensive use of obsidian by Archaic groups is probably a function of high mobility (Prince 1982:100).

Preliminary Evaluation: LA 89019 is a large, medium-density sherd and lithic artifact scatter with diagnostic artifacts indicative of late Paleoindian/Early Archaic, Middle Archaic, Pueblo I to early Pueblo III, and late Territorial Period (1880–1912) components. Although the northern portion of the site has been disturbed or removed by the construction of I-40, most of the site is probably intact, and the low dunal areas may contain buried cultural deposits. The site, therefore, is likely to provide important information concerning late Paleoindian/Archaic, Puebloan, and historic occupations of the area. The site has been determined eligible for inclusion on the NRHP under Criterion D, information potential (HPD Log Nos. 48689 and 61423).

Project Impact: Alternatives 3 and 5 will have an adverse effect on the site.

LA 89020

Description: LA 89020, a large, very diffuse, low-density sherd and lithic artifact scatter on south- and west-facing slopes, was originally recorded in

1992 by the NMDOT (Marshall 1992). The site is within the I-40 south right-of-way and extends south onto Town of Cubero Grant land. Most of the site is south of the highway right-of-way. The site is bounded on the north by an I-40 road cut and a rest area is on the west (Fig. 8). An intermittent tributary of the Rio San José is to the south. Flower (Cubero) Mountain is to the southeast. Large areas of sandstone bedrock occur throughout the site. Low dunal areas are also present. Artifacts occur on the dunes and on the bedrock. The site measures 435 by 105 m (1427 by 344 ft). The local plant community includes grasses, snakeweed, juniper, prickly pear cactus, narrowleaf yucca, globemallow, rabbitbrush, four-wing saltbush, Indian paintbrush, aster, fleabane, and Russian thistle. Ground visibility is 90 percent. The soil, a fine sandy loam, is classified as the Hagerman-Bond Association, 1 to 10 percent slopes (Parham 1993:78–79, Sheet No. 31).

When the site was initially recorded, a small area north of I-40 was included within the site boundary (1992 site form). A later survey north of I-40, however, did not support this delineation. “An inspection of the area revealed a very diffuse scatter of artifacts over a wide area (Locality 44) with no focus of cultural activity” (Marshall 1997:4). During a later site visit by SWCA (Polk 2000:42), no artifacts were found in the I-40 north right-of-way. During the present project, LA89020 was considered to be entirely south of I-40.

Disturbances consist of wind and water erosion, highway construction and maintenance, and grazing livestock. The northern portion of the site was removed during the construction of I-40. Much of the site is deflated. Although most of the cultural material is surficial due to the presence of sandstone bedrock at or just below the surface, the dunes may retain integrity. Cultural material may extend to a depth of 30 cm (12 inches) in these areas. An estimated 75 percent of the site remains intact.

Features: No features were found when the site was initially recorded (1992 site form). A later visit by SWCA (Polk 2000:42) identified a fire-cracked rock concentration in the I-40 south right-of-way, at the edge of the road cut. This feature was not relocated during the present survey but a possible hearth, consisting of a 1-m-diameter (3.3 ft) soil stain with charcoal and possible fire-cracked rock,

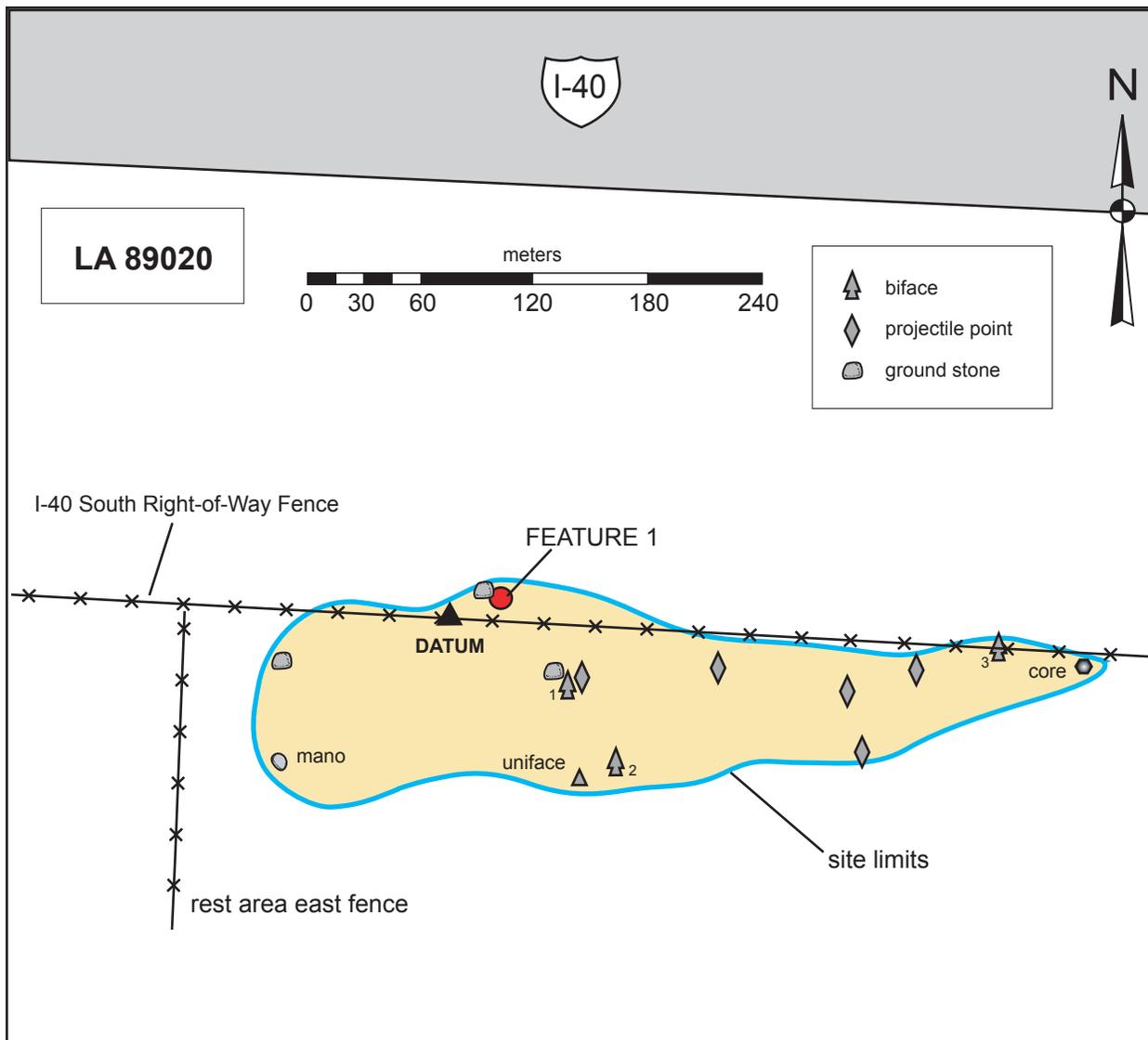


Figure 8. LA 89020 site map.

was found near the edge of the road cut. A sandstone mano is nearby.

Artifacts: When the site was originally recorded, a light but nearly continuous scatter of artifacts was noted across the site, with a slight concentration in the eastern portion. Observed artifacts included a chert side scraper, a tested quartzite cobble, chipping debris, plain gray ware sherds, and historic Acoma/Laguna-type polychrome bowl sherds. The sherds were primarily in the western portion of the site. A variety of lithic raw materials—clear and opaque obsidians, chalcedony, cherts, quartzite, and basalt—were identified. The presence of two components was discerned on the basis of the arti-

facts. The component represented by the lithics was classified as unknown prehistoric. The Acoma/Laguna-type sherds were suggestive of a post-1700 Puebloan component (Marshall 1992:5; 1992 site form).

When SWCA revisited the site, 67 chipped stone artifacts, a hammerstone, a mano, and a manuport were recorded within the I-40 south right-of-way. No pottery, however, was found. The chipped stone assemblage included a lateral fragment of an apparent Jemez obsidian En Medio corner-notched point, a chert biface, a chert scraper, three irregular cores, two tested pieces, and chipping debris. Identified lithic materials included opaque, Polvadera, red-banded, Jemez, and clear

Table 5. Surface Artifact Assemblage, LA 89020.

Description	Total
Chinle chert En Medio-like corner-notched base	1
Smoky obsidian dart point base, corner-notched	1
Opaque obsidian arrow point base	1
Chert biface, complete	1
Opaque obsidian biface, fragment	1
Smoky obsidian biface, fragment	1
Chalcedony biface, fragment	1
Chert uniface	1
Basalt uniface	1
Chert core, multidirectional, exhausted, complete	1
Chalcedony flakes	92
Chinle chert flake	1
Chert flakes	19
Opaque obsidian flakes	15
Smoky obsidian flakes	8
Quartzite flakes	5
Quartz flake	1
Chalcedony angular debris	3
Chert angular debris	2
Opaque obsidian angular debris	1
One-hand sandstone manos, complete, 1 use surface	2
Sandstone slab metate, fragments, 1 use surface	2
Tularosa Black-on-white body sherd	1
Indeterminate PIV/PIII body sherd, bowl	1
Indeterminate whiteware body sherd, bowl	1
Indeterminate whiteware body sherd, plain, bowl	1
Indeterminate whiteware body sherd, plain, jar	1
Indeterminate redware rim sherd	1
Indeterminate redware body sherd	1
Indented corrugated grayware body sherds	3
Indeterminate grayware rim sherd, everted	1
Total	172

obsidians, chalcedony, chert, quartzite, basalt, and sandstone. Based on the En Medio point, a Late Archaic component, dating from 1000 B.C. to A.D. 200, was identified (Polk 2000:42).

LA 89020 contains a very diffuse, low-density sherd and lithic artifact scatter. All artifacts observed on the surface of the site (n=172) were recorded during the present project (Table 5). No artifacts were collected. The chipped stone assemblage (n=157) primarily consists of chipping debris (n=147, 93.6 percent) but also contains three projectile point bases, a complete biface, three biface fragments, two unifaces, and an exhausted multidirectional core (Table 5). Many

flakes are small, suggestive of tool maintenance and the later stages of chipped stone tool production. Of the point bases, two are from dart points and the third is from an arrow point. One of the dart bases is an En Medio-like corner-notched specimen (Turnbow 1997:182–186). It is made of Chinle chert and has an expanding stem with a slightly convex base. Only one corner notch remains. The specimen is 23+ mm long and 24+ mm wide. Due to their fragmentary condition, the projectile point types represented by the other two point bases are not determinable. The dart point is smoky obsidian and the arrow point is opaque obsidian. The En Medio-like point base is suggestive of a Late Archaic, 1000 B.C. to A.D. 200, component (Turnbow 1997:185). The chipped stone assemblage represents a variety of activities, including stone tool production and maintenance, hunting, and hide processing.

A variety of raw material types—opaque and smoky obsidians, chalcedony, Chinle and other cherts, quartzite, basalt, and quartz—are represented in the recorded chipped stone assemblage (Table 5). The smoky obsidian contains fine white and black inclusions that give it a smoky gray or cloudy look. The smoky obsidian and the Chinle chert—a yellow-brown spotted chert (Viera 1993:163)—are exotics. The smoky obsidian is probably from the Polvadera Peak area of the Jemez Mountains and the Chinle chert is from the Lookout Mountain area in the Zuni Mountains. The opaque obsidian is probably from the Mount Taylor area, possibly Grants Ridge or Horace Mesa. The presence of exotic lithic materials suggests trade networks or seasonal rounds, or both.

The recorded ground stone assemblage (n=4) contains metate fragments and one-hand manos. All are sandstone. Both manos are complete and exhibit use-wear on one surface. The metate fragments are from slab metates with one use surface. The ground stone tools represent plant processing.

Compared to the rest of the artifact assemblage, sherds are rare (n=11, 6.4 percent) (Table 5). Although the sherd assemblage is very limited, the presence of a Tularosa Black-on-white sherd is suggestive of an early Pueblo III component. The red ware sherds may also be associated with this component. None of the historic Acoma/Laguna-type sherds noted during the original recording of

the site in 1992 was found. Most of the sherds, however, including the red ware, are in the western portion of the site.

In summary, the LA 89020 surface artifact assemblage indicates the presence of two prehistoric components. A Late Archaic component is indicated by the presence of two En Medio-like corner-notched projectile points, one of which was recorded by SWCA (Polk 2000:42). The sherd assemblage suggests the presence of an early Pueblo III component. The paucity of sherds, however, suggests this occupation was very limited and ephemeral. Although the surface of the site was thoroughly examined, the presence of a historic (post-1700) Acoma/Laguna component was not verified during the present project and is not included herein.

Preliminary Evaluation: LA 89020 is a large, low-density sherd and lithic artifact scatter with diagnostic artifacts indicative of Late Archaic and early Pueblo III components. Although the northern portion of the site has been destroyed by the construction of I-40, most of the site is probably intact, and the low dunal areas may contain buried cultural deposits. LA 89020, therefore, is likely to provide important information concerning Archaic and Puebloan occupations of the area. The site has been determined eligible for inclusion on the NRHP under Criterion D, information potential (HPD Log No 61423).

Project Impact: Alternative 5 will have no effect on LA 89020. Alternative 3, however, will have an adverse effect on the northwestern portion of the site.

LA 108511

Description: LA 108511, a multicomponent, low-density sherd and lithic artifact scatter on an open plain, was originally recorded in 1995 by Cibola Research Consultants (Marshall 1995). The site, which is entirely on Pueblo of Acoma land, is 400 m (1,312 ft) north of I-40 and 180 m (590 ft) west of SP 30 (Fig. 9). A gas pipeline borders the site on the south and a gravel road lies along the southeastern edge of the site. A drainage ditch and ditch embankment cut through the site's southern por-

tion. The terrain is flat and the site is open on all sides. The site measures 108 by 84 m (354 by 276 ft). The local plant community includes grasses, snakeweed, fourwing saltbush, aster, and Russian thistle. Ground visibility is 80 percent. The soil, a sandy loam, is classified as the Penistaja-Oelop Association, 0 to 5 percent slopes (Parham 1993:81, Sheet No. 31).

As originally mapped, the drainage ditch and embankment formed the northern boundary of LA 108511 (Marshall 1995:18). The site consisted of a hearth with an associated artifact scatter (southeast), a concentration of about 20 sherds from a reconstructible Kana'a Neckbanded pot on the ditch embankment (north-central), and a diffuse sherd scatter (west). Spatially, two distinct components were identified. The hearth and pot drop, both relocated during the present survey, represent a Pueblo I component and the pottery scatter in the western portion of the site is associated with a Pueblo II component. During the present project, a low-density artifact scatter, primarily sherds, was found north of the ditch and was incorporated into the site boundary. The presence of the reconstructible pot on the embankment dirt excavated from the drainage ditch suggests that substantial and intact cultural materials may be below the present surface. This also raises the possibility that the site boundary as defined by surface observations will be incomplete when subsurface data are available.

Disturbances include wind and water erosion, grazing livestock, and the drainage ditch. Although just outside the site limits, the gravel road and gas pipeline are also possible site disturbances. No cultural deposits are visible in the ditch, but the pottery concentration on the ditch embankment and the hearth suggest the presence of intact subsurface cultural deposits. The vertical extent of cultural material, however, is unknown. An estimated 80 percent of the site remains intact.

Features: A single feature, a hearth (Feature 1), was identified in the southeast portion of LA 108511 during the 1995 survey (Marshall 1995:17) and was relocated during the present project. The hearth, a burned area with a concentration of 15 pieces of fire-cracked sandstone and basalt, is 1.5 m (5 ft) in diameter and about 15 m (49 ft) north of

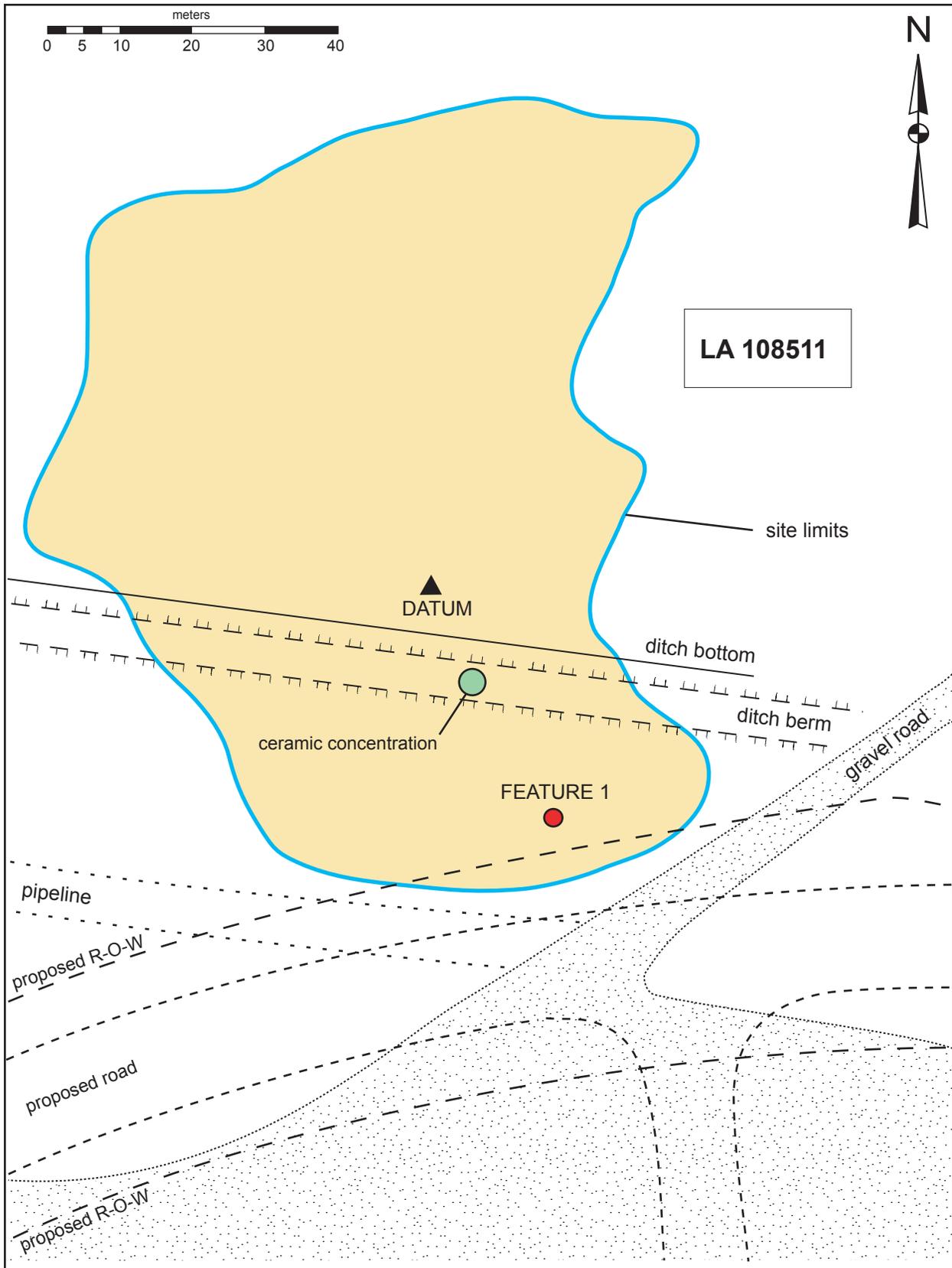


Figure 9. LA 108511 site map.

the intersection of the gas pipeline and gravel road. No ash or charcoal is visible. A low-density artifact scatter surrounds the hearth.

Artifacts: LA 108511 contains a low-density sherd and lithic artifact scatter. The lithic assemblage recorded during the 1995 survey consisted of a chalcedony flake, a quartzite flake, and a ground sandstone slab. The recorded pottery assemblage included plain and exuberant corrugated gray ware, Kana'a Neckbanded, Gallup Black-on-white, and unidentified white ware sherds. The Kana'a sherds, representing three vessels—including the reconstructible vessel—are indicative of a Pueblo I (A.D. 800–900) component. The Gallup Black-on-white sherds in the western portion of the site represent a Pueblo II (A.D. 1000–1100) component (Marshall 1995:18). No artifacts were recorded during the present site visit.

Preliminary Evaluation: LA 108511 is a multi-component—Pueblo I and Pueblo II—low-density sherd and lithic artifact scatter with a hearth (Feature 1) and pot drop. Although no cultural deposits are visible in the drainage ditch, the pot drop on the ditch embankment and the hearth suggest the presence of intact subsurface cultural deposits. The vertical extent of cultural material, however, is unknown. Because the existence of buried cultural deposits remains unverified, testing is necessary to determine the site's nature and extent. As part of the review of the 1995 survey report (Marshall 1995), the BIA has required testing to confirm the eligibility of LA 108511 for inclusion on the NRHP. Currently, the eligibility status remains undetermined.

Project Impact: Alternative 3 will have no effect on LA 108511. Alternative 5, however, may have a direct or indirect adverse effect on the site, given its proximity to the apparent site boundary and the likelihood of more extensive subsurface deposits.

LA 145685

Description: LA 145685, a small, low-density sherd and lithic artifact scatter, is on a gentle north-northwest-facing slope (Fig. 9). The site is on NMDOT property within a rest area on the south

side of I-40, at Exit 102. The northern edge of the site is 2 m (6.6 ft) south of the I-40 south right-of-way fence. A picnic shelter is to the southeast and the northern portion of the rest area loop road is just to the south. Exposures of sandstone bedrock occur throughout the site. Low dunes are also present. Artifacts occur in blowouts and on and around the bedrock. The site measures 44 by 13 m (144 by 43 ft). The local plant community includes grasses, juniper, snakeweed, prickly pear cactus, four-wing saltbush, and daisies. Ground visibility is 95 percent. The soil, a fine sandy loam, is classified as the Hagerman-Bond Association, 1 to 10 percent slopes (Parham 1993:78–79, Sheet No. 31).

Disturbances consist of wind and water erosion, a rest area, and highway construction. The construction of I-40, especially the eastbound entrance ramp, destroyed the northern portion of the site. The construction, maintenance, and use of the rest area have also disturbed LA 145685. The presence of innumerable fragments of broken glass obscures artifact visibility. Wind and water have exposed and buried various portions of the site. Portions are deflated and eroded, and low dunes cover other areas. Artifacts are eroding downslope. Although most of the cultural material is surficial due to the presence of sandstone bedrock at or just below the surface, the dunes may retain integrity. Cultural material may extend 20 cm (8 inches) below the surface in the dunal areas. An estimated 75 percent of the site remains intact.

Features: No features were found.

Artifacts: LA 145685 contains a low-density chipped stone artifact and sherd scatter. All artifacts observed on the surface (n=58) were recorded in the field (Table 6). No artifacts were collected. The chipped stone assemblage (n=54) primarily consists of chipping debris (n=52, 96.3 percent) but also contains a uniface fragment and a retouched flake. No diagnostic chipped stone artifacts were found. The sherd assemblage (n=4) is very small. The gray ware sherds represent an unknown Puebloan component.

Preliminary Evaluation: LA 145685 is a small, low-density sherd and lithic artifact scatter with plain gray ware sherds representing an unknown

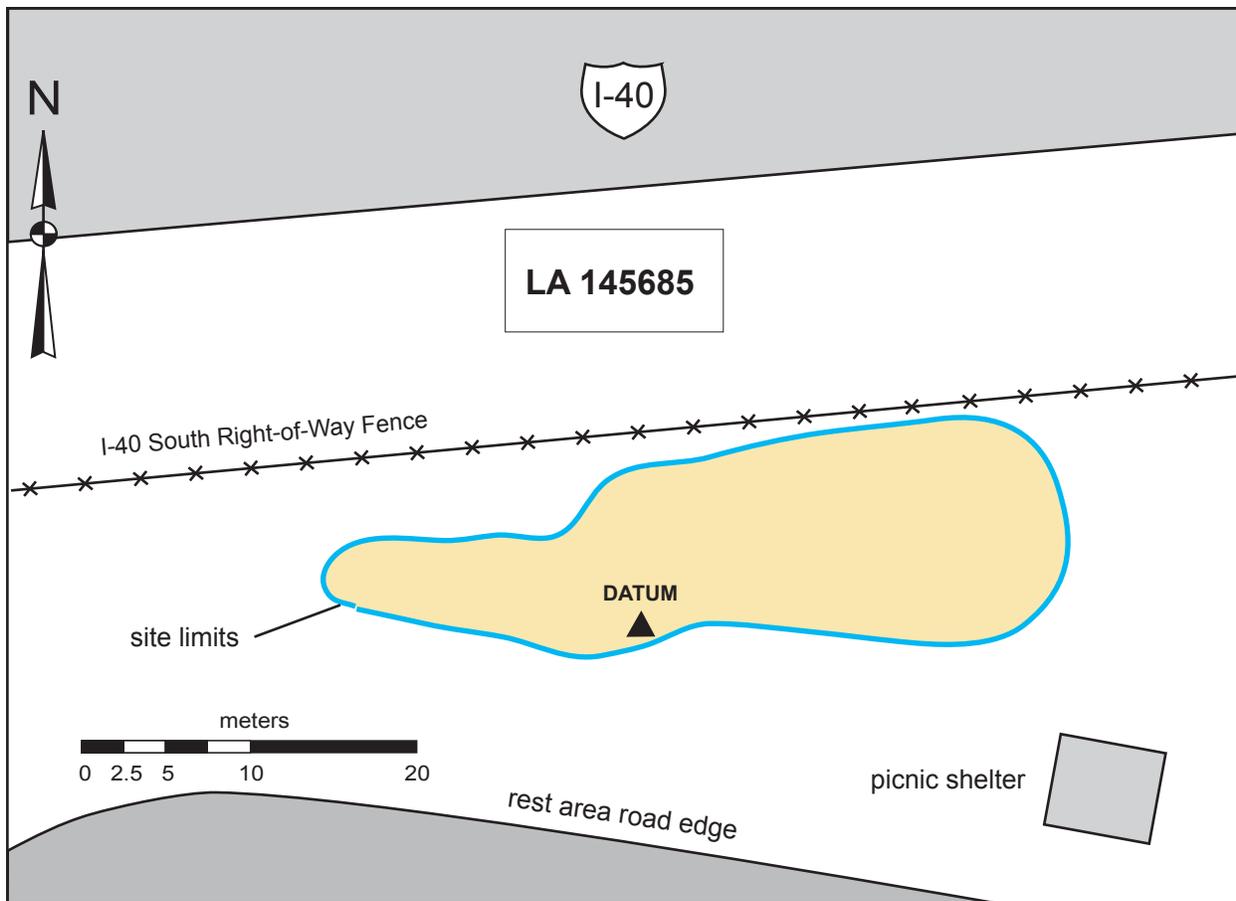


Figure 10. LA 145685 site map.

Table 6. Surface Artifact Assemblage, LA 145685.

Description	Total
Chalcedony uniface, fragment	1
Retouched obsidian flake	1
Obsidian flakes	27
Chert flakes	9
Chalcedony flakes	8
Basalt flakes	4
Quartzite flakes	3
Obsidian angular debris	1
Plain gray ware sherds	4
Total	58

Puebloan component. Although most of the cultural material is surficial due to the presence of sandstone bedrock at or just below the surface, much of the site is probably intact and the low dunal areas may contain buried cultural deposits. The site, therefore, is likely to provide important information concerning the Puebloan occupation of the

area. LA 145685 is recommended eligible for inclusion on the NRHP under Criterion D, information potential.

Project Impact: Alternative 5 will have no effect on LA 145685. Alternative 3, however, may have an adverse effect on the site.

LA 149868

Description: LA 149868, a multicomponent prehistoric and historic structural site, is on an east-facing ridge slope southwest of I-40 Exit 102 (Fig. 11.) The site, which is on both Town of Cubero Grant and private land, is 200 m (656 ft) south of I-40. Most of the site is on private land. The southwest corner of the private property fence passes through the southern and western portions of the site. Small, shallow drainages dissect the site. The site is open on the east. Eolian deposits blanket portions of the site. The site measures 130 by 30 m

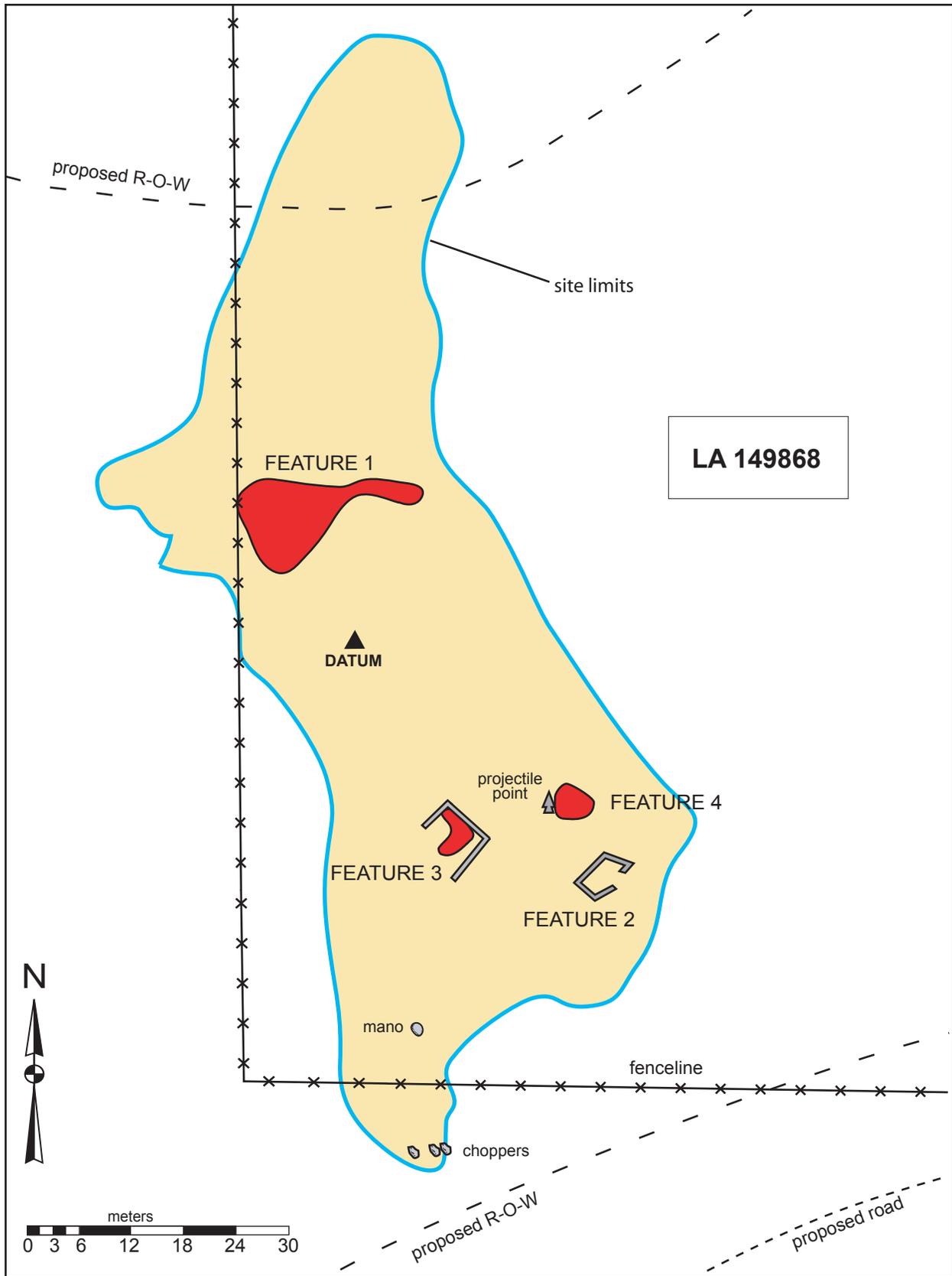


Figure 11. LA 149868 site map.

(426 by 98 ft). The local plant community includes juniper and a relatively sparse understory of grasses, snakeweed, rabbitbrush, and fourwing saltbush. Ground visibility is 90 percent. The soil, a sandy loam, is classified as the Hagerman-Bond Association, 1 to 10 percent slopes (Parham 1993:78–79, Sheet No. 31).

The prehistoric component consists of a dense concentration of rock rubble in the west-central portion of the site, near the west fence line, and a very low-density sherd and lithic artifact scatter across the site. The historic component is in the southern portion of the site and consists of a sandstone rock foundation and a small pond or reservoir. A rock concentration near the house foundation is probably associated with the historic component as well.

Disturbances include wind and water erosion and construction of the fence. The former has exposed, displaced, and buried cultural material. Artifacts are visible in eroded areas. Rocks from the prehistoric structure are eroding downslope. Intact subsurface cultural deposits may extend 50 cm (20 inches) below the surface. Overall, the site appears to be in good condition. An estimated 95 percent of the site remains intact.

Features: LA 149868 contains four identified features, of which one—a dense concentration of rock rubble (Feature 1)—is prehistoric and three—a sandstone foundation (Feature 2), a small reservoir (Feature 3), and a small rock concentration (Feature 4)—are historic. Feature 1, the remains of a prehistoric structure, consists of a dense concentration of sandstone rubble in eolian deposits on the upper portion of the ridge slope, just east of the west fence line. The feature also contains basalt cobbles. The main portion of the concentration is 11.5 m (38 ft) long northeast-southwest and 9.4 m (31 ft) wide. Most of the sandstone is about 10 cm (4 inches) or less. A shallow drainage is on the north and south and rubble eroded from the feature is in both drainages. Artifacts are scattered throughout the area. Feature 1 probably represents the remains a multiroom jacal structure.

Feature 2, a rectangular sandstone foundation in the southeastern portion of the site, is associated with the historic component. The foundation is 4.9 m (16 ft) long and 3 m (10 ft) wide. Except for the

southwest corner, which is two courses high, the foundation consists of a single course of unshaped sandstone slabs, the largest of which is 50 cm (20 in) long and 30 cm (12 in) wide.

Feature 3, a small reservoir formed by a low earthen berm that is open on the southwest, is west of the foundation (Feature 2). The reservoir is 6.1 m (20 ft) long northeast-southwest and 5.9 m (19 ft) wide. The berm is 20 to 25 cm (8–10 inches) high. The reservoir contains an L-shaped area with mud cracks, suggesting it still holds water occasionally.

Feature 4, a circular concentration of unmodified sandstone, is northwest of the foundation (Feature 1). The concentration, which is partially obscured by a juniper, is 4.5 m (15 ft) in diameter. The function of Feature 4 is unknown but it is most likely historic.

Artifacts: The prehistoric component of LA 149868 contains a diffuse, very low-density sherd and lithic artifact scatter, with a concentration in the vicinity of Feature 1. A 20 percent arbitrary representative sample (n=48) was recorded in the field (Table 7). No artifacts were collected. The recorded chipped stone artifact assemblage (n=17) primarily consists of chipping debris (n=12, 71 percent) but also a complete corner-notched chert

Table 7. Surface Artifact Assemblage, LA 149868.

Description	Total
Chert projectile point, complete	1
Basalt choppers	3
Chert core fragment	1
Chalcedony flakes	4
Obsidian flakes	2
Basalt flakes	2
Chert flakes	2
Quartzite flakes	2
Quartzite mano	1
Unidentified ground stone, sandstone	1
Gallup Black-on-white body sherd, jar	1
Tularosa Black-on-white body sherd, jar	1
Indeterminate white ware sherds, bowl	2
Indeterminate white ware sherds, jar	2
Indented corrugated gray ware body sherds	20
Clapboard corrugated gray ware body sherds	2
Plain gray ware body sherds	1
Total	48

projectile point, three choppers, and a core fragment. The projectile point has a triangular blade with straight edges, a broad neck, broad corner notches, and a broad expanding stem with a slightly convex base. The choppers are near the south edge of the site. The sample contains a variety of raw material types—chalcedony, chert, basalt, obsidian, and quartzite. Except for the obsidian, which may be exotic, the various lithic material types are available locally. The recorded ground stone assemblage (n=2) consists of a quartzite mano and a ground sandstone fragment. Although limited, the recorded lithic artifacts represent a variety of activities, including stone tool production and maintenance, hunting, animal carcass processing (i.e., butchering), and plant processing. The recorded pottery assemblage (n=29) primarily consists of indented corrugated gray ware sherds (n=20, 69 percent) and includes Gallup Black-on-white and Tularosa Black-on-white sherds indicative of a Pueblo II to early Pueblo III component.

The historic artifact assemblage is very small, consisting of two pieces of unidentified metal, a can fragment, and a flattened can. The latter is probably a small matchstick filler type (milk) can. The chronological indicators are extremely limited and only indicate that the historic component dates after 1905. The absence of the building, represented by Feature 2, on the 1957 USGS 7.5-minute Cubero quadrangle sug-

gests building abandonment prior to 1955.

Preliminary Evaluation: LA 149868 is a multi-component site. The prehistoric component consists of a dense concentration of rock rubble—a probable multiroom jacal structure (Feature 1)—and an associated very low-density sherd and lithic artifact scatter representing a Pueblo II to early Pueblo III occupation. The historic component—a sandstone foundation, small reservoir, and a sandstone concentration (Features 2–4)—probably dates to the first half of the twentieth century. Eolian deposits blanket portions of the site and cultural material is eroding downslope. The presence of prehistoric structural remains suggests the presence of intact subsurface cultural deposits. The site, therefore, is likely to provide important information concerning the Pueblo II to early Pueblo III and early twentieth-century settlement of the Acomita area. In addition, ceramic and lithic artifact analyses may provide important information regarding pottery and tool technology and trade networks. LA 149868 is recommended eligible for inclusion on the NRHP under Criterion D, information potential.

Project Impact: Alternative 3 will have no effect on LA 149868. Alternative 5, however, may have a direct or indirect adverse effect on the site, given its proximity.

RESEARCH DESIGN AND DATA RECOVERY PLAN

Six archaeological sites, LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868 are within the proposed limits or rights-of-way for I-40 Exit 102, Acomita Interchange Alternatives 3 and 5. The amount of affected site area depends on the proposed limits of Alternatives 3 and 5. This data recovery plan is being submitted in advance of the selection of design alternatives and in advance of final design and construction plans. Areas of effect will be reviewed once final design information is available, and field strategies will be revised as necessary. For most sites, less than 25 percent of the site area occurs within the limits proposed for either design alternative. The following research design and data recovery plan is divided into an introduction and probable scope of work, research design, data recovery field methods, and artifact and sample analyses and research issues. The intent of the research and data recovery plan is to propose field investigations and analyses consistent with the data potential of the site areas that will be affected by each design alternative. Research directions will focus on site-specific and regional issues as may be relevant to the site remains to be affected by the project.

INTRODUCTION

Site information used in this research design and data recovery plan is derived from surface observations made by multiple archaeologists over the last nineteen years. No testing or subsurface observations have been conducted. Various commercial and transportation-related developments in the project area have changed, removed, or obscured some of the surface indications and exposed new remains. This plan is based on the most recent information provided in the inventory report completed by Marron and Associates, Inc. (M. E. Brown and K. L. Brown 2005) and on site visits by OAS staff in October 2005. The six sites are briefly summarized relative to the area that may be affected by Design Alternatives 3 and 5.

LA 54902 is located west and along the north right-of-way limit of the current Acomita Interchange Exit 102. The site covers a 606 sq m area, of which none will be affected by Alternative 3 and 202 sq m or 33 percent of the site area will be affected by Alternative 5. The site area within Alternative 5 is south of the main artifact concentration and possible structure foundation. The pottery types, including Cebolleta, Gallup, and Socorro Black-on-whites, suggest a Pueblo II or Cebolleta phase (A.D. 1000–1150) occupation. These surface components are near the existing right-of-way fence that bounds the site on the north. Within the Alternative 5 limit, the site consists of a very dispersed artifact scatter with fewer than 10 sherd and lithic artifacts observed during the OAS site visit. The surface indications suggest that LA 54902 may contribute to research focused on Pueblo II or Cebolleta phase occupation of the middle Rio San José. However, the nature and extent of subsurface deposits within the site area within Alternative 5, and their potential to contribute to research, is unknown.

LA 89019 is the largest and temporally most complex site in the project area. The elongated site exhibits high density lithic artifact concentrations in deflated or blow-out areas and dispersed low density artifact distributions in the more stable dune areas. There are temporally diagnostic projectile point styles from late Paleoindian and Early and Middle Archaic periods. Pueblo I and Pueblo II pottery types include Kiatuthlanna, Red Mesa, and Gallup Black-on-whites, emphasizing the Cibola Ware tradition, rather than an Acoma Province tradition. A hole-in-top can and purple-glass bottle fragment are associated with a sandstone slab foundation that probably dates to the late nineteenth or early twentieth century. Soil and cultural deposit depth and the condition of the cultural deposit may be highly variable depending on the intensity, extent, and frequency of dune deflation/stabilization over the last 8,000 years. Ground stone artifacts and scattered oxidized sandstone

slabs suggest that plant or thermal processing of foodstuffs or raw materials occurred at various times. Alternative 3 will affect 1,200 sq m of a predominantly deflated portion of the north limit of LA 89019 as currently designed. Alternative 5 will affect 8,030 sq m of the 12,230 sq m site area within the north half of the site limit. This area combines deflated and stabilized areas that do not encompass the majority of the ground stone or pottery identified during the inventory and OAS site visit. Given the size of LA 89019, Alternatives 3 and 5 excavations will encounter artifact distributions, features, and possible structure remains from seasonally occupied Archaic base camps, seasonally occupied small-scale Pueblo I–II limited activity or fieldhouse sites, and seasonal historic pastoral or ranching activities.

LA 89020 is an elongated multicomponent site located along the south side of the eastbound on-ramp of Acomita Interchange Exit 102. Surface artifacts indicate occupation during the Late Archaic and late Pueblo II or early Pueblo III period. Artifact types include projectile points, ground stone, and pottery and suggest activities associated with a Late Archaic seasonal base camp or late Pueblo II or early Pueblo III limited activity site. LA 89020 will not be affected by Alternative 5 construction and only a small portion of the northwest site area will be affected by Alternative 3 slope modification. The OAS site visit indicated that little or no intact cultural deposits occurred within the NMDOT right-of-way or proposed slope modification. This area will be re-examined during data recovery to determine if intact cultural deposits exist within the proposed construction zone or right-of-way. If present, it is expected that these deposits will be shallow and will provide limited information on the organization and nature of Late Archaic or late Pueblo II–early Pueblo III subsistence activities.

LA 108511 is a multicomponent, Pueblo I and Pueblo II, low density sherd and lithic artifact scatter with a hearth (Feature 1) and Kana'a Gray vessel fragments that may have been unearched from an intact subsurface context. The site is located north of the Sky City Casino parking lot and will not be affected by Alternative 3. A narrow section of the site limit may be affected by Alternative 5. LA 108511 covers 7,170 sq m, of which 40 sq m,

or less than 1 percent, is within Alternative 5. Field observations indicate that the majority of LA 108511 consists of buried cultural deposits. The low-lying setting and potential for alluvial soil accumulation reinforce this observation.

Therefore, the surface artifact distribution may not indicate the full extent of the site. Backhoe trenching within the planned access road right-of-way is recommended with at least one trench location passing through or near the LA 108511 south site limit. The potential buried cultural deposits may remain from seasonal use of this area. Small pit rooms or structures are commonly located in potential agricultural locations during Pueblo II and III periods. It is expected that LA 108511 or the adjacent non-site areas may have limited activity or seasonal residential components from the Pueblo I and II periods.

LA 145685 is a small Pueblo I sherd and lithic artifact scatter located along the south side of the eastbound on-ramp of Acomita Interchange Exit 102, west of LA 89020. LA 145685 and LA 89020 share a similar site setting and have been affected by the same natural and manmade processes of erosion, deflation, and drainage. Roughly 25 sq m of a 385 sq m area, or 6 percent of LA 145685, may be affected by Alternatives 3 and 5. During the OAS site visit the 25 square meter area within NMDOT right-of-way contained lithic artifacts that could remain from Pueblo I site use, but the artifacts may also be contemporaneous with other temporal components described for LA 89019 and LA 89020. If this limited cultural deposit has any depth and spatial integrity, excavation and artifact recovery may provide comparative data for the Archaic and Pueblo period limited activity, base camp, or seasonal residential site studies proposed for other sites within the project area.

LA 149868 is an elongated multicomponent feature and artifact distribution within intermittently stable and deflated dunes. The site is located west of the current Acomita Interchange Exit 102 Interchange along the south I-40 right-of-way. Observed components include a Pueblo II–early Pueblo III rubble and artifact concentration (possibly a deflated fieldhouse) and three historic era foundations. LA 149868 is outside planned Alternative 3 limits, but the northern site limit is crossed by the planned eastbound on-ramp for

Alternative 5; 284 sq m of a 3,656 sq m area, or 8 percent of the site area, is within Alternative 5. The majority of the artifact distribution and all structural features are outside the construction zone. The site area within Alternative 5 is a generally stable but shallow dune that may encase or cover buried cultural deposits. An excavation plan consisting of exploratory and data recovery phases may yield artifacts and features from Pueblo II–Pueblo III seasonal occupation of this area. Earlier components may be hidden that will provide additional data for Archaic and Pueblo period limited activity, base camp, or seasonal residential site studies that are proposed for other sites within the project area.

Non-site areas within Alternative 5 need to be considered for this data recovery effort. The potential for buried Archaic or Pueblo period deposits

especially exists north of the I-40 right-of-way west of the current interchange. North of I-40, gently sloped surfaces are covered by colluvial and alluvial deposits of unknown age and depth.

Artifacts were unearthed during utility line excavations near the Casa Blanca casino and parking lot. Therefore, it is expected that buried cultural deposits may exist in adjacent areas. These areas will be examined by monitored backhoe trench excavation. Buried archaeological deposits will be recorded, dated, and interpreted relative to the research design and data recovery plan. Artifact distributions, features, or other cultural deposits similar to those found at sites within the project area will be addressed according to existing field data recovery methods and the data will be integrated into the analysis and research effort.

RESEARCH DESIGN AND ORIENTATION

Archaeological investigations in the Acoma Province have been sporadic and scattered over the last 40 years. In the 1950s and early 1960s, dissertation research and highway and salvage archaeology projects provided, and still do provide, the bulk of excavation data for the area (Danson 1957; Dittert 1959). Scattered inventories have been conducted more recently in compliance with federal and state laws governing cultural resources management and commercial, mineral, land, and transportation development. As outlined in the Previous Research section, only 96 sites with 109 temporal and spatial components are listed in the NMCRIS files for the Cubero Quadrangle. These include 6 Archaic components, 55 Anasazi or Pueblo components, 31 historic components reflecting Pueblo of Acoma and Town of Cubero Grant land use, 1 probable Navajo component, and the remaining 16 were temporally non-diagnostic sites or of unknown affiliation. The latter site class is mostly lithic artifact scatters. The component density can be expressed as 1.5 components per sq km, a grossly underestimated component density for an area that undoubtedly has a rich culture history. When it is compared with the 13 sites comprised of 20 to 25 temporal components found in the 1 sq km of the project area, the magnitude of the difference suggests that the Exit 102 Acoma Interchange project area and its vicinity possessed qualities that attracted occupation.

A combination of local and regional physiographic, topographic, geologic, and geomorphological characteristics supported a wide range of changing and flexible land-use behaviors for up to 10,000 years. The evidence for some of the temporal components, late Paleoindian-Early Archaic for example, is limited and may actually reflect scavenging and curation behaviors by later people. However, the overall impression of the component distribution and inferred settlement pattern is that the project area was an important place within a regularly inhabited region. Some of the major regional features that may have influenced past

settlement patterns are the nearby Rio San José, the broken-land mesas of the Acoma Region, and the mesa and montane volcanic environments of Mount Taylor. Diverse faunal and floral resources would have been available seasonally, annually, and across centuries as changing climatic conditions shifted ecotones and microecological zones. Populations adjusted their economic patterns and social relationships in response to these changes as they moved across the regional landscapes. It is against this backdrop of environmental diversity and temporal longevity that the material culture patterns may be studied and explained. Therefore, this research design and data recovery plan will address issues of time, technology, economic organization, and change from the archaeological perspective of sites left by populations with recognizably different social and economic organizations that periodically occupied the same space for the same and different reasons.

Survey recording has documented the potential for cultural materials, features, and deposits spanning from late Paleoindian-Early Archaic, Middle Archaic, Late Archaic, Pueblo I through early Pueblo III, and late Territorial or early Statehood periods. The research design will focus on the distinct chronological divisions of late Paleoindian-Archaic, Pueblo, and historic period components with the intent that data and interpretations from these disparate chronological periods may be examined from a diachronic perspective to better understand the long-term implications of the changing social, economic, and land-use patterns and behaviors.

LATE PALEOINDIAN-ARCHAIC PERIOD

Late Paleoindian-Archaic period components are represented by six projectile points recorded at two sites, LA 89019 and LA 89020. At LA 89019, a late Paleoindian-Early Archaic point base, an Early Archaic Jay-like, and Middle Archaic San José-like point were each recorded by a different team

of archaeologists. LA 89020 had two Late Archaic En Medio-style base and lateral fragments recorded by SWCA (Polk 2000) and MAI (M. E. Brown and K. L. Brown 2005). Biface manufacture debris and ground stone implements may also reflect Archaic occupation, but may also remain from Pueblo period forager-hunters.

Identified projectile point styles are assigned to the Oshara Tradition classification scheme for chronological control (Irwin-Williams 1973). That the projectile points reflect Oshara (Anasazi ancestry) or Cochise (Mogollon ancestry) culture group boundaries more than the wide distribution of commonly employed projectile point styles by intermountain, basin and range, and plateau pre-Pueblo hunter-gatherer groups is clearly rejected by most Archaic period researchers working in the northern Southwest for the last 25 or 30 years (Matson 1991; J. Moore and Boyer 2002; Hogan 1986; Holmer 1986; Turnbow 1997; Vierra 1994). Vierra (1994) summarized the history of the Archaic tradition observing that there were inherent difficulties in rectifying the researchers' different emphases on cultural-historical constructs and cultural-ecological frameworks based on interpretive models of adaptation (J. Moore and Boyer 2002:53; Vierra 1994:17). Wills (1988:10) characterized this cultural-historical approach by the statement, "Underlying this belief in preceramic cultural boundaries is a series of unstated assumptions about hunter-gatherer organization and about the role of style in egalitarian societies. The fundamental tenet is that material culture varies spatially with social and cultural corporateness." Cultural entities are assigned spatial limits based on the geographic distribution of diagnostic artifacts or traits. In the case of the Acoma Province, which can be conceived as transitional between Oshara and Cochise culture areas, ascribing occupations to a particular culture group is a tenuous exercise at best. Importantly, defining culture groups based on material culture and settlement patterns limited interpretation of archaeological sites that did not fit the models and obscured the important variability necessary for understanding human-to-environment/landscape relationships.

J. Moore and Boyer (2002:53) recently recognized the cultural-historical framework limitations and opt for the more flexible and workable cultur-

al-ecological/adaptational approach. They state that, "Southwestern Archaic as an adaptation to local environmental and demographic conditions is marked by a high degree of residential mobility, lack of permanent or semipermanent residential nodes, and dependence on hunting and gathering for subsistence needs. The use of pottery and specific weapon systems do not enter into the equation. Limited horticulture may have been used to supplement food resources, but domesticates did not represent a subsistence focus"(J. Moore and Boyer 2002:53). By following this perspective, archaeologists expend less energy on determining which culture group may have occupied an area and focus more on how and why occupations occurred at different times. The approach combines cultural-ecological and processual orientations and methodologies.

This orientation is especially appropriate for the Exit 102 Acoma Interchange project because it is located in an area that could be argued as cultural and geographically transitional between two long accepted culture areas, the Oshara and Cochise or Anasazi and Mogollon. While useful for categorizing sites according to material culture trait lists and chronological assignments, these archaeological culture group assignments are not useful for understanding or explaining how and why occupations occurred and under what environmental conditions. By limiting the effort spent on studying culture groups and interaction through material culture, assemblages recovered from loci within a dune field may be more productively examined using processual models developed for investigating and interpreting hunter-gather activities, sites, and systems.

Research Orientation

LA 89019 and LA 89020 have Archaic period components as determined by the presence of projectile point styles observed on the sites' surface. Since a large proportion of LA 89019 will be investigated, it is most likely to yield sufficient data to address most of the research issues outlined in the following research orientation and expectations. Depending on the integrity and preservation of the contexts and associated artifact and feature assemblages (if any are present), LA 89020 data

may be used to address one or more of the research issues. Because the proposed hunter-gatherer model may be applied to the full temporal range of Archaic phases, it is also expected that this research design will be effectively applied to any unexpected or currently unknown Archaic period contexts that may be encountered in the course of the data recovery effort. Much of the following research design has been adapted from J. Moore and Boyer (2002, 2003).

A Hunter-Gatherer Model

Archaic period populations derived their subsistence mainly from hunting and gathering. Even with an increasing reliance on farming, ancestral and historic Pueblo populations also depended on hunting for protein and gathering as a seasonal supplement. The hunting and gathering strategies employed would have been dictated by the environment, demography, and social and economic dynamics like trade alliances and marriage practices. Models have been presented for groups that rely mostly on hunting and gathering and trade for subsistence (Binford 1980). The models have been applied to archaeological sites in an attempt to understand temporal and spatial variability in artifact patterns, and identified patterns have been applied to temporally nondiagnostic sites, especially in the San Juan Basin (Reher 1977; Vierra 1980, 1985; Elyea and Hogan 1983).

Sites were classified as functional units indicative of different organizational elements of hunter-gatherer settlement and subsistence strategies (Binford 1980; J. Moore 1989; Vierra 1980; Elyea and Hogan 1983). Site types most commonly defined were residential sites, base camps, field camps, and resource extraction locations. The frequency and distribution of different site types was determined by the subsistence strategy, which was conditioned by temporal and spatial periodicity in biotic and geologic resources. Binford (1980) proposed two major hunter-gatherer strategies—forager and collector—that have been applied widely throughout the northern Southwest to study and interpret Archaic period sites and examine regional settlement patterns (Hogan 1986; Hudspeth 1997; Lent 1991; J. Moore 2001; Sattler 1986; Vierra 1985, 1994). Expectations for forager or

collector site structure and settlement patterns were based on ethnographic studies, which were then extrapolated to distributions of artifacts and features across a landscape.

Briefly summarized, foraging strategies describe the collection of resources that would then be returned to a residential site for processing and consumption. Resource extraction locations were distributed around the residential base camp within a round-trip distance that could be traveled in a day. This strategy would work best in an environment where most resources were evenly distributed across the landscape, with residential camp locations determined by the most critical resources like water. Residential camps were moved as resources were depleted or the camp became uninhabitable. With this strategy, many base camps would be scattered across the landscape. There would be few or no intermediate sites between the residential site and the resource extraction locations (Binford 1980:5–10).

Collecting strategies describe the pattern in which people would collect and partly process resources at distant locations, returning them to the base or residential camp for further processing, consumption, and storage. Residential camps would be located at or near critical resources, like water, fuel, and seasonally abundant plant and animal resources. Stays at collector residential camps would be longer than for occupation length at forager camps, with some resource procurement occurring as a multistage process. The residential site might have structures and storage and production facilities. Most resource extraction locations would be distributed within a one-day round trip from the residential site. More distant, but critical resources would be procured from temporary base camps that might have production, processing, and consumption facilities, but no long-term food storage facilities or structures. The temporary base camps would be surrounded by resource extraction locations. Long-range resource procurement would be supported by short-term storage facilities or caches of raw materials and processing implements (Binford 1980:10–12).

The Archaic components at LA 89019 and LA 89020 can be studied from a hunter-gatherer perspective. The following are relevant research questions and data sources.

Site Dating

What are date ranges for Archaic period components that may be identified at LA 89019 and LA 89020? Do different dating sources support one another allowing for diachronic interpretation of Archaic settlement and subsistence patterns relative to broad trends in environmental data?

Chronological control is critical to understanding where LA 89019 and LA 89020 fit in the occupational sequence of the middle San Rio San José and Acoma Province and for building site occupation histories as diachronic frameworks for understanding how LA 89019 and LA 89020 functioned within the long-term seasonal mobility patterns of Archaic populations. Accurate dating of Archaic components at LA 89019 and LA 89020 will also be necessary to support site structure analyses, identifying and unmixing multicomponent contexts and strata. Obviously, the more absolute or chronometric dates that are obtained, the more confidence there will be in diachronic analyses and interpretations. Furthermore, the Archaic period is so poorly understood in this area that any absolute dates will provide a baseline for future studies.

Within the dune setting it is probable that temporally unrelated components may be collapsed and mixed, resulting in features from one occupation co-occurring with artifacts from another component. The potential for mixing and conflation of components will need to be considered. Therefore, as early as possible, a geomorphologist will be employed to assess the site stratigraphic integrity relative to intact paleosols, mixed strata, and dune formation processes. Geomorphological study will aid in assessing the reliability of associations between artifact and feature distributions and the contexts of chronometric samples.

In order to maximize contextual control over chronometric dating and so that cross-dating by multiple methods is most effective, features and their surfaces of origin will be the primary focus of sample collection. Radiocarbon assays will be the most appropriate dating method for the Archaic period. When possible, multiple samples will be obtained from each feature and surface. Considering Smiley's (1985) and Dello Russo's

(1999) assessments of radiocarbon sample precision and accuracy, we will target carbonized remains of annuals or the outer layers of construction elements, should these types of samples be available. Charcoal from fuel wood will also be collected for analysis, especially from features. However, we realize that dates from these types of samples often represent decades, sometimes centuries, of wood growth prior to fuel use. As a last resort, we will collect bulk soil samples containing powdered charcoal from features and paleosols, for dating only if no better materials are available for sampling.

Archaeomagnetic samples will be collected from suitable burned contexts. Currently, archaeomagnetic measurement results from Archaic sites have limited dating potential since curve development for the Archaic period is in its infancy, but sample collection may help build a curve, especially if reliable radiocarbon dates are obtained from associated contexts. While we do not expect to be able to date features at the two sites using archaeomagnetic samples, they will help expand the current data base and may be comparable to the small array of samples already obtained from other Archaic sites (Cox and Blinman 1999). Artifacts with temporally defined stylistic variation may also help provide dates, though it is more likely that dates currently assigned to specific artifact styles will be evaluated and refined in light of radiocarbon dates.

Obsidian hydration can be useful for dating but the error estimates tend to be large (200 to 400 years), which provides poor resolution. The quality of the hydration dates depends on the sample depth, the length of time it was subjected to corrosive processes, and the care with which samples are selected. Clearly, surface samples or samples that were on the surface for a long time are suspect because of rime deterioration. The deeper the context, the better the chance for a "good" date. Care in samples selection is important because obsidian in certain situations may have a very long "use-life." Recycling and scavenging of artifacts at residential, base camp, and quarry sites may result in reworked edges or flake scars of very different ages. Each will have its own rime thickness and the average of an Archaic and Pueblo period date is really no date. Obsidian hydration may provide rel-

ative dating, if rime thickness corresponds to temporal sequence suggested by stratigraphy, radiocarbon dates, or specific projectile point styles.

Indirect dates or associated dates may be derived from temporally diagnostic lithic artifacts. Projectile points will provide only a general date that will only reinforce occupation sequences relative to existing cultural-historical frameworks. However, the combination of radiocarbon dates and projectile points may allow for some adjustment of cultural-historical framework dating, particularly if transitionally early or late date ranges are obtained.

The Archaic Settlement System

What part of the Archaic settlement system is represented by the occupations at LA 89019 and LA 89020? Does the role played by the sites change through time?

Considering the types of Archaic sites identified in the vicinity of the middle Rio San José and the Acoma Province, a range of possibilities exists for what will be uncovered at LA 89019 and LA 89020. Hunter-gatherers use different site types and occupational strategies to exploit the landscape encompassed by the territory through which they range. Two basic hunter-gatherer subsistence strategies have been proposed, and each associated with somewhat different types of sites. Binford (1980) defines two basic hunter-gatherer organizational systems—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 dominating by the Late Archaic. For example, Vierra (1990:63) feels that Southwestern Archaic hunter-gatherers "may have implemented a foraging strategy from spring to fall, and a collector or 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." However, neither this sequence nor a division into foragers and col-

lectors is necessarily clear-cut.

Early, Middle, and Late Archaic occupations appear to be represented at the project area, as indicated by the projectile points reported at LA 89019 and LA 89020. Therefore, excavation of these sites may provide an opportunity to evaluate the change from forager-dominant to collector-dominant subsistence strategies and settlement patterns. Excavation may also provide the opportunity to examine changes in settlement or organization through time, if components display artifact and feature variability. 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. While it is probable that sufficient data will be recovered from LA 89019 and LA 89020 to evaluate components relative to forager and collector organization, the ability to make diachronic interpretations will depend on the condition and integrity of the artifact and feature associations across the sites.

Forager and collector site types are commonly broken down into two basic categories, though there may be considerable variety within each category. Residential sites (base camps) tend to be the most common type of Archaic site found, representing locales where a band lived for a variable length of time depending on the season and the distribution and abundance of subsistence resources. Resource extractive locales are places where biotic resource and geological materials were gathered or procured, perhaps partly processed or reduced, and then transported to a base camp. Since most activities that extract resources from the environment leave few material remains behind, the actual resource extractive locales may be archaeologically invisible. Exceptions to this include quarries, where debris was generated during the extractive process. Locations where floral or faunal foods were collected and processed for transport may only be marked by a low density scatter of chipped stone artifacts and perhaps a thermal feature. Repeated harvesting or processing over a long period may result in accumulations of artifacts and features, thereby increasing the site visibility, but also blurring the distinction between limited base camp and resource gathering or procurement sites.

This last scenario is acknowledged by Fuller (1989:18), who suggests that field camps are an

important intermediate site type that were essentially short-term residential locales used by task-specific groups while collecting resources that will be returned to the base camp for storage. Resources were sometimes cached at field camps for later recovery and movement to the base camp. This type of site may be very difficult or impossible to distinguish from short-term base camps used by foragers.

In general, foragers inhabit base camps for a short period, ranging out from them to exploit resources on an encounter basis. Collectors inhabit base camps for longer periods, exploiting surrounding resources through day trips and sometimes through the use of short-term 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.

Three theoretical forager and collector site types were identified above—residential 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 residential 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 residential 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 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 camps occupied for short periods from field camps used by collectors. Both should exhibit evidence of short-term occupation, and 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. One way the problem can be dealt with is through analysis of the chipped stone assemblage.

The manufacture of general purpose bifaces reflects a mobile lifestyle, and more commonly occurs at residential base camps than at field camps or resource-extractive locales. Kelly (1988:731) defines three types of bifaces: (1) those used as cores as well as tools; (2) long use-life tools that can be resharpened; and (3) 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 they are made from 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 residential 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, "[i]n 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 residential rather than logistical sites (Kelly 1988:721).

Using these concepts, Kelly developed a model to aid in distinguishing between residential and logistical or field camp sites. 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.

The assemblage diversity and potential presence of features at LA 89019 and LA 89020 suggest that these locales may have primarily served as residential base camps. The potential for a late Paleoindian to Late Archaic date for the sites suggests that a both forager and collector subsistence strategies should be found if Irwin-Williams's (1973) reconstruction is correct. However, if Vierra's (1990) evaluation of the Archaic subsistence strategies is more accurate, the type of strategy identified will be dependent on the season of occupation. We expect that our studies of LA 89019 and LA 89020 will provide baseline data on flexible subsistence strategies and shifting settlement patterns as late Paleoindian and Archaic hunter-gatherers responded to the long-term climate changes that occurred between 7500 B.C. and A.D. 700 (Wills 1988).

If the sites or portions of the sites represent a foraging focus, we would expect to find evidence for warm-season use. This may include ephemeral shelters lacking internal heating features. There will be no evidence of storage features, and a wide range of activities should be reflected in fairly small artifact assemblages. The types of floral and faunal materials recovered should also reflect warm-season use. If storage features are present and a limited range of activities is represented in

the artifact assemblages, we will consider the possibility that field camps associated with a collecting strategy are represented. As this discussion suggests, a wide range of data will be needed to address this research issue. Information on how structures and features were built and interrelated will be needed, as will detailed data on artifact type and function, and the types of foods that were consumed.

Archaic Site Spatial Organization and Function

If discrete temporal or occupation components are identified at LA 89019 or LA 89020, what can their spatial organization tell us about how these locations were used through time? How does data from spatial organization inform on generalized Archaic site structure and occupation patterns?

The artifact distributions within the deflated areas of LA 89019 and LA 89020 have the potential for examining factors that influenced selection of particular locales for occupation and conditions under which repeated occupation may have occurred over a long period. The extensive distribution and multicomponent nature of LA 89019 and LA 89020 suggests that the sites were repeatedly occupied by small microbands or commensal units. While larger or macroband size groups may have occupied these locales, there is no immediate indication of larger-scale cooperative resource gathering and processing or hunting preparation. The amount and variety of artifact types is consistent with repeated, but discontinuous, long-term occupation by smaller groups. Investigations of sites located in dune settings in the Grants area to the west (Bryan and Toulouse 1943; Agogino and Hester 1956) and at the Moquino site 15 miles to the east (Beckett 1973) indicate that stratigraphically and spatially discrete components may be intermingled with highly mixed deposits for base camps and logistical sites. How and why the sites were reoccupied through time may be addressed through the association and distribution of artifacts, features, and structures. The following discussion of occupation behaviors should be useful for distinguishing repeated occupations by the same group by sequential occupation by different

or unrelated groups.

Vierra (1985) has examined the process of site reoccupation using ethnographic and archaeological data. In summary, several factors appear to affect the decision to reoccupy previously used sites. Sites might be reused if the selection of suitable alternate locations is limited: "Certain site functions demand much more specific requirements. The more specific the requirements are, and the more limited the number of locations which meet those requirements, the more frequently these advantageous positions will be reused" (Vierra 1985:64).

In general, logistical sites tend to be reoccupied more often than residential locations, especially when hunting is dependent on the planned intercept of game rather than unplanned or unanticipated encounters (Vierra 1985:64). Locational requirements for residential sites are often more flexible, resulting in less need to reoccupy the same spot (Vierra 1985:65). There were also two very good reasons for not reoccupying old residential locations: hygiene or health and resource depletion (Vierra 1985). Old camps contain unsanitary debris and garbage that can cause infection and sickness as well as parasitic infestation. The zones around them have also been depleted of useable resources, and may require several years to recover sufficiently to allow successful exploitation to again occur. When the same area is reused, new camps tend to be located near, even adjacent to, rather than on top of old camps (Vierra 1985:65).

This pattern is replicated archaeologically. Vierra (1985:183–184) found that multicomponent sites containing Archaic and Pueblo materials in the San Juan Basin did not represent a blending of materials, as might be expected when specific areas were reoccupied. Rather, later occupations were structurally distinct, and appear to represent use of adjacent areas. Camilli (1989) found evidence of similar site reoccupation patterns on Cedar Mesa in southeast Utah. While smaller sites appear to represent single-use locales, larger sites contain evidence of overlapping occupations. Eschman (1983) studied site structure at LA 19374 in the San Juan Basin, and concluded that, "The overall extent of these cultural deposits . . . appears to be the result of multiple, overlapping occupa-

tions over a considerable time period" (Eschman 1983:379). Thus, when camps were reused, the exact locations were rarely reoccupied. New camps were instead placed in adjacent areas, at times overlapping earlier deposits. This produced sites of large areal extent with artifact densities similar to those of single occupation sites.

In the cases cited above, Archaic strata were mostly deflated and compressed, forming areally extensive but thin deposits. LA 89019 and LA 89020 should be similar in structure to those sites, as is suggested by the investigations by Bryan and Toulouse (1943), Agogino and Hester (1956), and Beckett (1973). Variation in the type of remains occurring in each potential occupational zone identified at LA 89019 and LA 89020 could indicate that repeated uses of the same general area occurred during different seasons and do not represent the same site function. If different site functions are suggested for locales that reflect the same season of use, a basic forager pattern might be represented in which site use and longevity were dependent on the array of resources available in a particular year.

Locational information and data on artifact type and distribution will be needed to address this research issue. By imposing a system of grid units over the sites we will be able to control for location and artifact distribution, providing data amenable to a variety of analytical methods. Analysis of all recovered artifacts will provide information on the types of activities they represent, which can be combined with the distributional analysis. In addition to these data needs, information on seasonality (discussed later) and dating (discussed earlier) will be critical.

Archaic Subsistence

What was the subsistence focus during the Archaic occupations at LA 89019 and LA 89020? Did the subsistence activities change as might be expected in response to long-term climate change from late Paleoindian to Late Archaic times?

Surface artifact classes observed at LA 89019 and LA 89020 indicate that a relatively broad spectrum of subsistence activities occurred. Projectile points

and evidence of biface manufacture and maintenance suggest hunting and potentially meat processing, packaging, and consumption. Ground stone implements indicate gathering and processing of the wide variety of plants and plant products that would have been seasonally available. The Late Archaic projectile point leaves open the possibility that limited horticulture was practiced, although there is no evidence for early corn from any of the local and regional Archaic site investigations (Agogino and Hester 1956; Beckett 1973; Bryan and Toulouse 1943; Lentz 2004).

We expect to recover data suggesting a generalized hunting-gathering subsistence system involving the consumption of locally available wild plant and animal foods. It is expected that direct evidence of subsistence activities will be obtained from three sources. Faunal remains will hopefully provide information on the types of animals that were exploited for subsistence needs. Macrofloral materials should be recoverable using flotation analysis, and all contexts that appear able to provide this type of information will be sampled. Finally, pollen analysis may provide a more limited view of the subsistence system. In particular, pollen washes from ground stone artifacts may provide subsistence data that will augment information provided by flotation analysis.

Indirect evidence of subsistence may be obtained from artifacts and features. Artifacts will be analyzed for morphological and technological attributes that may reflect manufacture, function, and use. Feature morphology and content should provide information on the range of processing activities. Different analytical orientations that will be applied to artifacts and features are further discussed in the Analytical Methods section that follows.

Archaic Seasonality and Mobility

During what season(s) were LA 89019 and LA 89020 occupied and did the seasonality pattern change through time? What mobility patterns are suggested by the lithic raw materials? Do the lithic raw material distributions indicate changing mobility patterns through time?

Seasonality is an important structuring variable for occupation type, length, and activities. Based on the surface artifact information, we expect that LA 89019 and LA 89020 were primarily occupied during late summer and fall when a variety of plant foods were available and fall hunting in preparation for overwintering would have occurred.

If LA 89019 and LA 89020 sites were occupied during cold seasons, one or more definable structures should be present. Given the large portion of LA 89019 that will be investigated one or more structures may be encountered. At LA 89020, only a small portion of the site may be investigated and it is less likely that any structure remains will be encountered. Instead, activity areas or rubbish disposal debris from residential occupation may be encountered in the deflated deposits located within the right-of-way. If structures occur at either site, they will probably be ephemeral and difficult to define because they should have been built in shallow pits without formal floor or walls. One or more thermal features should occur within each structure, there may be evidence of post holes for interior roof supports, and interior storage pits may be present. The occurrence of structures that lack internal thermal features and storage pits may be evidence for occupation during the warm season, counter to our expectations.

Information on the season of occupation may also be obtained through study of macrofloral remains recovered from flotation samples. If a cold-season occupation took place, evidence for the processing of plant foods available in late summer or fall is expected. Plant foods available in the spring or early summer are not expected, unless there is evidence that they were stored in anticipation of future need. In particular, we expect corn macrofossils to occur, providing that this domesticate was available for use by site occupants.

Some evidence for seasonality may also be available from faunal remains, provided enough identifiable bone is obtained to allow analysis of subsistence patterns. If a cold-season occupation is reflected, we would expect evidence of 6-month-old artiodactyls, an absence of hibernating species like prairie dogs, and perhaps the presence of bird species that winter in the area. However, Archaic sites rarely yield well-preserved faunal remains, and the bone recovered from this type of site is

usually either burned or very small unidentifiable fragments. Thus, faunal analysis may augment information available from structural remains and macrofloral fossils, but by itself fauna is unlikely to provide data that are strongly indicative of seasonality.

LA 89019 and LA 89020 represent one component of extensive annual or lifetime territories that were occupied by mobile populations over the last 8,000 years (Binford 1982; Kelly 1992). It is probable that the middle Rio San José was an important stop as hunter-gatherers moved between low and high altitude resource areas, and as indicated above, may have been primarily occupied during late summer to late fall months.

Mapping hunter-gatherer mobility or settlement patterns has been especially productive for the San Juan Basin. For example, Vierra (1990) has suggested populations moved into and out of the San Juan Basin during the warm weather months with fall and winter camps occurring in well-watered higher altitude settings, similar to the middle Rio San José. We might further expect that Archaic populations may have moved between lowland settings of the middle Rio Grande to the south and east and upland settings of the Mount Taylor–Acoma area. While moving between these different areas, local lithic resources may have been used to produce tools or portable cores or large bifaces that were brought to and reduced at LA 89019 and LA 89020 resulting in their disposal or production of waste products from their reduction. These behaviors could result in a wide range of low frequency non-local lithic raw materials deposited at the sites as a reflection of the long distance aspect of the hunter-gather settlement pattern. Obviously, the tracking of non-local raw material type distributions has long been used to infer trade, travel, long-distance exchange or interaction (Matson 1991; Vierra 1990). For LA 89019 and LA 89020, which were intermittently occupied by Archaic occupations for 5,000 to 8,000 years, analysis of lithic raw materials may be particularly fruitful.

Lithic raw material studies will be included in the chipped stone analysis outlined in the Analysis Methods section of this report. During the analysis special attention will be focused on identifying exotic raw materials to known and potential source

areas. While precise source locations may not be determined given the vagaries of long-term effects of geomorphological and geographical processes on geological materials, we should be able to source some raw materials to geographically discrete regions. X-ray diffraction will be used to source obsidian artifacts from all temporal and spatial components. Comparative lithic collections available at the Office of Archaeological Studies and other institutions will be used to identify the varieties of Zuni, Chinle, Narbona Pass, Brushy Basin, and Morrison Formation cherts and other cryptocrystalline materials that may be recovered.

THE PUEBLO PERIOD (A.D. 700–1200)

Pottery identified on the surface of LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868 indicate that these sites may have temporal components dating from A.D. 700 to 1200. This period spans much of the prehistoric Pueblo occupation of the Acoma District, the middle Rio San José to the east, the San Juan Basin to the north, and eastern Red Mesa Valley to the west, and the Zuni-Mogollon Highlands to the west-southwest. The project area is more or less centered within the geographical region ascribed to the Eastern Anasazi culture area and Anasazi-Mogollon culture area transition. Previous studies in this area have focused heavily on identifying and explaining material culture variability that at different times in the past exhibited more similarity to Anasazi or Mogollon or mixed Anasazi/Mogollon or Mogosazi, as is it has been termed by some researchers (Cordell 1979a; Danson 1957; Dittert 1959; Eidenbach 1982; Tainter 1982; Tainter and Gillio 1980). These predominantly cultural-historical studies provide good descriptions and comparisons of material culture trait lists. They document the variability that stems from a long-term seasonally and residentially mobile agriculturally focused adaptation that predominantly relied on locally available resources for producing the objects employed in quotidian activities. Some choices resulted in differential distribution of material culture across a vast physiographically and ecologically diverse region and may have reflected cultural difference or identity. However, it has also been demonstrated that much of the variability, at least

before A.D. 1000, may reflect distribution and availability of resources. These environmentally influenced attributes were manifested in pottery of a different paste color or different house forms that were used in essentially the same way across the region (Wilson 2002). Later in the temporal sequence, variability could be partly attributed to long-distance social or economic interactions that resulted in movement of goods rather than people.

Sites with Pueblo components within and near the project area are evidence of a long-term use pattern that appears to focus on arable land and available water sources that occur in mesa canyon bottomlands and the middle Rio San José and its tributaries. Distribution of sites and the activities they represent may be partly conditioned by the distribution of different soil types and depths across the project area. North of Interstate 40, deep alluvial soils that may have been suitable for farming cover a large area. These deep and stable soils also may contain buried cultural deposits. South of Interstate 40, the soil is more typically dune field with deep alluvial deposits farther south and up the side canyons. These shallower, less stable dune soils could have been farmed as garden patches or they may have been foraging loci that supported different seasonal plant species than were available in the deeper alluvial soils. Therefore, the project area may have been suited to two farming strategies, as well as a source of seasonally diverse plant products.

The Exit 102 Acomita Interchange sites represent only a small part of regional culture history and social and economic interaction and change that will be investigated from the further limited perspective of site areas within Alternatives 3 and 5. The site areas that fall within the alternatives have relatively few surface artifacts or visible features from which data may be recovered for this study. The low frequency of surface materials initially suggests limited Pueblo period occupation within the project area. However, surface artifact and feature distributions may not be the best indicators of the extent and density of subsurface deposits. Shifting dunes and aggraded alluvial deposits mask some of the past occupation evidence, but nonetheless, the low frequency of surface ceramics from any period suggests that buried deposits will reflect small-scale and short-duration

activities consistent with seasonal occupations.

LA 54902 and LA 108511 have few artifacts and no features within the proposed limits of Alternatives 3 or 5, with larger site areas outside of the proposed construction zones. However, the sites are located north of Interstate 40 in a geomorphic setting where there is potential for deep soils that may contain buried cultural horizons. The surface artifacts in the site areas outside of Alternatives 3 or 5 include pottery from Pueblo I or White Mound phase and Pueblo II or Cebolleta phase occupations. Data recovery will focus on determining if buried deposits exist in these deep alluvial soils within and adjacent to the LA 54902 and LA 108511 site limits.

LA 89019, LA 89020, LA 145685, and LA 149868 are located on the south side of Interstate 40 in stabilized and deflated dunes interspersed with exposed sandstone bedrock. LA 89020 and LA 145685 lack Pueblo period ceramics in the proposed Alternative 3 and 5 limits. The small site areas that may remain within the construction zones should have limited depth with mixed-age deposits. It is unlikely that these sites will contribute more than basic artifact data to the study. LA 89019 has a greater area of stabilized dune within the Alternative 5 limit, but with few ceramics present on the surface. Buried, but ephemeral or light duty architectural remains and collapsed or deflated features may be present in low numbers. Segregating Archaic and Pueblo period components in the dunes may be difficult. LA 149868 has a well-defined Pueblo II or Cebolleta phase component with possible architectural remains and a midden or refuse concentration that are probably the remains of a fieldhouse. The artifact distribution from the fieldhouse does not extend into Alternative 5. Therefore, the site area may contain scattered artifacts and ephemeral features that may be contemporaneous with the fieldhouse occupation or small-scale resource procurement and processing activities.

Research Orientation

The archaeological remains at these sites reflect broad trends in prehistoric Pueblo subsistence practices, settlement, land-use patterns, and identity and social organization. The sites represent an

accumulation of material from discontinuous occupation episodes that occurred between A.D. 700 and 1200. Initial evidence suggested that the sites played multiple roles within seasonal subsistence strategies that changed through time in response to population growth and movement and climatic variability. Based on the survey evidence it is likely that the Pueblo II period or Cebolleta phase will be best represented by the surface and buried artifacts, features, and cultural deposits. The following research design focuses on dating the site Pueblo components and studying them in terms of seasonal subsistence strategies.

Identifying and Dating Pueblo Period Components

Are discrete or identifiable Pueblo period components present at the sites?

Identifying and dating Pueblo period components are crucial to implementing the research design. Surface evidence at the six sites suggests that the project area was intermittently occupied from A.D. 700 to 1200. However, except for the LA 149868 fieldhouse component, the temporally diagnostic sherds that date the sites occur in low frequency and may reflect ephemeral or brief occupations. Two sites are mixed with Archaic period materials (LA 89019 and LA 89020) and the other four (LA 54902, LA 108511, LA 145685, and LA 149868) have no temporally diagnostic artifacts within Alternatives 3 and 5. Therefore, the initial data recovery effort will focus on determining if discrete or intact Pueblo period components exist at the sites.

Field assignment of site occupation dates will rely on established ceramic typologies for the Acoma Province and Cibola and Mogollon Highland regions (Carlson 1970; Dittert 1949, 1959; Gladwin 1945; F. Hawley 1936; Ruppé 1953, 1966; M. Marshall 1991). The well-documented white and red ware and less temporally diagnostic brown and gray ware traditions will be employed to assign broad temporal ranges. Unmixed Pueblo period deposits or contexts will be represented by ceramic types from one or two of the temporal phases outlined in the Culture

History and Native American Ceramics sections of this report. Recognizing that ceramics from two phases may represent a discrete temporal component allows for transitions between cultural phases, such as a transition from Cebolleta to Pilaes phase, which may be represented by the co-occurrence of Socorro Black-on-white, Los Lunas Smudged, and Gallup Black-on-white pottery. Also, some pottery types, such as Socorro Black-on-white, have a long manufacture span in addition to wide geographic distribution.

The co-occurrence of Archaic projectile points and prehistoric Pueblo pottery may indicate mixed deposits or Pueblo collection and reuse of tools exposed in deflated dunal areas. Probable Pueblo period deposits or contexts that have one or two Archaic period projectile points, especially if they are from different phases, will be treated as Puebloan. Multiple Archaic projectile points in association with a predominance of biface manufacture debris, and one-hand manos and basin metate fragments in association with Pueblo pottery are more likely to represent post-occupational mixing. These contexts will be sampled and the recovered artifacts and samples may be used to examine site function and subsistence strategies from a general or non-temporal perspective. LA 89019 and LA 89020 should have the greatest potential for mixed deposits because of their dune setting and presence of deflated and probably mixed surface deposits.

Chronometric samples will be collected when appropriate contexts or deposits are encountered. The number and range of contexts or features that may yield chronometric samples should be conditioned by the length and intensity of the occupation(s). Limited activity sites consisting of low frequency artifact assemblages and one or two thermal or pit features will have less chronometric potential than seasonal residential sites, which may have a greater number and variety of intramural and extramural thermal features and pits and burned or unburned structural elements or activity spaces. Permanent residential sites would be expected to have sources for chronometric samples similar to seasonal residences, but perhaps in greater abundance. White Mound, Kiatuthlanna, Red Mesa, Cebolleta, and Pilaes phase occupations may be represented within the project area by

one or more site types or occupation patterns. Later phase residential sites occur near but probably not within the project area. These different site types may yield contexts or samples for radiocarbon, archaeomagnetic, and dendrochronological dating. Obsidian was observed in the field and may be recovered from subsurface contexts. In the absence of ceramics or other chronometric samples, obsidian hydration may be considered as a means for obtaining relative dates. Collection procedures and justifications are provided in the Chronometrics section of this document.

Farming and Foraging along the Middle Rio San José

What is the nature of the occupations at LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868? Do the artifacts and features represent seasonal fieldhouse occupations or repeatedly used gathering base camps? What subsistence strategies are represented and did they change through time? Did these sites function as seasonal residences or limited activity camps?

The project sites are expected to consist of multiple components of Pueblo period settlement and subsistence systems. Activities and behaviors that are associated with semi-permanent or seasonal residences and foraging, hunting, and travel camps may be represented by the artifact and feature distributions. While the project area has been divided into archaeological sites as administrative units, it is more likely that this area, which evidences persistent, if intermittent occupation, functioned as a more integrated spatial component of local and regional settlement and subsistence systems. Occupation duration and intensity and the tendency to reoccupy the same location were conditioned by distribution, availability, viability, and abundance or extent of critical resources, and distance to primary residence, if seasonal occupation occurred. Site architecture is sensitive to these factors, in addition to its possible function as landscape or claim marker, as population increased and viable agricultural land grew in importance late in the prehistoric sequence (Kohler 1992; Schlanger 1992). Abundance and variety of tools, containers,

and facilities should also increase in proportion to occupation duration and intensity. Therefore, it is expected that when discrete or discernible Pueblo components are encountered, their excavation will inform on the relationship between site structure, human behavior and activities, and environmental and social influences.

Previous researchers have developed criteria for recognizing occupation patterns that were associated with different facets of Pueblo subsistence organization (B. Moore 1980; J. Moore 1989, 2001, 2003; Post 2002). These studies focused on modeling seasonal residence, fieldhouse and limited activity sites relative to length and intensity of occupation, range of activities, proximity to economically important resources such as agricultural fields, diverse or abundant biotic resource patches, and distance from a primary or permanent residence. Criteria were suggested and are offered below for unpacking site structure and artifact assemblage variability relative to different types of seasonal occupation. Utility of these criteria on a site-by-site basis will be determined by the amount and kinds of remains found at each site.

Fieldhouses or Seasonal Residences

The following are criteria and discussions of occupation pattern and site structure for fieldhouses or seasonal residences.

1. Structure. Structures consisting of one to three rooms may be present, with one room large enough to permit occupation by one adult. Floor area may be consistent with the average for contemporaneous habitation-village sites within the same settlement system or cultural tradition. Structures may be above ground or subterranean.

Initially, fieldhouses were recognized as one- or two-room masonry structures on or near arable land (Haury 1956; Woodbury 1961). Haury (1956) considered the occurrence of fieldhouses or farmhouses after A.D. 1000 to be a result of settlement nucleation and population aggregation. Because single-room masonry structures were not common prior to A.D. 1000, fieldhouses were also presumed to be uncommon. More recently, fieldhouses and their purpose within prehistoric settlement and subsistence systems have been more broadly

and probably more accurately defined (Burns 1978; B. Moore 1978; Burns and Klager 1979; Sebastian 1983; Miller 1985).

B. Moore (1978:9) describes fieldhouses as the largest class of architectural prehistoric site spanning Basketmaker III to Pueblo IV times; they are the most frequent site type during Pueblo III and Pueblo IV times. Fieldhouses were used on a daily basis, as seasonal camps, and as way-stations for hunters and wayfarers (B. Moore 1978:10). The factors most often affecting fieldhouse use are distance from the primary habitation and time of year. Ethnographic data show that field locations may range from direct line of sight to 8 miles distant (B. Moore 1978:10).

Fieldhouses or seasonal residences will have site structure and artifact assemblages distinct from limited activity sites. Known site structure attributes are briefly summarized by time and then general expectations for occupation patterns are provided.

During the White Mound phase, seasonal residences primarily consisted of subterranean dwellings or pitstructures in association with a range of storage, processing, and thermal features and light-weight jacal or brush shelters or shades. Late spring to early fall residences were located near arable land and water with distance to most other resources more variable and less critical.

During the Kiatuthlanna and Red Mesa phases, subterranean pitstructures may have continued in use, but they have not been documented for the region surrounding the project area. Seasonal residences continued to be formal and substantial consisting of jacal-walled structures with slab foundations. A similar suite of extramural features have been present when areas outside the structure have been investigated. Residences continue to be located following the White Mound phase pattern.

During the Cebolleta and Pilares phases, permanent residences consist of formal above-ground room blocks divided into suites of rooms used as residences and for storage. Walls are masonry with room suites suggesting household or suprahousehold organization (*sensu* Wilshusen 1988). Residences may not be located near arable land used by all site residents. Such a residence is represented by LA 148687, which is located immediately south of the project area. Seasonal fieldhouses

may be established near arable land and occupied for different lengths of time depending on geographic (distance to site) and social factors (participation in seasonal rituals or ceremonies). Seasonal fieldhouses may consist of above-ground masonry or jacal structures or small pitstructures may be employed. Obviously, the latter are archaeological invisible without excavation. Multiple small pitstructures, contemporaneous with the Cebolleta phase, were found at LA 3558 about 30 km to the east in the middle Rio San José Valley. Small pitstructures are more widely known from the Rio Grande valley near Belen (Wiseman 1995) and Santa Fe (Hannaford 2000). Small pit structure invisibility leads to artifact scatters being characterized as limited activity sites in survey data. It is probable that many of the small Cebolleta phase sites have pitstructures reflecting a trend toward a more land-extensive settlement pattern.

2. Site location. Land potentially suitable for agriculture should be near the site. Such land should be in a direct line of sight with the structure. Based on soil characterizations and on-site visits, the area north of Interstate 40 within the project limits includes arable land. Additional arable land is available immediately to the south of the project area. Field locations may be verified by pollen analysis and presence of water control or irrigation features.

3. Pattern of Use. Three limited-use patterns are proposed.

Daily use would occur during crucial parts of the agricultural cycle, such as planting, early sprouting, preharvest, and harvest. Daily-use fieldhouses were primarily near the residence but out of direct view. Sporadic visits to the fields for maintenance and inspection would also be similar to daily visits. Sporadic visits would involve limited activities and therefore have limited visibility in the archaeological record (B. Moore 1980:85; Sebastian 1983:404). Brush structures and lean-tos would be the most common architectural feature. Food consumption and preparation would be represented by bowl vessel fragments or one or two storage vessels for water. Breakage of these vessels would probably be a rare event because of low traffic and

infrequent use. Hearths, if present, would be expected to be extramural.

A daily-use pattern, with overnight stays restricted to preharvest and harvest conditions, should produce the sparsest remains. Tools and containers used in food procurement, preparation, and consumption may be present, with processing tools rare or in low frequencies. Hearths, if present, should be exterior, used for food preparation rather than heat. Repeated use over a long period of time may result in greater artifact frequencies and difficulty in segregating daily use from biseasonal use.

Seasonally used fieldhouses would be located near fields that were too distant for daily travel. Use would occur during planting, preharvest, harvest, and when the crops were threatened by bird or animal foraging. Full-time surveillance of the fields could be necessary. A household with a substantial structure could be established (B. Moore 1978:12), which would minimize the inconvenience created by distant field locations. This behavior pattern would result in more highly visible archaeological remains. Early surveys and research projects in the Southwest were often less concerned with artifact scatters not associated with architecture. As a result, earlier fieldhouses were not identified by Haury (1956).

Biseasonal use with continual occupancy during the growing season will be difficult to distinguish from year-round occupation. An artifact assemblage reflecting nearly a full range of food preparation, tool production, and maintenance activities should be present. Characteristics of full-time residency, which should not be present, include interior hearths for heating and cooking; ritual features, such as kivas; stratified midden deposits; and other features from which evidence of nonseasonal occupation may be derived.

Occasional use by travelers or wayfarers might not be distinguishable from other uses. Use of existing hearths, tools, and containers is likely, and introduced objects may not be distinguishable from existing items.

Repeated occupation of a fieldhouse would result in mixed deposits. Annual or periodic reuse of these more substantial fieldhouses would result in an artifact assemblage that is very similar to that of a residential site. Sebastian (1983:411) classifies full-time or substantial fieldhouses as a substantial

structure with an interior hearth and a concentration of trash reflecting a full range of domestic activities. The actual length of occupation, the number of occupants, and the number of times they or their descendants return may be extremely variable. Substantial fieldhouses are also known as farmsteads (Wilcox 1978; Haury 1956).

In addition to habitation, masonry fieldhouses may have served as storage units (Wilcox 1978:28). Such fieldhouses would have allowed the farmer to transport the harvested crop on demand rather than immediately after harvest. This would be desirable if the distance between the fieldhouse and winter residence was great. Another reason for more seasonally intensive use of fieldhouses could be the need to build and maintain water and erosion control devices (Wilcox 1978; J. Moore 1985).

Fieldhouses may have functioned as rest stations or base camps for hunting and gathering forays and trade trips. These activities might increase artifact frequencies without being separable in the archaeological record. Binford (1980) observed a great amount of variability and overlap in site use by mobile hunters and gatherers. B. Moore (1978:14) and Sebastian (1983:404) suggest that residents of seasonal or full-time fieldhouses would also have relied on hunting and gathering for food. Processing and cooking of gathered foods and stored grains at a habitation would result in an artifact assemblage that virtually masks hunting and gathering activities.

Besides acting as shelters and part-time homes, it is possible that masonry or well-maintained jacal structures may have served as boundary markers or symbols of ownership (Kohler 1992). A maintained structure would be visible proof of field ownership. This might have been important as population in the Acoma Province increased and primary farmland became more valuable. Primary farmland would be close to the settlement, well watered, and proven productive. Greater competition for fields could have made the marking of ownership necessary especially after the Red Mesa phase.

This brief overview of fieldhouse attributes demonstrates that there is much variability in form and function. These two main attributes, artifact assemblages, and archaeological visibility are con-

ditioned by distance from primary habitation, reason for occupation, length of occupation, number of occupations, number of occupants, and types of activities performed. These variables are by no means mutually exclusive, and each depends on the others.

Gathering sites. Gathering sites, when used only for that purpose, may have characteristics that are different from those of fieldhouses. These characteristics are mostly derived from attributes of Archaic period sites and from studies that included so-called gathering sites (Sebastian 1983; Reher 1977; Moore and Winter 1980). Gathering sites may be present for temporal components suggested by the site data.

1. Structure. Structural evidence may be absent, or if it is present, it should be insubstantial. Examples of insubstantial structures are lean-tos or wickiups. Evidence of these structures may include shallow, saucer-shaped depressions or postholes. Structures would be used primarily for shelter against wind and rain and for very temporary seasonal use.

2. Site location. Gathering sites should be located in environmental transition zones where plant diversity may be high, allowing for exploitation of a wide range of plant species. Alternatively, site locations may be near an area where one seasonal plant could be harvested in abundance. Sites may or may not be located near potentially arable land.

3. Pattern of use. Use should be seasonal and short term. Overnight stays are implied, and the length of stay corresponds to the amount of time it takes to collect a sufficient supply of a given resource. Depending on the distance from the habitation and the nature of the resource, the length of stay may include processing time. Features may include interior and exterior hearths, and fire-cracked rock discard piles or scatters. Artifact assemblages would reflect a focus on processing, including grinding implements, scrapers, and hammerstones. The types of seeds or nuts gathered would dictate the types of ground stone. Diversity in ground stone may be expected when transitional zones are exploited. A more restricted tool kit

should occur with single or limited resource procurement. Small numbers of vessels for consumption and processing and short-term storage vessels would be expected. Reworked vessel fragments used as scoops or plates may also be present.

Survey recording of LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868 suggest that they could have been fieldhouse or foraging locations. Excavation and recording of architectural and feature remains should provide site structural information that can be related to the intensity and duration of the occupation, as well as the range of site activities. By analyzing the surrounding area for agricultural potential it should be possible to assess the spatial relationship of the sites to potential fields or gathering resource areas. Recovery of floral and faunal remains from features and trash deposits should provide information about the range of activities performed at the sites. Depending on specimen preservation, indexes of seasonality using plant remains may be developed. Recovery and analysis of artifacts will also provide information about the activities performed, and artifact distributions may lead to inferences about intensity of occupations and potential for repeated occupations. Field and analytical methods, frameworks, and ancillary research directions are provided in the following section.

HISTORIC PERIOD COMPONENTS

LA 89019 and LA 149868 are multicomponent sites with prehistoric and historic features and artifacts. The historic era features probably date from the late Territorial period (A.D. 1879 to 1912) and most likely reflect aspects of a pastoral subsistence pattern. Grazing was the primary subsistence activity in the local rural landscape throughout the historic period beginning with sheep and changing to cattle around the turn of the century (Polk 2000:12–13; Tainter and Gillio 1980:142–143). Hispanics were centered in the Town of Cubero Grant with domestic residences at the town of Cubero several miles northwest of the project area. Pueblo Indians were centered at the Pueblo of Acoma and smaller villages such as Acomita. Both Pueblo Indians and Hispanics practiced a grazing economy within the checkerboard pattern of land ownership that characterizes the project area.

LA 89019 contains a single rectangular sandstone structure foundation measuring about 6.8 m by 6.5 m. A hole-in-top can fragment and a single fragment of purple glass were the only historic artifacts noted in the area. The site occupation date range is based on the artifact manufacture dates. The low-frequency artifact assemblage and lack of midden argues for a seasonal rather than full-time domestic occupation. The site is located on a private grantee parcel (Baca) within the Town of Cubero Grant. Alternative 5 would affect 60 percent of LA 89019 including the entire foundation of the structure. Alternative 3 would not affect the historic component.

LA 149868 contains three historic features including a similar rectangular sandstone structure foundation measuring 4.9 m by 3.0 m, a concentration of unmodified pieces of sandstone measuring about 4.5 m in diameter, and a reservoir measuring about 6.0 m in diameter. Historic artifacts were limited to two pieces of unidentified metal, an unidentified can top, and a small spot-solder (milk) can. The site was given a date of ca. 1900 based on these few artifacts. The small reservoir suggests a concern for grazing activities, but the small number of artifacts again argues for a seasonal rather than a full-time domestic occupation. The site has general Town of Cubero Grant land status. Alternative 3 would not affect the historic component. Alternative 5 roads would affect the north and south edges of LA 149868, but the historic era features would not be impacted. At the most, a few scattered historic era artifacts may be in the site area affected by Alternative 5.

LA 89019 and LA 149868 are only about 60 m apart suggesting that the historic era features on the two sites may actually be related or contemporaneous. The low frequency of surface artifacts argues for a seasonal pastoral subsistence pattern within the shifting socio-political boundaries of Acoma Pueblo and the Town of Cubero Grant. Acoma land parcels are just to the south and east of the Town of Cubero Grant parcels containing the sites. Some nine historic pueblo residential and ranching components have been recorded showing rather extensive Pueblo local land usage. The site area is still currently utilized for grazing.

Research Questions and Data Needs

It is unrealistic to draw far-reaching conclusions

from the rather ephemeral features and low-frequency artifact assemblages present at the sites. Therefore, two basic questions will be addressed to better understand the place of the sites in the regional settlement pattern: temporal context and site function.

Temporal Context

What is the temporal context of the historic era features?

The sites are currently dated to around 1900 based on five artifacts. Dating of the sites is the first step in understanding regional patterns of social and subsistence organization, and the relationship of the site to larger social aggregations. Minimally, the recovery and analysis of the artifact assemblages will supply temporal information. A search of documents in the state archives centered around the Cubero Town Land Grant may provide an additional source of temporal information. Lastly, interviews with members of the Town of Cubero Grant association and Acoma tribal members with help from the Acoma Historic Preservation Office may provide oral testimony unrecorded in public documents.

Site Function

What is the site function? Are the sites actually related to an aspect of a seasonal grazing economy? Were the sites associated with sheep or cattle grazing? Is the feature at LA 89019 the remains of a structure or some kind of animal pen or corral? Is it possible to delineate whether the site occupants were of Hispanic or Pueblo cultural affiliation?

Again, the recovery and analysis of the artifact assemblages will supply baseline information on the range of activities, duration of occupation, and possibly identity, which will begin to shed light on settlement and subsistence. The presence or absence of manure may inform on the function of the LA 89019 feature. However, Cattle et al. (1977) concluded that the best mitigation of sites attributed to Laguna herding was through ethnological rather than archaeological fieldwork.

Archaeology will complement an understanding of site function, but an examination of documents and oral interviews will most likely provide information critical to understanding site function of the ephemeral archaeological remains. As with the question of temporal affiliation, a search of documents in the state archives centered around the

Town of Cubero Grant may provide an additional source of documentary information. Similarly, interviews with members of the Town of Cubero Grant association and Acoma tribal members with help from the Acoma Historic Preservation Office may provide oral testimony unrecorded in public documents relevant to site function.

DATA RECOVERY FIELD METHODS

This section provides a general overview of the techniques that will be used during data recovery investigations. Because each site has unique characteristics, specific work plans for each site are provided in the next section. The methods, which are tailored to data recovery at the six sites, are in part adapted from Boyer et al. (2003:67–72)

GENERAL FIELD METHODS

Horizontal Provenience

The first step in excavation will be to establish a Cartesian grid system across the site. The main site datum, usually designated as the intersection of 100 N and 100 E or 500 N and 500 E lines in the grid, will be used to reference all horizontal and vertical measurements. A plan of the site will be prepared, illustrating the locations of excavation areas, structures, and features.

Surface collection and excavation units will be linked to the grid system. These units will be identified by the grid lines that intersect at their southwest corners. The basic excavation units will be 1-by-1-m grid units, but naturally defined horizontal and vertical units are considered optimal. Therefore, areas with probable features visible from the surface will first be cleared using grid control until a unit such as a structure, or other feature type is defined, at which time they will become independent excavation units. Very large features (such as structures) will be subdivided, usually into halves or quadrants, to increase the precision of horizontal provenience control. Point proveniencing within these horizontal subdivisions will use the Cartesian coordinate system.

Vertical Provenience

Just as the grid system will be linked to the main datum, so will all vertical measurements. All measurements will be made in meters with 10.00 m as an arbitrary elevation for the site main datum. All

elevations will be recorded relative to the site main datum. Since it is often difficult to provide vertical control for an entire site with one datum, subdatums will be established as needed. Horizontal and vertical control of these points will be maintained relative to the main datum.

Before it is possible to delimit the extent and nature of soil or sediment strata, it is usually necessary to examine them in cross section. This requires the excavation of exploratory units, which will consist of 1-by-1-m grid units excavated in arbitrary 10 cm vertical levels. When natural divisions—soil or sediment strata—have been defined, they will be used to delimit the boundaries of a level. Outside exploratory grid units, strata will be used as the main units of vertical excavation. In general, stratigraphic control for any feature will be established through controlled excavation of part of the feature to provide a profile. The profile will then guide removal of the remaining fill in natural stratigraphic units. Fill immediately above defined use surfaces (formal floors or other activity surfaces) will be removed as single units of 10 cm or less, leaving floor artifacts in place for plotting. Floor artifacts and samples will be numbered sequentially (point proveniences or pp numbers), located horizontally and vertically, and indicated on feature maps. Subfloor tests will be placed in any excavated architectural feature to ascertain whether cultural deposits continue; all excavations will be taken to sterile soil.

Mechanical Excavation

Exploratory backhoe trenches are planned for the data recovery plan particularly in the area north of the interstate highway where deeper soils are expected and surface development may mask buried cultural deposits. Backhoes will be equipped with buckets between 32 to 36 inches (81 to 91 cm) in width, and trenches will be excavated to a minimum width of 35 inches (90 cm) and to a maximum depth of 4 ft (1.2 m).

An archaeologist will monitor the excavation of each backhoe trench (BHT). Functionally or temporally diagnostic artifacts will be opportunistically collected from trench backdirt as they are observed. After excavation, loose and smeared soil will be cleaned off of the trench walls with hand tools, and all trenches will be closely examined for exposed cultural deposits or features. The stratigraphic character and cultural content of each backhoe trench will be documented on a standardized excavation form. Artifacts found in situ in trench walls may be point-provenienced. Horizontal provenience of trenches will be maintained at each site by assigning each trench a unique number.

Mechanical scraping will be employed when Phase I hand excavation fails to encounter cultural deposits. Scraping will also be used to remove non-cultural overburden from above cultural deposits, or to explore for horizontally extensive cultural deposits or features. Mechanical scraping may be accomplished with a wide, smooth-edged bucket or scraping blade. Soil will be removed in 5- to 10-cm-thick layers to minimize disturbance or displacement of features, deposits, or artifact concentrations that may be exposed. An archaeologist will monitor and direct all scraping activities with the goal of identifying and exposing use surfaces, features, or stratigraphic breaks as the scraping proceeds.

Recovery of Cultural Materials

Most artifacts will be recovered in two ways: visual inspection of levels as they are excavated, and screening through variable-sized mesh. Other materials may be collected as 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 recorded on all related excavation forms and bags of artifacts. FS numbers will be tied to provenience, so that all materials collected from the same horizontal and vertical provenience units will receive the same FS number. The FS number will be the primary tool that will maintain the relationship between recovered materials and

associated spatial information from excavation through analysis and curation.

Most artifacts will be recovered by systematically screening soil and sediment removed from excavation units. All soil and sediment from exploratory grids and features will be passed through screens. Two sizes of screen, 1/4-inch and 1/8-inch mesh, will be used. While many artifacts are usually large enough to be recovered by 1/4-inch mesh, some, such as smaller biface flakes, are too small to be retrieved by that size screen. These artifacts can provide important clues about 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 screen soil and sediment to 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 to the discretion of the site supervisor. However, as a minimum, all soil and sediment in certain types of features (such as hearths and ash pits) should be screened through 1/8-inch mesh, as should all soil and sediment at floor or living surface contacts. Other potential applications of this recovery method include culturally deposited strata and activity areas.

Other cultural materials, such as macrobotanical samples, will be recovered from bulk soil or sediment samples. In general, samples for flotation analysis will be collected from culturally deposited strata and features. Where adequate material is available within a provenience, samples should contain at least 2 liters of soil. Macrobotanical materials like corn cobs, piñon shells, wood samples for identification, charcoal, etc., will be collected as individual samples whenever found. All botanical samples will be cataloged separately and noted on pertinent excavation forms.

Field collection of pollen will be determined by feature or stratigraphic context. First priority samples will be taken from lower structure and feature strata and floors. Preferred collection points should not exhibit evidence of post-occupation disturbance or mixing. Second priority samples will come from upper feature fill or proveniences that exhibit limited evidence of disturbance. A control

sample will be collected from an off-site location to allow the pollen analyst to account for sample contamination with modern pollen. Sample contexts will include burned and unburned contexts and stratigraphic contexts in possible field or agricultural locations.

Up to ½ cup of soil will be collected from all features or internal feature strata for pollen or other macrobotanical analyses. These samples will be collected in coin envelopes and labeled with provenience information. Samples will be sealed in the field. They may be opened in the laboratory to determine if they have dried sufficiently for repackaging according to analyst instructions.

SPECIFIC FIELD METHODS: STRUCTURES, FEATURES, AND EXTRAMURAL AREAS

Most excavation will be accomplished using hand tools. Methods of excavation will vary depending upon whether a structure, a feature, or an extramural area is being examined.

Structures

Individual numeric designations will be assigned to structures on a site, as well as to the rooms they contain. Excavation within rooms or single-room structures will begin by digging an exploratory trench, in 1-by-1-m grid units, from one wall to the center of, or completely across, a room. Soil and sediment in each unit will be screened through 1/4-inch mesh. Due to safety concerns, exploratory trenches will not exceed 1.3 m in depth. Below 1.3 m, adjacent unit(s) or quadrant(s) may be removed to guard against collapse. Exploratory trenches will be excavated by grid units to provide controlled samples and cross sections of the deposits. In some cases, this procedure will be repeated, perpendicular to the initial trench, to provide additional information on the filling processes. The exploratory cross section(s) or profile(s) will be mapped and the nature of the fill defined. Remaining fill will be excavated by quadrant. Quadrant boundaries will be determined by the locations of grid lines or exploratory trench(es) and, thus, may not always be the same size.

At least one quadrant, whether cultural or non-cultural in nature, will be excavated by the defined

strata. This method will provide a sample of materials associated with these strata, allowing for a more comprehensive understanding of the fill sequence. Recognizing that quadrants are rarely equal in size, the quadrant(s) selected for sampling will usually be the largest, in order to maximize the number of artifacts recovered from each stratum. However, a smaller quadrant may be chosen if defined strata are better represented. Factors determining quadrant selection include the presence of representative strata, obtaining a representative sample of associated materials, and the discretion of the site supervisor. For example, if a structure is filled with cultural deposits that address specific research questions, more than one quadrant may be sampled. Remaining fill will be removed without screening, though artifacts will be collected when observed. All roof fall, floor fill, and floor deposits will be screened.

Following complete excavation of a structure, architectural details will be recorded on a series of forms. Building elements encountered during excavation will be included. In particular, any roof elements found during excavation will be mapped and described. Samples of roof material, if encountered, will be collected for species identification. Descriptions of individual rooms will include information on wall dimensions, construction materials and techniques, and associated features. In addition, scaled plan and profile maps of each structure will be drawn, detailing the locations of rooms and internal features, artifacts found in direct contact with floors, and any other details considered important. A series of 35-mm black-and-white photographs will be completed for each structure showing its overall form, individual rooms, construction details, and the relationship of features with other architectural elements. In addition, photographs may be taken during excavation when warranted and 35-mm color slides may be taken at the discretion of the site supervisor.

Features

Features will constitute individual horizontal provenience units. Features will be assigned sequential numbers as they are encountered at a site. Feature numbers will be recorded on a feature log. Feature information will be recorded on a fea-

ture form describing, in detail, its shape, content, use history, construction detail, and inferred function. All features will be photographed, using 35-mm black-and-white film, documenting the excavation process. Other photographs, including 35-mm color slides and digital images, showing construction or excavation details may be taken at the discretion of the excavator.

After defining the horizontal extent of a feature, such as a hearth or ash pit, it will be bisected. To efficiently define internal stratigraphy, one half of the feature will be excavated in a single level and fill screened using 1/8-inch mesh. A scaled profile of internal strata will be drawn. The second half will be removed by internal strata. Flotation and pollen samples will be recovered from each associated stratum and remaining fill will also be screened through 1/8-inch mesh. After all the fill has been removed, a second cross section, perpendicular to the soil profile, will be drawn illustrating the feature's vertical form. In addition, a scale plan of the feature showing the grid location, size, and location of profile lines will be drawn.

Extramural Excavation Areas

Areas outside structures or around features like hearths, were often used as work areas. Thus, certain zones may be examined to determine whether work areas can be defined. Excavation in these zones will proceed by grid unit. Most soil and sediment encountered during these investigations will be screened through 1/4 or 1/8-inch mesh depending on the circumstances. Plans of each extramural area investigated will be drawn, detailing the excavation limits and location of any features.

Midden deposits can be extensive and deep. If midden deposits are encountered, depending on the depth below surface, overburden will be removed by hand or mechanical equipment to expose the feature limit. Once the midden extent is known, a trench consisting of contiguous 1-by-1-m units will be excavated across two axes. If internal features are present, excavation units will be expanded to define them. Features will then be excavated as outlined above. Following excavation of the two cross trenches, the midden excavation may halt depending on the field archaeologists' judgment as to whether sufficient data has been recovered to address the research questions. Additional excava-

tion units may be placed in the midden area to recover additional information, if warranted.

SPECIAL SITUATIONS

Sensitive Materials

This category pertains to the discovery of culturally sensitive materials or objects of religious importance. At this time, the only special situations we can prepare for are human burials, but no burials are expected given the apparent non-residential nature of the sites. Appendix 2 presents a plan for treatment and disposition of human remains, should they be encountered at the sites. Specific procedures are determined by land ownership status and associated statutory and regulatory requirements.

In accordance with the plan, consultations would be initiated upon the initial recognition of fragmentary or articulated human remains. Human remains would be excavated using standard archaeological techniques, including definition of the burial pit, use of hand tools to expose skeletal materials, mapping and photographing the positions of the skeleton and grave goods, and the collection of appropriate nonosteological samples.

While human remains or other sensitive materials are being excavation, no person will be allowed to handle or photograph them except as part of data recovery and repatriation efforts. Photographs of sensitive materials related to data recovery efforts will not be released to the media or general public.

Unexpected Discoveries

There is always a risk of finding unexpected deposits or features during an archaeological excavation; this is especially true for the project outlined in this plan since it is based solely on survey observations. Procedures that will be followed in the event of an unexpected discovery will vary with the nature and extent of the find. Small features, structures, or cultural deposits that were not anticipated will be excavated according to the procedures outlined above. On the other hand, finds that have the potential to significantly alter the scope and intent of this plan will require consultation with the NMDOT, the State Historic Preservation Division, the Bureau of Indian Affairs, and the Pueblo of Acoma.

DATA RECOVERY STRATEGIES FOR LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, AND LA 149868 FOR ALTERNATIVES 3 AND 5

Our knowledge of LA 54902, LA 89019, LA 89020, LA 108511, LA 145685, and LA 149868 is limited to surface materials, some of which may have been unearthed by recent construction activities. Consequently, data recovery excavations at the sites will proceed in phases oriented toward:

1. Assessing the nature, depth, and extent of deposits at each site, and
2. Recovering data from the components represented at each site.

Because the scope of the data recovery effort will be determined by the selected design alternative, data recovery strategies for each site will be organized by Alternatives 3 and 5. As already stated, the design alternative ultimately selected will affect which sites and amount of site area that will require data recovery. Any modifications of the design alternatives will be within the overall scope of the research orientation, and strategies will be amended as necessary to accommodate the modifications.

ALTERNATIVE 3

LA 89019

LA 89019 covers a 12,230-sq-m area, of which 1,400 sq m is within Alternative 3. Temporally diagnostic artifacts indicate late Paleoindian-Early Archaic, Early and Middle Archaic, Pueblo I and Pueblo II, and historic period components are present. Prehistoric surface artifacts are most visible and abundant in deflated or blow-out areas that cover the site area within Alternative 3. Cultural deposits are expected to be of mixed age and shallow depth.

Phase 1: Site preparation and preliminary investigations.

1. Establish site grid and main datums.
2. Systematic surface artifact location within

project limits.

3. Preliminary site map locating features, temporally diagnostic artifacts and artifact concentration locations.
4. 100 percent artifact collection employing an electronic total station for point-proveniencing in low density areas and 1-by-1-m collection units in higher density areas. Site boundaries will be redefined following this stage, if warranted.
5. Excavate a 1 percent sample of subject area using 1-by-1-m units placed where field observations suggest there is the most potential for providing preliminary information on stratigraphy, artifact distribution, and cultural deposit extent and integrity.
6. If subsurface cultural materials, features or deposits are encountered, excavations will be expanded and follow Phase 2 strategy.
7. If scattered, low frequency artifact distributions and no features are encountered, up to five areas 5-by-20- m in dimension will be mechanically scraped to noncultural material-bearing levels.
8. If no subsurface cultural materials, features, or deposits are encountered, then the investigation will be halted.
9. If artifacts, features, or cultural deposits are exposed, then excavation will follow Phase 2 strategy.
10. Final site recording and mapping will be completed, if no subsurface artifacts, features, or cultural deposits are encountered.

Phase 2: Excavation of features and deposits and recovery of artifacts and samples.

11. Phase 1 hand or mechanical excavation will be expanded to define and fully excavate the features or define the extent and depth of artifact distributions or cultural deposits (i.e., midden). Excavation around features will be expanded to expose associated surfaces, features, or deposits.

12. Features, structures, and deposits will be excavated using hand techniques and documented following procedures outlined in Data Recovery Field Methods.
13. Site map will be annotated to show excavation areas and features or cultural deposit extent.
14. Once hand excavation and documenting of artifacts, features, or cultural deposits has been completed, up to 500 sq m will be mechanically scraped to ensure the exposure of any other horizontally or vertically extensive occupation components. If no additional features or intact cultural deposits are encountered, work will be halted.
15. If additional features or cultural deposits are encountered, the Phase 2 procedures will be repeated. Mechanical equipment may be used to remove non-cultural material-bearing overburden to advance the hand-excavation effort.
16. Final site mapping will be conducted.

LA 89020

LA 89020 is a multicomponent artifact scatter located primarily outside Alternative 3. Within Alternative 3, few artifacts were observed during the OAS site visit and the deflated and water-scoured surfaces seemed to have little or no potential for intact, subsurface deposits. The site area will be re-examined and, if areas with potential are observed, then Phase 1 and 2 excavation will be completed.

Phase 1: Site preparation and preliminary investigations.

1. Establish site grid and main datums.
2. Systematic surface artifact location within project limits.
3. Preliminary site map locating features, temporally diagnostic artifacts, and artifact concentration locations.
4. 100 percent artifact collection employing an electronic total station for point-proveniencing in low density areas and 1-by-1-m collection units in higher density areas.
5. Excavate one or more 1-by-1-m units placed where field observations suggest the highest potential determining cultural deposit extent and integrity.

6. If subsurface cultural materials, features or deposits are encountered, excavations will be expanded and follow Phase 2 strategy.
7. If scattered, low frequency artifact distributions and no features are encountered, the investigation will be halted.
8. If artifacts, features, or cultural deposits are exposed, then excavation will follow Phase 2 strategy.
9. Final site recording and mapping will be completed, if no subsurface artifacts, features, or cultural deposits are encountered.

Phase 2: Excavation of features and deposits and recovery of artifacts and samples

10. Phase 1 hand or mechanical excavation will be expanded to define and fully excavate the features or define the extent and depth of artifact distributions or cultural deposits (i.e., midden). Excavation around features will be expanded to expose associated features or deposits.
11. Features, structures, and deposits will be excavated using hand techniques and documented following procedures outlined in Data Recovery Field Methods.
12. Final site mapping will show excavation areas and features or cultural deposit extent.

LA 145685

LA 145685 covers a 385-sq-m area, of which 25 sq m is within Alternative 3. Artifacts occur on a shallow eolian dune remnant overlying sandstone bedrock. There are no temporally diagnostic artifacts within the subject area, although the larger site potentially has Late Archaic and Pueblo period components.

Phase 1: Site preparation and preliminary investigations.

1. Establish site grid and main datums.
2. Systematic surface artifact location within project limits.
3. Preliminary site mapping including feature or artifact concentration locations.
4. 100 percent artifact collection within the project area.
5. Placement of two 1-by-1-m excavation units

within the 25-sq-m area.

6. If subsurface cultural materials, features, or deposits are encountered, excavations will be expanded and follow Phase 2 strategy.
7. If no artifacts are encountered, the investigation will be halted.
8. If artifacts, features, or cultural deposits are exposed, then excavation will follow Phase 2 strategy.
9. Final site recording and mapping, if no subsurface artifacts, features, or cultural deposits are encountered.

Phase 2: Excavation of features and deposits and recovery of artifacts and samples

10. Phase 1 hand excavation will be expanded to fully excavate 25 sq m within Alternative 3.
11. Cultural deposits will be excavated using hand techniques and documented follow procedures outlined in Data Recovery Field Methods.
12. Site map will be annotated to show excavation areas and features or cultural deposit extent.
13. Once hand excavation and documenting of artifacts, features, or cultural features has been completed, the investigation will halt.
14. Final site mapping conducted

ALTERNATIVE 5

LA 54902

LA 54902 covers a 606-sq-m area, of which 202 sq m is within Alternative 5. Artifact frequency within the project area is low. Potential for soil depth is high because of the gentle slope and probably long-term geomorphological stability. A Cebolleta phase component is indicated by the pottery types.

Phase 1: Site preparation and preliminary investigations.

1. Establish site grid and main datums.
2. Systematic surface artifact location within project limits.
3. Preliminary site mapping including feature or artifact concentration locations.
4. 100 percent artifact collection within the project area.
5. Placement of four to eight 1-by-1-m excavation units in artifact concentrations. If no con-

centrations are identified, then excavation units will be spaced at systematic intervals across the site.

6. If subsurface cultural materials, features, or deposits are encountered, excavations will be expanded and follow Phase 2 strategy.
7. If no artifacts are encountered, then three 14-m-long backhoe trenches will be excavated at 5 m intervals across the site area constituting a 20 percent sample.
8. If no subsurface cultural materials, features, or deposits are encountered, the backhoe trench stratigraphy will be profiled and pollen samples collected from each major stratum.
9. If artifacts, features, or cultural deposits are exposed, then excavation will follow Phase 2 strategy.
10. Final site recording and mapping, if no subsurface artifacts, features, or cultural deposits are encountered.

Phase 2: Excavation of features and deposits and recovery of artifacts and samples

11. Phase 1 hand or mechanical excavation will be expanded to define and fully excavate the features or define the extent and depth of artifact distributions or cultural deposits (i.e., midden). Excavation around features will be expanded to expose associated surfaces, features, or deposits.
12. Features, structures, and deposits will be excavated using hand techniques and documented following procedures outlined in Data Recovery Field Methods.
13. Site map will be annotated to show excavation areas and features or cultural deposit extent.
14. Once hand excavation and documenting of artifacts, features, or cultural features has been completed, backhoe excavation of two or three trenches across the excavation area will be used to determine if other features or intact cultural deposits are present at similar or deeper stratigraphic levels. If no additional features or intact cultural deposits are encountered, work will be halted.
15. If additional features or cultural deposits are encountered, the Phase 2 procedures will be repeated. Mechanical equipment may be used to remove non-cultural material-bearing over-

burden to advance the hand-excavation effort.
16. Final site mapping conducted.

LA 89019

LA 89019 covers a 12,230-sq-m area, of which 8,030 sq m is within Alternative 5. Temporally diagnostic artifacts indicate the presence of late Paleoindian–Early Archaic, Early and Middle Archaic, Pueblo I and Pueblo II, and historic period components. Prehistoric surface artifacts are most visible and abundant in deflated or blow-out areas that cover the north half of the site area. The south half is covered by dune deposits of varying stability with fewer prehistoric artifacts visible. The historic component is in the southwest portion of the site area to be investigated with few associated artifacts.

Phase 1: Site preparation and preliminary investigations.

1. Establish site grid and main datums.
2. Systematic surface artifact location within project limits.
3. Preliminary site map locating features, temporally diagnostic artifacts, and artifact concentration locations.
4. 100 percent artifact collection employing an electronic total station for point-proveniencing in low density areas and 1-by-1-m collection units in higher density areas.
5. Excavate a 1 percent sample of subject area using 1-by-1-m units with half of the units distributed systematically across the investigation area to provide preliminary information on stratigraphy, artifact distribution, and cultural deposit extent and integrity. A geomorphologist will examine strata exposed in a sample of the hand excavation units. The geomorphological assessment will be used to guide Phase 2 excavations and mechanical scraping.
6. If subsurface cultural materials, features or deposits are encountered, excavations will be expanded and follow Phase 2 strategy.
7. If scattered, low frequency artifact distributions and no features are encountered, five areas 5-by-20 m in dimension will be mechanically scraped to non-cultural material-bearing levels. The 500-sq-m mechanically scraped

area will constitute 10 percent of the more stable dune area within Alternative 5.

8. If no subsurface cultural materials, features, or deposits are encountered, then the investigation will be halted.
9. If artifacts, features, or cultural deposits are exposed, then excavation will follow Phase 2 strategy.
10. Final site recording and mapping will be completed, if no subsurface artifacts, features, or cultural deposits are encountered.

Phase 2: Excavation of features and deposits and recovery of artifacts and samples

11. Phase 1 hand or mechanical excavation will be expanded to define and fully excavate the features or define the extent and depth of artifact distributions or cultural deposits (i.e., midden). Excavation around features will be expanded to expose associated features or deposits.
12. Features, structures, and deposits will be excavated using hand techniques and documented following procedures outlined in Data Recovery Field Methods.
13. Site map will be annotated to show excavation areas and features or cultural deposit extent.
14. Once hand excavation and documentation of artifacts, features, or cultural features has been completed, mechanical scraping of up to 500 sq m will be completed within the most stable dune areas or peripheral to excavations areas that had horizontally or vertically extensive occupation components. If no additional features or intact cultural deposits are encountered, work will be halted.
15. If additional features or cultural deposits are encountered, the Phase 2 procedures will be repeated. Mechanical equipment may be used to remove non-cultural material-bearing overburden to advance the hand-excavation effort.
16. Final site mapping conducted

LA 108511

LA 108511 covers a 7,170-sq-m area, of which 40 sq m or less than 1 percent is within Alternative 5 as indicated by surface artifacts. Artifact frequency within the project area, which passes through the southernmost site limit, is low. The potential for

soil depth is high because of the gentle slope and probable long-term geomorphological stability. White Mound and Cebolleta phase components are indicated by the pottery types. Further, subsurface deposits have been unearthed by recent construction and utility installation activities.

Phase 1: Site preparation and preliminary investigations.

1. Establish site grid and main datum.
2. Systematic surface artifact location within project limits.
3. Preliminary site mapping including feature or artifact concentration locations.
4. 100 percent artifact collection within the project area.
5. Placement of two 1-by-1-m excavation units to determine the depth of the cultural deposit within the project area.
6. If subsurface cultural materials, features, or deposits are encountered, excavations will be expanded and follow Phase 2 strategy.
7. If no artifacts are encountered, then one backhoe trench will be excavated across the site area. Also, one 50-m-long backhoe trench will be excavated within the planned access road limit adjacent to LA 108511. This trench will be part of a series of backhoe trenches that will be excavated to ensure that buried cultural deposits are not within non-site areas.
8. If no subsurface cultural materials, features or deposits are encountered, the backhoe trench stratigraphy will be profiled and pollen samples collected from each major stratum.
9. If artifacts, features, or cultural deposits are exposed, then excavation will follow Phase 2 strategy.
10. Final site recording and mapping, if no subsurface artifacts, features, or cultural deposits are encountered.

Phase 2: Excavation of features and deposits and recovery of artifacts and samples

11. Phase 1 hand or mechanical excavation will be expanded to define and fully excavate the features or define the extent and depth of artifact distributions or cultural deposits (i.e., midden). Excavation around features will be expanded to expose associated features or deposits.

12. Features, structures, and deposits will be excavated using hand techniques and documented following procedures outlined in Data Recovery Field Methods.
13. Site map will be annotated to show excavation areas and features or cultural deposit extent.
14. Once hand excavation and documentation of artifacts, features, or cultural features has been completed, one or more backhoe trenches across the site will be excavated across the excavation area to determine if other features or intact cultural deposits are present at similar or deeper stratigraphic levels. If no additional features or intact cultural deposits are encountered, work will be halted.
15. If additional features or cultural deposits are encountered, the Phase 2 procedures will be repeated. Mechanical equipment may be used to remove non-cultural material-bearing overburden to advance the hand-excavation effort.
16. Final site mapping conducted.

LA 149868

LA 149868 covers a 3,656-sq-m area, of which 284 sq m are within Alternative 5. Artifact frequency within the project area is low. Alternative 5 incorporates the northernmost site area, which is predominantly a deep stabilized dune deposit. Most of the cultural material and features occur in the southern three-quarters of the site area. Surface artifacts within Alternative 5 may represent limited site activity or distribution through post-occupation disturbances or processes.

Phase 1: Site preparation and preliminary investigations.

1. Establish site grid and main datums.
2. Systematic surface artifact location within project limits.
3. Preliminary site mapping including feature or artifact concentration locations.
4. 100 percent artifact collection within the project area.
5. Placement of four to eight 1-by-1-m excavation units in artifact concentrations. If no concentrations are identified, then excavation units will be spaced at systematic intervals across the site.

6. If subsurface cultural materials, features, or deposits are encountered, excavations will be expanded and follow Phase 2 strategy.
7. If no artifacts are encountered, then two 2-by-20-m areas will be mechanically scraped to the bottom of potential cultural-material bearing deposits, as defined by geomorphological examination of LA 89019 site stratigraphy.
8. If no subsurface cultural materials, features, or deposits are encountered, the investigation will be halted.
9. If artifacts, features, or cultural deposits are exposed, then excavation will follow Phase 2 strategy.
10. Final site recording and mapping, if no subsurface artifacts, features, or cultural deposits are encountered.

Phase 2: Excavation of features and deposits and recovery of artifacts and samples

11. Phase 1 hand or mechanical excavation will be expanded to define and fully excavate the features or define the extent and depth of artifact distributions or cultural deposits (i.e., midden). Excavation around features will be expanded to expose associated features or deposits.
12. Features, structures, and deposits will be excavated using hand techniques and documented following procedures outlined in Data Recovery Field Methods.
13. Site map will be annotated to show excavation areas and features or cultural deposit extent.
14. Once hand excavation and documenting of artifacts, features, or cultural features has been completed, work will be halted.
15. Final site mapping conducted

Non-site Areas

LA 54902 and LA 108511 are in an area with the potential for deep, stable alluvial or colluvial deposits. These stratified deposits may contain or overlie cultural materials, features, and deposits

that are not represented or are poorly indicated by the surface materials. Therefore, to minimize the potential for unexpected discoveries during Alternative 5 construction, a series of backhoe trenches is proposed for the open or non-site spaces north of Interstate 40 and west of the existing Exit 102 Acomita Interchange. A work plan is provided for the backhoe trench placement and excavation. If subsurface cultural deposits are found, the nearest site limit will be expanded to incorporate the new finds.

To the west and northwest of LA 54902, is a 30,000-sq-m area of stable colluvial deposits. Up to eight backhoe trenches ranging in length from 25 to 75 m long and spaced at 60 m intervals will be excavated to a minimum of 1.3 m deep. The backhoe trenches constitute a 1 percent spatial sample of the area. We expect that a 1 percent sample should be sufficient to determine if extensive buried cultural deposits or features are present. If cultural deposits or features are encountered, Phase 2 excavation will be implemented. If no evidence of cultural deposits or features are encountered, then the backhoe trench stratigraphy will be profiled and pollen samples will be collected from the major strata visible in each trench.

An access road is planned for the area to the south and west of LA 108511. The road corridor passes through the south site limit. As previously mentioned, one 50-m-long backhoe trench will be excavated parallel to the current site limit. Three other 50-m-long backhoe trenches will be spaced at 50-m intervals along the length of the proposed road corridor. We expect that these trenches will expose any extensive cultural materials or features that may be encased by potentially deep alluvial deposits. If cultural deposits or features are encountered, Phase 2 excavation strategies will be implemented. If no evidence of cultural deposits or features are encountered, then the backhoe trench stratigraphy will be profiled and pollen samples will be collected from the major strata visible in each trench.

ARTIFACT ANALYSES AND RESEARCH ISSUES

CHRONOMETRICS

JAMES L. MOORE

Accurate dates are needed in every archaeological study to place sites in the proper context, both locally and regionally. Inaccuracies are built into many chronometric techniques, or perhaps more properly phrased, some methods may not actually reflect the age of the cultural 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 researcher to identify and eliminate faulty dates. Several categories of chronometric data are potentially available from the sites, including dateable artifacts, radiocarbon samples, archaeomagnetic samples, and tree-ring samples. Each category can provide useful and important temporal information, but there are also problems associated with each. Various types of samples will be collected under different circumstances, as detailed below.

Artifact Dating

Several categories of artifacts have the potential to provide dates, including pottery, chipped stone, Euroamerican artifacts and bone. It is likely that only pottery will provide the dating resolution needed to address research issues posed for Puebloan remains. Ceramic types that have been dated by tree-ring correlations can be especially useful, and an attempt will also be made to seriate the local ceramic sequence. If any of the components yield independent and high-precision chronometric results, this should help fine-tune both the prehistoric and historic ceramic sequence, and may improve the accuracy of dates assigned by pottery associations.

Some chipped stone artifacts also have the potential to provide relative dates. Projectile points, in particular, are often used for this type of

dating (see, for instance, Thoms 1977; Turnbow 1997). Unfortunately, dates for specific projectile point styles are usually not well anchored. In most cases they can only be assigned to time spans measured in centuries or millennia rather than years or decades. Some styles were used for long periods of time, often overlapping a wide range of ceramic types and styles. In addition, projectile points were frequently collected from earlier sites and reused, "contaminating" later sites with earlier styles. Thus, this artifact category can only be used to provide very gross dates.

Certain chipped stone materials are somewhat more useful for dating sites. The physical properties of obsidian allow it to be dated, but the results are often questionable and open to interpretation. This type of analysis is based on the tendency of obsidian to absorb moisture at a relatively constant rate, depending on certain factors. The first of these factors is source. Obsidians from different flows vary in composition and absorb moisture at different rates. This problem can be overcome by certain tests (such as x-ray fluorescence) that provide information on the elemental makeup of obsidians, allowing them to be assigned to sources with known hydration rates (if a match exists). Temperature and soil moisture also affect the rate at which obsidian absorbs moisture. By placing sensors on or next to sites to monitor variations in soil moisture and temperature over time, enough information can be gathered to take these effects into consideration.

However, even when obsidians are sourced and environmental information gathered, this dating method is fraught with potential problems. Foremost among them is determining what event is being dated. Obsidian is perhaps the best material available in the Southwest for production of chipped stone tools, and it does not occur naturally in the immediate project area. Obsidian had to be imported (the nearest sources are associated with Mount Taylor), and it therefore represented a desirable resource when found on abandoned sites.

Collection and recycling of high quality raw materials in antiquity, especially obsidian, can result in much of the obsidian on sites having been salvaged from earlier sites in the area. Depending on where an artifact is sampled, hydration dating analysis could date either the original period of use or a secondary or tertiary period of use.

Given the problems that are associated with obsidian hydration analysis, this method is best used when other types of chronometric data are available for corroboration, or it can be used cautiously when it is the only dating technique available. Since it appears that obsidian found on the surface or at shallow depths hydrates at different rates than specimens that are deeply buried where soil temperature and moisture content are more constant, analysis of samples from less than a meter deep is considered undesirable. If deep cultural deposits are encountered, it is unlikely that obsidian will be the only temporally sensitive material present. This material will be used to provide chronometric information judiciously or in extreme cases.

Euroamerican artifacts are another source of dating information. Manufacturing techniques, brand names, and other technological attributes can be very sensitive temporal indicators. Various earthenwares often have very long temporal spans, but a few types have fairly limited production spans and can provide useful temporal data.

Bone is another category of artifact that can potentially provide temporal information. Like wood, bone contains a radioactive isotope of carbon that is amenable to accurate dating. However, floral specimens are better suited for this type of analysis, and it is unlikely that we will need to submit any bone for radiocarbon dating.

Radiocarbon Dating

Radiocarbon analysis has been used to date archaeological sites since the 1950s. While this process was initially thought to provide accurate absolute dates, several problems have cropped up over the years that now must 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 fol-

lowing 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 parts are often available on sites, this technique is usually applied to those types of materials. However, more recent 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 the life of the plant, hence only the outer rings and bark actively absorb new carbon. Samples of wood submitted for dating may contain numerous rings, each representing growth in a different year, and each "aging" in terms of isotope ratios with each passing year. Thus, rather than measuring a single event (when the tree died or was cut down), the radiocarbon assay of a series of growth rings averages isotope ratios from the entire span of growth represented in the sample. 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 long periods of time. Disparities as large as 1,000+ years were found in dates from Black Mesa, and there was an 80 percent chance that dates were overestimated by over 200 years and a 20 percent chance that the error was over 500 years (Smiley 1985:385–386).

The disparity in dates was even greater when fuel wood rather than construction wood was used for dating (Smiley 1985:372). This is because residents sought out dry wood for fuel, wood that 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. Also, wood combusts from the outside in, eliminating younger carbon of the outer rings and preserving the older carbon of the inner rings for dating.

One other problem with the use of this method is caused by solar activity. Sunspots cause fluctuations in atmospheric ^{14}C levels, and hence 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 indicates that we are still learning about how this isotope is absorbed and decays, and that it is affected in many ways that were not originally considered.

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 for radiocarbon dating. 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 submitting only bark and outer rings instead of sending in charcoal that contains inner rings. This is often difficult and time consuming, but this cautious practice provides dates that are much more reliable.

We will only submit radiocarbon samples in certain circumstances. Samples of fuel woods will not be submitted unless there are no other temporally sensitive materials available. Construction wood is the best type of material for radiocarbon dating, especially when it comes from small elements like latillas and lintels. Large elements, like vigas and posts, may be sampled, but it must be remembered that they were often salvaged from older structures and reused. Thus, they may be dating the occupation of another structure and not the one being investigated. Construction wood would be sampled as outlined above. Only bark (if available) and outer rings will be segregated for submission. In general, these materials are more accurately dated by dendrochronology. However, deteriorated wood often does not survive the process of removal in good enough shape or with enough rings to make that type of analysis possible, and not all types of wood can be used for tree-ring dating (such as cottonwood). The principal source of radiocarbon samples will be plant parts that can be given botanical identifications, that can be demonstrated to include one or only a few years of carbon accumulation, and that can be linked to the cultural event that is the target of the dating effort.

Archaeomagnetic Dating

Archaeomagnetic dating analyzes the remanent magnetization in materials that were fired prehistorically. Those materials must contain particles with magnetic properties (ferromagnetic minerals), usually iron compounds like magnetite. 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 changes location over time and the pattern of its movement has been plotted for about the last 1,500 years in the Southwest, comparison 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 being dated. Thus, a feature could have been in use over a span of decades, but only the last time that it was fired to the proper heat can be dated by this method.

Archaeomagnetic analysis can potentially contribute good temporal data for sites, providing the proper fired materials are encountered. When a structure burns it occasionally attains the necessary heat for remagnetization to occur, and these events can also be dated. However, as noted above, one must keep in mind the event that is actually being dated. An archaeomagnetic date from a pithouse hearth can not be used to place the construction of that structure in a temporal perspective because that is not the event being dated. Thus, archaeomagnetic samples can provide dates for the last use of certain features at a site, but cannot be used to determine when they were built.

Archaeomagnetic samples will be taken whenever possible. In most cases only hearths will be amenable to this type of analysis. However, if other burned soils are found in situ, samples of them may also be taken if they appear related to events that occurred during the time of occupation.

Tree-Ring Dating

This method was developed in the early twentieth century, and 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 with 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. An absolute date can be obtained by matching sequences of tree-rings from archaeological samples to master plots. This is the most accurate dating technique available because it can determine the exact year in which a tree died (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 prehistoric and historic Southwest, it is not always possible to determine whether a date derived from a viga is related to the construction of the structure within which it was found, or to a previous use. Clusters of similar dates in roofing materials are usually , but not always, a good indication of the approximate date of construction. 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 represent the year in which a tree stopped growing (was cut down), the outer surface of the tree is needed. Evidence that the outer surface is present can include the bark covering of the tree, beetle galleries that can occur under the bark (either causing tree death or coincident with tree cutting), or outer rings that are continuous around the circumference of the sample. In addition, enough rings must be present to allow an accurate match with the master sequence. It is often possible to provide a date when only inner rings are present, but this will not be a cutting date.

Even considering the potential problems associated with this technique, it represents the best method available for dating sites in the Southwest. Samples of construction materials that appear to contain enough rings for analysis will be collected. Latilla and lintel fragments would be the best specimens for collection, since it is less likely that they were salvaged from earlier dwellings and reused.

Since building materials were often salvaged from pithouses at the time of abandonment or soon after that event, few tree-ring samples will probably be available from these sites.

Documentary Sources and Local Informants

Documents can be particularly productive sources of temporal information and yield data on site occupants, when they arrived in the area, when they left, how they lived, and their relative social position. Documents in the state archives in Santa Fe pertaining to the Town of Cubero Grant may be a productive source of information on the sites with historic period components.

In addition to a documentary search, an ethno-historian will conduct interviews with members of the Town of Cubero Grant association and Acoma Pueblo concerning the Historic period components. This approach can be particularly useful when descendants of site occupants can be located and interviewed. Information obtained in this manner is often an important adjunct to documentary sources because informants may know details that do not appear in public records.

CHIPPED STONE ARTIFACTS

JAMES L. MOORE

The primary contributions of chipped stone analyses derive from data on material selection, reduction technology, and tool use. These topics provide information about ties to other regions, mobility patterns, and site function. While material selection studies cannot reveal how materials were obtained, they can usually provide some indication of where they were procured. One of the most important concerns for economic and social organization is residential mobility, or how often people moved around the landscape. Hunter-gatherers tend to move their camps often, occupying many residential sites during the course of a year. In contrast, farmers tend to occupy a single residential site for one or more years at a time, though they may also use logistical camps to collect resources that occur at some distance from the main village. Analysis of chipped stone assemblages should allow us to examine mobility patterns exhibited by the occupants of these sites and to define degrees

of residential mobility. By studying the reduction strategies employed by each component, it should be possible to compare how different cultural groups approached the problem of producing useable chipped stone tools from raw materials. These comparisons can contribute to discussions of ethnic group affiliation. The types of tools in an assemblage can be used to help assign a function, and to aid in assessing the range of activities that occurred at a site. Chipped stone tools provide temporal data in some cases, but unfortunately they are usually less time-sensitive than other artifact classes, like pottery and wood.

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

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. Analytical results will be entered into a computerized database to permit more efficient manipulation of the data, and to allow rapid comparison with other databases on file at the OAS.

Attributes that will be recorded for all flakes, angular debris, cores, and tools 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, platform width, evidence of platform lipping, presence or absence of opposing dorsal scars, and distal termination type.

Chipped stone artifacts should have been used

for a wide range of tasks in both prehistoric and historic contexts. The variety of formally designed tools and used edges in an assemblage provides information on the range of activities performed at a site, and an assessment of these data can help determine how a site and its structures and features functioned in the settlement and subsistence system. The distribution of various classes of chipped stone artifacts across a site often provides clues concerning how different areas were used and can augment data provided by other analyses.

By tracking the occurrence of local and nonlocal raw material use, we should be able to define some of the ties this population had to other regions. Such ties can include indirect acquisition of lithic raw materials through exchange or direct procurement by logistical expedition. The condition of materials when they were brought to sites (early reduction stages) can provide information that will allow us to determine which of these processes is most likely, but such interpretations will be strongest if they are augmented with data from other classes of artifacts.

An assessment of strategies used to reduce lithic materials at a site often provides evidence of residential mobility or stability. Two basic reduction strategies have been identified in the Southwest. Efficient (also termed curated) strategies entail the manufacture of bifaces that served as both unspecialized tools and cores, while expedient strategies were based on the removal of flakes from cores for use as informal tools (Kelly 1985, 1988). Technology was usually related to lifestyle. Efficient strategies tended to be associated with a high degree of residential mobility, while expedient strategies were typically related to sedentism. The reason for this type of variation is fairly simple:

Groups on the move tended to reduce the risk of being unprepared for a task by transporting tools with them; such tools were transportable, multi-functional, and readily modifiable. Sedentary groups did not necessarily need to consolidate tools into a multi-functional, lightweight configuration. (Andrefsky 1998:38)

Of course there are exceptions to this general statement. Highly mobile groups living in areas that

contained abundant and widely distributed raw materials or suitable substitutes for stone tools would not need to worry about efficiency in lithic reduction (Parry and Kelly 1987). Where lithic materials suitable for chipping occurred only in the form of small nodules, efficient reduction may have been impossible and another strategy would have been used (Andrefsky 1998; Camilli 1988; J. Moore 1996). Neither of these exceptions applies to the study area.

Southwestern biface reduction strategies were similar to the blade technologies of Mesoamerica and Europe in that they focused on efficient reduction with little waste. While the initial production of large bifaces was labor intensive and resulted in much waste, the finished tools were easily and efficiently reduced. Efficient strategies allowed flint knappers to produce the maximum length of useable edge per biface. By maximizing the return from cores, they were able to reduce the volume of raw material required for the production of informal tools. This helped lower the amount of weight transported between camps. Neither material waste or transport cost were important considerations in expedient strategies; flakes were simply struck from cores when needed. Thus, analysis of the reduction strategy used at a site allows us to estimate whether site occupants were residentially mobile or sedentary.

GROUND STONE ARTIFACTS

JAMES L. MOORE

The primary but not exclusive contribution of ground stone analysis data will be through support of functional inferences. Ground stone artifacts usually are not abundant, but they provide unique data on subsistence. Such information can be derived either indirectly or directly. Tool size, form, and other general design characteristics are commonly used to infer function. However, many assumptions are made when such attributes are used to assign function to an artifact. An additional perspective on how ground stone tools functioned is to collect data that are directly related to use. The most commonly used methods of doing this include the analysis of wear patterns on surfaces and the recovery of residues (especially pollen).

Most ground stone artifacts in Southwestern assemblages are related to grinding foodstuffs or other raw materials. The design of passive and active grinding implements is assumed to be conditioned by the type of material being ground, the importance of grinding within the food preparation tasks, the intensity of episodes of grinding, and the mobility of the subsistence adaptation. Residentially mobile Archaic hunter-gatherers tended to use one-hand manos, basin or slab metates, and mortars. These are fairly generalized tools that can be used to grind a variety of generally fine-grained wild and domestic plant foods. However, these forms were not designed to rapidly and efficiently process large quantities of food. Ground stone tools used by Southwestern farmers were more specialized toward the processing of corn and usually included trough or through-trough metates and two-hand manos. Such tools allow large quantities of foods like corn to be processed more rapidly and efficiently (Lancaster 1983). Mano surface areas may also provide quantitative information concerning the degree of reliance on cultigens (Hard 1986). Coupled with other evidence, data on grinding surface area may support comparisons of the degree of agricultural dependence of different components. Although there is a general trend toward more efficient grinding tool design through time, the trend is not unilinear, and the introduction of small-seeded cultigens (such as wheat and barley) in historic period mission settlements appears to be accompanied by an increased use of one-hand manos (Eric Blinman, pers. comm. 2003).

Formally designed grinding tools are assumed to be related to the processing of seeds, especially corn. In the latter case this has been confirmed in many cases by both contextual evidence and residue studies (pollen and starch). However, grinding surfaces are multipurpose and can be used for both other food and nonfood materials. Items such as cholla pollen, clay, and pigments have been found on grinding surfaces as well as corn. Residue samples will be collected from grinding surfaces from secure contexts and from items with macroscopic evidence of residue presence.

The ground stone artifact category is defined by manufacturing technique as well as by the grinding function, and there are many diverse arti-

fact types that can fall within this class. Axes can occur as either ground stone or chipped stone implements, and items such as polishing stones and ornaments can also fall within this class. Although theoretical bases for interpretations are poorly developed for most of these other types of artifacts, morphological and functional classifications are useful for component and feature interpretations. Residue analysis may also be carried out in some cases to either confirm or explore possible interpretations.

Ground stone artifact assemblages, especially grinding stones, can also contribute to questions of occupation duration and abandonment. Grinding implements can break and can routinely wear out through use and resurfacing. Discarded ground stone or ground stone that is reused in architecture can provide an indication of site longevity and reuse. Similarly, formally designed tools are often heavy and represent a significant investment of time and energy in manufacture. The decision to remove or to cache or abandon ground stone can contribute to interpretations of residential mobility, residential stability (relocation distances), and the social context of structure abandonments (Schlanger 1991).

Ground stone artifacts will be analyzed 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 database 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 that will be recorded in this assemblage 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 under go 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 post-manufacturing changes in artifact shape and function and can 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 and ground surface cross section are specialized measures aimed at describing aspects of form for manos and metates, since as these tools wear they under go regular changes in morphology that can be used as relative measures of age.

Pollen washes will be conducted in the laboratory, necessitating certain precautions. Ground stone tools from trash deposits will be placed in plastic bags after removal from the ground and will be lightly brushed to remove loose soil. A thin cover of dirt will be left on tools found on floors until they are ready for photographing. Loose dirt will be removed prior to photographing, and the artifacts will be placed in plastic bags as soon as is feasible after that procedure is completed. Laboratory processing will proceed as follows: the entire surface of tools will be brushed before samples are collected. Using distilled water and a tooth brush, 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 and packaged for storage until samples are selected for analysis.

NATIVE AMERICAN CERAMICS
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Data recorded for pottery from individual components, structures, and features include ceramic type and descriptive attribute categories. Information regarding distributions of various type and attribute categories contributes to the overall research goals by providing insights relating to the produc-

tion, area of origin, decoration, and use of the associated pottery. One of the most important uses of ceramic data is the determination of the time of occupation represented at various sites and contexts, through the comparison of ceramic distributions at a particular assemblage with those from dated proveniences in the region. Examinations of distributions of ceramic types and attributes from dated proveniences may provide information regarding trends in ethnic affiliation, patterns of pottery production and exchange, and the use and function of pottery in various activities.

Ceramic Attributes

Attribute categories used in these investigations will be similar to those employed in recent OAS studies. These categories include temper type, paint type, surface manipulation, post-firing modification, and vessel form. Other types of data that will be recorded for smaller samples of sherds will involve more detailed characterizations of pastes through refiring and petrography. Design style and vessel construction methods have the potential to contribute to both refined dating inferences and to ethnicity discussions. If whole or substantially reconstructible vessels are recovered, vessel attributes (such as volume and use wear) will be recorded in addition to the sherd attributes described above.

Basic ceramic classification encodes a large amount of information. Ceramic types refer to groupings identified based on 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.

Ceramic Traditions and Types

Most of the pottery from the Acoma area resemble types defined for the Cibola Gray Ware, Cibola White Ware, or White Mountain Redware traditions, although low frequencies of Mogollon

brown ware types may also be present in some assemblages (Dittert 1959; Ruppé 1953, 1966; Marshall 1991). Ceramics are assigned to Cibola types based on the presence of sand and sherd temper and mineral paint, and in some cases by stylistic traits (Gladwin 1945; Hawley 1936). Pottery exhibiting characteristics of Cibola types dominate assemblages occurring over a very wide geographic area covering most of the Southern Colorado Plateau including the Cebolleta Province or Acoma District. This district has been characterized as a distinct expression of the Cibola region (Dittert 1949, 1959). Some investigators differentiate ceramic types thought to be unique to this district, while others do not. This has resulted in some inconsistency in the ceramic typology used for this area. Our strategy of analysis will involve mainly using ceramic type categories utilized for the entire Cibola tradition, as well as a few type categories defined for the Cebolleta variants, if deemed appropriate. Such distinctions are often based on subtle differences in paste, slip, and decorative tradition.

Cibola tradition gray ware types are usually defined by the presence of white to gray pastes, and the absence of polished or painted decorations. The great majority of gray wares from sites in the Acoma District dating to all temporal periods exhibit combinations of light gray to white pastes and sand or sherd temper indicative of Cibola Gray Wares. These gray wares will be assigned to specific types based on exterior surface treatments such as plain, neckbanded, and corrugated.

Cibola White Ware types are decorated with black mineral paint and exhibit light gray to white pastes. Types produced early within the tradition (pre-A.D.1000) are tempered with sand but were tempered with crushed sherd during later periods. Cibola White Ware types are defined by a progression of design styles, which in temporal order include La Plata Black-on-white, White Mound Black-on-white, Kiatuthulanna Black-on-white, Red Mesa Black-on-white, Escavada Black-on-white, Gallup Black-on-white, Reserve Black-on-white, Cebolleta Black-on-white, Tularosa Black-on-white, and Klagetoh Black-on-white.

White Mountain Redware types represent a specialized technology that developed in areas of the Southern Colorado Plateau (Carlson 1970). Such pottery was produced within a fairly limited

area in west-central New Mexico and east-central Arizona but was widely traded throughout much of the southwest. White Mountain Redware is characterized by a white or gray to orange paste, crushed sherd temper and a deep red slip. Surfaces are well polished, and painted decorations are usually executed in a black mineral or organic paint, although polychrome effects are sometime achieved through the additional use of a white clay paint. Examples of White Mountain Redware types that may be identified include Puerco Black-on-red and polychrome, Wingate Black-on-red and polychrome, St. Johns Black-on-red and polychrome, Springerville Polychrome, and Heshotautla Glaze-on-red.

It is likely that all the previously discussed traditions could have been locally produced in the Acoma area. The most common intrusive pottery is represented by Mogollon brown ware types dominating sites in the southwestern part of New Mexico. Mogollon brown wares are made from self-tempered clays derived from redeposited volcanic sources common in the Mogollon highlands (Wilson 1994). These clays are high in iron content and contain igneous and sandstone inclusions. Mogollon brown wares were assigned to previously defined types based on differences in textured decoration, coil patterns, and smudging (Haury 1936). Other intrusive ceramic types or traditions that may be represented include Socorro Black-on-white and San Juan and Mimbres White Ware types.

Ceramic Dating

The relatively wide variety of pottery types noted during initial survey indicates a very long temporal sequence, covering the Pueblo I through Pueblo III periods. Some investigations have attempted to define a series of temporally distinct phases for the Acoma region (Dittert 1949, 1959; Ruppé 1953, 1966; Marshall 1991). Based on pottery types noted during the initial survey, phases that could be represented in sites that will be tested include the Early Cebolleta phase (A.D. 950 to 1050); Late Cebolleta; Early Wingate phase (A.D. 1050 to 1125), Pilares or Late Wingate phase (A.D. 1125 to 1200), Early Kowina or Tularosa Phase (A.D. 1200 to 1275), and Late Kowina phase (A.D. 1275 to 1325). The assignment of pottery to these various

phases will provide an opportunity to examine various synchronic and diachronic issues and trends.

Trends in the Production and Exchange of Ceramic Vessels

Temper and paste characterizations, along with any direct evidence of production (raw materials, tools, unfired pottery, or firing failures) provide an opportunity to examine issues associated with trends in the production and exchange of vessels. Binocular microscope observations of temper and paste will be the basis for most source evaluations. Petrography will be used to confirm and refine resource and characterizations. Depending on sample characteristics, more precise paste characterizations may be warranted to distinguish regional production tracts. These patterns in turn will support inferences of social interactions within and between communities, both in terms of formal models of production and consumption and in terms of social networks and alliances. These issues are relevant to the reconstruction of prehistoric cultural patterns. Embedded within production and exchange interpretations are issues of the ethnicity of pottery production. While some studies have attempted to distinguish similar pottery forms produced by different ethnic groups through rim shape, surface manipulation, or temper size, there is considerable overlap in such attributes. Ultimately, detailed examination of pottery resources and manufacturing techniques will be required to argue any ethnic affiliation of pottery recovered from the site collections.

Trends in production and exchange networks may be most obvious in changes in total frequency of pottery assigned to various traditions. Shifting patterns in production, exchange, and cultural association of utility ware vessels will be reflected by changes in the total frequency of Cibola Gray Ware to Mogollon Brown Ware types. For example, an increase in the frequency of Mogollon Brown Wares would reflect increasing ties and interactions with "Mogollon" groups to the south. For decorated ware vessels, changes in frequency of Cibola White Ware, White Mountain Redware, as well as Socorro Black-on-white, and San Juan White Wares reflect geographic distribution of social and economic ties.

Trends in the Use and Function of Ceramic Vessels

Functional qualities of vessel assemblages can be inferred from sherd distributions in ware as well as form categories that reflect the shape and portion of a vessel. Vessel form identification is generally based on rim shape and the presence and location of polish and painted decorations. It is often easy to identify the basic form (bowl vs. jar) of body sherds from prehistoric vessels for many Southwestern regions by the presence and location of polishing.

Rim sherds will also contribute functional information through measurement of rim diameter. Rim diameter correlates with vessel size in many forms, and simultaneous measurement of rim arc (in degrees) can help quantify vessel assemblages. The former measure can contribute to interpretations of the nature of economic activities for each component, as well as the size of social groups involved in food preparation and consumption. The latter measure is the most efficient means of quantifying vessel contributions to components, and it can support interpretations of occupation duration as well as the intensity of different functions that result in vessel breakage.

Detailed analysis of any whole vessel that might be recovered will provide more specific information about the use of pottery containers. Attributes that will be examined include shape, overall size, thickness, and wear and sooting patterns. Attempts will also be made to compare and relate patterns noted in sherd and vessel-based distributions. While sherds often reflect the context of pottery discard, the occurrence of complete vessels may provide information concerning actual loci of use.

BOTANICAL REMAINS

MOLLIE S. TOLL, PAMELA McBRIDE, AND JAMES L. MOORE

Macrobotanical materials recovered from sites provide direct evidence of subsistence practices. Most of these floral materials will be recovered from flotation samples, but preserved vegetal material (such as charcoal, seeds, or even textile fragments) also can be recovered directly during

excavation. Charred seeds can tell us what plants were included in the diet, both domestic and wild. Charcoal from hearths and trash deposits can be used to examine fuel wood gathering activities. Floral materials contained in architectural materials can be used to augment other types of botanical data, and samples from historic corrals provide information on the diet of livestock. These types of data not only tell us what plant foods site occupants were gathering, growing, or trading for, they also provide important information on what the local environment might have looked like.

Pollen analysis should be considered complementary rather than parallel to macrobotanical data from flotation samples. Pollen is preserved in very different contexts than carbonized seeds, is usually dominated by environmental rather than cultural sources, and has different contributions to make to the biological data corpus that informs on subsistence and environmental parameters. Whereas primary and secondary deposits from thermal features make up much of the useful flotation record (along with far less frequent catastrophic burn events), pollen does not survive burning or deposition in alkaline, water-holding features. Pollen's particular contribution lies in characterizing plant utilization activities that do not involve burning, such as milling bins, ground stone artifacts, storage features, coprolites, and living surfaces. On well-preserved interior floors, systematic intensive sampling (such as alternate grid units) of pollen and flotation can work well together to produce relatively detailed mapping of activity areas of household space. The potential contributions of pollen analysis are more restricted from strata such as trash fill, roof fall, and middens.

Prior to submitting pollen samples for analysis, they will be evaluated by the project director according to their potential to contribute information on research issues. The project director will rely on context evaluations provided by the excavators. Pollen analysis may be used to address issues of seasonality, environmental change, subsistence mix, post-depositional mixing, and social practices (as might be associated with human interments). The pollen analyst will need to determine the quality of the sample in terms of preservation, intermingling of modern, post-depositional, and subject pollen (pollen related to feature use).

Sample sufficiency for addressing the range of related research questions will also be assessed and evaluated.

The potential contribution of botanical analyses is necessarily limited by the sampling universe of provenience types and preservation conditions that is encountered within the sites. Interpretable samples require confidently defined temporal and behavioral contexts. Prime among differentiated, potentially informative contexts are intact interior floor surfaces protected by fill and roof fall. Sampling multiple locations on interior floors contributes data for mapping cultural activities involving plant materials. This patterning informs on the organization of economic and cultural behavior on a household level. Analogous exterior surfaces, such as extramural work areas with associated cooking and storage features, are of equal interpretive interest but tend to have very poor preservation of perishable remains, and consequently do not merit intensive sampling. Primary deposits within features, architectural deposits, and refuse strata provide specific sampling opportunities.

Botanical studies of archaeological deposits 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 separation of floral materials from the soil matrix. It takes advantage of the simple principle that organic materials (and particularly those that are nonviable or carbonized) tend to be less dense than water, and will float or hang in suspension in a water solution. Each soil sample is immersed in a bucket of water. After a short interval allows heavier sand particles to settle out, the solution is poured through a screen lined with "chiffon" fabric (approximately 0.35 mm mesh). The floating and suspended materials are dried indoors on screen trays, then separated by particle size using nested geological screens (4.0, 2.0, 1.0, and 0.5 mesh), before sorting under a binocular microscope at 7 to 45x.

This basic method has been in use since 1936, but did not become widely used for recovery of subsistence data until the 1970s. Seed attributes such as charring, color, and aspects of damage or

deterioration are recorded to help in determining cultural affiliation vs. post-occupational contamination. Relative abundance of insect parts, bones, rodent and insect feces, and roots help to isolate sources of biological disturbance in the ethnobotanical record.

All macrobotanical remains collected during excavation will be examined individually, identified, repackaged, and cataloged. Condition (carbonization, deflation, swelling, erosion, damage) will be noted as clues 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 will be measured as well as counted. Corn remains will be treated in greater detail. Width and thickness of kernels, cob length and mid-cob diameter, number of kernel rows, and several cupule dimensions will be measured following Toll and Huckell (1996). In addition, the following attributes will be noted: overall cob shape, configuration of rows, presence of irregular or undeveloped rows, and post-discard effects.

EUROAMERICAN ARTIFACTS

CHARLES HANNAFORD

LA 89019 and LA 149868 have late Territorial period components seemingly reflecting pastoral subsistence patterns within the shifting socio-political boundaries of Acoma Pueblo and the Town of Cubero Grant. Historic period artifacts were very sparse around the structural remains at LA 89019 and the primary historic component at LA 149868 should be avoided by the proposed construction projects. The historic component at LA 149868 may represent extramural activity areas associated with the structural remains at LA 89019, which is only about 60 m away. However, historic artifacts recovered from LA 149868 will probably be confined to stray items from the north and south site edges and away from the primary activity centers. Abundant historic artifact assemblages are not expected from either site, but recovered artifacts should contribute information as to how the sites functioned in the settlement-subsistence system.

Euroamerican artifacts will be examined using a standardized analysis format developed by the Office of Archaeological Studies (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 "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). This is especially relevant in understanding the function and use intensity of the structure at LA 149868. The function of each artifact is described by a hierarchical series of attributes that classifies it by functional category, type, and specific function. These three attributes are all closely related and provide a chain of variables that will specify the exact function of an artifact, if known.

Eleven functional categories are used, including economy/production, food, indulgences, domestic, furnishings, construction/maintenance, personal effects, entertainment/leisure, communication, and unassignable. Other variables are recorded to amplify the hierarchy of functional variables and provide a more detailed description of each artifact. Included in this array of attributes are those that provide information on material type, dating, manufacturer, and what part(s) are represented. Chronological information is available from a variety of attributes, as are data on manufacture, and physical descriptions.

The Euroamerican assemblage should provide information on critical areas including chronology, activities performed at the sites, site function, trade contacts, and social standing.

FAUNAL REMAINS NANCY J. AKINS

Faunal remains have the potential to contribute information on the kinds of animals present in the local and regional environment, strategies used to take these animals, relative dietary contribution, and food preparation techniques. If occupations are determined to be nonresidential (such as field-houses), the assemblages can contribute to our understanding of the seasonal logistics of the subsistence economy, including an assessment of the garden hunting model.

A growing body of data indicates that the initial strategy of Southwestern farmers was one of garden hunting. The garden hunting model, as proposed by Linares (1976:331), suggests that the

abundance of some taxa found in archaeological assemblages is the direct result of farmers hunting in gardens and cultivated fields. Disturbing the primary vegetation for agricultural plots not only attracts and increases the biomass of some animals, but hunting in fields eliminates seasonality and scheduling conflicts while protecting fields from crop predators. As horticultural activity increases, so do the habitats that support higher densities of small mammals and their availability for human procurement. When communities become larger, more residentially stable, and more committed to horticulture, large animals increase in importance as hunters turn to scheduling hunting activities. Reliance on maize, which is low in two essential amino acids and niacin, increases the need for high-quality animal protein, at least seasonally (Speth and Scott 1989:71, 74).

Sedentary groups generally exploit a wider variety of animals than do mobile ones. They also depend more on smaller animals, and use more traps, ambushes, and long-distance hunts (Kent 1989:3). When hunting close to home, a wider range of animals is taken, including less-preferred smaller animals. To maximize their return, the farther a group travels to hunt, the narrower the range of species and the larger the size of the animal sought. Once the locally available large game has been depleted, hunters must travel greater distances to acquire these resources, relocate their settlements closer to more productive areas, or reduce their commitment to horticulture (Speth and Scott 1989:75, 78).

In areas where the garden hunting model fits well, artiodactyl indices (a measure of relative proportions of lagomorphs and artiodactyls calculated by dividing the combined counts of artiodactyls and probable artiodactyls by this sum plus the count for lagomorphs) start low and increase over time, presumably with respect to agricultural commitment. For Chaco Canyon, the indices begin at 0.13 in early Basketmaker III assemblages and increase to 0.39 in Pueblo III assemblages (Akins 1999:11). For the Dolores Program sites from southwestern Colorado, the index starts much higher at 0.58 for the A.D. 600 to 720 period, falls dramatically to 0.20 between A.D. 720 and 800, and eventually rises to 0.42 (Neusius 1986:214–253). Sites excavated in San Juan Basin and Rio Puerco drainage for the Transwestern

Pipeline Project have indices that fall between 0.00 and 0.03 for all periods (Brown and Brown 1993:354–366). On the West Mesa of Albuquerque, Basketmaker sites have low indices (0.04) increasing to 0.08 and 0.32 at the Coors Road site (Akins 1986a, 1986b; Sullivan and Akins 1994:141). Unlike these sequences that fit well with a garden hunting model, Late Developmental period (A.D. 900–1100) sites between Santa Fe and Pojoaque Pueblo, where groups appear to have been more mobile and less committed to agriculture have indices that differ significantly from all but the earliest Dolores assemblages. In four sites with sample sizes between 1,273 and 3,507 specimens, the artiodactyl indices are much higher, between 0.71 and 0.73 for LA 388, LA 391, and LA 3119 and somewhat lower for LA 835 (0.55). Thus, with adequate samples, these simple indices can reveal a great deal about mobility and subsistence within a given region.

Preexisting data on animal subsistence in the Acomita area is scant. Either the sites investigated produced little or no bone or the reports are from eras when the standard for reporting fauna was to simply list the species recognized without any indication of even relative quantities. Excavations at two nearby PII–PIII pueblos (LA 2639 and LA 2640) with 10 and 15 rooms produced unknown quantities of fauna. Species lists for the two include deer, fox, jackrabbit, and cottontail from LA 2639 and deer, turkey, jackrabbit, cottontail, gopher, and hawk from LA 2640 (Olson and Wasley 1956:305, 317–318). Relatively recent excavations have been conducted along Interstate 40 at State Road 6 west of the project area. Small faunal assemblages were recovered from two sites focused on agriculture with permanent or seasonal occupations between A.D. 750 and 900 (Post 2002:187–188). The assemblage of 57 bones from three features and general fill at LA 70163 had more cottontail rabbit (n=18) than any other species. Other taxa include a variety of mice, jackrabbit, artiodactyl, and bird. A larger sample (n=291) from nine features and general fill was recovered from LA 3558. However, much of the sample (n=191) was from a single dog burial and a partial toad (n=41). Otherwise, identified taxa are rare, single prairie dog and cottontail bones and 16 from jackrabbit (Mick-O'Hara 2002:263–266).

Even farther west near Interstate 40, sites tested as part of the Elena Gallegos land exchange Atrisco sites generally produced small samples of fauna. Sample sizes are not always given and data are generally presented as MNIs (minimum number of individuals). From earliest to latest, a Late Archaic to Pueblo I site (1A) with a sample of 150 pieces of burned bone had squirrel, jackrabbit, and cottontail identified; an Early Basketmaker III site (31C) had jackrabbit, cottontail, and woodrat; a Pueblo I–II site (15C) with a sample of about 500 bones was mainly cottontail and jackrabbit with some woodrat and artiodactyl; a Pueblo II artifact scatter and hearth (38C) had artiodactyl and jackrabbit-sized bones; a Pueblo IV lithic and ceramic scatter (12B) had jackrabbit, cottontail, woodrat, rodent, and domestic sheep; and a lithic scatter with no ceramics (36C) had burned bones of cottontail and jackrabbit (Bertram 1995a:11–76, 1995b:94–195).

While the data are scant, there is a hint that the Basketmaker and Pueblo assemblages from the general area are consistent with the garden hunting model outlined above. Only a small number of taxa have been reported and nearly all indicate exploitation of the immediate environment. The abundance and consistent presence of cottontail rabbits, which are the hallmark of the Southwestern garden hunting strategy, and the near absence of artiodactyl remains may suggest a primarily agricultural subsistence strategy for prehistoric groups inhabiting this general area. Because subsistence data are so rare, any information recovered from the excavation of these sites will add considerably to our knowledge of the past. If suitable samples of bone are recovered it may be possible to suggest how the area was used and how this may have changed over time.

Specimens recovered by project will be identified using the Office of Archaeological Studies comparative collection supplemented by those at the Museum of Southwest Biology, at the University of New Mexico. 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. Variables for the analyses include a suite of provenience descriptions, taxon, element, completeness, a series of taphonomic observations,

burning, butchering, and modification. Quantification conventions record elements and groups of conjoined elements in order to minimize the inflation of counts that can result from fragmentation and partial carcasses.

HUMAN REMAINS

NANCY J. AKINS

Land status determines which laws and regulations govern the treatment of human remains recovered from archaeological sites. Some of the project sites are located on Pueblo of Acoma land, invoking the Native American Graves Protection and Repatriation Act (25 U.S.C. 3002, 1990). This Act states that human remains and associated funerary objects, sacred objects, or objects of cultural patrimony belong to the lineal descendants or if the lineal descendants cannot be ascertained, to the tribe on whose land the objects were discovered. Acoma Pueblo and other groups that could be lineal descendants must be consulted before any items are excavated or removed. The criteria for determining lineal descent (43CFR10.14) are fairly rigorous. Lineal descendants are individuals who can trace their ancestry directly without interruption by means of the traditional kinship system of the appropriate tribe. Consultations will be completed with Acoma Pueblo as the land owner and any other groups who may reasonably claim to be the lineal descendants concerning any human remains, funerary objects, sacred objects, or objects of cultural patrimony that might be encountered on Tribal land. All aspects of discovery, recovery, analysis, and final disposition will be agreed on before excavation begins.

On state and private land, state law (NMSA § 18-6-11.2, 1989 and HPD Rule 4 NMAC 10.1 1) requires a permit for excavation of unmarked burials. As defined in the regulation, an "unmarked burial ground" is "a location where there exists a burial or burials of any human beings that are not visibly marked on the surface of the ground in any manner traditionally or customarily used for marking burials and includes any funerary object, material object or artifact associated with the burial or burials" (4 NMAC 10.1 1.7G). Since virtually every archaeological and historic site has the potential to be an unmarked human burial ground

under this definition, the type of permit required must be determined by whether or not the site is known to contain or is reasonably expected to contain human remains. If the site is known to contain burials, an individual permit is needed to exhume any human remains. When the presence of human remains is unanticipated, they will be treated as discovery situations and excavated under an annual burial permit. Because human remains are not reasonably expected at any of the project sites located on state or private land within the project area, any that are encountered will be excavated under the annual burial permit issued to the Office of Archaeological Studies. Following the permit provisions, if human remains are discovered 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 NMCRI LA Project/Activity Number for the permitted excavation will be submitted in writing to the State Historic Preservation Division (HPD) before excavation of the burial 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 medico-legal significance. Within 45 days of completing the permitted excavation, recommendations for the disposition of human remains and funerary objects will be made to the HPD. 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, other artifacts found in association, or collected in the course of excavation. The HPD, after consulting with the State Indian Affairs Department (IAD), will determine the appropriate disposition of the human remains and associated funerary objects. If a final report cannot be completed within a year of the completion of fieldwork, an interim report will be submitted along with an estimated completion date for a final report.

In addition to the provisions of the State Burial Law, the draft Department of Cultural Affairs Policy Regarding Tribal Consultation requires that OAS make a good faith effort to consult with Native American governments when actions could affect Native American human remains. Under this policy, in a discovery situation, OAS will augment the HPD and IAD consultations with informational letters to pueblos, tribes, or nations who have made a claim or have a history of interest in the geographic area where the human bone was discovered. If any of these groups expresses an interest in making a claim to the remains, OAS will assist them in initiating contact with the HPD/IAD.

None of the project sites are of the size and duration of occupation that we expect to encounter human remains as either isolated pieces or intact burials. If any are found, it is unlikely that the number will be large, and the primary objective will be to provide life history information that can be integrated into broader research perspectives on topics such as subsistence, diet, and demography (e.g., Martin 1994). Even in small samples, the basic analysis of human remains has the potential to contribute significant information on life during prehistory. Human bones and teeth record conditions during life as well as at death (Goodman 1993:282). Several indicators of physiological stress are used to address general health. These include adult stature, which may be related to nutrition, and subadult size, which can indicate the timing of stress events. Defects in dental enamel (hypoplasias or pitting) are associated with specific physiological disruptions and can be relatively accurately assigned an age of onset. Dental asymmetry begins in utero and reflects developmental stress, while dental crowding can be nutritional or genetic. Dental caries reflect refined carbohydrates in the diet and can lead to infection and tooth loss. Dental abscessing can become systemic and life-threatening. Osteoarthritis and osteophytosis can indicate biomechanical stress. Osteoporosis, related to calcium loss and malnutrition, can be acute to severe during pregnancy and lactation, and can also affect the elderly. Porotic hyperostosis is related to iron deficiency anemia and leaves permanent markers. Periosteal reactions result from chronic systemic infections (Martin 1994:94–95). Although limited by the quality of preservation of bone and the integrity of the interment, all of these observations can be made without

invasive or destructive analyses.

In addition, mortuary treatment places the individual into a social context adding valuable information concerning social, demographic, and economic conditions (Brown 1995:7; Larsen 1995:247). Recent mortuary analyses have approached a variety of topics, ranging from individual, gender, ethnic, political, and social identity, to interpersonal conflict, resource control, labor and organization, ritual and meaning, social inequality, trade, population dynamics, and residential patterning (Larsen 1995:260).

Few human burials have been recovered from the vicinity of the project area. The four Basketmaker III–Pueblo I burials found in the Interstate 40 State Road 6 sites were all adults found in a possible pit structure (LA 70163) or extramural pits (LA 3558) (Mick-O'Hara 2002:142–146; Post 2002:48). All have extensive dental wear, tooth loss, and caries (Mick-O'Hara 2002:199–211) suggesting that maize comprised a large part of the diet. Rates of dental caries generally increase along with the horticultural component of the diet (Stodder 1989:181). Yet, femoral indices (a mean of 1.04 for the three females and 1.23 for the male) suggest that at least the male (and the female from LA 70163 at 1.2) may have maintained a degree of mobility. Femur shaft shape is an indication of strength and of mobility. Smaller, more circular indices (midshaft anteroposterior diameter divided by the midshaft mediolateral diameter) are associated with decreased mobility while higher ratios are characteristic of hunter-gatherers (Bridges 1996:118).

One of the primary issues to be addressed by this project concerns the nature of the prehistoric occupation. Were these sites the product of small groups of settled agriculturalists who moved frequently, fairly mobile groups who were seasonally sedentary, or camps or fieldhouses built by residents of more settled agricultural communities using the area on a seasonal basis? If human remains are recovered, the information collected could aid in answering these kinds of questions. This will be done by examining the evidence for mobility or the degree of sedentism and agricultural commitment of the groups who lived at the project area sites. Mortuary practices, simple metric measurements, demographic structure, indications of general health and nutrition, and dental wear and

carries frequencies all can give us some indication of the diet and mobility . Other methods, that require destruction of small pieces of bone, can provide fairly accurate indications of the diet of prehistoric populations. Strontium/calcium ratios characterize the amount of meat consumed by individuals, as does a broad spectrum of trace elements found in bone. Stable carbon isotope ratios in bone and tooth apatite are used to measure the dietary importance of maize (Buikstra and Ubelaker 1994:168–169). Basic data will be compared to other populations, particularly those from the Southwest, to assess the relative success of these individuals and this particular adaptation.

Burial excavation procedures will meet 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, drawn, and photographed. Any associated materials and the potential cause of disturbance or evidence of deliberate placement will be recorded in detail.

Analysis methods will follow the procedures and conventions set out in Standards for Data Collection from Human Skeletal Remains (Buikstra and Ubelaker 1994). This comprehensive protocol collects the maximum amount of information by recording a standard set of attributes using the same criteria. A series of 29 forms and diagrams of skeletons and anatomical parts allow for illustrating the extent and location of observations. Another form codes commingled or incomplete remains. The process for recording includes:

1. A coding procedure for each element that makes up a skeleton is provided. Diagrams of skeletons and anatomical parts allow for the location of any 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. For immature remains, the age-at-death is determined by scoring epiphyseal union, union of primary ossification centers, and measurements of elements.

3. 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, or damaged, congenitally absent, or lost pre-mortem or post-mortem. Tooth development is assessed, occlusal surface wear is scored, caries are located and described, abscesses are located, and dental hypoplasias and opacities are described and located with respect to the cemento-enamel junction. Any pre-mortem modifications are described and located. The secondary dentition is measured and dental morphology scored for a number of traits.
4. Measurements are recorded for the cranium (n=35), clavicle, scapula, humerus, radius, ulna, sacrum, innominate, femur, tibia, fibula, and calcaneus (n=46). Nonmetric traits are recorded for the cranium (n=21), atlas vertebra, seventh cervical vertebra, and humerus.
5. Post-mortem changes or taphonomy are recorded when appropriate. These include color, surface changes, rodent and carnivore damage, and cultural modification.
6. 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.
7. Cultural modifications such as trepanation and artificial cranial deformation are recorded in another set of forms.

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