LA 457: AN EARLY MESILLA PHASE OCCUPATION ALONG NORTH FLORIDA AVENUE, ALAMOGORDO, NEW MEXICO

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ADMINISTRATIVE SUMMARY

LA 457, an extensive Jornada Mogollon site near Alamogordo, Otero County, New Mexico, was investigated by the Office of Archaeological Studies (OAS) in 1986 and again in 1988. The site is on the *State Register of Cultural Properties* and covers an area of 64 ha (160 acres) extending along North Florida Avenue and U.S. 82. Only a small portion of the site has been examined. An El Paso phase room complex (dating to approximately A.D. 1200) is 300 m east of the OAS excavations within the highway right-of-way. However, within the proposed right of way, OAS staff uncovered several cultural features dating to multiple occupations within the Early Mesilla phase, between cal. A.D. 250 and 790. Most dates fall between A.D. 455 and 531. Features include three storage pits, a roasting pit, a burned surface, two saucer-shaped surface structures, three pithouses, and an ash lens. A minor occupation dating to cal. 40 B.C. is also present at the site.

Work was conducted for the New Mexico State Highway and Transportation Department (NMSHTD), which proposes to widen North Florida Avenue and U.S. 82 in the vicinity of the site. Haecker (1986, 1988) conducted initial surveys of the area within the highway right-of-way, which was acquired from private sources.

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INTRODUCTION

An extended testing program was conducted by the Office of Archaeological Studies for the New Mexico State Highway and Transportation Department at LA 457, a Jornada Mogollon site within the proposed highway rights of way of North Florida Avenue and U.S. 82, north of Alamogordo, Otero County, New Mexico. The NMSHTD proposes to widen Florida Avenue and U.S. 82 within site limits of LA 457 in the highway rights-of-way acquired from private sources. The project vicinity is shown in Figure 1, and site location information is given in Appendix 1.

The Florida Avenue project begins at UTM Zone 13, 3644000N, 411000E, and ends at 412000E, 3647900N, for a distance of 5.12 km (3.2 miles). The width of the proposed right of way is 18.2 m (60 ft). The U.S. 82 line begins at the intersection of U.S. 70 and U.S. 82 and extends for a distance of 4.8 km (3 miles), terminating at Milepost 3.0. The width of the proposed right of way is 150 ft.

The project supervisor was Yvonne R. Oakes, assisted by Dorothy A. Zamora. Crew members consisted of Gerri Smith, Jackie Talley, Arturo Zamora, Keith Berry, James Berry, and Cathy Soulon. David A. Phillips Jr. served as principal investigator for the project. The fieldwork for the project took place between February 24, 1986, and May 5, 1986, and September 3 to 5, 1986. U.S. 82 was investigated from November 14, 1988, to December 2, 1988. Prior to beginning work, the files at the New Mexico Cultural Records Information System (NMCRIS), Archeological Records Management Section, Historic Preservation Division, Santa Fe, were consulted. LA 457 is in the *State Register of Cultural Properties*, a component of the six Jornada Mogollon villages in the Alamogordo Archaeological District, created on September 9, 1988.

The purpose of the OAS investigations was to determine the extent and subsurface nature of LA 457. An initial survey of the area was conducted by the NMSHTD (Haecker 1986, 1988), and a dispersed artifact scatter was recorded within the proposed highway rights-of-way. Initial results of the testing program suggested, but did not confirm, the presence of subsurface features. The testing program was extended with authorization from the State Historic Preservation Division. Subsequent testing with hand-dug trenches and mechanical equipment uncovered several features. These included three storage pits, a burned surface, a roasting pit, two saucer-shaped surface structures, an ash lens, and three pithouses.

LA 457 covers 64 hectares (160 acres) and is a multicomponent site. An El Paso phase room unit lies 300 m east of the Florida Avenue right-of-way and dates to approximately A.D. 1200 (Hunter 1988). The portion of the site examined by OAS dates to the Early Mesilla phase between A.D. 250 and A.D. 790 (calibrated), with a minor Archaic occupation at cal. 40 B.C.

Because of the intensive nature of the archaeological testing program at LA 457, it is believed that no further information significant to the prehistory of the area is forthcoming, and no further archaeological work is recommended.

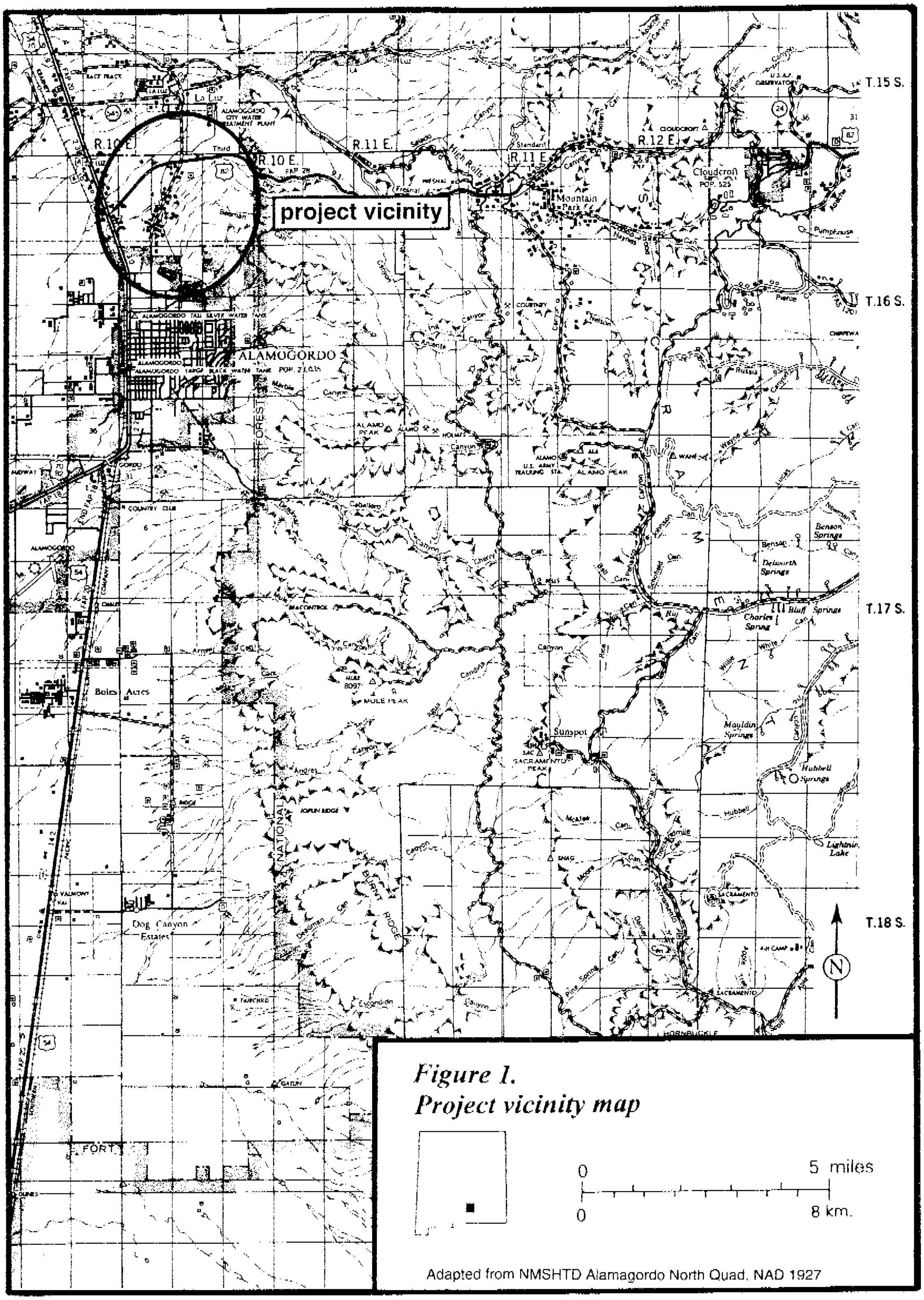


Figure 1.
Project vicinity map

Adapted from NMSHTD Alamagordo North Quad, NAD 1927

ENVIRONMENT

Peter Y. Bullock

The site is in the south-central portion of New Mexico on the eastern edge of the Tularosa Basin within the Basin and Range Province of the United States.

Geology

The Tularosa Basin is a geological depression between the Sacramento-Sierra Blanca Mountains to the east, the Oscura-Organ-San Andres Mountains to the west, and the Mesa Jumanos to the north. On the south, the Tularosa Basin is separated from the adjoining Hueco Bolson by an indefinite line running west of the Jarrilla Mountains, near the Texas/New Mexico state line (Sandeen 1954:81). The basin is 201.1 to 241.3 km long and 64.4 to 95.5 km wide, with an area of 8,054 to 9654 sq km. Altitude within the basin and adjoining mountains ranges from 1,184 m near Lake Lucero to 3,657 m in the Sacramento Mountains (Neher and Bailey 1976:59).

The south-central area of New Mexico, which includes the Tularosa Basin, was periodically inundated by ancient seas from the Precambrian period, over 350 million years ago, until the close of the Cretaceous period, 70 million years ago (Oakes 1981:10). The final retreat of the seas was followed by a period of geological unrest known as the Laramide Revolution. Widespread faulting, tilting, and regional uplift occurred during this time, continuing through the Tertiary and Quaternary periods (Sandeen 1954:87). The foothill/frontal slope area of the Sacramento Mountains are the result of faulting and uplift occurring at this time (Pray 1954a:10).

The Tularosa Basin is defined as a graben, an area separated by faults from and lower than the surrounding land mass. Regional uplift occurring to the east and west of the sinking central portion of the basin increased the height differentiation between the separate areas (Sandeen 1954:86). The resulting basin has partially filled with bolson alluvial deposits. Bolson deposits are "heterogeneous, poorly consolidated sediments. . . . Age determinations are almost impossible to make" (Sandeen 1954:86). These deposits are known to be at least 300 m deep and may be more than 3,500 m deep in places (Sayre and Livingston 1945). Frequent flooding of the basin during the Pleistocene is indicated by the presence of terraces, most noticeable in the northern portions (Jicka 1954:88).

Some geologists believe the Tularosa Basin was a huge dome formation, which subsequently collapsed (Oakes 1981:10). Domes are common in the Sacramento Mountains (Pray 1954b:105).

The existence of Permian limestone knolls running in a north-south series through the central portion of the basin would indicate a buried anticline, or fault break. This would make the basin more the product of recurring faulting and slope displacement (Sandeen 1954:81).

A recurring line of faults has occurred, associated with the main uplift thrust of the Sacramento Mountains, producing an area of frontal slope along their western edge. This frontal slope consists of blocky, uneven, sharply angled rock outcrops cut by canyons generally running north and south, or east and west. In the Tularosa Basin, these faults are also the result of low-angle faulting. As faults occur, the smaller land mass dips inward at an angle of 20 to 30 degrees. In this case, the faults produced segments of land which are tilted toward the Sacramento Mountains to the east. The ground displacement averages 70 m per fault in the area of Alamogordo (Pray 1954a:21). One aspect of these low angle dip slopes is their ability to collect water.

Subsurface water collects along the fault lines when stratigraphic displacement causes dense layers of rock (such as quartzite) to block the flow of water in porous layers (Pray 1954a:18). Springs and seeps result when the amount of water at a specific blockage becomes too great to be contained by the surrounding rock and soil matrix.

Historically, a major factor in the settlement of Alamogordo was the availability of large amounts of water in Alamo Canyon (Pray 1954a:18). The possibility exists that other canyons in the area, La Luz to the north, Mule Canyon to the south, or Indian Wells, Fresnal, and Marble canyons, all to the east, also contained permanent streams. Even now the area around Alamogordo contains the most potable groundwater in the Tularosa Basin (Conover et al. 1955:119).

Most of the canyons running in a north-south direction along the western frontal slope of the Sacramento Mountains follow fault lines (Pray 1954b:103). Water courses that follow fault lines may be more prone to erosion. This may be a factor in the heavy alluvial deposits in the basin area.

Alluvial fans, or outwash slopes of erosional material, are characteristic of desert regions. They tend to occur at the mouths of canyons around the edges of the Tularosa Basin and overlay the general bolson fill of the basin itself. The site is on an alluvial fan in this type of area.

Climate

The climate of the Tularosa Basin tends to be arid, with warm weather in the spring and fall, hot weather in the summer, and mild, cool conditions in the winter (Oakes 1981:8). Days are warm to hot, and nights are cool, with an average temperature difference of 30 degrees. Annual mean temperatures range from 56 to 60 degrees F (Neher and Bailey 1976:56).

Annual precipitation averages 18.5 cm in the basin to over 63 cm on the crests of the Sacramento Mountains (Wimberly and Rogers 1977:9). Moisture mainly occurs as winter snows or brief summer thundershowers. Frost-free days average 201 per year. Humidity averages 20 to 60 percent (Maker et al. 1974:27).

The geological record of lake terraces, alluvial fans, etc. indicate a warmer and damper climate for the Tularosa Basin during the Pleistocene (Jicka 1954:88). Pollen profiles from the Holocene collected in the Jornada del Muerto support this view (Gile and Hawley 1968:709).

Soils

The soils along the eastern edge of the Tularosa Basin fall into three main types. Soil types tend to vary according to general altitude placement. These consist of the Reaker-Russler Series of the Calcuorthids-Conborthids Association, the Nickel-Tencee-Delnorte Series of the Rock Land-Calciorthids Association, and the Rock Land-Lozier Series of the Calciustoll-Rock Land Association (Maker et al. 1974; Maker et al. 1972).

The Calcuorthids-Conborthids occupy the level to gently sloping lower frontal slope and valley fill areas to the west of the Sacramento Mountains. Medium to fine textured, these soils are formed primarily from sedimentary rocks. They tend to contain gypsum and soluble salts. These soils are only mildly susceptible to erosion and are capable of supporting moderate to heavy stands of grasses (Maker et al. 1974:39).

The Reaker soils are the most extensive of the Calcuorthids-Conborthids. Generally these consist of a 12 to 24 cm layer of brownish gray to brown calcareous loam over a light brown calcareous loam or clay-loam subsoil layer. This subsoil layer may be as much as 48 cm thick. A layer of light brown clay-loam containing lime concretions and soft lime nodules generally occurs below 52 cm (Maker et al. 1972:27).

The other main soil type in this association is the Russler, which occurs in the lower portion of the frontal slope, generally upslope from the Reaker soils. Russler soils are reddish brown, with a thick reddish brown calcareous loam surface layer up to 24 cm thick over a reddish brown calcareous silty clay-loam. Gypsum crystals occur in the lower subsurface layer, just above bedrock (Maker et al. 1972:28).

Rock Land-Calciorthids occur in the rolling to hilly and very steep areas upslope from the Calcuorthids-Conbouthids. The soils in this association tend to be shallow, cobbly, and stony, and are formed primarily of weathered limestone, with small amounts of other weathered sedimentary materials (Maker et al. 1974:44). The main soils within this association are the Nickel, Tencee, and Delnorte types.

Nickel soils are the most common within this group of soil types and consist of a very shallow light brown or brown gray gravelly loam surface layer which grades through a light brown calcareous, very gravelly loam to caliche. The Tencee soils typically have a thin light brown gravelly loam surface layer, grading through a pale brown, very limey gravel to caliche. Delnorte soils consist of a very shallow light brown sandy or gravelly loam containing very little lime, directly over caliche (Maker et al. 1972:28,29).

These soils tend to retain considerable moisture due to the high sand and gravel content and are able to support moderate to fair grass cover in areas where erosion has not occurred (Maker et al. 1972:28).

The Calciustolls-Rock Land Association generally occurs in the upper foothills and lower Sacramento Mountains, from 1,700 to 2,300 m. These soils tend to be shallow, gravelly and rocky, with moderately deep to deep soils occurring in valley bottoms, swales, and upland flood-prone areas along drainages. Generally these soils overlay limestone bedrock; however, because of the faulting and tilting of the Sacramento Mountains, bedrock of shale, sandstone, and other sedimentary rocks sometimes exist (Maker et al. 1974:126).

Lozier soils are the most common series within the Calciustolls-Rock Land Association. Consisting of a calcareous, very stony, thin loam, the surface layer overlays a yellowish brown to brown, very calcareous rocky loam. Calcium carbonate tends to accumulate directly above bedrock. Santo Tomas soils, which also make up a good portion of this soil complex, consist of a grayish brown, gravelly loam occurring over a light brown gravel subsurface layer.

Dark clay-loams and silty clay-loams of the Pachic and Aridic Argiustolls occur in areas where alluvial deposits have collected, along water courses, and in high mountain valleys and swales (Maker et al. 1972:20).

The high gravel content of these soils tends to promote the retention of moisture. Moderate stands of grass can occur in areas where erosion has not eliminated the thin surface soil layer (Maker et al. 1974:126).

Flora and Fauna

A number of ecological zones occur within the area of the eastern Tularosa Basin and Sacramento Mountains. Plant types range from desert to mountain varieties within an area of perhaps 15 km. Available moisture, as well as the variation caused by the broken nature of the frontal slope, have tended to blur the edges of these vegetational zones (Goodyear 1975:18, 19).

The lowest areas of the Tularosa Basin support a thin desert shrub complex of plants. This is made up primarily of mesquite, soapwood yucca, various cactus species, snakeweed, four-wing salt bush, creosote bush, and various dropseed grasses (Oakes 1981:16).

The Calcuorthids-Conborthids soil zone, which makes up the lowest slopes of the Sacramento Mountains, also covers a substantial area, including the alluvial fan to the west. The whole of this area is dominated by creosote bush with lesser amounts of mesquite, tarbush, and various yucca and cactus species. Grasses present include black grama, blue grama, bush muhly, tobosa, burro grass, and various three-awns (Maker et al. 1974:39).

The midlevel slopes of the Sacramento Mountains, the area of the Rock Land-Calciorthids soils, is occupied by a ground cover of grasses which include the gramas, side oats, and plains bristlegrass. This broken frontal slope area also supports a number of shrubs, including creosote bush, mesquite, winterfat, and, in the higher elevations, thin stands of juniper (Maker et al. 1974:44).

The presence of grasses in substantial stands supports the historical reference to the area as primarily grassland. As late as the end of the nineteenth century, grasslands predominated throughout the Tularosa Basin area until cattle grazing exploited them. Overutilization of this grassland by cattle ranching could very well have destroyed the grassland balance, causing the spread of woody shrubs and increasing the possibility of erosion. This possible increase in erosion would have hastened alluvial deposition along the edges of the basin. A lack of ground cover also limits the moisture-carrying capacity of the soil, contributing to a lower water table, the drying up of springs, and a change from permanent to intermittent water flow in streams.

The Tularosa Basin is in the lower Sonoran Life Zone and extends up to the Canadian Zone within the mountains to the east. A variety of mammal and bird life occurs within this area because of the multiple zones occurring within a close area (Wimberly and Rogers 1977:10). Mammals found on the floor of the basin itself include kangaroo rats, prairie dogs, pocket mice, plains jackrabbits, coyotes, kit foxes, and pronghorn.

The frontal slope of the Sacramento Mountains contains a large variety of mammal species within this broken area. Species inhabiting this area include cottontail rabbit, pocket gopher, Mexican wood rat, desert bighorn sheep, mule deer, whitetail deer, and skunk. In the higher altitudes, the mammals include porcupine, raccoon, bobcat, black bear, and mountain lion. Previously, grizzly bear, Mexican wolf, elk, and possibly bison were also found in portions of the Tularosa Basin or Sacramento Mountains.

A wide range of bird species are found in the region, including scaled quail, bobwhite, mourning dove, raven, golden eagle, western meadowlark, roadrunner, red-tailed hawk, and turkey.

CULTURE HISTORY OVERVIEW

This chapter is concerned specifically with the development of prehistoric adaptations in the Jornada Mogollon area of south-central New Mexico. The Jornada Mogollon is defined as a cultural adaptation encompassing a geographic area generally bounded on the west by the Rio Grande up to the mountain foothills, the New Mexico border on the south and into Mexico, the Texas–New Mexico line on the east and into the Trans-Pecos area of Texas, and the northern limits of the Tularosa Basin. Original limits of the Jornada Mogollon as defined by Lehmer (1948) are less expansive on the eastern edge; currently, boundaries have been pushed out to extend the Jornada area into Texas.

The Jornada Mogollon cultural concept as set forth by Lehmer (1948) is considered an area where specific cultural adaptations have made this portion of the Southwest distinctive. Some of these adaptations include a desert subsistence economy, extremely mobile populations throughout prehistory, late adoption of pueblo-style architecture, and the use of brown ware ceramics indigenous to the area. Speculations on the origins of the Jornada Mogollon peoples include the supposedly earlier Mogollon culture to the west in the southwestern New Mexico mountains, in the Mimbres region, or as an outgrowth of earlier Archaic adaptations--either the Cochise from southeastern Arizona or the Hueco, a local development suggested by Lehmer (1948).

The Jornada Mogollon sequence may be divided into three phases for the southern (Hueco Bolson) and central (Tularosa Basin) portions of the study area. These include the Mesilla phase, thought by Lehmer (1948) to begin in A.D. 900 and last until A.D. 1100. However, the beginning date is now considered to be many centuries earlier, A.D. 200 (see later discussion). The Transitional period (Doña Ana phase) extends from A.D. 1100 to 1200, and the final prehistoric sequence, the El Paso phase, lasts from A.D. 1200 to 1400.

This report describes an Early Mesilla phase site, LA 457, with a minor Late Archaic occupation. However, this section presents a brief overview of all prehistoric Jornada Mogollon adaptations to provide a contextual background for the site.

Early Hunting and Gathering Periods

Early Paleoindian groups (ca. 10,000 to 5,000 B.C.) utilized the desert environment of the Jornada Mogollon region repeatedly over many centuries. Clovis projectile points and camp sites from ca. 9,000 B.C. dot the eastern portion of the area. Later, Folsom points (from about 9,000 to 8,000 B.C.) are numerous in the central Tularosa Basin and are found near late Pleistocene lakes or playas. Scottsbluff-Eden artifacts (ca. 7,000 B.C.) are also recovered in the Tularosa Basin near springs or on the basin floor (Laumbach 1986:A-1).

These groups are presumed to have focused on big game hunting, but the identification of Paleoindian sites is usually only determined by the presence of large, diagnostic dart points used in hunting activities. If Paleoindian populations also depended on wild plant resources, we are presently not able to distinguish Paleoindian plant processing tools (except for a distinct type of end scraper) from others of later cultural groups, and therefore we may have a biased conception of Paleoindian subsistence patterns (Sebastian 1989:33).

Later Archaic groups (ca. 5,000 B.C. to A.D. 200) persisted in a hunting/gathering subsistence adaptation focused on broad-spectrum use of a variety of plant resources and smaller game. Diagnostic dart points are ubiquitous throughout the region and assist in the identification of camp sites and work areas. Grinding implements have also been recovered with the projectile points, providing verification of the importance of wild plant foods in the Archaic diet. Numerous Archaic food resources have been recovered from Fresnal Shelter, in the nearby Sacramento Mountains, which dates between 600 B.C. and A.D. 1. These include mescal, piñon nuts, acorns, mesquite, sedge, agave, wild onion bulbs, Indian ricegrass, dropseed, alkali sacaton, hackberry, goosefoot, amaranth, beans, gourds, yucca fruit, cholla, prickly pear, deer, pronghorn, and bison (Human Systems Research 1973). There is some very slight evidence for the domestication of crops such as corn and beans during this period.

Chronologies of both the Paleoindian and Archaic periods are generally based on similar morphological attributes as found on dated projectile points; however, many comparative assemblages are from areas as far away as central Texas. This has led to very broad dating of points from the Jornada area and may not be accurate for this region. Some researchers believe the local Archaic tradition originally derived from the neighboring Cochise Culture of southeastern Arizona (Laumbach and Beckett 1982), while others, like Lehmer (1948), maintain that it developed out of the local Hueco tradition. Many more early absolute dates are required before the issue can be adequately addressed.

Recent emphasis on obtaining in situ radiocarbon and archaeomagnetic dates is producing a body of dates for specific Jornada Mogollon sites and will hopefully lead to a refinement of current projectile point typologies and site chronologies. Several sites suggest a continuance of the Archaic settlement pattern for some groups into late prehistoric occupation of the region at A.D. 1200 to 1400.

Jornada Mogollon

Mesilla Phase (A.D. 200-1100)

The Mesilla phase was thought by Lehmer (1948) to begin around A.D. 900. This date has been challenged, and in the light of subsequent archaeological work has been pushed back to approximately A.D. 200 (Morenen and Hay 1978; Whalen 1980). Researchers have frequently broken down this extended period into Early and Late Mesilla phases or the comparable Early and Late Pithouse periods (Whalen 1985:21). Initially, this phase was thought to represent the beginning of a sedentary occupation in the Jornada area; however, sites are now considered more ephemeral than previously realized, indicating a more mobile settlement adaptation (Carmichael 1990:125). Camp sites are common, but longer-term habitation sites are relatively few.

The Mesilla phase is characterized by the presence of small pithouses, both round and subrectangular, the use of storage pits, and the introduction of brown ware pottery, specifically El Paso Brown and Jornada Brown. Indications of ceramic trade with other areas is not common, but some Mimbres Black-on-white from southwestern New Mexico does occur. The production of crops such as corn seems to have been a very minor component of Early Mesilla phase botanical assemblages. Food items that have been recovered include charred mesquite pods, sunflower seeds, cheno-ams, and cactus parts (Whalen 1981:83).

Habitation locations consisting of larger pit structures, storage pits, and trash middens are found at the mouths of canyons and on high alluvial terraces on the margins of the basin (Laumbach 1986:A-3). Small camps are dispersed over the basin floor, suggesting gathering locales for the diverse plant resources and large rabbit population found there.

Doña Ana Phase (A.D. 1100-1200)

This is a controversial phase, originally identified by Lehmer (1948) as a period of transition between pithouse adaptations and later pueblo occupations. Researchers have called for the elimination of this transitional phase (Seaman and Mills 1987; Anyon 1985), renamed it the Transitional phase (Whalen 1980), or continued to use the term Doña Ana phase (Carmichael 1984). Whether it signifies a cultural break is debatable, but there is no question that during this time, architecture in the region begins to change from pithouses to above-ground adobe or, occasionally, masonry structures. Pottery develops into primarily El Paso Polychrome with increasing occurrences of trade wares from the Middle Rio Grande, the Mimbres area, and Zuni.

During the Doña Ana phase, population seems to have increased, and larger sites appeared in areas where there is likely to be permanent water. These are usually alluvial fans and low hills along the basin edges catching rain runoff from the mountain ranges. There is also a concomitant increase in plant cultivation (Whalen 1981:88).

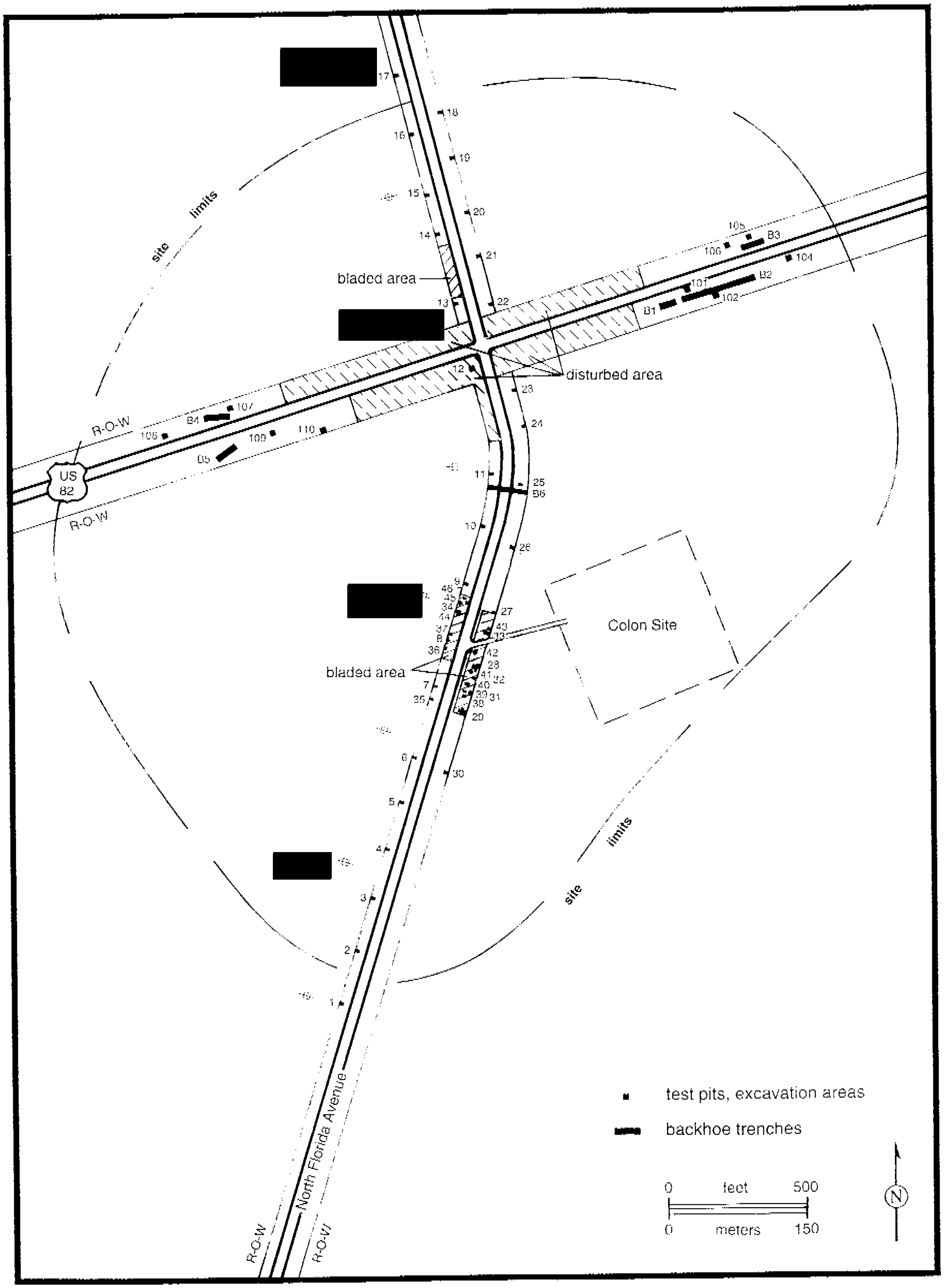
El Paso Phase (A.D. 1200-1400)

This phase has been more recently termed the Pueblo period by Whalen (1980). During this time, above-ground pueblos become the dominant form of architecture for the region. Roomblocks are present, made generally of adobe, and sometimes have interior plazas. El Paso Polychrome remains the primary pottery type, although there is a large variety of trade wares by now, including several types from northern Mexico. Even with the more substantial architecture, Carmichael (1990:130) calls into question the concept of permanent settlements thought to prevail during this period, citing relatively small trash middens, few storage pits, and lack of variety in tool kits.

On El Paso phase sites, food resources are varied and include corn, beans, acacia, screwbean, mesquite, yucca fruit, acorns, amaranth, cheno-ams, portulaca, sunflower seeds, coyote melon, and cactus (Whalen 1981:85). It is obvious that both wild and domesticated foods are a large part of pueblo subsistence adaptations.

Sites cluster along the edges of the Tularosa Basin with many larger pueblos concentrated along the base of the Sacramento Mountains in the general vicinity of LA 457. In this area of larger stream flows and gentler slopes, the drainage systems carry water from rain runoff out onto and between alluvial fans (Meinzer and Hale 1915:199). Also, this location provides access to adjacent mountain resources such as agave, sotol, oak, small mammals, and deer (Whalen 1980:360).

Perhaps because of severe drought conditions prevalent throughout the Southwest in the late fourteenth century, virtually the entire region was abandoned between A.D. 1350 and 1400.



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site limits
bladed area
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Colon Site
US 82
R-O-W
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North Florida Avenue
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test pits, excavation areas
backhoe trenches
0 feet 500
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FIELD AND LABORATORY METHODS

Field Methods

The purpose of the extended testing program was to determine the nature, depth, and extent of a dispersed sherd and lithic artifact scatter existing within the proposed highway right-of-way along North Florida Avenue near Alamogordo for approximately 900 m. First, a primary datum and a baseline were established for the site. The initial stage of testing involved the placement of 2 by 1 m test trenches systematically every 60 m (every other highway station marker) to assess the entire length of the artifact scatter (Fig. 2). A total of 30 test trenches were excavated during this initial phase. Trenches were hand-dug with shovels, picks, and trowels in 10 cm arbitrary levels until culturally sterile soil was reached. Designations for the various levels are: 0 = surface; 1-8 = levels (10 cm increments); 9 = floor fill; 10 = floor; 11 = pit fill; 12 = surface blading; 13 = pit in feature; 14 = below 87 cm. This depth ranged from .10 to 1.45 m below ground surface (Table 1). All excavated soil was screened through 1/4 inch mesh screen. Auger tests were conducted within each test trench to confirm the presence of sterile soil.

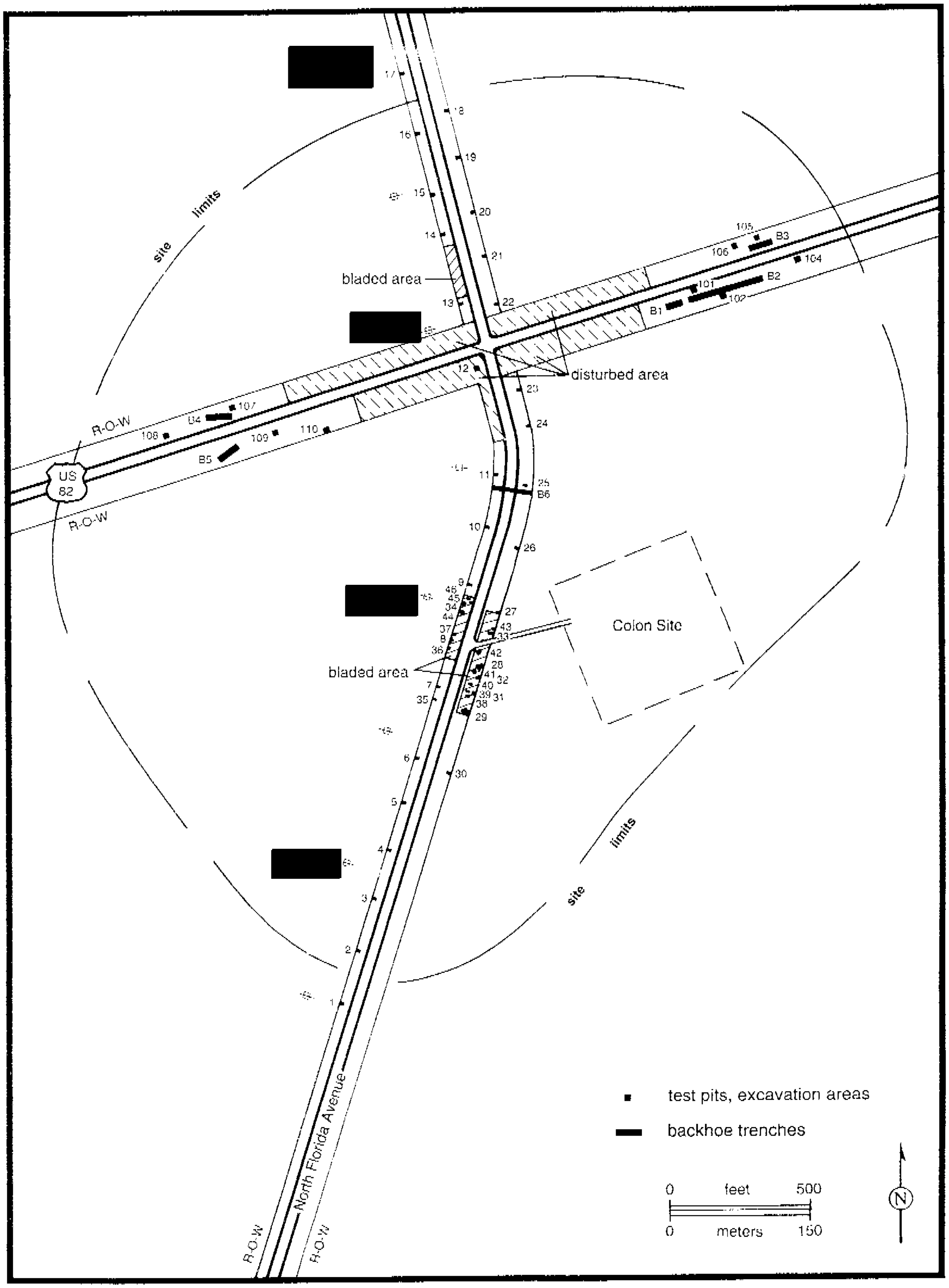
A record was kept of the type and frequency of artifacts recovered at each level of excavation. Artifacts were collected by provenience level from the site surface and within each trench and sorted by general artifact type. Several flotation, pollen, and radiocarbon samples were taken for later analysis. Profiles were drawn for each cultural feature and photographs taken. A site map was produced using a transit and stadia rod. Test trench locations, cultural features, and rights-of-way limits were plotted on the map.

Three burned stains were discovered within the test trenches south of the North Florida–U.S. 82 intersection during the initial testing. However, few artifacts were recovered within the trenches or on the surface in the 330 m long right-of-way north of the highway intersection (Fig. 2). To confirm that no cultural features were present in this area, mechanical equipment was used to excavate a trench 61 m long by 1.5-2.0 m deep within this right-of-way. No concentrations of artifacts were found. One small (40 by 30 cm) stain was probably the result of a natural vegetation burn. No further work was done in this area north of U.S. 82 along North Florida Avenue.

After consultation with the NMSHTD and the Historic Preservation Division, it was agreed to expand the testing program in the area south of the highway intersection along North Florida Avenue to ensure that all subsurface features were documented. Therefore, the second phase of the testing program involved the intensification of investigations within a 150 m area along both sides of North Florida Avenue based upon artifact clusters and observed soil changes, such as burned stains. First, the test trenches around the three burned stains were extensively expanded. As a result, excavations uncovered one storage pit, a burned surface, and a shallow surface structure. Then, ten more 2 by 1 m test trenches were placed in areas near the burned stains. One more storage pit was found, and another surface structure was uncovered (Fig. 3).

As a final procedure, mechanical equipment was employed to blade both sides of North Florida Avenue to search for further cultural features. Six more 2 by 1 m trenches were hand-dug in areas of burned or charcoal-stained soil. One more storage pit and a pit structure were located.

All remaining surface artifacts within the proposed right-of-way were collected by provenience location. Also, all hand-dug and mechanically dug trenches were backfilled upon completion of testing.



[redacted]
bladed area
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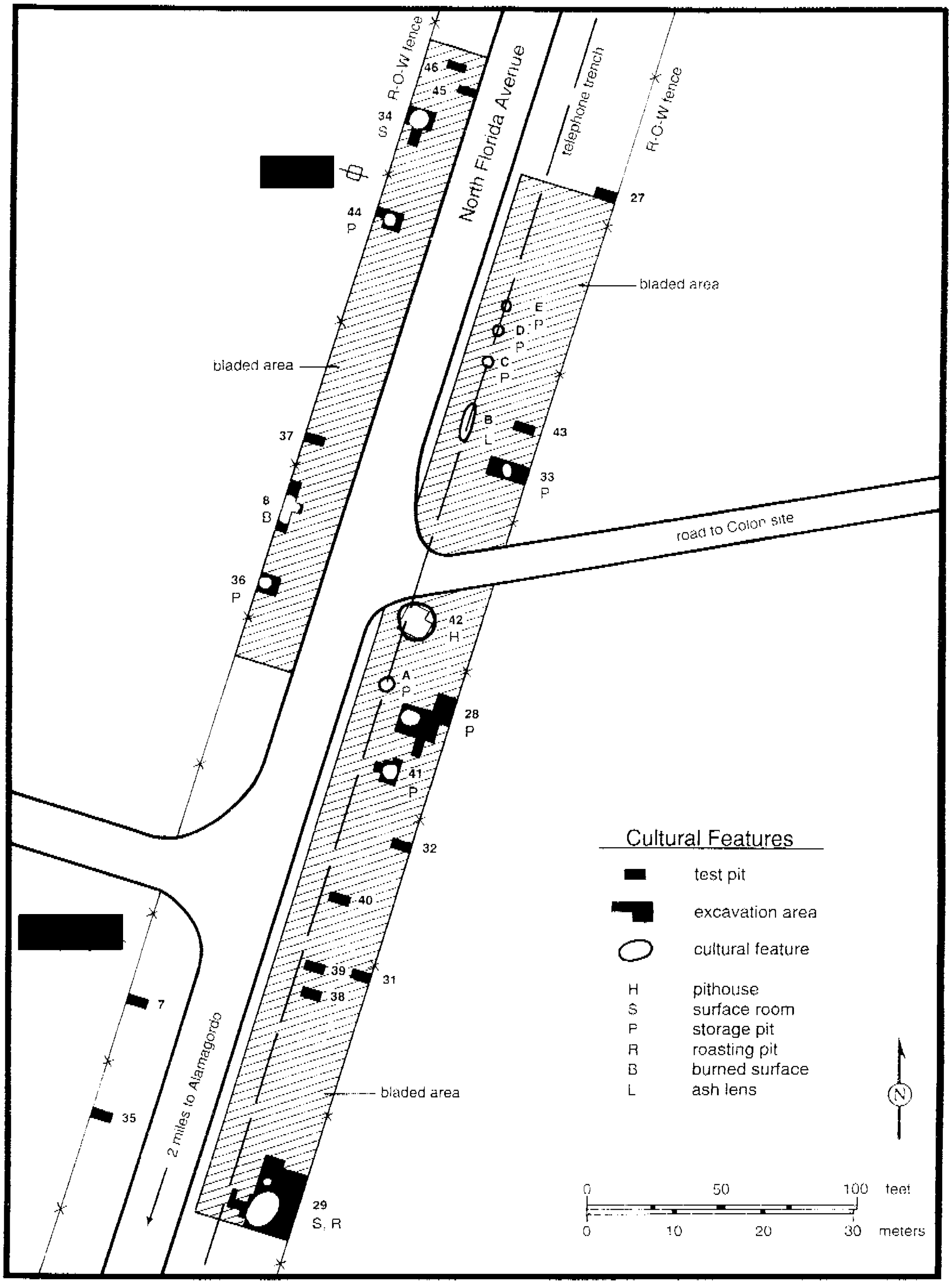
North Florida Avenue
R-O-W fence
telephone trench
R-O-W fence
[redacted]
bladed area
bladed area
bladed area
road to Colon site
2 miles to Alamagordo
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46
45
34 S
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27
E P
D P
C P
B L
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33 P
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8 B
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A P
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41 P
32
40
39
38
31
7
35
29 S, R
Cultural Features
test pit
excavation area
cultural feature
H pithouse
S surface room
P storage pit
R roasting pit
B burned surface
L ash lens
N
0 50 100 feet
0 10 20 30 meters

An additional testing program was conducted along the northern edge of LA 457 within the U.S. 82 right-of-way (Fig. 1), and the same testing procedures were followed. A total of ten 1 by 1 m test pits were placed approximately every 30 m along both sides of the right-of-way. Allowances were made for areas with heavier artifact concentrations. Mechanical equipment was used to further explore the subsurface of portions of the site in this area. A total of five trenches, a total of 141 m by 1.2-1.4 m deep, were placed over the site. Few artifacts were recovered, and the great majority were within the upper 10 cm of fill.

However, a human skeleton was uncovered in one of the backhoe trenches at 24 cm. No artifacts were associated with it, and its position indicated that it was secondarily deposited in an area that has witnessed severe flooding in the past, as attested by several local residents. No cultural features were found within the U.S. 82 right-of-way, and it appears that this area constitutes a small artifact scatter defining the northern limits of LA 457.

In addition, OAS staff monitored a telephone trench placed along the east side of North Florida Avenue. An additional four storage pits and an ash stain were recorded within the trench.

Laboratory Methods

At the completion of the extended testing program, all recovered artifacts were processed at the OAS offices in Santa Fe. They were washed, sorted, and given individual field specimen numbers. OAS staff conducted ground stone, lithic, faunal, and skeletal analyses. Ceramics were sent to Human Systems Research in Tularosa for study and comparison with materials from nearby Jornada Mogollon sites. Flotation, pollen, and radiocarbon samples were contracted to other professionals for analysis.

The artifact analyses focused on the determination of site function and temporal placement of cultural features. All OAS analysis results were entered on an IBM System 36 computer and statistically manipulated. Photographs, maps, and artifacts are stored at the Museum of New Mexico Archaeological Repository and in the New Mexico Cultural Records Information System, Archeological Records Management Section, Historic Preservation Division, both in Santa Fe.

RESULTS

LA 457 is an extensive prehistoric Jornada Mogollon site north of Alamogordo on a broad alluvial fan at the mouth of Dry Canyon, which emerges from the Sacramento Mountains onto the Tularosa Basin. The site was first recorded in 1931 as a "rather large site and one of the few in which house mounds are still visible" (NMCRIS). The mounds are no longer visible today.

A portion of LA 457 has been the focus of on-going excavations by a private party, Rosemarie Hunter, with cooperation from Human Systems Research, Inc., from 1984 to the present (Hunter 1988). It has been designated the Tony Colon site and occupies approximately 7 acres. Occupation of this portion of LA 457 dates from at least A.D. 1100 to possibly A.D. 1450, based on ceramic typologies. This date places the Tony Colon site within the El Paso phase of the Jornada Mogollon culture. A wide variety of ceramics, projectile points, and ornaments were recovered from this area, many of Mexican derivation, indicating trade or exchange. Some artifacts include Playas Red Incised, El Paso Polychrome, Lincoln Black-on-red, Mimbres Classic Black-on-white, Ramos Polychrome, Gila Polychrome, St. Johns Polychrome, a human effigy sherd, human effigy foot, shell pendants, corncob fragments, olivella shell, turquoise, beads, and a shell bracelet. Work here also uncovered a residential unit with postholes and burned wood beams. Adobe with beam impressions was found on the floor. An adobe-lined firepit was also recorded within the room. No information is available on the size of the structure.

Lehmer (1948) notes that two other large prehistoric sites are located near LA 457. Both are on alluvial deposits deriving from the Sacramento Mountains, and both date to the El Paso phase of the Jornada Mogollon culture. Alamorgordo Site I was investigated by Bradfield in 1929 and is about 2.4 km (1.5 miles) south of LA 457. It is a pueblo site with approximately 17 rooms and walls of adobe, prepared adobe floors, some adobe-collared hearths, and post supports in a number of the rectangular rooms. The dominant pottery was El Paso Polychrome.

Alamogordo Site II (Lehmer 1948) is 3.2 km (2 miles) southeast of Alamogordo and has approximately 60 rooms with the same basic architectural features as Site I. Both had small, elongate, triangular projectile points typical of pueblo period sites, but also present were large, heavy Archaic-type points. These later points were also present at LA 457. It is of interest that both Alamogordo sites had evidence of earlier structures beneath the El Paso phase units.

Testing by OAS was restricted to the two highway right-of-way corridors that pass through the site. Artifacts are widely dispersed in this area, and many local, private collections contain material from this site. However, there were no indications that subsurface features existed within the proposed right-of-way prior to testing the area. The pit units and surface structures found on this project reveal an earlier Mesilla phase occupation (ca. A.D. 250 to A.D. 790 cal.), and most dated between A.D. 455 and 531. These features are quite different in architectural and ceramic characteristics from the adjacent Tony Colon site.

LA 457 is on a slightly undulating alluvial fan, which has recently become heavily commercialized and divided into small housing lots. Open land is rapidly diminishing. The dominant vegetation on the site is creosotebush, with lesser amounts of small mesquite bushes. Grasses, cacti, and weedy plants that grow in disturbed soil sparsely dot the gravelly landscape. Dry Canyon was known historically to have produced heavy runoff from the Sacramento Mountains, causing arroyo formation and intense flooding on occasion. A dam built in the canyon in the 1940s now prevents further flooding. This periodic runoff may have attracted prehistoric settlers to this location.

Most test units produced few sherds or lithic artifacts, and no indication of subsurface features. The following discussion deals only with those units that did produce cultural manifestations. These are concentrated in a single area along North Florida Avenue, between [redacted] and [redacted]

Burned Area (Excavation Area 8)

Excavation Area 8, a 2 by 1 m test unit, was placed at highway Station 108+75 within the proposed right-of-way (Fig. 4). Ceramics, lithic artifacts, and a small amount of fire-cracked rock were present on the site surface in this area. Test excavations revealed artifacts present below ground surface to a depth of 50 cm. Pieces of burned adobe and charcoal showed up at 20 cm and continued to 33 cm. A hard-packed utilized surface with a lens of charcoal containing burned pieces of wood appeared at 33 cm. The wood pieces were a maximum of 10 cm long. This charcoal level initially covered an area of 25 by 22 cm and extended beyond the trench to the west. A radiocarbon sample was taken from this area.

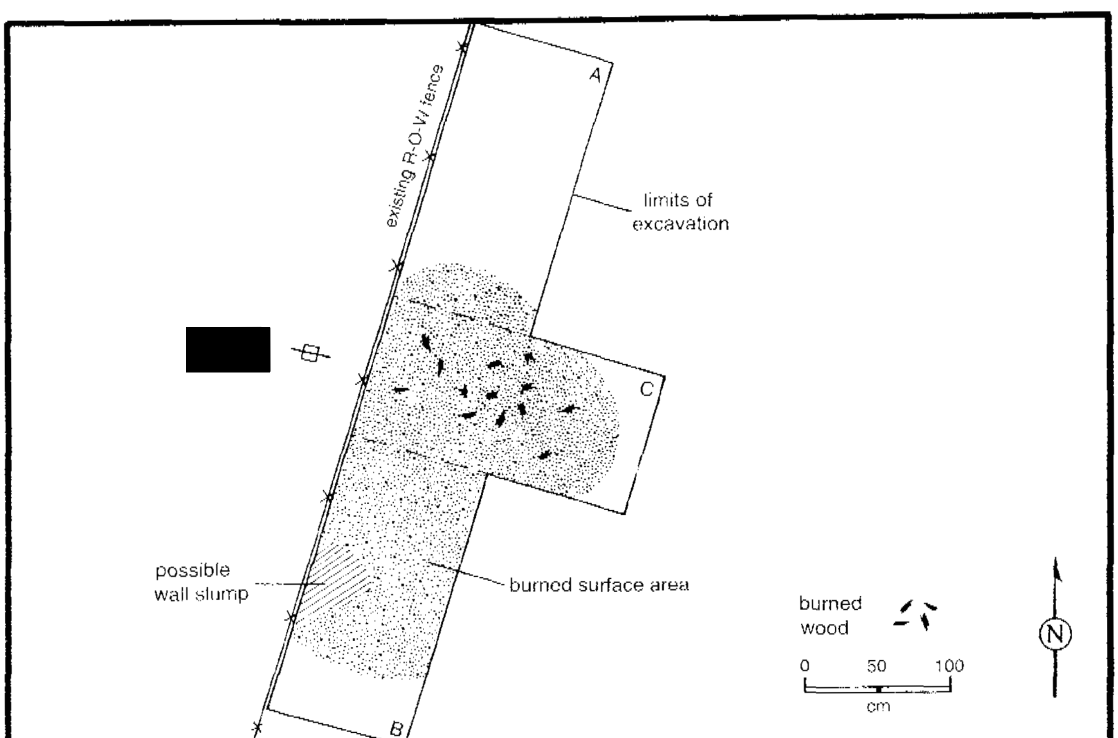

Figure 4. Burn surface in Excavation Area 8.

Two more trenches (8A and 8B) were excavated adjacent to the original test units to follow the charcoal level. A total of 6 sq m were investigated in this area. The charcoal surface extended from Excavation Area 8 for 40 cm to the north into Excavation Unit 8A. Patches of charcoal-stained soil extended into Excavation Unit 8B for 1.6 m. The depth of this burned level ranged from 33 cm in Excavation Area 8 to 38 cm in Excavation Unit 8A.

No boundary wall or interior features were found, suggesting this was an exterior used surface. The presence of burned adobe and possible associated wood fragments may indicate a nearby structure to the west, outside of the right-of-way. A patch of compacted soil along the west edge of Excavation Unit 8B, sitting on the burned surface, may be wall slump.

The charcoal surface produced a calibrated date of A.D. 250 with a one sigma deviation of A.D. 140 to 382. Only brown ware ceramics were recovered at the level of the burned surface. Fire-cracked rock was present in the fill, however. The radiocarbon date places the burned feature within the Early Mesilla phase.

Pithouse (Excavation Area 28)

Excavation Area 28 is on the east side of North Florida Avenue at [redacted] Numerous sherds and lithic artifacts were on the site surface in this area. Artifacts continued throughout the test unit to a depth of 37 cm. Pieces of burned adobe vegetal casts occurred from 20 to 37 cm depth. At 30 cm, a projectile point and a metate fragment were encountered. At 37 cm, a burned surface was found on which were a mano, polishing stone, several burned adobe casts, and sherds. The surface was oxidized to a reddish color and had several rodent holes. The depth of the burned surface ranged from 37 to 58 cm.

Because of the high frequency of artifacts in the fill and the presence of a burned surface, eleven trench expansions were ultimately opened up (Fig. 5), covering 20 sq m. The burned surface continued into Excavation Units 28A, 28B, 28C, 28D, 28E, 28G, and 28H. In Excavation Unit 28B, a gravel and rock-filled pit of 80 by 80 cm was encountered, which proved to be a modern intrusion. Another intrusion, a telephone cable trench, ran along the west side of the test unit.

In Excavation Unit 28H, on the burned utilized surface, we found the outline of a pit structure. It measured 1.94 m (east-west) by 1.51 m (north-south) by .44 m deep, with a floor area of 2.9 m (Fig. 6). The fill consisted of dark, charcoal-stained soil with sherds, burned adobe, a few lithic artifacts, including a hammerstone and several cutting implements, and some faunal remains. The pit unit extended west into Excavation Units 28I and 28J. The floor of the structure was level but unprepared and consisted of sand and small gravels. There were no interior features. A chipped stone flake used as a cutting implement was found on the floor.

In summary, the initial test trench revealed a burned surface at 37 cm depth. This surface was picked up in several subsequent adjoining trenches, ranging in depth from 34 to 45 cm. One modern, intrusive pit was found in the fill in Excavation Unit 28B. However, a prehistoric pithouse had been dug into the burned, utilized surface. Numerous artifacts were recovered from within this structure, including an incised piece of tabular bone and three expediently used cutting implements.

Five projectile points were found in the excavation of the test units in this area. Two are Archaic and came from 10 to 20 cm below ground surface. Three smaller, later, Scallorn-like points came from a depth of 20 to 50 cm, indicating mixed deposits. No points were on the floor or utilized surface.

A single radiocarbon sample from the fill of the pit structure produced a calibrated date of A.D. 540 with a one sigma range of A.D. 405 to A.D. 629. This date places the feature within the Early Mesilla phase, approximately 200 years after the utilization of the burned surface in nearby

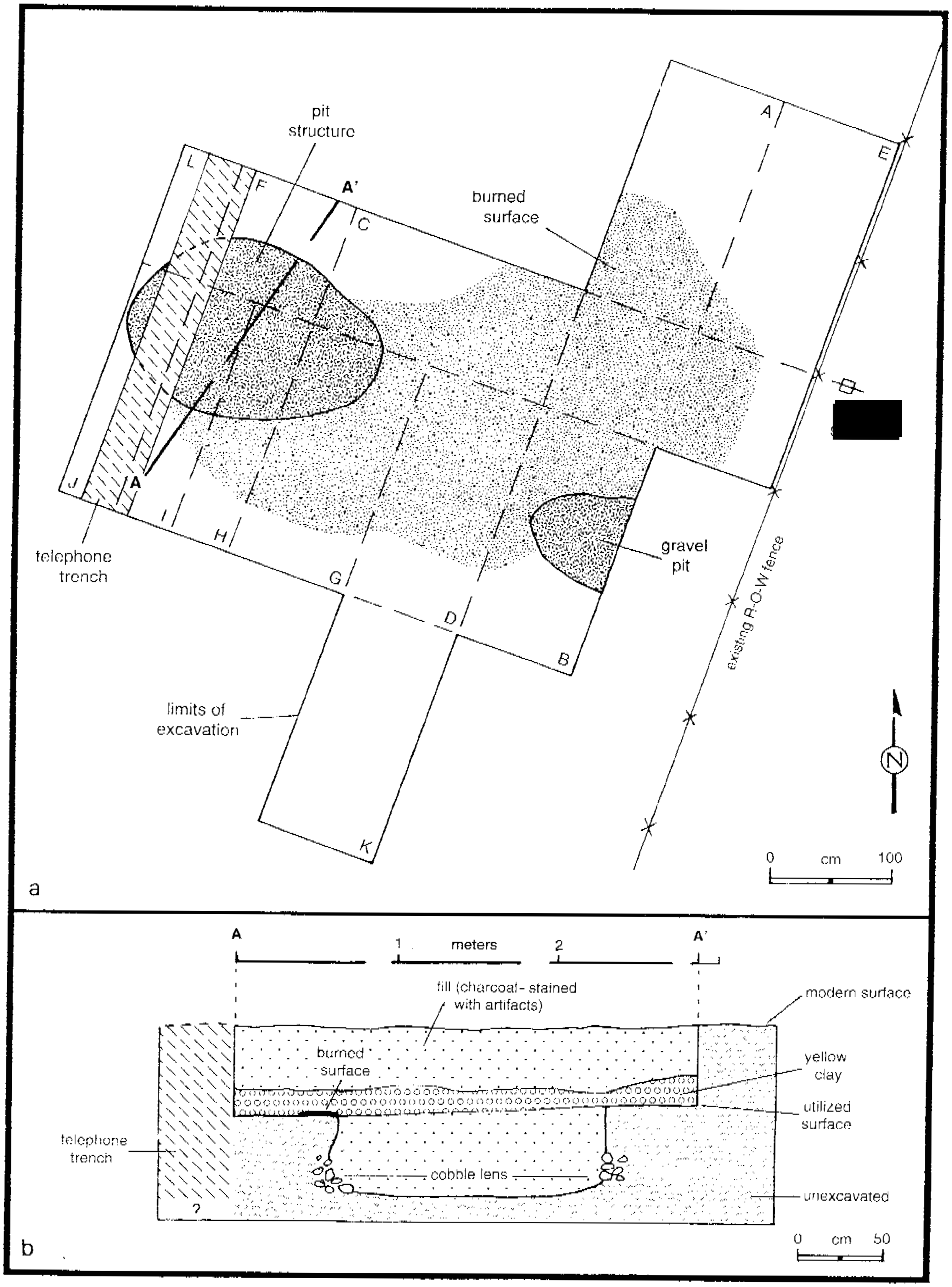

Figure 5. Plan (a) and profile (b) of features in Excavation Area 28.

Figure 6. Pit structure in Excavation Area 28.

Surface Structure and Roasting Pit (Excavation Area 29)

Excavation Area 29 is on the east side of North Florida Avenue near [redacted]. Soil on the surface was slightly compacted, with only a few artifacts. In the initial test unit, charcoal staining, burned adobe, and fire-cracked rock appeared at 14 to 28 cm below the surface level. Excavation continued until sterile soil was reached at 40 cm. Because of the charcoal, more test trenches were opened to the north and west, where charcoal staining continued. A burned, poorly preserved surface was found at 15 to 33 cm below the ground. This proved to be the floor of a shallow surface structure measuring 4.10 m (north-south) by 3.02 m (east-west) by about 14 cm deep. It had a floor area of 12.28 sq m (Figs. 7 and 8). Approximately 10 cm of uplifted clay edging was found around most of the perimeter of the structure.

The surface unit contained four pits, three postholes, and a hearth area with a stone sphere and several manos in floor contact. The pit dimensions are as follows: Pit 1, 24 by 16 cm, 20 cm deep; Pit 2, 36 by 35 cm, 10 cm deep; Pit 3, 60 by 38 cm, 48 cm deep; Pit 4, 58 by 41 cm, 21 cm deep. The fill in each pit was dark and charcoal-stained. Pit 2 had a mortar within the fill. It is interesting that out of the five largest structures on the project that had macrobotanical samples submitted for analysis, this is the only feature that produced no carbonized corn remains within its pits. Only modern grasses and Russian thistle were present in this shallow structure.

The three postholes are filled with charcoal-flecked soil and are aligned roughly north-south within the surface structure. Their dimensions are as follows: Posthole 1, 10 by 10 by 10 cm; Posthole 2, 10 by 10 by 6 cm; Posthole 3, 23 by 18 by 26 cm. This post support alignment suggests a type of gable roof support with sides sloping to the east and west.

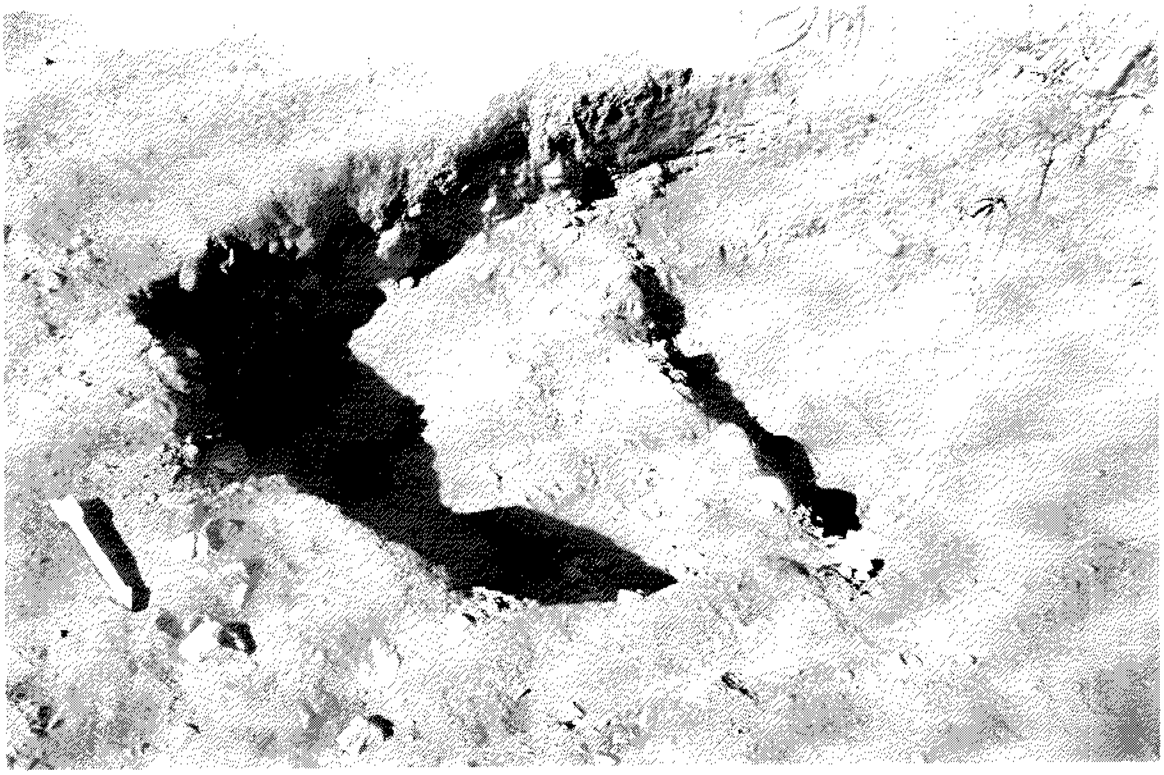

Figure 6. Pit structure in Excavation Area 28.

Surface Structure and Roasting Pit (Excavation Area 29)

Excavation Area 29 is on the east side of North Florida Avenue near [redacted]. Soil on the surface was slightly compacted, with only a few artifacts. In the initial test unit, charcoal staining, burned adobe, and fire-cracked rock appeared at 14 to 28 cm below the surface level. Excavation continued until sterile soil was reached at 40 cm. Because of the charcoal, more test trenches were opened to the north and west, where charcoal staining continued. A burned, poorly preserved surface was found at 15 to 33 cm below the ground. This proved to be the floor of a shallow surface structure measuring 4.10 m (north-south) by 3.02 m (east-west) by about 14 cm deep. It had a floor area of 12.28 sq m (Figs. 7 and 8). Approximately 10 cm of uplifted clay edging was found around most of the perimeter of the structure.

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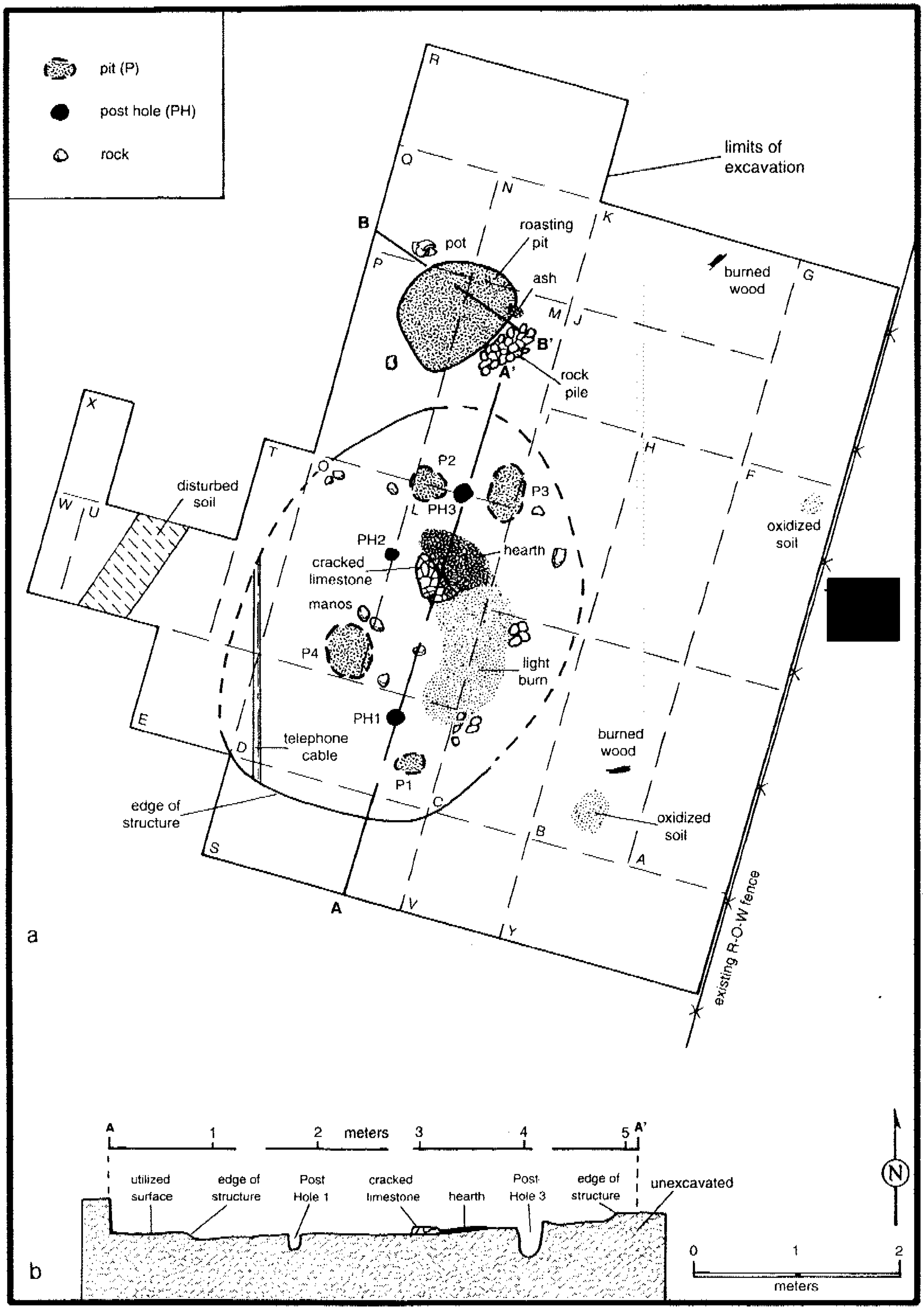

Figure 7. Plan (a) and profile (b) of surface structure in Excavation Area 29.

Figure 8. Surface structure in Excavation Area 29, looking northeast.

Figure 9. Cracked rock of hearth, surface structure, Excavation Area 29.

The hearth area was identified by a very heavy, circular charcoal and ash concentration bordered on the south edge by an elongated slab of limestone, crazed from intense heating (Fig. 9). There was no firepit or basin; rather, the site inhabitants used the compacted surface of the structure for burning activities. The burned hearth area measures 75 by 40 cm.

We were able to trace the remains of a compacted utilized surface in the grids surrounding the structure. A total of 20.75 m were opened up. In several places, the soil had been oxidized from burning. Also, a small ash stain, a partial El Paso Brown jar, and several pieces of burned wood and adobe with plant casts were found on this outside surface. A single projectile point, a later Scallorn-type, was recovered in Excavation Unit 29J at a depth of 10 to 20 cm. Only on the western edge of the test trenches was the ground too disturbed to follow the surface. A single olivella shell bead was recovered in Excavation Unit 29U, but because of soil disturbance, it could have been a surface artifact deriving from the El Paso phase component to the east.

A large pit was found just northwest of the structure. It measured 1.32 m (north-south) by 1.08 m (east-west) by .37 m deep, with a floor area of 1.42 m. It had been dug below the yellowish sand and clay matrix into a rocky substrate, visible on the sides of the unprepared pit (Figs. 10 and 11). The floor had been packed with dirt, which was charcoal- and ash-stained, to cover the rocks. A pile of fire-cracked rocks, presumably removed from the pit, was found adjacent to this pit. Fill within the pit was soft, and charcoal was mixed throughout the dark soil. Because of the heavy burning within the pit fill and the associated pile of rocks, this pit probably was used for roasting activities. Flotation samples produced only modern grasses and shrub seeds, however.

Three radiocarbon samples, corrected and calibrated, were obtained from Excavation Area 29. A calibrated date of 30, 20, and 10 B.C. with a 1 sigma range of 157 B.C. to A.D. 76 was recovered from Pit 3 within the burned surface structure. A burned area outside of the structure (Excavation Unit 29F) yielded a date of A.D. 430 with a 1 sigma range of A.D. 389 to A.D. 542. The roasting pit produced a comparable date of A.D. 420 with a 1 sigma range of A.D. 340 to A.D. 538.

Using Stuiver and Reimer (1993), a mean calibrated date of A.D. 420 was produced for the unit, placing this portion of LA 457 into the Early Mesilla phase. The calibrated date of 30, 20, and 10 B.C. from Pit 3 may be an old-wood problem but also suggests the presence of a Late Archaic occupation. The surface structure and its associated pits seems to have been a residential locus or camp. It was probably used for short-term gathering activities, as attested to by the expedient hearth and lack of a heavy deposit of surrounding trash.

Storage Pit (Excavation Area 33)

Excavation Area 33 is on the east side of North Florida Avenue at [redacted] The trench was dug after the surface area had been bladed. Two cores were recovered from the surface, as well as numerous artifacts from 1-10 cm below the blading, including a Scallorn-like projectile point. The trench was ultimately taken down to 58 cm, where a poorly preserved surface was found. A soil change in the southwest quarter of the trench suggested the outline of a pit. This outline was traced for 8 sq m, through subsequent trenches A, B, and C to reveal an unburned pit. It was dug below the utilized surface into a gravel substrate. The pit measured 1.42 m (north-south) by 1.38 m (east-west) by .49 deep, with a floor area of 1.95 m (Figs. 12 and 13).

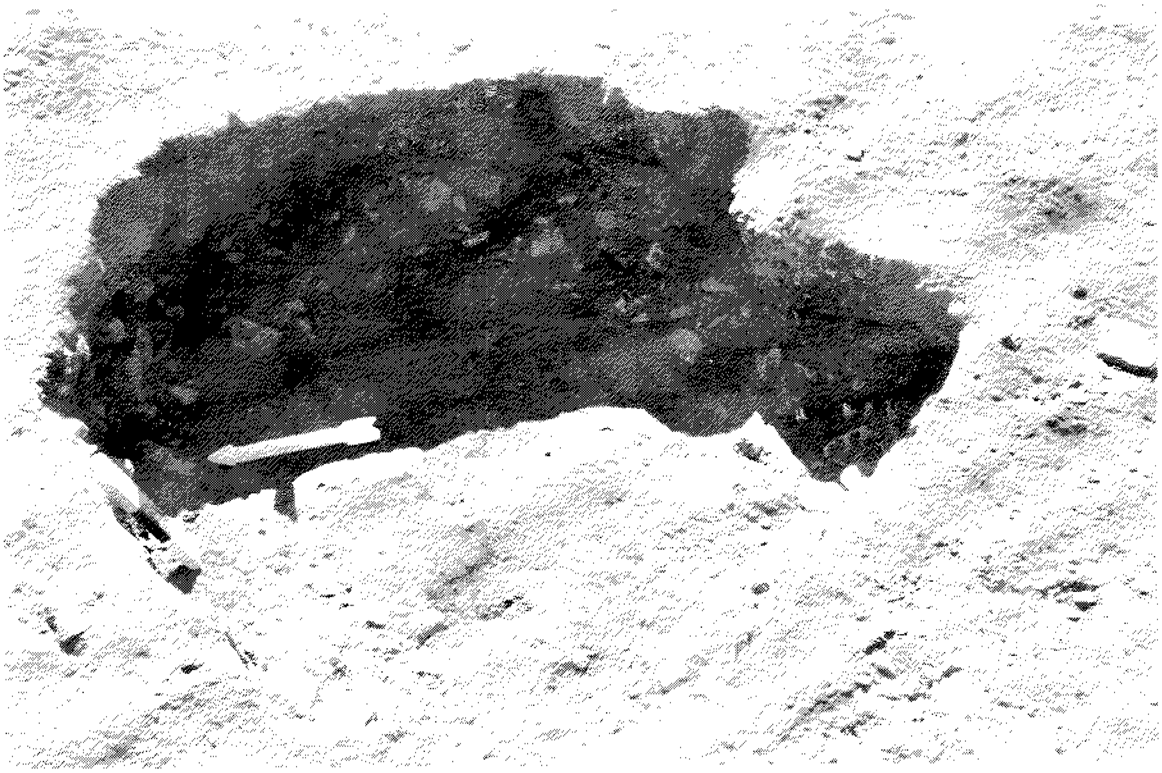

Figure 10. Roasting pit in Excavation Areas 29M and 29P.

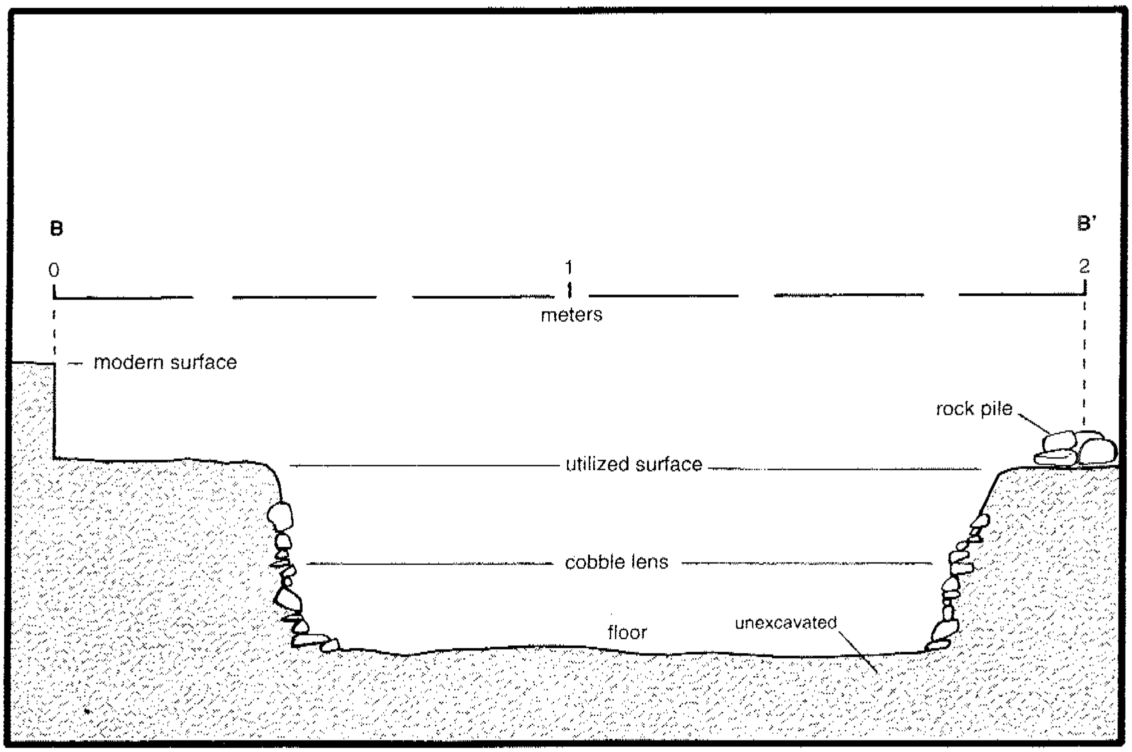

Figure 11. Profile of roasting pit in Excavation Areas 29M and 29P.

Figure 12. Storage pit in Excavation Area 33.

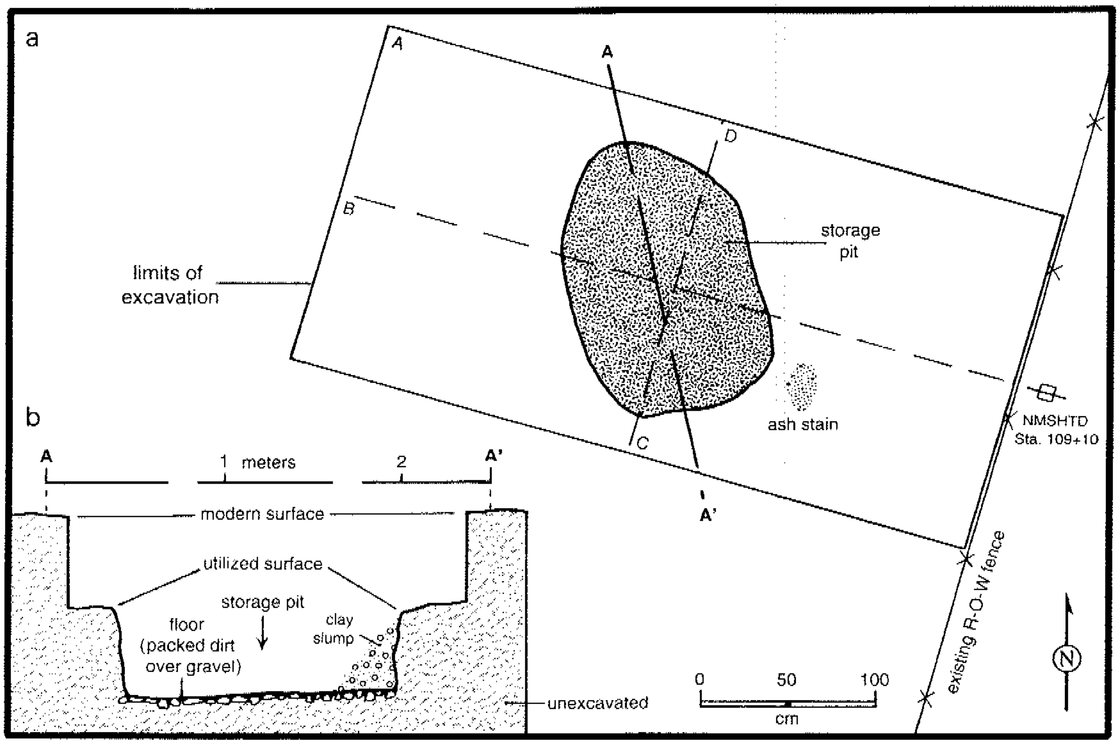

Figure 13. Plan (a) and profile (b) of storage pit in Excavation Area 33.

The walls were unprepared; however, a dirt floor had been packed down over the gravel. The fill contained hard, charcoal-flecked clay with some artifacts, including an expediently made cutting tool and a mano. Of significance, corncob fragments were found within this pit fill and were the only plant remains recovered here. There were no interior features. The small size of the pit and lack of inside features indicate that this was a storage pit, very possibly used to store corn. No dating of this pit was possible because of its lack of burning.

Surface Structure (Excavation Area 34)

Excavation Area 34 is on the west side of North Florida Avenue at [redacted] Fire-cracked rock and numerous artifacts, including two cutting tools expediently made, were present on the surface. Burned adobe casts, charcoal, and other artifacts were found in the general fill to a depth of 47 cm. At this depth, a burned surface was revealed. It was concentrated in a 60 by 55 cm area and continued to the south.

Three more test units were opened up to the south and east of the original trench for a total area of 6 sq m (Figs. 14 and 15). At a depth of 48 cm, the same burned surface was found, and two burned partial utility vessels of El Paso Brown were sitting on it. A burned piece of wood (30 cm long by .03 cm wide) was also lying on this surface, along with three manos, a polishing stone, and a core. No hearth was present, but heavy surface burning was visible. On this surface were six postholes ringing three-fourths of the pit structure floor. An entrance may have been located to the east, where there are no postholes. The diameters and depths of the postholes are as follows: Posthole 1, 8 cm, 10 cm deep; Posthole 2, 8 cm, 6 cm deep; Posthole 3, 6.5 cm, 6 cm deep; Posthole 4, 7 cm, 6 cm deep; Posthole 5, 7 cm, 7 cm deep; Posthole 6, 9 cm, 8 cm deep.

Excavations revealed a very shallow surface room with a measurement of 2.25 m (east-west) by 2.15 m (north-south) by .18 m deep, for a floor area of 4.83 m. This surface structure is probably a habitation unit because of its size, greater investment in construction (post supports), and the presence of partial brown ware pottery vessels, ground stone, and lithic artifacts on the floor. No radiocarbon sample was retrieved from this structure. However, the presence of only plain brown wares implies that this is also an Early Mesilla phase unit.

Storage Pit (Excavation Area 36)

Excavation Area 36 is on the west side of North Florida Avenue at [redacted] Initial excavations produced charcoal-flecked soil containing several artifacts. A compacted surface was found at 53 cm below the surface. A partial circle of darker soil was seen in this surface and proved to be a pit structure (Fig. 16). A dirt floor was found at 70 cm depth. Another trench was opened to the south to expose the structure. It is very shallow--only 17-20 cm below the exposed utilized surface, with unprepared walls dug into the gravelly substrate. The pit measures 1.30 m in diameter, for a floor area of 1.69 square m. Within the fill were two cores, a mano, and burned adobe pieces. A water line cuts the southeast corner of the pit. Given its small size and lack of features, this unit was probably a storage pit.

There was not enough charcoal in the structure for a radiocarbon sample. However, because of its construction and the presence of early brown wares, it can be assumed to be of the Early Mesilla phase. Of importance is the fact that both unburned and charred corn cupules were

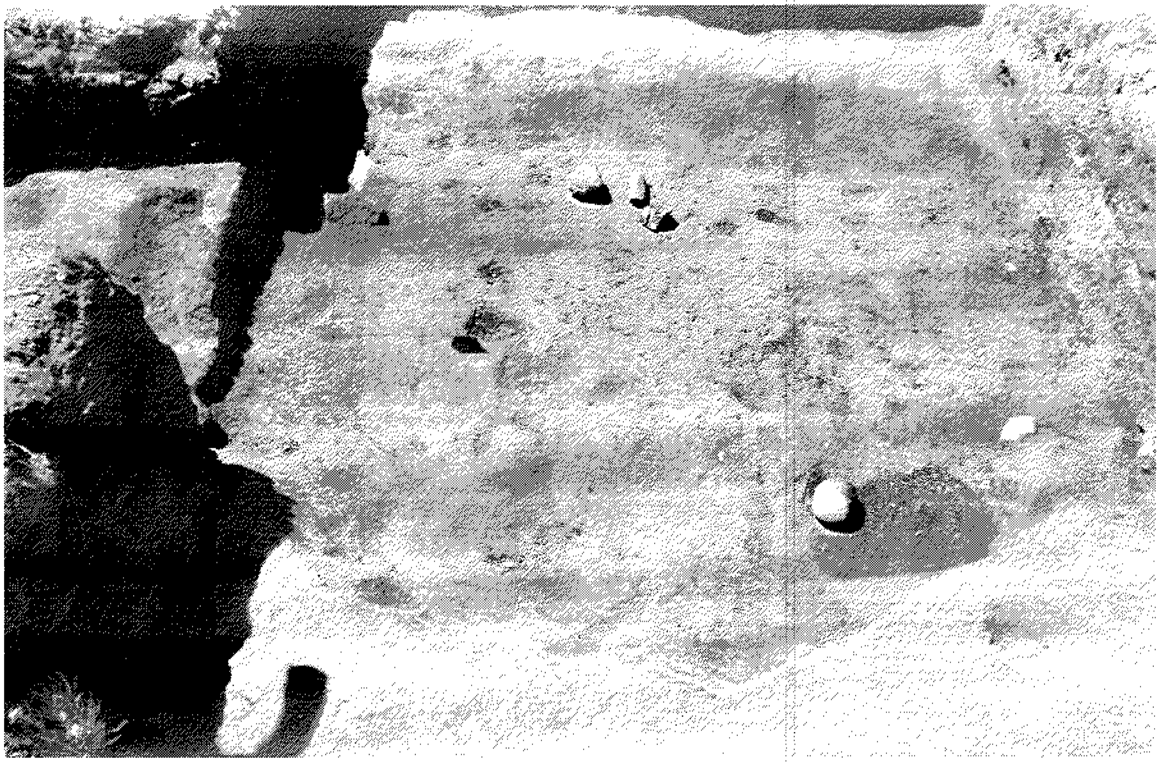

Figure 14. Surface room in Excavation Area 34.

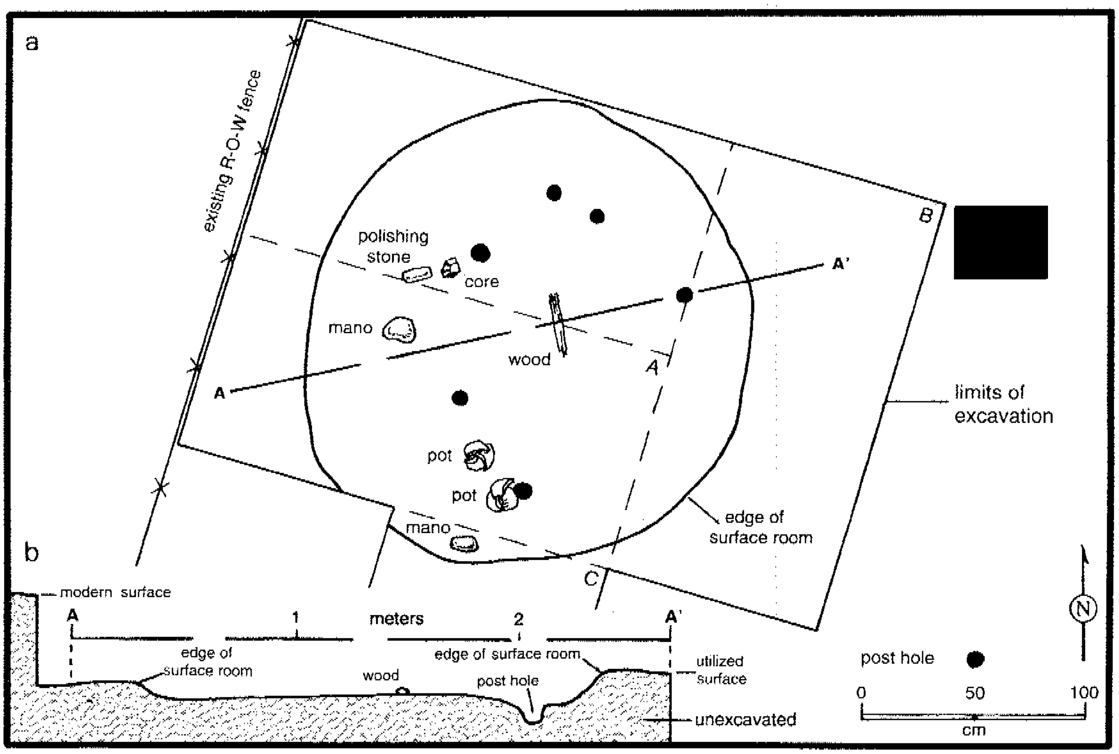

Figure 15. Plan (a) and profile (b) of surface room in Excavation Area 34.

recovered from the fill of this pit structure--the only prehistoric plant remains found. The very small pieces of charcoal associated with the plant remains included juniper, mesquite, and saltbush, indicating that a variety of woods from different ecological zones were selected for fuel.

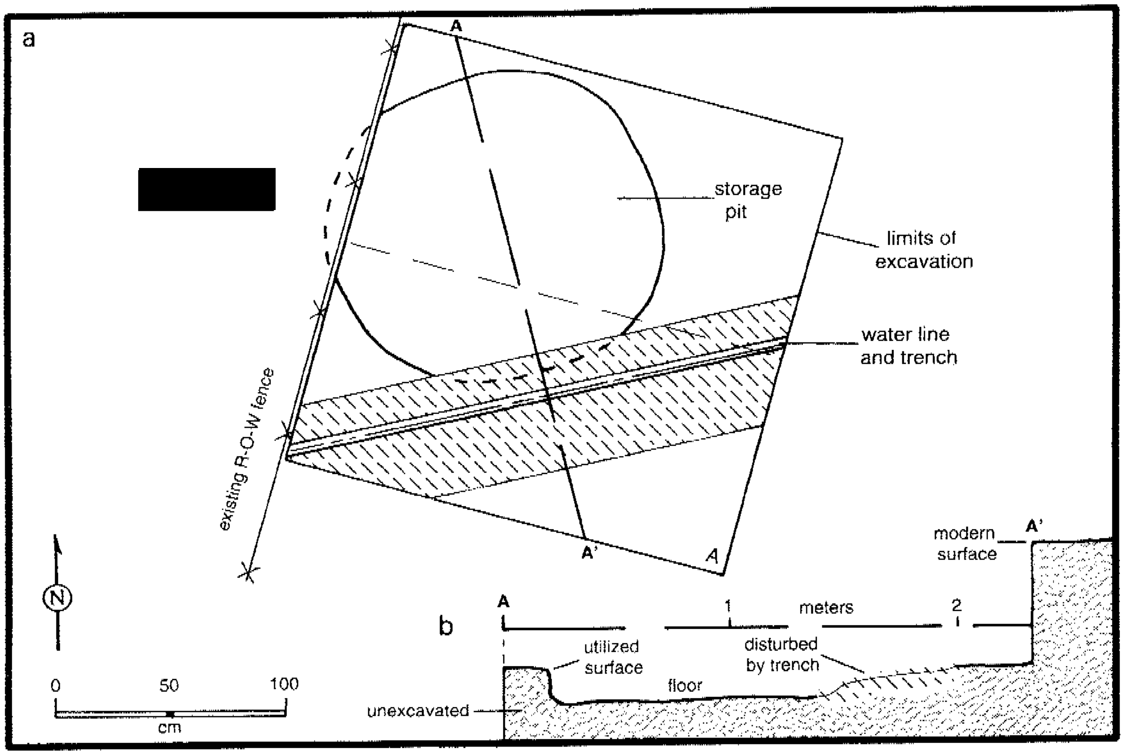

Figure 16. Plan (a) and profile (b) of storage pit in Excavation Area 36.

Pit Structure (Excavation Area 41)

Excavation Area 41 was placed in an area of dark soil uncovered by blading activities 2.7 m south of Excavation Area 28 at [redacted]. The blading process uncovered numerous artifacts. Excavation of 8.25 sq m revealed the outline of a pit dug into a gravel matrix beneath a hard-packed clay surface at 30 cm below the blading surface (Figs. 17 and 18). Within the pit, a telephone cable ran north-south at 50 cm depth. The unprepared floor was reached at 96 cm below the surface. The oval-shaped pit measures 2.04 m (east-west) by 1.64 m (north-south) by .67 m deep, with a floor area of 3.34 square m. A partial vessel and a dipper and scoop of El Paso Brown ware, along with a hoe and slab mano, were found on the floor of the pit.

In the northwest corner of the pit unit, a small pit of .70 by .70 by .30 m was excavated. The fill contained burned soil, charcoal, two manos, two cutting implements, and a variety of botanical remains. These included corncob fragments, grass seeds, knotweed, and hedgehog cactus seeds.

No hearth or interior features other than the small pit were found on the floor of the pit structure. The unit was probably used as a small habitation. Fill above the pit floor yielded a calibrated radiocarbon date of A.D. 790 with a 1 sigma range of A.D. 719 to 888. This places the pit structure within the mid-Mesilla phase, the most recent date at the project.

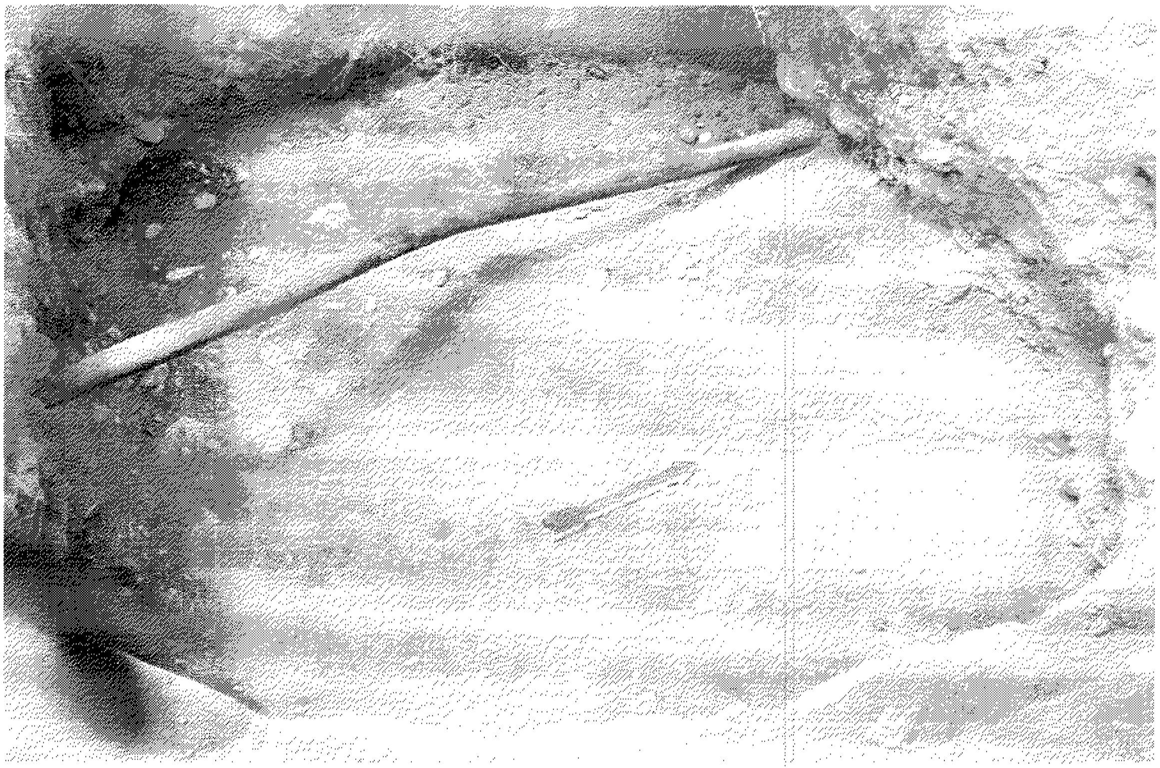

Figure 17. Storage pit in Excavation Area 41.

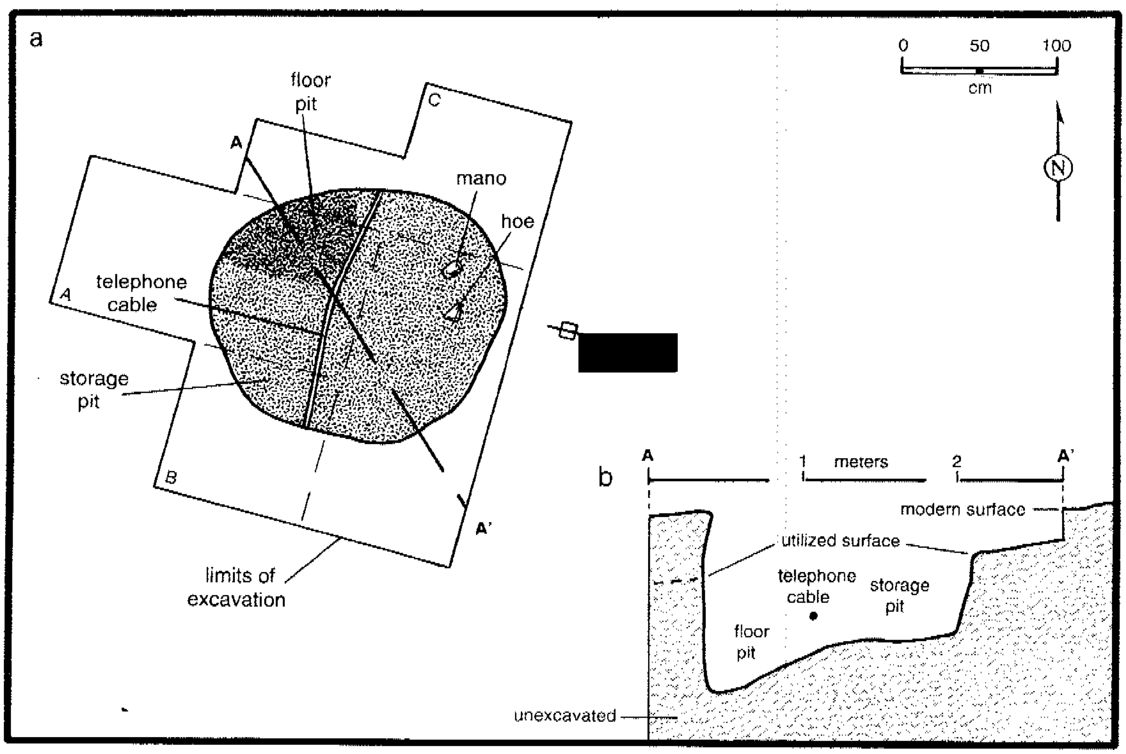

Figure 18. Plan (a) and profile (b) of storage pit in Excavation Area 41.

Pit Structure (Excavation Area 42)

Excavation Area 42 is 6.1 m north of Excavation Area 28 at [redacted] in an area where a dark stain was revealed by the blading activity. Also, an Archaic projectile point was found on the surface. A test unit in the darkened soil was taken down to 35 cm, where the outline of a pit structure was found. A total of 8.0 sq m were opened. The fill of the pit unit contained charcoal, burned adobe casts, and numerous artifacts. The structure measures 4.05 m (north-south) by 3.45 m (east-west) by 1.07 m deep, with a floor area of 13.97 sq m. It is the deepest and largest architectural feature found at the project (Figs. 19 and 20). The walls had slumped on the north and west edges, and a telephone cable and waterline cut through the unit. The pit structure had been dug into a gravel substrate. The fill was charcoal-flecked and contained several artifacts, including a Scallorn-like projectile point. Also, in the lower fill were two manos, a polishing stone, and two partial prehistoric human skeletons (discussed later). On the dirt-packed floor was an ash-stained area that probably served as a hearth. No postholes or other features were found on the floor of the structure.

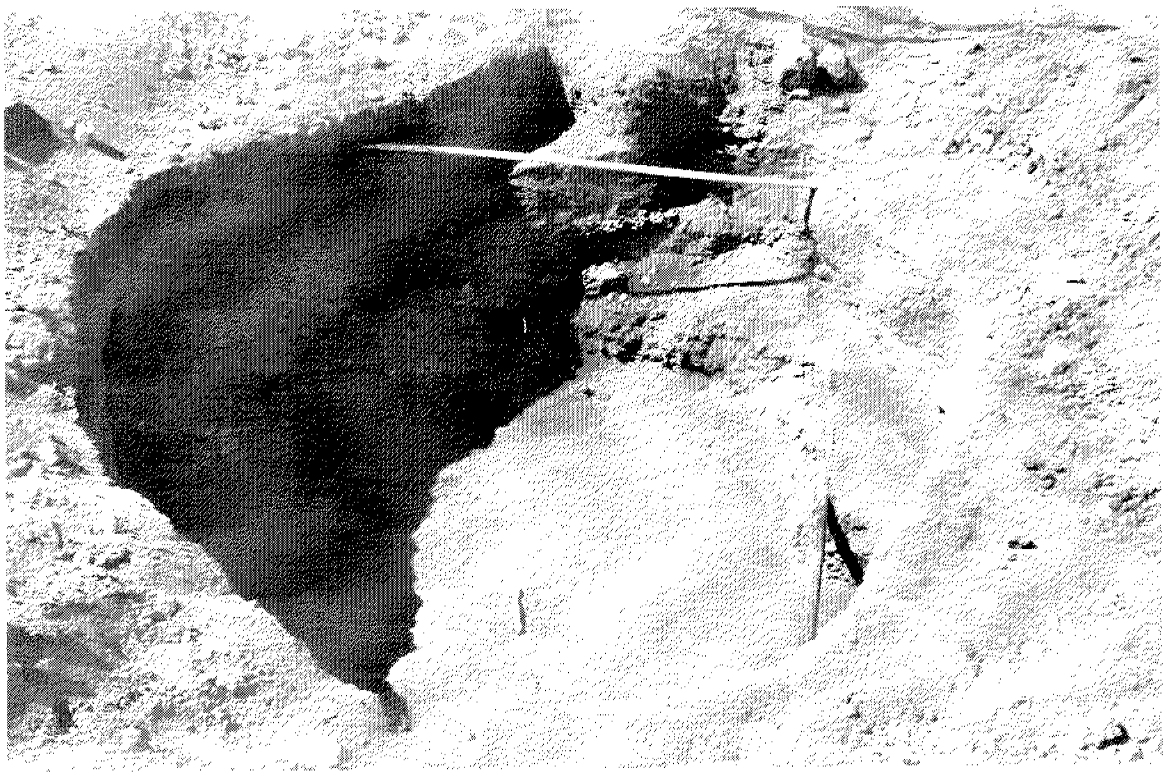

Figure 19. Habitation unit in Excavation Area 42.

A small sample of reeds *(Phragmites communis)* was recovered from immediately above the floor and a variety of plant remains were found within the structure. In the hearth area were carbonized corn cupules, grass seeds, pigweed, and prickly pear seeds. Within the floor contact sample, wild potato seeds and corn cupules were also recovered. Charcoal fragments in the hearth were identified as juniper, piñon, saltbush, mesquite, cottonwood or willow, and undetermined conifer. These woods again indicate that prehistoric occupants of the site utilized a variety of environmental zones.

Two radiocarbon samples were retrieved, one from the hearth area on the floor of the pit

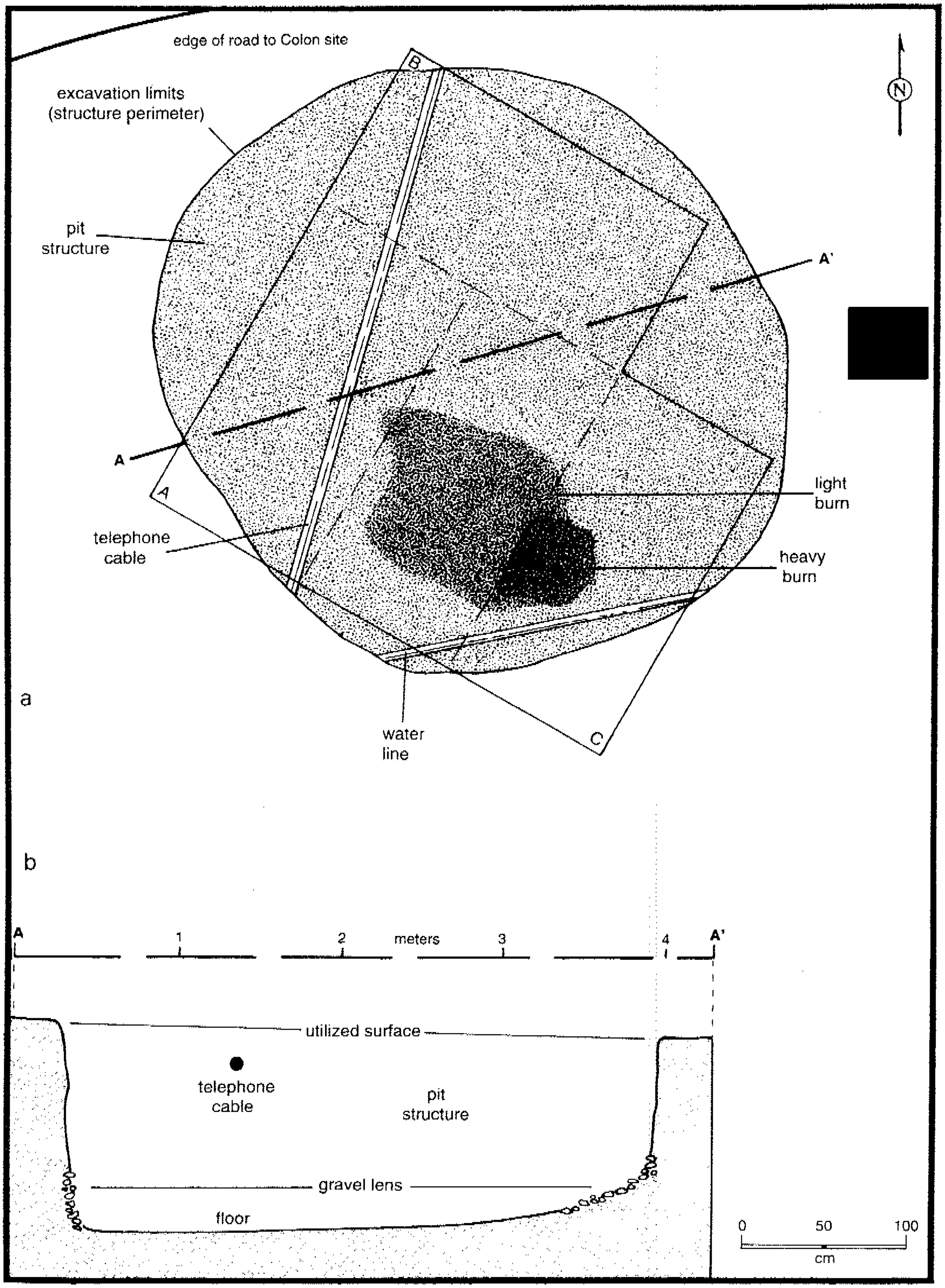

Figure 20. Plan (a) and profile (b) of habitation unit in Excavation Area 42.

structure and another from the charcoal-stained floor. The hearth area yielded a calibrated date of A.D. 430 with a 1 sigma range of A.D. 260 to 610. The floor contact date was 90 and 70 B.C. with a 1 sigma range of 369 B.C. to A.D. 84. An old-wood problem may have caused the early date but, again, the date may indicate a Late Archaic occupation in the vicinity.

Storage Pit (Excavation Area 44)

Excavation Area 44 is 7 m south of Excavation Area 34 at [redacted] The area was bladed by OAS staff, and several cutting implements were observed on the surface. Test excavations (5 sq m) revealed many burned adobe vegetal casts, charcoal flecking, and artifacts from 8 to 17 cm depth below the blading. A utilized, compacted, charcoal-stained surface was encountered at a depth of 10 -17 cm. Upon this surface, the partial outline of a pit was visible (Figs. 21 and 22). Fill within the pit contained dark-stained, charcoal-flecked soil and a few flakes of chipped stone. An ash lens was found at 55 cm below the surrounding utilized surface. Immediately below this was the pit floor.

The pit measures 1.42 m (north-south) by 1.30 m (east-west) by .55 m deep, with a floor area of 1.84 m. A calibrated radiocarbon date of A.D. 550 with a 1 sigma range of A.D. 454 to 620 was obtained from the utilized surface adjacent to the pit, placing the structure within the Early Mesilla phase.

The presence of an ash lens at the bottom of the pit structure and the heavy charcoal staining indicates that this unit burned rather intensely. However, in construction method, presence of unprepared walls and floor, size, and lack of internal features, it is very similar to the other small pits identified on the site as storage features.

Telephone Cable Monitoring

On September 3-5, 1986, we also monitored a telephone cable trench being laid along the east side of North Florida Avenue, within the proposed right-of-way, from north of the U.S. 82/Florida Avenue intersection south through the project area. The telephone trench was .60 m wide by 1.36 m deep. Nothing was found north of the intersection. However, several artifacts were collected from the trench south of the junction, including a large mortar, two manos, two lithic artifacts, and a El Paso Brown sherd. In addition, several probable storage pits and an ash lens were observed in the cable trench and recorded (Fig. 23). Data on these areas is given in Table 2. From the table, it can be seen that Storage Pits C, D, and E are all at about the same depth and are very near each other. It is likely that they are contemporaneous.

Discussion

Four types of structural features were recorded during the testing program along North Florida Avenue. These include storage pits, a roasting pit, pit structures, and surface rooms (Fig. 23). Both the pithouses and surface rooms indicate use as habitation units because of their size, presence of some internal features, or the variety of artifacts within them when compared to storage facilities. Summary statistics of these features follow: Pit Structure 28, 2.92 sq m, A.D. 540; Pit Structure 41, 3.34 sq m, cal. A.D. 790; Pit Structure 42, 13.97 sq m, cal. A.D. 430; Surface Room 29,

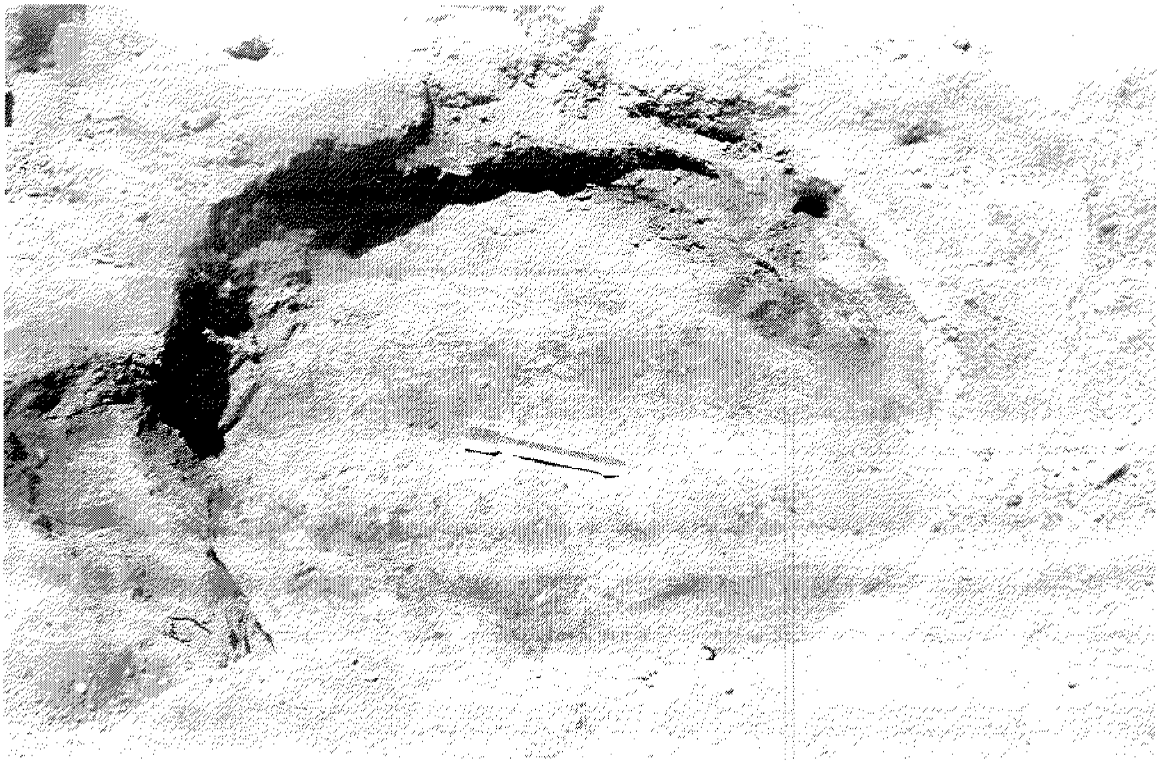

Figure 21. Roasting pit in Excavation Area 44.

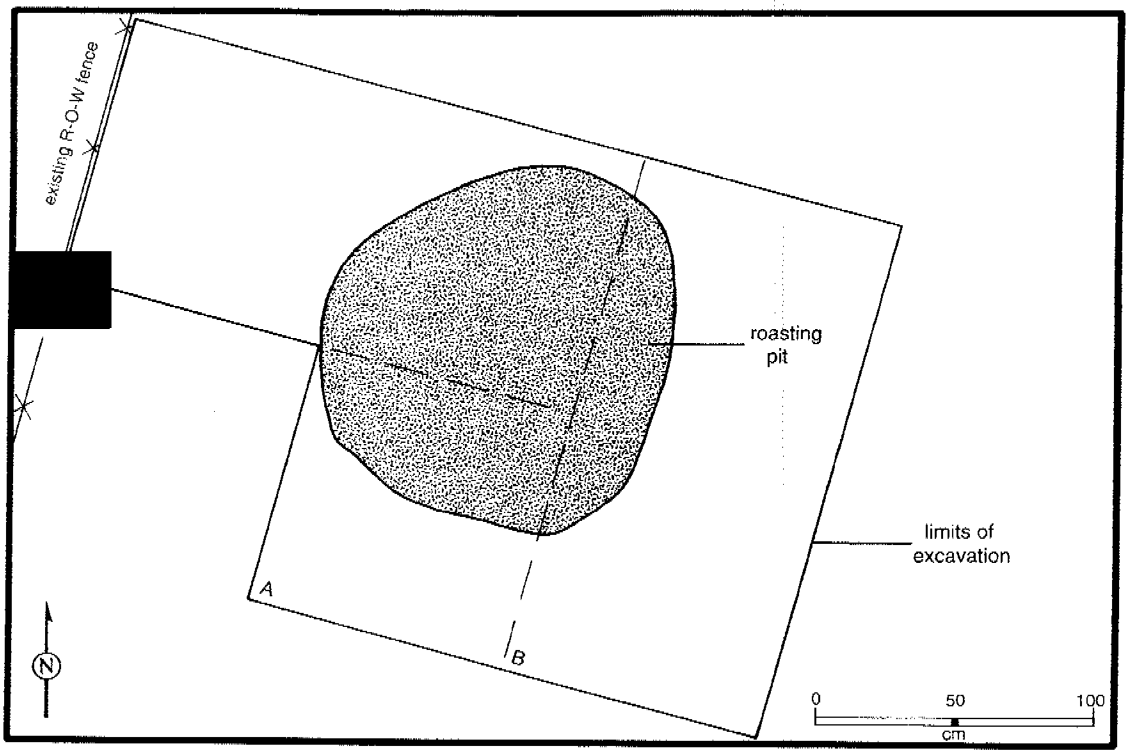

Figure 22. Plan of roasting pit in Excavation Area 44.

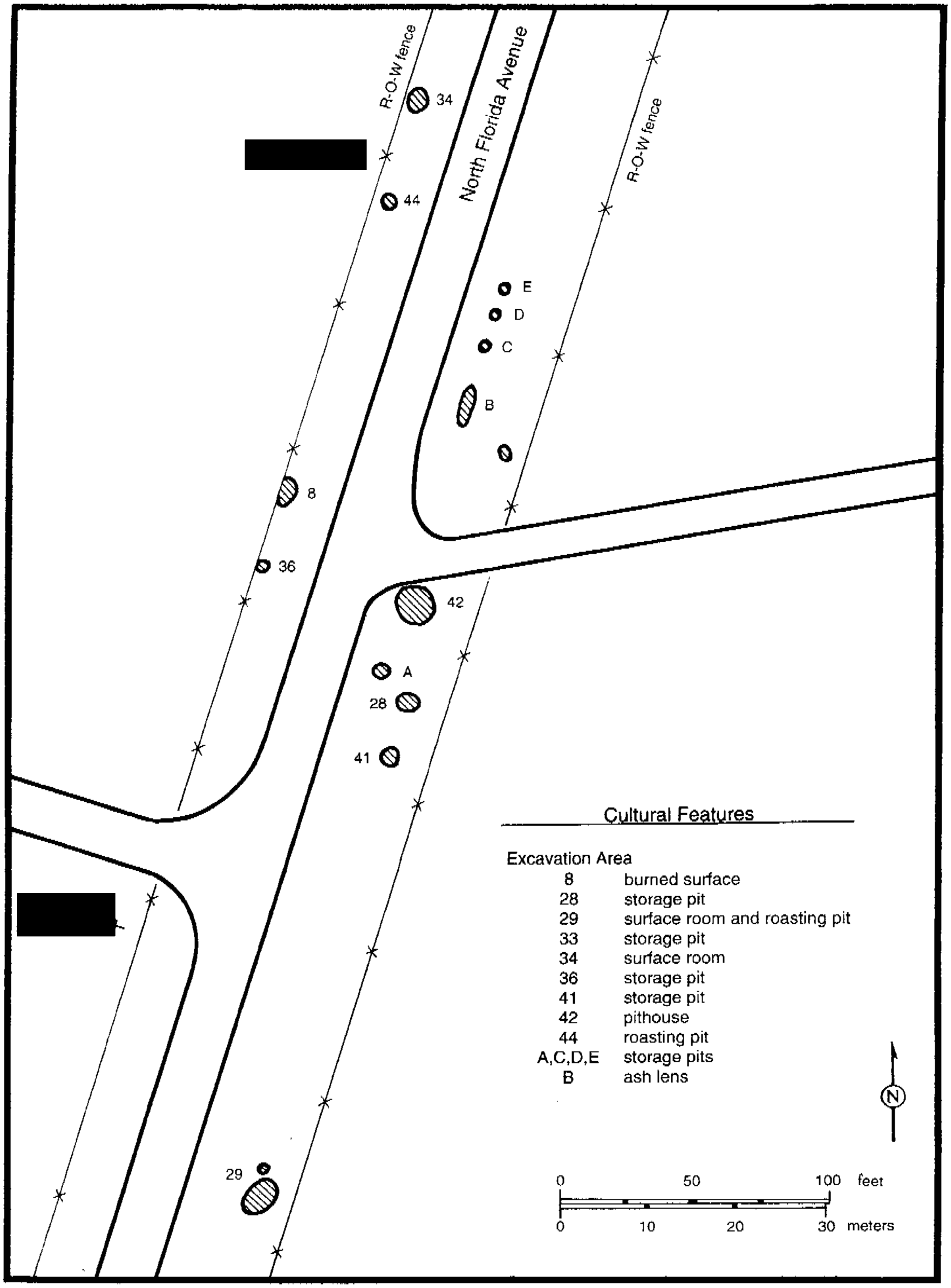

Figure 23. Location of cultural features.

12.28 sq m, cal. A.D. 420; Surface Room 34, 4.83 sq m.

Pit structures have increasingly been found dating to the Late Archaic period in southern New Mexico (O'Laughlin 1980; O'Leary 1987; Whalen 1994a). These units can be large, with a mean living space of 6 sq m, or small, at approximately 3.8 sq m (Whalen 1994a). By the Early Mesilla phase, larger pithouses measure an average of 11.8 sq m. The pit structure at LA 457 (Unit 42) is very large, 13.97 sq m, and dates to the Early Mesilla phase at cal. A.D. 430. However, in spite of its size, it fits Whalen's definition (1994a:629) of a "simple" pit structure because of its lack of interior features except for an expediently used hearth area. The other two pit structures (Units 28 and 41) are much smaller and fit the pattern for "small" pit units in the early to mid-Mesilla phases.

All three structures have straight to slightly sloping sides and are dug into the natural soils with no wall preparation. Floors have been leveled and packed with dirt. One, Unit 41, also has a small pit dug into the floor along one edge. Depths of the two small pit structures are shallow, .44 m (Unit 28) and .67 m (Unit 41), whereas the large structure in Unit 42 is 1.07 m deep. These differences in depths and floor areas between the smaller pit structures and the large one are not easily interpreted in terms of function. One possibility is that the large pit structure, which was deeper and had a hearth, was a year-round habitation, and the smaller units were used for shorter periods of time or seasonally.

Two of the pit structures, two storage rooms, and the two surface rooms contained remnants of hardened, burned clay with plant impressions. The 171 casts of branches or bush limbs ranged from 1 to 11 mm wide, with a mean of 3.4 mm. However, most ranged from 1 to 5 mm, indicating small limbs were used. Another 49 pieces of burned clay or adobe were recovered without casts. The presence of casts suggests that the structures were roofed with branches and clay plastered over the plant material. In the largest pit structure, Unit 42, fragments of reed (*Phragmites communis*) were found on the floor and once may have been part of the roofing. O'Laughlin (1980) suggests that, at the Late Archaic Site 33 at Keystone Dam, the similar, light-branch adobe casts were probably from mud plastering covering small pithouses with domed superstructures. The same pattern is suggested for at least the smaller pithouses at LA 457, where no postholes were found. The two posthole alignments in the surface rooms indicate a stronger roof-support system, but still covered with adobe plaster.

Only Structure 29 of the two surface rooms produced a chronometric date: cal. A.D. 420. However, both units possessed floor features, which were lacking in all of the pit structures. Surface Room 29 had a definable hearth area, four subsurface pits, and evidence of two post supports. Unit 34 had a charcoal-stained surface with a circular post pattern and six postholes with a gap, suggesting a possible entry to the east. Both structures were only 10-20 cm deep and had uplifted clay edges around their perimeters, indicating the rooms were of open-sided, ramada-like construction or had brush coverings plastered with clay.

The archaeological record does not give much information on shallow, basin-shaped habitation units. At the Huesito site of the Late Mesilla phase, Whalen (1994a:630) mentions an activity area near some pit structures that had features within a "depressed, blackened area." At an Early Mesilla phase site, Turquoise Ridge, Whalen (1994a:629) describes activity areas with pits surrounded by heavily blackened ground. He may be talking about the same type of feature as the surface rooms at LA 457. If the clay uplifts were eliminated from the record at LA 457, then the surface rooms would be very similar to his (1994) activity areas. Postholes and numerous burned-clay casts argue for a roofed unit, however, rather than an open-air activity area.

O'Laughlin recorded numerous "houses" at the Keystone Dam, Site 33, near El Paso, which date to the Late Archaic period, between 550 B.C. and A.D. 150. These structures are remarkably similar to the Early Mesilla sites of the A.D. 400-500s at LA 457. The house remains were shallow, about 3 m in diameter--saucer-shaped depressions with or without internal hearths and often with postholes and burned clay roofing material (O'Laughlin 1980:145). At Sunland Park, Zamora (1993) excavated a shallow, 20 cm deep pithouse with a floor area of 3.76 sq m with no internal features. This structure dates to A.D. 465, within the Early Mesilla phase.

We may conclude that surface rooms, shallow pithouses, huts, and possibly some designated activity areas may all represent the type of habitation unit described in this report. The antecedent for these shallow structures does not lie in the Early Mesilla phases, but obviously in the Late Archaic. A strong continuum is indicated from the Late Archaic into the Mesilla phase from the archaeological data known to date.

Inferring that the pithouses and surface rooms at LA 457 are habitation units does not imply that they are long-term residences. The lack of interior features, particularly hearths, within the pithouses suggests a short-term or seasonal occupation. The shallowness of the structures also argues for short-term use. None of the structures reveal modification or reuse. We suggest that they represent relatively short-term occupations at the mouth of Dry Canyon for the purpose of planting or harvesting crops and/or gathering resources from the mountains and desert in an area where both environments were accessible.

DATING OF THE SITE

All cultural features at LA 457 within the North Florida Avenue right-of-way seem to date to the Early Mesilla phase of the Jornada Mogollon culture. However, there are also indications that a very late Archaic component is present on the site. Chronometric dating of these features has been based on radiocarbon sampling and ceramic data.

Looking at the ceramic data, it is evident that the earlier brown wares are present in the lower fill and floors of all of the surface rooms, pithouses, and storage pits at the site. Later El Paso Polychrome and nonlocal trade wares occur only on the site surface and in the upper 20 cm of fill. These likely derive from the nearby, upslope Tony Colon site, which dates to the El Paso phase, ca. A.D. 1200 (Hunter 1988). Therefore, even without the verification from radiocarbon analyses, all features would be assigned to the early end of the Mesilla phase, before the introduction of El Paso Polychrome and later trade wares.

However, radiocarbon samples did provide strong confirmation for an early pithouse period occupation and produced some of the earliest documented dates for this time period within the northern Tularosa Basin. Results of the analysis are presented in Table 3.

Two radiocarbon dates fall within the very late Archaic period, with calibrated intercept dates of 30, 20, and 10 B.C. and 90 and 67 B.C., producing a pooled calibrated date of 40 B.C. Both dates are within later-dating features and may be skewed by old wood. However, numerous Archaic projectile points were recovered from the testing program, suggesting that Archaic peoples did indeed occupy the site area, perhaps for the same advantages that were available to later Mesilla populations: site accessibility to a variety of natural resources, closeness to good runoff, and topographic and climatic respite from the Tularosa Basin floor.

Four of the cultural features produced five calibrated radiocarbon dates, which are statistically the same at the 95 percent confidence level (Stuiver and Reimer 1993). These include Features 28, 29, 42, and 44 (one pithouse, one surface unit, a storage pit, and a possible roasting pit, Fig. 24). The mean calibrated range of dates for these features is A.D. 455-531. Within this time range is found an example of each of the four architectural types recorded from the testing program. Together with the numerous artifact types, this suggests that an extensive variety of activities took place at this locale during the Early Mesilla period.

While five of the nine radiocarbon dates center on this 76 year span (A.D. 455-531), there are two dates that fall somewhat out of this range, A.D. 250 and 790 (calibrated), although still within the Mesilla phase. These dates, together with the Late Archaic calibrated date of 40 B.C., present a scenario of probable continual reuse of the site along North Florida Avenue from the earliest beginning of the Mesilla phase to beyond the midpoint of the period. Still later occupation within the site vicinity (at the Tony Colon site) occurred several hundred meters to the east during the late El Paso phase, A.D. 1000-1200.

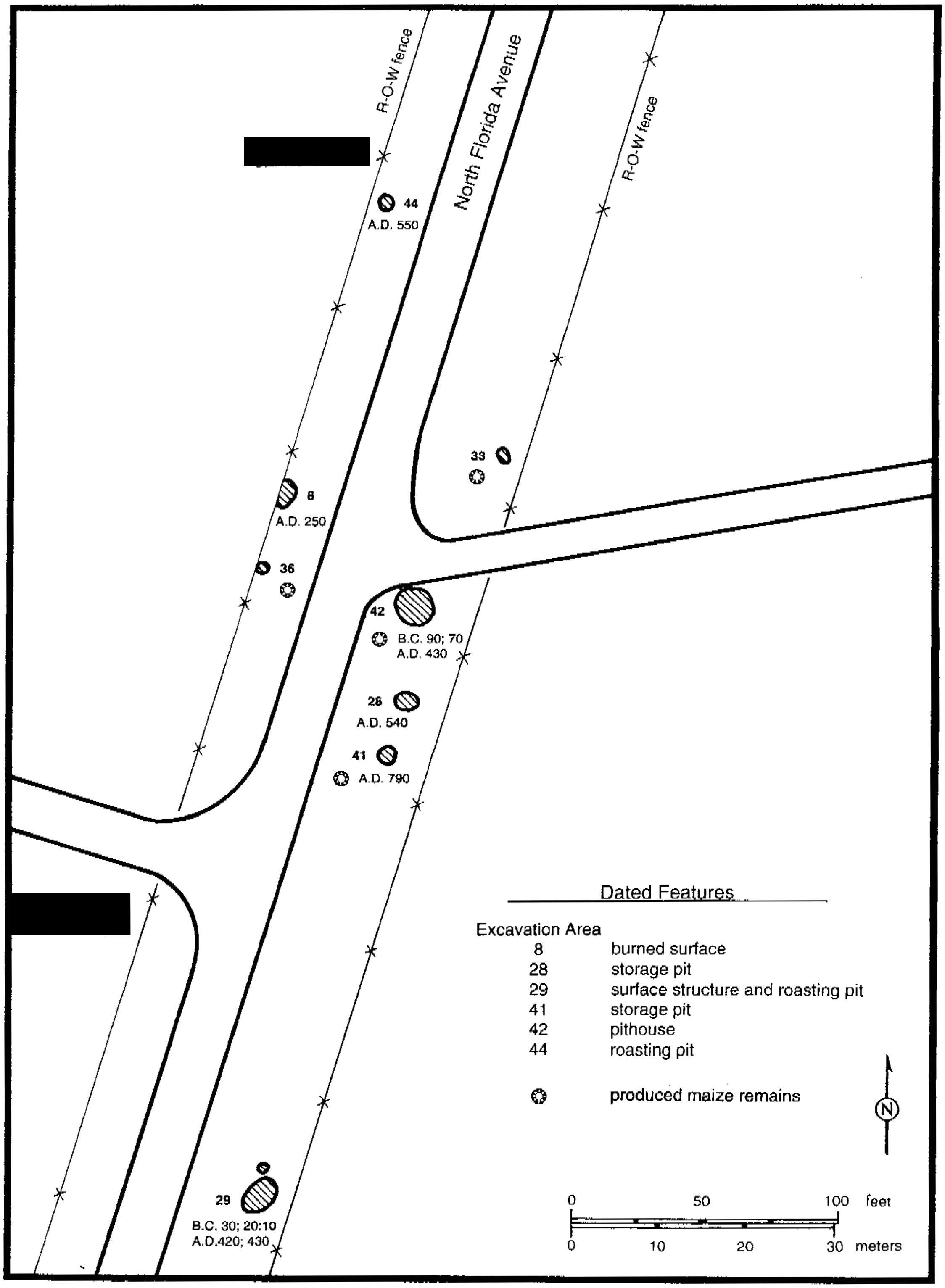

Figure 24. Location of dated features.

CERAMIC ANALYSIS

Helen B. Shields, Toni Sudar-Laumbach, and Karl W. Laumbach

A total of 6,400 sherds were collected from LA 457 during excavations. Most are El Paso Brown Ware. Archaeological data recovery on the Colon site, a portion of LA 457 on privately owned property approximately 200 m east of the OAS excavation, yielded ceramic, lithic, and other artifacts related to the El Paso phase of the Jornada Mogollon (ca. A.D. 1200-1400; Hunter 1988). The ceramic assemblage from that portion of the site contains painted wares in large numbers.

Human Systems Research undertook the ceramic analysis of a sample of 3,213 sherds from the 6,400 collected during the OAS excavation. All rims and painted wares were included in the analysis.

The purpose of the analysis was to provide descriptions and observations of technological variability in the ceramics collected. It was intended that these data would allow us to summarize ceramic types by vessel form and temporal period as well as identify possible areas of production.

Methodology

The first step in the analysis was to rough sort all of the sherds. Rough sorting consisted of organizing the sherds from each field bag (representing a distinct provenience and level) by surface color, painted features, and vessel form. Next, the sherds were tabulated more specifically by type, vessel form, and rim form.

The third step in the analysis was scanning a sample of the ceramic assemblage using a 20 power microscope to define gross temper attributes. All of the painted wares, all the undifferentiated brown wares, and all rim sherds were inspected. A 6 percent sample (180 sherds) of the 2,961 El Paso Brown ware body sherds, stratified by provenience and level, was scanned. This sample was selected by first counting the brown ware body sherds in each level within each major provenience. Then, 10 percent of the sherds were taken from each grid and level of each major provenience to make up the sample. Minor proveniences containing only a few sherds were not sampled. A listing of the number of sherds in the 6 percent sample by provenience and level is given in Appendix B.

The painted and indeterminate sherds and the sample of El Paso Brown sherds were used to compile the ceramic descriptions, whereby core, surface, and vessel form were defined. The last step of the analysis entailed measuring the El Paso Brown rim sherds, determining vessel type, and calculating rim sherd indices.

All of the painted and indeterminate brown ware sherds and the sample of the El Paso Brown sherds were examined for core attributes of color, texture, and temper type. Surface treatment and color were inspected. Vessel form was determined when possible. Criteria used for determining vessel form included the relative amount of polish on interior and exterior surfaces and the presence or absence of scraping marks on one surface. Interior and exterior surfaces of vessels were recognized, when possible, by the curvature or rim of the sherd. Many sherds were too small or too eroded to determine vessel form.

Surface and core color for brown ware body and rim sherds were classified as light brown, medium brown, and dark brown. Paint-decorated sherds were described with the adjectives light, medium, or dark plus a color designate, such as gray or brown. Core texture was defined as fine, medium, or coarse. Cores having a coarse texture exhibit diverse sizes of temper particles, and these particles comprise at least 40-50 percent of the paste volume. A coarse-textured core is friable and not compact. Fine-textured cores were identified as compact, and the particles were generally small and uniform.

Temper particles were described in terms of quantity, color, material type, and physical characteristics. Quantity of temper was defined as (a) sparsely tempered with visible particles of tempering comprising less than 15-30 percent of the paste, (b) moderately tempered with visible particles comprising from 30 to 40 percent of the paste, and (c) heavily tempered with visible particles comprising over 40 percent of the paste. Physical characteristics of the temper were described as angular (temper particles have sharp, angular edges), subangular (particles have angular and rounded edges), and rounded (particles have rolled, smoothed edges). Angular particles, particularly those with rough, cortical surfaces, suggest that detritus was a source for raw material and that little or no processing (e.g., grinding) of temper occurred. Subangular temper particles, particularly fine, small particles, may indicate that the temper was processed (ground). Rounded temper suggests water-borne raw material, commonly identified as sand. Temper particles were also characterized as light or dark and opaque or translucent.

Sherd surfaces were examined for quality of finish. Quality was defined as poorly smoothed, moderately smoothed, or well smoothed. Poorly smoothed sherds were characterized as having temper particles protruding on the exterior or interior surface or both, striations or drag lines on one or both surfaces, and rough texture on one or both surfaces. Moderately smoothed sherds have some temper (generally larger particles) on the exterior or interior surface or both, but smoothing is evident. Finely smoothed sherds have no striations, temper particles are not readily apparent, and the surfaces exhibit a smooth and well-finished surface on the exterior or interior surface or both.

Pottery Descriptions

Eight ceramic types were identified during the analysis. These included two brown ware types, El Paso Brown Ware and indeterminate brown ware. Painted ceramics include El Paso Polychrome, Chupadero Black-on-white, Mimbres Black-on-white, Three Rivers/San Andres Red-on-terracotta, and a historic earthenware.

El Paso Brown Ware (180 sherds)

Core construction is coiled and scraped. Pottery was fired in an oxidizing atmosphere. Color range includes light brown (10 percent), medium brown (49 percent), and dark brown to black (40 percent). Carbon streaking is common. Texture is granular, friable, and coarse. Only five sherds exhibit fine, compact texture. Temper is moderately to heavily tempered with angular particles of white (or frosty gray-white) quartz in combination with colorless quartz. Temper particles make up 20 to 50 percent of the volume of the paste. Approximately 12 percent of the sherds have a low-density temper; however, 48 to 50 percent of the collection is characterized by moderate- to high-density temper. Auxiliary temper particles are predominantly white and opaque, probably feldspar. Some auxiliary particles are black. The variability of temper particle size suggests little or no processing (e.g., grinding) of tempering material.

Smoothing of the surface of these sherds ranges is poorly smoothed (28 percent), moderately smoothed (48 percent), and well smoothed (24 percent). A common feature is temper particles that protrude through the surfaces. A few sherds exhibit smoothing striations (24 percent) of variable depth. Color ranges from light (30 percent) to medium (25 percent) and dark brown (25 percent), to reddish-brown (20 percent).

There are 99 jar body sherds, 27 bowl body sherds, and 54 indeterminate sherds. They range in age from A.D. 400 to 1200-1400 (Whalen 1978).

Indeterminate Brown Ware (28 sherds)

Core construction is coiled and scraped. The sherds were fired in an oxidizing atmosphere. Their color is light brown, yellow brown, grayish brown, and light reddish brown. Their texture is moderate to fine and compact. The temper is of medium to small particles, mostly angular and subangular quartz, with temper comprising less than 50 percent of the paste. Quartz particles range from colorless to frosty gray-white and golden brown.

The interior and exterior surfaces are well smoothed and compact. Eight sherds have some shallow stria; however, bumpy or rough surfaces are rare. Polishing on one or both surfaces is uniform on most sherds.

The indeterminate group is notably lighter in surface color than El Paso Brown Ware. Surfaces are consistently well smoothed and compact (temper particles do not protrude through the surfaces). Polishing is a common feature on surfaces. The cores notably lack carbon streaks. It is likely that some of the sherds in the indeterminate group represent Alma Plain (the Mimbres Branch variety). Others, particularly the light reddish-brown specimens may be body sherds from painted Three Rivers Red-on-Terracotta vessels.

The vessel forms are not easily distinguished because of the size of the sherds. No rims are present.

The age of the sample is basically indeterminable. The presence of Alma Plain (Mimbres variety) suggests a time range as early as A.D. 200 or as late as ca. A.D. 1150 (Wheat 1955).

El Paso Polychrome (10 sherds)

Core construction is coiled and scraped. The pottery was fired in an oxidizing atmosphere. Core color is brown, dark brown, black. Carbon streak is common. Texture is medium to coarse. Temper is angular to subangular, colorless to frosty gray-brown or brown quartz.

Exterior and interior surfaces are medium to well smoothed. No striations are present on surfaces of the sherds in this collection. Larger temper particles protrude through the surfaces. Surface color ranges from reddish-brown to brown and dark brown. Decoration pigments are a black, carbon/organic material and a red, iron mineral paint ranging in color from bright brick red to dull reddish-brown. Design bands on El Paso Polychrome are executed in fine or wide-line geometric elements consisting of two opposing painted units. One rim sherd has red, iron pigment on the lip and a wide band of black, organic pigment positioned below the lip. The rims are straight-walled, with a thick, rounded lip.

There are six jar sherds and four bowl sherds. They date to A.D. 1200-1350 (Runyon and Hedrick 1973).

Chupadero Black-on-white (50 sherds)

The core construction is coiled and scraped. The pottery was fired in a reducing atmosphere. The core color is light, ranging from gray to off-white. Carbon streak is absent. The texture is uniformly fine. The temper is small to medium-sized, angular and subangular particles of predominantly translucent quartz sand with inclusions of sherds. Small, uniform particle size suggests processing of some kind, such as grinding of temper materials.

The exteriors of jars and interior of bowls are smoothed. Decorative elements and slip occur on the smoothed surfaces. Slip color is basically white, but ranges from off-white or grayish white to bluish gray and gray. Striations of varying depth are present on interiors of jar sherds and on the exteriors of bowl sherds. Decoration is of black mineral pigment. Bold, solid, linear elements, multiple parallel lines, and hatching with solid opposing motifs are the predominant design elements. No visible difference in execution or style of the design occurs on painted sherds with off-white slip (26 sherds) or those with blue-gray or gray slip (16 sherds). Several sherds in the collection were unpainted body sherds. Slip color in this group ranged from bluish gray/gray (6 sherds) to off-white (2 sherds). The paint-decorated sherds are too small to see the details of the overall design system.

There are 13 jar body sherds, 2 jar rim sherds, 15 bowl body sherds, and 20 indeterminate sherds. They date to A.D. 1150-1400 (Breternitz 1966:58).

Mimbres White Ware (13 sherds)

Core construction is coiled and scraped. The pottery was fired in a reducing atmosphere with variable control, as evidenced by a broad range of core colors. Core color is gray (3 sherds), brownish gray (2 sherds), light reddish brown with gray toward the interior surface (6, probably from the same vessel), and carbon streak. The texture is moderately fine and compact. Temper material of angular to subangular quartz or quartz combined with angular to subangular igneous material predominates. Quartz sand with subangular and rounded particles occurs in one sherd. The rounded temper particles and a distinctive black core make these sherds remarkably similar to sherds found at LA 1082 in the Rio Grande Valley.

The surface is smoothed on both exterior and interior surfaces of bowl and jar forms. Slip is applied to interiors of the bowls and exteriors of jars. The slip ranges in color from light creamy white to chalky white. The decoration is of iron mineral pigment varying from black to orangish red as a result of variable control of the firing atmosphere. The design sample is exceptionally small. Sherds representing possibly four vessels (one jar and three bowls) have design remnants. Two bowls and one jar probably represent Mimbres Classic Black-on- white. This is suggested by fine-line hatching framed by fine lines and multiple parallel lines, which separate the central design from the rim (LeBlanc 1976:20).

There are 2 jar sherds, 10 bowl body sherds, and 1 indeterminate sherd. They date to the Mimbres period, A.D. 730-1250 (Breternitz 1966:86); and the Mimbres Classic, A.D. 1000-1150 (LeBlanc 1976; Sudar-Laumbach 1983:85-87).

Three Rivers/San Andres Terracotta Ware (10 sherds)

Core construction is coiled and scraped. The pottery was fired in an oxidizing atmosphere. Light reddish-brown (terracotta) to dark reddish-brown is the most common core color. Three sherds have light gray cores that are suggestive of carbon streaks. Texture is moderate to fine and compact. Small to medium angular to subangular quartz (colorless, white, gray-white) temper predominates; quartz combined with angular, porcelaneous white material (probably feldspar) also occurs.

All sherds are well smoothed on both interior and exterior surfaces (3 sherds have damaged surfaces). Interiors of bowl sherds are floated or have a thin slip. Interior surfaces are also compact and appear to be polished. The decoration is of iron mineral pigment; oxidized to a brick red. Three Rivers Terracotta includes two ceramic types: San Andres Red-on-terracotta and Three Rivers Red-on-terracotta. San Andres Red-on-terracotta, thought to be the earlier of the two types, is distinguished from Three Rivers Red-on-terracotta by the width of the painted lines. San Andres Red-on-terracotta has wider lines, about 5-6 mm or greater, and Three Rivers Red-on-terracotta lines are narrower, 5 mm or less (McCluney 1962). Based on line width, three sherds are classified as San Andres Red-on-terracotta. One of these sherds has two parallel lines with dots between. Only one sherd can be attributed to the narrow-line type, Three Rivers Red-on-terracotta. The remainder of the collection is undecorated body sherds.

The sherds were from bowls. San Andres Red-on-terracotta is a predecessor to Three Rivers Red-on-terracotta (McCluney 1962). Three Rivers Red-on-terracotta dates to A.D. 1150-1350 (Breternitz 1966; Runyan and Hedrick 1973).

Historic Glaze Ware (1 sherd)

The core construction is unknown. The core color is light brown. The texture is moderate to coarse, typical of an earthenware. The temper is small, uniform, subangular to rounded sand. The sherds have a smooth, glazed exterior. The interior surface is smoothed but unglazed. The glaze is a terracotta color and crackled.

The sherd is from an indeterminate vessel form, possibly a bowl. It dates to the twentieth century and suggests a modern Mexican ware or American kitchen ware. The sherd was found on the surface.

Modified Sherds

Sherds with intentional modifications, such as edge rounding or drill holes, were classified as disks, dippers or scoops, or sherds with drill holes.

A round disk was reconstructed from six sherds from 8B, Level 1. The disk appears to be made by smoothing and rounding a large sherd from a broken vessel. Three other fragments of modified sherds, all circular, were collected from Excavation Areas 35 and 39, and Excavation Unit 44D. These sherds may have been utilized as spindle whorls, gaming pieces, or ornaments.

The exterior of the rim of a large, cuplike sherd appears to have been smoothed by a scraping action. Sherds collected from Excavation Area 41, floor, were reconstructed to the form of a broken vessel that was used as a dipper or scoop. A hole was drilled through the piece, perhaps in an attempt to repair the vessel. The dipper or scoop could have been for water or seeds, and it could have been hung.

Two sherds with drilled holes were collected. They exhibit no other wear or modification. The holes were probably drilled to patch breaks in the vessels by lacing them with rawhide or cord.

El Paso Brown Ware Rim Index Measurements

A total of 168 El Paso Brown Ware rim sherds were tabulated. Of these, 100 were large enough to measure. The rims were first separated by provenience, level, vessel form, and rim type. Rims on bowls include 6 flattened rims and 3 rounded rims (no pinched bowl rims were found). Rims on jars include 7 pinched rims, 40 flattened rims, and 44 thickened rims. Three indeterminate vessel rim sherds with pinched rims and one with a thickened rim were also present.

The thickness of the rim wall was measured on sherds over 15 mm long. The measurement was made 2 mm and 15 mm below the rim. The first measurement is used as the numerator and the second as the denominator in the rim sherd index (RSI) (Seaman and Mills 1988). The RSI values are summarized by vessel and rim type in Table 4 and totaled in Table 5. Although the sample was not sufficiently large or diverse, the RSIs and rim forms support the C-14 dates obtained from the project.

The largest number of pinched rims were collected from the lowest levels. This rim type is suggested for the Early Mesilla phase of the Jornada Mogollon (Lehmer 1948; Whalen 1977,1978). A substantial number of pinched rims were also collected from the surface and upper levels. The rounded or flattened rims follow the same pattern of occurrence by level as the pinched rims. All of the major proveniences contained a mixed assemblage of rim types at all levels. This pattern suggests that these rim types were contemporary during the use/occupation of these proveniences. The lack of diversity in rim sherds and depths supports the suggested homogeneity of occupation indicated by the corpus of early dates.

El Paso Brown Ware Vessel Form, Size, and Function

Jar rims far outnumber bowl rims, rounded or pinched, in the El Paso Brown Ware assemblage. Due to the diminutive size of the rim sherds, it is difficult to assess whether they belonged to inverted or direct-neck jars. If the correlation between pinched rims and inverted-neck jars suggested by Whalen (1978) is correct, then inverted-neck jars were present. Of the four sherds large enough to observe neck shape, three are classified as having direct necks with rounded rims, and one has an inverted neck with a pinched rim.

Only three of the El Paso Brown sherds were large enough to precisely determine the rim type or estimate the vessel size. The estimates are listed in Table 6.

Seaman and Mills (1988) suggest that inverted-neck vessels are more common during the Mesilla phase, while direct-neck vessels are more common during the Doña Ana and El Paso phases. If this is true, LA 457 may reflect several hundred years of occupation spanning the

Mesilla phase.

Seaman and Mills (1988) also suggest that inverted-neck vessels were utilized primarily for storing dry materials and limited cooking. They maintain that direct-rim vessels were more efficient for storing, processing, or transporting liquids. They further argue that large, everted-rim vessels were used for short-term storage and that smaller, everted-rim vessels would have efficiently served for cooking.

The lack of painted wares in the El Paso Brown Ware assemblage suggests that LA 457 was an early Mesilla phase provenience or a separate location used for storing and preparing foodstuffs.

Painted Wares and Indeterminate Brown Wares

In the assemblage, 113 sherds are painted or are brown wares other than El Paso Brown Ware. The painted ware and indeterminate brown ware sherds are listed by provenience and level in Appendix C. These include 27 indeterminate brown ware sherds, 10 El Paso Polychrome sherds, 51 Chupadero Black-on-white sherds, 13 Mimbres White Ware sherds, 10 Three Rivers Terracotta Wares, and 1 historic glazed sherd. Roughly, 3 percent of the sherds fall into these categories. Ninety-five percent of the sherds not classified as El Paso Brown Ware were collected from the surface or the upper four levels (up to approximately 30 cm deep).

The presence of small quantities of late-period ceramics from the surface and upper levels suggests that the sherds may have washed in from another area east and upslope from the excavated area along North Florida Avenue. The Colon site, located in this area, has yielded a wide variety of late-period painted wares (Hunter 1988). Painted wares from the Colon portion of LA 457 include Three Rivers Red-on-terracotta, Lincoln Black-on-red, St. Johns Polychrome, El Paso Polychrome, Rio Grande Glaze A Red, Chupadero Black-on-white, Mimbres Classic Black-on-white, Mimbres Polychrome, Gila Polychrome, Ramos Polychrome, Corralitos Polychrome, Heshotauthla Polychrome, and Arenal Glaze Polychrome. The painted wares recovered from the OAS project are less varied and quite small, further suggesting that they are intrusive.

No proveniences yielded late-period painted ceramics from the lower levels (Table 7). El Paso Polychrome, Mimbres Black-on-white, and Chupadero Black-on-white are only found on the bladed surface and Levels 1 and 2 at the site. Thus, all below-surface cultural features may be from the Early Mesilla phase.

Possible Origins of the Ceramic Assemblage: Suggestions for Petrographic Analysis

Petrographic analysis of the sherds from LA 457 has the potential to provide data that reinforce or refute the suggested origins of the ceramic wares.

El Paso Brown Ware

The homogeneous nature of the El Paso Brown Ware assemblage suggests that all or almost all of the sherds were locally produced using unprocessed detritus for temper and probably the local red, La Luz clay. A historic pottery kiln also used this clay. Sherds from the historic kiln are still available for comparison.

El Paso Polychrome

As with El Paso Brown Ware, the El Paso Polychrome sherds all appear to be locally produced. Petrographic analysis could confirm this conclusion.

Indeterminate Brown Ware

The Indeterminate Brown Ware group of sherds presents a wide variety of possibilities. Some may be Alma Plain and could be profitably compared to sherds from Mimbres sites on the Rio Grande (such as LA 1082). Others may be plain wares more commonly found in the Bonito Valley with Three Rivers Red-on-terracotta. Others may simply be local aberrations.

Chupadero Black-on-white

The center of manufacture of Chupadero Black-on-white is unknown. A comparison with sherds from the Kit site (LA 38448) near Gran Quivira (Wiseman 1986:3) would be interesting. The small assemblage from LA 457 is homogeneous in appearance, suggesting this group of sherds was produced in one area.

Mimbres White Ware

Petrographic studies of Mimbres White wares collected near Orogrande indicate that the type was "produced over a broad geographic range and at a tremendous number of localities" (Rugge 1986:17). Rugge interprets "heterogeneous mature sand temper as being indicative of production in the Rio Grande Valley" (1986:17). As noted in the description, all of the Mimbres sherds contain angular to subangular quartz and igneous temper particles except one. The sherd from Test Pit 24, Level 2, contains subangular to *rounded* particles of quartz. Sudar-Laumbach has noted that this temper, in combination with a distinctive black core, is common in sherds from LA 1082, just north of Hatch on the Rio Grande.

Three Rivers and San Andres Terracotta Ware

The Ruidoso and Bonito Valleys are thought to be the principle sources of San Andres and Three Rivers Red-on-terracotta. A comparison to assemblages from those valleys as well as to the local El Paso Polychrome and Chupadero Black-on-white would be profitable.

ADDITIONAL TESTING PROGRAM

Yvonne R. Oakes and Regge N. Wiseman

Additional testing was conducted along U.S. 82 on the north edge of LA 457. No cultural features were found in the area. The ceramics recovered from this area basically duplicate what was obtained along North Florida Avenue; however, relative frequencies reflect a skewing toward an El Paso phase assemblage rather than a Mesilla phase one. This is likely because the A.D. 1200s Tony Colon site is directly upslope to the southeast of this area and may extend close to the U.S. 82 corridor.

The following observations on the ceramic assemblage from U.S. 82 were made by Regge Wiseman.

Of the Chupadero Black-on-white jar sherds (N=74), 53 have sherd temper, 13 Capitan monzonite temper, 7 Gran Quivira-like paste, and 1 Pueblo Colorado-like paste. Of the Chupadero Black-on-white bowl sherds, 20 have sherd temper, 5 Capitan monzonite temper, 7 Gran Quivira-like paste, and 4 Pueblo Colorado-like paste.

Only one sherd is the classic or Sierra Blanca variety of Jornada Brown. All others are the "lowland" variety (as yet undescribed formally). A number of sherds have gray syenite temper that is rather coarsely ground to be typical Jornada temper. The two jar rims are of the early jar shape (inward slanting neck and rim with rounded lip).

None of the Playas Incised sherds are red-slipped or red-fired. All have temper that suggests origin either in the El Paso region (temper is comparable to El Paso Polychrome) or the Silver City region (crushed tuffs, rhyolites, and/or rhyolitic tuffs).

One South Pecos Brown rim is direct with a square lip, and the other is slightly tapered with a round lip. At least one of the sherds has well-polished surfaces in addition to very coarse gray syenite temper (too coarse to be Jornada Brown).

A Three Rivers Ware sherd from a small jar has a polished exterior surface with the remnants of a red line design. Not enough of the design or line-work remains to place the sherd into a more specific type.

Analysis of ceramic debris has indicated that the Jornada Mogollon occupied LA 457 from the Mesilla phase (ca. A.D. 250-790) through the El Paso phase (ca. A.D. 1200-1400). The great majority of the sherds reflect the Mesilla phase component. Sherds from the later components appear to be intrusive from a nearby portion of the site, the Colon site. The early Mesilla phase occupation is indicated by the overwhelmingly high percentage of jar and bowl rims with direct rounded, pinched, and flattened lips of El Paso Brown Ware vessels (Lehmer 1948; Runyan and Hedrick 1973). The late Mesilla and early Doña Ana phases are represented by the limited presence (10 sherds, representing 4 vessels) of Mimbres Classic Black-on-white and two sherds of San Andres Red-on-terracotta. Three Rivers Red-on-terracotta, El Paso Polychrome, and Chupadero Black-on-white all represent ceramic types that date to the later Doña Ana and El Paso phases.

GROUND STONE ANALYSIS

Karen Wening

The primary goal of the LA 457 ground stone analysis was to determine the function of the 156 artifacts. By examining selected morphological and use surface attributes, the manipulative and material associations of the artifacts were ascertained. With this idea of function in mind, the following material attributes were monitored for all artifacts: lithic material type, grain size, color, and type of mineral inclusions. Table 8 presents the material types and their frequencies.

Other attributes monitored include cross-section shape, completeness of artifact, exposure to fire, striation patterns, ground surface texture, sharpening or shaping, number of use-surfaces, original rock form, use as hammerstone, combination of uses, and staining.

The additional testing program along U.S. 82, the northern edge of LA 457, produced another 11 pieces of ground stone. These are briefly discussed at the end of this section.

Artifact Types

Manos

The ground stone assemblage is perhaps best characterized by a large and varied mano group (N=96). Virtually every kind of mano use-surface, shape, and size is represented, yet definite groups are discernible. Common trends exist with regard to ground surface texture, material selection, and morphology. Loaf manos, the largest mano subgroup (N=29), perhaps best exemplify some of these assemblage-wide trends. One-hand manos, for purposes of this analysis, do not exceed 15 cm in any dimension. The actual range is 6.2-13.8 cm. The smallest mano classified as two-handed measures 18.4 cm.

Loaf manos are found in many western states from California (Riddell and Pritchard 1971) to Utah (Fry and Dalley 1979:45; Shields and Dalley 1968:85; Jennings and Sammons-Lohse 1981:96) to southern New Mexico (Kelley 1964; Farwell 1978). Manos from the Rainbow Point site are described as "classic loaf shaped mano(s) so common . . . in California" (Riddell and Pritchard 1971:67). Other descriptive terms include domed or loaf shaped and "large, heavy manos" with triangular cross sections (Kelley 1964:349, 373).

Aside from the Rainbow Point and Karlo site reports (Riddell and Pritchard 1971; Riddell 1960), virtually no speculation is made as to the role of loaf manos in food and other material processing. In this report, particular attention is paid to loaf manos since they comprise the largest portion of the mano assemblage (30 percent), exhibit highly consistent overall morphology and use-surface characteristics, and have received the greatest amount of attention where shaping is concerned.

Although loaf manos are found over a large temporal and geographic range, they are far less common than the two-hand slab manos associated with increased dependence on corn agriculture. They appear to be a specialized tool group at LA 457, as indicated by the remarkably consistent presence of smooth-textured, transversely convex use-surfaces and a thickness measuring at least one-half the width.

Loaf manos from this site exhibit four basic shapes: convex, biconvex, true loaf, and triangular. Convex forms possess four sides, all of which are slightly to markedly convex. These are the thickest manos found at the site, with a mean thickness of 7.6 cm. The biconvex loaf manos have two opposing convex sides, which are joined by two short, flat sides. The true loaf form has two adjoining convex surfaces, one gently convex and one markedly convex. Variations to this basic true loaf form are discussed below. Triangular forms have a triangular cross section. Of the 29 loaf manos in the assemblage, 22 (75.9 percent) can be classified as one of the four cross-sectional shapes.

Convex Loaf Manos (8). The convex shape has the greatest number of available ground surfaces, yet in virtually all examples, a single, heavily ground surface is present. These manos are typically shaped over the entire surface by pecking and grinding. Though all four surfaces are often ground, the light grinding on three surfaces appears to be for shaping rather than use. The single use-surface is usually heavily ground, often nearly to a polish. This smooth use-surface is especially remarkable considering the predominance of coarse-grained sandstones. The convex shape is most frequently found in the two-hand forms (N=6). Ground surfaces are all convex longitudinally as well as transversely.

Of the five complete manos found in this group, two have little or moderate use. They are oblong with slightly tapering ends and are pecked to shape over the entire surface. Other complete convex manos include an unshaped, unused two-hand cobble, a triangular preform, also unused, and a broken mano, which has been reworked into a one-hand form. Of the three fragments, one is quite large, and another is small when compared to other loaf manos. The third fragment, a black and white granite, has a width of 7.0 cm. Dimensions of the other seven convex loaf manos are given in Table 9.

Biconvex Loaf Manos (7). Biconvex forms exhibit two opposing convex surfaces connected by two short, flattened sides. They are somewhat thinner than convex and true loaf mano forms but are equally well shaped. As with convex manos, a single, convex use-surface is present, though only three biconvex loaf manos are heavily ground. The remaining four are ground lightly on one surface. Only two complete manos are present. One is broken and reworked into a one-hand form, and the other could be manipulated with one or two hands. Five biconvex loaf manos are end fragments with sharply tapering ends. One end fragment was probably a two-hand mano (incomplete length is 16.9 cm). The biconvex group is made entirely of coarse-grained sandstones (Table 10).

True Loaf Manos (5). True loaf mano cross sections present the most variety with regard to frequency of ground surfaces and orientation. Two manos in this group warrant detailed discussion. One complete two-hand form possesses three adjoining ground surfaces, giving it almost a triangular cross section. The other specimen has two adjoining ground surfaces, one of which wraps continually around nearly three-fourths of the perimeter. Both of these manos are unusual in that ground surface texture varies within the surface rather than between the various surfaces. The heaviest grinding has occurred on either side of the juncture of the surfaces, and use-wear becomes coarser toward the center of the ground surface. In addition, when rolled, these two manos do not come to rest on the heavily ground surface, but on the coarser surfaces. These factors indicate that a stationary, rocking motion was used where the coarser surface meets the metate, and a dragging motion was used to create the smooth surface area, perhaps to regather foodstuffs beneath the mano. This type of wear is also present on one convex mano. It seems unlikely that the narrow, smooth surface of these manos was created from a back and forth motion; both the narrow dimensions (ca. 2.0 cm) and the marked convexity of the smooth surface suggest otherwise.

An additional fragment is tentatively grouped with the above two manos. It is broken both across the width and along the length, but the ground surface remaining is identical to that of the above specimens with one exception: of the two adjoining surfaces present, one is heavily ground not just along the narrow band, but also over the entire remaining surface. Macroscopic striations clearly indicate a unidirectional or bidirectional motion across the width. The second surface is not so heavily ground and exhibits no striations. This is the only loaf mano with evidence of a back and forth grinding motion on such a markedly convex surface.

The two remaining manos in this group have one convex ground surface and an adjoining, markedly convex surface that is not ground (Table 11). Though they have cross sections similar to those of the above manos, they appear to have been used in a back and forth motion, as evidenced by the heavy use-wear over the entire surface. All of the true loaf forms are of coarse-grained, indurated sandstone.

Triangular Loaf Manos (2). The two manos in this group have natural triangular cross sections. One is made from an unidentified igneous material with black, micalike mineral inclusions. It exhibits one lightly ground, slightly convex surface. The other triangular loaf mano is the longest in the assemblage at 42.5 cm. It is 12.3 cm wide by 7.6 cm thick. It is an incomplete preform that has been roughly chipped around the perimeter and does not exhibit grinding wear. The mano is made from a green and orange-banded, fine-grained indurated sandstone. These manos, the preform in particular, indicate that the selection of thick, high-backed rocks was ideal for loaf mano manufacture. The two unshaped convex loaf manos exhibit a similar morphology.

Indeterminate Loaf Preforms (2). Both manos appear to be unfinished. One has been chipped and pecked into a triangular shape and would probably have a convex cross section in its finished form. Most of one surface of the mano has either exfoliated or is incompletely shaped. The opposite, slightly convex surface exhibits light grinding, whether from use or shaping is not clear. It is of coarse-grained, indurated sandstone and measures 23.8 cm long by 15.4 cm wide (contracting to 7.0 cm) by 9.0 cm thick.

The second preform is partially shaped. It is pecked around approximately one-third of the perimeter. Two fragments have been reconstructed to obtain complete dimensions, though it retains a crescentlike shape in longitudinal cross section. It measures 14.0 cm long by 11.7 cm wide by 7.0 cm thick. Whether the concavity was formed when the rock broke or is natural is not clear. Because its thickness is greater than one-half its width, it is classified here with the loaf manos.

Indeterminate Loaf Mano Fragments (5). All of these mano fragments have suffered some degree of heat exposure, three of them to the point of fracture. They are complete enough to be classified as loaf manos, however. All are of coarse-grained sandstone. The degree of induration is not clear due to the friability caused by heat exposure.

Slab Manos (18). Slab manos are defined as having two roughly parallel ground surfaces and a thickness equal to or less than one-half the width (Table 12).

Two-Hand Slab Mano Fragments (6). Two end fragments, two medial, and two corner fragments comprise this group. They appear to be two-hand fragments based on thickness, shaped rectangular form, and ground surface morphology similar to the complete specimens. One end fragment and the two corner fragments exhibit one heavily and one lightly ground surface and rectangular cross section. One medial fragment exhibits two heavily ground surfaces, and the remaining medial fragment is a partially formed wedge. It exhibits macroscopic striations across the width. Longitudinal cross sections, what remain of them, are flat.

One-Hand Convex Slab Mano (1). This artifact is anomalous in the one-hand mano assemblage in that it is shaped and exhibits a more markedly convex longitudinal cross section. It was apparently used on either a wide basin or a decidedly concave slab metate. It is of coarse-grained, hematitic sandstone.

One-Hand Slab Mano Fragments (2). Both of these fragments are extensively fire-cracked but are nevertheless slab mano portions. One is heavily ground on one flat surface and appears to have been partially shaped by pecking and chipping. It is of coarse-grained sandstone. The other mano fragment has one heavily ground convex surface, which has exfoliated from heat exposure. The mano is of an unidentified igneous material with a brown matrix and white and black micalike inclusions. The thicknesses of the two fragments are 4.6 and 4.8 cm.

Slab Mano Preform (1). This preform is of an extremely coarse-grained (with grains up to 1.3 cm in size) indurated sandstone. It has been chipped along one side of its roughly oval shape and lightly ground on one flat surface. All other surface areas are unmodified, giving the artifact an unfinished appearance. Complete dimensions are 24.4 cm long by 13.6 cm wide by 6.4 cm thick.

Two-Hand Convex Slab Manos (3). All of these manos are well-shaped, rectangular forms with one heavily ground surface. Although two use-surfaces are available, only one is ground. Red pigment stains are present opposite the ground surface side of one specimen, and the use-surface is burned. The surfaces are ground along the flat midsections only and not on the upwardly curving ends, indicating use of these manos on flat metates. All manos are of coarse-grained, indurated sandstone (Table 13).

Flat-Surfaced, One-Hand Manos (6). This artifact group is defined on the basis of flat longitudinal and transverse cross sections, one-hand manipulation, and absence of shaping. All six manos are expediently selected cobbles. All are ground on a single, coarse-grained cortical surface. Three are of igneous materials, two have a brown matrix with white mineral inclusions, and one has a green matrix with the same inclusions. The remaining three are of coarse-grained, indurated sandstone (Table 14).

Faceted One-Hand Cobble Manos (3). These three manos are undoubtedly the most unusual in the assemblage (Table 15). They are markedly convex, both transversely and longitudinally. This shape is caused by two adjoining ground surfaces that virtually cover the entire mano. Both cross sections resemble that of the true loaf mano except for the atypical juncture of the two ground surfaces and the one-hand form. One surface appears to be the result of use with a circular motion, which involves rolling the mano around on its sides. The meandering line delineating the two use-surfaces would thus probably be formed by contact with a basin metate, and in effect, the sides of the mano would be performing the grinding. This supposition is substantiated by the circular patch of unground cortex in the center of this use-surface. The opposite surface of one of the manos does not exhibit this wear pattern; however, it was probably rocked from side to side or back and forth.

As stated above, all of the above manipulations could probably be performed in a small basin metate.

The two smaller tools in this group possess two ground surfaces with the described circular motion, although in both artifacts the ground surfaces are diagonally oriented to each other. One of the smaller tools was also used as a hammerstone or pestle. These two manos are of red, fine-grained, indurated quartzite, while the larger tool is of a fine-grained, pinkish-gray banded quartzite.

Expedient One-Hand Cobble Manos (9). This mano group is distinguished from other one-hand manos primarily by their smaller size (under 12.0 cm maximum length), absence of shaping, and consistent use of abrasive materials (Table 16). All nine sandstone cobbles exhibit one lightly ground cortical surface. All use-surfaces are flat to slightly convex and could have been used on flat surface base stones. These artifacts appear to be expedient tools that received very slight use. One mano exhibits red pigment stains. Seven are complete; two are fragmentary. Coarse-grained sandstones predominate. One fine-grained, green sandstone specimen is the exception.

Smooth-Textured Manos (28). All of these artifacts are of smooth-surfaced, minimally abrasive materials (Table 17). These smooth surfaces are frequently ground to a polish with striations clearly visible. Though they do not differ greatly morphologically from one-hand manos, the use-surfaces exhibit polish suggesting a specialized function.

Sixteen flat-surfaced manos in this group are comprised of unshaped, natural cobbles and tabular rocks ground on at least one flat cortical surface (Fig. 25a). A variety of materials are represented, including quartzite, limestone, quartzitic sandstone, and a very fine-grained, indurated sandstone. Textures of all the materials are nonabrasive and nearly glassy. Heavy wear is present on seven artifacts, and the remaining nine have received barely discernible use. One is hematite-stained and two are battered from use as a hammerstone or pestle. Multidirectional striations are visible on the minimally used limestone specimens. However, these may not be culturally produced because of the soft, chalky nature of the limestone.

In this grouping, five artifacts are identical to the above group except for the marked convexity of the use-surface (Table 18). Three are heavily fire-cracked and exhibit striations, two multidirectional and one bidirectional. One has been used as a hammerstone. Two are of quartzite, one of limestone, and one very fine-grained sandstone.

Smooth-Textured Mano Fragments (7). These fragments are too small to classify further, but all exhibit use-wear on a smooth-textured surface. The three quartzite specimens are heavily ground, and the four limestone specimens exhibit light grinding only. One quartzite fragment is battered on one projection.

Unidentified Mano Fragments (3). Two of these artifacts are fire-cracked. Two are heavily ground on the only remaining surface area, and the other is lightly ground on an uneven cobble surface. Both heavily ground artifacts are of coarse-grained, hematitic sandstone, the other of fine-grained sandstone.

Small, Coarse-Textured Handstones (5). These tools are all coarse-grained sandstone and are ground on one surface, but they are too small to be classified as manos (Table 19). All have received light to moderate use on flat (N=4) or slightly convex surfaces (N=1) and in this respect resemble the expedient coarse-textured cobble manos mentioned above.

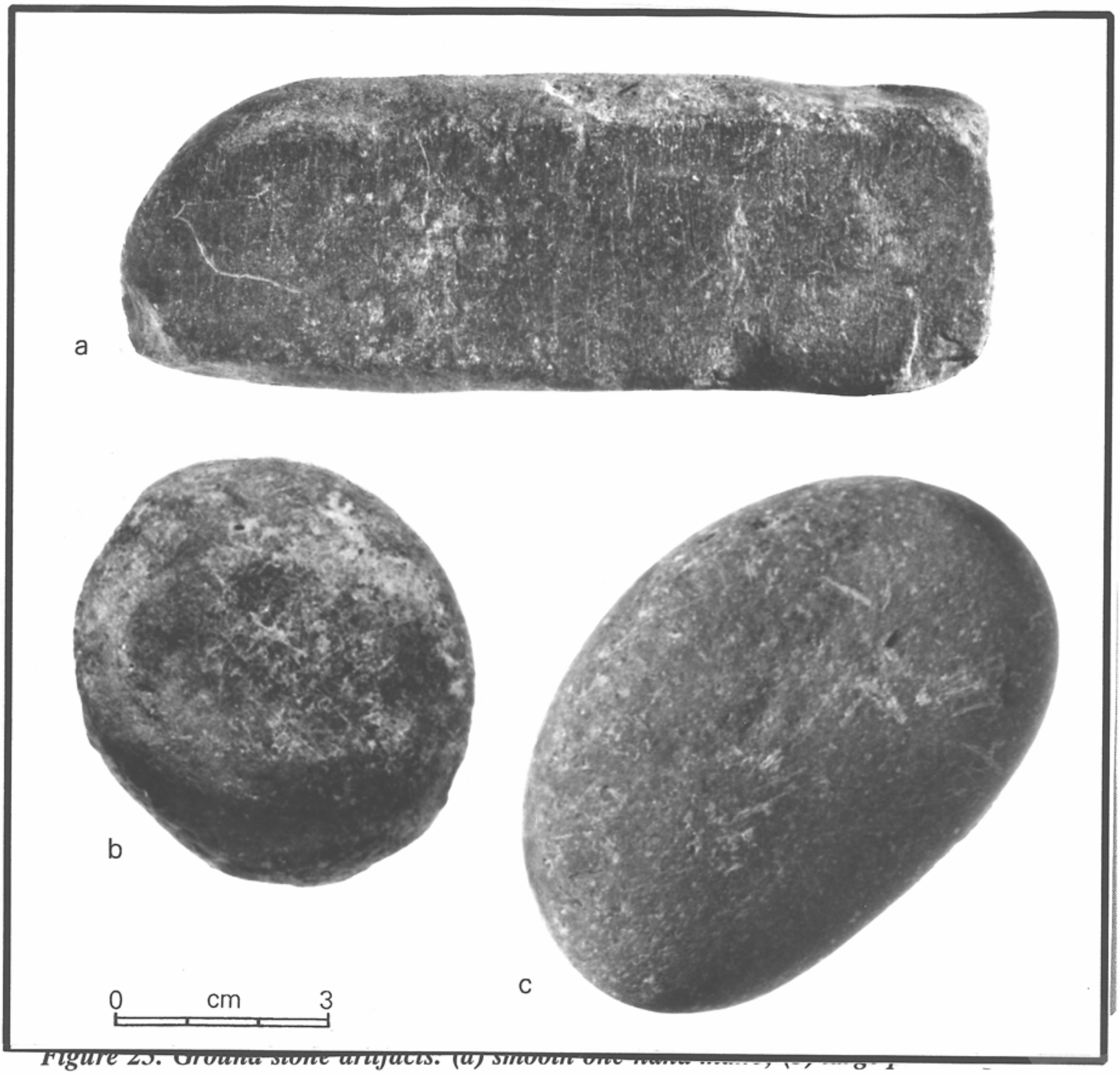

Figure 25. Ground stone artifacts: (a) smooth one-hand mano; (b) large p[illegible] stone/mano; (c) polishing stone.

Metates (16)

The metate assemblage is overwhelmingly fragmentary (14 of 16 artifacts, or 82 percent), although the majority are complete enough for type classification. As with manos, a large variety of morphological types are represented. Basin, slab, small cobble base stones, and flat tabular base stones comprise the metate assemblage, but much variation exists within these classes.

Basin Metates (3). From the single complete and two fragments, a range of basin sizes is evident (Table 20).

Metates 1 and 2 appear to be partially shaped preforms. One basin is quite small and the other irregular in form. Neither is ground, indicating an unfinished preform state. Basin Metate 3 is classified on the basis of the marked concavity of the ground surface (Fig. 26). This is the only utilized basin metate. Metate 1 was fractured by heat into three large fragments; however, the basin remained intact. Metate 2 has also been exposed to heat. The metates are made of coarse-grained sandstone.

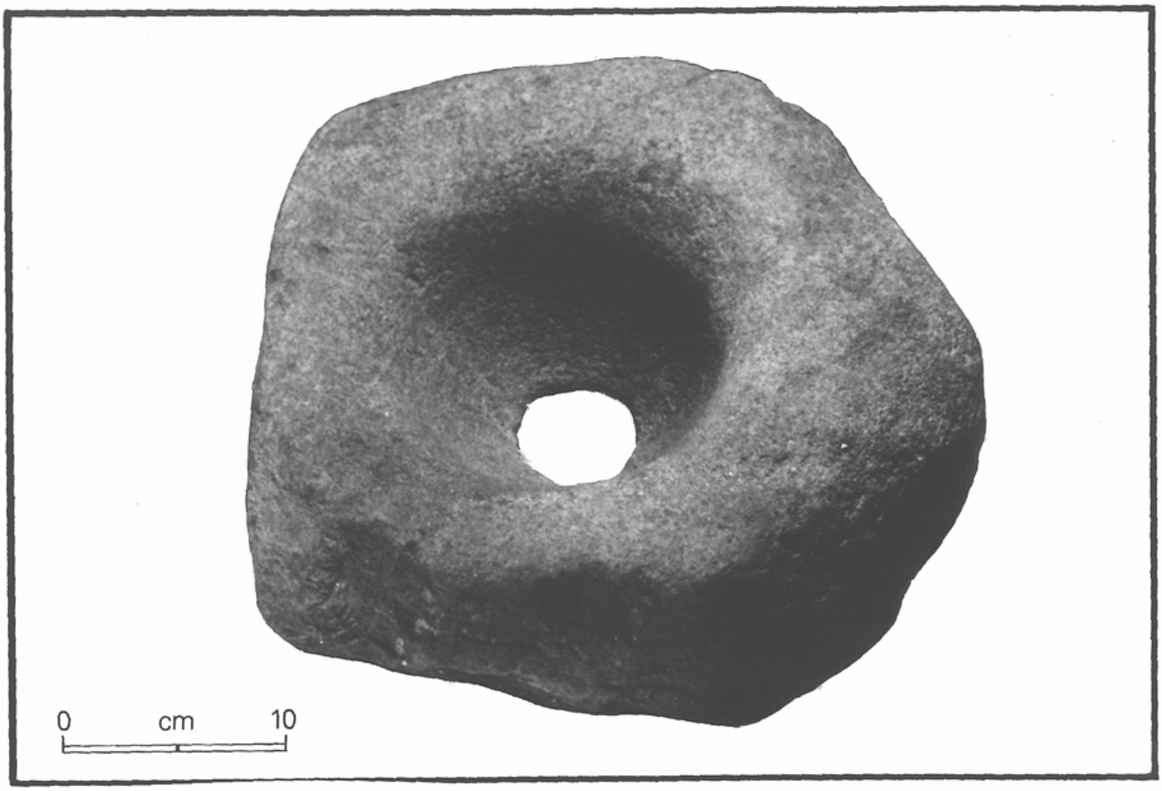

Figure 26. Basin metate.

Slab Metates (4). All four slab metates are medial fragments. The most complete specimen is of monzonite. It has a slightly concave ground surface and a partial mano shelf measuring 11 cm wide. The metate is 9.7 cm thick.

Another specimen has retained a small portion of the edge. This edge and bottom of the metate are quite well shaped by pecking and grinding. It is of quartzitic sandstone and measures 7.0 cm thick.

The third fragment is identical to the one above except that it is much thinner (1.5 cm at the center and 6.0 cm at the edge) and is completely fire-blackened. It is also more deeply concave than the specimen above.

The remaining fragment is of friable, green sandstone, which is roughly shaped along the edge and exhibits light grinding only. This is in contrast to the other slab metates, which are all heavily ground. The bottom of this metate has exfoliated, and it is not possible to determine if it has been shaped in this area.

Unidentified Metate Fragments (4). Five fragments representing four artifacts are too small for further classification. All exhibit concave ground surfaces. Two are sandstone, one quartzitic sandstone, and one igneous. One sandstone and the igneous fragment are fire-blackened. One sandstone metate fragment has been ground to shape it on the bottom.

Small Cobble Base Stones (4)

These four artifacts vary considerably in size, material type, and ground surface, but all possess concave use-surfaces and were probably used as a hand metate (Brook 1977) or lapstone (Table 21). One sandstone cobble has a naturally concave surface that has been lightly ground. It is shaped around the perimeter into a rectangular form though the bottom is unshaped and quite irregular. When resting on a flat surface, the ground surface is at an angle, suggesting the base stone was set into the ground or used as a lapstone.

The largest cobble base stone has an unusual ground surface contour. The transverse cross section has an inverse saddle shape, and the longitudinal cross section is concave. The surface is heavily ground but remains pitted due to the very coarse-grained sandstone texture of the item. The cobble is pecked and chipped around the perimeter and over the entire bottom.

The third cobble base stone appears to be a reused, rectangular metate fragment of an unidentified igneous material. It is cracked and blackened from fire. The slightly concave surface is heavily ground to a smooth texture and extends over one broken edge, indicating use following breakage. It is pecked and ground along the unbroken edges, probably to shape the metate. The ground surface is heavily striated lengthwise. It is small and lightweight enough to have been used as a hand metate.

Another hand metate is much smaller. It is made of reddish limestone and has one concave and one flat ground surface. The flat surface is heavily striated across the width, and the concave surface exhibits heavy grinding but no striations.

Flat Tabular Base Stone (1)

This artifact is a tabular limestone fragment with two opposing use-surfaces, both of which exhibit bidirectional striations. The single unbroken edge has not been shaped. Use-surfaces are slightly concave but exhibit heavy grinding.

Miscellaneous Ground Stone

Large Polishing Stones (7). This artifact group is composed of smooth-textured cobbles, all of which possess a polished, striated, and flat to convex ground surface (Table 22). All are oval or round, unshaped cobbles, three of which have received use extensive enough to create a well-delineated, heavily striated, flat facet (see Figs. 25b, 25c). All others possess polished and striated use-surfaces, although no defined facets are present. Two of the latter are burned, one of which is ground only along a sharply convex edge. These stones are separated from other smooth-textured handstones because of their small size. Their function is problematical given their large size, compared to other polishing stones, but hammerstone use-wear is present on three stones, and red hematite stains are present on two. These stones could also be suitable for finishing pots. Five are of limestone, one of quartzite, and one of igneous material.

Small Polishing Stones (3). One limestone, one igneous, and one sandstone cobble are ground on smooth cortical surfaces. The limestone cobble is ground on all four surfaces of its rectangular cross section. No striations are present, and the cortex is polished in places. It measures 7.3 by 3.0 by 2.5 cm.

The igneous cobble is ground on two surfaces oriented at right angles to one another, one of which is striated lengthwise. The width and thickness only are complete at 3.0 by 2.4 cm.

The sandstone cobble (5.1 by 4.5 by 2.9 cm) is heavily ground and diagonally striated on one surface. These stones are grouped together because of their small size and heavily used polished surfaces.

Lightning Stone (1). This quartzite cobble has a white matrix with tan marbling and exhibits uniform, shallow striations across the width in a nearly continuous band around the entire cobble. Light battering wear is present on one end. The stone could have been used in polishing pots, but the consistent direction and uniformity of the striations around the triangular cross section suggest use as a lightning stone. It measures 7.4 by 3.8 by 3.0 cm.

Shaped Limestone (1). This rectangular piece of limestone is ground on four sides with lengthwise striations on two opposing surfaces. The stone could have been used in grinding or polishing but would probably be ineffective because of its small size, 7.2 by 2.0 by 1.5 cm. It is therefore likely that the grinding wear is the result of efforts to further shape the natural rectangular form.

Shaped Spherical Stone (2). The first example is a nearly perfect sphere, ground and striated over its entire surface. Two unutilized, naturally spherical rocks occur elsewhere on the site, and informants say that because of their shape, many were collected by local residents. This particular stone may have been ground to perfect the natural form, because it appears too small to have functioned as a ground stone (3.9 by 3.9 by 3.8 cm). The second, larger stone may have been used as a pestle. It has no modifications but has been utilized in one small area of the sphere. It measures 5.1 by 5.1 by 5.0 cm.

Pestle (1). A small limestone cobble has a teardrop shape. It has been battered over the rounded end. Three unground cortical areas are located around the upper portion in such a way as to suggest grasping areas for the thumb, index, and middle fingers of the right hand. It measures 5.3 by 4.3 by 4.0 cm.

Hoe (1). A thin slate slab is chipped around the perimeter into a rough square measuring 14.5 by 14.0 by 2.5 cm. One edge is heavily rounded and exhibits striations perpendicular to the edge on both faces of the slab. The rounding and striations extend 2.0 cm from the edge in some locations. The tool does not exhibit hafting notches or edge grinding, suggesting it was held in one or both hands with a pushing or chopping motion. It was recovered from the floor of Pithouse 41.

Chipped Slab Fragment (1). This limestone slab is chipped along two edges, apparently to shape the slab. No other modification is present on the fragment, indicating possible use as a comal or slab cover. It measures 18.6 by 10.4 by 2.1 cm. It was recovered from the fill of Structure 29.

Possible Mortar (1). A thick, doughnut-shaped stone with a deep, conical grinding area is formed from coarse-grained sandstone. The cone-shaped ground surface extends completely through the stone, with a hole at the bottom. Grinding wear within the cone is minimal and appears to be formed through shaping rather than use, whereas the flat surface around the cone is more heavily worn. If the stone was used in grinding, it may have been placed over another stone or container of some sort to catch materials as they fell through the hole. The artifact measures 34.0 by 16.3 cm.

Unidentified Ground Stone Fragments (21). The majority of these fragments are ground on one flat or convex surface (85 percent), two are shaped, and one has two ground surfaces. Half are burned or fire-cracked. All of these ground stone pieces are too fragmentary for further classification.

Natural Spherical Stones (2).

Both spherical rocks are of vesicular volcanic rock. Neither is ground or shaped. They may have been present on the site as boiling stones or collected items. They measure 5.6 by 5.5 by 4.2 cm and 3.2 by 2.9 by 2.6 cm.

Minerals (3)

Three small lumps of unmodified yellow ochre were recovered from the fill of Pit Structure 42.

Additional Testing Program

An additional 11 pieces of ground stone were recovered from the small testing program along U.S. 82 on the northern edge of LA 457 (Table 23). The ground stone artifacts are of various grades of sandstone, with one exception, an indeterminate piece made from quartzite. Artifacts are similar to those found along the North Florida portion of the site.

Discussion

The ground stone assemblage is in large part characterized by artifacts made of readily available, minimally used, unshaped materials. Broken pieces (58 percent) are quite common, which may be the result of the site being subject to heavy collecting over time. Thus, the assemblage is believed to be incomplete and not representative of the full range of ground stone tools and activities that occurred on the site. However, despite their expedient nature and fragmentary shape, these ground stone artifacts do form distinct tool groups, which provide information on the variety of ground stone at the site.

Smooth, finely ground, or polished convex use-surfaces emerge as the predominant ground stone of the assemblage (Table 24). This smooth, convex use-surface holds across many artifact categories regardless of size, morphology, and shaping. In addition, flat surfaces are primarily smooth-textured.

A preference for nonabrasive surfaces is doubtless related to tool function rather than degree of use alone. Even though coarse-grained materials are overwhelmingly chosen (66 percent of the time), their use-surfaces are frequently ground to fine, nearly polished textures. Tools of coarse, abrasive materials were probably ground against a base stone prior to use on food or other material to reduce abrasiveness. Deeply convex, highly polished facets are believed to have been used "with a heavy rocking motion, with the heel of the hand depressed sharply at the end of the stroke" (Riddell and Pritchard 1971:69).

Convex facets have been linked to "vigor in grinding" for manos at the Rainbow Point site in northern California (Riddell and Pritchard 1971:69). Descriptions of loaf manos found at this site are quite similar to those found at LA 457, which exhibit striated, polished, convex facets believed to be the result of a heavy, forceful grinding action such as used in "cracking, smashing, pulverizing of hard seeds, dried bulbs, roots, nuts and acorns" (Riddell and Pritchard 1971:67). The high arched back of the mano would have served as a hand grip. However, contrary to the motion hypothesized for LA 457 true loaf manos, a rolling, reciprocal motion is thought to have been used with the loaf manos in California.

This same motion is postulated for convex use-surfaces on two-hand slab manos from the Mimbres Valley, New Mexico: "The application of force will move fairly smoothly from the leading to trailing edge of the mano, thus resulting in a convex or . . . rocker-shaped mano" (Lancaster 1983:29). These manos become increasingly convex as the grinding stroke lengthens. The great weight of these manos (12 lbs for a large preform) alone would seem to reduce the possibility of their having been used in a reciprocal motion, although wear patterns on all loaf manos but the true loaf forms do seem to reflect this method of use.

It seems likely that the two-hand loaf and possibly the convex slab mano from LA 457 were used in the above manner, similar to those of the Rainbow Point and Mimbres Valley sites. Locally available foods such as mesquite, acorns, and corn may have been processed in this manner, given the probable subsistence combination of hunting, gathering, and agriculture that were being practiced in the nearby Hueco Bolson area at this time (Whalen 1981:83,88). These tools may well have been more functionally specific than the one-hand manos found on the site.

However, the Tularosa Basin Mescalero Apaches have been observed grinding soft foods such as soaked sumac berries, boiled acorns, melons, deer meat, and "leafy substances" on metates (Basehart 1973). Dried datil fruit, yucca root, shelled and unshelled piñon nuts, mesquite beans, chokecherries, and yellow medicine root were also mashed or pounded, although no mention of ground stone is made in association with those plant materials. The only tool described was a vesicular basalt metate for grinding leafy substances, but the exhaustive list of plant materials processed is at least some indication of the great variety of textures that were mashed, pounded, or ground in the Tularosa Basin, presumably with stone tools.

Thus, it seems likely that the one-hand manos from this site are functionally variable, perhaps even more so than the two-hand slab and loaf manos. Lancaster (1983:32) states, "It is questionable that one hand manos were used primarily to grind wild seeds and, therefore, may be used to monitor the degree of dependence on this type of subsistence."

Ethnographic study of the Maidu tribe of northern California revealed extremely flexible tool use varying with food type and personal preference (Riddell 1960:40). In one notable example, one woman used a two-hand mano and another a one-hand form for an identical task, though both used a reciprocal motion. Furthermore, a reciprocal motion was used on both hard and soft foods among the Maidu, and both Paiute and Maidu women have been observed using a reciprocal motion on thin, oval-shaped metates (Riddell 1960:42). Riddell discusses at some length the erroneous association of one-hand manos and basin metates as well as the circular motion frequently assumed for these manos. Ethnographic studies show one-hand manos were most often used in a reciprocal motion on flat-surfaced metates.

Although the LA 457 metate assemblage is small and fragmentary, it provides sufficient evidence to suggest the large and varied one-hand mano group was used primarily on flat, tabular or slab metates, as evidenced by the predominance of flat, longitudinal cross sections among that artifact group. This is not to be confused with the convex transverse contour, which is produced with the rolling, rocking motion previously described. The faceted, one-hand cobble manos represent the single exception to this, because they possess deeply convex transverse and longitudinal use-surface contours created by using them in a basin metate.

Ground surface contours of the flat and convex one-hand manos would provide very little surface contact with the basins present in the assemblage, and visible striations indicate a reciprocal motion for most, not a pattern resulting from circular or rotary manipulation (Lancaster 1983:23). Thus, the one-hand manos are here considered to be "utility tools which were used in a variety of tasks" (Lancaster 1983:34), including the processing of the numerous foods previously listed, hammerstone use, and pigment grinding. Although they were probably less functionally variable, loaf and slab manos may have been used on harder foods and other resistant materials such as ceramic temper and during the shaping of ground stone tools.

In summary, several factors combine to indicate flexible functions for tool types at LA 457: (1) A large variety of food types and textures are represented in ethnographic studies of groups in the Tularosa Basin, which may suggest a variety of tools were used to process them. (2) Despite its small size, the ground stone assemblage from LA 457 contains an impressive variety of tool types, although use-surfaces are overwhelmingly convex with smooth textures. These characteristics indicate similar tool manipulation and use-surface preparation. (3) Thus, a variety of materials may have been processed in a somewhat similar manner, with some tool groups, the one-hand manos in particular, having flexible, less specialized functions, and the loaf and slab manos having more restrictive, though also variable, functions.

An examination of the various types of ground stone manos and metates in relation to specific proveniences does not show any patterning (Appendix D). No architectural feature has a predominance of any one type of ground stone, but rather, the cultural units each have a variety of grinding implements. Floor artifacts also do not indicate a ground stone type preference during this Early Mesilla occupation, lending credence to the above statement that a variety of grinding tools was needed to process a wide range of food resources.

CHIPPED STONE ANALYSIS

Karen Wening

Because of the size of the lithic assemblage (N = 2,577) and budget limitations, a 50 percent, nonrandom sample was chosen for analysis. Each bag of lithic artifacts representing an individual locus and level was divided in half. Lithic artifacts to be analyzed were chosen according to the following priorities: tools (100 percent), cores (100 percent), exotic materials (100 percent), whole flakes, flake fragments, and angular debris. On several occasions, over half of the material from one bag was chosen to include all tools, cores, and exotic materials. In these cases, another bag containing, for example, a large percentage of locally abundant San Andres limestone fragmentary flakes and angular debris was sampled at under 50 percent. Therefore, half of the lithic assemblage was analyzed, and the vast majority of material consists of unutilized, fragmentary flakes and angular debris of San Andres limestone.

All lithic artifacts were monitored for material type and color, debitage type (flake or angular debris), cortex (percentage present), presence and degree of heat treatment, and metric dimensions. Flakes were also monitored for flake type, condition, location of cortex, and platform type. Tools were examined for number of modified edges, type and location of retouch, edge outline, presence or absence of projections and/or serration, and edge angle.

The additional testing program along U.S. 82 produced a total of 215 lithic artifacts.

Attributes Monitored

Lithic Material Type and Color

Five color groups were established: pink, gray, high-quality gray, yellow-brown, and green. An additional 15 colors that did not fall into one of the above categories were treated individually.

Seven material type groups were devised for common sources: local, fossiliferous, clastic cherts, jasper, and chalcedony; Alibates, Edwards Plateau-like, and oolitic cherts; limestone, including that grading to chert, clastic chert, or quartzite; San Andres limestone; quartzite; silicified wood; and obsidian.

Limestone (1,207, or 47 percent). The most abundant material (n=1,207) is the locally available San Andres limestone. Although the majority of the limestone is gray to black, a variety of other colors are present, including pink, green, yellow-brown, white, red-brown, dark brown, and gray and brown banded. Common in the limestone is a "second cortex," a thick, granular, orange-colored deposit occurring on the limestone after human modification. This thick deposit greatly obscures wear patterns and even retouch modification on some artifacts.

Limestone Grades (215, or 8 percent). Separated from the limestone group were materials grading to chert, clastic chert, and quartzite. These materials have a higher silica content and are more brittle than the limestone, but are obviously similar in source location. Limestone grades vary more frequently in color, particularly in the orange and cream color ranges, though the gray and brown banding present in the limestone is not present in the limestone grades.

Local Chert (1,074, or 42 percent). Local cherts vary greatly both in color and quality. The largest chert group, light gray to black, exhibited a range of qualities from a smooth texture, waxy luster, and good conchoidal fracture to very poor fracture with crystalline impurities. Perhaps the best indicator of the quality of the chert is the fact that 32.8 percent of the tools on the site were made from local chert, which is only 20.4 percent of the available material (Table 25).

Although the limestone is a very dense, somewhat coarse-grained material, it is consistent throughout, rarely containing impurities or irregularities. Limestone is apparently the most suitable material for the manufacture of large, heavy, steeply angled scraping tools, the most numerous tool type at the site. Chert seems to have been somewhat less available and of less predictable quality. It occurred in smaller pieces and was more suitable for tools requiring retouch modification and/or sharp edges.

Exotic Chert (58, or 2 percent). This small group consists primarily of a high-quality gray chert, sometimes mottled with red and exhibiting a red cortex. Pieces without this red coloring are identical to Edwards Plateau chert, but may be like the material found at ENM 20011 where a chert "macroscopically identical to Edwards Plateau" was found to originate in gravels in southeastern New Mexico (Brett and Schermer 1984:21). Included in the exotic chert group are three pieces of Alibates chert and 24 pieces of oolitic chert. Oolitic chert varies in color and is of a consistently good quality.

Quartzite (12, or 0.5 percent). Fine- and coarse-grained quartzites are present in a variety of colors but exhibit poor fracture and are used primarily for ground stone tools at the site. Quartzite is presumably locally available given its cobble form and frequent use for ground stone.

Obsidian (1, or 0 .03 percent). A single piece of opaque, black obsidian was angular debris.

Flake Types

Core flakes are flakes that have been detached from a core. They may or may not be modified.

Biface flakes are retouch flakes that have been detached from a bifacially retouched artifact. They are typically small and thin. They exhibit bidirectionally retouched platforms with platform angles of 50 degrees and have dorsal scars that are parallel to each other and to the platform.

Uniface flakes are retouch flakes that may have been detached from a unifacially retouched artifact. They have the same characteristics as biface flakes, with the exception that retouch flakes from scrapers exhibit a unidirectionally retouched platform and a platform angle of 60-90 degrees.

Undetermined Tool. Tool retouch flakes that cannot be confidently defined as biface or scraper flakes are called undetermined tool flakes.

Blades are flakes that are removed from a prepared blade core. Their length is generally twice their width, and they have two or more parallel dorsal scars and parallel lateral sides.

Other Variables

Flake *condition* was recorded as whole, proximal fragment, distal fragment, midsection, lateral fragment, or undetermined fragment.

Cortex was noted for presence or absence on angular debris and was recorded for location on flakes as absent, entire platform, partial platform, entire dorsal, partial dorsal, entire platform and partial dorsal, entire platform and entire dorsal, and partial platform and partial dorsal. One flake exhibited a milky white, overall patina. The second cortex on limestone artifacts was not considered original cortex and was noted only as gray/orange limestone.

Vierra's (1985) *platform* definitions were used. In one case, a platform consists of a single flake scar. Other platform types include cortical, faceted, unidirectionally retouched, collapsed, battered, or absent. A cortical platform is unprepared and situated on the cortex. A faceted platform has been prepared by removing a flake(s) to create a scar, which is then used as a striking platform. Cortical and faceted platforms generally represent core reduction.

Unidirectionally retouched platforms are prepared platforms that represent the remnant edge. This retouch is only present on the dorsal surface of the flake. Bidirectionally retouched platforms, on the other hand, represent the remnant edge margins of bifacially retouched artifacts (e.g., bifaces, projectile points, or cobble bifaces). Unidirectionally and bidirectionally retouched platforms generally represent tool retouch flakes; however, cores might also have platforms prepared by retouch. A collapsed platform occurs when the majority of the platform breaks away during the removal of the flake. A battered platform exhibits impact scars or percussion rings, which are the result of a cortical platform being struck, or the platform surface being hit against another object.

Tools

Tools were also monitored for all debitage attributes, retouch type and location, edge outline, number of modified edges, edge angle to the nearest five degrees (using a template), tool type, and edge damage.

Edge Damage

The majority of edges analyzed for damage fall into the seven damage categories devised by Vierra (1985): unidirectional scarring, bidirectional scarring, unidirectional rounding, bidirectional rounding, unidirectional scarring and rounding, bidirectional scarring and rounding, and abraded/ground. However, for this analysis, an additional 27 damage codes were used, principally to describe a very diverse, specialized group of scraping tools.

This coding is primarily the result of numerous combinations of several attributes and not 27 unique types of damage. For instance, surface abrasion that extended from the scraper edge into the dorsal or ventral surface was thought to be unique in that it does not represent abrasion that is the result of grinding action, as with manos and metates, nor is it primarily confined to an edge, as with sawing or cutting tools. Striations are sometimes present with this abrasion, both parallel and perpendicular to the edge, along with scarring, edge rounding, and polish. In many cases this abrasion occurs on the same surface with scarring, indicating that both ventral and dorsal surfaces of a steeply angled tool were used for scraping, in contrast to the single-surface planing type of motion commonly associated with scrapers. Wear patterns resulting from this double-sided scraping action are coded as such, as are another class of scrapers used in a vertical type of motion.

These scraper subgroups and accompanying wear patterns are described in the section on tools.

In addition to the wear pattern combinations noted for scrapers, edge snapping was observed on several tools. This is where a flake termination was broken off during use and formed a nearly 90 degree angle. In some cases this broken edge was rounded, indicating use following the edge snapping.

Cores

Cores were monitored for type. Of Vierra's (1985) six core types, three were encountered during analysis. Unidirectional cores have flaking removed from the same platform. Bidirectional cores have flakes removed in two directions, not necessarily opposing, from two platforms that may be opposing or tangentially oriented. Multidirectional cores have flakes removed from multiple platforms in many different directions.

Analysis Results

Debitage

The lithic artifact assemblage contains 2,577 pieces and is comprised of flakes (1,584), bipolar flakes (1), angular debris (225), large angular debris (14), tools (602), projectile points (30), and cores (121). An additional 19 artifacts, including 14 projectile points, donated by Mr. John Ambrose, are discussed separately.

Flakes

Flakes dominate the analyzed assemblage because of the deliberate selection of flakes for analysis during the sampling process. Core flakes comprise the vast majority (Table 26). Specialized flakes such as bifaces and unifacially reduced, bipolar, and blades are present in fewer numbers.

The large number of core flakes is due to several factors. The character of the most abundant and most preferred material, limestone necessitates a high frequency of core flakes. Retouch modification of the type which would produce biface and uniface reduction flakes was rarely performed on the large, heavy duty types of tools made from limestone. Where refined retouch modification is present on chert tools, it is overwhelmingly minimal and marginal. Both the tools and the debitage resulting from facial tool manufacture are minimally represented at the site.

The predominance of single flake scar platforms and cortical platforms among all material types (particularly limestone) indicates a simple but uniform pattern of core reduction and flake removal. Platforms are rarely prepared in other ways. Chert flakes more frequently exhibit faced platforms than do all other materials.

The contrasting character and availability of various material types is also responsible for the difference in mean flake size as illustrated in Table 27.

Chert flake size is clearly limited by the small size of available cores, which in turn affects debitage and tool size. Limestone, on the other hand, available in virtually unlimited size and amount, was also of the desired character for the types of tools manufactured at the site. This is not the case with the local chert, which is characterized by an abundance of material impurities.

Heat treatment was often used to improve the quality of this chert, but it remained the least frequently chosen material for most tools with the exception of facially retouched tools and projectile points.

Although a patterned reduction of chert materials was undoubtedly taking place, it is not discernible from the few small cores found at the site. Chert cores are nearly all reduced to within several centimeters, obviously owing to the comparatively limited availability and size of the material.

The high-quality chert artifacts are larger than the local chert because the more readily available Edwards Plateau-like chert comprises most of this group. Flakes of oolitic and Alibates chert are smaller than the mean.

Perhaps the most unexpected dimensional attribute was that of the limestone grades, materials similar to limestone and locally available. A larger mean dimension, closer to that of the San Andres limestone, was expected. The material is apparently less available locally, supported by the lower frequency of debitage and the near absence of cores of that material.

Cores (121)

Cores are primarily of limestone (87, or 72 percent) and limestone grades (14, or 11 percent) with local chert (19, or 16 percent) and quartzite (1, or 1 percent) also represented. Limestone cores, while primarily multidirectional (70, or 58 percent) have nearly all been reduced to uniform spherical shapes regardless of size. Unidirectional and bidirectional cores together represent nearly half the assemblage (Table 28).

Unidirectional cores are usually reduced by the removal of one large flake, forming a relatively flat platform. Flakes are then removed around this platform, resulting in a domed or rectangular core. Bidirectional cores exhibit similar platforms but are more often reduced from cortical platforms. Platforms are rarely symmetrical, but rather tangentially oriented to one another, giving the cores an irregular appearance, though a patterned flake removal has taken place (Table 29).

Tools

A wide variety of tool types are recognized, due in great part to multiple-edged tools with contrasting uses, for instance, scraper/knife, drill/spokeshave, etc. These numerous tool combinations are grouped into 12 functional categories. Tool function was assigned overwhelmingly on the basis of wear patterns and edge shape rather that angle measurements, although these were taken into consideration. Bidirectional versus unidirectional wear and the presence of ventral and/or dorsal abrasion are deemed the most important functional indicators.

Studies done by Siegel (1985:93) prompted the following observation: Once edge angle observations have been used to narrow the probable use of the tool down to gross categories (such as longitudinal vs. transverse motions), it is then necessary to rely upon the use-wear characteristics of the tools to generate more specific functional determinations.

The tool group most affected by this functional approach is the large and variable scraper assemblage, with edge angle measurements ranging from 20 to 95 degrees. The lower extremes of this range (20-33 degrees) are classified as scrapers because of ventral or dorsal scarring and/or edge rounding, indicating use as scraping tools. All scraping tools exhibiting edge angles under 40 degrees are of dense San Andres limestone, giving an acute angle of enough durability for scraping or shaving activities. These few examples represent exceptions, however, for 82 percent of all scrapers (283 edges) fall within the 45-75 degree range.

Scrapers (279)

Scrapers are by far the largest tool group and are comprised of scrapers (259), denticulated scrapers (2), scraper/abraders (10), cobble uniface scrapers (5), cobble biface scrapers (1), and scrapers with an additional functionally indeterminate edge (2).

Three scraping manipulations are indicated by wear patterns on these tools. The most common is single position use, in which the tool is held flat or at an angle and pushed forward (232 edges, or 73 percent). This type of manipulation results in various combinations of unidirectional scarring, rounding, polish, or central or dorsal surface abrasion, sometimes occurring with striations perpendicular to the edge. Highly siliceous materials are all used in this manner, as are the majority of limestone scrapers.

Dual, or reversible, motion is the next most common scraping manipulation (71 edges, or 22 percent). Such motion is used with a tool that has been used as a scraper in a flat or slightly elevated planing position on, for example, the ventral surface, then turned over onto the dorsal surface and used again in the same manner. This type of reversible use results in a surface which exhibits abrasion overlying scars, the scarring from use on the opposite surface, then abrasion from use on that surface.

The third scraper wear pattern is an unusual "vertical" manipulation. Tools used in this manner are typically long flakes with thin proximal ends that expand and thicken greatly at their termination. The tools appear to have been grasped at the proximal end and pushed or pulled along the dorsal surface. These flakes all exhibit dorsal surface abrasion, frequently coupled with ventral scarring. They are generally smaller than single or dual motion scrapers but are all of limestone, as are most scrapers, regardless of manipulation. Scrapers of siliceous materials are much thinner, smaller, and more frequently exhibit retouch along the used edge than limestone scrapers, and they do not display any evidence of reversible or vertical manipulation (Table 30).

Cutting Tools (115)

The cutting tool group is comprised of knives (96), gravers (13), denticulates (3), unfinished denticulates (2), and one combination graver/knife. Cutting tools are formed from thin, elongated flakes of cherts, limestone, and quartzite and exhibit bidirectional scarring and/or rounding, usually along one or two lateral edges (Fig. 27). Limestone knives are frequently short, wide flakes that have been used along the termination. Retouch is seldom present on knives of any material. Gravers, in contrast, are usually retouched unidirectionally. Gravers are separated by the presence of a concave, usually retouched edge with unidirectional use. Use and/or retouch is present along a small portion of the edge only.

As with scrapers, a wide range of knife angle measurements is represented, 10-55 degrees, although the majority of cutting tool edges do not exceed 40 degrees (122, or 90 percent). Use-wear patterns are again the primary criterion for tool classification. A 55 degree edge angle with bidirectional rounding and scarring is assumed to have been used in a longitudinal cutting or sawing motion despite the obtuseness of the angle. More steeply angled cutting tools are primarily of chert, and the extremely acute edges are on limestone. No evidence of hafting was encountered in the cutting tool group, which may be unusual, considering the small size of many knives (Table 31).

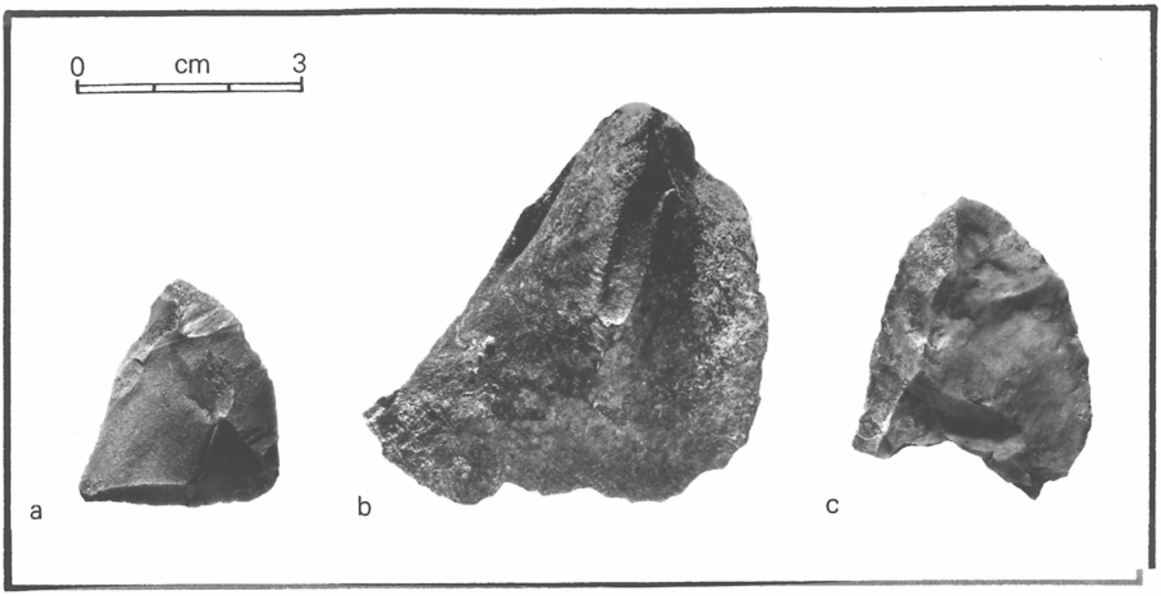

Figure 27. Cutting implements: (a) Sta. 121-123, surface; (b) Excavation Area 28G, Level 2; (c) Excavation Area 28E, Level 1.

Scraper Combination Tools (51)

This group is comprised of combination scraper/knives (33), scraper/gravers (2), scraper/choppers (6), scraper/drills (5), and scraper/spokeshaves (5).

Scraper/Knives (33)

Scraper/knives are nearly equally of chert or limestone. Tools are formed from square and rectangular flakes and consist of an acutely angled edge used for cutting, usually a lateral, unretouched edge and a steeply angled, retouched scraping edge, and usually on the termination or platform. Chert artifacts in this group are nearly the same size as limestone artifacts, which is not the case with other tool classifications.

Scraper/Gravers (2)

One of these tools is a limestone flake with one steeply angled, terminal edge used for scraping and one straight lateral edge with unidirectional scarring. The dorsal surface of the scraping edge exhibits abrasion, an indication of vertical manipulation. The second tool has one unretouched, lateral edge, which may have been used for scraping or shaving. Although the edge angle is 40 degrees, the function is not clear.

Scraper/Choppers (6)

These tools are all large, rectangular limestone flakes with at least one steeply angled edge exhibiting bidirectional crushing and/or step fracturing. All appear to have been hand held, because no hafting facilitation is present (Table 32).

Scraper/Drills (5)

These unusual tools are made from large, roughly triangular limestone flakes (Table 33). They have been used as scrapers on one lateral edge and as a drill on one terminal projection (Fig. 28).

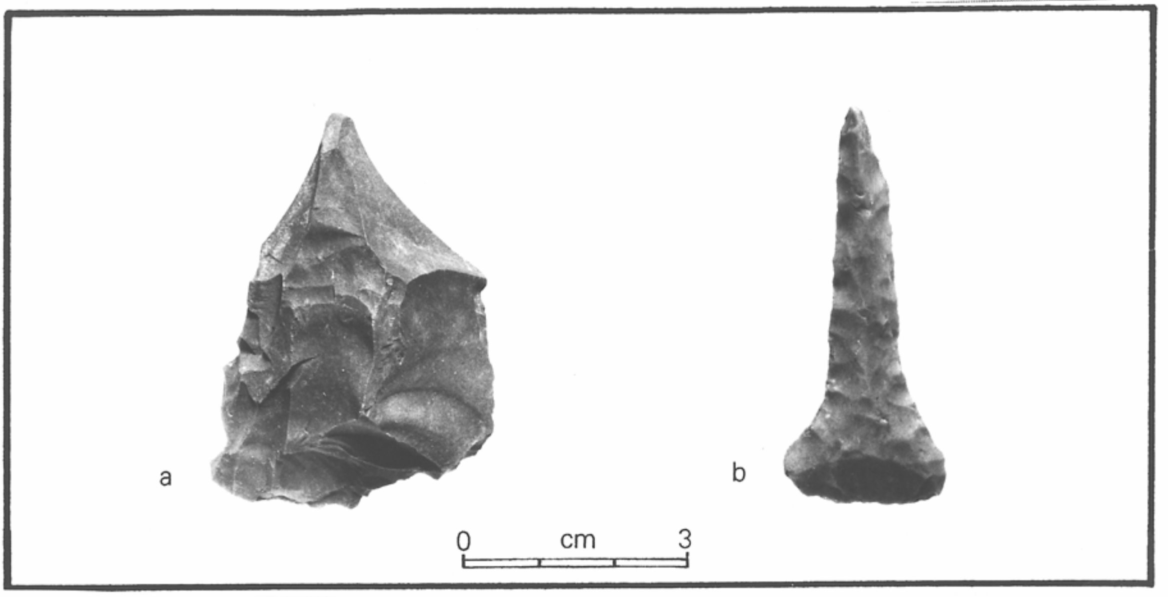

Figure 28. (a) Scraper/drill; (b) drill.

The projection is formed by removal of a few large flakes on three of the tools. A single heat-treated chert tool is the smallest artifact in the group and is functionally identical to the larger complete scraper/drills.

Scraper/Spokeshaves (5)

These tools vary in size, but all exhibit one lateral scraping edge (both retouched and unretouched) opposing a single notched edge used as a spokeshave. The notches on all five specimens are formed by unidirectional retouch. The two smallest scraper/spokeshaves are nearly identical; both are black chert flakes with notches formed near the platform and an opposing, retouched scraping edge. The remaining artifacts are of limestone and fossiliferous chert. Dimensions of the complete scraper/spokeshaves are shown in Table 34.

Drills (33)

All drills and drill combination tools are placed within this category. They include drills (17), drill/gravers (11), drill/knives (2), incomplete drill/gravers (2), and a single double drill. Srcaper/drills are discussed above with the scraper combination tools.

The majority of drills are elongated flakes with projections formed by minimal or absent retouch at the termination. Where retouch is present it is usually a simple removal of one to three flakes to form a sharp projection. As with most tool groups, drills are primarily of limestone or limestone grades (19), but chert is nearly equally represented (14). And as with other tool groups, chert tools are smaller than those of limestone. Four chert drills are anomalous within the group in that they are quite small and may have been more extensively retouched along the projections.

The most unusual specimens are a completely retouched, long drill (5.2 cm) of heat-treated chert with an expanding base, and an unretouched double drill of limestone (Fig. 28). Three bidirectionally retouched drill tips have thick biconvex cross sections and are morphologically similar to the long chert drill.

Where retouch is present on drills, it often extends up the edge to form a possible drill/graver combination tool. If wear was present along this edge it was classified as a drill/graver (n=11); if not, the tool was considered a drill only. Graver edges are steeper and shorter than knife edges and possess unidirectional wear along nearly the entire edge, exhibit a much more acute angle and bidirectional wear in addition to small retouched projections at the flake terminations (Table 35).

Spokeshaves (16)

Spokeshaves are perhaps the least uniform tool group. A great range of flake size, material type, and notch size is represented. All, however, possess a single notch formed by the removal of one to three flakes. Notches vary in degrees of concavity, but all exhibit unidirectional scarring within the concavity only. Notches are usually placed along the thinnest lateral or terminal edge of the flake, though three specimens are notched along thick edges. Notch edge angles vary from 35 to 90 degrees (Table 36).

Choppers (3)

The three choppers are different morphologically. One limestone grade chopper (8.3 by 7.2 by 5.1 cm) is bifacially reduced around a single platform and shaped into a leaf form. It is heavily rounded and striated along one edge, and crushed and rounded at two locations along this same edge. It appears to have been hand-held. The second chopper (14.8 by 9.3 by 3.4 cm) is a limestone slab that has been bimarginally reduced around most of the perimeter into a rounded triangular form. The artifact appears unfinished and has not been used. The third chopper, while admittedly small for this category even though fragmentary, is heavily crushed and step-fractured along a single edge, indicating heavy use, rarely found on limestone artifacts at this site.

Facially Retouched Artifacts (53)

This tool group is perhaps the best example of the contrasting treatment given to limestone and chert materials at the site by site occupants. Unifacially or bifacially reduced tools of limestone are large, thick, round to oval forms and do not exhibit pressure flaking along the edges. All limestone tools in this group appear complete, but all are unused except for a single tool. Facially retouched chert tools, by contrast, exhibit frequent heat treatment and a controlled reduction to thin plano-convex or biconvex cross sections. All are fragmentary but appear to have been oval and subrectangular.

Tools with facial retouch are remarkable for the nearly complete absence of wear (49, or 92 percent), due mainly to the unfinished and/or fragmentary condition of most tools in the group. There are few shared traits within this tool group except unifacial or bifacial retouch.

Facially retouched tools are the only group, aside from projectile points, that are primarily of chert (38, or 72 percent), another indication of the specialized treatment given different materials at the site.

This tool group is comprised of fragmentary and/or unfinished tools that cannot be assigned to a specific category. Two subgroups make up the indeterminate category: (1) flakes or angular debris exhibiting unidirectional marginal retouch along a portion of an edge, giving the tool an unfinished appearance; and (2) flakes exhibiting wear along a broken edge too small for functional classification. Small and/or broken chert flakes comprise the bulk of the assemblage (38, or 73 percent). Limestone and limestone grades complete the group (14, or 27 percent).

Projectile Points (30)

A broad temporal range may be indicated by the projectile points from the site. Of the 30 points, 21 are classifiable by type. Eight of the classified points are generally associated with Archaic or Late Archaic occupations. Eleven others are Scallorn-type points common at ceramic period sites in western Texas and eastern New Mexico.

One Early Barbed/Castroville point is similar but not identical to the Early Barbed/Castroville type (Fig. 29a). This type is known from Val Verde County, Texas (Word and Douglas 1970:22, Fig. 10J). Similar points were also found in the "earliest, deepest Archaic strata" at Devil's Mouth site in the same county (Johnson 1964:33). Johnson prefers to leave the type unnamed because of the great variation among points in this group. Suhm and Krieger (1954) date this type from 4000 B.C. to A.D. 1000. The point from LA 457 is complete with a continuous retouched edge opposite the long barb. It is of gray fossiliferous chert and is completely bifacially retouched with small pressure flakes removed perpendicular to the blade edges. One flutelike flake has been removed from one side of the base. The complete point measures 3.7 by 2.9 by .4 cm.

A single point of heat treated, brown fossiliferous chert is tenuously classified as a Gary point. It is complete and bifacially retouched, measuring 2.3 by 1.3 by .4 cm. Gary points occur over a wide temporal span, 2000 B.C. to A.D. 1000.

One Desmuke point, thick and crudely chipped, is associated with Archaic sites in southwestern Texas (Bell 1960:30, Plate 15). It is of cream-colored chert grading slightly to limestone. Its irregular leaf shape and crude chipping give it a preform-like appearance (Fig. 29b). The point is bifacially chipped with a biconvex cross section. One surface is more markedly convex than the opposite face, giving one edge a beveled appearance. The complete point measures 3.9 by 3.2 by .7 cm.

One well-formed barb and one poorly formed one are present on a diagonally notched Marcos point (Fig. 29c). Dates for the type are estimated at 2000 B.C. to A.D. 1000 (Bell 1958:42, Plate 21). It is bifacially reduced by the removal of long, thin flakes perpendicular to the blade edges and base. The biconvex cross section is thick and slightly irregular. Longitudinally, the point is plano-convex, giving it a curved appearance. The complete, cream colored fossiliferous chert point measures 3.4 by 2.4 by .5 cm.

Kent points are associated with nonpottery, Late Archaic sites in Texas. The two points found at the site are fragmentary but possess the bulbous stem characteristic of the point type. One Kent point (Fig. 29d) is of heat-treated, gray and red mottled chert with a narrower blade and thicker cross section than the other. It measures 3.0 (incomplete) by 2.0 by .4 cm.

The base is missing from one large, crudely chipped Late Archaic point, but blade shape, size, and type of manufacture bear some resemblance to Morphiss or Palmillas points, both Archaic types (Fig. 29e). No pressure flaking is present, leaving the blade edges quite thick. One edge angle measures nearly 90 degrees. The point is bifacially reduced and biconvex in cross section. It measures 4.4 (incomplete) by 2.5 by .6 cm.

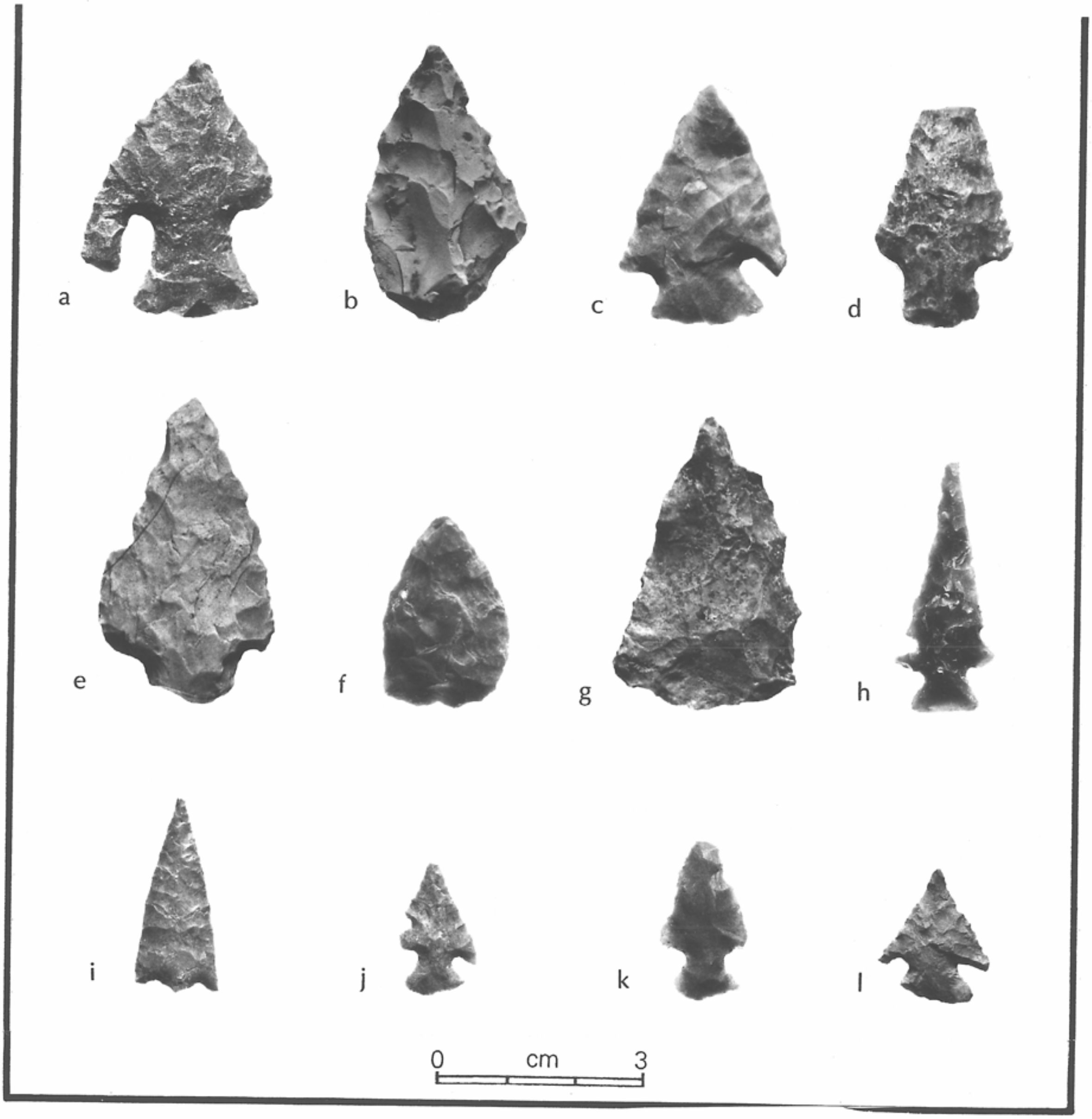

Figure 29. Projectile points: (a) Early Barbed Castroville; (b) Desmuke; (c) Marcos; (d) Kent; (e) Late Archaic; (f) Catan; (g) Tortugas; (h-l) Scallorn.

Two fragmentary Catan points were recovered from the site, and two more were donated to the project. The two Catan points recovered in excavations are small and leaf-shaped but do not exhibit the beveled edges or thick cross sections common to the type (Bell 1958:14, Plate 7), whereas the two donated points are more typical of the type. The two project points are thin (.3 cm) and finely chipped. One is of heat-treated, gray fossiliferous chert and is missing the blade tip (2.2 incomplete by 2.2 by .3 cm). The other Catan point is of cream and orange chert and is missing the extreme tip of the blade (Fig. 29f) and a corner of the rounded base (2.4 incomplete by 1.7 by .3 cm). In Tamaulipas, Mexico, and along the Texas coast, Catan points occur in association with ceramics (Suhm and Jelks 1962:215) over a broad temporal span from A.D. 500 to the eighteenth century (Bell 1958:92).

One Tortugas point was recovered (Fig. 29g). Although more crudely manufactured than the typical Tortugas point (Suhm and Jelks 1962: Plate 125; Bell 1958:92, Plate 46), it is beveled along one blade edge and thinned at the base with one large flake, giving a fluted effect typical of the type. The complete point is of gray fossiliferous chert and measures 4.3 by 2.7 by .7 cm.

Five complete and six fragmentary artifacts are classified as Scallorn points (Figs. 29h-29l). Scallorn points are the most numerous at the site. They are more consistently associated with lower levels of site features than the Archaic points (Table 37). Scallorn points are associated with Pithouse and Pueblo period sites in eastern New Mexico and west Texas.

Scallorn points show considerable variation in size and morphology (Bell 1958: Plate 42) but are characterized by "an expanding stem, sharp barbs and occasional serrated blade edges" (Miller and Jelks 1952:176). At LA 457, Scallorn points are serrated, but along lower portions of the blade only. Where the base is missing, sharp barbs are present. The estimated age of Scallorn points is A.D. 700-1500 (Bell 1958:84). The point type is commonly found at ceramic sites in Texas (Table 38).

Nine blade sections are too fragmentary for classification. They are of chert (7), limestone grade (1), and silicified wood (1).

Donated Points (14)

Fourteen points, one knife, one scraper/spokeshave, and three flakes from the site surface were collected prior to OAS excavations by Mr. John Ambrose and subsequently donated by him to the project. Information on these points is provided only where it does not duplicate that in the above projectile point descriptions.

One Early Barbed/Castroville point is heat treated and of gray fossiliferous chert. The complete point measures 3.4 by 2.6 by .4 cm.

Of two Gary points, one is a complete, white fossiliferous chert projectile point measuring 3.2 by 1.8 by .5 cm. The other is also complete, of pink fossiliferous chert. It measures 3.2 by 1.7 by .5 cm.

Two Late Archaic points were donated. One complete point of gray chert resembles a common point found in open sand dunes at sites in southeastern New Mexico (Smith 1974:22). The type is usually made from material found in the Sacramento Mountains and was possibly used as a dart point with an atlatl. This artifact is irregularly serrated along two blade edges and is more asymmetric in outline than others of this type (Fig. 30a). The other Late Archaic point (Fig. 30b) is similar to those found in nearby Rhodes Canyon (Eidenbach 1983:108, Fig. VIII.2, Row 2) and Bat Cave (Datil-like; Dick 1965:28, Fig. 22w). This artifact is irregular in outline and crudely chipped on both faces. Notches are formed by the removal of one flake from the blade edge. The complete point is of cream fossiliferous chert and measures 4.3 by 1.76 by .6 cm.

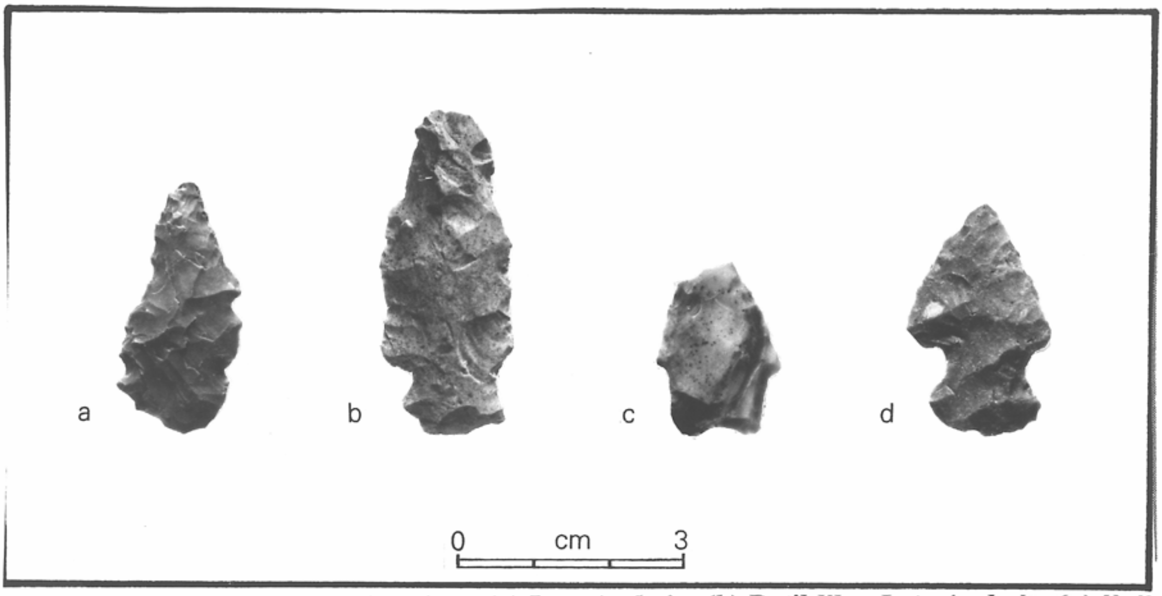

Figure 30. Donated projectile points: (a) Late Archaic; (b) Datil-like, Late Archaic; (c) Dallas, Archaic; (d) Palmillas, Late Archaic.

One incomplete Dallas point is of heat-treated pink and white banded chert and measures 2.3 (incomplete) by 1.7 by .3 cm (Fig. 30c). The stem edges are ground, a typical feature of this Archaic point (Bell 1960:24, Plate 12). Bases are concave but can frequently be straight.

One Palmillas point was found just east of the site in Alamo Canyon (Fig. 30d). Palmillas points are illustrated in Suhm and Jelks (1962), but this point more closely resembles those recorded by Bell (1960:74). The point is of light brown fossiliferous chert and measures 3.1 by 1.9 by .4 cm.

One fragmentary Elam-like point is similar to the Elam type, estimated to date from 500 B.C. to A.D. 450. It is of gray fossiliferous chert and measures 2.1 by 1.7 by .4 cm. One corner of the stem is missing.

Two Catan points were donated. One is a complete, light brown fossiliferous chert, beveled on one edge, and has a thick, biconvex cross section. It measures 2.7 by 1.1 by .6 cm. The other is also complete, of pink fossiliferous chert, beveled on one edge, and has a thick, biconvex cross section. It measures 2.7 by 1.1 by .6 cm.

One Tortugas-like point is a complete, dark brown fossiliferous chert with no beveling. The base is thinned with one flake removed. It measures 3.1 by 1.9 by .6 cm.

Two Scallorn points were donated. One is fragmentary, of white and gray mottled chert, with one barb missing. It measures 2.4 by 1.6 (incomplete) by .4 cm. The other is also fragmentary.

It has been heat treated and is of white chert with one barb missing. It measures 1.7 (incomplete) by 1.6 by .3 cm.

One Refugio-like small leaf-shaped point is finely chipped unifacially to a thin plano-convex cross section and is thinned at the base by the removal of one flake perpendicular to the base. The point resembles that of the much larger Refugio point in shape, type of manufacture, and basal thinning. It dates between 2000 B.C. and A.D. 1000.

Three points of white, gray, and heat treated light brown fossiliferous chert have not been classified. The white chert point is an irregular leaf blade with unifacial retouch. The cross section is plano-convex along the blade and biconvex at the somewhat bulbous base. The complete point measures 2.7 by 1.2 by .3 cm. It most resembles the Catan point type but is too irregular in form for definite classification.

The gray chert point is triangular with a slight, off-center protrusion on the base. It appears to have been broken and reworked. It measures 2.0 (incomplete) by 1.3 by .3 cm. It has not been typed because of the missing, reworked base.

The brown fossiliferous chert point is missing the bottom of an expanding base, the extreme blade tip, and both barbs. It has a thick, biconvex cross section and measures 2.7 (incomplete) by 2.2 (incomplete) by .5 cm.

Other Donated Artifacts (5)

A scraper/spokeshave recovered from Alamo Canyon exhibits a single retouched scraping edge opposite a retouched concavity. Both edges exhibit unidirectional wear. A knife of high-quality gray chert is bidirectionally worn along 20 and 40 degree edges. Three chert flakes are of high quality gray chert, gray fossiliferous chert, and white chert.

Additional Testing Program

Lithic artifacts (N=215) were recovered from the small, additional testing program along U.S. 82. The only tools that exhibit formal preparation or style include three projectile points and two scrapers. Only one projectile point is identifiable. It appears to be a broken Shumla point from the Archaic period (see previous discussion). Dominant material types are chert (including chalcedony) and San Andres limestone, at 62.7 and 37.2 percent. These are the two predominant material types found along North Florida Avenue.

Provenience Distribution

The features and areas that yielded the greatest number of lithic artifacts (n=1,324) are shown in Table 39.

The majority of lithic activities appear to have occurred in and around the largest structures on the site, the two surface structures and the pithouse. A small percentage (12 percent) of these lithic artifacts came from floor and floor fill within these features. Most of the lithic artifacts occurred on the surface of the site and in the fill, generally between 10 and 40 cm below ground surface. Although frequencies of lithic artifacts vary considerable around the site, percentages of different tool types within each area of activity do not vary significantly. This would suggest that similar activities occurred in several places around the site.

Discussion

The lithic assemblage is characterized by a large variety of specialized tool types. These numerous tool varieties can be grouped into functional categories that are remarkably similar morphologically: scraping tools, cutting tools, scraper combination tools, drills, spokeshaves, choppers, facially retouched tools, and projectile points. All of these functionally specific tools are simple, rarely retouched flakes, yet their homogeneity within groups indicates they were being manufactured for a specific use. The abundance of the preferred material, limestone, and the obvious control the tool manufacturers had over it, has resulted in the creation of uniform specialized tool groups. These groups are believed not to be the result of expedient use of randomly produced, fortuitously shaped flakes.

Where chert was available, it was chosen far less often for tool use, but where high quality chert was available, it was frequently heat treated and reduced to projectile points, thin, facially retouched tools, and drills, again maximizing the use of each material type through specialized treatment.

Five artifacts that may be classified as ornamental or nonsubsistence related were recovered from LA 457. Three were found during testing, and two were donated by a private collector. These include four beads and one piece of incised bone (Fig. 31).

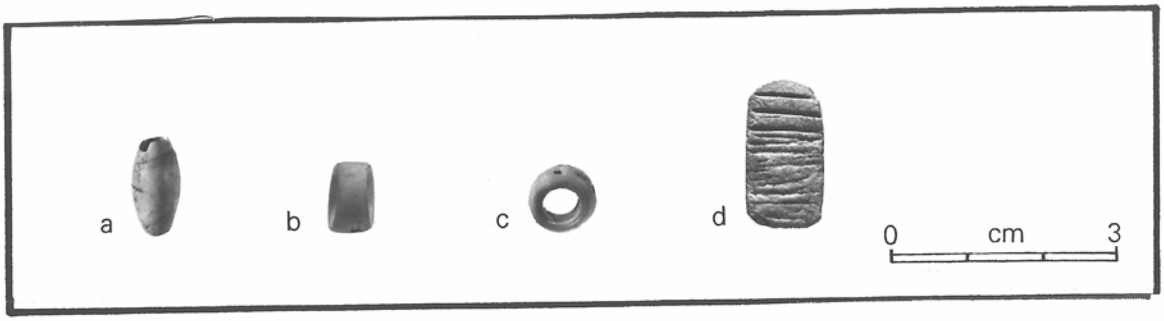

Figure 31. Miscellaneous artifacts: (a) olivella bead; (b) shell bead; (c) shell bead, donated; (d) possible gaming piece.

The beads are all of shell. Only one could be identified as to species, an olivella shell (Fig. 31a). This bead had the spire ground down to allow for stringing on a cord of some type. Wear polish is evident on both ends where the cord passed through. The measurements of this bead are 13 mm long, 7 mm wide, and 6 mm thick. It was recovered from the surface structure in Excavation Unit 29U, near the floor.

In Excavation Unit 29H, a large shell bead (possibly olivella) had been ground down heavily on both ends to create a round bead (Fig. 31b). The original surface is still intact, and some wear polish is evident where the bead had been strung on a cord. Its measurements are 10 mm long, 9 mm wide, and 6 mm thick, with an opening of 6 mm.

From Excavation Unit 28H, within a storage pit, came a bone artifact generally classified as a gaming piece (Fig. 31d). Whether this assessment is correct is impossible to determine. It is a section of bone shaped into a thin rectangle with rounded edges and polished. The piece is incised horizontally on one face. Its measurements are 20 mm long, 10 mm wide, and 3 mm thick.

Two additional shell beads were donated to the project and are supposed to have come from the project area. One bead is very similar to the large bead found in Excavation Unit 29H. It has been ground heavily at both ends, where wear polish is evident. The measurements are 8 mm long, 9 mm wide, and 8 mm thick, with a conical opening 4-5 mm wide passing through the bead (Fig. 31c).

The other donated shell bead has been worked into a disc and polished. The conical opening is 2-3 mm wide through the bead. Two grooves run across one face of the bead from the drilled hole but do not extend all the way to the edge of the bead. The measurements are 6 mm long, 6 mm wide, and 2 mm thick.

THE UTILIZATION AND DISPOSAL OF FAUNAL REMAINS IN THE EARLY MESILLA PHASE COMPONENT AT LA 457

Linda Mick-O'Hara

The excavations at LA 457 produced a faunal assemblage of 898 bone elements and fragments. This faunal sample was recovered from 16 excavation areas that were placed to explore features observed during the initial testing stages of the project. Bone was recovered from within and around these feature areas. Formal midden areas are uncommon at Mesilla phase sites, but the presence of roasting pit ring middens and activity area middens are well documented. The dispersal of these areas over time into general sheet trash may have been responsible for the patterns noted in the recovery of faunal remains from LA 457 (Lehmer 1948; Hard 1983).

In the following report, the recovered faunal assemblage will be addressed on two levels, for the site as a whole and for each excavation area and the features isolated within these areas. The faunal preservation from the current excavations at LA 457 was excellent, and questions of differential species use along with processing and consumption patterns may also be addressed. The differential use of jackrabbit over cottontail is addressed using both element and distributional data to approach environmental, procurement, and processing parameters that may have influenced the patterns noted in this Mesilla phase faunal assemblage.

Methods

All faunal remains recovered during the excavation phase of the Alamogordo project were returned to the Office of Archaeological Studies for processing and analysis. The faunal materials were dry brushed to remove dirt from all surfaces so that muscle attachments, other identifiable surface features, and processing marks would be visible if present.

The remains were then identified to the most specific level possible using the comparative faunal materials housed at the Office of Archaeological Studies, Museum of New Mexico, Santa Fe, and the Museum of Southwest Biology, University of New Mexico, Albuquerque. Identifications were also aided by using guides to the taxonomic and element identification of mammals and birds (Olsen 1964, 1968; Gilbert 1985,1990). Guides were used only for preliminary identification, and all specimens were specifically compared to osteological specimens for final identification.

Identification of all specimens included taxonomic level, element, portion, completeness, laterality, age, and developmental stage. In addition, each specimen was assessed for any environmental, animal, or thermal alteration that may have been present. Finally, any butchering marks (cuts, impacts, etc.) (Olsen and Shipman 1988; Fisher 1995) were noted, along with any apparent modification for tool manufacture or use (Semenov 1964; Kidder 1932).

The data recorded for these variables was then entered as an SPSS database and used in the analysis of the faunal remains in this report.

Overview

The faunal assemblage recovered from the Mesilla phase component at LA 457 consists predominately of small mammal species. The assemblage, as a whole, exhibited a small amount of fragmentation and excellent preservation. In the entire recovered faunal assemblage, 446 bone fragments (49.7 percent of the sample) were only generally identifiable as small, medium, or large mammal, or bird. Generally, this segment of any faunal assemblage comprises 60 or 70 percent of any sample (Todd and Rapson 1988; Mick-O'Hara 1994). The lower percentage of minimally identifiable bone fragments at LA 457 indicate the smaller-body-size taxa utilized by site occupants, processing and cooking practices, and overall bone preservation factors. These variables and their effect on the faunal assemblage are addressed in more detail later in this section.

Small mammal remains comprise 73.3 percent of the generally identifiable faunal sample (36.4 percent of the faunal sample) and clearly reflect the taxa identified. Table 40 presents the entire sample, including the generally identifiable bone. Most small mammals other than the lagomorphs, including rock squirrel (*Spermophilus variegatus*), Botta's pocket gopher (*Thomomys bottae*), banner-tailed kangaroo rat (*Dipodomys spectabilis*), and white-throated woodrat (*Neotoma albigula*) are represented by only one or two elements. The presence of only a few elements indicate that the rodent species identified were not intrusive burrow deaths (Thomas 1971) or animal kills, but an occasional part of the diet of the Mesilla phase occupants of this multicomponent site. Though most remains were broken during processing and cooking as well as by postdepositional processes, the amount of bone identifiable to species is high in this sample.

Medium and large mammals make up a small part of the overall faunal assemblage. In the generally identified bone fragments, medium mammal bone comprises 5.0 percent, and large mammal bone comprises 5.3 percent of the overall sample. As with the small mammal bone, these percentages correspond well with the few medium- and large-mammal species identified. Medium mammals are represented by only one tooth, identified as skunk (*Mephitis* sp.). Large-mammal bone could be identified to the order Artiodactyla, which is represented by tooth, rib, and metapodial fragments, and to mule deer (*Odocoileus hemionus*), represented by a single phalange. This identified bone represents fragments of low-meat-utility elements and may indicate that high-meat-utility elements discarded as post-consumption trash were disposed of in other areas of the site (Binford 1981; Grayson 1984; Lyman 1994b).

A few bone fragments were identified as avian remains. From this group, five bone fragments could only be assigned to the general class of Aves. A single coracoid could be assigned to the family Corvidae (jays, magpies and crows), while another coracoid and carpometacarpus could be identified as Mexican jay (*Aphelocoma ultramarina*). Birds may have been sporadically used by the site occupants in ritual context and as food, but the few bones and species isolated in this assemblage preclude any further interpretations along that line.

A single radia/ulna was identified to the order Salienta (frogs and toads). This places amphibians at the site prehistorically, but the paucity of data, as with the birds, prevents any further analysis or interpretation.

The most frequently identified group were the lagomorphs, including cottontails (*Sylvilagus auduboni*) and jackrabbits (*Lepus californicus*), which fall into the small mammal category. They clearly make up the majority of the assemblage reflected in the small mammal remains as well as the identified remains. Jackrabbits dominate the entire assemblage (36.3 percent). Jackrabbit remains were almost four times more frequent than cottontail remains in the assemblage. The element representation and interpretation of the increased occurrence of jackrabbits over cottontails are included in the next section, which is devoted to the investigation of lagomorphs in this faunal assemblage.

The Mesilla phase occupants of LA 457 exploited some large mammals, but the focus of their meat-procurement strategy was small mammals. Small mammals other than lagomorphs were used as part of the diet, but lagomorph procurement was central to their subsistence strategy. The dominance of jackrabbits over cottontails corresponds well with other Mesilla phase faunal assemblages from the same general area and time period (Whalen 1978, 1994a; Hard 1983; O'Laughlin 1980; Carmichael 1985).

Lagomorph Use at LA 457

The occurrence of lagomorphs as a major contributor to the meat diet of the early Mesilla phase occupants at LA 457 reflects a general animal resource pattern identified at numerous Mesilla phase sites. Whalen (1978:72) characterized hunting as an important part of the subsistence strategy during the Mesilla phase. He suggests that hunting was restricted to small game. Large quantities of jackrabbit bone were recovered from two pithouses at a small village he had excavated. Hard's (1983:72) excavations at the Castner Heights sites recovered fragmentary bone. All identified specimens were jackrabbit or cottontail. In Hard's analysis, cottontail remains outnumbered jackrabbit remains, and the entire assemblage was heavily fragmented. This resulted in a lagomorph index of 0.58, while the overall lagomorph index of the early Mesilla phase occupation at LA 457 is 0.20, reflecting the increased use of jackrabbits at the Alamogordo site. The lagomorph index as developed by Bayham and Hatch (1985) is calculated as the NISP for cottontails divided by the sum of the NISP of all lagomorphs. The index provides a way to quantify the contribution of cottontails and jackrabbits to an assemblage. If cottontail is seen as the most desirable of the lagomorph species, decreases in the quantity of cottontail bone recovered would provide some indication of changes in the local environment and/or in procurement technology.

Lagomorphs are included in the small mammal category because behaviorally they correspond well with most rodent species (Findley et al. 1975). Cottontails and jackrabbits do, however, exhibit different responses to prey and habitat preferences, thus responding in dissimilar ways to various procurement techniques and technology. Cottontails prefer brushy undergrowth and overall thicker cover than jackrabbits (Diersing and Wilson 1980, for cottontail). This cover provides excellent camouflage for hiding from predators while they are out of their burrows (Legler 1970). Cottontails exhibit "fright" response to predators in their environment. They hide in the thick undercover and remain still even if the predator is close (Madsen 1980). Jackrabbits tend to be more numerous in open environments, where vegetation is sparse (Legler 1970; Erickson 1985). They use their long back legs to raise their heads, or a least ears, over the plant cover, providing a greater range for hearing the movement of probable predators on the landscape. Jackrabbits use their hearing, as a "flight" species, to provide time for escape from potential predators (Palmer 1897; Erickson 1985). These habitat and behavioral differences make some procurement techniques better suited to hunting cottontail and others more appropriate for taking jackrabbits.

Animal Behavior and Procurement Techniques: The Lagomorph Case

Lagomorphs may be taken by techniques similar to those used to procure other small animals. Underhill (1943:67-70; 1946:97-99) indicates that among the Puebloan Indians, small animals were hunted with several techniques. Rabbit drives were a communal activity associated with hunting ceremonies. This technique used large nets stretched across the landscape. People used rabbit sticks or clubs to kill rabbits as they were caught in the netting. "Beaters" yelled and beat sticks together or beat drums, chasing the rabbits toward the extended nets. The rabbit drive was a highly organized communal activity that took preparation time and the gathering of allied individuals, who then shared in the proceeds.

Most other techniques used to hunt small mammals involved only one or two individuals (Underhill 1946:68-69). These hunting techniques included individual hunting with rabbit sticks. A person would carry a stick while traveling to and from agricultural fields and take small mammals on an encounter basis. The Puebloan Indians also used a variety of traps to capture small mammals. The rabbit stick or any convenient club would then be used to kill small animals caught in these traps (Underhill 1946:69). The Puebloan groups also used bow and arrow to hunt smaller game, concentrating on species that could be frightened out of their hiding places.

The Mojave tribe along the Colorado River hunted small mammals as they were forced from flooding fields in the spring and filled burrows with water to drown or force small animals out. They would then skewer them in their burrows or club them as they fled (Castetter and Bell 1951; Forde 1934). The Papagos (Underhill 1939; Castetter and Underhill 1935; Joseph et al. 1949) used long sticks with blunt or hooked ends to ram into rodent holes and rabbit burrows, skewer these animals, and then pull them out. Most of these small animal procurement techniques using traps, clubs, polls, and bows could be accomplished by a single individual. The small game was consumed by that person or taken back to the family campsite. All of these hunting techniques use implements that could easily be carried from place to place by mobile groups or used by more sedentary populations.

Of the above techniques, the rabbit drive would result in the highest animal return per event, though animals would be shared among a number of allied individuals or households. Any hunting technique that concentrates on driving small mammals from predators would inevitably bias the species procured. Since among the lagomorphs, jackrabbits run to escape from predators, rabbit drives should favor the capture of jackrabbits over cottontails. With the numerous techniques requiring only a single individual, any animals taken would be cooked and consumed in the field or returned to the household or campsite to be included in the family's dietary fare. Hunting techniques used by a single individuals or few individuals could take species that are fleeing from their human predator or hiding from them, but lagomorphs such as cottontails that tend to freeze and hide when pursued would be a considerably easier target for such techniques. Hunting techniques that focus on a single individual procuring food would be biased toward the capture of cottontails over jackrabbits, though both would be taken.

The numerous procurement techniques noted suggest that small mammal procurement was an important strategy in the Southwest from early prehistoric times into the historic Puebloan period. Bayham (1982), Szuter and Bayham (1989), and Szuter (1991) have noted this of their research in the Hohokam area. Szuter (1991) has found at several desert Hohokam sites that cottontails were most frequent at farmsteads, while jackrabbits were more frequent at village sites. Whalen (1994a:120-125), describing Bayham and Broughton's research for the Turquoise Ridge report, indicates that the increase in jackrabbits over cottontails in the faunal assemblage resulted from hunting small mammals on a landscape degraded by intensified cultivation. Though this may provide sufficient environmental changes to establish a landscape more preferable to jackrabbits than to cottontails in some desert areas, several other factors may provide more plausible arguments for such a shift in lagomorph use both at Turquoise Ridge and at LA 457.

Factors Influencing Lagomorph Ratios in the Desert Southwest

Environmental and cultural factors that influence the ratio of cottontails to jackrabbits taken by a group vary with the geographical landscape. In the lowland desert Southwest, environmental factors include topography or relief, vegetational cover, variation in seasonal and annual precipitation, and seasonal temperature variation. Cultural factors affecting the capture of various lagomorphs consist of use of or intensification of agricultural techniques that change the overall amount of plant cover, use of various hunting techniques, area covered by individual and communal hunting, distribution and processing of animals captured, and disposal and preservation of remains. Any or all of these factors may be affecting the composition of the recovered faunal assemblage and thus the ratio of lagomorphs. The use of differences in habitat preference and animal behavior, and ethnographic evidence of the use of hunting techniques that favor the capture one taxon over another allow inferences about the rates of occurrence of different species in the archaeological record.

As discussed earlier, open areas with little brushy undercover are preferred by jackrabbits, while areas with greater amounts of vegetation are preferred by cottontails (Findley et al. 1975). As agricultural practices change the landscape by clearing ground cover, the environment would favor jackrabbit over cottontail populations (Bayham and Szuter 1989). Precipitation changes from year to year can dramatically affect the vegetational pattern on the landscape (Dick-Peddie 1993:27-31). The reproductive cycles and thus population peaks, along with a real preference for lagomorphs, are influenced by these often subtle changes in the lowland desert Southwest. Cottontails reach peak populations when increased precipitation increases the overall vegetational cover, providing needed food and hiding places (Findley et al. 1975:86-89; Diersing and Wilson 1980). This increase may be mitigated, however, by any increased agriculture, which would alter the vegetational cover around the main site area, though hunting out from these areas may increase the likelihood of the capture of cottontails. Seasonal temperature variation is more drastic in some years than in others and tends to affect vegetational cover in combination with any variations in moisture (Dick-Peddie 1993:27-32). If winters are colder and the relative moisture in an area is decreased, it affects the reproduction and survival of both cottontails and jackrabbits. While the overall decrease in vegetational cover would favor jackrabbits, with a decreased population, environmental affects in the archaeological record would be seen more in the size of the adult jackrabbits recovered than in overall numbers, though jackrabbits would increase in numbers as well. In general, any environmental parameters that decrease vegetation increase the likelihood of taking jackrabbits, while increases in moisture and vegetation are favorable to cottontail populations, increasing the probability of capturing those taxa.

Cultural variables often work with the environmental dynamics at hand by using procurement techniques that optimize the capture of animals already favored by varying vegetational cover and precipitation regimes. As mentioned before, the use and intensification of agriculture in the desert Southwest would be pursued in years of higher overall precipitation, producing a landscape that would favor jackrabbits. But the cottontail population would be on the rise as well. With these conditions, more animals, including more immature lagomorphs, would be taken, and areas surrounding the habitation would produce more jackrabbits than cottontails, depending on the hunting techniques employed. As discussed previously, communal rabbit hunts, some bow and arrow strategies, and techniques conducive to frightening small game into flight would favor the capture of jackrabbits. The greater the area covered by a local population, the more likely the encounter and capture of cottontail would entail individual hunting techniques. Increased precipitation, along with the use of individual hunting strategies, would increase the procurement of cottontails of all ages, including numerous immature specimens.

Whether taken in a communal drive or by an individual, most small mammals are distributed as complete carcasses to single households for processing and consumption (Underhill 1946; Castetter and Underhill 1939). Processing and cooking methods can affect the survival rate of bone depending on the relative bone density of the elements (Binford and Bertram 1977; Lyman 1985, 1994b). The processing of small mammals, including lagomorphs, often involves the removal of the head and loose skin before cooking. The crania and mandibles would be discarded prior to cooking and preserve better postdepositionally than postcranial remains exposed to roasting or boiling. Since lagomorph crania are more fragile than the thicker mandibles, the mandibles would be more frequent in deposits associated with populations using this processing technique.

Different cooking techniques may leave evidence of their use on bone surfaces. Roasting meat over an open fire can burn any exposed bone surfaces and discolor meat-covered bone during the cooking process. On recovered bone, this should appear as dark or blackened articular surfaces where bone is exposed and mottled light to dark brown diaphyses where the fluids and grease from the meat and bone produce such patterning. Boiling of bone tends to reduce the surface of elements that are cooked continually for an extended period. Bone grease and some collagen are removed, and the surface becomes "chalky" to the touch and in appearance. Mechanisms of bone disposal and preservation greatly affect the extent to which these processes can be observed. Groundwater erosion and leaching along with weathering from exposure can make such observations impractical, but evidence of cooking processes is important in the study of human behavior. While weathering or other taphonomic factors preclude the observation of some processes, they provide evidence of the postdepositional environment in the site area (Lyman 1994b).

The bone recovered from the early Mesilla phase component at LA 457 appeared to be from sheet trash concentrated around structures and associated facilities and from feature fill. Bone was well preserved and not heavily fragmented, so surface observations could be made.

Inference from the Lagomorph Sample at LA 457

The lagomorph sample from LA 457 includes 21 pieces of bone identified to the family Leporidae (rabbits), 86 pieces of bone identified as desert cottontail (*Sylvilagus auduboni*), and 326 bone fragments identified as black-tailed jackrabbit (*Lepus californicus*) (Table 41). These taxa comprise 48.2 percent of the total sample and 95.7 percent of the identified sample. Lagomorph identifications are clearly dominated by jackrabbit remains, which comprise 72.1 percent of the identified sample, while cottontails represent 19.0 percent of the identified sample. As mentioned earlier, this results in a lagomorph index of 0.20, which reflects a lagomorph ratio similar to the indices calculated for the earlier proveniences at Turquoise Ridge (Whalen 1994a:124) and lower than that from Hard's (1983:73-75) excavations at Castner Heights (0.58). The Turquoise Ridge site and the Castner Heights sites date later in the Mesilla phase than the component isolated at LA

457, but they reflect some of the possible variation seen in lagomorph usage during this phase.

The NISP for jackrabbit does not address the distribution and surface modification of elements. Figure 32 presents the element distribution for jackrabbits. This histogram illustrates the element distribution throughout the entire area excavated but shows the general occurrence of most skeletal elements. Mandibles were the most frequently identified element (n=46) and represent at least 19 individuals (MNI=19; right and left mandibles were equal). This element was nearly complete or exhibited postdepositional breakage and appears to have been discarded prior to cooking. Very few elements were burned in this assemblage, and no burning was noted on mandibles. The scarcity of ribs and vertebrae in the jackrabbit distribution may indicate that the axial skeleton received differential processing or cooking, which would alter the disposal pattern and adversely affect the survival of these elements. Though there is diversity in the preservation and retrieval of elements, the general picture suggests that preservation of the cranium, mandible, and appendicular skeleton varied widely, indicating that methods of processing and cooking biased element preservation in significant ways. Chi-square adjusted residuals were used to illustrate that jackrabbit mandibular preservation and recovery in this faunal sample differs significantly at the +/- 1.95 level of confidence (p=0.01) from that of the postcranial skeleton (Table 41). Mandible recovery is also significantly different from that of cranial fragments, but the fairly fragile nature of lagomorph crania suggests this was a result of dissimilar bone density rather than processing differences (Lyman 1985, 1994a, 1994b). An evaluation of the postcranial elements, especially long bones with densities greater than that of the mandible, illustrates no significant differences in the recovery except for the calcaneum. The calcaneum, one of the higher density elements, is subject to differential recovery because of its greater density and distinct shape, indicating that mandibles, not cooked like the rest of the carcass, were probably discarded along with the skin prior to cooking. This is supported in this faunal sample by the separate recovery proveniences for a large number of the mandibular fragments. Fifty percent of the jackrabbit mandibles were recovered from the pit structure fill in Excavation Area 42, and 28.3 percent were recovered from the fill of the storage pit in Excavation Area 41. The occurrence of mandibles in these features and feature areas exhibits some segregation in element discard patterns related to processing.

Cottontail remains show a similar pattern, though overall, their rate of recovery was lower. Table 41 presents the chi-square adjusted residual values for cottontails, which correspond exactly to those for jackrabbit. Again, mandible recovery is significantly greater (+/-1.95 level, p=0.01) than the recovery of fragments of the cranial complex or postcranial elements. This similarity suggests that cottontails were processed like jackrabbits but taken in lower numbers. The element distribution for cottontails is presented in Figure 33. This distribution is similar to that of jackrabbits, but the range of elements recovered is reduced. An inspection of the element distribution shows that long bones occur in similar frequencies, indicating a common or parallel pathway from processing through discard.

The lagomorphs represent the main taxa taken by the Mesilla phase inhabitants at LA 457. These species not only provide information on the species utilized but also on probable methods of processing and cooking employed by this prehistoric population. A closer look at the lagomorph and other species distributions at specific excavation areas can provide more information about the use and disposal of these animals.

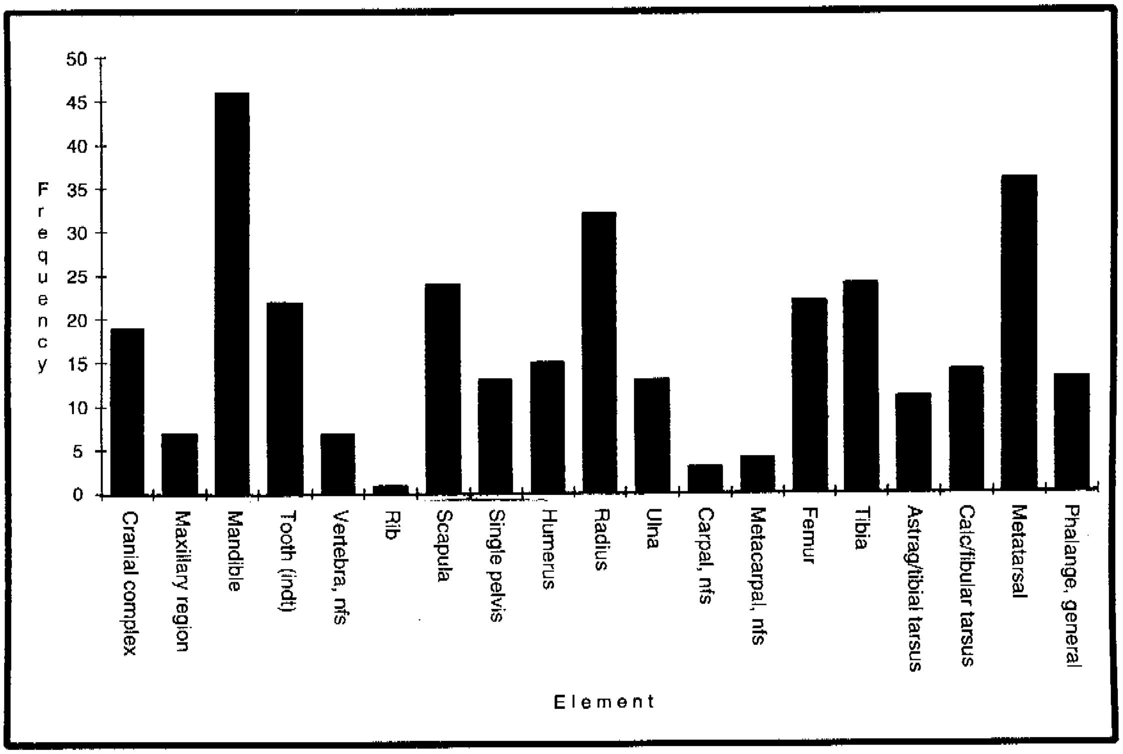

Figure 32. Element distribution of jackrabbits, LA 457.

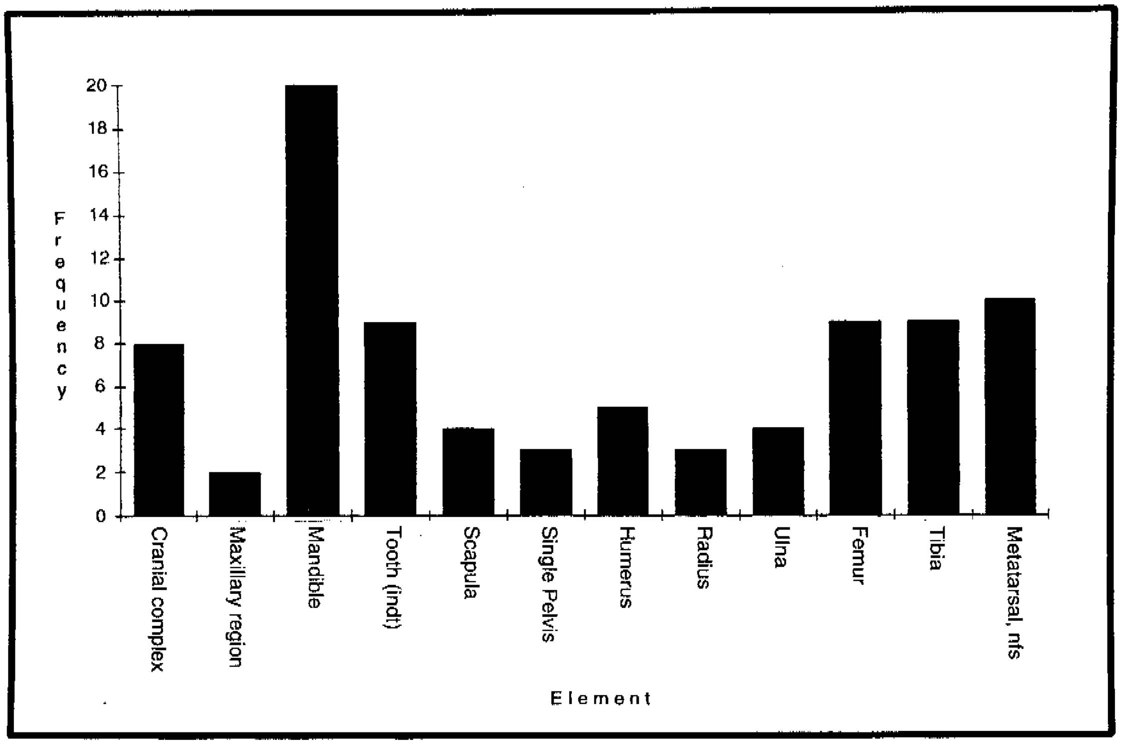

Figure 33. Element distribution of cottontails, LA 457.

Faunal Remains Recovered from Excavation Areas at LA 457

Faunal remains were recovered from sixteen test trenches, which were expanded to investigate stains isolated in the initial testing. Bone was recovered from activity areas around features and from feature fill. Most of the excavation areas had only a few pieces of bone in associated context (Table 42), but excavations at four localities resulted in the recovery of faunal samples that were large enough to make some inference about activities and disposal patterns: Excavation Area 28, which contained a storage pit and dates to approximately A.D. 540 (n=203); Excavation Area 36, which also contained a large storage pit (n=93); Excavation Area 41, a large storage pit dating to A.D. 790 (n=173); and Excavation Area 42, which contained a pithouse and associated activity area dating to A.D. 430 (n=315). The patterns noted in the general faunal assemblage are also present at these locations. Lagomorphs are the primary taxa recovered. Other small mammals, medium mammals, large mammals, and birds contribute incidentally to each sample. As in the general sample, jackrabbits are the predominant lagomorph recovered, but the ratio of cottontails to jackrabbits changes from excavation area to excavation area. Table 43 presents the NISP of cottontails, jackrabbits, and the overall NISP for lagomorphs, along with the lagomorph index of each of the excavation areas reviewed above. From the dates obtained for three of the features within these areas, at least a general trend in lagomorph use can be seen. Excavation Area 28 and Excavation Area 42 date to the earliest part of the Mesilla phase and have lagomorph indices of 0.25 and 0.24, respectively. These indices reflect the use of substantially more jackrabbits than cottontails during this time period, since an index of 1.0 would suggest that only cottontails were being captured, but a number of cottontails were being procured as well. The storage pit within Excavation Area 41 has a later Mesilla phase date (A.D. 790). A lagomorph index of 0.07 shows the nearly exclusive use of jackrabbits in a sample size similar to those of the other two earlier excavation area features. This indicates some change in the landscape or in hunting techniques used by the site occupants during the Mesilla phase component. The indices of the earlier features already indicate hunting strategies that were taking place in a landscape with sparse vegetation and suggest the use of hunting techniques, such as rabbit drives and individual hunting, that would further affect the ratio of cottontails to jackrabbits. The subsequent declines in the number of cottontails and increase in the number of jackrabbits taken by A.D. 765 represented by Excavation Area 41 suggest a change related to decreased vegetational cover as a result of precipitation and temperature changes, environmental degradation from agricultural practices, or a change in hunting techniques.

Since we know that groups such as the Mansos (Beckett and Corbett 1992) pursued an agricultural strategy only when moisture and temperature conditions were optimal, it seems unlikely that landscape alteration from agricultural pursuits during the Mesilla phase would be an effective factor in changing the proportions of lagomorphs taken. Also, if overhunting was affecting the composition of the lagomorph population, more immature animals would be taken through time. The lagomorph sample from LA 457 shows that throughout the Mesilla component, mainly adults were captured. The 10.5 percent of the cottontail sample and the 3.7 percent of the jackrabbit sample from immature individuals were part of the features dating to the earlier Mesilla phase use of the site. This indicates that more individual hunting and perhaps a more intensive suite of hunting techniques was used during that series of occupations. Using these arguments, the greater use of jackrabbits observed as recovered specimens from the later Mesilla phase feature could be the result of the greater use of organized rabbit drives by a group now exploring the use of some agricultural products.

The distribution of faunal remains between feature fill and general sheet trash in activity areas around isolated features also provides some interesting insight into the consumer behavior and site maintenance associated with this component at LA 457. Using only the excavation areas that produced the largest number of faunal remains during excavation, recovery proveniences were studied for all bone fragments isolated. Table 44 presents these recovery locations as within features or from surrounding activity area trash. In the case of Excavation Area 28, 15.8 percent of the faunal remains recovered from that unit were isolated from the fill of the storage pit, while the remainder of the bone was recovered from the general area. At Excavation Area 36, 69.9 percent of the faunal sample was recovered from the storage pit fill, while the rest came from areas adjacent to the feature. Excavations within Excavation Area 41 isolated 52.6 percent of the faunal sample from the storage pit fill and the other bone from the area surrounding this feature. The greatest amount of bone recovered was isolated during the excavations of Excavation Area 42 (n=315), and yet only 9 bone fragments (see Table 44) were recovered from feature context. The remainder were recovered from the activity areas surrounding that pit structure. Generally, faunal remains were not associated with occupation surfaces or the bottom of storage facilities but were from the trash fill and general sheet trash in surrounding activity areas.

The recovery context of faunal remains from these selected excavation areas indicate that most, if not all, faunal remains were disposed of in activity areas around the excavated features. Faunal refuse that ended up within feature context was part of the feature-filling process and was washed in or at some point thrown in when the length of site occupation required the cleaning of activity areas. This prevalence of general trash throughout the feature localities investigated suggests that most of the Mesilla phase occupations at LA 457 were fairly short, and the site was maintained only occasionally to clear refuse from activity areas. The storage pits in Excavation Areas 36 and 41 are examples of refuse disposal from maintenance or processing activities in which faunal remains ended up in storage pits that were no longer in use.

Schiffer (1976:46-53) discusses flow models and behavioral chains of cultural activities that end up in the primary or secondary disposal of refuse at a site and suggests that duration of occupation affects the pathways artifacts take throughout the site history. These ideas about site maintenance and length of occupation were discussed by Binford (1967; 1976; 1978; 1980; 1982; 1983:189-192) in his research on site formation processes and site structure, culminating in his overview of people and their life spaces. Basically, people perform maintenance as the situation requires. As refuse becomes noxious or as an area becomes cluttered and unsafe, site maintenance activities are initiated, not as a vigorous effort on the whole site, but to alleviate the specific problem at hand. If room is available during subsequent occupations at a temporary habitation site, new habitations and activity areas will be used rather than cleaning and revamping old structures. These observations are clearly applicable to the faunal distributions seen at LA 457.

The Mesilla phase occupations and features investigated are spread along the right-of-way, and faunal remains were recovered primarily from general refuse. Some site maintenance did take place, and remains were discarded into storage pits that had been abandoned. The duration of each occupation in the area may have been only a week or two, but because of the disposal of bone into abandoned features and the dating of the habitations and storage facilities, it appears that the area was used repeatedly for hundreds of years.

Discussion

A number of Mesilla phase sites in southern New Mexico and Texas show similar occupational histories to that of LA 457, for example, the sites investigated at Castner Heights (Hard 1983) and the Turquoise Ridge site (Whalen 1994a). All of these sites have faunal assemblages that are dominated by or exclusively lagomorphs. Site 80 at Castner Heights (Hard 1983:72-75) produced a faunal assemblage dominated by cottontails, while the faunal remains from Turquoise Ridge show a dominant utilization of jackrabbits in a ratio to cottontails similar to that of LA 457. Site 80 reflects faunal usage from the late Mesilla phase in that area. Given the fluctuation in precipitation and vegetational cover in the area (Dick-Peddie 1993), perhaps an increase in moisture and a concomitant increase in vegetational cover produced a spike in the cottontail population when this site was occupied. This may also be a reflection of the hunting techniques used by the site occupants but probably is a combination of factors. Lagomorphs are still the predominant taxa used, but in proportions that reflect both the cultural and environmental parameters of that particular occupation.

The faunal remains from the Turquoise Ridge exhibit close to the same ratio of cottontail to jackrabbit use as those from the Mesilla phase occupation at LA 457. Bayham and Broughton's (Whalen 1994a:120-125) faunal analysis of the Turquoise Ridge site indicates that the increased use of jackrabbits over cottontails reflects the degradation of the surrounding landscape by a population pursuing and intensifying an agricultural strategy. Turquoise Ridge may be a larger site with a more complex history than LA 457, but the degradation of the environment by agriculture during a phase of substantial residential mobility is only a very small part of the reason for the lagomorph ratios at that site. The use of hunting techniques such as rabbit drives by larger, more organized communities would change the ratio in favor of lagomorphs. Changes in precipitation that would reduce plant growth and provide less vegetational cover would also result in the increase in habitat preferred by jackrabbits over cottontails. It is clearly a combination of factors that produced the faunal assemblage we see from the excavations at Turquoise Ridge, and I suggest that similar conditions were affecting the use and ratios of lagomorphs at LA 457. The repeated occupation of LA 457 by Mesilla phase groups suggest that it was an important locality but that mobility was still a primary adaptive strategy in which subsistence practices were related to their movement on and use of the landscape, not to the intensification of agriculture.

Conclusions

The small faunal assemblage recovered from the Mesilla phase component at LA 457 has provided yet another example of the intense use of lagomorphs associated with this phase. Lagomorphs form the predominate taxa associated with many of these sites, indicating that the Mesilla phase populations were using hunting techniques that concentrated on the capture of these species as an integral part of their subsistence strategy. At LA 457 this concentration on the procurement of lagomorphs resulted in an assemblage with a lagomorph index that reflected the use of jackrabbits to a significantly greater degree than cottontails. In a similar assemblage from Turquoise Ridge, Whalen (1994a) suggests from Bayham and Broughton's faunal analysis that degradation of the environment by agriculture was producing a similar ratio of jackrabbits to cottontails in their faunal assemblage. When Mesilla phase habitation and disposal and subsistence patterns are considered along with the analysis of the lagomorphs from LA 457, it is clear that agricultural degradation of the landscape is not a sufficient explanation for the proportion of jackrabbits to cottontails in the Turquoise Ridge or LA 457 faunal assemblages.

These residentially mobile hunters and gatherers were including horticulture in their subsistence regime, but the intensity of this use of cultigens is still in question, and the impact of cultivation on the landscape is unknown. Environmental fluctuations in rainfall and resultant vegetational changes provide a variation in habitat from year to year. Sparser vegetational cover is preferred by jackrabbits, and drier years would result in more of this sparse vegetational cover and more jackrabbits to be taken by these populations.

The use of various hunting techniques also results in the differential procurement of jackrabbits or cottontails. Rabbit drives and bow and arrow hunting tend to extract animals that run from their predators, such as jackrabbits, while traps and other individual hunting techniques tend to take animals that hide, such as cottontails. The predominance of jackrabbits in the LA 457 sample is interpreted as the result of both environmental changes and the use of hunting techniques that favor the procurement of jackrabbits.

The disparate preservation of lagomorph (both jackrabbit and cottontail) mandibles when compared to postcranial remains provided evidence for probable processing and cooking practices used by the Mesilla phase inhabitants of LA 457. The mandible, a dense cranial element, was preserved and recovered far more often than postcranial long bones of similar density. The crania and probably the loose skin of these rabbits were removed during processing with roasting and or stewing affecting only the postcranial remains, leaving the mandibles better preserved and more recoverable in this sample.

The distribution of the faunal remains recovered from the various excavation areas at LA 457 illustrates a general disposal pattern primarily in activity areas surrounding features and structures. There was some occasional site maintenance and secondary discard, but the general pattern indicates that an single Mesilla phase occupation was fairly short, and in subsequent occupations, new facilities were constructed, and the abandoned features were used for occasional refuse disposal.

The faunal remains provide a picture of a hunting and gathering population concentrating on the procurement of small mammals, especially lagomorphs. The predominance of jackrabbits was a result of the mix of environmental and cultural parameters and is similar to parameters that existed at other Mesilla phase sites.

SKELETAL ANALYSIS

Ann Noble

Disarticulated skeletal remains recovered from Excavation Area 42 in the lower fill of the large pithouse at LA 457 were analyzed by OAS personnel. Two individuals were represented by the bones recovered. The skeletal remains are in extremely fragmentary condition. One of the individuals was approximately five years old at the time of death, and the other was a young adult.

Burial 1

The child is represented by approximately 50 skull fragments, including the left petrous portion of the temporal, an orbit fragment, the central portion of the hyoid, and the left malleus. A small section of the right side of the mandible body containing the first and second deciduous molars and a fragment of the coracoid process were also recovered. Thirty-seven teeth were found with the fragmentary skull.

The deciduous dentition includes one upper central incisor, two lower lateral incisors, three canines, two lower first molars, and two lower second molars. Permanent dentition is represented by two upper central incisors, one lower central incisor, both upper lateral incisors, all four canines, five premolars, and seven molars. Only one of the molars exhibits any indication of wear in the permanent teeth, so apparently it was the only permanent tooth to have erupted.

The lower portion of the skeleton is also extremely fragmentary in nature, with apparent postmortem breakage.

The axial skeleton consists of 12 neural arch and three centrum fragments, the complete left clavicle, 40 rib body fragments, and five right and five left vertebral end fragments of ribs.

The appendicular skeleton is represented by the left humerus shaft, the left ulna shaft, both fibula shafts, one femur fragment, and numerous small fragments of longbone shafts, which were nonreconstructible. Five metatarsals represented by shaft fragments and one phalanx were also recovered. No epiphyses were recovered.

The sex of the child was not determined due to the lack of secondary sexual characteristics that show up in the skeleton after puberty. The age of the individual was determined by tooth eruption sequences (Bass 1979).

One pathological process was noted in the skeleton. The fragment of the eye orbit that was recovered shows quite pronounced evidence of cribra orbitalia, indicating that the child suffered from malnutrition or a metabolic disease that interrupted absorption of nutrients, causing malnutrition. None of the bones of the vault of the skull show any sign of pitting or porosity, which is frequently associated with orbital porosity, nor do the teeth show any sign of hypoplasia, which is often a good indicator of malnutrition as well.

The only anomaly observed was slight shovel shaping in the central permanent incisors, which indicates that the child was probably from a Native American population.

Burial 2

The adult skeleton is represented only by a fragment of the distal portion of the left ulna, one proximal end and shaft of a second metacarpal, and one carpal, the lunate. Although it is difficult to ascertain sex from such a fragmented assemblage, these remains are probably from a female because the bones are quite gracile. The individual is probably in her early twenties, since the line of union between the shaft and the epiphysis is still evident in the ulna.

FLOTATION ANALYSIS

Mollie S. Toll

Seven flotation samples were taken from LA 457. The site is in a creosotebush shrub-grassland in the lower foothills of the western slope of the Sacramento Mountains, at the outlet of Dry Canyon. Only a small portion of this very large site was encountered in the proposed highway right-of-way. Residential structures sampled for flotation included a saucer-shaped depression (Feature 29) with a hearth built directly on the floor and a large pit structure (Feature 42). Three extramural storage pits were also sampled.

LA 457 is relatively shallow (deposits average less than 0.5 m below the surface) and has been disturbed in places. Pits were apparently cleaned out prehistorically, and fill consisted chiefly of postoccupational material. The carbon-14 dates range mostly from A.D. 455 to 531.

The seven soil samples collected during excavation were processed in the laboratory by the simplified "bucket" version of flotation (Bohrer and Adams 1977). Samples were measured by volume in the lab and ranged from 600 to 1900 ml. Each sample was immersed in a bucket of water, and a 30-40 second interval was allowed for settling out of heavy particles. The solution was then poured through a fine screen (about 0.35 mm mesh) lined with a square of chiffon fabric, catching organic materials floating or in suspension. The fabric was lifted out and laid flat on coarse-mesh screen trays, until the recovered material had dried.

Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5 mm mesh) and then reviewed under a binocular microscope at 7-45x. Samples 1, 2, and 7 were sorted entirely. The smallest size particles (those caught in the 0.5 mm mesh screen and those passing through all screens) were subsampled in the remaining four samples; in these cases, an estimated number of seeds for the total sample was calculated. For all samples, the actual number of seeds encountered is reported, as well as an adjusted number (estimated total of seeds per liter of soil) that takes into account subsampling and nonstandard soil sample sizes.

From each of the two flotation samples with sufficient charcoal (Samples 3 and 6), a sample of 20 pieces of charcoal was identified (10 from the 4 mm screen and 10 from the 2 mm screen). Each piece was snapped to expose a fresh transverse section and identified at 45x. Low-power, incident-light identification of wood specimens does not often allow species- or even genus-level precision but can provide information useful in distinguishing broad patterns of utilization of a major resource class.

Results

Feature 29, a shallow, saucer-shaped depression thought to have functioned as a residence, contained chiefly unburned seeds that are likely modern contaminants (Table 45). Russian thistle, introduced to this country in the nineteenth century, is an obvious intrusive in this provenience, and most other species present have little economic utility. Seeds, including the grass caropses, are in relatively undeteriorated form. This is the only sample location at LA 457 that lacked carbonized corn remains.

Feature 33, one of several extramural pits, contained only charred corncob fragments (cupules). The fill in Feature 36, a similar pit, also contained corn cupules, the only plant debris that could be related to the prehistoric occupation (unburned contaminants were present in addition). Tiny fragments of charcoal from this pit included a variety of woods (juniper, saltbush, mesquite, and an undetermined nonconifer; Table 46). A pithouse, Feature 41, may have been filled with trash. Higher-density corn remains were joined by charred grass seeds, hedgehog cactus, and knotweed. A carbon-14 date of A.D. 790 indicates Feature 41 was used late in the span of site occupation.

Feature 42, a large pit structure, produced a variety of carbonized floral materials in the two sampled proveniences. Carbonized corn was present in both locations. Pigweed, grass, and prickly pear seeds were also present in the hearth, while wild potato and hedgehog cactus seeds were present in floor fill. The hearth dated to A.D. 430 and contained a variety of fuel types.

Discussion

Despite shallow, disturbed deposits and a fairly early date, botanical materials from LA 457 are able to tell us several interesting things about plant utilization at this site. Initially, remains large enough to be recognized as corn were entirely lacking at this site, and it was assumed that the site was preagricultural. However, microscopic corncob fragments were present in nearly every flotation sample and numerous in some locations, indicating that farming was indeed part of the economic adaptation at this large, early site. Wild economic plants utilized at this site (recovered chiefly from Features 41 and 42) include several weedy annuals, grasses, and two types of cactus. Firewood (including possible reused construction materials) exhibits a variety of wood types, including coniferous types of the Sacramento foothills, mesquite, and riparian and shrubby types. This indicates that site inhabitants traveled short distances to a number of different ecozones to procure wood.

CONCLUSIONS

Excavation or testing data on Early Mesilla (or Early Formative) pithouse sites from A.D. 200 to 750 is minimal in the Tularosa Basin and Hueco Bolson areas and in the Mesilla Bolson, slightly to the west. Whalen (1994b) reports only four excavated pithouses within this area. We can add three more sites (Whalen 1994b; Zamora 1993; and LA 457) to that total. Thus, LA 457 becomes a very important site in terms of a contribution to our understanding of this early prehistoric settlement period in southeast and south-central New Mexico.

Chronology

Nine radiocarbon dates were obtained from six cultural features at the site (Table 3). These range from very Late Archaic, at a mean cal. date of 40 B.C., to the Mid-Mesilla phase, at cal. A.D. 790. Most fall between A.D. 455 and A.D. 531.

The Late Archaic occupation is represented by two dates: cal. 30, 20, 10 B.C.; and 90 and 70 B.C. These were obtained from pit fill inside of a surface structure (Unit 29) and from the floor of a large pithouse (Unit 42). However, both dates are overlain by later cal. A.D. 400s dates, suggesting that these earlier Archaic dates may represent an old wood problem. The recovery of numerous Archaic projectile points does argue, however, for an Archaic presence on the site.

All other dates fall within the Early Mesilla (Early Formative) phase between cal. A. D. 250 and 790. These dates confirm the presence of El Paso Brown wares, dating as early as cal. A.D. 250, and definitely establish a brown ware tradition by the mid-A.D. 400s for the northern Tularosa Basin. Ninety-seven percent of all recovered sherds were El Paso Brown wares, and many of the jar rims were pinched, a suggested characteristic of early brown wares (see ceramics section). Nonlocal wares are few and limited mostly to Chupadero Black-on-white and Mimbres Black-on-white. The majority were recovered from the surface and upper levels of the site, probably present as sheet wash from the nearby El Paso phase component at LA 457, the Tony Colon site.

Settlement Pattern

Most Mesilla phase sites have been recorded on the basin floors and along the lower Rio Grande Valley (Whalen 1994b:26). These sites are almost always small and usually consist of a light scatter of artifacts associated with one or more hearths. Pithouses of this period found on the basin floors are invariably shallow, with low floor areas, and are few in number. Very few pithouse sites have been recorded for the alluvial fans and low hills around the margins of the basins, although sherd and lithic artifact scatters are not uncommon.

After A.D. 1000, during the Transitional and El Paso phases, roomblocks appear on these marginal fans and rarely, if ever, on the basin floors. This patterning has suggested to archaeologists that Early Mesilla settlements were scattered across the basin floors, small, and very ephemeral, with minimal labor investment, which all suggest a high degree of mobility. But as populations increased through time and as food resources on the basin floors became competitively controlled or scarcer, it is likely that, by A.D. 1000, settlements made use of the graveled and better-watered alluvial fans on the edges of the basins, where horticultural pursuits were possible.

More recently, while this basic pattern seems to hold, refinements have been presented that heighten our appreciation of mobility for all periods within southern New Mexico's desertic environment but which also blur the cultural boundaries between phases. Laumbach (1986:A-2, A-3) sees early pithouse sites not only as isolates on the basin floor but as possibly aggregating into small villages near potentially arable land by A.D. 400, somewhat earlier than the traditional view. He also sees a fairly rapid progression, by A.D. 500, to placement of settlements at canyon mouths and higher alluvial terraces, where agriculture was definitely possible. LA 457, which seems to represent continued use of an area by small population groups from the Late Archaic up to the El Paso phase at post-A.D. 1000, fits this scenario very well. In other words, population movement to higher locations off of the basin floor occurred before Late Pithouse or Pueblo period times (Carmichael 1990:125; Whalen 1981:88). It may have taken place from as early as the Late Archaic, at least in the northern Tularosa Basin. But as Carmichael suggests (1990:126), even utilization of these areas by later Pueblo times does not necessarily infer settlement permanence. He believes that a fair degree of mobility and seasonal population movement probably still occurred late in prehistory.

Whalen (1994a:632) writes that during the Mesilla phase, seasonal sites were occupied in the higher basin edges in winter, and gathering and hunting took place on the basin floors in summer and fall. This may be a fairly accurate perception of what occurred in this region. Certainly, large pithouse sites (and sites with large pithouses) are not found in the central basins, and we are beginning to discover them among the higher alluvial fans and in runoff zones. LA 457 may be the only recorded early pithouse site in this area in this type of setting. However, ceramic and lithic scatters of this period are numerous, and as Sebastian (1989:73) points out, many architectural sites could be covered with alluvium. This was definitely true at LA 457, where only a dispersed artifact scatter was recorded on the initial project survey (Haecker 1986). We suspect this is a key factor in the low visibility of early sites here and in the entire southern portion of New Mexico.

In general, it is probable that a fairly high degree of mobility occurred throughout all prehistoric occupation periods. Not just late sites (post A.D. 1000) have been found away from the basin floor on the alluvial fans, but sites of all time periods. Thus, settlement patterns for all Jornada Mogollon phases tend to be more similar than they are dissimilar. Is this a function of cold vs. warm weather resource availability or the much higher potential for agriculture on the graveled and well-watered terraces, which appeals to all populations of whatever time period?

Subsistence

As expected, the bulk of plant remains recovered from the pits at LA 457 represent gathered wild food resources. They include grasses, hedgehog cactus, prickly pear cactus, knotweed, amaranth, and wild potato. Cultigens are represented by corn cupules in several of the structures. Faunal remains from the site include a high percentage of jackrabbits (72.2 percent) followed by cottontails (19.1 percent), suggesting a high dependence on lagomorphs. Artiodactyls constitute only 2.0 percent of the total assemblage. Charcoal recovered from burned pit fills and hearth areas reveal use of a variety of fuel woods, including mesquite, juniper, piñon, indeterminate conifer, saltbush, and cottonwood/willow.

The presence of corn cupules is confirmed in two pit structures (Units 41 and 42) and the two extramural storage pits (Units 33 and 36). Dates obtained for these features are cal. A.D. 430 (Unit 42) and A.D. 790 (Unit 41). Slab and loaf manos found throughout the site suggest the processing of cultigens near all cultural features. However, the degree of dependency on corn agriculture cannot be determined from these findings because of the small sample size. Only an unknown percentage of use of the cultigen by site occupants can be validated beginning at least by cal. A.D. 430. The practice of at least incipient agriculture by populations at this time may explain the specific location for LA 457 at the mouth of Dry Canyon in a runoff zone on moisture-retaining graveled soils.

Summary

LA 457 is important to our understanding of early pithouse settlements in the northern Tularosa Basin and throughout southern New Mexico because of the excavation of radiocarbon-dated structures, the early dates for those structures, the fact that structures are present, the recovery of corn remains, and its location off of the basin floor in a well-watered ecotone. We are still so limited in our ability to explicate Mesilla phase settlement patterns, including seasonal or short-term movements, that almost any site with good dates and sufficient artifact and ancillary data increases our knowledge by leaps and bounds.

By no means do we think LA 457 is a unique site by virtue of its location, presence of pit structures, and at least incipient agriculture. In fact, it is probably only the beginning of the eventual discovery of quite a few Early Mesilla phase sites in locations where agriculture or the exploitation of a variety of environmental niches can be pursued.

RECOMMENDATIONS

LA 457 is an important site for understanding the Mesilla phase of the Jornada Mogollon within the context of the prehistory of the northern Tularosa Basin. The testing program was conducted in multiple stages and proved to be quite extensive. A number of pithouses, surface structures, and pits were revealed within the proposed highway right-of-way. The data recovered from these cultural features provided information on Mesilla phase architecture, artifact typologies, settlement patterns, and subsistence. Perhaps most importantly, the study established a good chronometric sequence for occupation of the site specifically and for the northern Tularosa Basin in general.

We believe that these data are sufficient to interpret site activities and produce a synthesis of cultural processes for the area within the right-of-way. The site obviously extends outside of highway project limits, and these portions are available for future investigation. Therefore, we recommend that no further archaeological work be performed in the portion of LA 457 within the proposed highway right-of-way.

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Table 1. Testing data

Test	Depth (cm)	Auger	Soil	Artifacts*
1	80	-	Rocks. Gravel. Hit rocks and gravel layer.	-
2	60	103	Rocks. Gravel. Slight charcoal. Hit fine soil.	FSGB
3	35	82	Rocks. Gravel. Some charcoal. Hit cobble layer.	FS
4	75	102	Gravel and small rocks. Ash. Turns to fine sand.	FSLG
5	100	154	Sandy. Charcoal. Some ash. Hit sand.	FSLB
6	105	162	Sand and clay. Some gravel. Slight charcoal. Hit gravel.	FSGB
7	85	126	Clay, loamy. Some charcoal. Hit gravel, then sand.	SG
8	60	98	Compact. Some charcoal. Hit gravel.	SLGB
9	65	99	Loamy. Some charcoal. Hit gravel.	SLGB
10	30	65	Compact. Sand and clay. Some charcoal. Hit gravel.	SL
11	20	65	Gravels. Compact. Hit fine soil.	SLB
12	30	47	Compact. Some gravel. Hit rocks.	SL
13	30	65	Sandy. Hit gravels.	SL
14	30	60	Sandy. Gravels. Same throughout.	L
15	10	32	Gravel. Rocks. Hit gravel layer.	SL
16	25	61	Sand. Gravels. Hit gravel layer.	L
17	10	54	Gravels. Hit sand and gravel.	-
18	50	193	Rocky. Rodent activity. Slight charcoal. Hit fine soil.	L
19	40	70	Gravels throughout.	L
20	30	60	Gravels with some sand. Hit gravel layer.	LG
21	30	54	Compact. Gravels. Hit gravel layer.	SL
22	20	138	Gravels. Hit clay.	S
23	20	40	Compact. Hit gravels.	L
24	30	113	Gravels. Slight charcoal. Hit fine sand.	SL
25	30	70	Sandy loam. Slight charcoal. Hit sand.	S
26	30	83	Compact. Some charcoal. Hit gravel layer.	FSLG
27	40	155	Compact. Slight charcoal. Hit gravel.	SLG
28	60	94	Slightly compacted. Charcoal. Hit cobble layer.	FSLGBK
29	80	102	Slightly compacted. Charcoal. Hit sand.	SLGBK
30	40	120	Clay. Hit cobbles.	SL

Test	Depth (cm)	Auger	Soil	Artifacts*
31	40	80	Rocks. Hit sand.	SL
32	40	130	Gravels. Hit sand.	FSL
33	70	105	Clay. Charcoal. Some ash. Hit sand.	SLGB
34	70	99	Clay. Charcoal. Hit sand.	FSLGB
35	30	54	Gravels. Hit sand.	SL
36	70	92	Gravels. Slight charcoal. Hit sand.	FSLGB
37	40	60	Large rocks. Gravel layer. Hit sand.	SLG
38	20	42	Some rocks. Hit sand.	SL
39	65	84	Gravels. Hit sand.	SL
40	55	81	Slight gravels. Hit layer of gravel.	SLG
41	120	142	Compact. Gravel. Some charcoal. Hit sand.	SLGB
42	145	175	Compact. Gravel. Some charcoal. Hit sand.	SLGB
43	35	58	Compact. Some rocks. Hit sand.	SL
44	90	109	Compact. Some rocks. Hit sand.	SL
45	20	44	Compact. Gravels. Hit sand.	SLB
46	20	49	Compact. Gravels. Hit sand.	SL
101	30	77	Silty. Small rocks. Hit caliche-covered cobbles.	SL
102	50	79	Slight charcoal. Some ash. Hit cobbles and sandy soil.	SL
103	50	98	Slight charcoal. Rodent activity. Hit cobbles.	SLB
104	40	84	Fine soil. Hit small rocks.	SL
105	40	66	Fine, silty soil. Hit cobbles.	SL
106	20	52	Compacted from surface traffic. Hit small rocks.	SL
107	30	73	Rocks throughout. Hit cobble layer.	SL
108	30	72	Gravels. Silty. Hit small cobbles.	SL
109	20	63	Compact. Hit small rocks.	SL
110	20	68	Loam. Hit large cobbles.	S

* S, sherds; L, lithics; F, fire-cracked rock; G, ground stone; B, bone; M, miscellaneous (ornaments)

Table 2. Features recorded in telephone trench

Feature	Dimensions	Depth (m)	Description
Storage Pit A	.20 by .20 cm	.92	Charcoal-flecked, ash. One El Paso Brown.
Ash Lens B	5.6 m long	.48	Charcoal-flecked.
Storage Pit C	.76 by .76 m	.38	Ash in bottom. Pit 45 cm below surface.
Storage Pit D	.68 by .68 m	.38	Burned dirt, ash. Pit 42 cm below surface.
Storage Pit E	.30 by .30 m	.25	Charcoal-flecked. Pit 35 cm below surface.

Table 3. Calibrated radiocarbon dates

Unit	Beta Sample	Radiocarbon Age (B.P.)	Calibrated 1 Sigma	Calibrated 2 Sigma	Calibrated Date*	Context
8	17322	1780±80	A.D. 140-82	A.D. 75-428	A.D. 250	burned surface
28	17323	1560±110	A.D. 405-629	A.D. 248-672	A.D. 540	pit fill
29	17324	1620±70	A.D. 389-542	A.D. 256-606	A.D. 430	burned surface
29	17325	1640±80	A.D. 340-538	A.D. 239-606	A.D. 420	lower fill
29	17326	2030±90	157 B.C.-A.D. 76	348 B.C.-A.D. 200	30, 20, 10 B.C.	Pit 3 fill
41	17328	1220±60	A.D. 719-888	A.D. 670-979	A.D. 790	Floor fill
42	17329	2090±170	369 B.C.-A.D. 84	480 B.C.-A.D. 324	90, 70 B.C.	Floor
42	17330	1610±140	A.D. 260-610	A.D. 124-677	A.D. 430	hearth
44	17331	1520±60	A.D. 454-620	A.D. 418-653	A.D. 550	pit fill

Table 4. Rim forms and rim sherd indices, El Paso Brown wares

Unit	Bowl		Jar		
	Flattened	Rounded	Pinched	Flattened	Rounded
33 (L4)					.90 .60
(Pit fill)			.90		
34 (L1)				.70	.79
(L3)	.90				
(L4)					.67* .64* .63*
(L5)				.89	

35 (L2)					.81
36 (L1)			.84	1.00	
(L4)					.62
37 (L1)			.75		
38 (Bladed)			.61		
39 (Bladed)				.53	
41 (Surface)					.63
(Floor)			.85 .68	.85 .68	.84 .79 .76
(Pit fill)	.77			.92	1.18 .86
(Bladed)				.77	
42 (Floor fill)	.73 .59				.82 .90
(Pit fill)				.91	
(Bladed)					.98 .67
(L14)					.67
44 (Floor fill)				.65	
(Bladed)	1.00 .95				
5/6 (Surface)				.92 .52	.48
6/7 (Surface)					.73 .56
7 (L1)				.91	
(L2)					.77
8 (Surface)	.94 1.77			.68	.76
8 (L1)				1.00 1.49	
8 (L5)			.85		
8 (Bladed)					.66
11 (L2)				.89	
28 (Surface)				.59 .94 1.00	

(L1)				.51 .84 .52	.75 .89 1.00
(L2)				1.22	.88
(L3)		.89		.92 .73	.89 .70
(L5)				.86 .69 .88	
(Floor)					.58
(Pit fill)				.69 1.00 .85 .80	
(Bladed)				.79	.95 .53 .64 .69 .79
29 (Surface)				.65 .71	
29 (L2)				.75 .94	.85 .74
29 (L3)				1.52	
29 (Pit fill)					.79
31 (L1)					.65
33 (L2)				.81	.82 .74 1.00

* same vessel
Note: Sample includes three indeterminate vessel rim sherds with pinched rims and one with thickened rim.

Table 5. Averages of rim sherd indices by vessel form, El Paso Brown wares

Rim Sherds	Bowl			Jar	
	Flattened	Round	Pinched	Flattened	Round
Frequency	6	3	7	40	44
Range	.77-1.77	.73-.89	.61-.90	.51-1.52	.48-1.00
Mean	1.06	.74	.78	.81	.71
SD	.33	.12	.10	.22	.14
Mode	0	0	.85	1.00	.79

Table 6. Rim sherds used to estimate rim neck diameter of El Paso Brown Ware jar

Provenience	Level	Rim Type	Estimated Diameter (cm)
41	floor	direct pinched	9
41	floor	inverted rounded	18
34	fill	direct rounded	12

Table 7. Ceramic types from lower levels

Ceramic Type	Provenience and Level
Early El Paso Brown Ware rims	28, floor
	29, lower fill
	33, lower fill
	41, floor, lower fill
	42, lower fill
El Paso Polychrome	blading
Chupadero Black-on-white	blading
Mimbres Black-on-white	Levels 1 and 2
San Andres and Three Rivers Red-on-terracotta	Levels 1-3

Table 8. Ground stone material types

Material Type	Count	Percent
Coarse-grained sandstone	68	43
Fine-grained sandstone	19	12
Limestone	26	17
Slate	1	1
Quartzitic sandstone	16	10
Quartzite	6	4
Igneous	20	13
Total	156	100

Table 9. Dimensions of convex loaf manos (cm)

Shape	Length	Width	Thickness
Two-hand forms	32.0	10.5	7.7
	29.8	9.2	9.7
Two-hand fragments	-	11.8	8.6
	-	6.2	5.2
One-hand forms	7.6	7.4	6.4
Preforms	26.8	12.2	9.1
	25.0	7.4	6.8
Mean	24.2	9.0	7.6
Standard deviation	9.7	2.3	1.6

Table 10. Dimensions of biconvex loaf manos (cm)

Shape	Length	Width	Thickness
Two-hand forms	15.2	8.1	5.0
One-hand forms	8.0	6.9	5.6
	-	9.0	6.8
	-	7.6	4.8
End fragments	-	7.7	4.9
	-	9.4	6.5
Mean	11.6	8.0	5.6
Standard deviation	5.1	.8	.8

Table 11. Dimensions of true loaf manos (cm)

Shape	Length	Width	Thickness
Two-hand	17.8	8.4	7.6
Two-hand fragment	-	10.0	9.9
One-hand	11.3	7.8	6.4
One-hand fragment	-	8.3	4.5
Mean	14.5	8.6	7.1
Standard deviation	4.5	.9	2.2

Table 12. Dimensions of slab manos (cm)

Shape	Length	Width	Thickness
Mean	16.5	11.3	4.6
Standard deviation	4.3	1.7	1.9
Range	11.9-24.4	7.6-14.9	2.8-7.4

Table 13. Dimensions of two-hand convex slab manos (cm)

Shape	Length	Width	Thickness
Two-hand convex	18.4	12.7	4.7
	19.7	14.9	7.4
	18.3	11.7	4.3
Mean	18.8	13.1	5.4
Standard deviation	.7	1.6	1.6

Table 14. Dimensions of flat-surfaced, one-hand manos (cm)

Shape	Length	Width	Thickness
Mean	13.3	8.6	4.9
Standard deviation	.4	4.1	1.2
Range	13.0-13.8	7.6-14.9	2.8-7.4

Table 15. Dimensions of faceted one-hand cobble manos (cm)

Shape	Length	Width	Thickness
Faceted one-hand manos	9.8	9.8	7.4
	8.1	5.6	5.7
	9.1	7.5	6.2
Mean	9.0	7.6	6.4
Standard deviation	.8	2.1	.8

Table 16. Dimensions of expedient one-hand cobble manos (cm)

Shape	Length	Width	Thickness
Mean	9.3	6.8	5.0
Standard deviation	1.5	1.7	.9
Range	7.7-11.6	4.8-10.0	3.1-6.3

Table 17. Dimensions of flat-surfaced, smooth-textured manos (cm)

Shape	Length	Width	Thickness
Mean	10.6	7.1	4.6
Standard deviation	1.4	1.2	1.4
Range	8.8-12.8	4.5-8.8	2.0-6.6

Table 18. Dimensions of smooth-surfaced, smooth-textured manos (cm)

Shape	Length	Width	Thickness
Smooth-surfaced manos	11.8	8.0	4.1
	5.8	6.0	2.8
	-	9.4	4.1
	-	-	6.9
	-	6.8	5.0
Mean	6.8	7.5	4.5
Standard deviation	3.0	1.4	1.5

Table 19. Dimensions of small, coarse-textured handstones (cm)

Shape	Length	Width	Thickness
Small handstones	7.1	4.3	2.2
	5.5	4.0	3.0
	5.7	3.8	2.5
	-	5.3	2.2
	-	5.9	2.6
Mean	6.1	4.6	2.5
Standard deviation	.8	.9	.3

Table 20. Dimensions of basin metates (cm)

Shape	Length	Width	Thickness
Basin Metate 1	20.9	18.4	12.4
(Basin area)	9.0	8.5	1.0
Basin Metate 2	19.2	23.8	12.8
(Basin area)	14.0	11.0	1.0
Basin Metate 3	15.4	15.2	9.5
(Basin area)	-	-	1.2

Table 21. Dimensions of cobble base stones (cm)

	Length	Width	Thickness
	14.7	13.1	7.7
	17.4	15.8	5.4
	15.3	9.9	6.7
	10.0+	10.4	2.9
Mean	15.8	12.3	5.6
Standard deviation	1.4	2.7	2.0

Table 22. Dimensions of large polishing stones (cm)

	Length	Width	Thickness
Mean	7.5	6.2	3.7
Standard deviation	1.1	1.0	1.8
Range	6.2-8.7	4.9-8.4	3.0-6.4

Table 23. Ground stone from U.S. 82 testing

Unit	Loaf Mano	One-hand Mano	Indeterminate Mano	Slab Metate	Indeterminate Ground Stone	Polishing Stone	Total
107	1						1
108				1			1
BH 1				1			1
BH 2		1			1		2
BH 4						1	1
258-263	1		1		1		3
421-451			1				1
Stake 155-S		1					1
Total	2	2	2	2	2	1	11

Table 24. Shapes and textures of ground surfaces

Shape	Fine	Coarse	Total	Percent
Convex	71	22	93	49
Flat	65	17	82	43
Concave	7	5	12	6
Inverse saddle	1	-	1	.5
Conical	-	1	1	.5
Indeterminate	1	-	1	.5
Total	145	45	190	

Table 25. Tool frequency by material type

Material Type	% of Assemblage	Tool Frequency (does not include cores)
Local chert	32.8	217
Limestone grades	6.0	40
San Andres limestone	53.0	350
Quartzite	.3	2
Exotic chert	7.5	50
Silicified wood	.1	1
Obsidian	0.0	0

Table 26. Frequency of whole unmodified flakes

Tool Type	Frequency
Core flakes	967
Biface reduction	3
Uniface reduction	2
Blade	4
Bipolar	1
Undetermined tool	32
Total	1009

Table 27. Mean whole flake dimensions among material types (mm)

Material	Length	Width	Thickness	Count
Local chert	22.8	20.3	6.6	403
Limestone grades	30.7	27.5	8.5	136
High quality chert	25.3	23.4	6.3	23
Quartzite	33.1	23.0	7.2	8
Silicified wood	24.0	21.0	5.0	2

Table 28. Core types and frequencies

Core Type	Frequency	Percentage
Unidirectional	25	21
Bidirectional	25	21
Multidirectional	70	57
Unidirectional/Bidirectiona l	1	1
Total	121	100

Table 29. Mean core dimensions by material types (cm)

Material Type	Length	Width	Thickness	Count
Limestone	69.6	57.5	44.3	87
Limestone grades	58.6	50.7	43.7	14
Local chert	40.4	33.0	26.8	19
Quartzite	6.3	4.3	3.1	1

Table 30. Mean dimensions of complete scrapers by material type

Material Type	Length	Width	Thickness	Count
Local chert	2.9	2.5	1.0	34
High quality chert	2.9	2.4	.7	4
Limestone	5.0	4.3	1.7	193
Limestone grades	4.2	3.7	1.4	20
Total				251

Table 31. Mean dimensions of whole cutting tools

Material Type	Length	Width	Thickness	Count
Local chert	3.0	2.4	.8	20
High quality chert	2.4	2.5	.6	3
Limestone	4.3	3.5	1.1	56
Limestone grades	3.5	2.2	.6	8
Total				87

Table 32. Dimensions of complete scraper/choppers

Length	Width	Thickness
11.4	9.0	4.1
8.5	7.9	3.5
7.3	5.3	2.3
7.8	6.9	2.1
5.8	3.9	2.5
X= 8.1	X= 6.6	X= 2.9

Table 33. Dimensions of complete scraper/drills

Material Type	Length	Width	Thickness
Chert	2.7	2.3	1.0
Limestone	5.2	3.7	1.7
	5.0	4.3	2.0
	4.2	3.7	1.2
	3.7	2.1	1.0
Mean	4.1	3.2	1.3

Table 34. Dimensions of complete scraper/spokeshaves

Material Type	Length	Width	Thickness
Limestone	4.9	3.1	1.3
	4.5	4.1	1.5
Black chert	2.9	1.9	.8
	2.6	1.6	.8
Fossiliferous chert	4.4	2.2	1.2
Mean	3.8	2.5	1.1

Table 35. Mean dimensions of complete drills

	Length	Width	Thickness
Mean	4.3	2.6	1.0
Standard deviation	1.2	1.0	.3
Range	2.2-7.3	1.4-5.7	.3-2.0

Table 36. Mean dimensions of complete spokeshaves

	Length	Width	Thickness
Mean	3.7	2.7	.9
Standard deviation	1.2	1.2	.4
Range	2.2-6.3	1.0-5.6	.4-1.8

Table 37. Provenience of projectile points

Point Type	Number	Provenience
Early Barbed/Castroville	1	Pit Structure 28, Level 2
Gary	1	Large Surface Structure 29, Level 1
Desmuke	1	Large Pit Structure 42, surface
Marcos	1	Surface
Kent	1	Small Pit Structure 28, Level 2
	1	Small Pit Structure 33, pit fill
Late Archaic	1	Surface
Catan	1	Small Pit Structure 28, Level 3
	1	Small Surface Structure 28, Level 3
Tortugas	1	Level 1, no feature
Scallorn	4	Small Pit Structure 28, Levels 2-5
	1	Large Pit Structure 29, Level 2
	1	Large Pit Structure 42, pit fill
	2	Small Pit Structure 33, Level 1
	2	Trench 32, Levels 2-3
	1	Level 1, no feature

Table 38. Scallorn point material types and dimensions (cm)

Material Type	Length	Width	Thickness
Light brown chert	3.5	1.4	.5
Red-brown chert	1.9	1.6	.2
Gray chert	-	1.1	.2
	2.4	1.2	.3
Black chert	-	-	.3
Light brown fossil chert	-	1.2	.3
White chert	-	-	.3
Gray chert (heated)	-	-	.3
Tan chert	-	-	.3
Dark brown fossil chert	-	-	.2
Mean	2.6	1.3	.3

Table 39. Concentrated distributions of lithic artifacts

Provenience	Tools	Debris	Cores	Points	Total
Surface Structure 28	62	249	12	11	334
Pit Structure 42	25	105	3	1	134
Surface Structure 29	97	329	25	3	454
Storage Pit 41	13	87	7	-	110
Trench 31	2	5	-	-	7
Trench 32	5	8	-	-	13
Trench 38	-	14	-	-	14
Trench 39	6	19	-	-	25
Trench 40	1	2	-	-	3
Blading, Features 28/29	41	137	10	1	189
Blading, Features 28/33	12	20	7	-	39
Total	267	975	64	18	1324
Percentage of site	20.1	73.6	4.8	1.3	

Table 40. Faunal remains by taxonomic frequency

Taxon	NISP	Percent Total	Percent Identified
Mammal	22	2.4	
Small mammal	327	36.4	
Medium mammal	45	5.0	
Large mammal	47	5.3	
Spermophilus variegatus (Rock squirrel)	1	0.1	0.2
Thomomys bottae (Botta's pocket gopher)	2	0.2	0.4
Dipodomys spectabilis (Banner-tailed kangaroo rat)	1	0.1	0.2
Neotoma albigula (White-throated woodrat)	1	0.1	0.2
Family Leporidae (Rabbits)	21	2.3	4.7
Sylvilagus auduboni (Desert cottontail)	86	9.6	19.1
Lepus californicus (Black-tailed jackrabbit)	326	36.3	72.2
Mephitis sp. (Skunks)	1	0.1	0.2
Artiodactyla (Even-toed hoofed mammals)	8	0.9	1.8
Odocoileus hemionus (Mule deer)	1	0.1	0.2
Aves (Birds)	5	0.6	
Family Corvidae (Jays, magpies, and crows)	1	0.1	0.2
Aphelocoma ultramarina (Mexican jay)	2	0.2	0.4
Salienta (Frogs and toads)	1	0.1	0.2
Total	898	100.0	100.0

Table 41. Chi-squared adjusted residuals for lagomorph element distribution

Element	Cottontails			Jackrabbits		
	Observed	Expected	Chi-square Adjusted Residual	Observed	Expected	Chi-square Adjusted Residuals
Cranial complex	8	5.64	1.16	19	21.36	-1.16
Maxillary region	2	1.88	0.10	7	7.12	-0.10
Mandible	20	13.78	2.06	46	52.22	-2.06
Tooth	9	6.47	1.16	22	24.53	-1.16
Vertebrae	0	1.46	-1.37	7	5.53	1.37
Rib	0	0.21	-0.51	1	0.79	0.51
Scapula	4	5.84	-0.89	24	22.15	0.89
Innominate (single)	3	3.34	-0.21	13	12.66	0.21
Humerus	5	4.17	0.46	15	15.82	-0.46
Radius	3	7.31	-1.87	32	27.69	1.87
Ulna	4	3.55	0.28	13	13.45	-0.28
Carpals	0	0.63	-0.89	3	2.37	0.89
Metacarpals	0	0.83	-1.03	4	3.16	1.03
Femur	9	6.47	1.16	22	24.53	-1.16
Tibia	9	6.89	0.94	24	26.11	-0.94
Astragalus	0	2.30	-1.73	11	8.70	1.73
Calcaneum	0	2.92	-1.96	14	11.08	1.96
Metatarsals	10	9.60	0.15	36	36.40	-0.15
Phalanges	0	2.71	-1.88	13	10.29	1.88

Chi-square = 26.40, df=18 (not significant at p=0.01)

Table 42. Faunal remains by test trench unit

Taxon	Test Trenches											
	2		5		6		8		9		28	
	N	%	N	%	N	%	N	%	N	%	N	%
Mammal (indeterminate)	-	-	-	-	-	-	-	-	-	-	6	3.0
Small mammal	-	-	7	63.6	10	66.7	1	6.7	1	100.0	74	36.5
Medium mammal	-	-	1	9.1	-	-	1	6.7	-	-	4	2.0
Large mammal	2	100.0	-	-	-	-	12	80.0	-	-	2	1.0
Spermophilus variegatus	-	-	-	-	-	-	-	-	-	-	-	-
Thomomys bottae	-	-	-	-	-	-	-	-	-	-	1	.5
Dipodomys spectabilis	-	-	-	-	-	-	-	-	-	-	-	-
Neotoma albigula	-	-	-	-	-	-	-	-	-	-	1	.5
Family Leporidae	-	-	-	-	-	-	-	-	-	-	-	-
Sylvilagus audubonii	-	-	-	-	2	13.3	-	-	-	-	26	12.8
Lepus californicus	-	-	3	27.3	3	20.0	1	6.7	-	-	76	37.4
Mephitis sp.	-	-	-	-	-	-	-	-	-	-	1	.5
Order Artiodactyla	-	-	-	-	-	-	-	-	-	-	5	2.5
Odocoileus hemionus	-	-	-	-	-	-	-	-	-	-	1	.5
Aves	-	-	-	-	-	-	-	-	-	-	3	1.5
Family Corvidae	-	-	-	-	-	-	-	-	-	-	1	.5
Aphelocoma ultramarina	-	-	-	-	-	-	-	-	-	-	2	1.0
Order Salienta	-	-	-	-	-	-	-	-	-	-	-	-
Total	2	100.0	11	100.0	15	100.0	15	100.0	1	100.0	203	100.0

Table 42 (continued). Faunal remains by test trench unit

Taxon	Test Trenches									
	44		45		103		107		Total	
	N	%	N	%	N	%	N	%	N	%
Mammal (indeterminate)	1	14.3	-	-	-	-	-	-	22	2.4
Small mammal	1	14.3	-	-	-	-	-	-	327	36.4
Medium mammal	-	-	2	20.0	-	-	1	100.0	45	5.0
Large mammal	4	57.1	8	80.0	-	-	-	-	47	5.2
Spermophilus variegatus	-	-	-	-	-	-	-	-	1	.1
Thomomys bottae	-	-	-	-	-	-	-	-	2	.2
Dipodomys spectabilis	-	-	-	-	1	50.0	-	-	1	.1
Neotoma albigula	-	-	-	-	-	-	-	-	1	.1
Family Leporidae	-	-	-	-	-	-	-	-	21	2.3
Sylvilagus audubonii	1	14.3	-	-	1	50.0	-	-	86	9.6
Lepus californicus	-	-	-	-	-	-	-	-	326	36.3
Mephitis sp.	-	-	-	-	-	-	-	-	1	.1
Order Artiodactyla	-	-	-	-	-	-	-	-	8	.9
Odocoileus hemionus	-	-	-	-	-	-	-	-	1	.1
Aves	-	-	-	-	-	-	-	-	5	.6
Family Corvidae	-	-	-	-	-	-	-	-	1	.1
Aphelocoma ultramarina	-	-	-	-	-	-	-	-	2	.2
Order Salienta	-	-	-	-	-	-	-	-	1	.1
Total	7	100.0	10	100.0	2	100.0	1	100.0	898	100.0

Table 42 (continued). Faunal remains by test trench unit

Taxon	Test Trenches											
	29		33		34		36		41		42	
	N	%	N	%	N	%	N	%	N	%	N	%
Mammal (indeterminate)	-	-	-	-	-	-	1	1.1	10	5.8	4	1.3
Small mammal	1	8.3	19	54.3	2	66.7	35	37.6	51	29.5	125	39.7
Medium mammal	5	41.7	1	2.9	-	-	25	26.9	-	-	5	1.6
Large mammal	3	25.0	-	-	1	33.3	2	2.2	4	2.3	9	2.9
Spermophilus variegatus	-	-	-	-	-	-	-	-	-	-	1	.3
Thomomys bottae	-	-	1	2.9	-	-	-	-	-	-	-	-
Dipodomys spectabilis	-	-	-	-	-	-	-	-	-	-	-	-
Neotoma albigula	-	-	-	-	-	-	-	-	-	-	-	-
Family Leporidae	-	-	-	-	-	-	-	-	2	1.2	19	6.0
Sylvilagus audubonii	1	8.3	5	14.3	-	-	3	3.2	7	4.0	40	12.7
Lepus californicus	1	8.3	9	25.7	-	-	27	29.0	96	55.5	110	34.9
Mephitis sp.	-	-	-	-	-	-	-	-	-	-	-	-
Order Artiodactyla	-	-	-	-	-	-	-	-	2	1.2	-	-
Odocoileus hemionus	-	-	-	-	-	-	-	-	-	-	1	.3
Aves	1	8.3	-	-	-	-	-	-	1	.6	-	-
Family Corvidae	-	-	-	-	-	-	-	-	-	-	-	-
Aphelocoma ultramarina	-	-	-	-	-	-	-	-	-	-	-	-
Order Salienta	-	-	-	-	-	-	-	-	-	-	-	-
Total	12	100.0	35	100.0	3	100.0	93	100.0	173	100.0	315	100.0

Table 42 (continued). Faunal remains

Taxon	Total Percent
Mammal (indeterminate)	2.4
Small mammal	36.4
Medium mammal	5.0
Large mammal	5.2
Spermophilus variegatus	0.1
Thomomys bottae	0.2
Dipodomys spectabilis	0.1
Neotoma albigula	0.1
Family Leporidae	2.3
Sylvilagus audubonii	9.6
Lepus californicus	36.3
Mephitis sp.	0.1
Order Artiodactyla	0.9
Odocoileus hemionus	0.1
Aves	0.6
Family Corvidae	0.1
Aphelocoma ultramarina	0.2
Order Salienta	0.1
Total	100.0

Table 43. Lagomorph indices and temporal designations for feature areas

Test Trench	Date	Cottontail NISP	Jackrabbit NISP	Total Lagomorph Bone*	Lagomorph Index
Test Trench 28	A.D. 427	26	76	102	0.25
Test Trench 36		3	27	30	0.10
Test Trench 41	A.D. 765	7	96	105	0.07
Test Trench 42	A.D. 342	40	110	169	0.24

* Total Lagomorph bone includes fragments identified as Leporidae.

Table 44. Distribution of faunal remains from the main test trenches

Taxon	Test Trench 28		Test Trench 36		Test Trench 41		Test Trench 42	
	Feature	General Trash	Feature	General Trash	Feature	General Trash	Feature	General Trash
	#/%	#/%	#/%	#/%	#/%	#/%	#/%	#/%
Mammal		6/3.0		1/1.0	6/3.4	4/2.3		4/1.3
Small mammal	13/6.1	61/30.0	22/23.6	13/14.0	22/12.7	29/16.8	1/0.3	124/39.4
Medium mammal		4/2.0	25/26.9				1/0.3	4/1.3
Large mammal		2/1.0	2/2.1		2/1.2	2/1.2		9/2.8
Spermophilus variegatus (Rock squirrel)								1/0.3
Thomomys bottae (Botta's pocket gopher)		1/0.5						
Neotoma albigula (White-throated woodrat)	1/0.5							
Family Leporidae (Rabbits)						2/1.2		19/6.0
Sylvilagus auduboni (Desert cottontail)	10/4.9	16/7.9		3/3.2	6/3.5	1/0.6	1/0.3	39/12.4
Lepus californicus (Black-tailed jackrabbit)	8/3.9	68/33.5	16/17.2	11/11.8	54/31.2	42/24.3	6/1.9	104/33.0
Mephitis sp. (Skunks)		1/0.5						
Artiodactyla (Even-toed hoofed mammals)		5/2.5				2/1.2		1/0.3
Odocoileus hemionus (Mule deer)		1/0.5						
Aves (Birds)		3/1.5			1/0.6			
Family Corvidae (Jays, magpies, and crows)		1/0.5						
Aphelocoma ultramarina (Mexican jay)		2/1.0						
Total	32/15.8	171/84.2	65/69.9	28/30.1	91/52.6	82/47.4	9/2.9	306/97.1

Table 45. Seeds in flotation samples

Sample	1	2	3	4	5	6	7
Feature	29P	33C	36	36A	41	42C	42
Provenience	Ash Lens	Storage ? Pit	Storage? Pit	Pit	Storage? Pit	Hearth	Floor Fill
Possible Economics							
Annuals:							
Amaranthus (pigweed)						2/1.6*	
Polygonum (knotweed)					3/2.1*		
Solanum (wild potato)							1/0.6*
Grasses:							
Gramineae (grass family caryopses)	5/8.3				16/33.6*	2/1/1*	
Perennials:							
Echinocereus (hedgehog cactus)					4/5.7*		2/1.1*
Opuntia (pricklypear)						3/1.6*	
Cultivar:							
Zea mays cupules (cob fragments)		c*	c*	c*	c*	c*	c*
Probable contaminants:							
Compositae (sunflower family)	1/1.7*		4/5.0				
Euphorbia (spurge)							1/0.6
Salsola kali (Russian thistle)	1/1.7*			3/2.1			
Verbesina (crownbeard)	1/1.7						
Unknowns:							
cf. *Serinea* (serinea)	1/1.7*						
cf. *Salvia* (sage)						2/1.1*	
Sample	1	2	3	4	5	6	7
Feature	29P	33C	36	36A	41	42C	42
Provenience	Ash Lens	Storage ? Pit	Storage? Pit	Pit	Storage? Pit	Hearth	Floor Fill
Total actual seeds	9	0	4	3	23	7	4
Total adjusted seeds	15.1	0	5.0	2.1	42.8	4.3	2.3

Sample	1	2	3	4	5	6	7
Feature	29P	33C	36	36A	41	42C	42
Total taxa	5	1	2	2	4	5	4
Total burned taxa	1	1	1	1	4	5	3

*some or all items charred

a/b: Number before slash indicates actual number of seeds recovered. Number after slash indicates adjusted number of seeds per liter of soil, taking into account any subsampling.

Table 46. Charcoal composition of flotation samples

Taxon	FS 3		FS 6		Total Percent	
	#	g	#	g	Pieces	Weight
Juniperus (juniper)	9	0.1			23	14
Pinus edulis (piñon)			1	<0.05	3	<0.5
Undetermined conifer			8	0.6	20	86
Total coniferous:	9	0.1	9	0.6	46	100
Atriplex (saltbush)	1	<0.05	2	<0.05	8	<0.5
Prosopis (mesquite)			4	<0.05	20	<0.5
Populus/Salix (cottonwood/willow)			4	<0.05	10	<0.5
Undetermined nonconifer	5	<0.05	2	<0.05	18	<0.5
Total nonconiferous	11	<0.05	11	<0.05	56	<0.5
Sample size	20	0.1 g	20	0.6 g		