MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

ARCHAEOLOGICAL TESTING REPORT AND DATA RECOVERY PLAN FOR TWO HISTORIC SPANISH SITES ALONG U.S. 84/285 BETWEEN SANTA FE AND POJOAQUE, SANTA FE COUNTY, NEW MEXICO

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ADMINISTRATIVE SUMMARY

Between September 20 and October 18, 1999, the Office of Archaeological Studies conducted testing at two historic sites, LA 160 and LA 4968, near Pojoaque, New Mexico. Five prehistoric sites were also tested, but they are discussed in a separate document. This project was conducted at the request of the New Mexico State Highway and Transportation Department in preparation for the reconstruction of U.S. 84/285 between Pojoaque and Tesuque, Santa Fe County, New Mexico. LA 160 is on Pueblo of Pojoaque land. LA 4968 has multiple owners, including private, Pueblo of Pojoaque, and state of New Mexico.

Testing was conducted to assess the extent of remains at LA 160 and LA 4968 and determine whether they can provide important information on local history. Both sites appear to have been occupied during the Santa Fe Trail period (1821 to 1880), though there may also be a Late Spanish Colonial period component at LA 4968. Cultural sheet trash deposits and a possible trash pit were found at LA 160, and LA 4968 contains at least seven structures, a well, one or more trash pits, and sheet trash deposits. Both sites have the potential to yield information relevant to local history, and further work is recommended.

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PROLOGUE

Just before this report was to be printed, events occurred that have the potential to alter the scope of work at LA 160. A materials stockpile was planned for the area within the proposed right-of-way directly south of that site, which was to be protected by a 75 m wide buffer zone between the south edge of LA 160 and the north edge of the materials stockpile, and by fencing along the north edge of the materials stockpile area. The materials stockpile was to be used to store spoil dirt removed during construction along another segment of U.S. 84/285 to the north of the current project area. Since that use was for a different highway project, it is not reported upon in this document. Unfortunately, the access road to the material stockpile was inadvertently run directly through LA 160, causing considerable damage to the portion of the site within the right-of-way proposed for this project.

Because of this, the scope of excavation outlined for LA 160 may no longer be accurate. All three of the sheet trash deposits (ca. 25 to 30 cm thick) that were defined within project limits at the site and scheduled for more detailed examination during data recovery were affected by construction activities. Thus, we may not be able to recover the same level of information that was expected to be available when this document was prepared. Aspects of the data recovery plan for LA 160 that will not be affected by this event include detailed mapping of the entire site, ethnohistoric investigations, limited examination of parts of the site outside the proposed right-of-way, and reexamination of materials produced by earlier investigations of the site.

Treatment of the section of site within the proposed right-of-way that was damaged will undoubtedly change. No damage assessment had been completed at the time this prologue was written, but one was in the planning stages. Any changes that are made to the treatment plan will pertain to how that area will be studied during data recovery, and perhaps to the amount of data expected to be recovered. These changes will be covered in an addendum that will be prepared after the damage assessment has been made and consultations between the NMSHTD, SHPO, BIA, and other interested parties are completed. However, while the amounts and types of information recovered may be different, the research orientation, field methods, and analytic techniques are not expected to change. No changes will be made to the treatment plan presented for LA 4968, since it was not affected by these activities. Thus, LA 4968 is the only site that can be considered to be fully treated by this document.

JLM
January 13, 2000

INTRODUCTION

At the request of the New Mexico State Highway and Transportation Department (NMSHTD), the Office of Archaeological Studies (OAS) of the Museum of New Mexico conducted test excavations and prepared a data recovery plan for two historic sites along U.S. 84/285 between Pojoaque and Tesuque in Santa Fe County, New Mexico (Fig. 1 and Appendix 1). Fieldwork was conducted between September 27 and October 18, 1999. Jeffrey L. Boyer was the senior project director for this endeavor and supervised testing activities at LA 4968. James L. Moore supervised testing at LA 160. Field assistants included Susan Moga, Natasha Williamson, Sam Sweesy, James Quaranta, and Christy Davis. The report was edited by Tom Ireland, and maps were drawn by Ann Noble. Timothy D. Maxwell acted as principal investigator. LA 160 is on land belonging to the Pueblo of Pojoaque. Some portions of LA 4968 are privately owned, and others are owned by the Pueblo of Pojoaque and the state of New Mexico.

This project was initiated to examine sites that extend within project limits along a stretch of U.S. 84/285 between Pojoaque and Santa Fe for which improvements are planned. The improvements include reconstruction of the highway, construction of frontage roads, and the building of interchanges that will channel traffic onto the highway from the frontage roads. The entire project is broken into three sections, and the historic sites reported upon here are in the northernmost segment. Five prehistoric sites along the same segment were also tested, and they are discussed in a separate document.

Both historic sites have been known, archaeologically, for a number of years. Testing showed that mostly sheet trash deposits are present within project limits at LA 160. A probable structure is just outside the proposed right-of-way and was not examined during this study. At least one small trash pit appears to be present within the sheet trash deposits at this site. The portion of LA 4968 within the proposed right-of-way contains numerous structures and features. At least seven structural mounds were identified at this site, four of which are wholly within project limits. Two other structural mounds may also extend into project limits. Testing also revealed the presence of sheet trash deposits, a deep trash pit, and a probable well. Both sites have the potential to provide information on local history.

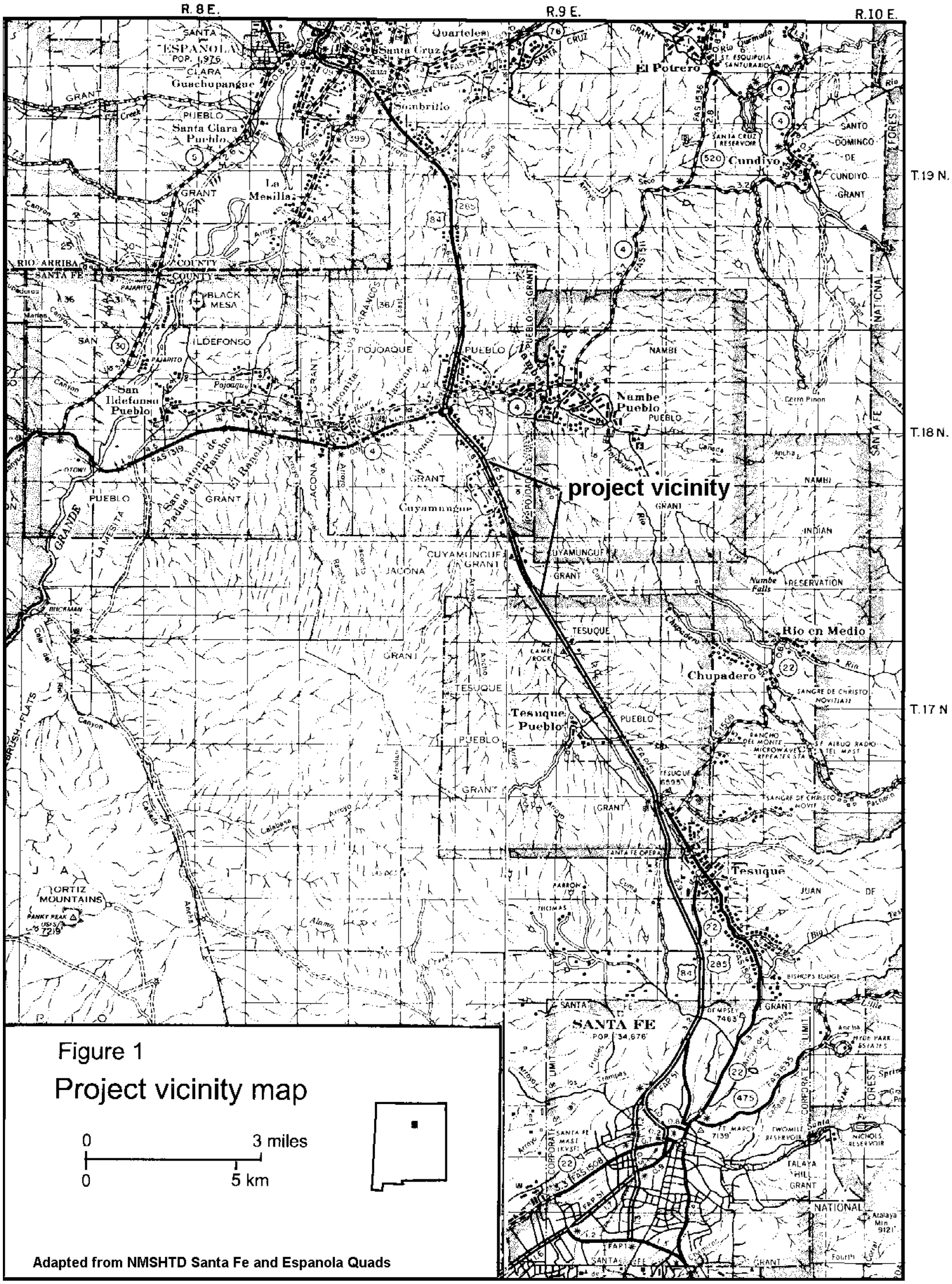

Figure 1
Project vicinity map

CULTURAL HISTORY OVERVIEW

Since only historic sites are considered in this plan, the prehistory of the region is discussed only in passing. When the first Spanish explorers arrived in the Southwest, the project area was inhabited by the northern Tewa group of Pueblo Indians. At least eight pueblos were encountered in the Tewa Basin by the Spaniards, including San Gabriel (Yungue), San Ildefonso (Powhoge), Santa Clara (Kapo), San Juan (Ohke), Jacona, Tesuque, Nambe, and Cuyamunge. Casteñeda's chronicle of the Coronado expedition of 1540 to 1542 mentions that the people of the province of Yuqueyunque (or Tewa) had "four very strong villages in a rough country, where it was impossible for horses to go" (Winship 1896:137). These villages were not visited by Coronado. Schroeder (1979:250) believes they were in the Chama Valley and may have included the ancestral Tewa pueblos of Sapawi, Psere, Teewi, Ku, and Tsama. The rough country mentioned by Casteñeda could also have been a reference to the northern Pajarito Plateau, which was also occupied by ancestral Tewas, but since recent research suggests that the large Tewa villages on the Pajarito Plateau were abandoned by the end of the Middle Classic period, ca. A.D. 1400 to 1500 (Preucel 1987), this is unlikely.

The next expedition to enter the northern Tewa area and report on it was that of Gaspar Castaño de Sosa in 1590 (Hammond and Rey 1966). While de Sosa's expedition quite clearly explored the Tewa Basin, extant accounts lack sufficient detail to allow determination of the specific villages that were visited.

Documents related to Oñate's colonizing expedition in 1598 provide a confused list of villages in the Tewa area (Hammond and Rey 1953:346). The list seems incomplete and includes names that are not mentioned for this area by any other expedition. Five of the eight historically known northern Tewa villages are listed, including Tesuque (possibly), San Ildefonso, Santa Clara, San Juan, and San Gabriel, as are possible versions of names for Tsirege and Tsama, which are considered ancestral by the Tewa but were abandoned by at least the early 1600s (Schroeder 1979:250). Five other villages are listed for the Tewa district, but their names are suspiciously similar to those of several southern Tiwa pueblos (Schroeder 1979:250). This may represent a clerical error, since these names are not associated with the Tewa in other documents.

Eight villages were occupied by the Tewa in the 1620s, as noted by Fray Alonso de Benavides in his Memorial of 1630 (Ayer 1916). People from other northern Tewa pueblos probably joined these villages voluntarily, as part of a continuing process of population movement out of the Chama-Ojo Caliente drainages and off the Pajarito Plateau, or because of forced resettlement as part of the Spanish policy of combining villages to make governing them easier. Two Tewa villages, Jacona and Cuyamunge, were abandoned during the Pueblo Rebellion of 1696 and never resettled. The six remaining villages were inhabited through the Spanish period and continue to exist to the present day, interacting with the European populations that moved into the region. Spanish settlements were also common in the Tewa Basin, as illustrated by the Pacheco map of 1779 (Adams and Chávez 1956).

The historic period in New Mexico began with the entrance of the first Spanish exploring expedition into the region in 1540. Several methods have been used to divide the European occupation into shorter periods. One of the most common methods is to divide the history of the region into politically based periods including Protohistoric (1540 to 1598), Spanish Colonial (1598 to 1821), Mexican Territorial (1821 to 1846), American Territorial (1846 to 1912), and Statehood (1912 to present). This overview takes a somewhat different approach, dividing the historic period according to changes in economy and transportation methods. Thus, we divide the historic occupation of New Mexico into the Exploration period (1540 to 1598), Early Spanish Colonial period (1598 to 1680), Pueblo Revolt period (1680 to 1693), Late Spanish Colonial period (1693 to 1821), Santa Fe Trail period (1821 to 1880), and Railroad period (1880 to present).

Exploration Period (1539 to 1598)

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

Early Spanish Colonial Period (1598 to 1680)

Juan de Oñate established the first successful colony in New Mexico at San Juan Pueblo in 1598. By 1600 the Spaniards had moved into San Gabriel del Yunque, sister village to San Juan, which was abandoned for their use by its residents (Ellis 1987). The lack of visible wealth in the new province caused unrest among the Spaniards (Espinosa 1988:7), many of whom seem to have accepted the challenge of establishing the new colony because they thought they would soon get rich. This unrest in addition to Oñate's neglect of the colony while on frequent journeys of exploration eventually contributed to his loss of the governorship. Oñate was replaced as governor in 1607 by Pedro de Peralta, who arrived in New Mexico in 1609 (Simmons 1979:181). Peralta moved the capital to Santa Fe, which he founded around 1610 (Simmons 1979).

Oñate's colony was a disappointment because of its failure to find the wealth that was expected in New Mexico. Many settlers wanted to abandon the colony, and the government was seriously considering doing just that (Espinosa 1988:8-9). However, the baptism of 7,000 Pueblo Indians in 1608 and reports that many others were ready for conversion provided a viable alternative to an economically autonomous colony (Espinosa 1988:9). New Mexico was therefore allowed to continue, with its maintenance almost entirely underwritten by the royal treasury (Simmons 1979:181). The colony was maintained as a mission area in the seventeenth century, and its primary function was christianization of the Pueblos. Because of this, the church was extraordinarily powerful and influential, causing considerable conflict with the secular government (Ellis 1971:30-31). Beginning in the 1640s this struggle weakened the Spanish hold on the province (Simmons 1979:184).

Rather than furnishing a permanent military garrison for New Mexico, the Spanish government created a class of citizen-soldiers responsible for defense. As a reward for their services, these citizen-soldiers were given the right to collect an annual tribute from the pueblos, a system known as *encomienda.* The number of *encomenderos* was set at 35 (Espinosa 1988). In times of trouble, of course, all able-bodied citizens were conscriptable for military service (Espinosa 1988:10). Pueblo Indians were also conscripted to serve as laborers on Spanish farms and haciendas. This system of forced labor, *repartimiento*, was designed to provide workers for Spanish holdings (Simmons 1979:182). While laborers were supposed to be paid for their work, abuses of the system were common, and the Spaniards often failed to compensate them (Simmons 1979:182-183).

Since New Mexico was primarily viewed as a mission effort, the secular population received little official support. The church in New Mexico was supplied by a caravan system, which was notoriously inefficient (Moorhead 1958). While caravans were theoretically scheduled for every three years, as many as five or six years often passed between deliveries (Moorhead 1958; Scholes 1930). However, Ivey (1993:41) indicates that there was an average of three years between caravan arrivals through most of the seventeenth century. Irregular supply at fairly long intervals led to serious shortages of important supplies, such as metal, and kept the cost of manufactured goods high.

Supplies carried by the caravans were meant for support of the missions, though at times goods were also carried north for profit (Hackett 1937; Moorhead 1958). This was particularly true between 1664 and 1671, when the caravan passed out of the church's control and was contracted to Don Juan Manso. Apparently, Manso used up to half of the wagons to carry goods for sale in New Mexico (Scholes 1930). According to Ivey's (1993:44) calculations, the supply caravans each carried more than 80 tons of goods. Products shipped out of New Mexico by the missions provided income that enabled them to purchase luxury items that would not otherwise have been available (Ivey 1993:46).

In addition to shipments controlled by the missions and governors, private trade over the Camino Real also occurred. A fairly wide variety of goods moved in both directions:

> Imports represent practical, utilitarian tools, equipment, household items, and a range of luxury goods, primarily clothing and textiles. The latter consisted of materials made in New Spain as well as yard goods imported from Europe and China. In return, New Mexicans sold coarse, locally made textiles and clothing (mostly stockings), hides, and aside from animals on the hoof, occasional subsistence foods locally produced. (Snow 1993:141)

Most pottery used for domestic purposes was purchased from the Pueblos and Apaches. Majolica imported from Mexico was considered somewhat of a luxury, at least into the nineteenth century (Snow 1993:143). This was partly due to the cost of long-distance freighting. However, it was still cheaper than Chinese porcelain and, initially, English ironstone (Snow 1993:143). While the markup on majolica was not as great as might be expected (Snow 1993:143), manipulation of the New Mexican monetary system by Chihuahuan merchants probably assured them of considerable profit and kept the price of imported pottery high when compared to locally produced pueblo wares.

On the civilian side, the seventeenth-century upper class was mainly comprised of the families of the governor and the 35 encomenderos (Scholes 1935; Snow 1983). Though governors were banned from engaging in trade, they often broke this regulation by sending goods south with the caravans or shipping them independently (Scholes 1935). The encomenderos were given the right to collect tribute from pueblos in lieu of salaries. An example of how this worked is Francisco Anaya Almazán, who at one time held half of the villages of Quarai and Picuris and all of La Cienega in encomienda (Snow 1983:355). The prestige of the encomenderos, coupled with the requirement that they maintain a residence in Santa Fe, raised them to a dominant position in the local government and economy (Anderson 1985:362). But not all encomenderos were equal, and a few dominant families formed the core of the upper class: “Their wealth was greater than that of families of lesser social standing; the best lands were theirs; they had greater opportunities to engage in trade; and they probably received the best encomiendas” (Scholes 1935:98).

The Lucero de Godoy, Goméz, Domínguez de Mendoza, Romero, Baca, and Duran y Chávez families were among the most prominent in seventeenth-century New Mexico (Scholes 1935). This class was critical to the Early Spanish Colonial economy. Not only did the encomenderos receive goods like cotton blankets and buffalo hides from Pueblos as tribute, they may also have acted as the upper level of a redistribution network based on kin ties or population clusters (Snow 1983:351).

Even with the tribute system and the ability to occasionally send goods south for sale in Mexico, the Early Spanish Colonial economy was based on a stable barter system rather than hard cash (Snow 1983:348). Goods like corn, wheat, piñon nuts, hides, and cotton blankets were used in lieu of coinage, and the accumulation and shipment to Mexico of these products by governors and mission personnel seem to have done little to stimulate the local economy (Snow 1983:348).

Trade with the Plains Apaches, also an important source of income during this period, mostly occurred at pueblos along the edge of Spanish New Mexico, including Pecos, Taos, and the Salinas villages. Much of this trade was between the Pueblos and Apaches, but the Spaniards also exploited the relationship for goods that could be sold in Mexico. Slaves were an important trade commodity and were often bought from the Apaches for resale to the mines of northern Mexico. The Spaniards often supplemented this source of slaves by raiding Apache villages during the seventeenth century. This antagonized both the Apaches and their Pueblo trading partners and caused the former to unleash a series of devastating raids against the Spaniards and certain Pueblos in the 1660s and 1670s (Forbes 1960). This, in turn, exacerbated Pueblo resentment of the Spaniards, causing several rebellions, which culminated in the general revolt of 1680.

Pueblo Revolt Period (1680 to 1693)

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

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

Late Spanish Colonial Period (1693 to 1821)

Though failing in its attempt to throw off the Spanish yoke, the Pueblo Revolt caused many changes. The hated systems of tribute and forced labor were never reestablished, and the mission system was scaled down (Simmons 1979). The royal government continued to subsidize the province, but it now served as a buffer against the enemies of New Spain (Bannon 1963). New Mexico was a distant province on the frontier of New Spain and continually suffered from a shortage of supplies while shielding the inner provinces from Plains Indian raids and the ambitions of the French in Louisiana. These aspects of frontier life are critical to an understanding of Late Spanish Colonial New Mexico.

Relations between Spaniards and Pueblos became more cordial during this period, at least partly because of changes in the structure of both populations. The Spanish population grew rapidly and finally surpassed that of the Pueblos by the late 1780s (Frank 1992). The increased number of Spaniards created demand for land in the Rio Grande core area, and a drop in the Pueblo population caused a shortage of cheap labor. These trends resulted in a shift from large land holdings to smaller grants (Simmons 1969). A large labor force was no longer needed to work Spanish holdings, which was just as well, because the demise of the repartimiento system meant that the Pueblos could no longer be forced to provide labor. Also contributing to this trend was an increased danger of attack by Plains Indians beginning in the early eighteenth century.

Spanish New Mexico was a frontier on the edge of New Spain during the Early Spanish Colonial period. This situation changed after 1700 as a core area developed around the social and economic center at Santa Fe. Other parts of New Mexico remained a frontier, though now they were centered on Santa Fe rather than the merchant centers of Mexico. The development of New Mexico into a core and frontier was undoubtedly related to its physical separation from the primary core in Mexico and to the fact that for so much of its history it had to stand alone. While the local economy remained linked to the primary core in Mexico through a few wealthy families and merchants, New Mexico also developed an internal economy dominated by trade between the Spaniards and Pueblo and Plains Indians. This is probably what led to the formation of what Frank (1992:17) has called "the dynamic folk culture and innovative elaboration of Spanish tradition" that prevailed in New Mexico. Separated from the mainstream economy and society, the territory generated its own versions of them.

While New Mexico developed into a secondary core and frontier during this period, it remained on the frontier of New Spain and continued to be dependent on the primary core. For much of the Late Spanish Colonial period, the secondary core seems to have included little more than the capital and its immediate environs, perhaps expanding a bit during periods of peace and contracting when hostilities resumed. It was not until late in the period that the core seems to have begun a steady expansion.

With the reconquest of New Mexico, much of the earlier economic system was abandoned. The dominance of the church and formal mission supply caravans eventually ended. The military role of the encomenderos was filled by regular presidial garrisons at Santa Fe and El Paso, and they were replaced as an economic force by families who prospered by dealing in sheep. However, most of the people who reoccupied New Mexico were poor farmers and herders.

By the middle of the eighteenth century a considerable trade had developed between New Mexico and Chihuahua (Athearn 1974), mostly to the benefit of the Chihuahuan merchants. This was documented by Father Juan Augustín de Morfi in 1778 (Simmons 1977). Not only did the Chihuahuan merchants inflate prices, they also invented an illusory monetary system that was manipulated to further increase profits (Simmons 1977:16). Thus, New Mexico was poorly supplied with goods sold at exorbitant prices. This problem was partly rectified by trading with local Indians for pottery, hides, and agricultural produce, and some goods were apparently manufactured by cottage industries. Unfortunately, many products had no local substitutes.

Metal, especially iron, was in short supply in New Mexico (Simmons and Turley 1980). Nearly all iron was imported from Spain, and colonial iron production was forbidden by royal policy to protect the monopoly enjoyed by Vizcaya (Simmons and Turley 1980:18). While imported iron was relatively cheap in Mexico, by the time it arrived on the New Mexico frontier it was quite costly. Production of tools and weapons was limited by the lack of metal, and those that were produced were expensive. The lack of metal and the unreliable supply system hurt New Mexico in its role as a defensive buffer. Many accounts mention scarcities of firearms and other weapons (Kinnaird 1958; Miller 1975; Reeve 1960; Thomas 1940). In addition, only a few soldiers were stationed at the New Mexican presidios, forcing local authorities to use militias and other auxiliary troops. Continued conflict with nomadic Indians caused many settlements to adopt a defensive posture, and even individual ranches were built like fortresses.

By the 1730s, attempts were being made to reestablish the New Mexico sheep industry, and at least one shipment of wool was sent south by 1734 (Baxter 1987:26). In the following year, the governor embargoed all exports of wool, livestock, and grain, considering them harmful to the colony (Baxter 1987:26). This was protested by a number of citizens, who petitioned the governor to lift the embargo, arguing that "trade in the forbidden commodities offered the only means available to purchase manufactured goods for themselves, their wives, and children" (Baxter 1987:27). Even so, the embargo remained in place, and the acquisition of manufactured goods continued to be difficult.

One of the most important developments in this period was the origin of the *partido* system, in which sheep owners apportioned parts of their flocks out to shepherds, receiving the original animals and a percentage of the increase back at the end of the contract period.

> Increased use of partido brought an increase in livestock numbers, but also added another dimension to the local economy. As multiplying flocks made management more difficult for their owners, partido provided a means of spreading responsibility and served as a substitute for wage payments in a region virtually without cash. . . . Partido offered advantages to merchants who accepted sheep in exchange for goods, and to widows or children who inherited flocks but were unable to manage them or sell them because of export regulations and the local cash shortage. (Baxter 1987:29)

By the mid-1750s the embargo on livestock trading seems to have been relaxed. A few traders managed to manipulate the system, which was dominated by merchants in Chihuahua, and had accumulated fortunes by this time. As Baxter (1987:44) notes:

> Frequently allied by marriage ties, this little group of "haves" not only maintained a tight grip on New Mexico's economy, but increasingly dominated political and religious affairs as well. Usually, extensive livestock interests, cared for by dependent partiderios, provided the foundation for their growing wealth and set them apart from less affluent competitors.

The development of wealthy *partiderios* and relaxation of the trade embargo should have set the stage for accelerated economic growth. Unfortunately, other factors intervened, slowing growth for several decades.

Between 1750 and 1785 New Mexico was hit by a defensive crisis caused by intense Plains Indian and Apache raids (Frank 1992). While New Mexico suffered from varying degrees of hostile Indian activity virtually from its founding (Forbes 1960), certain periods were worse than others. Attacks by Utes and Comanches began as early as 1716 with raids against Taos, the Tewa Pueblos, and Spanish settlements (Noyes 1993:11). In particular, Comanches were bent upon driving Apaches from the Plains and cutting their ties to the French colonies in Louisiana, from whom they were receiving firearms (Noyes 1993). They also raided Taos, Pecos, and Galisteo Pueblos—the villages that were most closely tied to the Apaches by trade. However, most of the Comanches' fury was directed against the Apaches during this period.

By 1740 the Apaches had been driven off the Plains or south of the Canadian River, and the Comanches were at peace with the Spaniards (Noyes 1993:24-25). This peace was short-lived, because by the mid-1740s the Comanches were mounting intensive raids against Pecos and Galisteo Pueblos, culminating in a series of devastating attacks against Spanish settlements east of the Rio Grande. These raids caused the temporary abandonment of many villages on the east side of the Rio Grande from Albuquerque northward in the late 1740s (Carrillo in prep.; Noyes 1993:25). While Governor Tomás Vélez Cachupín established short-lived periods of peace during his two terms of office (1749 to 1754 and 1762 to 1766), most of the years between 1750 and 1780 were marked by war with Comanches (Noyes 1993).

Raiding by Athabaskans aggravated this situation. Apaches raided New Mexican settlements sporadically in the 1750s and 1760s, the latter period of hostility apparently sparked by a severe drought in 1758 and 1759 (Frank 1992:39). A second drought in the 1770s caused a deterioration of the defensive abilities of the territory and led to a resumption of raids by the Navajos (Frank 1992:39-40). By the late 1770s, southern New Mexico was under attack by the Sierra Blanca, Mimbres, Gila, Natagé, and Lipan Apaches (Thomas 1932:1). In alliance with the Navajos, the latter three groups even raided Zuni, Albuquerque, and nearby settlements (Thomas 1932:1).

During the early 1770s the government of King Carlos III began to rebuild its power in New Spain (Frank 1992:88). Solving the problem of Indian raids against the northern provinces was part of this process. The defenses of northern New Spain were reorganized beginning in 1772. Vigorous campaigning had driven the Apaches back by 1776, and a line of presidios was established (Frank 1992; Thomas 1932). Despite these successes, Indian raids continued to be a major problem. With the reorganization of northern New Spain into the Provincias Internas in 1776 came the development of a plan that eventually proved successful:

> Established in 1776, Don Teodoro de Croix received the command of the Interior Provinces and arrived in Mexico City early in 1777 to take over his duties. In the few brief years, 1777-1783, that Croix served his king on this immense frontier, he found a solution for this Indian problem and held for all time the border line of Mexico against northern aggression. (Thomas 1932:14)

According to Croix's plan, continual campaigns were to be undertaken against the Apaches from Nueva Vizcaya, Sonora, Coahuila, and New Mexico, and an alliance was to be sought with the Comanches against the Apaches (Thomas 1932:18-19). Governor Juan Bautista de Anza of New Mexico concluded a peace treaty with the Comanches in February 1786, which also allied the two nations against their common enemy, the Apaches (Noyes 1993:80; Thomas 1932:75). The Comanches and Utes reconciled their differences soon afterward and also concluded a peace treaty (Thomas 1932:75). Later in the same year, Anza successfully broke up an alliance between the Gila Apaches and Navajos that had been plaguing settlements in southern Arizona and concluded a peace with the Navajos (Thomas 1932:52). As Frank notes, these events:

> brought New Mexico into an era of relative peace for the first time since mid-century. Although the province experienced continued occasional raids, nothing close to the frequency and magnitude of the Comanche and Apache raids of the 1770s occurred during the next quarter century. . . . Until the last years of Spanish rule, the alliance system erected to protect the northern provinces from Plains Indians hostility gave the inhabitants of New Mexico respite from the burden of their own defense and freed energies needed to improve the quality of other aspects [of] their lives on the frontier of New Spain. (Frank 1992:95)

Unfortunately, just as hostilities on the New Mexican frontier were ending, a second disaster hit. A major smallpox epidemic struck New Mexico in 1780 to 1781, killing a large portion of the population (Frank 1992:64). While rising birth rates soon countered the immediate effects of the epidemic on the population, it had a much longer lasting effect on demography—the Hispanic population surpassed that of the Pueblos in size for the first time, and held that position until the Anglo influx beginning in the second half of the nineteenth century (Frank 1992:64-65). The reduction of population may have concentrated capital at the same time that communications with Mexico over the Camino Real were freed up, and settlers gained the ability to open new lands without fear of Indian attack (Frank 1992:71). Thus, while in the short run the epidemic seriously disrupted New Mexico, in the long run it may have enhanced the province's ability to take advantage of the economic opportunities provided by the newly established peace.

Frank (1992:166) suggests that the juxtaposition of these trends created an economic boom between 1785 and 1815. Beginning in 1732, a 10 percent tithe was levied on New Mexico by the Bishop of Durango, and the right to collect it was auctioned for a flat annual fee (Frank 1992:168-169). He traces the economic boom through the value and competition for the tithe rental in New Mexico:

> The increase in the real value of the tithe contracts represents a measurable and significant increase in the per capita production of the Vecino population of late colonial New Mexico. The rising value of the tithe rental signifies an active and expanding provincial economy during the last decades of colonial New Mexico. (Frank 1992:191)

At the same time, the Hispanic population was expanding outward from the established settlement zone (Frank 1992:199). New Mexicans were founding a series of new frontiers as they moved into areas that had previously been closed because of the danger of Indian attack. The improving economic situation undoubtedly fueled this drive, since new lands were required to graze the continually increasing flocks of sheep that were the basis of wealth in the province.

Despite the improving economic situation, New Mexico still depended on shipments from the south to provide manufactured goods, particularly metal and cloth, that could not be produced locally. Caravans continued to supply New Mexico via the Camino Real. While they still followed an irregular schedule, by the middle of the eighteenth century they operated almost annually (Connor and Skaggs 1977:21). Since the ox-drawn wagons of the seventeenth century were eventually replaced by mule trains, it is likely that fewer goods were carried by the caravans (Connor and Skaggs 1977:21). There were apparently only a few New Mexican merchants, and they were exploited by their suppliers in Chihuahua, who managed to keep them in almost perpetual debt. Isolation and dependence on Chihuahua caused goods sold in Santa Fe to cost several times their original value (Connor and Skaggs 1977:21-22; Frank 1992:237-239).

While circulating cash is considered to have been nearly nonexistent in colonial New Mexico, Baxter (1987) notes several occasions on which relatively large sums of cash were used to pay taxes or purchase goods for shipment north. This indicates that hard cash did exist in New Mexico during this period, but was concentrated in the hands of a few at the top of the economic ladder and rarely entered into local transactions. Thus, economic conditions for most New Mexicans through the seventeenth and eighteenth centuries seem to have been rather dismal. The economy was controlled by small groups of wealthy families both before and after the Pueblo Revolt, who retained most of the profits realized through trade with Mexico. Some of this wealth trickled down from the upper class to the bulk of the Spanish population. During the seventeenth century this may have taken the form of a redistribution system in which goods collected as tribute from the pueblos found their way into the hands of the Spanish lower class. During the eighteenth century this was replaced by the partido system, which theoretically provided a means for poor Spanish settlers to better themselves.

Santa Fe Trail Period (1821 to 1880)

Under the treaty of Cordova, Mexico gained independence from Spain on August 24, 1821, and New Mexico became part of the Mexican nation. Mexican independence brought two major changes to New Mexico: a more lenient land grant policy and expansion of the trade network (Levine et al. 1985). Mexican colonial law and custom concerning settler's rights were applied to New Mexico, resulting in conflict over ownership of lands held by the Pueblos. Trade between Missouri and Santa Fe began soon after independence and dominated the New Mexican economy for the next quarter century (Connor and Skaggs 1977). Trade with the United States brought ample and comparatively inexpensive goods to New Mexico and broke the Chihuahuan monopoly. This is reflected in the material culture of sites from this period, in which more manufactured goods are found than in older sites.

Numerous expeditions into the recently acquired Louisiana Purchase brought American explorers and traders west from the Missouri River, eventually establishing the Santa Fe Trail. The first trading expedition to use this general route was that of William Becknell in 1821. The initial goal of Becknell's expedition was to trade with the Comanches, but they encountered some Mexican rangers and were persuaded to change their plans and trade in Santa Fe instead (Gregg 1844:13). Because of their favorable report, others soon followed. While the trail was officially opened in 1821, the amount of commerce moving over it to New Mexico was limited for the first several years of its existence, and there were only eight to ten expeditions between 1821 and 1824 (Connor and Skaggs 1977:34). Trade began in earnest after 1825, which is when the United States completed a survey of the trail to mark its route and secure safe passage through Indian Territory (Connor and Skaggs 1977).

The eastern terminus of the Santa Fe Trail was at Franklin, Missouri, until 1828. From that year on, the trail began at the new town of Independence, Missouri (Connor and Skaggs 1977). Expeditions tended to leave in small groups and form up later at Council Grove, where they would elect leaders and agree on the rules to be followed (Connor and Skaggs 1977; Gregg 1844). Two main routes were used: the Mountain branch, which followed the Arkansas River to Bent's Fort before turning south; and the Cimarron branch, which crossed the Arkansas River between the south bend and present-day Dodge City, then headed southwest along the Cimarron River. The Cimarron branch was shorter (865 miles or 1,392 km from Franklin to Santa Fe) than the Mountain branch (909 miles or 1,463 km) (NPS 1990:14). After the move to Independence, the Cimarron branch was 753 miles (1,212 km) long, while the Mountain branch covered 797 miles (1,282 km) (NPS 1990:14). The Mountain branch was the more popular route during the early years of the trail but became less popular during the later years, even though it was an easier journey because of better water availability (Connor and Skaggs 1977).

Trade over the Santa Fe Trail expanded geographically (to Chihuahua) and in the volume of consumer goods transported until 1828, when Indian raids, military escorts, and Mexican trade regulations caused notable fluctuations in the flow of commerce (Pratt and Snow 1988:296). The economic impact of such an extensive trade network may be hard to detect, but it is likely that local inhabitants were introduced to a wide variety of material goods like nails, iron hardware, bricks, wallpaper, cotton muslin, and window glass, which were previously impossible or too expensive to acquire (Pratt and Snow 1988:302).

The first ruts caused by traffic over the trail were seen after Becknell's second expedition to Santa Fe in 1822, in which goods were transported in three ox-drawn wagons (Connor and Skaggs 1977:33). Otherwise, most early expeditions carried goods on horse or mule back (Connor and Skaggs 1977:35). Most of the later expeditions transported goods in wagons drawn by mules or oxen, which could carry much heavier loads. They often traveled four wagons abreast to avoid being strung out for miles in hostile territory (Duffus 1930:137; Gregg 1844:24).

The Santa Fe trade was disrupted in the three years preceding the Mexican War (1846 to 1847) because of a Mexican embargo against American goods (Connor and Skaggs 1977:203). As a result of that conflict, New Mexico became a territory of the United States in 1846. The years immediately following the acquisition of New Mexico by the United States were characterized by a growing interest in commerce and a market economy that demanded more dependable means of transportation (Pratt and Snow 1988). By 1850, long-distance stagecoach routes were established to transport travelers and the mail.

Trade again declined during the Civil War. A resurgence of trade over the trail following the end of that war also doomed it (Connor and Skaggs 1977:204), since railroad promoters saw the possibilities of overland routes to the west and began developing their finances. The railroad reached Santa Fe by 1880, effectively bringing trade over that route to an end, since it was more economical to ship goods by rail.

This period saw profound changes in the economic and ethnic structure of New Mexico. The movement of materials over the Santa Fe Trail meant that many goods that had been difficult or impossible to obtain during most of the Spanish periods could now be acquired. Initially, there seems to have been a lack of sufficient currency in both New Mexico and Chihuahua to support the Santa Fe trade (Connor and Skaggs 1977). However, records indicate that large amounts of raw materials were bartered in New Mexico and Chihuahua for American goods, and without the barter system it is doubtful whether the Santa Fe trade would have long survived (Connor and Skaggs 1977:200).

In addition to material goods, the Santa Fe trade also brought citizens from the United States to New Mexico. Most remained only a short while, but some settled down for good, entering into economic relationships with local merchants. This trickle became a flood when New Mexico was annexed by the United States in 1846. Eastern settlers came to New Mexico in increasing numbers seeking economic opportunity, and sometimes finding it.

The New Mexican economy underwent major changes during this period. The influx of eastern goods most likely disrupted the Spanish economic system. An indication of this may be the growth of pottery production by Spaniards from a rarity to a minor cottage industry. Spanish pottery production is questionable prior to 1821, except on rare occasions by few individuals. After 1821 pottery appears to have been produced in numerous Hispanic villages, as suggested by Carrillo (1997). This may be a reflection of changes in the economic relationship between the Hispanic and Pueblo populations.

Before the Santa Fe trade began, Pueblos were dependent on Spanish traders for manufactured goods and metal. After the Santa Fe trade began, such goods became cheaper and more easily obtained, and Spanish traders no longer held a monopoly, especially after 1846. Pueblo pottery was an important, albeit inexpensive, commodity to the Spanish. It was used for storing and cooking food, and in the poorer households was also used for food serving and consumption. The availability of comparatively cheap Euroamerican pottery from the east may have cut into Spanish demand for Pueblo pottery. At the same time, less pottery may have been available because of the altered manufactured goods supply structure. Pueblo pottery may have become more difficult or expensive to acquire, providing a niche for disadvantaged Hispanics to enter.

Railroad Period (1880 to Present)

The arrival of the railroad significantly altered supply patterns in New Mexico. Rail lines reached New Mexico in 1878, when construction began in Raton Pass (Glover and McCall 1988:112). By 1879 the Atchison, Topeka, and Santa Fe line was in Las Vegas, and by early 1880 it was completed to Lamy (Glover and McCall 1988). With this link to the eastern United States, New Mexico entered a period of economic growth and development, primarily in the larger urban areas (Pratt and Snow 1988:441). This linkage also ended New Mexico's long-term position as a frontier territory. It was now firmly linked to the economy of the United States as a whole. In addition to increasing the ease of supply to the region, it also made New Mexico more accessible to tourism from the east, which soon became an important part of the local economy.

With the availability of rapid and inexpensive transport, several industries boomed in New Mexico. While sheep and wool production expanded, the cattle industry was also stimulated and soon became the dominant ranching industry. Mining expanded into the early 1900s, and coal became an important export. The transformation of the New Mexican economy into its modern form was well under way by the time it became the 47th state in 1912.

The arrival of the railroad created another major economic impact, one that rivaled the opening of the Santa Fe Trail in importance. Goods manufactured in the east could now be easily and cheaply transported to New Mexico, resulting in great changes in consumption patterns. While traditional

Hispanic consumption patterns seem to have survived the changes in availability of manufactured goods caused by the Santa Fe trade, they did not long survive the flood of goods carried by the railroad.

An example of this process is the use of Pueblo pottery for cooking and storage. This practice continued into at least the early Railroad period, as shown by the results of excavation at the Trujillo House and La Puente in the Chama Valley (Moore et al. in prep.). Pueblo pottery, apparently supplemented by Hispanic made wares, was used at these sites until at least the end of the nineteenth century. However, they were associated with large amounts of Euroamerican wares that seem to have mostly replaced the traditional Pueblo and Mexican wares used for serving and consuming food. As the Pueblos began producing increasing amounts of pottery for the tourist trade, their wares became more expensive. Accompanying this was the availability of other methods of cooking and storing food. Eventually, the use of earthenwares for these purposes virtually disappeared.

Trade over the Santa Fe Trail represents the first erosion of the traditional New Mexican economy, which was mostly based on the barter of agrarian products and goods produced by cottage industries. Before that time there is little evidence for the circulation of specie in New Mexico, and indeed the early Santa Fe traders complained that there was little hard cash in the territory, and what little was available was controlled by just a few families (Connor and Skaggs 1977). Even though much of the commerce conducted over the Santa Fe Trail continued to be based on barter, New Mexico in general was finally introduced to a cash economy. As the territory was integrated into the United States after 1846 and especially after the railroad arrived in 1880, New Mexico finally became fully integrated into the cash economy that dominated the rest of the North American continent.

PHYSICAL ENVIRONMENT

James L. Moore

Physiography and Geology

The study area is situated in the Española Basin, one of six or seven downwarped basins that formed along the continental rift now occupied by the Rio Grande between southern Colorado and southern New Mexico (Chapin and Seager 1975; Kelley 1979). Three episodes of deformation contributed to the development of these depressions, including formation of the ancestral Rocky Mountains during the late Paleozoic and the Laramide uplifts of late Cretaceous to middle Eocene times (Chapin and Seager 1975:299). These events created a north-trending tectonic belt, along which the Rio Grande rift formed. Chapin and Seager (1975:299) note: “The Rio Grande rift is essentially a "pull-apart" structure caused by tensional fragmentation of western North America. Obviously, a plate subjected to strong tensional forces will begin to fragment along major existing zones of weakness and the developing "rifts" will reflect the geometry of the earlier structure.” The early deformations weakened the continental plate, causing it to split along the Rio Grande depression and resulting in the formation of downwarped basins as the plate pulled apart.

The Española Basin is considered an extension of the Southern Rocky Mountain Province (Fenneman 1931) and is enclosed by mountains and uplifted plateaus (Kelley 1979:281). The Rio Grande flows through the long axis of the basin, entering through a gorge on the north and exiting through a gorge on the south (Kelley 1979). Boundaries for this physiographic feature include the Taos Plateau on the north, the Brazos and Tusas mountains on the northwest, the Sangre de Cristo Mountains on the east, the Cerrillos Hills and north edge of the Galisteo Basin on the south, the La Bajada fault escarpment and Cerros del Rio hills on the southwest, and the Jemez volcanic field on the west.

The Rio Chama is the main tributary of the Rio Grande in the Española Basin, and the confluence of these rivers is near the center of that feature (Kelley 1979). The Rio Tesuque and Rio Pojoaque are the principal drainages in the study area and originate in the Sangre de Cristo Mountains. Both streams flow through narrow valleys and merge northwest of Pojoaque Pueblo, then trend west to empty into the Rio Grande (Anschuetz 1986).

As subsidence proceeded, sediments were eroded into the Española Basin from the highlands to the north, northwest, and east, forming the Santa Fe group. This group of formations contains thick deposits of poorly consolidated sands, gravels, conglomerates, mudstones, siltstones, and volcanic ash beds (Lucas 1984). At one time the Tesuque formation of the Santa Fe group was covered by the Ortiz Pediment gravels, but severe erosion removed most of the latter, leaving isolated remnants on high ridges and hilltops. Subsequent gravel deposition was in the form of channel deposits along the Rio Grande.

In places, the Santa Fe group sediments were covered by volcanic deposits, especially in the north and northwest parts of the basin. There, the Puye fanglomerate, which formed after erosion of the Ortiz Pediment began, was covered by a thick layer of Bandelier tuff and local basalt flows. These igneous deposits form the Pajarito Plateau and Black Mesa.

Climate

Temperature is determined by latitude and elevation, though the latter is the more powerful determinant in New Mexico, with temperature decreasing more rapidly with a rise in elevation than with an increase in latitude (Tuan et al. 1973). Mean annual temperatures reported for Española are

49.4 to 50.7 degrees C (Gabin and Lesperance 1977). Summers tend to be warm, while winters are cool, and the Española area averages 152 frost-free days during the growing season (Reynolds 1956).

Cold air drainage is a common feature of deep New Mexico valleys. Night-time, down-valley winds are cool, but reverse to warm, up-valley winds during the day (Tuan et al. 1973:69). While narrow canyons and valleys create their own temperature regimes by channelling air flow in this way, temperatures on broad valley floors are influenced by local relief (Tuan et al. 1973:69). A study of these patterns has shown that temperature drops before sunrise are gradual or at least not extreme when winds are relatively stable throughout the night during spring and fall (Hallenbeck 1918:364-373). However, on clear nights accompanied by gentle horizontal gradients, sudden dips in temperature are not uncommon, and resultant crop damage is possible (Tuan et al. 1973:70). Studies at Hopi and Mesa Verde demonstrate that cold air drainage can significantly shorten the length of the growing season in valleys (Adams 1979; Cordell 1975). This phenomenon may be responsible for a shorter growing season in the Española area than in the Santa Fe area, which is higher in elevation (Anschuetz 1986).

New Mexico is one of three places in the United States that receives over 40 percent of its annual rainfall during the summer months (Tuan et al. 1973). Summer rainfall in the Southwest follows a true monsoon pattern (Martin 1963). Moisture-laden winds flowing north from the Gulf of Mexico are the main source of summer moisture, and their movement is controlled by a high-pressure system situated over the Atlantic Ocean. The amount of summer precipitation in the Southwest depends on the positioning of this system. When it is in a northward position, moist tropical air flows into the Southwest, and the summer is wet. When it is positioned southward the summer can be dry, a condition that may be caused by abnormally cold years in north temperate latitudes (Martin 1963).

Winter precipitation is derived from air masses originating in the extratropical regions of the Pacific Ocean or in Canada. While summer storms are generally short and intense, winter precipitation usually falls as snow, which melts slowly and soaks into the soil rather than running off, as does most summer rain. Though all precipitation is beneficial to local biota, winter precipitation is more effective because it soaks into the ground and recharges soil moisture reserves.

This is not to say that precipitation patterns are consistent across the Southwest. Indeed, great variation in rainfall patterns has been found between different parts of the region. Dean and Funkhouser (1995:92) suggest that a bimodal precipitation pattern prevails in much of the southern Colorado Plateau (northwest component) with maxima in both winter and summer. Conversely, a unimodal pattern with a summer maxima seems to prevail in the San Juan Basin and northern Rio Grande Valley (southeast component). This pattern has prevailed since at least A.D. 966 (Dean and Funkhouser 1995:92). There have been disruptions of the pattern since that time, but they have mostly occurred in the northwest component (Dean and Funkhouser 1995:94).

Annual precipitation records from Española indicate that the study area receives a mean of 237 to 241 mm of precipitation per year (Gabin and Lesperance 1977). However, precipitation levels can be quite variable from year to year. July through September are the wettest months in the area, receiving about 45 percent of the annual precipitation (Gabin and Lesperance 1977). However, the violence of summer storms results in a great deal of runoff, reducing the amount of moisture actually available for plant growth. Quite a bit of moisture is also lost through evaporation from plants and the soil surface, resulting in an annual moisture deficit of 691 mm in Española (Anschuetz 1986). Climatological data suggest that the inner Española Basin is a high-risk area for dry farming (Anschuetz 1986).

Soils

Soils in the study area can be divided into two groups based on geomorphology. Soils of the Dissected Piedmont Plain are most common in the area, and soils of the Recent Alluvial Valleys also occur (Folks 1975). The Pojoaque-Rough Broken Land association comprises the former group and is derived from Quaternary sediments and alluvium of the Tesuque formation of the Santa Fe group (Lucas 1984). These deep soils are well drained and occur on rolling to hilly uplands dissected by intermittent gullies and arroyos, though a few nearly level to gently sloping valley bottoms and floodplains next to intermittent streams are also included in the association. Most of these soils are forming in unconsolidated coarse to medium-textured and gravelly old alluvium, which is usually calcareous and contains sandy clay loam, sandy loam, or gravelly sandy loam surface layers. Lag gravel deposits often cover the surface of these soils (Folks 1975:4; Maker et al. 1974:33).

Soils of the Rough Broken Land association occur on broken topography, steep slopes, and rock outcrops. This association is dominated by rock outcrops and small areas of highly variable soils (Maker et al. 1974:24). Rough Broken Land soils are intermingled with Pojoaque soils and together tend to occur on ridgetops between drainages.

The El Rancho-Fruitland association dominates the soils of the Recent Alluvial Valleys. They are deep and loamy like the Pojoaque soils, but unlike them tend to occur on low terraces along the Rio Tesuque and Rio Pojoaque. El Rancho-Fruitland soils are derived from sedimentary rocks of the Tesuque formation and granites from the Sangre de Cristo Mountains (Folks 1975:3). They are currently used for irrigated crops, while the Pojoaque soils are not used in modern agriculture.

Flora and Fauna

The study area contains juniper-piñon grasslands, dry riparian, and riparian/wetland habitats. The former is most common and supports an overstructure dominated by juniper and piñon pine, with an understructure containing muhly grass, grama grass, other less common grasses, four-wing saltbush, sagebrush, rabbitbrush, prickly pear, and cholla. A recent invader that occurs in the north part of the area is Russian knapweed.

The dry riparian habitat occurs in arroyo bottoms, on arroyo banks, and on floodplains adjacent to some of the wider drainages (Anschuetz 1986). Plants commonly found in this habitat include rabbitbrush, fourwing saltbush, mountain mahogany, scrub oak, Rocky Mountain beeweed, Indian ricegrass, three-awn grass, side-oats grama, and flax (Pilz 1984). The riparian/wetland habitat occurs only along perennial streams such as the Rio Tesuque and Rio Pojoaque (Anschuetz 1986). Today, this habitat supports willow, cottonwood, tamarix, rushes, and sedges (Pilz 1984).

Animals commonly found in the study area include coyote, badger, porcupine, blacktailed jackrabbit, desert cottontail, spotted ground squirrel, and various birds. Small numbers of mule deer now occur in the region, as do black bears (Pilz 1984). Indeed, bear scat was noted at LA 4968 and showed that black bears still come down from adjacent highlands to take advantage of plants that ripen in the late summer and early fall, such as juniper berries. Animals that were originally common in higher elevations of the region include mule deer, wolf, coyote, bobcat, mountain lion, squirrel, various species of mouse, chipmunk, prairie dog, woodrat, jackrabbit, cottontail, skunk, raccoon, black bear, and elk (Anschuetz et al. 1985; Fiero 1978).

TESTING FIELD METHODS

General field methods were standardized for this project, and a manual describing the methods to be used in most of the situations that would potentially be encountered and explaining how forms were to be completed was prepared prior to entering the field. Thus, the same general field methods were applied to all prehistoric and historic sites examined during this study. However, there were specific differences in how certain methods were instituted and how particular types of data were recorded at these sites. Variations in site structure and the nature of remains encountered were responsible for these differences and are detailed in individual site reports. This chapter describes the general methods used during testing at all of the sites examined by this project. For a more detailed discussion of the field methods used during this project, the reader is referred to the field manual (Boyer and Moore in prep.).

Preparation for Testing

The initial step in testing was to dispatch a crew to complete an initial layout of datums and grid systems for each site along the northernmost stretch of U.S. 84/285 within project limits. A location for a main site datum was selected for each site, and was marked by a length of ½ inch rebar. All subsequent horizontal and vertical measurements were tied to this point. The main site datum was assigned an arbitrary elevation of 10 m below datum, which allowed us to avoid negative elevations.

A grid system was then established and oriented to magnetic north. For ease of recording, it was considered preferable to keep all grid designations in the northeast quadrant of the arbitrary coordinate system. Thus, the main datum was designated as the intersection of the 500N and 500E grid lines, except at LA 160, where it was labeled 900N/900E because the projected size of that site was much larger than any of the others along this stretch of highway. Subdatums were placed at 10 and 20 m intervals along grid lines, providing a framework for site mapping and testing activities. Subdatums were marked in the same way as the main site datum.

Testing Procedures

The surface of each site was inspected to locate potential structural remains, features, artifact clusters, and horizontal limits. Plans were produced for each site using a transit and stadia rod or 30 m tape and include the locations of all tests, potential structures, features, artifact concentrations, and current cultural and topographic features within proposed right-of-way limits. Topographic contours were mapped to provide an accurate depiction of site structure in relation to its immediate physical environment.

Auger Holes

Initial subsurface probing was completed using soil augers. Auger holes were placed in areas that contained surficial artifact concentrations or were suspected of containing subsurface features, but they were not used to investigate possible structural mounds. Soil was removed from auger holes in 10 to 20 cm vertical units (the maximum being the approximate depth of an auger bucket) and screened through ¼ inch mesh or smaller hardware cloth. Approximate depths at which cultural materials were encountered were recorded, and any artifacts recovered in screens were retained for analysis. A standard form was completed for each auger hole that recorded its location, maximum depth, types of associated cultural materials, and the depths at which they were found, and descriptions of each soil layer encountered.

Test Pits

Test pits were used to examine possible structural mounds, and they were sometimes used to augment the results of auger tests in areas containing potential cultural deposits. The use of test pits in these cases allowed a more detailed examination of subsurface deposits and a more exact delineation of cultural remains. Test pits were excavated by hand tools in 1 by 1 m grid units. Grid units were dug in arbitrary 10 cm levels unless distinct natural stratigraphic breaks were found. When natural strata were defined they became the vertical units of excavation. Soil removed from test pits was screened through ¼ inch mesh hardware cloth, and all artifacts recovered by this procedure were retained for analysis.

Each excavated grid unit was assigned a provenience according to the grid lines that intersected at its southwest corner. Thus, a grid unit that had the 500N and 500E grid lines intersecting at its southwest corner was labeled 500N/500E. A standard form was completed for each level of excavation in a grid unit. Data recorded on each form included the grid provenience, ending depths, a description of the soil matrix, and a list of artifacts recovered. Profiles were drawn when more than one cultural stratum was encountered, and soil strata were described on separate forms. Plans were completed for test pits that contained features or structural remains. Test pits ended when sterile strata were encountered, and auger holes were sometimes used to verify that sterile strata had been reached. Following completion of all necessary records, test pits were backfilled.

Mechanically Excavated Trenches

The final technique as used to examine some sites during testing was the excavation of trenches using mechanical equipment, in this instance a backhoe. This method of examination was primarily used to provide a more detailed look at natural soil stratigraphy in off-site areas. At times it was also used to examine certain topographic or vegetational features to verify that they were not of cultural derivation. In the latter case, all surface evidence pointed to a noncultural origin, and mechanical testing was performed to verify that conclusion.

A standard form was completed for each mechanically excavated trench, including information on trench location and dimensions, descriptions of the soil strata encountered, and summaries of any cultural materials noted during excavation. Profiles were completed when cultural strata or features were encountered; otherwise they were considered unnecessary unless the natural soil stratigraphy was too complex to be adequately described in narrative form.

Artifacts

As noted earlier, all artifacts recovered in screens were collected for analysis. All types of artifacts from an excavation unit (arbitrary level or stratum) were assigned the same field specimen (FS) number, but were bagged by category. For example, if a level yielded pottery, chipped stone, and bone, each class of artifact was placed in separate bags, but all received the same FS number. Field specimen information was recorded in a separate catalog, and the FS number was placed on all bags and related excavation forms so that artifacts could be tracked back to the location from which they were recovered.

Photographs

Photographs were taken when necessary, but there was no standardized format for this procedure during testing. In general, testing was aimed at extracting just enough information to enable us to develop an adequate data recovery plan. This means that the verification of a feature or structure location was considered to be a sufficient expenditure of effort, and no attempt was made to define their exact limits during this study. Thus, few photographs were considered necessary at this level of examination because the types of remains that would typically be documented in this manner were not completely exposed.

Disposal of Records and Artifacts

Following the completion of all phases of this study, testing records will be on file at the Archeological Records Management Section of the New Mexico Historic Preservation Division. Artifacts will be curated at the Museum of New Mexico in Santa Fe, unless ownership is retained by private land owners.

TEST EXCAVATIONS AT LA 160

James L. Moore

LA 160 is near the north edge of the project area and falls within a wide zone that will contain an interchange when the project is completed. Testing was initiated to examine the part of LA 160 within the proposed right-of-way and assess the depth and extent of any remains found in that area. The section of site within project limits probably comprises less than 10 percent of its total area, but this is uncertain, since the full extent of the site has never been accurately determined, even though it has been examined by archaeologists on several occasions. Previous studies have usually been confined to surface examination. Part of the site was excavated but never reported upon. Unless otherwise noted, records discussed in this section are on file at the Archeological Records Management Section of the New Mexico Historic Preservation Division.

Previous Studies of LA 160

LA 160 was first recorded in the 1930s by H. P. Mera of the Laboratory of Anthropology. His site plan shows a fairly large structure in the form of a reverse-h measuring about 35 m east to west by 31 m north to south, with a smaller detached structure (15 by 9 m) a few meters to the east. If this is the same structure identified during later surveys of the site, it is outside but directly adjacent to the proposed right-of-way. Mera's field notes indicate that he recognized LA 160 as a historic residence, since mostly historic Tewa series pottery types were recorded. However, a few Biscuit B sherds were apparently also seen.

In preparation for construction along U.S. 84/285, Stewart Peckham of the Laboratory of Anthropology excavated a four-room structure at LA 160 in 1959. According to a photocopy of a section of NMSHTD project plans included in the LA 160 site file, this structure was on the east side of the current right-of-way, opposite the area examined during this project. Though Peckham's study has never been reported, his notes indicate that the structure dated to the last half of the nineteenth century. Local informants identified the structure as the post office of the former settlement of Valdez, but this identification is questionable. Dike (1958-1959) indicates that only one post office was associated with a community named Valdez during the American Territorial period (1846 to 1912), and it was in Taos County. In addition, Peckham's notes indicate that an horno was associated with the structure in addition to domestic refuse. Thus, this structure was probably a residence.

The next examination of LA 160 occurred in 1962 as part of the Highway Cultural Inventory Project, a state-wide survey of sites within highway rights-of-way. The site form from this examination describes LA 160 as a prehistoric site, dating ca. A.D. 1100 to 1500, that might contain multiple eroded pithouses. A note to this effect was entered on Mera's survey card. The sketch map associated with this examination places LA 160 in the correct location. Considering that no historic pottery types were identified during this study, we must conclude that the archaeologist had little or no knowledge of historic native pottery types and misidentified the assemblage.

LA 160 was again recorded in 1987 in preparation for the construction of a port-of-entry along U.S. 84/285 by the NMSHTD (Haecker 1987). This study recognized the site as a historic Spanish residence and assigned it a seventeenth- to eighteenth-century date. A data recovery plan was prepared for portions of LA 160 within project boundaries (Moore 1989) but was never carried out because the planned port-of-entry was canceled before excavation began. Haecker's field notes suggest the presence of a structural mound (40 by 30 m) between a shallow arroyo and an abandoned roadbed west of the current highway (Provenience 2 in Fig. 2). Southeast of the mound he noted a

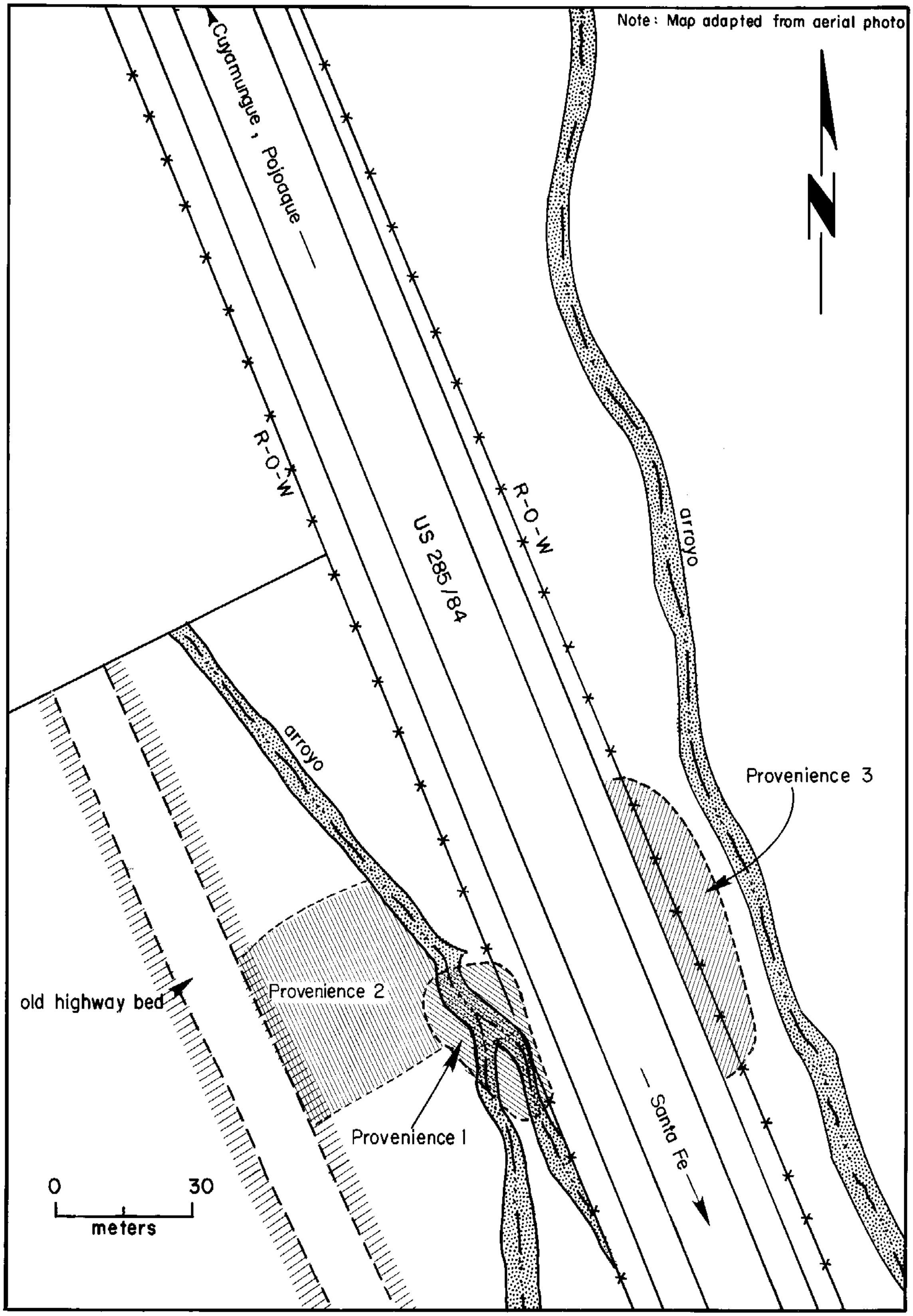

Figure 2. Plan of LA 160 (from Moore 1989, based on Haecker 1987).

midden containing numerous artifacts (Provenience 1 in Fig. 2). A scatter of artifacts was identified on the east side of U.S. 84/285 (Provenience 3 in Fig. 2), but Moore (1989) concluded that they did not represent intact cultural deposits. Indeed, this artifact scatter appears to be the location of Peckham's 1959 excavations.

Subsequent examination in preparation for the aforementioned data recovery plan verified the presence of the structure and midden, which at that time appeared to be an eroding trash pit. Based on these studies, LA 160 was recommended for the Archaeological Site Stabilization and Protection Program, another examination of sites within highway rights-of-way conducted by the OAS for the NMSHTD. However, a site update form from that study indicates that LA 160 is not eligible for study under the guidelines of that project because there were no obvious cultural remains within the current highway right-of-way.

Another study of LA 160 was completed in preparation for the current highway project (Hohmann et al. 1998). This examination again defined LA 160 as a Spanish Colonial residence. However, more recent historic materials were also noted across the site which seem to date to the twentieth century. A fairly large structural mound was observed (51 by 30 m), consistent in location with the one seen by Haecker. The possible midden seen during earlier studies was also found.

Finally, LA 160 was examined by Peter McKenna of the Bureau of Indian Affairs in 1999, shortly before we entered the field to begin testing along U.S. 84/285. McKenna mapped the structure and midden noted by earlier investigators and extended site limits nearly to the Rio Tesuque to include several other potential structures and trash areas. In this study the structural mound measures 45 by 15 m, which is much smaller than others have suggested. McKenna's examination of vegetation patterns on aerial photographs suggested that other major structural remains, potentially a Spanish plaza settlement, might be located directly south of the known structural mound. Several other possible structures were defined on the same basis. This led to concerns that LA 160 might be much larger than recognized by previous researchers and that it would represent a major effort during data recovery.

To summarize, LA 160 has been examined by archaeologists on at least eight occasions. With the exception of Peckham's excavation, the section of LA 160 recorded by the various surveys is situated on the west side of U.S. 84/285. The Mera, Haecker (1987), Hohman et al. (1998), and McKenna studies all identified a mound that seems to represent the remains of a melted adobe structure. Though each researcher gives the mound a different size, the relative consistency of measurements suggests that it is the same feature in each case. Haecker (1987), Moore (1989), and Hohman et al. (1998) indicate that a midden (or trash pit) is east and southeast of the mound. In addition to the probable structure and midden, Haecker (1987) and Hohman et al. (1998) felt that the wide gully that separates these features represents the remains of an acequia. Haecker (1987) based this conclusion on the straightness of this section of channel, which he considered unnatural. McKenna suggests the presence of numerous other structures that were not identified by earlier studies, based on the pattern of Russian knapweed distribution.

It is evident that descriptions of cultural remains at LA 160 differ according to the archaeologist doing the recording. In order to provide the most detailed description of LA 160 possible, it is necessary to summarize from the more recent examinations of the site including Haecker (1987), Moore (1989), Hohmann et al. (1998), and McKenna's unpublished notes.

Haecker (1987) indicates that LA 160 measures 120 by 80 m and includes a structural mound, midden, and scatter of artifacts on the east side of the highway. Moore (1989) essentially agrees with these dimensions, though he questions the association of remains on the east side of the highway. Hohmann et al. (1998) suggest that the site measures 210 by 185 m, extending it to both the west and south to include the limits of an associated artifact scatter, but not the structure excavated by Peckham. In all three of these descriptions, the only features mentioned are the structural mound and one or more trash areas.

The most detailed examination of LA 160 was the unpublished survey completed by McKenna. Dimensions derived from his sketch map indicate that the site measures 225 m from southwest to northeast, and 85 m from northwest to southeast. In addition to the probable structure and midden observed by the other surveys, McKenna identified five other possible structures, trailing off toward the southwest and distinguished by slight mounding in heavy stands of Russian knapweed. Artifacts are also scattered across this area and cluster in several locations.

Structure 1 is a crescent-shaped mound that measures about 45 by 15 m and is directly adjacent to the edge of the proposed right-of-way. This mound was identified by every examination of the site. The remaining structures are west of the abandoned road in Figure 2 and are not shown on this plan. Structure 2 is a crescent-shaped mound measuring 26 by 6 m. The other structures are represented by rectangular mounds measuring 16 by 6.5 m (Structure 3), 15 by 12 m (Structure 4), 7 by 5 m (Structure 5), and 12 by 5 m (Structure 6).

Other than the abandoned gravel road that probably represents the old route of U.S. 84/285, at least four other linear features cross LA 160. The configuration of these features suggests that all represent segments of unimproved roads that are no longer in use. However, it is also possible that they are segments of abandoned acequias. Several structures and linear features were cursorily examined during testing. In most cases, stands of knapweed were so dense around potential structural mounds that their true nature could not be determined. The linear features were clear of undergrowth and appear to be old roads rather than acequias.

Several areas containing fairly dense scatters of trash were also noted during this cursory examination. Most of the trash scatters contain modern refuse deposited less than 50 years ago, but in some areas clusters of earlier native pottery were also observed. In one instance a scatter of native pottery is partly overlapped by a more recent dump. The structure of this scatter suggests that two separate periods of trash disposal are represented.

The densest scatter of cultural materials was in the midden identified by Haecker (1987). At that time it was described as containing hundreds of native sherds, a few chalcedony flakes, fragments of ground stone, and a few pieces of bone. This area is cut by two erosional channels, creating separate proveniences (Fig. 2). Moore (1989:2) suggests that the distribution of artifacts on the surface of the midden and in the gully banks indicates the presence of trash-filled pits of unknown depth. Since all potential structures are outside project limits, testing concentrated on the midden identified as Provenience 1 in Figure 2.

Questions concerning the Nature of Archaeological Remains at LA 160

Several questions can be generated from this discussion that may be useful in guiding this study as well as data recovery. The most important questions from a cultural resource management viewpoint concern the location and extent of archaeological remains within project limits. Testing was initiated to address this question. Most other questions can only be answered when more data become available. While a set of questions is posed in this section, they are addressed in later parts of the report. Those that could be answered by this study are considered after presentation of testing results, while the rest are discussed later in the data recovery plan.

1. Are historic trash deposits present within project limits? If so, what is their vertical and horizontal extent?

2. If cultural deposits are present, are they in trash pits as suggested by Moore (1989)?

3. Does the mound identified by nearly all archaeological studies of LA 160 represent structural remains, or is it a natural feature of the landscape?

4. Do the vegetative patterns identified on aerial photographs by McKenna represent structural remains, or are they natural? Could they instead represent areas in which the surface has been disturbed rather than structures?

5. What is the nature of the five low mounds identified by McKenna? Do they represent the remains of structures, or are they natural features of the landscape?

6. Could the presence of underlying prehistoric remains have led to the erroneous identification of LA 160 as a prehistoric site during the 1962 survey?

7. What is the relationship between the late nineteenth-century structure excavated by Peckham and the rest of the site? Is the Spanish Colonial period date that has traditionally been assigned to this site correct, or is LA 160 a later settlement dating to the same period as Peckham's structure?

8. What is the nature of the wide gullies that bisect LA 160? Are they the remains of acequias or segments of unimproved roads?

9. What is the relationship (if any) between subsurface remains at LA 160 and deposits of what has been assumed to be later trash from the twentieth century?

Testing Procedures

Before testing began, the edge of the proposed right-of-way was marked by the engineering firm responsible for design of this section of the Santa Fe to Pojoaque Corridor Project. The first step in testing was establishment of a main site datum and grid system. The main datum was placed at the intersection of the 900N and 900E grid lines. A grid system was set up consistent with the methods described in *Testing Field Methods*. Because this study concentrated on what appears to be only a small part of LA 160, a detailed site plan was not completed during this phase of work. This was because of the potentially large size of LA 160 and vegetative cover that obscured the ground surface and made definition of structural remains difficult. A plan of the entire site will be prepared as part of data recovery investigations.

Three types of test units were used to examine subsurface deposits: auger holes, test pits, and mechanically excavated trenches. Auger holes were used for initial subsurface probing and allowed us to closely examine soil stratigraphy across different parts of the site. This helped define the nature of most of the strata encountered and to isolate areas containing subsurface cultural materials. When necessary, these areas were further examined by test pits to help define their nature. Test pits provided a more extensive look at subsurface deposits and their artifact content. Mechanically excavated trenches were used to examine a large area south of the 900N grid line. This area was characterized by a vegetative signature that was thought to represent potential structural remains. After smaller test units demonstrated that this assumption was incorrect, mechanically excavated trenches were used to verify this conclusion.

Auger Holes

Seven transects of auger holes were used to examine subsurface deposits at LA 160 (Fig. 3). Five were set along grid lines, and the last two were oriented at an angle to grid lines to more easily examine areas that contain surface artifact concentrations. Augering continued until the excavator encountered rocks or the sterile preoccupational substrate, or the full extent of the auger handle was reached. Auger hole data are summarized in Table 1.

Table 1. Auger holes at LA 160

Area of Site	Auger Hole	Location	Total Depth (cm)	Cultural Deposits?	Depth of Cultural Deposits (cm)
Trash Area 2	AH-1	950N/891E	150	no	
	AH-2	947N/890E	95	yes	to 95
	AH-3	944N/890E	51	yes	to 25
	AH-4	941N/890E	175	yes	to 100
	AH-5	938N/890E	176	yes	to 40+
	AH-6	935N/890E	110	no	
	AH-7	932N/890E	180	no	
Trash Area 2	AH-8	940N/893E	180	no	
	AH-9	940N/896E	150	no	
	AH-10	940N/899E	170	yes	to 45
Trash Area 1	AH-11	969N/875E	151	no	
	AH-12	976N/875E	120	no	
	AH-13	978N/875E	58	yes	to 30
	AH-14	980N/875E	92	yes	to 30
	AH-15	982N/875E	84	yes	to 20
Trash Area 1	AH-16	978N/875E	72	no	
	AH-17	976N/876E	80	yes	to 10
	AH-18	974N/877E	56	yes	to 10
	AH-19	972N/878E	50	no	
	AH-20	971N/879E	44	no	
	AH-21	969N/880E	56	no	
	AH-22	967N/881E	72	no	
	AH-23	965N/882E	97	no	
	AH-24	963N/883E	188	no	
	AH-25	962N/883E	142	yes	to 55
	AH-26	960N/884E	132	yes	to 35
	AH-27	958N/885E	125	yes	to 26
Trash Area 1	AH-28	960N/890E	70	yes	to 30
	AH-29	958N/890E	60	yes	to 20
900E line	AH-30	905N/900E	64	no	

Area of Site	Auger Hole	Location	Total Depth (cm)	Cultural Deposits?	Depth of Cultural Deposits (cm)
	AH-31	910N/900E	60	no	
	AH-32	915N/900E	65	no	
	AH-33	920N/900E	95	no	
Trash Area 3	AH-34	940N/905E	70	no	
	AH-35	938N/904E	75	yes	to 10
	AH-36	936N/904E	80	no	
	AH-37	934N/905E	95	yes	to 20
	AH-38	932N/906E	95	yes	to 10

The first auger transect ran along the 890E grid line between 932N and 950N and was used to examine Trash Area 2. The seven auger holes in this transect were spaced at 3 m intervals. In each case the uppermost soil layer was a .18 to 1.30 m thick layer of brown silty clay loam. In AH-1 this unit was underlain by .50 m of dark brown clay and .32 m of yellow-brown silty sand, and ended in a dense dark brown clay with reddish-brown and black mottling. This auger test was outside the trash area and provided a view of the natural stratigraphy.

AH-2 encountered a .25 m thick layer of silty clay loam, which was underlain by .20 m of brown silty sand and .35 m of brown sandy clay. This test ended .15 m into a light brown silty sand when rock was encountered. Not only was this the only case where subsurface rocks large enough to stop an auger were found, but the lowest soil layer also yielded two historic earthenware sherds. Both factors suggest that a subsurface feature, probably a small trash-filled pit, is located in this area.

Charcoal was noted in the .25 m thick layer of silty clay loam at the top of AH-3, which was underlain by .23 m of bioturbated brown clay and ended in dense dark brown clay with reddish-brown and black mottling. AH-4 and AH-5 each contained a series of alluvial silty sands and clays, and ended in dense dark brown clay with reddish-brown and black mottling. Historic sherds were recovered to a depth of about 1 m in AH-4 and .3 m in AH-5, suggesting the presence of fairly thick cultural deposits in that area.

AH-6 returned to what appeared to be the natural soil stratigraphy. A .47 m thick layer of silty clay loam was underlain by .53 m of brown bioturbated clay in this test, which ended in dense dark brown clay with reddish-brown and black mottling. A fairly atypical though natural sequence of soil layers was found in AH-7 and consisted of 1.30 m of silty clay loam underlain by fine-grained yellow-brown sand. A small fleck of charcoal was found in each layer, probably natural in origin.

The second auger transect ran along the 940N line between 893E and 899E and was also used to examine the limits of Trash Area 2. This transect contained three holes spaced at 3 m intervals and did not confirm the presence of the cultural deposits encountered in the first transect. Similar soil layers were found in all three auger holes. AH-8 contained .15 m of silty clay loam underlain by 1.10 m of a brown bioturbated clay and ended .55 m into light yellow-brown fine silty clay. In AH-9 the

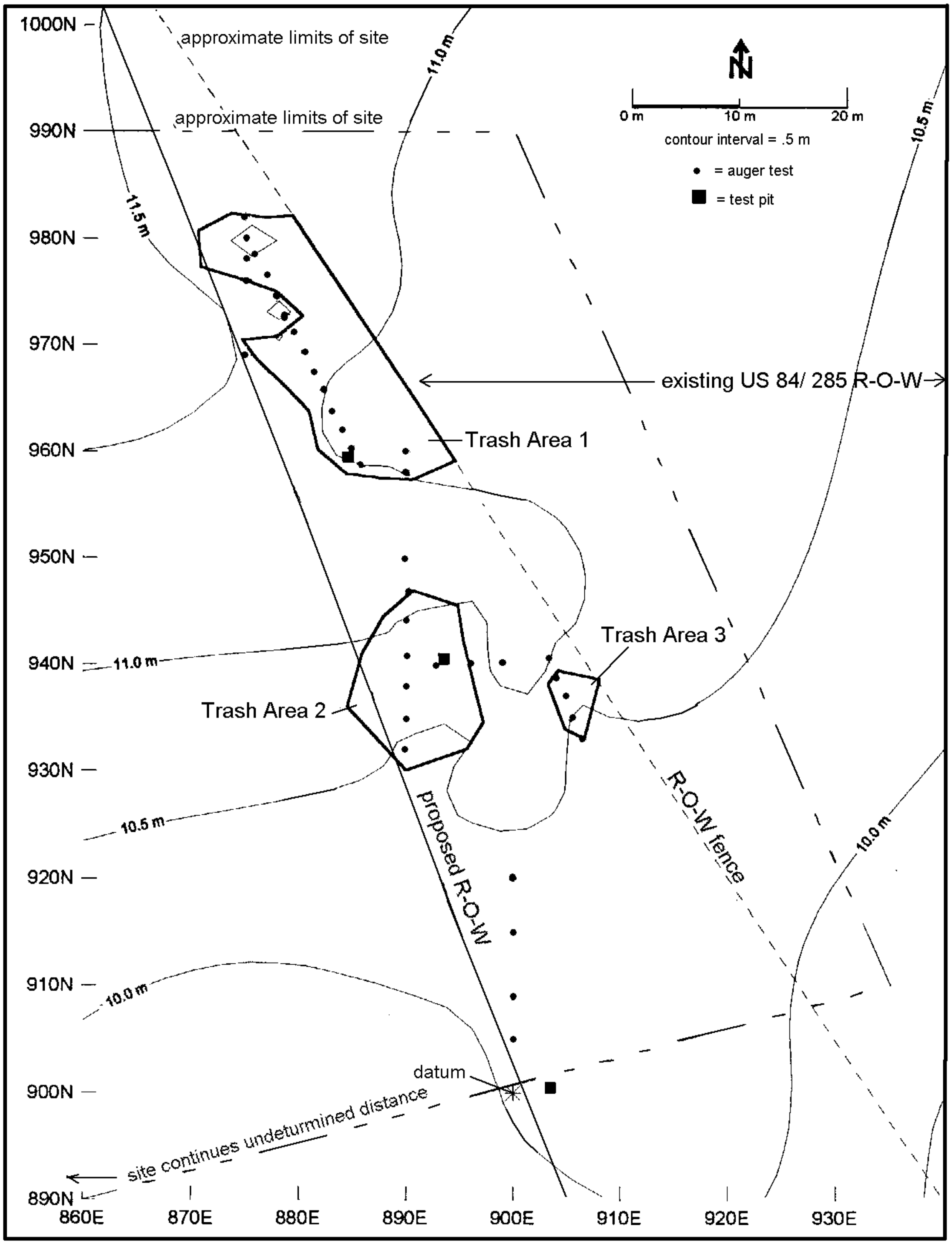

Figure 3. Location of auger transects at LA 160.

silty clay loam was .30 m thick and underlain by .60 m of brown bioturbated clay and .20 m of dense dark brown clay with reddish-brown and black mottling, and ended .40 m into the light yellow-brown fine silty clay found in AH-8. The silty clay loam was .15 m thick in AH-10 and underlain by .30 m of brown bioturbated clay and .73 m of light yellow-brown fine silty clay, and ended .52 m into dense dark brown clay with reddish-brown and black mottling. The only materials of potential cultural derivation in this transect were charcoal flecks in the upper .45 m of AH-10.

A transect of five auger holes was placed along the 875E grid line between 969N and 980N and was used to examine the west edge of Trash Area 1. AH-11 was on a projection between two erosional swales. The surface layer of silty clay loam was eroded from this area, so the upper soil was a .52 m thick layer of brown bioturbated clay. This was underlain by .58 m of dense dark brown clay with reddish-brown and black mottling, .16 m of light yellow-brown fine silty clay, and .23 m of fine yellow-brown sand, and the auger hole ended .4 m into a dark brown silty clay.

The other auger holes in this transect began 6 m north of AH-11 and were spaced 2 m apart. In AH-12, a .30 m thick surface layer of silty clay loam was underlain by .80 m of dense dark brown clay with reddish-brown and black mottling, and the test ended .10 m into fine-grained light yellow-brown sand. In AH-13 the silty clay loam was .40 m thick, and the auger hole ended .18 m into the dense clay. A sherd was found .10 to .20 m below the surface, and charcoal flecks were noted between .20 and .30 m. The same layers were repeated in AH-14, except that they were separated by .05 m of yellow-brown sand. In this case the silty clay was .50 m thick, and the auger hole ended .37 m into the dense clay. Charcoal flecks occurred to a depth of .30 m. The soils in AH-15 were the same as those in AH-13. The upper silty clay was .54 m thick, and it ended .30 m into the dense clay. Charcoal flecks occurred to a depth of .20 m.

Twelve auger holes oriented at an angle to the grid system were also used to examine Trash Area 1 and were spaced 2.0 m apart. The upper .34 m of soil in AH-16 was silty clay loam, and this probe ended .38 m into dense dark brown clay with reddish-brown and black mottling. A shallow abandoned stream channel was noted in AH-17 and AH-18. Under a surface layer of silty clay loam (.40 m and .27 m thick, respectively), alluvial deposits were encountered to nearly the bottoms of these auger holes. AH-17 ended .20 m into the dense clay, and AH-18 ended .21 m into the same stratum. Both contained charcoal flecks in their upper .10 m. The next five tests along this line toward the south contained silty clay loam over dense clay and yielded no cultural materials. The thickness of the silty clay loam was .18 m in AH-19, .15 m in AH-20, .30 m in AH-21, .45 m in AH-22, and .66 m in AH-23. Ending depths for these auger holes are shown in Table 1.

Deposits from a wide, shallow abandoned stream bed were found in the last four auger holes along this transect. The surface layer in each was silty clay loam, the thickness of which was 1.02 m in AH-24, .66 m in AH-25, .70 m in AH-26, and .84 m in AH-27. Various alluvial sand, clay, and silty clay strata occurred below this layer. Cultural materials were found to depths of .35 m in AH-25 and AH-26, and to .26 m in AH-27. Except for a historic earthenware sherd from AH-25, these materials were charcoal flecks. Charcoal flecks were noted between .95 and 1.05 m below the surface in AH-24 and at about 1.25 m in AH-25, but these examples were probably of noncultural derivation because of their location deep in the stream deposits.

A short transect of two auger holes was placed along the 890E line 5 m east of the south end of the last transect described in order to substantiate the occurrence of cultural remains in that area. Though these auger holes were only a few meters away from the previous transect, they contained no stream deposits. Silty clay loam comprised the upper .45 m of fill in AH-28 and the upper .46 m in AH-29. This was underlain by dense dark brown clay with reddish-brown and black mottling in both tests. Charcoal was encountered in the upper .30 m of AH-28, while in AH-29 a sherd was recovered from the upper .10 m, and charcoal occurred to a depth of .20 m.

Four auger holes were used to examine an area between 905N and 920N along the 900E grid line that, because of vegetative patterns, was suspected of containing structural remains. These auger holes were spaced 5 m apart and yielded no evidence of cultural deposits. Silty clay loam comprised the surface layer in all four holes and was .37 m thick in AH-30, .27 m in AH-31, and .20 m in AH-32 and AH-33. In each case this was underlain by .24 to .28 m of brown bioturbated clay, except for AH-33, where the brown clay was .67 m thick. Excavation ended in dense dark brown clay with reddish-brown and black mottling, again except for AH-33, which penetrated into light yellow-brown fine silty clay.

The last transect was used to examine subsurface deposits in Trash Area 3. These auger holes were oriented at an angle to the grid lines and were spaced 2 m apart. The surface layer consisted of .05 to .15 m of silty clay loam in AH-34, AH-37, and AH-38. This stratum was missing from AH-35 and AH-36, where the surface layer was the brown bioturbated clay, which was more typically under the silty clay loam in the other three auger holes. A series of alluvial sands and clays was encountered beneath the brown clay in each case, and excavation ended in dense dark brown clay with reddish-brown and black mottling, except for AH-34, which ended in the alluvial deposits. Two sherds were recovered from the upper .10 m of fill in AH-35, and one was found in the upper .20 m of AH-37. Charcoal was noted in the upper .10 m of AH-38, and between .75 and .80 m in the same test. While the former was probably of cultural origin, the latter most likely represents a natural burn.

Test Pits

Three test pits excavated at LA 160 were used to investigate two trash areas and a possible structure. In all three cases, the test pits were used to augment and verify conclusions based on the results of nearby auger tests. Excavation in test pits continued until no further cultural materials were recovered or the sterile preoccupational substrate was encountered. Test pits were labeled according the intersecting grid lines at their southwest corners.

959N/884E

All three auger transects placed across Trash Area 1 suggested the presence of cultural deposits in that part of the site, but we were uncertain how dense the artifact content was. A test pit was excavated near the south edge of the trash area between auger transects in an attempt to address this question. The entire grid was excavated in three levels to a depth of .31 m. A fourth level penetrated another .21 m in the west half of the grid. The upper .05 m of fill consisted of a brown silty clay loam, which was underlain by brown bioturbated clay. Numerous artifacts were recovered from the upper .25 to .30 m of fill, and some chunks of charcoal occurred between .20 and .30 m below the surface.

Only ceramic artifacts were recovered from this test pit. Level 1 contained 13 native sherds. Nineteen native sherds were found in Level 2, and 20 came from Level 3. No cultural materials occurred below this level. Though root disturbance was noted in the upper .30 m of fill, the density of artifacts in this zone cannot be attributed to bioturbation, especially considering the presence of cultural (probably) charcoal near its bottom. Interestingly, the mean size of sherds in this test pit appears to increase with depth, suggesting that those in the upper levels may actually have been moved upward by bioturbation.

940N/893E

This test pit was used to investigate Trash Area 2 in an effort to define the nature of suspected cultural deposits in that part of the site. The presence of probable cultural deposits in this area was suggested by the results of two nearby auger transects. 940N/893E was excavated in five levels to a depth of .50 m, and an auger hole penetrated another .20 m. The upper .20 m of fill consisted of brown silty clay loam containing numerous artifacts and fragments of charcoal. The lower fill was brown bioturbated clay containing few artifacts and small fragments of charcoal.

Level 1 contained the largest number of artifacts, including 26 native sherds and three pieces of glass. Fifteen native sherds were recovered from Level 2, while Level 3 yielded only six native sherds and a glass fragment. The only artifact recovered from Level 4 was a glass fragment, and no cultural materials were found in Level 5. The presence of a few artifacts in the clay is probably attributable to bioturbation, since some rodent disturbance was noted.

900N/903E

This test pit was placed in an area that was initially thought to contain structural remains because of the vegetative pattern noted on aerial photographs. Adjacent auger tests suggested that this assumption was incorrect, and 900N/903E was excavated to verify these conclusions. This test pit was excavated in three levels to a depth of .28 m, and an auger hole penetrated another .41 m. Two basic strata were encountered in this grid. The upper .05 m of fill was brown silty clay loam, which was underlain by dark brown clay. The clay contained some sands and pea gravels at and just below the boundary with the silty clay loam, but these inclusions disappeared by the bottom of the test pit. The upper two levels each contained a sherd and a fragment of charcoal. The sherd recovered from the second level came from near the top of that .10 m thick unit.

Basically, the clay encountered just below the surface in this test pit matches the uppermost preoccupational substrate found elsewhere in this area. The lack of structural remains in this grid suggests that the vegetational pattern in this area does not represent structural remains, verifying the results of the nearby auger transect. The paucity of artifacts in this test pit indicates that cultural deposits are also lacking.

Mechanically Excavated Trenches

A probable structural mound occurs directly east of Trash Area 1 and northwest of Trash Area 2. While this feature is not shown on the testing plan (Fig. 4), it is directly west of the proposed right-of-way in that area. The mound is fairly low and is covered by Russian knapweed, but it has been identified as a probable structure during nearly every study of LA 160. The area south of the mound also contains heavy growths of knapweed, which on aerial photographs resembles a plaza surrounded on four sides by roomblocks. Other similar vegetative stands trail off to the south. The presence of possible structures in this area was of particular concern, because earlier examinations of the site had not noted their presence.

Initial reconnaissance showed that this area contains few surface artifacts. Though the knapweed stands initially appeared to be mounded, closer examination showed that the apparent mounding was caused by the way in which the knapweed was growing: plants on the exterior edges of patches were shorter than those on the interior. Thus, the vegetative growth pattern created the illusion of low mounds, which closer inspection showed were not really there.

Examination of an auger transect along the 900E grid line between 905N and 920N showed that

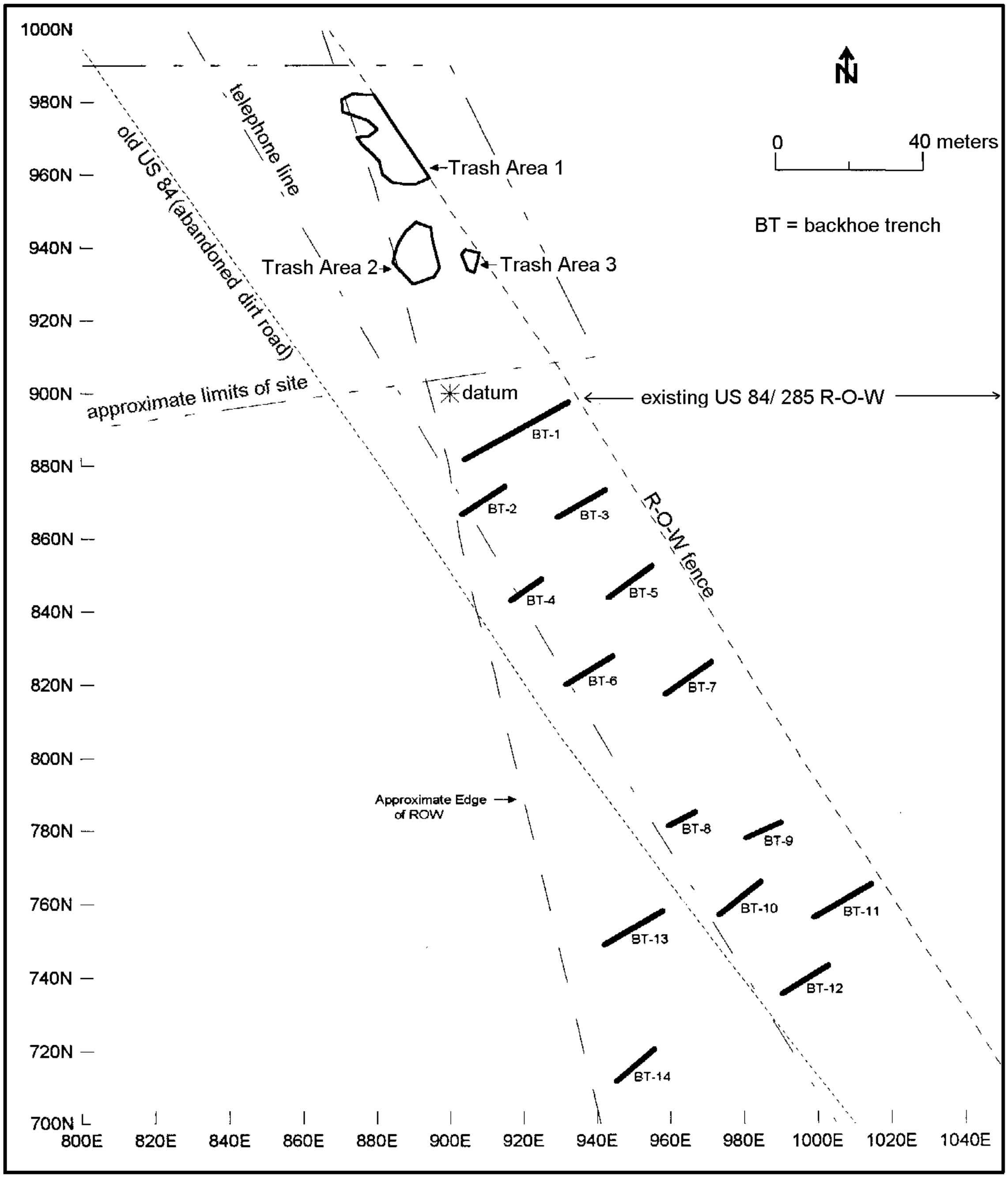

Figure 4. Overall map of LA 160 showing locations of mechanically excavated trenches.

the knapweed-covered area southwest of Trash Area 2 does not contain structural remains. This was confirmed by the test pit placed at 900N/903E. These results indicated that other knapweed patches that lack clusters of associated surface artifacts or definite mounding also do not represent cultural features. In order to test this conclusion, 14 trenches were excavated by mechanical equipment within proposed right-of-way limits for a distance of about 180 m south of the main site datum at 900N/900E.

The mechanically excavated trenches were all oriented along a WSW to ENE axis, and the first 12 were offset along two parallel lines (Fig. 4). Within each line the distance between trenches was paced and set at about 50 m. Two additional trenches, excavated at the south end of this area where the proposed right-of-way was widest, were used to examine a zone on the west side of an abandoned gravel road. The latter also helped examine a low mound noted in that area.

All mechanically excavated trenches were dug by backhoe and backfilled by front-end loader. The walls of each trench were closely examined, and a section that appeared to contain a representative soil profile was described. No structural remains or artifact deposits were encountered in any trench; thus, we tended not to draw profiles. In general, the strata encountered in the mechanically excavated trenches were very similar to those seen in the auger transects and test pits, suggesting that these deposits are fairly widespread and that there has been little subsurface disturbance caused by cultural use. Most importantly, we encountered no evidence of earlier remains underlying the Spanish occupation. Each trench is described separately, and overall metric data are presented in Table 2. Locations are shown in Figure 4.

Table 2. Mechanically excavated trenches at LA 160

Trench No.	Length (m)	Maximum Width (m)	Minimum Width (m)	Depth, East End (m)	Depth, West End (m)	Maximum Depth (m), Location
BT-1	30.70	.70	.60	.63	.70	.90, center of trench
BT-2	12.70	.84	.66	.60	.56	.60, center of trench
BT-3	14.3	.75	.63	.62	.62	.84, center of trench
BT-4	9.80	.65	.63	.65	.65	.65, center of trench
BT-5	14.50	.76	.64	.58	.52	.72, center of trench
BT-6	14.70	.53	.46	.52	.80	.80, west end of trench
BT-7	15.10	.82	.62	.52	.80	.80, west end of trench
BT-8	7.70	.69	.58	.80	.60	.80, east end of trench
BT-9	19.50	.79	.69	.50	.58	.60, center of trench
BT-10	13.40	.70	.58	.50	.75	.75, west end of trench
BT-11	17.65	.85	.68	.47	.67	.70, center of trench
BT-12	14.20	.72	.64	.87	.75	.87, east end of trench
BT-13	17.50	.69	.63	.66	.69	.71, center of trench
BT-14	12.35	.68	.64	.72	.58	.75, center of trench

BT-1

BT-1 was the northernmost mechanically excavated trench at LA 160. It was also the longest trench, extending nearly from the proposed right-of-way edge to the fence along the west edge of the current right-of-way. The upper .45 m consisted of fine- to coarse-grained yellow-brown alluvial sands interspersed with layers of clay. Below this was dense dark brown clay with reddish-brown and black mottling.

BT-2

BT-2 was northernmost along the west line. The upper .10 to .12 m of fill was brown silty clay loam, which was underlain by dense dark brown clay with reddish-brown and black mottling.

BT-3

BT-3 was northernmost along the east line. The upper fill consisted of a series of alluvially deposited yellow-brown laminated fine-grained sands, fine- to coarse-grained sands, and brown clays. These strata were a maximum of .64 cm thick near the west end of the trench, tapering down to .10 m at the east end. The trench ended in dense dark brown clay with reddish-brown and black mottling.

BT-4

The upper .40 to .45 m of fill in BT-4 was dark brown sandy clay containing numerous caliche flecks and occasional lenses of fine-grained yellow-brown sand. This was underlain by dense dark brown clay with reddish-brown and black mottling.

BT-5

The upper .40 to .50 m of fill in BT-5 was dark brown sandy clay containing occasional lenses of laminated fine-grained yellow-brown sand. This was underlain by dense dark brown clay with reddish-brown and black mottling.

BT-6

The upper .20 to .45 cm of fill in this trench was dark brown clay that appeared to have been heavily bioturbated, mostly by root growth. Caliche flecks were noted near the base of this stratum. Below this layer was a dense dark brown clay with reddish-brown and black mottling.

BT-7

The upper .45 to .50 m of fill in this trench was dark brown bioturbated clay containing occasional thin lenses of fine-grained yellow-brown sand. Small caliche flecks were common in this unit, which was underlain by dense dark brown clay with reddish-brown and black mottling. Providing some variation near the center of the trench was a series of alluvially deposited yellow-brown fine-grained sands, fine- to coarse-grained sands, and clays representing an abandoned stream channel. The channel was .46 m deep and 1.24 m wide and was sealed by silty clay loam. The trench ended in dense dark brown clay with reddish-brown and black mottling.

BT-8

A .14 m thick layer of silty clay loam was uppermost in BT-8, and to a depth of about .30 m it was underlain by a bioturbated dark brown clay. Flecks of caliche were noted near the base of the latter. The trench ended in dense dark brown clay with reddish-brown and black mottling.

BT-9

The uppermost .40 m of fill in BT-9 consisted of a dark brown clay containing numerous caliche flecks and considerable evidence of bioturbation. This was underlain by dense dark brown clay with reddish-brown and black mottling.

BT-10

The upper layer of fill in the west third of BT-10 was a .10 to .40 m thick layer of light yellow-brown fine-grained sand. The surface layer in the rest of the trench was brown silty clay loam. These strata were underlain by a .20 to .40 m thick layer of dark brown clay, which evidenced considerable bioturbation and contained numerous caliche flecks. The trench ended in dense dark brown clay with reddish-brown and black mottling.

BT-11

BT-11 was southernmost in the east line of trenches. At the east end the surface layer was a .05 m thick layer of fine-grained yellow-brown sand. This was underlain by a .40 to .50 m thick layer of dark brown clay, which formed the surface layer in the rest of the trench. This clay was bioturbated and contained numerous flecks of caliche. Under it was a dense dark brown clay with reddish-brown and black mottling.

BT-12

BT-12 was southernmost in the west line of trenches. The upper .30 to .35 m of fill was a yellow-brown silty clay loam. Under this was .30 m of dark brown bioturbated clay, which contained occasional caliche flecks. The trench ended in dense dark brown clay with reddish-brown and black mottling.

BT-13

BT-13 the northernmost of the pair of trenches placed on the west side of an abandoned gravel road, where the proposed right-of-way was widest. The upper .40 to .45 m of fill was fine-grained yellow-brown silty clay. This was underlain by .20 m of bioturbated brown clay containing a few flecks of caliche. Below this was dense dark brown clay with reddish-brown and black mottling.

BT-14

BT-14 was the southernmost of the pair of trenches placed on the west side of an abandoned gravel road, where the proposed right-of-way was widest. The upper .20 m of fill was fine-grained yellow-brown silty clay. This was underlain by .22 to .25 m of bioturbated dark brown clay containing a few flecks of caliche. The trench ended in dense dark brown clay with reddish-brown and black mottling.

Summary of Site Stratigraphy

The most common element in the series of stratigraphic cross sections provided by auger holes, test pits, and mechanically excavated trenches at LA 160 is the presence of dense clay in the lower reaches of nearly every cross section examined. In general, the two deepest strata are a dark brown clay above a dense dark brown clay with reddish-brown and black mottling. These layers are most likely different expressions of the same stratum. Indeed, in several field descriptions some mottling was noted in both the upper and lower clay layers. The upper clay appears to be a section of a thick clay stratum that principally has been bioturbated by roots. Some rodent and insect burrows were also noted.

Thin lenses of sand occasionally occurred in the upper clay layer, but none were seen in the lower stratum. However, this level of variation tends to be outweighed by the more general similarity between these units. The presence of occasional sand lenses in the upper layer could merely represent a minor change in the overall depositional environment.

The most consistent surface layer across the study area was silty clay loam. This stratum probably represents the upper levels of the clay bed where bioturbation was heaviest and caused the mixture of eolian sediments with alluvial clays. However, in places this stratum may represent sediments that accumulated during the Spanish occupation of LA 160, especially in the midden area east and southeast of the main structural mound.

Several abandoned and filled stream beds were noted in auger holes and mechanically excavated trenches. Since these deposits are in places overlain by sediments containing historic artifacts, most of the erosion represented by these features probably occurred before the site was occupied. The presence of a layer of silty clay above alluvial clays in BT-13 and BT-14 in the southwest section of the study area suggests that other alluvial deposits probably once overlay the clays but have mostly been eroded away.

The latest depositional episode appears to have involved the accumulation of eolian sands in some areas, most notably in the vicinity of BT-10 and BT-11. However, these sands could also represent the remains of a wide, shallow channel. While the silty clay loam that covers most of the site surface supports dense stands of Russian knapweed in places, elsewhere surface vegetation consists of moderately dense mixed grasses, prickly pear cactus, and occasional junipers. The lack of prehistoric remains throughout the study area at LA 160 suggests that these sediments have little agricultural potential.

Artifacts Recovered during Testing at LA 160

A total of 122 artifacts and three macrobotanical samples was recovered during test excavations at LA 160. Table 3 presents provenience data for these materials. It should be noted that the term "level" had different connotations for auger holes and test pits. Levels in test pits were arbitrary .10 m thick units of excavation. Levels in auger holes referred to distinguishable soil layers rather than arbitrary vertical divisions of excavation.

Native ceramics comprise the bulk of recovered artifacts (98.3 percent). No chipped stone artifacts were retrieved during testing, but several were seen on the surface in areas outside of test units, so this class of artifact is present at the site, despite the testing results. Only two Euroamerican artifacts (1.7 percent) were found in test pits. Three macrobotanical samples were also recovered but have not yet been examined.

A preliminary date can be assigned to these materials, based on the structure of the native ceramic assemblage. As is discussed in more detail in a later chapter, relatively high percentages of polished black and micaceous wares in comparison with percentages of decorated, polished red, and other utility wares suggest that LA 160 was occupied after the opening of the Santa Fe Trail in 1821. A comparative lack of Euroamerican artifacts in subsurface contexts may indicate that the occupation does not postdate the arrival of the railroad in 1880, and indeed probably occurred fairly early in the Santa Fe Trail period, perhaps prior to the American acquisition of New Mexico in 1846.

Table 3. Artifacts recovered during testing at LA 160

Location	Excavation Unit	Level	Native Ceramics	Glass	Macrobotanical Samples
Trash Area 1	AH-13	1	1		
	AH-25	2	1		
	AH-29	1	1		
	959N/884E	1	13		
		2	19		
		3	20		
Trash Area 2	AH-2	4	2		
	AH-4	2	1		
		4	1		
	AH-5	1	3		
		2	4		
	940N/893E	1	26	1	3
		2	15		
		3	6	1	
Trash Area 3	AH-34	1	2		
	AH-37	2	1		
Possible Structure	900N/903E	1	1		
		2	1		

Summary of Testing Results

Testing found that subsurface cultural deposits exist only in the north part of the area examined, and the approximate boundary of associated surface materials occurs just north of the main site datum at 900N/900E. Investigation of stands of Russian knapweed south of that point showed that concentrations of this plant do not accurately predict the location of structural remains. No evidence of structures or cultural deposits were encountered in the area south of 900N/900E within proposed right-of-way limits. Thus, that area was not included within site boundaries (Figs. 3 and 4).

Three areas within proposed right-of-way limits to the north of 900N/900E contain cultural deposits and are labeled Trash Areas 1, 2, and 3. The trash areas were initially defined as a single provenience (Haecker 1987; Moore 1989; Hohmann et al. 1998), but since they are separated by swales we decided to consider each separately. The swales represent erosional channels and an abandoned road or acequia. Whether the trash areas represent separate features or are parts of a single deposit of sheet trash as originally defined remains uncertain and will be addressed during data recovery.

The approximate extent of Trash Area 1 was defined by 18 auger holes in three transects, and the presence of cultural deposits in this area was verified by a test pit at 959N/884E. Most potential cultural deposits occurred to a depth of .25 to .30 m below the surface. However, in AH-25, cultural deposits were found to a depth of .55 m. These preliminary results suggest that Trash Area 1 measures at least 27.5 by 10.0 m, with most cultural deposits confined to the upper .30 m of fill.

Two transects containing a total of 10 auger holes were used to estimate the extent of Trash Area 2. The presence of cultural deposits in this area was verified by a test pit at 940N/893E. Potential cultural deposits were found to a depth of about 1.00 m in two auger tests, though they ended at a much shallower depth in most. This probably indicates the presence of at least one trash-filled pit in addition to thinner sheet trash deposits in the upper .25 to .45 m of fill. The latter was verified during excavation of a test pit at 940N/893E, which contained numerous artifacts in the upper .30 m of fill. These preliminary results suggest that Trash Area 2 measures about 17.0 by 12.0 m and contains at least 1 trash-filled pit in addition to sheet trash deposits in the upper .45 m of fill.

The presence of potential cultural deposits in Trash Area 3 was signaled by a surface scatter of artifacts and was verified by a transect containing five auger holes. Cultural materials were encountered to depths of .10 to .20 m in three auger holes. The similarity of strata in these tests with those found in Trash Areas 1 and 2 indicated that cultural deposits were likely, and further examination through the excavation of a test pit was considered unnecessary. These preliminary results suggest that Trash Area 3 measures at least 7.5 by 5.0 m and contains cultural deposits in the upper .20 m of fill.

Testing at LA 160 has provided tentative answers to five of the questions posited earlier in this chapter. First, we have determined that cultural deposits are indeed present within project limits, and their approximate horizontal and vertical extent have been determined. Second, while one or more small trash pits may exist within project limits, they are not as extensive, nor are they in the location that Moore (1989) thought they might be. Thirdly, the vegetative patterns observed on aerial photographs of the area do not indicate the presence of extensive structural remains within project limits. Though the probable structure defined by most studies of the site supports a stand of Russian knapweed, the presence of similar stands elsewhere in the general vicinity of LA 160 does not necessarily indicate that other structural remains are present. This is particularly true of the area south of 900N/900E within project limits, where extensive testing by mechanical equipment failed to discover cultural deposits or structural remains.

The fourth question for which we can supply a tentative answer involves the potential presence of underlying prehistoric remains. This could have contributed to the definition of LA 160 as a Pueblo III or IV site during the 1962 recording. Testing yielded no evidence of pre-Spanish remains at LA 160, though a few prehistoric sherds were noted on the surface in areas outside project limits. Thus, there do not appear to be any underlying prehistoric remains in the section of LA 160 that lies within the proposed right-of-way.

Finally, a tentative date for the portion of LA 160 that was tested was provided by an examination of the structure of the artifact assemblage recovered by this investigation. Rather than a Spanish Colonial period occupation, as most researchers have suggested, an occupation postdating the opening of the Santa Fe Trail is more likely. This is fairly consistent with the dates derived for Peckham's excavation of a four-room structure at the site in 1959. The larger assemblage that will be provided by data recovery at LA 160 should allow us to refine our date considerably.

Other questions listed earlier in this chapter could not be answered by the limited data supplied by testing. In order to address those questions, we need the data available from a more detailed examination of the section of LA 160 within project limits, interviews with local residents, and examination of archival data. These needs, in addition to the presence of cultural deposits within project limits, indicate that further work is necessary before the information potential of this part of LA 160 is exhausted.

TEST EXCAVATIONS AT LA 4968

Jeffrey L. Boyer and James L. Moore

LA 4968 is a large site on both sides of U.S. 84/285 about 290 m (950 ft) north of the northern boundary of the Tesuque Pueblo Grant (Fig. 1). The section of site on the west side of the highway is in a wide zone that will include a frontage road and access to an interchange. This will entail acquisition of proposed right-of-way from both private sources and Pojoaque Pueblo. The section of site on the east side of the highway is both within and beyond the existing highway right-of-way on private land. Acquisition of additional right-of-way in the east portion of the site is not planned.

Testing at LA 4968 was intended to accomplish several purposes. Eight large and small mounds thought to represent the locations of structures were recorded at the site. Five are within proposed project limits, and portions of the other three may extend into proposed project limits. Testing focused on the mounds, and was aimed at determining whether they represent structural remains. When structural remains were encountered, testing helped to define their condition and the nature of structural fill. Auger tests were used to explore areas between mounds and within the existing right-of-way on the east side of the highway.

The Site Record of LA 4968

An examination of New Mexico Cultural Resource Information System (NMCRIS) records at the Historic Preservation Division's Archeological Records Management Section (ARMS) revealed a confusing series of site numbers and project records linked to LA 4968. An undated card in the ARMS files describes the site as a "Mexican period/Spanish–American" site that was bisected by the highway. A low mound containing an unknown number of rooms was noted on the east side of the highway. Although the card is undated, its site description includes a reference to David Snow, dated 1969. The 1969 date is probably a later addition to the site record that refers to a November 1969 site form completed by David Snow. The form includes the same site description as the undated card and lists Stewart Peckham as an informant about the site. This may indicate that the first site record was completed by Peckham. LA 4968 seems to have seen no further investigations until 1991, when a survey along the west side of U.S. 84/285 was conducted prior to installation of a fiber optic telephone line (Evaskovitch 1991). Only an isolated occurrence consisting of a single redware sherd was recorded in the area of LA 4968 during that survey.

The first project linked to the site in the NMCRIS records is a survey of portions of the Pojoaque Pueblo Grant (Alexander 1993). This report does not actually mention LA 4968, and the two survey areas examined by this project are well north of that site. However, a handwritten note in the margins of Alexander's (1993:19) report asserts that LA 6580, a number assigned to a site recorded in 1962 during the Highway Cultural Inventory Project, is a duplicate number for LA 4968. The same assertion is made on the site form for LA 6580. It is important to note, however, that Alexander (1993:19) could not relocate LA 6580 and feels the site's location was probably recorded incorrectly in 1962. Ingraham's 1962 map of LA 6580 shows that it was about 100 m southwest of the port-of-entry in Pojoaque, about .8 km south of the intersection of U.S. 84/285 and NM 502. That location is 4.6 km north of the location of LA 4968, too far to argue for misidentification of the site location. Although Alexander (1993) was not able to relocate LA 6580, it is clear that LA 6580 is not a duplicate number for LA 4968.

In 1995, a survey was conducted for Mr. Robert Boissiere, who owns the land that includes the section of LA 4968 on the east side of the highway (Futch 1995). Futch (1995:2) recorded this portion of the site as Site 1:

> This mounded area, roughly in T-shaped ground plan, consists of melted adobe of about .5 meter in height. The west portion is terminated by a fairly recent swale ditch at the east end, leaving a section of about 25 meters in length. Several historic age sherds of San Juan Redware and Kapo Blackware were found along with two sherds of window glass. On the eastern, 70 meter long mound, another sherd of San Juan Redware and one micaceous ware sherd was found. The width of this mound is about 3 meters. At the north end of the longer mound, nine lead sealed tin cans were exposed, eroding out of a dump area.

This description and the accompanying site map appear to be the first real record of the site and show it to be historic. Although Futch (1995:1) initially described LA 4968 as previously unrecorded, an addendum to his report states that site records at ARMS list it as LA 4968 and include a 1969 "site note" describing the site as a "low mound with indeterminate number of rooms." Futch's site map also shows the site as LA 4968. There is no indication that the site includes the section of LA 4968 on the west side of the highway.

Although ARMS site records list the site, at least the east part, as LA 4968, the survey for this project recorded it as two different sites (Hohmann et al. 1998). The east part of the site was recorded as LA 111339, while the west part was recorded as LA 111324. Hohmann et al. (1998:23, 28) provide the following descriptions of LA 111324 and LA 111339:

> Site LA 111324 is a moderately-sized pueblo. . . . The site complex measures over 103 meters north/south by 112 meters east/west (11,536 square meters) and contains at least five pueblo room blocks, several small kivas, a large depression (possibly representing a great kiva), and at least two plaza areas along with numerous low-lying trash mounds. Several of the pueblo room blocks and plaza areas show evidence of past pothunting activities. Fragments of bone were observed in several locations.
>
> The artifactual assemblage includes 1150+ ceramics, 350+ chipped stone artifacts, and over 35 pieces of ground stone (including both manos and metates). The chipped stone assemblage reflects all stages of core reduction and subsequent tool manufacture. Chipped stone materials include cherts, chalcedony, red jasper, and quartzite. The ceramic assemblage includes bowl and jar forms of unidentified Black-on-white, Red Mesa Black-on-white, Tewa Black (mostly Kapo Black), and Tewa Polychrome, as well as numerous redwares, plainwares, and graywares. Rio Grande Corrugated and Tesuque Grey are also present. These ceramic remains suggest a date range of A.D. 1600 to A.D. 1800, but most closely aggregate to the mid- to late 1600s. LBA also observed several shell jewelry fragments and numerous pieces of burned animal bone. The assemblage reflects a full range of domestic activities associated with extended habitation behaviors.
>
> Three pieces of majolica ware were found including the earliest blue print pattern, Puebla Blue-on-white. . . . Such early historic wares were manufactured in Mexico beginning around A.D. 1521 with the first ordinances governing production and initial trade being established by 1653. Such early ware was traded into the project area until 1680—the Pueblo Revolt. Trade in majolica does not resume until after 1696 when the Spanish regained control of the region.
>
> Two pieces displaying banded yellow and green patterns (Aranama and Abo) were also observed suggesting dates from A.D. 1750 to 1850. . . . It is possible these few fragments of historic ceramics do not represent another component of the site complex, but represent early contact/trade between Native populations and historic Hispanic groups.
>
> A study of the range and distribution of the artifact scatter strongly suggests that this site

is related to Site LA 111339, which is another adobe pueblo room block located immediately across U.S. 84/285. It is LBA's belief that subsurface artifactual deposits and possibly buried features may be found under the existing pavement of U.S. 84/285.

> Site LA 111339 is a multi-component site consisting of an adobe pueblo room block, associated prehistoric trash deposits, and an historic period trash scatter (ca. l915 to 1925). . . . [T]he central component [is] an L-shaped adobe pueblo room block. There is also an 8.5 meter depression to the east/southeast of the pueblo unit which may represent an associated subsurface feature.
>
> Prehistoric artifactual remains include approximately 60+ sherds, 30+ pieces of chipped stone and six ground stone fragments. The chipped stone assemblage reflects all stages of core reduction and subsequent tool manufacture and includes various cherts, chalcedony, red jasper and quartzite. The ceramic assemblage includes bowl and jar sherds of mostly Tewa Polychrome and Kapo Black, as well as plainwares, and graywares with Rio Grande Corrugated and Tesuque Gray also being observed. These ceramic remains suggest a date range of A.D. 1600 to A.D. 1800. The Native American assemblage reflects a full range and distribution of habitation and subsistence activities.
>
> Historic glass deposits (aqua, brown, purple) are located near the pueblo unit with most dating from approximately 1905 to 1925. A few of the brown bottle pieces appear much older than the rest of the historic trash deposits. Most colored glass is found closer to the ruin and may reflect waste disposal occurring during early pothunting activities. The much earlier looking (and assumed dating) brown glass fragments may directly relate to the terminus of the pueblo unit's occupation. Futch (1995) suggests this is the location of the "Old Vigil Rancho" and indicates that the mound is the remains of the old adobe stage stop and the dirt road/trail located northeast of the mound is the historic road. The Vigil Rancho is thought to have operated during the mid-19th to early 20th centuries.
>
> A small can dump is located near the northern end of the site complex and includes 12 crimped-seamed, solder-top match-stick cans measuring 4-6/16" x 2-15/16" and dating between 1915 to 1930. One matchstick can measuring 2-1/2" x 2-1/2" (1915 to 1925) and three tobacco tins (1890 to 1925) were also observed.
>
> The associated Native American artifact scatter suggests this site is related to LA 111324, another adobe pueblo complex located immediately across U.S. 84/285 to the west. LBA believes that subsurface artifactual deposits (and possibly buried features) may be found under the existing pavement of U.S. 84/285.

The record of LA 111324 appears to be the first description of the part of LA 4968 on the west side of the highway, although the undated site card and 1969 site form do suggest that the site extended west of the highway. While Hohmann et al. (1998:8) refer to Futch's (1995) survey, they do not associate LA 111339 with LA 4968 and make no mention of LA 4968 or the fact that the east part of the site was previously recorded. Apparently because their descriptions of the site(s) included the presence of historic native ceramic types, Hohmann et al. (1998) elected to assign the site to historic Tewa occupants rather than Hispanics. Although late Euroamerican artifacts were observed, they are ascribed to postoccupation activities at the site(s)—specifically, pothunting.

Description of LA 4968

LA 4968 is a large site measuring at least 185 m east to west by 90 m north to south. As early descriptions point out, the site dates to the early to mid-nineteenth century and probably represents a multiresidence habitation locale. LA 4968 extends about 40 m east of the existing right-of-way and at least 85 m west of the existing right-of-way (Fig. 5). Within this large area are eight small to large mounds, six on the west side of the highway and two on the east. Mounds 1, 2, 3, 4, and 6 are within proposed project limits on the west side of the highway; Mounds 4 and 6 appear to have been cut by the existing right-of-way, and Mound 5 extends just into the proposed right-of-way. Mounds 7 and 8 are on the east side of the highway and may extend into the existing right-of-way. Prior to testing, the mounds were presumed to reflect the remains of adobe structures.

Western Mound Group

Mounds 1 through 6 comprise the western mound group at LA 4968 (Fig. 5). They correspond to the "five pueblo room blocks" recorded by Hohmann et al. (1998). Mound 1 is a large, C-shaped mound on the north side of this group. It corresponds to Unit 1 recorded by Hohmann et al. (1998). This mound measures 23.5 m east to west, ranges from 11 to 16.4 m north to south, and is .5 to 1 m tall. Two test pits containing three 1 m by 1 m test pits were used to investigate Mound 1.

Mound 2 is a low mound (about .5 m tall) in the approximate center of the western group. It appears to correspond to Unit 3 recorded by Hohmann et al. (1998). This mound measures 14.5 m north to south by 10 m east to west. One test unit consisting of three 1 by 1 m test pits was used to investigate Mound 2. Mound 3 is another low mound (about .5 m tall) on the south side of the western group. It corresponds to Unit 4, recorded by Hohmann et al. (1998). This mound measures 13 m east to west by 11 m north to south. One 1 by 1 m test pit was used to investigate Mound 3.

Mound 4 is very low (less than .5 m), and is on the east side of the western mound group along the existing right-of-way fence. It may correspond to Unit 5 recorded by Hohmann et al. (1998), though their Unit 5 is much larger than Mound 4, and T-shaped. No evidence of a mound fitting their description was observed during testing. Mound 4 measures 10 m northeast to southwest by 5.5 m northwest to southeast. This mound was investigated by four auger tests at the north end of the 520E grid line.

Mound 5 is a large, F-shaped mound on the west side of the mound group. It corresponds to Unit 2, recorded by Hohmann et al. (1998). This mound measures 32 m east to west, ranges from 10 to 16.5 m north to south, and is .5 to 1 m tall. Because Mound 5 is almost entirely outside proposed project limits, it was not investigated during this phase of the project.

Mound 6 is a very low mound (less than .5 m) along the existing right-of-way fence on the north side of the mound group. It was not recorded by Hohmann et al. (1998). It measures 12 m northwest to southeast by 5.5 m northeast to southwest, and was investigated by means of one 1 by 1 m test pit.

In addition to the mounds, a shallow depression was noted between Mounds 1 and 5 (Fig. 5). This feature was recorded as a "pot hole" by Hohmann et al. (1998). The depression, about 4 m in diameter and less than .5 m deep, is thought to be a well. It was not investigated during this phase of the project. The "plazas" recorded by Hohmann et al. (1998) are extramural areas between mounds. These extramural areas were investigated by several auger transects. No evidence of the small and large kiva depressions recorded by Hohmann et al. (1998) was observed, and no remains of subsurface structures were discovered by auger testing in those locations.

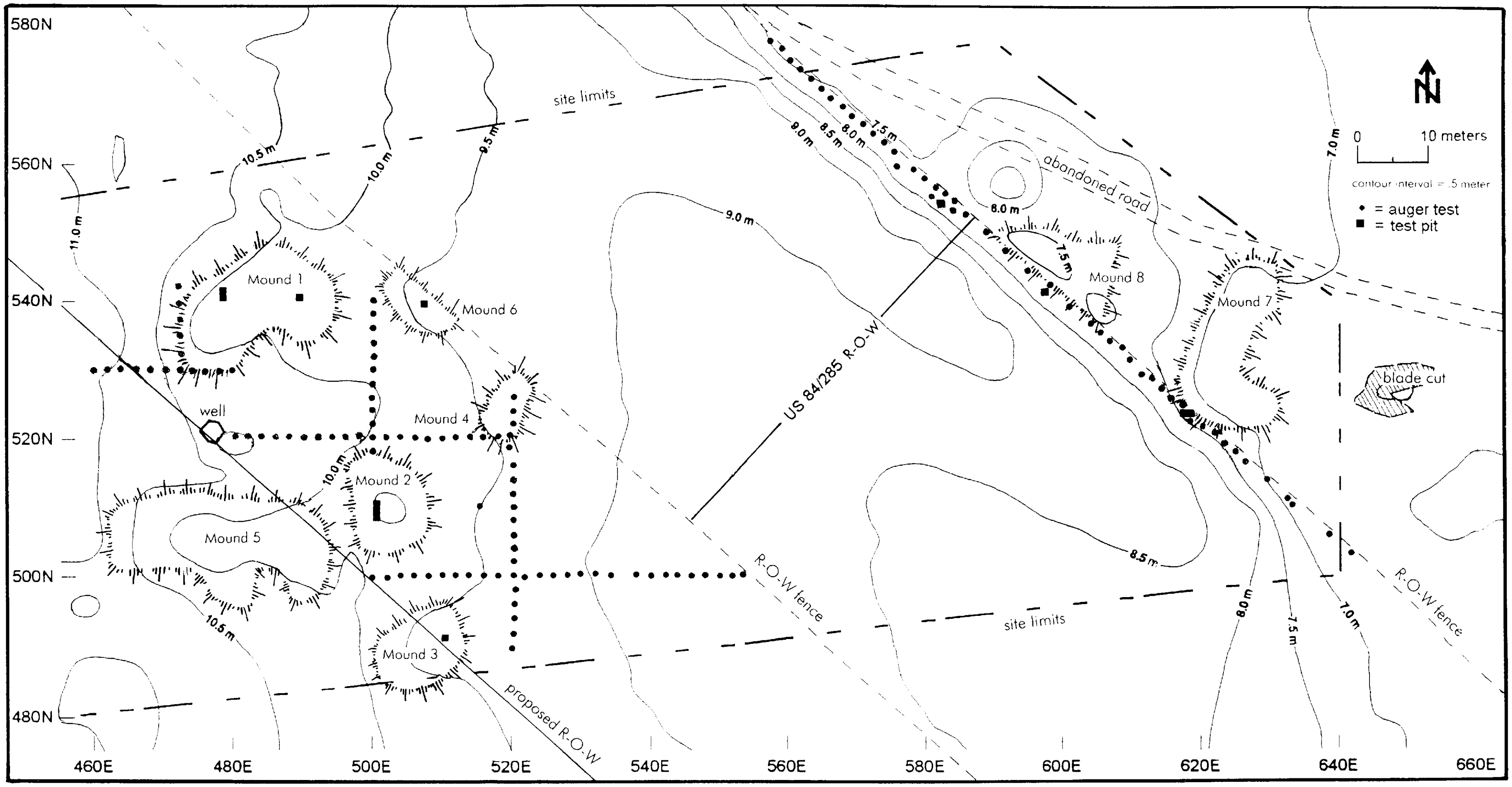

Figure 5. Plan of LA 4968 showing locations of excavation units.

Eastern Mound Group

Mounds 7 and 8 comprise the eastern mound group at LA 4968 (Fig. 5). Mound 7 is a large L- or C-shaped mound bounded on the southwest by the existing right-of-way and on the north by an abandoned road. This mound was recorded by Futch (1995) and corresponds to the "pueblo unit" recorded by Hohmann et al. (1998). It measures 24.5 m north to south, ranges from 7.3 to 14.5 m east to west, and is about .5 m tall. One test unit consisting of two 1 by 1 m test pits was excavated at the south edge of Mound 7 within the existing right-of-way. This edge of the mound was also investigated by a series of auger tests.

The abandoned road that runs along the north edge of Mound 7 was identified by Futch (1995) as a "swale ditch" and by Hohmann et al. (1998) as a "recent drainage ditch or pipeline." That it runs along the edge of the mound, a fact also observed by Futch (1995) and Hohmann et al. (1998), suggests that it is younger than the mound. About 12 m east of Mound 7 is a shallow depression that was probably created by mechanical blading. It was not recorded by Futch (1995) but was recorded by Hohmann et al. (1998) as a possible "associated subsurface feature." The discrepancies between these documents may indicate that the blade-cut depression is quite recent. About 25 m northeast is a long, narrow mound, which is not shown in Figure 5. Futch (1995) records it simply as a mound, perhaps implying that it is structural, while Hohmann et al. (1998) record is as an "uplifted" road bed. Our examination of this mound suggested that it is an earth berm used to dam the shallow drainage in which this part of the site is located. The soil behind the berm is clayey and supports a community of tall grasses that is thicker and characterized by different species than the grass community on the surrounding hill slopes. The berm is not a road bed or a structural mound.

Identification of LA 4968

The following discussion is summarized from information obtained by Baxter (1984) and Spivey (1998), including Spivey's files at the OAS. It is not a complete history of the region or of the lands surrounding LA 4968; consequently it is not completely referenced. A more thorough and detailed history of the land and site will be obtained during data recovery. However, this discussion does serve to indicate ownership of the land and to suggest the identity of the site's occupants.

In January 1731, Bernardino de Sena, his son Tomás, and his brother-in-law Luís López applied for a grant to "surplus lands" near the abandoned pueblo of Cuyamungue. Their application was approved, and they were placed in possession of the land by Domingo Vigíl, lieutenant alcalde of Santa Cruz. Vigíl specified the boundaries of the 1,086 acre (439 ha) Cuyamungue Grant as the hills west of the Rio Tesuque on the west, the hills and road to Nambe on the east, the house of Lázaro Trujillo on the north, and the arroyo at the north boundary of Tesuque Pueblo lands on the south. Four hundred eight-two acres (195.1 ha; 55.6 percent) of the grant overlapped lands belonging to Pojoaque and Nambe Pueblos. In 1745, López sold his share of the grant within the area that overlapped Pojoaque Pueblo lands to Ilario Archuleta and Lázaro Trujillo.

In 1786, Diego Borrego bought the southern part of the Cuyamungue Grant from the heirs of Tomás de Sena, who had been the sole heir of Bernardino de Sena, and so had finally owned the entire south part of the grant between Tesuque, Pojoaque, and Nambe Pueblo lands. Three years later, Borrego sold the land to Marcos Lucero and his son-in-law, Juan Domingo Valdez. Valdez and his wife, María Andrea Lucero de Valdez, had at least one daughter and four sons. One son, José Vicente, was born in 1797. He apparently went by Vicente because two other brothers were also named José (José Miguel and José Rafaél). Following the death of their mother (in the 1820s?), Vicente began acquiring his siblings' shares of the land.

In 1830, Vicente married María Guadalupe Ortiz, who was then 14 years old. In that year, they apparently built a house on the land Vicente had acquired. Although we cannot be sure, this may be the first occupation of LA 4968, a possibility supported by dates indicated by artifacts obtained during test excavations. In 1855, Vicente and María moved to another parcel of land which contained a house that they had purchased from Felipe Sena and his ex-wife, Trinidad Silva. The Senas had bought the land from Ilario Archuleta in 1808. That parcel was in the Cuyamungue Grant and was described as being bounded on the north by lands of Jesús Trujillo, on the south by lands of Julián García, on the east by low hills, and on the west by the Arroyo Matón. The Arroyo Matón runs from north to south along the east side of U.S. 84/285 across the highway from LA 160 and is now known as the Arroyo Cuyamungue. This description places the land in the west half of Section 21 (T 19E, R 9E), immediately east of LA 160. Most of this parcel was examined by Alexander (1993). Although two sites were recorded in that survey, both are small prehistoric artifact scatters. Most of the remaining land was included in the area surveyed for this project (Hohmann et al. 1998). No sites or artifacts associated with LA 160 were noted in that area, though LA 160 was recorded west of the highway.

While LA 160 is now separated from the Arroyo Matón by U.S. 84/285, Peckham's excavations there in 1959 show that the site once extended to the west edge of the arroyo. It seems likely that when Vicente Valdez and María Ortiz de Valdez moved to their new land in 1855 they lived at LA 160. This does not imply that LA 160 was not occupied prior to 1855; rather, it seems likely that the Valdezes moved to a small Hispanic community that was or became known as Cuyamungue. It may also explain why an informant told Peckham that the house he excavated at LA 160 was the Valdez post office. Although there is no documentary evidence for a post office in this area, the association with the name Valdez is interesting.

Thus, it seems apparent that Vicente, María, and their family lived at LA 4968 between 1830 (when Vicente and Maria married) and 1855 (when they moved north). These dates are similar to those suggested from artifacts obtained from LA 4968 during testing. They also match David Snow's description of the site as dating to the Mexican Period (1821 to 1848). Further, identification of LA 4968 as the home of the Valdez family is supported by an informant who, during a visit to the site, assured us that the area was historically known as Los Valdez.

In 1871, John W. Conway received approval of the Cuyamungue Grant from the United States surveyor general. His claim to the grant was based on the inheritance of Conway's wife, María de la Paz (or María Paz) Valdez, the daughter of Vicente and María Valdez. The grant as described on the original 1731 documents was surveyed in 1879. A small collection of houses in the south part of the grant is described as a "deserted village" on the resulting plat. Superimposing the grant plat on the USGS Tesuque 7.5' quadrangle reveals that this village corresponds to the location of LA 4968. Describing the site as a "deserted village" points out that several houses (and other buildings?) were once present there.

The grant as approved in 1871 and surveyed in 1879 overlaps Pojoaque and Nambe Pueblo lands. In 1902, the grant was surveyed again. This time, however, only the section that falls between Tesuque, Pojoaque, and Nambe Pueblo lands was recorded as the Cuyamungue Grant, as approved by the United States Court of Private Land Claims. In the same location as the "deserted village" on the 1879 plat, the 1902 plat shows the "Ruins of Rancho Conway" at LA 4968. The 1902 plat also shows the "plaza of Cuyamungue" as a cluster of buildings north of the grant. Superimposing the plat on the USGS 7.5' Tesuque quadrangle shows that this is the location of the small modern community of Cuyamungue and LA 160.

The 1879 and 1902 plats of the Cuyamungue Grant show that LA 4968 was not occupied after the late 1870s. We do not currently know whether it was occupied between 1855, when Vicente and María Valdez moved to the community of Cuyamungue, and 1879, when the grant was first surveyed. As we mentioned above and discuss later, however, dates for artifacts derived from testing suggest that the site was not occupied after the 1850s.

Questions concerning Archaeological Remains at LA 4968

The preceding description of LA 4968 and its history suggest several questions that can be addressed regarding the nature of archaeological remains at this site. While these questions apply to the entire site, they can be addressed using only the sections of LA 4968 within the existing and proposed rights-of-way. A data recovery plan which presents and discusses research issues for both of the historic sites is developed in later chapters. The questions presented here relate specifically to the remains at LA 4968.

1. Do the mounds recorded at LA 4968 represent the remains of structures?

2. If the mounds are structural, what building materials and techniques are represented? Can sequences of construction, addition or alteration, maintenance, and abandonment be defined for the various structures?

3. What activities or functions are represented by the structures? Can different structure types (residence, storage, stock shelter, etc.) be identified?

4. Can the relative and absolute ages of structures be established? Can sequences of construction, use, and abandonment between structures be defined?

5. Are nonstructural features like middens/trash pits, adobe mixing pits, hornos, and stock pens present at LA 4968?

6. If nonstructural features are present, can relative and absolute dates be established? Can sequences of construction, use, and abandonment between features be defined?

7. Do nonstructural features reflect a wide range of on-site activities commensurate with the documentary evidence that LA 4968 was a sizeable residence cluster and perhaps a rancho?

Questions concerning Documentary and Ethnohistoric Records of LA 4968

The description and history of LA 4968 also suggest several questions regarding the documentary and ethnohistoric records of the site. Again, this is not an exhaustive list of questions or issues. These questions relate specifically to LA 4968 and its occupants.

1. Documentary records clearly identify LA 4968 with a "deserted village" and the abandoned location of the "Rancho Conway." Do the records also clearly identify the site as the home of Vicente and María Valdez?

2. Since the records show that Vicente Valdez acquired the land from his family, did other family members live at LA 4968 before Vicente and María married and (apparently) moved to the site in 1830?

3. Do documentary and ethnohistoric records identify other occupants of the site? If so, are they Valdez family members? Can occupants who were not Valdez family members be identified?

4. Can documentary and ethnohistoric records clarify the nature of the site and the functions of different structures and features?

5. How is the Valdez family related to other prominent families in the Cuyamungue area? Are those relationships represented in patterns of land tenure, land use, site location, and occupation?

6. What economic strategies were pursued by the Valdez family at LA 4968? Are those strategies represented in patterns of land tenure, land use, site type, location, and occupation?

7. In what community and regional political activities were the family involved? Are those activities reflected in the family's land tenure, land use, and site occupation history?

Testing Procedures

Prior to testing, proposed right-of-way boundaries within the site were marked by the project design engineering firm. A main site datum was established and designated 500N/500E. A Cartesian grid system oriented to magnetic north was then extended across the site on both sides of the highway, and a plan of the site was produced (Fig. 5).

Two types of test units were used to investigate LA 4968. Excavation techniques followed those detailed in Field Methods.

Test excavation units consisting of 1 by 1 m test pits were used to examine four of the six mounds on the west side of the site, including Mounds 1, 2, 3, and 6. Mound 5 is largely outside the proposed right-of-way and was mapped but not otherwise examined during testing. Mound 4 was examined by auger tests along the 520E grid line. Excavation units were intended to determine whether structural remains are present, depths to structural floors, and the nature of structural fill. Test units on the east side of the site were used to examine the end of Mound 7 within the existing right-of-way and to investigate and define subsurface deposits discovered by auger tests along and near the west side of Mound 8, also within the existing right-of-way.

Auger tests were used to examine areas between mounds on the west side of the site. Toward that end, auger tests were excavated as transects along grid lines, allowing us to search for subsurface deposits and features and define soil strata across the site. Auger tests were used to examine the portion of the site within the existing right-of-way on the east side of the highway, and helped define soil strata, reveal locations and extent of subsurface deposits, and indicate whether architectural remains were present in the areas of Mounds 7 and 8. Results of auger testing were checked using test excavation units.

Testing Results

Auger Holes

Seven auger transects were used to examine subsurface deposits at LA 4968 (Fig. 5). Six transects ran along grid lines on the west side of U.S. 84/285, and the seventh ran at an angle to the grid system on the east side of the highway. Augering continued until the excavator encountered rocks or sterile substrate, or the full extent of the auger handle was reached. Thirteen soil types were defined. Following that, the results of augering along each transect are discussed.

Soil Types Defined during Augering

Soil Type 1. Yellow-brown silty, gravelly sand. The sand is fine- to coarse-grained, and gravel inclusions are small- to medium-sized. This unit tends to blanket nearly the entire surface of the site.

Soil Type 2. Silty sand, cream-colored to light yellow-brown, and very fine-grained with few gravel inclusions. This is a very common unit, which often occurs directly below Stratum 1 and appears to represent the main preoccupational substrate over most of the site.

Soil Type 3. This type was encountered in several places, and is a dark gray to black ashy soil containing abundant charcoal. In places it may represent deposits in buried thermal features; in others it seems to be trash deposited in pits.

Soil Type 4. This type, encountered in only one auger hole, represents rubble from collapsed walls in Mound 4.

Soil Type 5. This type represents an adobe floor in Mound 4.

Soil Type 6. Gravel lenses were encountered at various locations around the site and are given this designation.

Soil Type 7. Silty, gravelly, yellow-brown sand which is very similar to Soil Type 1, but contains less sand and more clay, with small banded chunks of clay and sand that may be adobe.

Soil Type 8. Dark gray to black ash and charcoal layer.

Soil Type 9. Sandy, gray-brown clay loam containing small to medium chunks of adobe and flecks of charcoal. This type may represent melted adobe.

Soil Type 10. Light brown silty sand containing small gravels.

Soil Type 11. Yellow-brown silty sand, resembles Soil Type 1 but also contains ash, so it is darker in color.

Soil Type 12. Yellow-brown clayey soil containing abundant charcoal fragments.

Soil Type 13. Red-brown gravelly sand containing some fragments of sandstone.

Auger Transect along the 500E Grid Line

This transect contained 13 auger holes spaced at 2 m intervals between 516N and 540N along the 500E grid line. The results of augering along this line are presented in Table 4. Most of these auger holes ended in Soil Type 1 when they encountered rocks or gravel layers that could not be penetrated. In the few instances that augering extended below Soil Type 1, Soil Type 2 was usually encountered. The only exception to this was in AH-9, where augering ended in Soil Type 3, which may represent an extramural thermal feature or trash deposited in a small pit (Trash Area 1 in Fig. 6). Artifacts tend to be common in the upper soil layers in this area, which probably reflects the location of this transect between structural mounds.

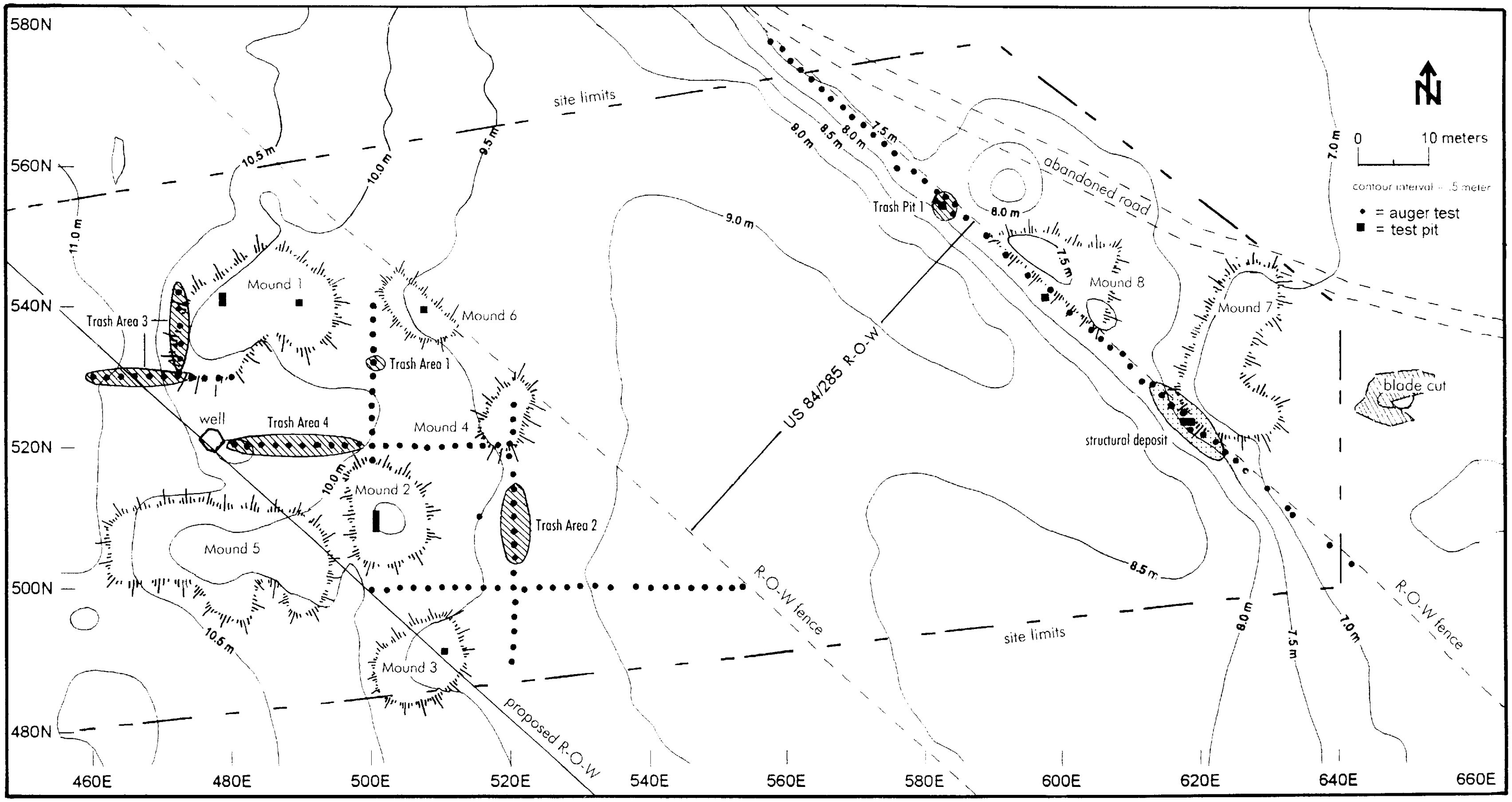

Figure 6. Plan of LA 4968 showing locations of cultural deposits defined by testing.

Table 4. Auger holes along the 500E grid line at LA 4968

AH	Location	Depth (m)	Stopped By	Soil Types	Thickness (m)	Cultural Materials
1	516N/500E	0.30	rock	1. silty, gravelly sand	1. 0.30	1. 1 sherd
2	518N/500E	0.23	gravels	1. silty, gravelly sand	1. 0.23	1. none
3	520N/500E	0.20	gravels	1. silty, gravelly sand	1. 0.20	1. 2 sherds
4	522N/500E	1.06	cobbles	1. silty, gravelly sand 2. silty sand	1. 0.70 2. 0.36	1. charcoal 2. none
5	524N/500E	0.47	rock	1. silty, gravelly sand	1. 0.47	1 sherd, charcoal
6	525N/499E	0.34	cobbles	1. silty, gravelly sand	1. 0.34	1. 1 sherd, charcoal
7	528N/500E	0.38	cobbles	1. silty, gravelly sand	1. 0.38	1. 2 sherds, charcoal
8	530N/500E	0.81	loose soil	1. silty, gravelly sand 2. silty sand	1. 0.65 2. 0.16	1. 4 sherds, charcoal 2. none
9	532N/500E	0.48	rock	1. silty, gravelly sand 3. dark ashy soil	1. 0.44 3. 0.04	1. 2 sherds 3. 1 sherd, charcoal
10	533N/500E	0.40	rock	1. silty, gravelly sand	1. 0.40	1. 7 sherds, charcoal
21	536N/500E	0.15	rock	1. silty, gravelly sand	1. 0.15	1. none
22	538N/500E	0.10	cobbles	1. silty, gravelly sand	1. 0.10	1. 2 sherds
23	540N/500E	0.45	rock	1. silty, gravelly sand	1. 0.45	1. 3 sherds

Auger Transect along the 520E Grid Line

This transect contained 19 auger holes spaced at 2 m intervals between 490N and 526N along the 520E grid line. The results of augering along this line are presented in Table 5. Most of these auger holes ended in Soil Type 1 when they encountered rocks or gravel layers that could not be penetrated. In the few instances that augering extended below Soil Type 1, Soil Type 2 was encountered. The only instance in which the stratigraphy was different was AH-49. This auger hole encountered a layer of sand and building debris (Soil Type 4), including jaspe (a hydrated gypsum whitewash) above what appeared to be an adobe floor (Soil Type 5), and ended in Soil Type 2. Since this area contains a low mound, it was defined as a probable structure (Mound 4). The presence of a possible adobe floor at about 60 cm below modern ground surface and the fact that the mound is less than .25 m in height suggests that the structure is a *soterrano*, a semisubterranean cellar. Charcoal and artifacts were consistently recovered from shallow depths between 503N and 515N and may represent sheet trash deposits (Trash Area 2 in Fig. 6).

Table 5. Auger holes along the 520E grid line at LA 4968

AH	Location	Depth (m)	Stopped By	Soil Types	Thickness (m)	Cultural Materials
11	490N/520E	0.24	cobbles	1. silty, gravelly sand	1. 0.24	1. 1 sherd, charcoal
12	492N/520E	0.18	cobbles	1. silty, gravelly sand	1. 0.18	1. none
13	494N/520E	0.74	rocks	1. silty, gravelly sand	1. 0.74	1. 1 sherd
14	496N/520E	0.82	cobbles	1. silty, gravelly sand	1. 0.82	1. 1 sherd, charcoal

15	498N/520E	0.80	cobbles	1. silty, gravelly sand	1. 0.80	1. charcoal
16	500N/520E	0.50	rocks	1. silty, gravelly sand	1. 0.50	1. none
17	502N/520E	0.40	rocks	1. silty, gravelly sand	1. 0.40	1. none
18	504N/520E	0.20	rocks	1. silty, gravelly sand	1. 0.20	1. 3 sherds, charcoal
19	506N/520E	1.15	rocks	1. silty, gravelly sand 2. silty sand	1. 0.95 2. 0.20	1. 1 sherd, 1 bone, charcoal 2. none
20	508N/520E	0.42	rocks	1. silty, gravelly sand	1. 0.42	1. 1 sherd, charcoal
42	510N/520E	1.13	rocks	1. silty, gravelly sand 2. silty sand	1. 0.90 2. 0.23	1. charcoal 2. none
43	512N/520E	1.10	sterile	1. silty, gravelly sand	1. 1.10	1. charcoal
44	514N/520E	0.94	cobbles	1. silty, gravelly sand	1. 0.94	1. 1 lithic, charcoal
45	516N/520E	0.34	cobbles	1. silty, gravelly sand	1. 0.34	1. charcoal
46	518N/519E	0.20	cobbles	1. silty, gravelly sand	1. 0.20	1. 1 sherd
54	520N/520E	0.27	gravels	1. silty, gravelly sand	1. 0.27	1. none
47	522N/520E	0.53	cobbles	1. silty, gravelly sand	1. 0.53	1. 1 sherd, charcoal
48	524N/520E	0.70	loose soil	1. silty, gravelly sand	1. 0.70	1. none
49	526N/520E	0.70	rocks	4. sand and building debris 5. adobe floor 2. silty sand	4. 0.60 5. 0.01 2. 0.09	4. jaspe, charcoal, adobe with plaster 5. adobe 2. none

Auger Transect along the 472E Grid Line

This transect contained six auger holes spaced at 2 m intervals between 531N and 542N along the 472E grid line. The results of augering along this line are presented in Table 6. Soil Type 1 constituted the surface layer all along this line and was underlain in places by gravels (Soil Type 6), mostly sterile silty sand (Soil Type 2) or cultural deposits (Soil Types 7, 8, and 9). These results suggest that there is culturally deposited refuse in this area (Trash Area 3 in Fig. 6).

Table 6. Auger holes along the 472E grid line at LA 4968

AH	Location	Depth (m)	Stopped by	Soil Types	Thickness (m)	Cultural Materials
85	531N/472E	0.40	rocks	1. silty, gravelly sand 6. gravels	1. 0.35 6. 0.5	1. 3 sherds, 1 bone, charcoal, jaspe 6. none
86	534N/472E	0.98	rocks	1. silty, gravelly sand 7. silty, gravelly sand 8. ash, charcoal lens 7. silty, gravelly sand 2. silty sand	1. 0.10 7. 0.20 8. 0.05 7. 0.20 2. 0.48	1. charcoal 7. 2 sherds, 1 bone, charcoal 8. ash and charcoal 7. 11 sherds, 2 bones, 1 lithic 2. none
87	536N/472E	0.60	rocks	1. silty, gravelly sand 7. silty, gravelly sand 2. silty sand	1. 0.40 7. 0.20 2. 0.05	1. 5 sherds, 11 bones, charcoal 7. adobe, plaster 2. none
88	537N/472E	0.34	rocks	1. silty, gravelly sand 2. silty sand	1. 0.15 2. 0.19	1. 1 sherd, charcoal 2. none

89	539N/472E	0.30	loose soil	1. silty, gravelly sand 2. silty sand	1. 0.10 2. 0.20	1. charcoal 2. none
90	542N/472E	0.53	gravels	1. silty, gravelly sand 6. gravel lens 9. sandy clay loam 2. silty sand	1. 0.10 6. 0.10 9. 0.25 2. 0.08	1. 1 sherd, 4 bones, charcoal 6. none 9. 1 sherd, 1 bone, charcoal, ash 2. charcoal

Auger Transect along the 500N Grid Line

There were 25 auger holes spaced at 2 m intervals in this transect, which ran between 500E and 553E along the 500N grid line. The results of augering along this line are shown in Table 7. The surface layer was Soil Type 1 in every case except AH-66, where a layer of gravel (Soil Type 6) was encountered at the surface. Wherever the auger was able to penetrate deeply enough, Soil Type 1 was underlain by Soil Type 2. While cultural materials were recovered from about half of these test units, no stratified cultural deposits were found. This area appears to contain the thin veneer of cultural materials that is expected around a settlement occupied for an extended period of time, but it contains no evidence of purposeful trash disposal.

Table 7. Auger holes along the 500N grid line at LA 4968

AH	Location	Depth (m)	Stopped By	Soil Types	Thickness (m)	Cultural Materials
55	499N/500E	0.10	rocks	1. silty, gravelly sand	1. 0.10	1. 7 sherds, charcoal
56	499N/502E	0.40	gravels	1. silty, gravelly sand 2. silty sand	1. 0.23 2. 0.17	1. charcoal 2. none
57	500N/504E	0.19	rocks	1. silty, gravelly sand	1. 0.19	1. none
58	500N/506E	0.70	rocks	1. silty, gravelly sand 2. silty sand	1. 0.30 2. 0.40	1. none 2. none
59	500N/508E	0.34	gravels	1. silty, gravelly sand	1. 0.34	1. none
60	500N/510E	0.20	rocks	1. silty, gravelly sand	1. 0.20	1. none
62	500N/513E	0.30	rocks	1. silty, gravelly sand	1. 0.30	1. 5 sherds, 3 bones
63	500N/516E	0.22	rocks	1. silty, gravelly sand	1. 0.22	1. none
64	500N/518E	0.13	rocks	1. silty, gravelly sand	1. 0.13	1. charcoal
65	499N/521E	0.34	loose soil	1. silty, gravelly sand	1. 0.34	1. charcoal
66	500N/523E	0.08	gravels	6. gravel lens	6. 0.08	6. none
67	500N/525E	0.15	gravels	1. silty, gravelly sand	1. 0.15	1. none
68	500N/528E	0.15	gravels	1. silty, gravelly sand	1. 0.15	1. 1 sherd
69	500N/529E	0.18	rocks	1. silty, gravelly sand	1. 0.18	1. none
70	500N/532E	0.30	rocks	1. silty, gravelly sand	1. 0.30	1. none
71	500N/534E	0.10	rocks	1. silty, gravelly sand	1. 0.10	1. none
72	500N/538E	0.28	gravels	1. silty, gravelly sand	1. 0.28	1. 1 sherd
73	500N/540E	1.28	loose soil	1. silty, gravelly sand 2. silty sand	1. 0.55 2. 0.73	1. none 2. none
130	500N/542E	1.17	gravels	1. silty, gravelly sand 2. silty sand	1. 0.25 2. 0.92	1. charcoal 2. charcoal
131	500N/543E	1.00	gravels	1. silty, gravelly sand 2. silty sand	1. 0.25 2. 0.75	1. 1 sherd, 1 lithic, charcoal 2. none

AH	Location	Depth (m)	Stopped By	Soil Types	Thickness (m)	Cultural Materials
132	499N/545E	0.92	gravels	1. silty, gravelly sand 2. silty sand	1. 0.25 2. 0.67	1. charcoal 2. none
133	500N/547E	0.99	gravels	1. silty, gravelly sand 2. silty sand	1. 0.30 2. 0.69	1. none 2. none
134	500N/550E	1.67	gravels	1. silty, gravelly sand 2. silty sand	1. 0.30 2. 1.37	1. 1 sherd 2. none
135	500N/551E	1.73	gravels	1. silty, gravelly sand 2. silty sand	1. 0.30 2. 1.43	1. 9 sherds, charcoal 2. charcoal
136	500N/553E	0.33	rocks	1. silty, gravelly sand	1. 0.33	1. 7 bones, charcoal

Auger Transect along the 520N Grid Line

Twenty-one auger holes were spaced at 2 m intervals between 480E and 520E along the 520N grid line. The results of augering along this line are shown in Table 8. The surface layer was Soil Type 1 in every case, and where the auger was able to penetrate deeply enough, this layer was underlain by Soil Type 2. While no stratified cultural deposits were encountered, high artifact counts between AH-24 and AH-33 suggest that trash may have been deposited in that area (Trash Area 4 in Fig. 6). These materials could also reflect the presence of ephemeral cultural features near a probable well and between several house mounds.

Table 8. Auger holes along the 520N grid line at LA 4968

AH	Location	Depth (m)	Stopped by	Soil Types	Thickness (m)	Cultural Materials
24	520N/480E	0.33	rocks	1. silty, gravelly sand	1. 0.33	1. 2 sherds, 2 bones, 2 glass, jaspe
25	520N/482E	0.18	gravels	1. silty, gravelly sand	1. 0.18	1. 4 sherds, 1 bone
26	520N/484E	0.16	gravels	1. silty, gravelly sand	1. 0.16	1. 9 sherds, 1 metal
27	520N/486E	0.15	gravels	1. silty, gravelly sand	1. 0.15	1. 5 sherds, 2 bones
28	520N/488E	0.20	rocks	1. silty, gravelly sand	1. 0.20	1. 17 sherds, 1 bone, 1 glass
29	520N/489E	0.44	rocks	1. silty, gravelly sand 2. silty sand	1. 0.40 2. 0.04	1. 6 sherds, 1 lithic, charcoal 2. none
30	520N/492E	0.28	rocks	1. silty, gravelly sand	1. 0.28	1. 2 sherds, 3 bones
31	520N/494E	0.50	rocks	1. silty, gravelly sand	1. 0.50	1. 5 sherds, 4 bones. charcoal
32	520N/496E	0.30	rocks	1. silty, gravelly sand	1. 0.30	1. 7 sherds, charcoal
33	520N/498E	0.15	rocks	1. silty, gravelly sand	1. 0.15	1. 1 sherd, charcoal
34	520N/500E	0.20	rocks	1. silty, gravelly sand	1. 0.20	1. none
35	520N/502E	0.23	rocks	1. silty, gravelly sand	1. 0.23	1. charcoal
36	520N/504E	0.30	gravels	1. silty, gravelly sand	1. 0.30	1. none
37	520N/506E	0.33	gravels	1. silty, gravelly sand	1. 0.33	1. none
38	520N/508E	0.23	root	1. silty, gravelly sand	1. 0.23	1. 1 sherd
39	520N/510E	0.23	rocks	1. silty, gravelly sand	1. 0.23	1. none
40	520N/512E	0.72	rocks	1. silty, gravelly sand 2. silty sand	1. 0.56 2. 0.16	1. none 2. none

51	520N/514E	0.24	gravels	1. silty, gravelly sand 2. silty sand	1. 0.14 2. 0.10	1. none 2. none
52	520N/516E	0.24	gravels	1. silty, gravelly sand 2. silty sand	1. 0.22 2. 0.02	1. none 2. none
53	520N/518E	0.25	gravels	1. silty, gravelly sand	1. 0.25	1. none
54	520N/520E	0.27	gravels	1. silty, gravelly sand	1. 0.27	1. 2 sherds

Auger Transect along the 530N Grid Line

This transect contained 11 auger holes spaced at 2 m intervals between 460E and 479E along the 530N grid line. The results of augering along this line are presented in Table 9. The surface layer in each case was Soil Type 1, which was usually underlain by Soil Type 2 when the auger was able to penetrate deeply enough. Tests in the west half of this transect (AH-74 through AH-79) had fairly high artifact counts, which probably indicates a continuation of the trash deposits defined in the transect along the 472E grid line (Trash Area 3 in Fig. 6). Tests in the east half (AH-80 through AH-84) crossed the south end of Mound 1, and reflect deposits associated with that structure.

Table 9. Auger holes along the 530N grid line at LA 4968

AH	Location	Depth (m)	Stopped By	Soil Types	Thickness (m)	Cultural Materials
74	530N/460E	0.30	gravels	1. silty, gravelly sand	1. 0.30	1. 5 sherds, 17 bones, jaspe
75	530N/462E	0.72	gravels	1. silty, gravelly sand	1. 0.72	1. 1 sherd, 35 bones, 1 lithic, charcoal, jaspe
76	530N/464E	0.14	gravels	1. silty, gravelly sand	1. 0.14	1. 1 sherd, 1 bone
77	530N/466E	0.51	gravels	1. silty, gravelly sand 2. silty sand	1. 0.38 2. 0.13	1. 4 sherds, charcoal 2. 1 sherd
78	530N/468E	0.24	gravels	1. silty, gravelly sand	1. 0.24	1. 2 sherds, charcoal
79	530N/470E	0.92	gravels	1. silty, gravelly sand 1. silty, gravelly sand 2. silty sand	1. 0.41 1. 0.42 2. 0.09	1. 18 sherds, 4 bone, 1 metal, charcoal 1. 2 sherds, charcoal 2. 1 sherd
80	530N/472E	0.50	rocks	1. silty, gravelly clay	1. 0.50	1. 5 sherds, 1 bone, 1 egg shell, charcoal, adobe
81	529N/474E	0.28	gravels	1. silty, gravelly sand	1. 0.28	1. 2 sherds, 1 bone, charcoal
82	529N/476E	0.23	cobbles	1. silty, gravelly sand	1. 0.23	1. charcoal
83	530N/478E	0.23	cobbles	1. silty, gravelly sand	1. 0.23	1. 7 sherds, 2 bones, charcoal
84	530N/479E	1.55	cobbles	1. silty, gravelly sand 2. silty sand	1. 0.65 2. 0.90	1. 10 sherds, 2 bone, egg shell, charcoal, jaspe 2. none

Auger Transect along the East Side of NM 84/285

There were 46 auger holes spaced at 2 m intervals along this transect, with two additional auger holes used to investigate potential cultural deposits. This transect was placed within project boundaries along the current right-of-way fence on the east side of U.S. 84/285. Results are shown in Table 10. The surface layer in all cases was Soil Type 1, which was dominantly underlain by Soil Type 2 where the auger could penetrate deeply enough. However, two areas differed significantly from this. Structural deposits containing artifacts associated with Mound 7 were encountered between AH-98 and AH-105. AH-118 and AH-119 both contained cultural materials and ashy soils. In order to better define deposits in this area, AH-144 and AH-145 were excavated out of the transect line. These investigations were later augmented by a test pit at 554N/582E, which demonstrated the presence of a trash-filled pit (Trash Pit 1).

Table 10. Auger holes on the east side of the highway at LA 4968

AH	Location	Depth (m)	Stopped by	Soil Types	Thickness (m)	Cultural Materials
91	503N/641E	0.35	gravels	1. silty, gravelly sand	1. 0.35	1. none
92	505N/638E	0.65	rocks	1. silty, gravelly sand	1. 0.65	1. none
93	510N/633E	0.47+	rocks	1. silty, gravelly sand 2. silty sand	1. 0.47 2. ?	1. none 2. none
94	511N/632E	0.45	loose soil	1. silty, gravelly sand 2. silty sand	1. 0.30 2. 0.15	1. none 2. none
95	513N/629E	0.40	sterile	7. silty, gravelly sand 2. silty sand	7. 0.30 2. 0.10	7. none 2. none
96	516N/626E	0.40	sterile	7. silty, gravelly sand 2. silty sand	7. 0.25 2. 0.15	7. 1 sherd, 1 glass,charcoal 2. none
97	517N/625E	0.33	sterile	7. silty, gravelly sand 2. silty sand	7. 0.20 2. 0.13	7. none 2. none
98	519N/623E	0.40	sterile	1. silty, gravelly sand 2. silty sand	1. 0.25 2. 0.15	1. 1 sherd, charcoal 2. 1 glass
99	520N/622E	0.65	sterile	9. sandy clay loam 7. silty, gravelly sand 2. silty sand	9. 0.30 7. 0.32 2. 0.03	9. 4 sherds, 4 bone, charcoal 7. charcoal, adobe 2. none
100	521N/620E	0.55	rocks	1. silty, gravelly sand 7. silty, gravelly sand 10. silty sand	1. 0.10 7. 0.33 10. 0.12	1. 1 sherd, 1 glass, charcoal 7. 4 sherds, charcoal 10. 2 sherds, charcoal
101	522N/618E	0.52	rocks	1. silty, gravelly sand 11. silty, ashy sand	1. 0.28 11. 0.17	1. 5 sherds, 1 bone, charcoal 11. charcoal
102	524N/617E	0.26	rocks	1. silty, gravelly sand	1. 0.26	1. 2 sherds, charcoal
103	525N/615E	0.14	rocks	1. silty, gravelly sand	1. 0.14	1. charcoal
104	527N/614E	0.47	rocks	1. silty, gravelly sand	1. 0.47	1. 6 sherds, charcoal
105	528N/612E	0.54	rocks	1. silty, gravelly sand	1. 0.54	1. 1 sherd
106	529N/611E	0.40	rocks	1. silty, gravelly sand 2. silty sand	1. 0.30 2. 0.10	1. 3 sherds, 1 glass, 1 metal 2. 4 sherds, charcoal
107	531N/609E	0.52	rocks	1. silty, gravelly sand	1. 0.52	1. 11 sherds, 2 bones
108	533N/608E	0.40	rocks	1. silty, gravelly sand	1. 0.40	1. 3 sherds, 1 lithic, charcoal
109	534N/606E	0.28	rocks	1. silty, gravelly sand	1. 0.28	1. charcoal
110	535N/605E	1.62	auger	1. silty, gravelly sand 1. silty, gravelly sand	1. 0.50 1. 1.12	1. 1 lithic, charcoal, plaster 1. none
111	536N/604E	0.72	rocks	1. silty, gravelly sand 1. silty, gravelly sand	1. 0.27 1. 0.45	1. charcoal 1. 1 sherd
112	539N/601E	1.77	auger	1. silty, gravelly sand	1. 1.77	1. charcoal, plaster
113	539N/601E	1.77	auger	1. silty, gravelly sand	1. 1.77	1. charcoal
114	544N/594E	1.64	auger	1. silty, gravelly sand	1. 1.64	1. charcoal, plaster, glass
115	547N/591E	1.76	auger	1. silty, gravelly sand	1. 1.76	1. charcoal, plaster

AH	Location	Depth (m)	Stopped by	Soil Types	Thickness (m)	Cultural Materials
116	550N/589E	1.50	auger	1. silty, gravelly sand	1. 1.50	1. charcoal
117	552N/585E	1.33	sterile	1. silty, gravelly sand 9. sandy clay loam 1. silty, gravelly sand	1. 0.20 9. 0.10 1. 1.03	1. charcoal 9. 1 lithic 1. charcoal, plaster
118	554N/584E	0.67	rocks	1. silty, gravelly sand	1. 0.67	1. 1 sherd, 2 glass, charcoal
144	553N/584E	1.70	auger	1. silty, gravelly sand 11. silty, ashy sand 2. silty sand	1. 0.50 11. 0.60 2. 0.60	1. none 11. charcoal 2. charcoal
119	555N/582E	1.83	auger	1. silty, gravelly sand 3. dark ashy soil 2. silty sand	1. 0.90 3. 0.20 2. 0.73	1. 2 sherds, charcoal 3. 3 sherds, 11 bones, ash 2. 2 bones, charcoal
145	554N/582E	1.78	auger	1. silty, gravelly sand 11. silty, ashy sand 3. dark ashy soil 2. silty sand	1. 0.50 11. 0.45 3. 0.15 2. .068	1. 3 sherds, charcoal 11. 2 sherds, charcoal 3. 2 sherds, 1 bone, 4 wood 2. 4 sherds, 3 bone, charcoal
120	556N/581E	1.55	rocks	1. silty, gravelly sand 2. silty sand 10. silty sand 12. clayey soil	1. 0.35 2. 0.65 10. 0.17 12. 0.38	1. 1 sherd, charcoal 2. 1 sherd, charcoal 10. 3 sherds, charcoal 12. 9 bones, charcoal, plaster
121	557N/580E	0.58	rocks	1. silty, gravelly sand	1. 0.58	1. 2 sherds
122	559N/578E	1.88	auger	1. silty, gravelly sand 2. silty sand	1. 0.65 2. 1.23	1. 2 sherds, 1 glass 2. none
123	559N/576E	1.14	gravels	1. silty, gravelly sand	1. 1.14	1. 1 glass
124	561N/575E	1.72	auger	1. silty, gravelly sand 2. silty sand	1. 0.60 2. 1.12	1. 1 sherd, 1 lithic 2. 1 sherd
125	563N/574E	1.56	auger	1. silty, gravelly sand 2. silty sand	1. 0.62 2. 0.94	1. 1 sherd, 1 glass, charcoal 2. 4 sherds, charcoal
126	564N/572E	0.84	bedrock	1. silty, gravelly sand 13. gravelly sand	1. 0.56 13. 0.28	1. charcoal 13. 1 sherd, charcoal
127	565N/571E	0.30	rocks	1. silty, gravelly sand	1. 0.30	1. none
128	567N/569E	0.80	sterile	1. silty, gravelly sand 2. silty sand	1. 0.60 2. 0.20	1. 6 sherds 2. none
129	568N/568E	0.30	bedrock	1. silty, gravelly sand	1. 0.30	1. 2 sherds, charcoal
137	569N/566E	1.78	auger	1. silty, gravelly sand 2. silty sand	1. 0.60 2. 1.18	1. none 2. none
138	572N/566E	0.44	bedrock	1. silty, gravelly sand	1. 0.44	1. 2 sherds, charcoal
139	572N/563E	1.87	auger	1. silty, gravelly sand	1. 1.87	1. 1 sherd, charcoal
140	573N/562E	1.53	auger	1. silty, gravelly sand	1. 1.53	1. charcoal
141	575N/560E	1.08	sterile	1. silty, gravelly sand	1. 1.08	1. 4 sherds, charcoal
142	576N/559E	0.48	rocks	1. silty, gravelly sand	1. 0.48	1. 10 sherds, charcoal
143	577N/557E	0.26	rocks	1. silty, gravelly sand	1. 0.26	1. 1 sherd, charcoal

Between the structural deposits associated with Mound 7 and Trash Pit 1, auger holes tended to contain artifacts and other cultural materials that may be indicative of sheet trash deposits. Conversely, most of these materials may be associated with Mound 8, though no structural remains were definitely identified in that area. Most auger holes northwest of Trash Pit 1 also contained cultural materials and may be indicative of the thin veneer of cultural materials expected to occur around structures, though some sheet trash deposits are also possible.

Test Units in the Western Mound Group

Five test units consisting of 1 by 1 m test pits were used to investigate four potential structures. Excavation in test pits continued until no further cultural materials were recovered, sterile substrate was encountered, or a floor was found. Test pits were labeled according to the intersecting grid lines at their southwest corners.

540N/489E. This was the first of two test pits excavated to determine whether Mound 1 represents the remains of a structure. It was placed in the east half of the mound. Excavation continued for six levels to a depth of .54 m below the surface and ended at an adobe floor, confirming the structural nature of this mound. The fill consisted of five layers of silty sand ranging in color from very pale brown to light yellowish brown. These soils were deposited after the structure was abandoned. The amount and size of adobe chunks increased with depth. Fragments of wood and plaster surfaced with gypsum whitewash were also noted. Artifacts were common throughout the matrix and included 127 native sherds, 51 bones, 37 glass fragments, 1 piece of chipped stone, and 1 Euroamerican sherd.

The floor revealed in this test pit is fairly uneven and deteriorated in places from bioturbation and apparent puddling before it was completely buried. The upper layers of adobe peeled off the floor in places, suggesting that it was replastered at least once. The matrix just above the floor surface was variable, in places consisting of silty sand and in others of melted adobe. Fragments of whitewashed adobe plaster were found at the floor contact, but no artifacts were recovered from this zone.

540-541N/478E. This test unit was placed in the west half of Mound 1. Excavation began in 540N/478E, where three levels were excavated to a depth of .21 m. Blackened soil was encountered just below the surface, and numerous micaceous sherds from what was initially thought to be a pot-drop were collected from the northeast quadrant of the grid. The second level revealed the edge of a possible adobe wall in the northwest corner of the grid, adjacent to which were two ash pockets. More ash pockets were encountered in the third level, which ended at a hard-packed layer that may represent a deteriorated floor. Artifacts found in this grid include 206 native sherds, 7 bones, 1 piece of chipped stone, and a mica fragment.

In order to determine the nature of what was uncovered in 540N/478E, excavation was begun in the next grid to the north (541N/478E). Two levels were removed to a depth of .23 m, revealing adobe bricks in the south half of the grid. This confirmed that the interior corner of an adobe wall was present in this location and suggested that the charcoal and ash pockets were the remains of a corner fireplace. If this is so, the large number of micaceous sherds recovered from this area probably came from a smashed chimney pot. Artifacts recovered from this grid include 130 native sherds and 18 bones.

If excavation halted at or just above a deteriorated floor, the room represented by these remains may have been superimposed above an earlier structure. The probable floor level in this test unit is about .40 m higher than the floor encountered in 540N/489E, which appears to represent the floor level of the original structure. Also, the wall alignments appear to be oriented at an angle to the structural mound. Unfortunately, too few data could be collected during this phase of investigation to either confirm or refute this possibility.

508N-510N/500E. This test unit was used to investigate the nature of Mound 2. It contained three 1 m by 1 m test pits excavated to varying depths and confirmed the presence of a structure at this location. The first grid investigated was 508N/500E, which was excavated to a depth of .43 m in five levels. The upper .10 m of fill was a very loose brown silty sand, with large cobbles occurring near the base of the unit along the north edge of the grid. Under this was a more consolidated silty sand varying in color from very pale brown to light yellowish brown. Artifacts from the upper soil unit include 15 native sherds, 2 Euroamerican ceramics, and charcoal. Cultural materials were also common in the next .21 to .24 m of fill, totaling 57 native sherds, 1 possible bead, 7 bones, 1 metal fragment, 1 chipped stone artifact, 1 piece of glass, and adobe. No artifacts were found below about .34 m.

Because we did not understand the nature of the cobbles along the north edge of 508N/500E, the trench was expanded northward, and 509N/500E was excavated. Only one level was removed from this grid. Chunks of adobe were found near the base of the level. Cobbles seemed to be confined to the area where 508N/500E and 509N/500E met. The soil in this unit was the same as the upper soil in 508N/500E, and artifacts were again plentiful: 22 native sherds and 3 fragments of bone were recovered.

Since the nature of this area was still questionable, excavation was shifted to 510N/500E. Two levels were excavated, providing the information we needed. An adobe floor was uncovered along the north edge of this grid between .08 and .10 m below the surface. The floor was built over a layer of cobbles and evidences several replastering episodes. Fourteen native sherds were recovered from this grid and seem to represent fragments of a polychrome vessel that was lying on or just above the floor surface. The layer of cobbles uncovered in this grid matches those found along the north edge of 508N/500E, suggesting that the floor originally extended at least that far south. Other cultural materials recovered from this grid include 1 bone, 2 pieces of glass, 2 metal fragments, 1 Euroamerican sherd, 2 pieces of leather, and 1 possible plastic bead.

There are two interesting aspects to the presence of a floor at this level in Mound 2. First, numerous artifacts were recovered from below a similar level in 508N/500E, suggesting that the floor may have been built over earlier deposits. Second, the floor is just below the surface of the mound, so debris from the associated walls and roof could not be responsible for the visible mounding in this area. This, coupled with the likelihood of deeper cultural deposits, suggests that Mound 2 probably contains superimposed historic structures.

491N/510E. In order to investigate the nature of Mound 3, a test pit was excavated at 491N/510E in the east central section of the mound. This pit was excavated to a depth of .50 m without encountering any structural remains. An auger hole in the southwest quadrant of the grid extended an additional .47 m downward and also encountered no evidence of structural remains. The upper .40 m of fill was Soil Type 1 and ended at a layer of silty sand containing numerous gravels and cobbles that appears to represent alluvial deposits. These materials continued downward to the base of the auger hole.

Cultural materials were fairly plentiful in this test pit but were most common in the upper level of excavation. They included 7 native sherds, 2 pieces of chipped stone, 9 bones, 5 glass fragments, 1 piece of metal, and 1 Euroamerican sherd. The deepest artifact found was the Euroamerican sherd, which was recovered from the upper .14 m of the auger hole. Though some construction materials (mostly wood) were noted in this test pit, there was no evidence of collapsed adobe walls or a floor. Thus, this mound may not represent structural remains and may have been created during the blading of a nearby road. Alternatively, a structure may be present in the west part of the mound, which is outside proposed project limits.

539N/507E. A single test pit was excavated in three levels to a depth of .30 m at 539N/507E to investigate Mound 6. The uppermost .10 m level was yellow-brown silty sand that contained fragments of adobe and charcoal as well as numerous artifacts. The latter included 33 native sherds, 1 bone, and 1 piece of glass. The second .10 m level was similar to the first, except that it was mostly a sandy adobe, containing 20 native sherds and 6 bones. A possible surface was encountered .02 to .03 m into the third level and consisted of a thin layer of consolidated soil. Though testing was unable to ascertain whether this represented the floor of a structure, a total of 25 native sherds was found above the consolidated level, while only 1 came from below it, suggesting that it represents a use-surface of some sort. A fourth level penetrated an additional .10 m into sterile silty sand. Though the results of testing in this unit were rather ambiguous, enough information was retrieved to suggest that the mounding in this area represents the remains of a collapsed structure.

Test Units in the East Portion of the Site

Three test pits consisting of 1 m by 1 m grids were used to investigate two potential structures and an area containing fairly deep cultural deposits in this part of the site. In the latter case, the test pit was used to augment and verify conclusions based on the results of auger tests. Excavation continued until no further cultural materials were recovered, sterile substrate was encountered, or a floor was found. Test pits were labeled according to the intersecting grid lines at their southwest corners.

523N/617-618E. This test pit contained two 1 by 1 m grids and was excavated to determine whether structural remains associated with Mound 7 occur within the existing right-of-way. Excavation began in 523N/617E, which was excavated to a depth of .40 m in four levels. The upper .14 to .15 m of fill was a light brown, fine-grained silty sand containing some large sands. Two lenses of very fine silty sand were encountered beneath this soil unit in the east half of the test pit, below which was a layer of compacted silty sand that ran across the grid. Artifacts were abundant and increased in frequency with depth. They included 234 native sherds, 1 Euroamerican sherd, 3 chipped stone artifacts, 35 bones, 5 glass fragments, and 1 metal item.

Beneath the compacted sand was a .06 to .12 m thick layer of melted adobe, which confirmed that Mound 7 is structural in nature. The melted adobe overlay a thin (.02 to .08 m) layer of silty sand containing small gravels, abundant charcoal, and numerous artifacts including 104 native sherds, 154 bones, 2 Euroamerican sherds, jaspe chunks, and wood fragments. This layer appears to represent a domestic trash deposit predating abandonment of the Mound 7 structure.

In order to determine whether actual structural remains were present, 523N/618E was excavated. This unit was excavated to a depth of .31 m in four levels. The last was only a few centimeters deep when excavation ended. Soil layers encountered were the same as those in 523N/617E. Ninety-one native sherds, 19 Euroamerican sherds, 3 chipped stone artifacts, 5 bones, 5 glass fragments, and 1 metal item were recovered from the upper three levels. These soils appear to have been deposited after the structure in Mound 7 was abandoned. Excavation of Level 4 stopped after .01 to .02 m when a possible trash pit was encountered in the northeast corner of the grid. Although shallow, this level yielded 120 native sherds, 30 bones, and 3 Euroamerican sherds, mostly from the top of the possible feature. Because excavation did not reach the melted adobe layer, this feature must date after abandonment of the structure.

Excavations in this area confirmed the presence of a structure in Mound 7, although actual structural remains were not found. They also revealed trash deposits and features dating before and after abandonment of the Mound 7 structure.

541N/597E. This test pit was used to determine whether structural remains associated with Mound 8 occur within the existing right-of-way and was excavated to a depth of .80 m in eight levels. A thin loamy topsoil was encountered at the surface. The remaining .75 m of fill consisted of a compact silty sand containing numerous large and small chunks of adobe, including identifiable brick fragments, adobe plaster fragments, jaspe chunks, charcoal, and wood fragments. Excavation stopped at the sterile silty sand substrate. Milled lumber fragments were recovered from this unit, as were several mica fragments. Artifact frequencies were low, and totaled only 26 native sherds, 2 chipped stone artifacts, 1 ground stone tool, 4 bones, and 8 glass fragments. Four wood fragments and one piece of gypsum were also collected. Excavation in this unit encountered the remains of a collapsed adobe wall. Although in situ structural remains were not found, this test pit confirms the presence of an adobe structure in Mound 8.

554N/582E. This test pit was excavated to define deep artifact-bearing deposits and a thick, ashy stratum encountered in auger holes AH-118, AH-119, AH-144, and AH-145. It was excavated to a depth of 1.18 m in 12 levels and contained a complex series of soils that represent intentional trash disposal, structural abandonment and deterioration, and natural processes of soil deposition and formation. The uppermost stratum was a thin (.02 to .07 m) layer of loamy silty sand. Beneath this was a .32 to .44 m thick layer of melted adobe that contained chunks of adobe, bits of jaspe, silty sand, and pea gravels. Within this soil unit was a thinner layer of melted adobe (.02 to .14 m thick), which contained more frequent and larger pieces of adobe. This layer sloped noticeably down to the south and west, and may represent a shorter but more active episode of structural deterioration than those that produced the surrounding layer of melted adobe. A juniper branch fragment recovered from the bottom of the melted adobe may be a latilla fragment. The artifact assemblage from the melted adobe layers includes only 23 native sherds, 8 chipped stone artifacts, 4 glass fragments, 2 wood fragments, and 1 metal item.

At the bottom of the melted adobe was a very thin layer of dark soil that appeared to be organic in nature and may have been deposited as the structure began to deteriorate. Conversely, it could represent an incipient topsoil horizon that was forming before it was covered by melted adobe. Below these soils were three layers of fine silt containing occasional small sands, hard clay lenses, and charcoal. The clay lenses were initially thought to be floors, but it is now clear that they are alluvial deposits which represent water movement across this part of the site. Artifact counts in these levels were much higher than in the four levels above them and included 151 native sherds, 2 chipped stone artifacts, 37 bones, 13 glass fragments, 2 metal items, and 4 Euroamerican sherds.

A shallow erosional channel beneath these soil layers along the northeast side of the grid contained laminar lenses of silts and sands. A charcoal deposit occurred at the top of the channel, with a thin ash lens above that separated the channel from the alluvial deposits immediately above it. It appears that the shallow channel filled with alluvium, and as deposition continued more layers of alluvium above it were laid down above it. At a later time, the layers of alluvium was covered by colluvium containing melted adobe.

Beneath the alluvium was a loose, thick (.40 to .54 m), dark gray soil containing definable layers. This soil consisted of a sandy matrix containing abundant charcoal, ash, wood, burned wood, and numerous artifacts. Charcoal and ash increased with depth, as did artifacts, so that the matrix near the bottom of the unit was largely charcoal and ash, with little sediment. The assemblage recovered from this layer includes 737 native sherds, many of them quite large, 4 chipped stone artifacts, 422 bones, 4 ground stone tools, 7 Euroamerican sherds, and 1 metal item. This layer represents a thick domestic trash deposit that dates before the abandonment of a nearby structure. It rests upon the sterile silty soil that occurs across the site. At the base of the trash deposit the silty soil is chunky and resembles adobe.

The horizontal extent of the trash deposit is indicated by auger testing to be 2 m or less. The potential size of the pit and the nature of the soil at the base of the trash deposit suggest that this feature represents a trash pit (Trash Pit 1), which may originally have been an adobe mixing pit. This feature will be examined more fully during data recovery. This test pit also confirmed the presence of an adobe structure in a low mound revealed by topographic mapping north of Mound 8, as discussed in the site description. It did not allow us to determine whether that mound is part of Mound 8, a possibility that will be examined during data recovery.

Summary of Testing Results

Testing at LA 4968 successfully fulfilled its intended goals. Auger tests revealed the presence and locations of subsurface artifact-bearing deposits in areas between and near mounds, and test pits clarified the nature of several mounds at the site. In so doing, answers were provided for several of the questions posed earlier in this chapter. Of the seven mounds investigated, five (Mounds 1, 2, 4, 7, and 8) are certainly structural, one (Mound 6) may be structural, and the seventh (Mound 3) may not be structural. All structural evidence points to use of adobe construction, with adobe plaster and floors, and jaspe whitewash. Testing in Mounds 1 and 2 suggest the presence of structural superimposition. Although we cannot be sure of structural types based on testing results, evidence was found to suggest that Mound 1 was a residence, while Mound 4 may have been a semisubterranean storage structure (*soterrano*).

Nonstructural features were also encountered. They include several shallow trash deposits and at least one trash pit, which may originally have been an adobe mixing pit. Stratigraphic relationships point to relative ages of structures, trash deposits, and features on the east side of the site. It is safe to assume that similar relationships can be defined on the west side of the site during more intensive investigations.

The number and size of the trash deposits and the number of artifacts recovered from them, as well as the range of structures and features defined, support the identification of LA 4968 as a residential locale. Whether the mounds reflect more than one house cannot be determined with the information available at this time. This should be determined during data recovery. More detailed answers to the questions posed earlier in this chapter will require intensive data recovery investigations. It is clear, however, that the portions of LA 4968 within the proposed and existing rights-of-way have the potential to provide data relevant to these site-specific questions and to the larger research issues presented in the data recovery section of this report.

DATING THE SITES

Preliminary examination of the assemblages recovered during testing suggests that the Spanish Colonial dates assigned to LA 160 and LA 4968 during various surveys may be erroneous. Though testing recovered only small assemblages, which have not yet been rigorously analyzed, some tentative temporal data are available from these artifacts. Since we have not yet conducted archival research or interviews with local inhabitants that might provide more accurate temporal frameworks for the occupations of these sites, these dates are the best that are currently available.

Dates can be derived from various categories of Euroamerican artifacts with known temporal ranges including ceramics, flat glass, bottle glass, and can parts. Unfortunately, these data are currently only available for LA 4968, since the few Euroamerican artifacts recovered from LA 160 are not amenable to accurate dating. The structure of the native ceramic assemblages from LA 160 and LA 4968 can be compared with those of other sites, providing relative dates. By combining these bits of information we should be able to provide tentative occupational dates for LA 160 and LA 4968. We may also be able to compare the assemblages from various structures and features from LA 4968 to determine whether they were used at the same or different times.

Euroamerican Artifacts

Pottery

Eight varieties of Euroamerican pottery with known temporal ranges were recovered during testing at LA 4968 (Table 11). They include three identifiable varieties of Mexican tin-enameled earthenware, or majolicas, and several types that were probably manufactured in the eastern United States.

Table 11. Dateable Euroamerican pottery types and their distributions at LA 4968

Artifact Type	Mound 1	Mound 2	Mound 3	Mound 6	Mound 7	Auger Holes	Trash Pit 1
Puebla Blue-on-white			x	x			
San Elizario Polychrome	x						
Orangeline Polychrome	x						x
Mexican glaze ware					x		x
Mexican Green Glaze							x
Flow Blue		x					
Annular ware					x	x	x
Yellow ware					x		

Probable Puebla Blue-on-white sherds were found in two proveniences. This is one of the most widespread and abundant types of majolica in the Caribbean, Florida, Mexico, and the Southwest (Deagan 1987:83). It also has a long temporal distribution, dating between about 1675 and 1830 (Deagan 1987:84). Cohen-Williams (1992) notes that Puebla Blue-on-white is common in majolica assemblages (more than 40 percent) until 1800 and was a standard type (10 to 40 percent) between 1800 and 1850. It also occurs rarely (less than 10 percent) in majolica assemblages dating between 1850 and 1900. By itself, Puebla blue-on-white is not a good temporal indicator, but since it is relatively common in the LA 4968 majolica assemblage, it probably indicates a pre-1850 occupation.

San Elizario Polychrome was recovered from one provenience. This variety of majolica was produced between 1750 and 1830 or 1850 and tends to comprise 10 to 40 percent of majolica assemblages through this period (Barnes and May 1972; Cohen-Williams 1992; Deagan 1987). Orangeline Polychrome was the final type of identifiable majolica recovered from LA 4968. Possible sherds of this type occurred in two proveniences. Deagan (1987:88) refers to this variety as a nineteenth-century ware, and C. Snow (personal communication, 1999) indicates that while it was produced during the late eighteenth century, it is to all intents and purposes an early nineteenth-century ware.

Few majolicas appear to have imported into the American Southwest after 1850 (Snow 1965:32). This undoubtedly resulted from changes in economic patterns caused by the acquisition of Mexican holdings in the Southwest during the Mexican War of 1846 to 1848 and the later Gadsden Purchase. Majolica sherds found on sites dating after about 1850 probably represent heirloom pieces (Snow 1965:32). Thus, the presence of quite a few pieces of majolica in the LA 4968 assemblage suggests that the main occupation of this site probably occurred in the first half of the nineteenth century.

Two varieties of Mexican earthenware were also recovered from LA 4968. Mexican glaze ware was found in two proveniences, and Mexican Green Glaze was found in one. Barnes (1980:93) indicates that both of these types were made from 1650 to the present. However, he notes that some varieties like green-glazed utility ware and totally green glazed ware have a more restricted temporal distribution and ended around 1850. Unfortunately, since we lack a more accurate identification for these sherds, they can not be used to provide dates for the site. However, like the majolicas, it is likely that few Mexican glaze wares were imported after 1850, and their presence suggests an occupation before that date.

Three or four wares imported from the eastern United States were recovered from LA 4968. One provenience contained possible Flow Blue sherds. This type was developed in 1820 and remained popular until the 1870s (Habicht-Mauche 1988:10). Annular ware was found in three proveniences and had a longer temporal distribution than Flow Blue, occurring between 1795 and 1930 (Habicht-Mauche 1988:12). However, Noël Hume (1962:131) indicates that annular ware was most popular in the first two decades of the nineteenth century. A few pieces of yellow ware were also recovered. It was popular between about 1830 and 1900+ (Habicht-Mauche 1988:8). Finally, three pieces of white ware, which appear to have been manufactured after 1850, were found. However, these fragments are small and could be pieces of Flow Blue vessels, in which case they could have been manufactured a bit earlier.

Spanish law severely restricted the importing of goods into New Spain. Direct contact between American traders and the Southwest was illegal until 1821, when Mexico was granted its independence by Spain. Trade with the United States over the Santa Fe Trail began almost immediately and by 1825 had begun in earnest. Thus, the presence of Euroamerican ceramics imported from the eastern United States indicates that the occupation of LA 4968 primarily occurred after 1821, and probably after 1825.

Table 12 shows the approximate temporal distributions of Euroamerican pottery types between 1750 and 1900. All but one type overlap between approximately 1830 and 1850, suggesting that the main occupation of LA 4968 was during that period. The white wares were the only type that did not

Table 12. Approximate date ranges for Euroamerican pottery types from LA 4968 between 1750 and 1900

Artifact Type	1750	1760	1770	1780	1790	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900
Puebla Blue-on-white	x	x	x	x	x	x	x	x	x	x	x					
San Elizario Polychrome	x	x	x	x	x	x	x	x	x	x	x					
Orangeline Polychrome						x	x	x	x	x	x					
Flow Blue								x	x	x	x	x	x			
Annular ware					x	x	x	x	x	x	x	x	x	x	x	x
Yellow ware									x	x	x	x	x	x	x	x
White ware											x	x	x	x	x	x

Table 13. Approximate thicknesses (in inches) of window glass

Dates	Approximate Primary Mode in Use
1830-1840	0.045
1835-1845	0.055
1840-1850	0.065
1850-1860	0.075
1855-1885	0.085
1870-1900	0.095

Source: Roenke 1978:44; cited from Chance and Chance 1976: Table 27 completely overlap this range, but as noted above, they may have been misidentified. Considering this and the possibility that the majolicas might represent heirloom pieces, the overlap is probably broader than this table suggests and could easily have extended for another 10 to 20 years. The presence of majolicas also suggests that the occupation could have begun earlier than these dates indicate. Thus, the suggested Euroamerican ceramic date for LA 4968 is from about 1821 to 1850 or 1870.

Flat Glass

Archaeologists have found that the thickness of flat glass used in windows is temporally sensitive. Chance and Chance (1976) were among the first to propose a dating scheme for flat glass based upon this attribute (Table 13). That study was expanded and amplified by Roenke (1978), whose analysis produced a series of approximate window glass thicknesses for the years between 1810 and 1915 (Table 14). The mean thickness of flat glass from LA 4968 is .056 inches (1.42 mm). When applied to Chance and Chance's (1976) data, this thickness suggests a date between about 1835 and 1845. Roenke's (1978) data provides a date of 1810 to 1845. Both date ranges are consistent with those provided by the Euroamerican ceramic assemblage.

Table 14. Window glass thicknesses (in inches) by date range

Dates	Approximate Primary Mode in Use
1810-1825	0.055
1820-1835	0.055
1830-1840	0.045
1835-1845	0.045-0.055
1845-1855	0.065
1850-1865	0.075
1855-1885	0.085
1870-1900	0.095
1900-1915	0.015

Source: Roenke (1978:116)

More recently, flat glass was rigorously studied by Moir (1982) and Schoen (1990). Both studies examined data from several sites of varying date and developed formulas that would allow researchers to estimate the date of construction for a structure from the thickness of associated window glass. Moir (1982) used data from 45 sites, 29 from the southern U.S. (most in east Texas) and 16 from the northeastern U.S. Most of his sites were occupied by low- to middle-class households (Schoen 1990:59), and window glass thickness data were used to produce a least-squares-linear-regression formula to estimate the initial date of construction. Moir reasoned that "regression analysis and the use of a single point in time is especially appropriate for window glass because most window panes are set in place at the time of initial construction" (Moir 1982:4). The equation he produced is

$$ID'84.22(TH)\%1712.7$$

where ID is the initial date of construction or occupation, and TH is mean glass thickness (in mm).

Schoen (1990) drew upon the work of earlier researchers and attempted to devise a similar formula specific to the Plains (Schoen 1990:60). He examined data from ten sites built between 1800 and 1900 that were initially isolated and utilitarian in function (Schoen 1990:61). Other criteria used to select his sample were short occupation spans, good site documentation, and construction during the nineteenth century. Nine of his sites had government or mercantile functions, and only one was a residence. This may have biased the sample as far as general use for the Southwest is concerned because glass for most of his sites may have been ordered directly from glass houses rather than being purchased from existing stores at mercantile establishments, thus circumventing the lag time that may have accompanied acquisition at one of the latter.

Following Schoen's (1990:63) methods, and taking into account certain of his recommendations, thicknesses of all flat glass specimens were measured regardless of size. Three measurements were taken for each fragment, and results were entered into a computerized data base using SPSS Data Entry. Both Schoen's (1990) and Moir's (1982) formulas were used in order to compare the dates provided by each. The equations were first run using all flat glass fragments from LA 4968. Then they were run again with the upper and lower 5 percent dropped to eliminate the accidental inclusion of nonflat glass and allow us to determine whether the sample was significantly affected by nonflat glass (Schoen 1990:67).

Data from this analysis are shown in Table 15. The same mean thicknesses and dates were obtained for both runs. The date derived from Schoen's equation is about 10 years earlier than the date provided by Moir's formula. Even considering the potential for bias in Schoen's formula, both procedures yielded dates in the early years of the Santa Fe Trail period. However, in this case we cannot presuppose that construction dates are indicated, since it would have been fairly easy to retrofit existing houses with windows once flat glass became widely available over through the Santa Fe Trail. Still, these results indicate that the site was occupied in the first half of the nineteenth century and that windows were probably installed in structures at LA 4968 well before 1850.

Table 15. Chronological analysis of window glass from LA 4968

Sample Type	Mean	N	Moir's Formula (date)	Schoen's Formula (date)
All flat glass	.056	48	1832.5	1821.6
All flat glass, 10% dropped	.056	43	1832.5	1821.6

Other Euroamerican Artifacts

A few other Euroamerican artifacts recovered from LA 4968 provide temporal information, though not as detailed or accurate as that of the pottery and flat glass. The types of nonflat glass recovered are mostly indicative of a pre-1880 date, with only a single fragment of possible amethyst glass found in any provenience. Since that specimen was recovered from the upper 10 cm of an auger hole near the east edge of the site, it could easily represent an unassociated contaminant. A few fragments of clear glass appear to be varieties that predate 1880, and the hand-applied finish of a black glass bottle predates 1880 and is possibly earlier than 1850. A fragment of can that was manufactured after 1847 is the last dateable Euroamerican artifact recovered during testing. While these materials do not provide dates as dependable as those derived from the Euroamerican pottery and flat glass, they do suggest that the occupation of LA 4968 was before 1880.

Native Ceramic Assemblage

This artifact category includes all earthenwares produced in the northern Rio Grande by Pueblos, Apaches, and Hispanics. It is usually difficult to differentiate between similar pottery types produced by all three groups, so no attempt is made to do so. Analysis of the structure of native ceramic assemblages from Spanish sites has shown that changes in the proportions of various types of wares can provide temporally sensitive information (Moore in prep. a). More specifically, alteration of economic patterns associated with the opening of the Santa Fe Trail in 1821 appears to have resulted in a major change in the types of pottery used in Spanish households. Five general ceramic categories were defined for this study: polished red wares, polished black wares, decorated wares, micaceous wares, and other utility wares. By using these general categories rather than types, it is possible to examine basic changes in pottery use patterns through time. This is done by comparing the general proportions of each category from an array of dated sites representing each of the historic periods defined in Cultural History Overview.

Table 16 presents the results of this analysis. Considering the four time periods first, a general decrease in percentages of polished red wares is visible from the Early Spanish Colonial period to the Railroad period. A radical increase in the use of polished black wares began in the Santa Fe Trail period and was sustained and intensified into the Railroad period. Decorated wares are very common in Spanish Colonial assemblages and are much less so in the Santa Fe Trail and Railroad periods. Micaceous wares follow the same pattern as the polished black wares and occur in large percentages in Santa Fe Trail period and later assemblages. Finally, percentages of other utility wares tend to drop considerably after the late Colonial period.

Table 16. Comparisons of ceramic type proportions by time period and component at LA 160 and LA 4968

Time Period	Polished Red Ware	Polished Black Ware	Decorated Ware	Micaceous Ware	Other Utility Ware
Early Spanish Colonial period	26.0	3.4	28.4	1.3	40.9
Late Spanish Colonial period	12.7	4.4	22.0	8.2	52.7
Santa Fe Trail period	9.5	28.7	13.8	30.4	17.6
Railroad period	7.3	37.2	17.5	23.8	14.1
LA 160 (Peckham's excavations)	12.6	8.1	15.7	32.4	31.2
LA 160 (testing)	8.9	14.5	21.0	26.6	29.0
LA 4968	4.2	16.5	23.8	31.0	24.5

The greatest amount of variation occurs between the Late Spanish Colonial and Santa Fe Trail periods. Assemblages dating before that transition generally contain moderate percentages of polished red wares and high percentages of decorated wares and other utility wares. Those dating after the transition contain high percentages of polished black and micaceous wares, and small to moderate percentages of the other types. The key seems to be the proportions of polished black wares and micaceous wares. When these categories comprise small percentages of an assemblage, it probably dates before the Santa Fe Trail period; when they make up large percentages, it tends to date after the opening of the Santa Fe Trail.

Two assemblages are available for examination from LA 160: materials from the current testing project, and pottery from Peckham's 1959 excavations. The latter assemblage was examined by Peter

McKenna of the Bureau of Indian Affairs, who was kind enough to share his data tables with us. The LA 4968 assemblage contains all of the native pottery recovered during testing. In general, the distribution of category percentages in the testing assemblages from LA 160 and LA 4968 suggest that the sites date to the Santa Fe Trail period or later. Percentages of polished red wares are small, percentages of micaceous wares are high, and percentages of polished black wares are fairly high. The sample from Peckham's excavations at LA 160 seem different: the percentage of polished red wares is fairly high, the percentage of polished black wares is low, and the percentage of micaceous wares is high. These results seem to mix tendencies from the Colonial and later periods.

It may be too much to expect any one site to completely follow the pattern of mean values shown in Table 16. Even when site occupants were generally following ceramic trends, personal preference, availability, access, and relative wealth could all affect the actual distribution of native ceramic categories. In general, the ceramic assemblages obtained during testing at LA 160 and LA 4968 match the tendencies in Table 16 for the Santa Fe Trail and Railroad periods. The comparatively small percentages of polished black wares and large percentages of decorated wares could be indicative of occupation near the early part of that time frame when the transition from the Spanish Colonial use pattern to that of the Santa Fe Trail period was still occurring, but this is uncertain. The assemblage from Peckham's 1959 excavations at LA 160 may also reflect occupation during that period of transition, but since we currently lack information on the Euroamerican assemblage recovered during that study, there is no way to confirm this.

Summary of Site-Wide Temporal Trends

Currently, the only dateable materials from both studies of LA 160 are native ceramics. A lack of Euroamerican artifacts other than a few undatable but fairly modern glass fragments fairly deep in sheet trash deposits tend to support the conclusion that this part of the site was occupied during the Santa Fe Trail period or later. The late nineteenth-century date assigned by Peckham to the remains he excavated in 1959 does not seem consistent with the ceramic data and must be re-examined. Perhaps this date was derived from the same informants who asserted that the structure he excavated was the post office for the former village of Valdez, which does not appear to be true.

More information is available from the assemblage recovered during testing at LA 4968. Dateable Euroamerican artifacts suggest that this site was occupied during the early Santa Fe Trail period, perhaps as early as the 1820s or 1830s, and was probably abandoned by or soon after 1850. However, it is also possible that parts of this small community existed during the Late Spanish Colonial period. If so, some evidence of potentially earlier dates may be available from individual structures and features at that site.

Dating Structures and Features at LA 4968

Temporal data can also be used to generate possible dates for five structural mounds and Trash Pit 1. However, it must be remembered that the number of dateable artifacts from any one provenience is small, so the dates derived by this method must remain tentative.

Mound 1

Because of its large size, two test pits were used to investigate Mound 1. The test pit at 540N/489E yielded quite a few temporal data, considering the limited size of this unit. Thirty-six fragments of flat glass were recovered from this test pit, comprising 75 percent of the total sample of this class of artifact. The mean thickness of these specimens is .055 inches (1.397 mm), providing tentative dates of 1830.4 (Moir's formula) and 1819.9 (Schoen's formula). Other Euroamerican artifacts from this test pit include fragments of San Elizario Polychrome and Orangeline Polychrome. When occurring together, these majolica types are probably indicative of an occupation in the first half of the nineteenth century. In combination with the flat glass dates, the Euroamerican artifacts from this test pit suggest a date between 1821 and 1850+. The distribution of native ceramics from this unit is shown in Table 17. The predominance of polished black wares and micaceous wares and a small percentage of polished red wares suggest an occupation postdating the opening of the Santa Fe Trail, essentially agreeing with the date provided by the Euroamerican assemblage.

Only one dateable Euroamerican artifact was recovered from the test trench at 540N/478E in Mound 1: a piece of clear glass that appears to date before 1880. The native ceramic assemblage is shown in Table 17. With a moderate percentage of polished red wares and a fairly small percentage of polished black wares, one might be tempted to suggest a Late Spanish Colonial date for this provenience. However, the very large percentage of micaceous wares and low percentage of decorated wares tend to argue against this conclusion. It is likely that sample error has skewed this assemblage and that a post–Santa Fe Trail period date is actually indicated. This is supported by the position of the structure this sample was obtained from, which appears to be superimposed on top of the main structure in Mound 1. The date obtained for 540N/489E seems more representative of the main structure.

Table 17. Comparisons of ceramic type frequencies and proportions by provenience for LA 4968

Provenience	Polished Red Ware	Polished Black Ware	Decorated Ware	Micaceous Ware	Other Utility Ware
Mound 1(540N/489E)	4 3.2	36 29.0	20 16.1	40 32.3	24 19.4
Mound 1 (540N/478E)	34 9.4	24 6.6	52 14.4	192 53.2	59 16.3
Mound 2	5 4.9	17 16.7	37 36.3	22 21.6	21 20.6
Mound 6	9 11.3	15 18.8	12 15.0	14 17.5	30 37.5
Mound 7	15 2.8	89 16.7	127 23.8	136 25.5	167 31.3
Trash Pit 1, upper levels	7 3.6	15 7.7	60 30.9	47 24.2	65 33.5
Trash Pit 1, lower levels	20 2.7	159 21.3	195 26.1	230 30.7	144 19.3

Mound 2

Only two dateable Euroamerican artifacts were recovered from this provenience, including a fragment of Flow Blue and an unidentified majolica sherd. Flow Blue was first manufactured around 1820 and reached its height of popularity in the 1870s (Habicht-Mauche 1988). The majolica sherd could not be identified to type but appeared to be a fragment of a nineteenth-century ware. While the beginning date is impossible to furnish, the likely ending date for this ware is around 1850, as discussed earlier. The distribution of native ceramics is shown in Table 17. Though the sample is fairly small, a low percentage of polished red wares and moderate to fairly high percentages of polished black wares and micaceous wares suggest that this structure was occupied after 1821. The best date that this small assemblage can provide is ca. 1821 to 1850+.

Mound 4

The only dateable Euroamerican artifacts recovered from this provenience were four pieces of flat glass with a mean thickness of .066 inches (1.676 mm). These artifacts yield a very tentative date of 1843.9 (Moir's formula) and 1838.7 (Schoen's formula). A decorated sherd was the only native ceramic specimen recovered from this provenience, so part of the assemblage cannot be dated. Thus, a very tenuous date of 1838+ can be assigned to this structure.

Mound 6

Two Euroamerican artifacts from this provenience provide temporal data. The first is a hand-applied black glass bottle finish, which dates before 1880 and perhaps before 1850. The second artifact is a Puebla Blue-on-white sherd. This majolica type was manufactured over a very long time span but probably was not imported into the Southwest after 1850. The native ceramic assemblage shown in Table 17 is fairly small, but the moderate percentages of polished black ware and micaceous ware are probably indicative of a post-1821 date. This provenience probably dates between ca. 1821 and 1850+.

Mound 7

This provenience contained numerous Euroamerican artifacts capable of providing temporal information. Euroamerican ceramics include yellow ware, which was popular between 1830 and 1900+, and annular ware, which was manufactured between 1795 and 1930 but was most popular between ca. 1800 and 1820. A print-over- glaze porcelain sherd was manufactured after 1730, and a fragment of Mexican glaze ware could have been manufactured nearly anytime between 1650 and the present but was probably not imported after 1850. Combining these data suggests a date after 1830 and before 1850+. Four flat glass fragments with a mean thickness of .067 inches (1.702 mm) provide dates of 1856.0 (Moir's formula) and 1840.4 (Schoen's formula). The native ceramic assemblage from this provenience is shown in Table 17. The small percentage of polished red wares and moderate percentages of polished black wares and micaceous wares support the above dates and suggest that this provenience was occupied after 1821. Taken together, the temporally diagnostic artifacts from this provenience suggest a date between ca. 1830 or 1840 and 1850+.

Trash Pit 1

The fill in Trash Pit 1 can be divided into two general units, with a break between Levels 7 and 8. The upper unit contained quite a few temporally diagnostic Euroamerican artifacts imported from the eastern United States. They include pre-1930 green glass, pre-1880 clear glass, and two fragments of flat glass. The latter have a mean thickness of .052 inches (1.321 mm), yielding potential dates of 1823.9 (Moir's formula) and 1814.7 (Schoen's formula). The Euroamerican ceramic assemblage includes annular ware and possible white ware sherds. The latter date after 1850 unless they are fragments of Flow Blue vessels, in which case they probably date between 1820 and the 1870s. Unfortunately, the white ware sherds were quite small and could not be more accurately identified at this level of analysis. The last dateable Euroamerican artifact is a fragment of can manufactured after 1847. Taken together, the upper levels of fill in Trash Pit 1 appear to have been deposited between 1821 and 1850+. The native ceramic assemblage shown in Table 17 is in essential agreement with this conclusion, considering the low percentage of polished red wares and fairly high percentage of micaceous wares.

Interestingly, Mexican glaze wares and majolicas were the only Euroamerican artifacts recovered from the lower unit of this feature. The only dateable specimen is Orangeline Polychrome, which suggests a date in the first half of the nineteenth century. The distribution of native ceramics suggests that this assemblage dates after 1821, with a very low percentage of polished red wares, and fairly high percentages of polished black and micaceous wares (Table 17).

Summary

We must reiterate that the small dateable assemblages from these proveniences do not provide tight temporal controls. Rather, they give us a general time frame to work with and provide a basic estimate of the period of occupation. These dates are simply meant to provide a temporal framework for building research questions. With this said, the tentative dates provided by this examination are all fairly consistent with one another. The presence of imported Euroamerican goods in nearly every provenience examined at LA 4968 except for the lower unit of Trash Pit 1 indicates that the main occupation probably began after 1821. For the most part, the diagnostic assemblage indicates that LA 4968 was occupied until 1850, but the terminal date is fairly hazy. The only possible exception to this date range is the lower unit of Trash Pit 1. The identifiable majolicas in that assemblage indicate a post-1800 date, and the structure of the native ceramic assemblage suggests a post-1821 date. However, the lack of Euroamerican artifacts other than earthenwares imported from Mexico is suspicious and could be indicative of a period of occupation in the Late Spanish Colonial period, just before the opening of the Santa Fe Trail. If so, the predominance of polished black wares and micaceous wares could date to slightly earlier than previous studies have indicated, but this is uncertain. Further excavation is needed before this possibility can be addressed in any detail. In general, the structural mounds tested at LA 4968 all seem to reflect a similar occupational span.

RESEARCH ORIENTATION

Spanish Colonial archaeology in New Mexico has been moving out of the realm of historical studies towards more problem-oriented research for the past decade. No longer is it enough to determine who might have lived at a site and when. Documentary research and interviews with local inhabitants still remain critical aspects of Spanish Colonial archaeology, since they can often provide information on site occupants, their social status, and when they lived there. However, rigorous analysis of artifact assemblages like that performed for prehistoric sites allows us to ask new questions of the data. The records provide information on certain aspects of Spanish life in New Mexico, but critical information is often missing. Spanish Colonial wills and estate inventories list the most important belongings of people, but they rarely include those inexpensive, yet extremely commonplace artifacts that are most often recovered from archaeological sites such as chipped stone and locally made pottery. Artifact categories like these allow us to examine the process of acculturation in a frontier setting and track the changes that occur as the frontier shifted or modes of transport become cheaper and more efficient. We can also look at how social status and wealth affects these artifact categories. Studies of Spanish Colonial assemblages at St. Augustine, Florida, has shown that the types of pottery used and the varieties of foods eaten can vary according to social status (Deagan 1983).

This research design builds upon experience gained from previous examinations of Hispanic sites dating from the Spanish Colonial period to the early Railroad period at Abiquiu (Moore et al. in prep.), Pecos (Moore in prep. b), Valencia (Akins in prep.), Talpa (Boyer and Goodman in prep.), and near San Ildefonso (Moore in prep. a). This section provides background information on frontiers and the more general research questions. The next chapter includes discussions of the artifact classes that are expected to be recovered and the more specific questions that will be asked of those data bases.

Adaptations to the New Mexico Frontier

New Mexico was a frontier through most of its history, first to New Spain (1598 to 1821), then to Mexico (1821 to 1846), and finally to the United States (1846 to mid-twentieth century). Its role as a buffer between the interior provinces of New Spain and Mexico and the Plains Indians shaped much of its history. It remained a frontier during these periods because of distance from the interior provinces, the cost and difficulty of communication and transport, and conflict with nomadic Indians. Though communication and transport costs decreased during the American Territorial period (1846 to 1912), and conflict with nomadic Indians ended in the late nineteenth century, New Mexico remained a frontier into the twentieth century because of its small population and distance from centers of manufacture and consumption.

It should be noted that throughout this discussion the terms *settlers* and *natives* are used without regard to ethnic origin. People moving onto a frontier are *settlers*, while *natives* are the people who already live there. Most discussions of frontiers are concerned with historic or geographic processes and are difficult to adapt to archaeological studies. Thus, a general discussion of frontiers is provided, followed by a model that attempts to apply these ideas to archaeological remains. Of particular interest to the model is the process of frontier acculturation.

The Frontier as Place and Process

Billington (1963) distinguishes between the frontier as a place and a process. As a place the frontier is "a geographic region adjacent to the unsettled portions of the continent in which a low man-land ratio and unusually abundant, unexploited, natural resources provide an exceptional opportunity for social and economic betterment to the small-propertied individual" (Billington 1963:25). By this definition, movement onto a frontier is an economic process, where individuals who lack wealth seek a chance to improve their economic situation. A frontier is also "the process through which the socioeconomic-political experiences and standards of individuals were altered by an environment where a low man-land ratio and the presence of untapped natural resources provided an unusual opportunity for individual self-advancement" (Billington 1963:25).

Again, this definition views the frontier as an economic process where movement into a new environment caused changes in the settler's social, economic, and political systems. Steffen (1980) criticizes this model, suggesting that it is not relevant to development of the American frontier past the first tier of states west of the Mississippi River. Rather than farmers struggling to tame the frontier, these later settlers were more closely linked to mercantile capitalism (Steffen 1980). Two types of frontiers are defined:

> Mining and ranching were essentially expeditionary frontiers while the farming frontier was more sedentary in its nature. On the expeditionary frontier there was an absence of a "settling" mentality. Individuals of the mining and ranching frontiers, while temporarily removed from "civilization," retained the value structure which they brought with them. On the farming frontier the settler often experienced an equal sense of removal from civilization, but he had no intention of returning. Individuals on the farming frontier were building their own civilization and in the process some of their original manners and customs were altered as an expedient to meet environmental circumstances. (Steffen 1980:25)

Thus, while changes in the settler's social organization and structure, customs, and subsistence patterns might be expected on a farming frontier, they should not occur on an expeditionary frontier. While movement onto the farming frontier resulted in value transformations, this did not occur with movement onto the expeditionary frontier because it remained closely linked to the mainstream culture (Steffen 1980).

In his discussion of frontiers and boundaries, Kristof (1959:272) notes, "The frontier has, and always had, also a strategic meaning--the defensive line which keeps enemies out--and in this depends on support from the hinterland." Frontiers are also areas of integration, representing a transition from one way of life to another, where traits from both are assimilated (Kristof 1959:273). As a place, New Mexico was a frontier that provided a chance for economic advancement while serving as a defensive buffer, first for the inner provinces of New Spain and Mexico, then for the United States. As a process, the New Mexico frontier was a place where Spanish, Indian, and Anglo-American cultures overlapped and adapted to one another, creating an amalgam that was neither wholly one nor another.

The degree of acculturation probably varied with wealth, the amount of interaction with other groups, and cultural biases. Rich individuals, particularly those of high social status, would be less likely to adopt the trappings of another culture and more likely to try to preserve their traditional lifestyle. Poor people may have had no choice; partial assimilation of another lifestyle may have been necessary for survival. Such trends are demonstrated in the Spanish Colonial remains at St. Augustine, Florida (Deagan 1983). There, the proportion of aboriginal to European pottery decreased as economic status rose. Among the European wares, the proportion of British trade ceramics to Spanish majolica and earthenware also decreased as economic status rose. Thus, access to the more desirable traditional commodities improved with economic status, and they were selected over other available merchandise.

No matter how close or attenuated contact between natives and settlers was, cultural bias could cause the acceptance or rejection of specific aspects of the other lifestyle. Traits seen as superior or adaptive might be assimilated, while those viewed as inferior would be rejected. This is a two-way street--as settlers adapt to new environmental and cultural constraints, they will adopt native traits that are considered useful or necessary. In a similar fashion, the native population will adopt desirable traits from the settlers. However, there may also be a forced assimilation of economic, organizational, or religious traits, in which settlers compelled natives to accept their ways.

Acculturation may also depend on the type of frontier being settled. It may act in both directions on a farming frontier, with settlers and natives assimilating adaptive traits from each other. Acculturation is more likely to be one-way on an expeditionary frontier. In that case, settlers should retain most of their traditional cultural baggage, while natives should assimilate traits from them. This may be true of the late New Mexican frontier, where the Anglo-American population maintained close ties with the East.

The Frontier as a Dynamic Process

Because of the nature of expansion, frontiers are spatially and temporally impermanent (Lewis 1977:153). They change over time when events that occurred in the center of an occupied region are repeated on its periphery as the region expands outward (Lewis 1977:153). Chances for economic advancement decrease as frontiers become settled. Unclaimed land becomes scarce and the best farming and herding areas are already occupied. New settlers begin to press beyond what had been the frontier in search of new economic opportunity. A new frontier is formed, and the former frontier becomes part of the core area.

Recent studies in Africa have identified another type of frontier, the internal frontier (Kopytoff 1987). The African internal frontier "consists of politically open areas nestling between organized societies but 'internal' to the larger regions in which they are found" (Kopytoff 1987:9). This concept has also been applied to the historic Hopi of northeast Arizona (Schlegel 1992). Internal frontiers are dynamic, particularly those defined in Africa, and occur between organized societies rather than at their edges (Kopytoff 1987:9). New settlements in these zones are usually formed by groups of people rather than individuals. Fissioning can be for political, social, or economic reasons, and frontier settlements that survive without being reabsorbed or conquered may develop into a new nation or village. While the Hopi and African examples share several characteristics, they are also quite different, suggesting that this is a complex process that can assume many forms.

While historic New Mexico mostly represented a traditional frontier related to an expanding society, internal frontiers may have also occurred. These areas probably consisted of lands that were occupied or claimed by Pueblo villages. Throughout the Spanish Colonial and Mexican Territorial periods and continuing into the American Territorial period, there were constant attempts by Spanish settlers to occupy and farmlands considered to be the property of Pueblo villages. Unlike the African and Hopi examples discussed by Kopytoff (1987) and Schlegel (1992), Spanish frontier settlements remained closely tied to the central government, from which they received their legitimacy. Still, these attempts to acquire lands that were ostensibly owned by another group but were not currently being used resemble the process of internal frontier settlement.

Although New Mexico was a frontier to New Spain and Mexico, when viewed as a discrete spatial entity it was itself comprised of a core area and frontier. The core area consisted of the capital at Santa Fe and the adjacent region where most of the population and wealth were concentrated. The frontier was the zone that surrounded the core and, to some extent, protected it. The frontier represented a chance for economic advancement and was settled by people who were willing to leave the relative safety of the core in search of land or wealth.

This process is illustrated by movement into the Chama Valley (Quintana and Snow 1980). The first settlements in that area were small scattered homesteads. Rather than community grants, early settlers built on individual allotments and may have used the valley seasonally for livestock grazing before formal grants were acquired. Occupancy became year-round as the region developed; more substantial homes were built, and multifamily plazas began to appear. This was a rapid process--the first individual grant was approved in 1724 and the first community grant in 1734 (Carrillo 1988; Quintana and Snow 1980). Conflict with Indians kept the frontier from expanding further outward until late in the Spanish Colonial period. Initially, the village of Abiquiu was an outpost on the edge of the frontier settlement zone. It stopped serving as an outpost and became a supply center when herders and later farmers pushed beyond to develop lands to the north and west (Van Ness 1980).

Thus, the location of the New Mexican frontier was variable, changing as areas on the fringe of the Spanish-occupied zone were settled or abandoned. The entire territory was a frontier during initial colonization. Later, a core area developed and expanded as the frontier was pushed outward by those seeking economic improvement. A lack of official support hindered this expansion, causing it to proceed slowly and suffer continual setbacks. This process underwent radical change as the United States came into close contact with New Mexico in 1821. Suddenly New Mexico was on the United States' frontier and represented an area that could be exploited for economic gain. Led by trappers and traders, Americans began filtering into the region. Movement onto this frontier increased after the area was acquired by the United States in 1846. These settlers considered both Spanish and Indians to be the native population. Thus, the position of the Spanish inhabitants of New Mexico was suddenly reversed--they were in the same position relative to the American settlers as Pueblo and other Indians had once been to them. Political and economic power had shifted hands, and they no longer completely controlled either. The process of acculturation began once again as both natives and settlers strove to adapt to these new conditions.

Socioeconomic and Cultural Change on Frontiers

Social change accompanies movement onto frontiers, and settlers often suffer a sudden loss of sociocultural complexity because of the attenuation of economic and social contact between frontier and core area (Doolittle 1973; Lewis 1973, 1977). Even so, Lewis (1977) suggests that settlers must maintain a higher level of sociocultural complexity than natives, and Casagrande et al. (1964) feel that settlers must possess technological superiority over natives, as well as a power advantage. Communication between frontier and core area are important, and a continuity of tradition with the parent culture is maintained (Casagrande et al. 1964). Doolittle (1973) distinguishes between *colonial* and *pioneer* societies. Colonial societies are almost completely dependent on the parent culture for economic and technological support, while pioneer societies are largely self-sufficient. These differences are relative and may be a function of communication and transportation speed.

Frontier societies must also be adaptable. Because of the difficulties involved in transportation and communication, many goods may not be available for long periods of time, the delivery of goods may be unreliable, or the cost of transport may make them so expensive that they are affordable by only a small part of the population. When this situation prevails there may be a reverse acculturation—rather than natives adopting the settlers technology, settlers may be forced to adopt native technologies. Thus, there is evidence that Spanish settlers in New Mexico adopted native lithic and ceramic technologies to supplement or replace goods that were economically unavailable to them (Levine 1990; Moore 1992).

While frontier models consider adaptational changes in settlers, they are generally silent on corresponding changes in native societies. Obviously, native societies must adapt to the presence of settlers in their midst, and it is necessary to examine these processes before frontier adaptations can be understood. Native responses to settlement by outsiders should be conditioned by a number of factors, including: (1) the degree of technological superiority displayed by the settlers; (2) the amount of interaction occurring between the groups; (3) communication and transport costs between core area and frontier; (4) cultural and political attitudes of one group toward the other; (5) the amount of sociocultural disruption caused by contact between settlers and natives; (6) the economic status of natives vis-à-vis settlers.

If settlers have little organizational or technological superiority over natives and there is no perception of an advantage to be gained by their presence, there may be an outright and hostile rejection of the settlers. The movement of Americans onto the northern Plains is an example of this process. European contact with this frontier was based on the fur trade until the early 1800s, operating according to customs that were violated by Americans who began entering Indian lands to hunt and trap in addition to trading (Swagerty 1988:363). Indians allowed trading posts to be built under the economically advantageous conditions of the early fur trade (Swagerty 1988). Their culture underwent significant changes in adapting to this economy, but those changes did not include accepting the presence of permanent settlers. The end of the Mexican War in 1848 brought a surge in westward movement, which was accelerated by the discovery of gold in California and the end of the Civil War (Utley 1988; Winther 1964). Resentful of the foreigners moving onto their lands, the Plains Indians unleashed a devastating campaign to drive them out. Among the factors that probably contributed to hostilities were a perception that the invaders were not militarily superior (frontier defenses were weakened by the Civil War), and there was no advantage to be gained by allowing them to remain.

Overwhelming technological or organizational superiority can result in an initial acceptance of settlers; however, if the deficits associated with colonization outweigh the benefits, organized resistance may eventually occur. Success or failure are dependent on the degree of technological or organizational superiority possessed by settlers. Initial Spanish settlement of New Mexico met little or no organized resistance (Bannon 1963; Sando 1979). However, as the deficits associated with this occupation became clear, a rebellion was organized, and the Pueblos were able to displace the settlers for twelve years (Sando 1979; Simmons 1979).

The acculturation of settlers and natives to one another depends on the amount of contact occurring between the groups. This is tempered by the cost of communication and transport between frontier and core area, and the cultural and political attitudes of one group toward the other. When settlers form elite enclaves and choose not to mix with native peoples except under controlled conditions, contact is severely limited. While acculturation can occur, it may be slow and selective. Native groups might adopt desirable aspects of the settlers' culture, but the settlers will maintain close ties with the core area and assimilate little of the native culture. However, as communication between frontier and core becomes more difficult and expensive, the amount of native material culture assimilated by settlers should increase. If native groups reject the settler's culture passively rather than overtly, settlers might still be restricted to enclaves and natives may adopt few traits other than the goods they find desirable. The former process is illustrated by the British colonization of India, and the latter by European attempts to establish colonies in China.

These processes can be affected by the amount of sociocultural disruption caused by contact between settlers and natives. This is best shown by early European colonies in the New World. Spanish settlers possessed little technological or organizational superiority over the native imperial powers of Mexico and Peru, yet small groups of adventurers were able to prevail over these powerful nations. In both cases, the appearance of Spanish settlers on the scene disrupted the balance of power and introduced new diseases to which the natives had no immunity. In Mexico, Cortez was able to exploit dissension between the Aztecs and their vassal states and enemies, using the latter to cause the downfall of the former (Bray 1968; Cantu 1966). Aztec resistance was seriously affected by an outbreak of smallpox, which reduced the leadership as well as the general populace (Bray 1968; Cantu 1966). Smallpox also contributed to the Spanish conquest of the Incas in Peru by devastating the population before Pizarro's arrival (Hyams and Ordish 1963). The ruling Inca was one of the victims of this epidemic, setting in motion events that culminated in a bitter civil war as two of his sons fought for the throne (Hyams and Ordish 1963). Pizarro was able to exploit these conditions, and several distant provinces eventually allied with him, seizing the opportunity to rid themselves of Inca rule. In both cases, extreme disruptions caused by the introduction of new diseases and alliances with an outside power contributed to the defeat of nations that should have been able to resist the colonial efforts of foreigners under more favorable conditions.

Interaction between natives and settlers and the adoption of aspects of each culture can be conditioned by wealth and proximity. Rich individuals have fewer reasons to interact with the other population than do poor people--they can always hire others to act as go-betweens. Thus, as economic status increases, direct contact with the other population should decrease; conversely, as economic status decreases, interaction with the alien group should increase. Wealth also allows some individuals to better maintain the outward trappings of their traditional culture, or to acquire those of another culture. Thus, wealthy settlers are able to maintain their traditional material culture, while wealthy natives can more easily acquire the settlers' material culture. A similar differentiation should occur at the lower end of the economic scale. The greatest degree of acculturation to native customs and material culture should occur among poor settlers. Economically, they are less able to maintain their traditional material culture, and more prone to adopt aspects of native culture that enhance their prospects for survival. Conversely, the least amount of acculturation in the native population should occur among poorer individuals, who are forced to maintain their traditional material culture because they can't afford to acquire that of the settlers.

A Model of Frontier Acculturation

While this discussion has considered New Mexico to be a frontier to New Spain, Mexico, and the United States, the model for examining LA 160 and LA 4968 will concentrate on the middle period. This research will continue studies begun at Santa Rosa de Lima (LA 806), La Puente (LA 54313), and the Trujillo House (LA 59658) near Abiquiu, the Pedro Sánchez Site (LA 65005) near San Ildefonso, the José María Martínez Site (LA 99029) near Pecos, and the Vigil-Torres Site (LA 77861) at Talpa. These sites were all occupied by Hispanics and span the period between 1740 and 1900. Profound variation in material remains from Spanish Colonial and later occupations has been found, reflecting differences in access to goods resulting from changing frontier, trade, and transportation patterns. Although general access to manufactured goods was poor during the Spanish Colonial period, the situation was particularly dismal on the New Mexican frontier. Few artifacts of distinctly European manufacture were found in Spanish Colonial deposits at Abiquiu and the Pedro Sánchez Site. Instead, those assemblages indicated heavy trade with local Indians for certain commodities and some adoption of native technologies. Santa Fe Trail and Railroad period deposits demonstrated a different orientation. Dramatically improved access to manufactured goods occurred after 1821 and particularly after 1880, when the railroad arrived, and was associated with decreased reliance on native technologies.

All of our assumptions concerning LA 160 and LA 4968 have not yet been explicitly stated, and this must be done before the questions that will be asked during data recovery are developed. LA 160 is a complex site containing multiple structures and trash areas. While most previous research has assumed a Spanish Colonial date for this site, the results of our testing program indicate that the main occupation was probably during the Santa Fe Trail period, and perhaps later. The part of this site within proposed project limits contains three sheet trash areas and at least one small trash pit. The largest structure that has thus far been found at LA 160 is adjacent to and just outside the proposed right-of-way. Though data recovery will focus on the trash deposits within proposed project boundaries, there will also be an examination of the entire site that will include detailed mapping, limited testing, and sample collecting of surface artifacts. Performance of limited site examinations outside project limits has been requested by both the Bureau of Indian Affairs and the NMSHTD.

LA 4968 (Los Valdez) contains multiple structures, features, and trash areas. Earlier surveys recorded this site as a Spanish Colonial settlement, but the results of our testing program indicate that it was occupied during the early Santa Fe Trail period between ca. 1821 and 1850+. However, there is a slight chance that some deposits reflect an earlier nineteenth-century occupation, so the site may also contain Late Spanish Colonial remains. Four structures occur within project boundaries at this site, and parts of two additional structures may also be present. Several features including a probable well, a trash pit, and sheet trash areas were also defined during testing. While excavation will be confined to the area within project boundaries, a detailed map of the entire site will be completed.

We have little information concerning the occupants of LA 160, other than an entry in Peckham's 1959 excavation notes indicating that local informants told him the four-room structure he investigated had once been the post office for the village of Valdez. As discussed earlier, this does not appear to be true, so the late nineteenth-century date he assigned to those remains is also questionable. The paucity of nineteenth-century and earlier Euroamerican artifacts in surface scatters at LA 160 and in the test pits excavated during this project suggest that this site was occupied very early in the Santa Fe Trail period or that site occupants were relatively poor and unable to acquire many imported goods. The situation is different at LA 4968, which preliminary information suggests was the residence of a fairly prosperous and locally important family. Further studies at these sites, both archaeological and ethnohistorical, should allow us to determine whether these assumptions are correct. If so, they will provide us with information concerning the adaptations of different social classes to the changing economic atmosphere created by the initiation of trade over the Santa Fe Trail.

It is possible that the project area represented an internal frontier at certain times in history, into which moved groups of people seeking an improved economic base. The near demise of Pojoaque and Tesuque Pueblos may have been seen as an economic opportunity, in which reductions in village populations were perceived as a chance to challenge their ownership of parts of their grants. Such a process would have been very difficult before the changes in interpretation of land laws resulting from Mexican independence from Spain. Spanish attempts to gain control of lands contained by active Pueblo grants should have been mostly unsuccessful before 1821. Thus, viable settlements in such areas would not be expected before that date and should represent an attempt to seize the economic possibilities inherent in the changes in land laws. However, movement into this area could also represent expansion of the core area population into a vacuum left by depopulation of the pueblo villages. It may be possible to distinguish between these processes using certain economic indicators, which are discussed in more detail below.

Research Questions

Data from LA 160 and LA 4968 will be used to address two types of questions. The first type concerns general economic trends in New Mexico, and how they varied according to transport efficiency, access to manufactured goods, and position on the frontier or in the core. The second type is more specific and explores the types of information available from specific classes of artifacts. General research questions are discussed in this section, while those that are artifact specific are covered in a later section of this plan.

The main question that will be addressed is relatively simple, but its implications are complex: What can these archaeological remains tell us about the process of acculturation on the Spanish and American frontiers?

Access to manufactured goods was limited in Spanish Colonial and Mexican Territorial times by distance to market, lack of money or trade goods, and dangers associated with moving goods to Santa Fe and from there throughout the territory. Thus, many important commodities had to be done without or replaced. Though the situation improved somewhat with the opening of the Santa Fe Trail in 1821, transport remained difficult, and goods continued to be comparatively expensive for poor people to acquire. Replacement of goods was accomplished in two ways: trade with nearby Indians, and local manufacture of substitutes. Previous studies have focused on two areas of substitution: ceramics and chipped stone tools.

Ceramics were more important in Spanish colonies than they were in British colonies. Hispanic assemblages from Florida and New Mexico are dominated by kitchen-related remains, which in turn are distinguished by a preponderance of ceramic artifacts (Boyer 1992; Deagan 1983; Moore in prep. b; Wiseman 1992). Local manufacture of ceramics is generally presumed to mean production by Indian potters. While Snow (1984) admits that pottery making by genízaros or mestizos was a possibility, he feels that Pueblo and Athabaskan potters dominated the manufacture of this commodity in New Mexico because pottery-making was a very low status occupation in the New World and was only undertaken by a Spaniard in dire need of economic support. Thus, Snow completely rejects Hurt (1939) and Hurt and Dick's (1946) arguments for a Hispanic ceramic tradition, even though evidence was found for pottery manufacture at Spanish Colonial sites at Cochiti Reservoir (Warren 1979).

In contrast, Carrillo (1987, 1997) asserts that a well-established Hispanic ceramic tradition did exist from a fairly early date. Ceramics produced by Hispanic (or Hispanicized) potters were similar to those made by Pueblos and Athabaskans but are in many ways distinguishable from them. Similarities in decorative style and manufacturing techniques suggest that pottery-making skills were acquired from local Indians and are representative of the acculturation process.

If Hispanic ceramic manufacture did occur, it was probably more common on the frontier than in the core. The isolated nature of frontier villages, their lack of wealth, and the difficulties of transport may have combined to make ceramic production a necessity of frontier life. The opposite may have been true in the core where comparatively more wealth, easier access and transport, and more concern for the outward trappings of social status probably united to severely limit Hispanic ceramic production. In considering the category of locally produced earthenwares, it is likely that the proportion of Indian to Hispanic manufactured pottery was higher at core area sites than at those on the frontier.

While Hispanic pottery manufacture may have occurred sporadically during the Spanish Colonial periods, a review of the pottery-producing Spanish villages listed by Carrillo (1997) suggests that most Hispanic pottery manufacture occurred after 1821, the beginning of the Santa Fe Trail period. Thus, this phenomenon may have had economic roots. Economic disruption caused by trade over the Santa Fe Trail may have further impoverished the Spanish lower classes, forcing some to seek alternative means of acquiring needed goods. At the same time, the Pueblos were no longer totally dependent on Spanish merchants for manufactured goods, perhaps increasing the price of their pottery or decreasing the amount manufactured. This would have provided an entry into a craft that could provide some income yet had not been heavily exploited by the Spaniards before this time. Thus, Hispanic pottery manufacture, as a cottage industry, may be closely linked to the expansion of trade networks and the resultant disruption of the traditional system associated with the opening of the Santa Fe Trail.

Chipped stone artifacts are common at Spanish sites in the Southwest and tend to reflect an array of activities, including fire-making, hunting/warfare, and the manufacture and maintenance of tools made from perishable materials (Moore 1992). The ubiquity of this artifact class at Spanish sites dating from the Early Spanish Colonial period through the early Railroad period is evidence that chipped stone artifacts are not necessarily indicative of Historic Pueblo or Plains Indian occupation, nor is their presence in so many assemblages evidence of earlier occupations or contamination from nearby prehistoric sites. The association of chipped stone artifacts with Spanish occupations is demonstrated by the presence of tool types indicative of fire-making activities mixed with debitage, cores, and occasional formal tools in stratified deposits at confirmed Spanish residences. Sites that fall into this category include the La Fonda Parking Lot site (LA 54000) in Santa Fe, the Pedro Sánchez site (LA 65005) near San Ildefonso, and the sites of La Puente (LA 54313) and the Trujillo House (LA 59659) near Abiquiu (Moore 1992; Moore in prep. a; Moore et al. in prep.). Use of chipped stone tools by Hispanics in New Mexico was undoubtedly related to the shortage and high cost of metal tools, and the irregular and undependable supply system. Chipped stone tool manufacture and use appear to represent the assimilation of native technology to supplement or replace metal tools.

It should be noted that lithic technology was not absent from the traditional Spanish lifestyle: gunflints and strike-a-light flints were integral components of firearms and fire-making kits. However, chipped stone tools were not normally used for other purposes. The use of other varieties of chipped stone tools is probably attributable to acculturation, and their substitution for metal tools was undoubtedly conditioned by wealth and access. Such substitutions are expected to have been considerably more common on the frontier than in the core.

By contrasting the assemblages from LA 160 and LA 4968 with those from other Spanish sites in northern New Mexico it may be possible to isolate variation attributable to settlement on the frontier versus occupation of the economic core. If our assumptions are correct, several propositions should hold true:

1. Evidence of variation in wealth and degree of access to manufactured goods should result in a higher proportion of European goods to locally produced goods at sites in the core versus those on the frontier.

2. Within the category of native-made ceramics, the ratio of pottery made by Hispanic potters to that produced by Indians should be higher at sites on the frontier than at sites in the core.

3. Chipped stone tools other than gunflints and strike-a-light flints should be more common at frontier sites than at sites in the core.

The model can be tentatively accepted if these propositions are upheld. If they are not, three possibilities must be considered: (1) the model is incorrect; (2) the variables being studied are not sensitive enough to measure local acculturative processes; and (3) trade over the Santa Fe Trail caused a complete disruption of the traditional economic pattern. If the model is wrong, factors other than variation in access to manufactured goods and distribution of wealth may be responsible for the assimilation of native technologies and the ability to acquire imported goods, and other acculturative processes must be considered. If the variables are not sensitive enough to measure the acculturative effects of residence on the frontier versus the core, the possibility that they are controlled by more general conditions must be considered. In other words, it is possible that they reflect life in New

Mexico as a frontier to New Spain and represent the acculturative process at a coarser-grained level. Disruption of traditional economic patterns by trade with the United States might be traced by comparing evidence of acculturation and differential access to manufactured goods for the Spanish Colonial periods to sites dating to the Santa Fe Trail period.

Transport cost and difficulty are important aspects of frontier acculturation. Settlers are more prone to adopt parts of the native adaptational system when it is difficult and expensive to acquire goods from the parent culture. Attenuation of contact with New Spain caused Spanish settlers in New Mexico to adopt aspects of native culture as noted earlier. New Mexico was a farming frontier during the Spanish Colonial and Mexican Territorial periods, and some alteration of traditional customs was necessary to meet environmental circumstances (Steffen 1980:25). Trade over the Santa Fe Trail improved the supply of manufactured goods in New Mexico and may have caused prices to drop somewhat. Still, imported goods remained relatively expensive, especially for the poorer strata of society.

New Mexico was primarily an expeditionary frontier during the American Territorial period (Steffen 1980). Most settlers from the east came to exploit the frontier while retaining their traditional value structure. The arrival of the railroad in 1880 caused the movement of manufactured goods to become much more efficient and less expensive. Settlers would be expected to assimilate few aspects of native material culture under these conditions, and natives would be expected to acquire more aspects of the settler's material culture.

Access to manufactured goods should have changed as transport became more efficient and associated costs decreased. Transport efficiency was never high in Spanish Colonial times and may have decreased during the Late Spanish Colonial period as the large wagons used during the early part of that period were replaced by mule trains. Transport efficiency and the availability of manufactured goods increased greatly between 1821 and 1825 as trade over the Santa Fe Trail became established. The arrival of the railroad marked another leap in transport efficiency and availability of manufactured goods. Amounts and types of manufactured goods in Spanish sites should vary according to the type of transport system in use and the position of a site on the frontier or in the core. Sites in the core should display evidence of better access to manufactured goods until at least the early Railroad period. Most Spanish sites occupied during the Santa Fe Trail period should contain higher percentages of manufactured goods than those dating to the Colonial periods. The types of manufactured goods present should reflect a mixture of Mexican and U.S. sources until at least 1850, after which time the latter should dominate.

These trends may be affected by wealth. People who possess money, whether living on the frontier or in the core, should have had greater access to manufactured goods than people from the lower economic strata who would have had less access to these materials, no matter where they lived. Thus, some idea of the relative economic status of site occupants may be necessary for an accurate assessment of these trends.

Data Required to Test the Model

The data needed to test our ideas on acculturation will be derived through analysis of native ceramic and chipped stone artifacts. Examination of ceramic artifacts will provide information concerning what cultural group(s) produced the pottery used at these sites. In particular, the analysis will attempt to distinguish pottery made by Pueblo or Athabaskan Indians and that which may have been manufactured by Hispanics. Chipped stone artifact analysis will focus on reduction technology and tool use patterns to determine the range of activities in which stone tools functioned, and whether they were produced on-site or procured elsewhere. Both of these artifact classes are available from

LA 160 and LA 4968, and should be available in sufficient quantities to allow us to examine these questions.

Questions concerning the availability and sources of manufactured goods will be addressed using the Euroamerican artifact assemblages from these sites. While it may be impossible to distinguish Mexican glass from that produced in the eastern U.S., ceramic artifacts from these sources are usually easily differentiated. This artifact category should also provide important temporal data, which will be used to augment documentary and informant sources.

Several other data sets will be used to amplify the results of these analyses and provide general information concerning Hispanic life in New Mexico. Botanical and faunal samples should demonstrate that domesticates dominated the array of plants and animals exploited for food. The identification of plant species recovered from flotation samples should provide information on the range of plants used as well as the relative importance of various domestic and wild species. Little is really known about the importance of wild plants in the traditional Hispanic economy (Toll 1989), so it is difficult to predict patterning. However, analysis of charcoal from the Abiquiu area indicated that patterns of use differed from those of the Pueblos, in that a narrow range of conifers was preferred for firewood over a broad range of locally available trees and shrubs (Toll 1989).

Bone should provide information that will be a valuable aid in testing the model. Spanish faunal remains consistently reflect the use of domestic animals for food. Deviance from this pattern can be particularly significant. In St. Augustine, use of domestic versus wild fauna varied according to social and economic status (Reitz and Cumbaa 1983). High-status households used a wider range of domestic as well as wild animal species. Middle-class households primarily exploited domestic animals for food (particularly cattle), but there was some use of wild terrestrial species. Lower-class mestizo households followed the aboriginal pattern of exploiting a wide variety of species, modified to some extent by use of domestic animals (Reitz and Cumbaa 1983:166). Thus, the variety of wild and domestic species in the assemblage could be used to support arguments concerning the economic status of households and their level of access to manufactured goods. Butchering marks can also indicate whether metal or stone tools were used by site residents. Use of the latter would be evidence of the substitution of native tools for traditional goods that were difficult and expensive to acquire.

Temporal control is critical to this analysis. Though LA 160 and LA 4968 seem to date to the Mexican Territorial period, they could actually be later. Several methods will be used to attempt to provide accurate dates for these sites. Most accurate would be documents that establish occupational spans. Diagnostic artifacts will also be used to estimate the period of occupation. Other chronometric data will be collected but should have limited utility. Radiocarbon and tree-ring samples can help establish an occupational date, but problems can develop when wood salvaged from abandoned structures was reused. This problem was encountered at La Puente (Boyer 1992), and radiocarbon and tree-ring dates are acceptable only when corroborated by other data. Archaeomagnetic samples may also be collected, but it is unlikely that features amenable to such methods will occur within project limits.

By focusing on the patterning of Euroamerican goods, locally manufactured ceramics, and chipped stone artifacts in these assemblages, and comparing the results of analysis with those derived from other studies of Spanish sites, an idea of the degree of assimilation of native technologies as conditioned by access to manufactured goods should be obtained. Data recovered from studies of floral and faunal remains are expected to corroborate these results. Temporal data and documentary information are necessary to establish the comparability of these sites with others from New Mexico and to place them in the proper historical setting.

DATA RECOVERY FIELD METHODS

The same general methods will be used to examine both sites, but since all sites have unique characteristics, it will be necessary to tailor our investigative techniques to individual cases. Criteria for determining why certain areas are selected for excavation, how zones around features are treated, and whether or not mechanical equipment is used may vary. The biggest difference in treatment will be in the intensity of data recovery efforts at individual sites, which is detailed elsewhere. However, it is not anticipated that the mechanics of excavation will vary to any large degree between sites. This chapter provides a general overview of the techniques that will be used during data recovery. For more comprehensive coverage, see Boyer and Moore (in prep.).

Except under certain circumstances, fieldwork will be confined to areas within proposed right-of-way limits. In order to fully document the sites, they will be completely mapped. This procedure will include areas that are within and outside proposed project limits. This will entail most of LA 160, while very little of LA 4968 appears to extend outside project limits. In addition, limited testing will be conducted in the main structure at LA 160. This mound is just outside project limits, and testing is needed to establish whether it actually represents a structure and help determine its relationship to trash deposits within project limits. Small surface collections will also be taken outside project limits to help establish the contemporaneity of other structures and trash areas. All examinations of areas outside project limits are being done at the request of both the Bureau of Indian Affairs and the NMSHTD.

General Excavation Procedures

Horizontal Proveniencing: The Grid System

The first step in excavation will be to reestablish the Cartesian grid systems that were set up during testing. The main site datum will be used to reference all horizontal measurements. This will either be the main datum established during testing or a new datum placed outside the zone of excavation. The main datum will only be moved if it is in an area that will be affected by excavation, or was removed or damaged in the time between phases of investigation. A plan of each site will be prepared, illustrating the locations of excavation areas, structures, and features.

Surface collection and excavation units will be tied into the Cartesian grid system. These units will be provenienced according to the grid lines that intersect at their southwest corners. For example, a grid which has the 110N and 115E grid lines crossing at its southwest corner would be labeled 110N/115E.

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

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

Vertical Proveniencing: Strata and Levels

Just as grid systems will be tied to main datums, so will all vertical measurements. All measurements will be made in meters below datum to avoid the problems encountered when dealing with both positive and negative measurements. When variation in surface elevation is extreme, it may be desirable to select a new location for the vertical proveniencing datum, particularly if the main datum is not at the highest point on the site. Another way to account for such variation is to assign an arbitrary depth to the main datum. In this case it does not matter whether there are higher elevations, and all measurements can be made consistent. This is the preferred method of accounting for variation in surface measurements, and the one that will be used in this endeavor.

Since it is often difficult to use one datum to provide vertical control for an entire site, subdatums will be established. Horizontal coordinates will be measured for each subdatum so that its location relative to the main datum can be plotted. The elevation of each subdatum will also be measured relative to the main datum. Thus, since the main datum is arbitrarily assigned an elevation of 10 meters below datum, a subdatum that is 1.50 m lower will have an elevation of 11.50 meters below datum.

The vertical treatment of deposits will vary according to their nature. Cultural deposits will be carefully excavated to preserve as much of the vertical relationship between materials as possible. Such care will not be taken with noncultural deposits, since the relationship between artifacts in deposits that built up naturally is rarely meaningful. For example, abandoned structures were sometimes used for trash disposal, filling with debris discarded by the inhabitants of houses that were still occupied. Conversely, others were simply left open to the elements, filling naturally with a combination of wind-blown soil and colluvial sediments. Cultural materials will usually be present in both cases, yet they have completely different meanings. Trash represents materials that were purposely discarded and can often be separated by strata to determine the sequence of deposition. This will often allow researchers to look for minute changes in the artifact assemblage. Artifacts in naturally deposited strata rarely have any similar meaning. Cultural deposits require careful excavation to preserve the relationship between artifacts discarded at different times. Noncultural deposits tend to be jumbled, and the relationship between artifacts is almost always obscured because they were moved from their original context and redeposited.

Thus, accurate vertical controls may be unnecessary in some cases. While we will always attempt to excavate cultural deposits by stratum, that level of control will only be attempted in noncultural strata if it appears that it will provide data of potential importance to site interpretation. Excavation by strata is considered optimal in cultural deposits because soil layers tend to represent specific depositional episodes.

Before it is possible to delimit the extent and nature of soil strata it is usually necessary to examine them in cross section. This requires the excavation of exploratory units, which will consist of 1 by 1 m grids dug in arbitrary 10 cm vertical levels unless natural stratigraphic divisions are encountered. When natural divisions are found, they will be used to delimit the boundaries of a level. Outside exploratory grids, soil strata will be used as the main units of vertical excavation. Exceptions may include noncultural deposits and cultural strata that are very thick and need to be subdivided to make excavation easier.

Two methods will be used to track vertical excavation units: strata and levels. Soil strata will be assigned unique numeric designations as they are encountered, and descriptions of each will be recorded on individual forms. Since the surface represents an arbitrary layer with no thickness, it will be designated Stratum 0 at each site. In order to track the sequence of strata from one area to another, each vertical excavation unit will also be assigned a level number, beginning with the surface. Again, since the surface is an arbitrary level with no thickness, it will be designated Level 0. The first vertical excavation unit to be dug will be labeled Level 1, the second Level 2, and so on. Since stratum and level numbers represent two completely different series, stratum numbers may not be in sequence as excavation proceeds downward, but level numbers will always be in order.

Augering

Soil augers can be effectively used to examine areas at depth with a minimum of effort. Thus, we will make use of this technique to examine portions of sites to determine whether features or structures are present. Soil removed from auger holes will be screened to determine whether cultural materials are present. Each auger test will be recorded on individual forms. In particular, augers may be used to examine parts of these sites which exhibit no surface signs of structures or features. When such are encountered, more intensive excavational techniques can then be applied to investigate them.

Recording Excavation Units

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

Recovery of Cultural Materials

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

Most artifacts will be recovered by systematically screening soil strata. All sediments from exploratory grids and features will be passed through screens, as will at least a sample of soil from both cultural and noncultural strata in structures, as detailed later. Two sizes of screen will be used. Most fill will be passed through 1/4 inch mesh hardware cloth, but 1/8 inch mesh hardware cloth will be used in certain circumstances. While most artifacts are usually large enough to be recovered by 1/4 inch mesh hardware cloth, some that are to small to be retrieved by that size screen can also provide important clues about the activities that occurred at a site. However, there is a trade-off in gaining this additional information. As the size of mesh decreases, the amount of time required to process soil and recover artifacts increases. Sampling is a way to balance these concerns; thus, smaller mesh will only be used under certain circumstances. Rather than establishing specific guidelines for sampling by 1/8 inch mesh screens, it is considered better to leave this up to the discretion of the site supervisor. However, as a minimum, all soil in certain types of features (such as hearths and ash pits) should be screened through 1/8 inch mesh, as should all soil at floor or living surface contacts. Other potential applications of this recovery method include culturally deposited strata and activity areas.

Cultural materials from certain types of strata will only be recovered by visual inspection. As is discussed in more detail later, only a sample of soil from noncultural strata will be screened to recover cultural materials. Rather than simply ignore artifacts from unscreened strata, cultural materials noted during excavation will be collected for analysis. While this will not be a statistically valid sample, it will expand the number of artifacts recovered and provide more detailed data about lifestyle.

Other cultural materials, primarily botanical in nature, will be recovered from bulk soil samples. Sampling methods for these materials are detailed in a separate section of this chapter. In general, however, sediments for flotation analysis will be collected from culturally deposited strata and features and should contain at least 2 liters of soil, if possible. Macrobotanical materials like corncobs, piñon shells, etc. will be collected as individual samples whenever found. All botanical samples will be cataloged separately and noted on pertinent excavation forms.

Specific Excavation Methods

The excavation of various parts of a site will be approached in different ways, even though the mechanics of excavation will be the same. Most excavation will be accomplished using hand tools. However, in some cases it may be preferable to use mechanical equipment to expedite the removal of noncultural deposits. Thus, it is possible that mechanical equipment will be used to strip noncultural overburden from buried extramural cultural strata, or in areas lacking surface remains. However, fill will be removed from structures by hand to avoid potential damage to remaining architectural elements. Methods of excavation will vary depending upon whether a structure, a feature, or an extramural area is being examined.

Structures

Individual numeric designations will be assigned to structures on a site, as well as to the rooms they contain. Excavation will begin by digging an exploratory trench from one wall to the center of large rooms, and completely across small rooms. Exploratory trenches will be excavated by grids to provide a cross section of deposits. When the nature of the fill is defined, the rest of the structure will be excavated by quadrants. Quadrant boundaries will be determined by the locations of grid lines that cross a structure; thus, they will not always be exactly the same size.

A sample of fill from each room will be screened through 1/4 inch mesh hardware cloth. The sample will consist of at least one quadrant, no matter whether the fill is of cultural or noncultural derivation. The quadrant selected for sampling will be left to the discretion of the site supervisor, but in most cases it will be the last quadrant excavated, because there will be two visible profiles rather than just one. If a structure is filled with cultural deposits, more than one quadrant might be sampled. Remaining fill will be removed without screening, though visible artifacts will be collected for analysis. The face of each quadrant will be profiled to provide a record of the placement of strata in both north to south and east to west directions.

Because of safety concerns, exploratory trenches will be no more than 1 m deep before they are expanded. Expansion will be accomplished by removing one quadrant. Excavation will halt between 5 and 10 cm above the floor to prevent damage to its surface during excavation and to permit a more systematic sampling of materials in contact with or near the floor. These materials will be removed by grid and will be screened through 1/8 inch mesh hardware cloth.

Most architectural details will be recorded on a series of forms following the completion of excavation in a structure. However, some building elements may be encountered in fill and should also be recorded. In particular, any roof elements found during excavation should be mapped and described. Samples of roof material, if encountered, should be collected for species identification. As discussed in the next chapter, prescribed samples of building materials will be obtained. Descriptions of individual rooms will include information on wall dimensions, construction materials and techniques, and associated features. Structure descriptions will include information on size and dimensions, a general description, and a sketch plan. In addition to profiles, plans of each structure will be drawn detailing the locations of rooms and internal features, artifacts found in direct contact with floors, and any other details considered important. A series of 35 mm black-and-white photographs will be completed for each structure showing its overall form, individual rooms, construction details, and the relationship of features with other architectural elements.

Features

Features will constitute individual units of excavation. As they are encountered at a site, features will be assigned a unique number. Small features (less than 2 m in diameter) may be excavated differently than large features (greater than 2 m in diameter). After defining the horizontal extent of small features like hearths and ash pits, they will be divided in half. One half will be excavated in 10 cm arbitrary levels to define internal stratigraphy, and a profile will be drawn. The second half will then be removed by strata. All soil removed from small features will be screened through 1/8 inch mesh hardware cloth. Plans showing the locations and sizes of excavation units will also be drawn. A second cross section illustrating its vertical form perpendicular to the profile will be drawn, and a plan of the feature and a form that describes and details its shape and contents will be completed.

Large features, such as trash middens, may be excavated by grid. The number of exploratory grids will be kept to a minimum, and as much of the feature as possible will be excavated by soil strata. A sample consisting of one or more grids (at the discretion of the site supervisor) will be screened through 1/8 inch mesh hardware cloth; otherwise, 1/4 inch mesh will be used. At least two perpendicular profiles will be drawn, and forms and plans that describe and detail their shape and contents will be completed. Large features that are not treated in this way will be excavated using the same methods applied to small features. The method of excavation selected for a particular feature will be left up to the site supervisor. All features will be photographed using 35 mm black-and-white film before and after excavation, when possible. Other photographs showing construction or excavational details may be taken at the discretion of the excavator.

Extramural Excavation Areas

Areas outside structures, particularly those around extramural features like hearths, were often used as work areas. Thus, certain zones may be examined to determine whether work areas can be defined. Excavation in these zones will proceed by grids. Most soil encountered during these investigations will be screened through 1/4 inch mesh hardware cloth, though a smaller-sized mesh may be used to sample certain areas. Plans of each extramural area investigated will be drawn, detailing the grids investigated and any features that are encountered.

Collection of Botanical Samples

Mollie Toll, Pam McBride, and James L. Moore

The potential contribution of botanical analyses to the study of these sites, while necessarily limited by the sampling universe of proveniences and preservation conditions within the right-of-way, is maximized by attention to reasonable and appropriate sampling in the field. It is helpful to recognize a fundamental difference between floral data collected in soil samples and virtually every other artifact category. Standard field procedure now dictates collection and curation with provenience information of every sherd, bone, and lithic artifact encountered during most excavation situations; sampling of this universe may take place later in the lab. Doing the equivalent for botanical materials would mean bringing home the entire site, a ludicrous proposition. This makes every soil sample collected in the field a sampling decision. Samples not taken are generally gone forever. On the other hand, a systematic decision to sample widely and intensively to guard against such information loss can generate hundreds or even thousands of unanalyzed samples. Lacking infinite time and resources, we must try to garner maximal information from judicious sampling.

Two aspects hallmark the most effective sampling protocols: awareness of which depositional contexts are most productive of floral remains, and recognition of site areas from which subsistence data will be of most interpretive use for the research foci of the project. Both are fundamentally selection processes. Researchers who aspire to sampling without bias had better approach the job with a very big checkbook indeed. The following guidelines for sampling specific provenience categories provide some simple directives for choosing flotation sampling locations.

Botanical Sampling Guidelines

Excavators should concentrate on covering the most informative contexts. By coping with less informative proveniences with minimal sampling (a small number of well-placed samples), we can maintain the option of sampling more complex and informative proveniences in greater detail, generating finer-scale information where it will be appropriate and helpful.

Prime among differentiated, potentially informative contexts are intact interior floor surfaces protected by fill and roof fall. Sampling multiple locations on interior floors contributes data for mapping cultural activities involving plant materials. This patterning informs on the organization of economic and cultural behavior at a household level. Analogous exterior surfaces, such as extramural work areas with associated cooking and storage features, are of equal interpretive interest but tend to have very poor preservation of perishable remains, and consequently do not merit intensive sampling.

Trash fill and roof fall, though voluminous and originating from cultural behavior, are of considerable interest, but as an entity. Except in the rare case of a burned roof falling intact on the floor below and being quickly covered by protective fill, horizontal differences in floral debris are really only a sampling problem. Sampling from contexts without good cultural affiliation (for example, disturbed areas) will be minimized.

Botanical Sampling Procedures

Botanical samples from floors can be a very important source of information, especially when taken from around thermal features. However, data on other work areas that might not be as well defined is also desired. For a clearer picture of what plant materials are associated with specific work areas, we need samples from floor contents unassociated with feature concentrations. The best way to ensure adequate coverage is to take samples from alternate grids, with the idea that analysts will later be able to select floor loci that will represent major activity areas, as well as one or more controls.

A single sample will be taken from near the bottom of primary deposits in interior features. Multiple samples will only be taken when primary deposits are clearly stratified. Samples may be taken from secondary deposits, with the understanding that they do not reflect the function of the feature itself. Single 2 liter samples will also be taken from roof fall zones, and from trash deposits, if well linked to a later or continuing occupation of the site.

Extramural features will be sampled in the same way as features inside structures: a single sample will be taken from near the bottom of primary deposits, and multiple samples will only be obtained when primary deposits are clearly stratified. Outbuildings like root cellars and sheds are particularly important because of their association with the storage of plant foods for people and/or livestock. Floor fill will be sampled for these types of nonresidential structures, and multiple samples will be taken if warranted (for instance, if a shelf or banco are present). Corrals and extramural middens will be sampled similarly. In both cases, a single 2 liter sample will be obtained from each clearly definable cultural stratum. If the sample is large enough and was taken accurately from the provenience it is meant to represent, multiple samples from the same stratum are redundant.

Attentive field collection of wood and charcoal can greatly increase the interpretive value of this artifact category. Charcoal samples will be taken from proveniences that most clearly represent fuel wood, floor boards, or construction timbers. To the degree to which such deposits can be confidently identified, species composition data will provide far more detailed and accurate pictures of historic wood utilization. We know from detailed wood data from Chaco Canyon that fuel and construction wood are likely to have wildly different selection trajectories (Toll 1985, 1987; Windes and Ford 1991). During the 1800s, opportunities for a more extensive choice of woods was provided by transportation in the form of horses and wagons, making selection a more influential factor. Consequently, some of the most interesting aspects of historic wood utilization emerge when these functional contexts are differentiated. The number of charcoal loci that are clearly one functional context or another may be few, but excavation surely constitutes the best opportunity for identifying suitable samples.

Special Situations

Sensitive Materials

Discovery of burials during data recovery seems unlikely. These sites appear to have been associated with residences occupied in the early to mid-nineteenth century, and on-site burials are unlikely. Related interments should be in cemeteries, and we can assume that no human remains will be found. However, if human remains should be discovered, standard archaeological excavation techniques will be employed to remove them after consultation with appropriate review authorities has been completed. They include definition of the burial pit, use of hand tools to expose skeletal materials, mapping and photographing of the position of the skeleton and any grave goods, and retrieval of soil for pollen analysis.

Field treatment of human remains and other sensitive cultural discoveries will be based on the Museum of New Mexico policy adopted March 20, 1986, "Collection and Display of Sensitive Materials" (SRC Rule 11; Appendix 2). If human remains or other sensitive materials are uncovered, no person will be allowed to handle or photograph them except as part of data recovery efforts. Data recovery related photographs of sensitive materials will not be released to the media or general public. Should human remains be encountered, local law enforcement officers and the State Historic Preservation Officer will be notified, and necessary consultations will be completed before the remains are excavated. Interested parties including the Catholic Archdiocese and relatives (if found) will be informed and will be consulted concerning disposition of the remains and any grave goods.

Unexpected Discoveries

There is always a risk of finding unexpected deposits or features during an archaeological excavation, and the project outlined in this plan is no exception. The procedure that will be followed in the event of an unexpected discovery will vary with the nature and extent of the find. Should human remains be found, appropriate consultations will be completed, and they will be treated according to the procedures outlined above and in Appendix 2. Small features, structures, or cultural deposits that were not located during testing will also be excavated according to the procedures outlined above. On the other hand, finds that have the potential to significantly alter the scope and intent of this plan will require consultation with the NMSHTD, the State Historic Preservation Division, and other agencies involved in permitting.

ANALYSIS METHODS AND ARTIFACT-SPECIFIC INQUIRIES

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

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

Chipped Stone Artifacts

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

The primary areas our analysis format explores are material selection, reduction technology, and tool use. These topics provide information about ties to other regions, mobility patterns, and site function. While material selection studies cannot reveal *how* materials were obtained, they can usually provide some indication of *where* they were procured. A study of mobility patterns is not integral to this project, but our analysis of the chipped stone assemblages will provide baseline data useful for evaluating information from other sites. By studying the reduction strategy employed at a site it is possible to compare how different cultural groups approached the problem of producing useable chipped stone tools from raw materials. The types of tools in an assemblage can be used to help assign a function and aid in assessing the range of activities that occurred at a site. Chipped stone tools provide temporal data in some cases, but unfortunately they are usually less time-sensitive than other artifact classes like pottery and wood.

Chipped Stone Analytic Methods

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

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

Research Questions

By combining chipped stone information with other data from these sites, we will be able to assess the economic condition and degree of acculturation demonstrated by site residents. Comparison of chipped stone artifact data with information from sites of similar type and date may aid in the isolation of specific manufacture or use patterns that are culturally rather than functionally determined. By comparing Spanish chipped stone assemblages with those of local Pueblo groups, we may be able to find enough differences in reduction strategy, material selection parameters, tool use, and formal tool manufacture techniques to allow us to define a signature for Spanish assemblages. In cases of uncertain ethnicity, this could prove useful in helping to determine what group occupied a site. These data will also help in examining how the Spanish approach to flintknapping differed from or was similar to that of the Pueblos and may provide clues concerning the degree to which the Spanish assimilated Pueblo reduction technology and strategy.

Chipped stone artifacts should have been used for a wide range of tasks at frontier sites, in many cases being substituted for metal tools. In the core area the opposite may be true. Most chipped stone artifacts should have been used in fire-making activities and not in tasks for which metal tools were better suited. The use of various classes of chipped stone tools should vary with the availability of imported goods, especially those that became available with the opening of the Santa Fe Trail. Are these changes visible in chipped stone assemblages? Better access to metal tools should mean less need for chipped stone substitutes and should lead to a decrease in the use of chipped stone cutting tools in Santa Fe Trail period and later assemblages. It should also mean less reliance on substitutes for firearms, resulting in fewer projectile points and gunflints.

Are these changes also reflected in material selection parameters? Cherts and flints are the only materials suitable for use in fire-making activities. Other materials would be useful for tasks that required substitutes for tools that were too expensive or rare for general use. As access to manufactured goods improved, we would expect to see a corresponding decrease in the percentages of noncherts used in Spanish chipped stone assemblages.

Ground Stone Artifacts

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

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

Ground Stone Analytic Methods

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

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

Pollen washes will be conducted in the laboratory, necessitating certain precautions. Ground stone tools from trash deposits will be placed in plastic bags after removal from the ground, and will be lightly brushed to remove loose soil. A thin cover of dirt will be left on tools found on floors until they are ready for photographing. Loose dirt will be removed prior to photographing, and the artifacts will be placed in plastic bags as soon as is feasible after that procedure is completed. Laboratory processing will proceed as follows: the entire surface of tools will be brushed before samples are collected. Using distilled water and a tooth brush, grinding surfaces will be scrubbed to collect embedded materials. The size of the area sampled will be measured and noted. Wash water will be collected in a pan placed under the sample and packaged for storage. Samples selected for analysis will receive a short (ca. 10 minute) acetolysis wash. Under certain circumstances, this may help preserve the cytoplasm in some modern pollen grains, allowing recent contaminants to be distinguished from fossil pollen. Pollen samples from ground stone artifacts will be subjected to full analysis to attempt to distinguish economically used wild plants as well as cultigens. The analyst will monitor for the occurrence of broken and whole grains and clumps of grains during counting. In addition, evidence for the presence of corn starch in samples will be noted.

Research Questions

In general, analysis of ground stone tools should yield both direct and indirect information on subsistence and may help to determine the types of foods consumed by site occupants. Since both sites seem to have been occupied after the opening of the Santa Fe Trail, we will be very interested in determining whether contact with the eastern United States impacted subsistence habits. Were new crops introduced during the early Santa Fe Trail period, and if so, can these changes be detected in the ground stone assemblages? The presence or absence of ground stone tools can also provide information on the local availability of mills. If a mill was available we would expect to find little or no evidence for the processing of grains at these sites.

The morphology of ground stone tools can be used to determine whether they were used in food preparation or for other purposes. Tools that do not appear to have the correct shape for grinding foods will be examined for residues to help define their function. The presence of such tools in these assemblages may provide subsidiary economic information. Were site occupants supplementing their income by making jewelry, were they grinding pigments for painting, or were they sharpening metal tools with grinding stones?

We may also be able to determine how ground stone tools were acquired. In particular, were ground stone tools obtained from nearby prehistoric sites, or were they manufactured for Spanish use? Tool morphology will be especially important in addressing this question. How do the shapes of ground stone tools from Spanish sites compare with those from prehistoric Pueblo sites in the area? If they are identical, we must consider the possibility that these tools were acquired from abandoned sites in the region. If they differ significantly, it is likely that they were manufactured for Spanish use.

Perhaps the most important question to be addressed with these data concerns economic changes resulting from trade over the Santa Fe Trail. Did ground stone tools begin to fall out of use soon after the opening of the trail, or did they continue as part of the traditional tool kit? As in other studies, the relative wealth of site occupants will have to be factored into this examination. A wealthy family may have begun shedding some of the more tedious subsistence tasks as soon as they could, while a poor family would have been forced to retain them.

Ceramic Artifact Analysis

Data relating to native pottery recovered during testing at LA 160 and LA 4968 provide a framework for investigations planned for the data recovery phase. This section discusses basic pottery trends noted for the sherds collected from LA 160 and LA 4968 to better determine potential approaches and questions for more intensive ceramic studies of the very large samples that will be collected during data recovery. The following sections discuss analysis procedures used and ceramic distributions noted for pottery collected during testing, and propose a series of research questions, reporting procedures, and detailed ceramic studies that will be implemented as part of the next stage of investigation.

The present analysis is concerned only with native ceramic types and does not include Euroamerican wares. Native types refer to pottery produced or inspired by the ceramic technology long associated with Pueblo groups in the northern Rio Grande. While Colonial and Territorial period ceramic assemblages from Pueblo and Hispanic settlements in the northern Rio Grande are dominated by pottery produced by Pueblo potters, native types found at sites in this region may also include forms that were inspired by Pueblo pottery traditions, but were made by Jicarilla Apache, genízaro, or Hispanic potters residing in this region.

Preliminary examinations of documentary and artifact data from both sites indicate that they were occupied by Hispanic families sometime during the Late Spanish Colonial or early Santa Fe Trail periods. LA 160 appears to have been primarily occupied during the Santa Fe Trail period, though some later use is also possible. LA 4968 is a large residential site that was probably occupied from the early nineteenth century into the mid-nineteenth century.

Native Ceramic Analytic Procedures

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

Attribute categories used in this study are similar to those employed in recent OAS projects in the northern Rio Grande (Wilson, in prep.). Attribute categories recorded for sherds recovered during testing included temper type, paint type, surface manipulation, modification, and vessel form. These attributes will also be recorded for all sherds examined during data recovery. Other studies planned for data recovery involve more detailed characterizations of selected subsamples of sherds. Such studies will include analysis of refired paste color, petrographic characterizations, design style, and construction methods. All categories employed will be defined and described during that phase of investigation. Studies of the distributions of these descriptive attributes will be used to examine various issues discussed below.

Many trends can also be examined using ceramic type categories. Ceramic types, as used here, refer to groupings identified by various combinations of paste and surface characteristics with known temporal, spatial, and functional significance. Sherds are initially assigned to specific traditions based on probable region of origin as indicated by paste and temper. They are then placed in a ware group on the basis of general surface manipulation and form. Finally they are assigned to temporally distinctive types previously defined within various tradition and ware groups.

While a number of historic Tewa ceramic types have been formally defined and described (Batkin 1987; Frank and Harlow 1990; Harlow 1973; Mera 1939), most of these type definitions are based on whole vessels and tend to emphasize decorated types. Historic Tewa decorated types are often distinguished from each other by characteristics such as overall design field or shape that are only observable in complete vessels. Such distinctions are of limited use in studies of pottery from archaeological assemblages, which tend to be dominated by plain ware sherds. Thus, this analysis will focus on the definition and use of sherd-based categories more suitable for sherd collections.

Sherd-based definitions of historic Tewa types have been used to examine historic archaeological assemblages (Dick 1968; Lang 1997; Snow 1982). In addition, a number of descriptive categories have been proposed for sherds that exhibit ranges of characteristics that differ from those used to define types from whole vessels. These categories are defined by a range of characteristics that may be ultimately connected to but are not necessarily equivalent to types previously defined for whole vessels. The degree of correlation between vessel and sherd-defined categories varies for sherds from vessels of the same type and depends on how much stylistic or decorative information is present. For example, unpainted sherds from a Powhoge Polychrome vessel would be placed into an unpainted historic slipped category, while sherds exhibiting some paint but without distinct decorations would be classified as "Tewa" Black-on-cream undifferentiated. In such cases, the assignment of sherds to Powhoge Polychrome would be limited to examples with distinct design styles indicative of that type. Still, a broken vessel of a specific pottery type should produce a recognizable pattern of sherds assigned to various formal and informal types. Information on this type of patterning may be derived from looking at how types are assigned to sherds that are eventually reconstructed into whole or partial vessels.

Most informal types reflect a range of characteristics indicative of sherds derived from vessels of previously defined types or groups of types. These characteristics are often self-evident in the type name. They are not described in detail here because of the preliminary nature of this study and the relatively small number of sherds examined. Analysis of the large number of sherds expected from data recovery will undoubtedly result in the addition of new categories as well as the refinement of categories already in use. The ceramic report produced from that study will include detailed descriptions of all sherd-based historic types recognized during the project, as well as illustrations and discussions of combinations of characteristics observed for each type. These descriptions will be presented in a manner that should serve as an important source of information for future analysis of historic northern Rio Grande pottery.

Examination of very basic ceramic patterns may be most efficiently served by creating a small number of ceramic ware groups by lumping types which share characteristics. Such groups include Decorated "Tewa" Polychrome, red-slipped utility, plain utility, black utility, micaceous utility, as well as a nonlocal group. The use of these basic broad categories will permit determination of coarse-grained patterning in ceramic assemblages, as opposed to the more basic patterning available from type distributions.

Research Questions

Temporal Patterns. Distributions of ceramic types and ware groups can help determine the period of occupation for a particular site or provenience within a site, based on the temporal ranges and frequencies of specific ceramic types and groups. Assignment of ceramic dates to historic assemblages is complicated by a general lack of detailed sherd-based ceramic dating studies for eighteenth- and nineteenth-century Hispanic sites in New Mexico, though ceramics from Hispanic sites spanning this period have been noted and described (Carrillo 1997; Dick 1968; Moore in prep. a). These include widely traded types produced by Pueblo potters as well as native forms produced by various groups including Hispanics. Many of the ceramic types and groups occurring in Spanish sites in New Mexico tend to have very long temporal spans, crossing several periods as currently defined. Moore (in prep. a) noted trends in the overall frequencies of different native pottery types during analysis of a historic site near San Ildefonso. These observations were used to recognize several ceramic-based dating periods, including the Early Spanish Colonial (1598 to 1680), Late Spanish Colonial (1692 to 1821), Santa Fe Trail (1821 to 1880), and Railroad (post-1880) periods. Trends noted include a decline in frequencies of decorated wares and polished red wares, and an increase in frequencies of polished black wares and micaceous wares (Moore in prep. a). Other trends include a gradual decline in the frequency of jars and soup plates and a corresponding increase in percentage of bowls.

Both sites examined during this study are overwhelmingly dominated by types indicative of a historic occupation, though very low frequencies of prehistoric types may reflect minor contamination from nearby Developmental period components. Frequencies of various ceramic types and groups from these sites indicate that assemblages recovered during testing date sometime during the Santa Fe Trail period, between 1821 and 1850+ (see Table 18). This is suggested by high frequencies of micaceous and smudged plain utility wares, which together make up over half the pottery from both sites, and a low frequency of decorated and red-slipped sherds. Dating assignments to the Santa Fe Trail period are also supported by other data (discussed in a later chapter).

Table 18. Distribution of ceramic types by site (frequencies and column percentages)

Period	Ceramic Type	LA 160	LA 4968
Prehistoric	unpainted (undifferentiated white)	0 0.0	1 0.04
	plain body	0 0.0	9 0.4
	mineral paint undifferentiated	0 0.0	1 0.04
	indented corrugated	0 0.0	1 0.04
	plain corrugated	0 0.0	1 0.04
	Red Mesa Black-on-white	0 0.0	1 0.04
	Kwahe'e Black-on-white	1 1.0	0 0.0
Historic	indeterminate utility ware	0 0.0	9 0.4
	Ogapoge Polychrome	0 0.0	2 0.1
	Pojoaque Polychrome	0 0.0	1 0.04
	Tewa polychrome (undifferentiated)	1 1.0	53 2.3
	black-on-cream	9 9.0	336 14.8
	historic organic paint	0 0.0	33 1.5
	Powhoge Polychrome	0 0.0	40 1.8
	historic slipped	3 3.0	58 2.6
	red-on-tan (San Juan?)	0 0.0	15 0.7
	Tewa buff	24 24.0	269 11.9
	polished gray ware	13 13.0	293 12.9
	polished black ware	6 6.0	379 16.7

Period	Ceramic Type	LA 160	LA 4968
	micaceous paste	3 3.0	187 8.3
	smudged with mica slip	17 17.0	302 13.3
	polished red ware	5 5.0	67 3.0
	buff ware with mica slip	16 16.0	117 5.2
	smudged micaceous	0 0.0	11 0.5
	smudged interior/buff exterior	1 1.0	10 0.4
	unpolished black ware	1 1.0	30 1.3
	buff utility (unpolished)	0 0.0	37 1.6
	interior micaceous (exterior missing)	0 0.0	1 0.04
Totals		100	2,264

There is also a small possibility that limited components dating before 1821 exist at these sites, as well as components from the late nineteenth century. Recent excavation at LA 6579 in the Pojoaque area by the OAS recovered a large ceramic assemblage. LA 6579 is a multicomponent site containing a Spanish Colonial occupation overlying a Developmental period Pueblo occupation. Sherds from LA 6579 were analyzed by the same personnel using types and conventions identical to those employed in this study. Ceramic distributions from the Spanish Colonial component at LA 6579 conform to the pattern suggested for the Late Spanish Colonial period by Moore (in prep. a). Thus, ceramic distributions from LA 6579 provide an opportunity to characterize native ceramics trends that immediately predate the main occupations of LA 160 and LA 4968, as well as providing criteria by which earlier occupations at these sites may be recognized.

Ceramic distributions from various proveniences may provide an opportunity for finer dating resolution of historic sites. Careful comparisons of native ceramics and historic artifacts may also provide information concerning temporally sensitive changes in distributions of native ceramics. Comparisons of pottery distributions from different spatial and vertical units may provide data that will allow us to make finer temporal distinctions. Thus, comparisons of ceramic distributions between levels within a stratigraphic profile may allow the documentation of changes that occurred within very short temporal spans, between and within presently defined periods. For example, assemblages with high frequencies of red wares and decorated wares may indicate components dating before the opening of the Santa Fe Trail, while those displaying high frequencies of black wares and micaceous wares may date after that event. Thus, ceramic distributions for basic proveniences at both sites will be monitored and compared. It may also be possible to monitor some temporal trends through the examination of design styles on decorated types. Recording of styles noted on larger Powhoge Polychrome and other historic sherds may isolate stylistic changes that could used to establish finer dating resolution. For example, a comparison of styles associated with Powhoge Polychrome from LA 6579 and other Spanish Colonial sites to those noted at LA 160 and LA 4968 may provide temporally sensitive information on stylistic changes in this type.

Examination of Ceramic Trends. The assignment of ceramic dates to proveniences will provide an opportunity to examine issues associated with trends in the production, decoration, and use of native pottery at Hispanic settlements in the Pojoaque area. Many previous examinations of eighteenth- and nineteenth-century occupations of small Hispanic settlements in the northern Rio Grande by the OAS have been oriented toward examining a frontier model (Moore in prep. b; Moore et al. in prep.). A frontier approach seems appropriate for the sites examined by this study, despite the fact they are only located 16 to 20 km from the economic and social core at Santa Fe (Moore in prep. b). During much of the eighteenth and early nineteenth centuries, the Pojoaque area, like most other New Mexico Hispanic communities, appears to have been very much on the frontier. Contributing factors include distance from major population and administrative centers, natural barriers that made communication and transportation difficult, and conflict with nomadic Indians.

The New Mexican frontier may be seen as a place where Spanish, Pueblo, Nomadic Indian, and Anglo-American cultures overlapped and adapted to one other. Ceramic distributions may provide clues about the effect of such adaptations on small Hispanic settlements. Distributions of native ceramics may also provide information concerning the nature of local ceramic production technologies and interaction between Hispanic and Indian groups, as well as the nature of activities for which this pottery was used by households on the New Mexico frontier. Since the main occupations of these sites occurred during the early Santa Fe Trail period, they encompass the shift of control of New Mexico from Spain to Mexico to the United States. Thus, changes in the frequencies of certain pottery categories associated with different occupational periods could provide information that will enable us to monitor the effects of these political shifts.

Pottery Exchange and Affiliation. The determination of area of production and cultural affiliation for pottery from LA 160 and LA 4968 will provide important clues concerning the nature of production and acquisition of ceramic vessels at Hispanic settlements in the Pojoaque area, as well as interaction between various groups in the late eighteenth and early nineteenth centuries. One important issue concerns relative rates of acquisition of native pottery vessels compared with Euroamerican pottery containers produced in Europe, Mexico, and the United States. Thus, the relative frequency of native to European-produced or inspired forms will be compared for assemblages from various proveniences. These comparisons may provide clues concerning the relative isolation or self-sufficiency of Hispanic settlers living on shifting frontiers.

It may also be possible to examine shifting interaction with more distant Pueblos outside the Tewa basin through the identification of types produced in other regions. Pottery produced in the Keres area can be identified by distinct basalt temper that sometimes occurs in glaze and Puname matte painted wares. Pottery produced in the Zuni, Acoma, or Laguna areas may be identified by white paste, sherd temper, and matte mineral paint. Other ceramics that may reflect exchange with other areas include Jemez Black-on-white, Jeddito Yellow ware, and Taos micaceous wares.

It is also important to determine the nature of local pottery production by identifying the area or group associated with the production of pottery found at Hispanic sites in the Pojoaque area. Such determinations, however, are often very difficult to make and reflect the complex dynamics of cultural interaction on the New Mexico frontier during the late eighteenth and nineteenth centuries. Examinations of temper categories (Table 19) as well as paste and surface characteristics at both LA 160 and LA 4968 indicate that most of this pottery conforms to previously defined Tewa types. Thus, most of the pottery from these sites appears to have been produced by Tewa-speaking potters residing at nearby villages like Tesuque and Pojoaque. Such distributions reflect the strong economic ties between Pueblo and Hispanic populations of this area that existed for nearly 300 years (Dozier 1970; Snow 1973). Hispanic settlers in much of New Mexico relied on the Pueblos and other Indians for many of their daily needs, including ceramic vessels. This reliance largely reflects the isolation of

New Mexico. It was never feasible to ship the large amounts of pottery from Mexico that were needed to supply this area.

Table 19. Temper type by cultural tradition (frequencies and column percentages)

Temper Type	LA 160		LA 4968			
	Rio Grande Prehistoric	Rio Grande Historic	Indeterminate	Rio Grande Prehistoric	Rio Grande Historic	Cibola
Sand	0 0.0	15 15.2	0 0.0	0 0.0	134 6.0	0 0.0
Mica, quartz, and feldspar fragments (schist granite)	0 0.0	1 1.0	0 0.0	11 91.7	95 4.2	0 0.0
Quartz and feldspar fragments (granite)	0 0.0	6 6.1	0 0.0	0 0.0	54 2.4	0 0.0
Highly micaceous paste	0 0.0	3 3.0	0 0.0	0 0.0	138 6.2	0 0.0
Sherd	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 100.0
Fine tuff or ash	1 100.0	2 2.0	9 90.0	1 8.3	365 16.3	0 0.0
Fine tuff and sand	0 0.0	50 50.5	1 10.0	0 0.0	1,117 49.8	0 0.0
Mica and tuff	0 0.0	0 0.0	0 0.0	0 0.0	33 1.5	0 0.0
Mica, tuff, and sand	0 0.0	22 22.2	0 0.0	0 0.0	305 13.6	0 0.0

A wide range of ceramics were produced by Tewa groups during the eighteenth and nineteenth centuries, including micaceous utility, black-slipped, and red-slipped utility wares, as well as decorated wares. Similar pottery forms found in Hispanic settlements may sometimes have been produced by other groups. Determination of the ultimate group affiliation or area of origin for a particular ceramic item from a Hispanic settlement is complicated by the fact that other groups in the area adopted Pueblo forms and pottery-making techniques. For example, eighteenth-century contact between Jicarilla Apaches and Tiwa-speaking groups in the Taos valley eventually resulted in the production of similar micaceous pottery by both groups (Woosley and Olinger 1990). By the nineteenth century, very similar micaceous pottery was produced by Tiwa, Tewa, and Jicarilla potters over a large portion of the northern Rio Grande. Jicarilla groups are known to have commonly come in contact with Hispanic settlers in areas just north of Pojoaque, so it is reasonable to assume that some degree of trade occurred during the nineteenth century, including pottery.

It also likely that pottery similar to that made by the Pueblos may have been produced by Hispanics in northern New Mexico during the eighteenth or nineteenth centuries (Carrillo 1997; Dick 1968; Levine 1990). Pottery vessels are postulated to have been made during this period at Hispanic villages and settlements ranging from El Paso, Texas, to southern Colorado (Carrillo 1997; Dick 1968). Pottery types thought to have been produced by Hispanics living in these villages include unpolished utility ware, red-on-tan ware, polished smudged, and micaceous forms similar to those produced by Tewa potters (Carrillo 1997; Dick 1968; Levine 1990).

Much of the disagreement concerning whether certain pottery was of Hispanic or Indian origin hinges on the definition of these terms. For example, while acknowledging that pottery was made at Spanish villages, Snow (1984) notes that the low status of pottery production associated with class distinctions prevented most Hispanics from taking up pottery manufacturing. He considers pottery made at Hispanic villages in New Mexico to have almost always been produced by Indians living at these villages or to represent isolated incidences of poor Hispanic women temporarily supplementing their income. Snow (1984) feels that documented cases of pottery-making by Hispanic potters represent the temporary adoption of Pueblo technologies to supplement income, and he does not believe that such occurrences represent a tradition passed from one generation of potters to the next. Regardless of the ethnic identity of these potters, it is likely that a significant amount of pottery was made at non-Indian villages during the eighteenth and nineteenth centuries and that these techniques were transmitted from one generation to the next. Still, Pueblo pottery is expected to dominate assemblages, even at most settlements where Hispanics may have made pottery.

While some studies have attempted to distinguish similar pottery forms produced by different ethnic groups though rim shape, surface manipulation, or temper size (Carrillo 1997; Levine 1990), there is considerable overlap in such attributes. For example, while cruder forms are sometimes assumed to have more often been produced by Hispanic rather than Pueblo potters, it is reasonable to assume that experienced potters in Hispanic villages may have produced pottery comparable to the best examples from Pueblo villages.

Ultimately, detailed examination of pottery sources will be required to determine the ethnic affiliation of pottery recovered from LA 160 and LA 4968. This will involve the study of pottery from nearby sites of known affiliation as well as collection of clays from sources near Tewa Pueblos, Hispanic villages, and Jicarilla camps. Characterization of these materials will include basic descriptions of clays, pastes, and plastic inclusions as well as more detailed petrographic and possibly compositional analyses.

A study conducted by Olinger (1988) on pottery from historic Pueblo villages used X-ray fluorescence (XRF) to define possible differences in clay sources used by the various villages. While some problems have subsequently been noted concerning the use of XRF to make such distinctions, Olinger's (1988) study seems to indicate that it is nevertheless possible to define differences in clay sources used by villages in this way. Such studies may be extended to pottery from known Hispanic and Jicarilla occupations.

Preliminary analysis of pottery recovered from LA 160 and LA 4968 identified a fairly wide range of temper categories (Table 19), which may ultimately provide for other distinctions. Compositional studies are being conducted by archaeologists from the University of Michigan on pottery from Hispanic and Jicarilla Apache sites near Abiquiu. Comparison of pottery from these sites to materials recovered from LA 160 and LA 4968 may provide clues concerning the identification of pottery made by different ethnic groups. Unfortunately, the complex nature of geological clay distributions will probably, in most cases, preclude clear-cut identification. However, it may still be possible to break pottery into basic groups that have possible ethnic connotations.

Functional Trends for Historic Pottery. Assemblages from Hispanic sites in the northern Rio Grande occupied during the late Colonial and early Territorial periods reflect the relatively isolated and largely self-sufficient economy of the New Mexican frontier. These assemblages tend to be dominated by Indian-manufactured utility wares associated with kitchen activities involving the storage and preparation of food. Certain sherd characteristics can provide data concerning the forms of ceramic vessels that were used and discarded at these settlements. Overall distributions of sherds assigned to various categories provide clues concerning the types and ranges of activities for which they were used.

Functional trends may be documented through the use of basic ware categories and ceramic groups, as well as categories that reflect the shape and portion of a vessel from which a sherd derived. Vessel form identification is based on rim shape, the presence and location of polish and painted decorations, and other traits indicative of form. It is often easy to identify the basic form (bowl versus jar) of body sherds from prehistoric vessels for many southwestern regions by the presence and location of polishing. However, such distinctions are not as easy to make for plain ware body sherds from historic northern Rio Grande vessels, because polishing on both sides is common in vessels of a variety of forms. Thus, while body sherds from most decorated vessels can be assigned to basic vessel forms, most plain utility ware body sherds are assigned to a series of descriptive categories representing combinations of surface treatments of unknown functional significance. These categories provide information that may be of functional significance without making more specific distinctions that are difficult to derive from plain ware body sherds alone. Examinations of rim sherds will provide more specific information about vessel form. Rim diameters of sherds and vessels will provide information concerning the overall size of vessels reflected by various forms.

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

Initial functional distribution data are provided by sherds recovered during testing at LA 160 and LA 4968 (Table 20). These data indicate that the assemblages are dominated by plain, micaceous, and smudged utility wares occurring in a wide variety of vessel forms. While plain wares dominate these assemblages, the frequency of decorated sherds is also fairly high. The variety of forms in these assemblages may indicate that native pottery was used for a wide range of tasks. This is also supported by the wide range of vessel form categories recognized. Body sherds are represented by a variety of surface manipulations, though they are dominated by forms that are polished on both sides. Comparison of rim sherds for both utility and decorated types indicates that the assemblage is dominated by a mixture of bowls and jars, though more bowl rim sherds were identified. Other forms noted include dippers, miniatures, and soup plates. Most of the native sherds appear to represent vessels used in domestic activities that may have included grain storage, bread making, and cooking. Relatively high frequencies of bowls and decorated pottery may indicate that native pottery was used for serving and consumption as often as for storage and cooking.

Studies of pottery recovered from LA 160 and LA 4968 during data recovery will attempt to define the activities that used native pottery in much more detail. The distribution of ceramic classes and artifacts from different types of features and proveniences may provide data concerning the organization of cooking, serving, and storage activities. Functional distributions will be compared to determine whether different ranges of activities occurred at LA 160 and LA 4968. Finally, pottery distributions from dated proveniences will be compared to examine changes in use patterns that may reflect shifting frontier economies.

Table 20. Vessel form by cultural tradition (frequencies and column percentages)

Vessel Form	LA 160		LA 4968			
	Rio Grande Prehistoric	Rio Grande Historic	Indeterminate	Rio Grande Prehistoric	Rio Grande Historic	Cibola

Indeterminate	0 0.0	1 1.0	9 90.0	1 8.3	162 7.2	0 0.0
Bowl rim	0 0.0	1 1.0	0 0.0	0 0.0	121 5.4	0 0.0
Bowl body	1 100.0	44.0	1 10.0	0 0.0	263 11.7	0 0.0
Olla rim	0 0.0	0 0.0	0 0.0	0 0.0	1 0.04	0 0.0
Jar neck	0 0.0	8 8.1	0 0.0	2 16.7	92 4.1	0 0.0
Jar rim	0 0.0	1 1.0	0 0.0	0 0.0	54 2.4	0 0.0
Jar body	0 0.0	17 17.2	0 0.0	1 8.3	191 8.5	0 0.0
Gourd dipper	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 100.0
Miniature pinch pot rim	0 0.0	0 0.0	0 0.0	0 0.0	3 0.1	0 0.0
Body sherd polished on interior and exterior	0 0.0	11 11.1	0 0.0	0 0.0	362 16.2	0 0.0
Body sherd, unpolished	0 0.0	13 13.1	0 0.0	8 66.7	270 12.1	0 0.0
Body sherd, unpolished interior and polished exterior	0 0.0	7 7.1	0 0.0	0 0.0	138 6.2	0 0.0
Body sherd, polished interior and unpolished exterior	0 0.0	36 36.4	0 0.0	0 0.0	528 23.6	0 0.0
Indeterminate rim	0 0.0	0 0.0	0 0.0	0 0.0	48 2.1	0 0.0
Soup plate	0 0.0	0 0.0	0 0.0	0 0.0	7 0.3	0 0.0
Dipper handle	0 0.0	0 0.0	0 0.0	0 0.0	1 0.04	0 0.0

From the Spanish Colonial period onward, domestic animals dominated the animal diet of both colonists and native groups. After the Pueblo Revolt, De Vargas brought new supplies of sheep, goats, and cattle for the colonists. The roughly 1,000 colonists received more than 4,000 sheep, 170 goats, 500 cows, and 150 bulls that were to be used for breeding draft animals (Baxter 1987:15-16; 1993:106). Households practicing subsistence-level agriculture and livestock raising generally had small numbers (20 to 100 animals) of sheep, goats, cattle, oxen, mules, horses, burros, and pigs. These provided the household with meat, hides, wool, lard, transportation, manure, and hoof action for threshing grain (Scurlock 1998a:115).

Sheep were the primary livestock into the twentieth century. Early sheep were a variety called *churros* that were common to southern Spain. Churros were small with minimal amounts of coarse, long-stapled wool. Adapted to semiarid pastures and able to withstand drought and drives, the wool was well suited to hand processing, and churros had excellent meat (Baxter 1987:20), making them ideal for conditions on the New Mexican frontier (Baxter 1993:103). At a time when sheep were valued primarily for food, there was little incentive to improve these small, easily herded, and well-traveling sheep.

Owners of huge flocks of sheep made three- to five-year contracts with *partidarios*, who received a flock of ewes and a few breeding rams and were required to return a percentage of each years increase and wool to the owner. At the end of the contract, the partidario was required to return the flock and anything else that was owed. The *partido* system was in place by 1750 and was well established by 1850. Successful partidarios could earn enough from their contract to establish homes and start their own flocks. Yet many remained indebted due to loss from Indian raids, predators, drought, and winter storms. This system and a lack of merchants and banks created two economic classes, the *ricos,* or *patrones*, and the poorer people, who were shepherds or sedentary agriculturalists (Baxter 1987:28; Carlson 1969:29-30).

By 1750, sheep ranching was New Mexico's most important industry (Baxter 1987:31). Into the early 1800s, sheep were raised to meet local needs and for markets in northern Mexico. By the early days of the Santa Fe Trail (1820s and 1830s), some wool was traded east by ox trains, but sheep were not driven east or west for food (Carlson 1969:26-27). Commerce with Mexico ended abruptly at the end of the Mexican War, and the sheep trade remained dormant until the discovery of gold in California created new markets for meat. Prices eventually fell and the Civil War stopped the trade (Baxter 1987:112).

The Civil War was at least partially responsible for major changes in the sheep industry. As the demand for wool increased, the industry turned from producing meat to producing wool. Heavy set, wool-bearing merino rams were brought from the East to cross with churros (Carlson 1969:30). Bred by Berber tribesmen from North Africa, merinos have kinky high-yielding fleece and are well adapted to seasonal drives between mountains and plains (Baxter 1987:20). A merino produced as much as seven or eight pounds of wool compared to one and a half pounds for churros and three to four pounds for the crossbreeds, which were also hardy, prolific, and good to eat. It was not until after 1868 that New Mexico had enough merinos to significantly affect the quality of sheep (Baxter 1987:149; Carlson 1969:33-34, 46). The wool clip rose from 14,500 kilos in 1850 to 223,600 kilos in 1860, 310,700 in 1870, and over 1,814,000 in 1880 (Grubbs 1960:171-172).

Herds of sheep increased dramatically. In 1850 there were 380,000 rather unprofitable sheep. By 1880 over 2,000,000 sheep were shorn annually. Meanwhile, another market was developing in the Midwest. Sheep shipped to feedlots in Kansas, Nebraska, and Colorado were fattened, then taken to meat-packing plants in Chicago, St. Louis, and Omaha. Railroads transformed the market by providing more outlets. In the 1890s, mercantile establishments began to play an increasingly important role in improving the stock and financing small operations, taking the place of the partido system. Key operations were established at railheads in Las Vegas, Socorro, Albuquerque, and Española. But the rails also allowed the cattle industry to compete for markets. Control of the range, the demise of the partido system, fences, private ownership of watering holes, placing land in forest reserves, and other factors reduced sheep husbandry to a sedentary industry by 1900 (Carlson 1969:34-39).

Although much fewer in numbers, goats played a vital role in Spanish livestock raising. Goats are relatively easy to care for, do well on diverse types of terrain, and are more healthy and disease resistant than sheep (Scurlock 1998b:8). Fairly early in their domestication, herders discovered that male goats were dependable leaders of sheep flocks. These "point goats" were provided with bells that allowed herders to keep track of the flock. Point goats sound an alarm when predators approach, respond to the herder better than most dogs, and do not lead flocks into dangerous areas in bad weather (Scurlock 1998b:9).

Spanish goats were long-legged with small bodies and provided meat, milk, and cheese (Scurlock 1998b:11). By the late nineteenth century, the angora goat, with its longer and more easily processed and woven hair, began to replace the Spanish goat. The first probably arrived around 1872. With the opening of new rail markets, angoras spread rapidly since their pelts brought higher prices and their wool could be used for rugs. By the early 1900s there were 30,000 angoras in New Mexico (Scurlock 1998b:14). Concerned with overgrazing of public land, the government reduced the number of sheep and goats allowed on the public domain in the 1930s. Spanish and Indian households continued to keep a few around their villages, but the overall number was greatly reduced (Scurlock 1998b:17-18).

Cattle also arrived with early settlers from Mexico and were an integral part of the subsistence economy at the end of the seventeenth century (Baydo 1971:12, 16). Early cattle were probably of a breed known as *criollos*, a meat and draft variety of Iberian origin. A docile breed, they had twisted, handlebar-shaped horns (Porter 1991:308-309). In the 1800s, oxcarts were the most common mode of transport (Hallenbeck 1950:340), but oxen were also used for farming (Simmons 1985:85).

In 1829, Santa Fe and the surrounding area had 1,450 cattle, 62,000 sheep and goats, 184 horses, and 592 mules (Carroll and Haggard 1942:43). As late as 1880, New Mexico had nearly 4,000,000 sheep but only 137,000 beef cattle. Numbers soon rose dramatically, and by 1884 there were nearly a million cattle and 5,500,000 sheep. In 1888 cattle numbered 1,250,000, while sheep dropped to about 3,500,000 (Carlson 1969:34, 37).

Horses were introduced by the Spaniards, but so many were lost to Indian raids that breeding was difficult, and horses had to be imported into the 1800s (Baxter 1987:69). Mules were a common form of transportation in the eighteenth century, hauling goods and carrying ore out of mines. The Asiatic donkey or burro came later, probably not before 1830, then quickly supplanted the mule (Baxter 1993:106; Hallenbeck 1950:340).

Iberian pigs arrived in Mexico with Cortez in 1524 (Bennett 1970:230). Iberians are small (50 to 150 kg), lean pigs with heavy shoulders, long legs, a long narrow snout, small erect ears, and an uncurled tail. In Mexico, they multiplied rapidly, adapting well to new environments (Gade 1987:36). Pigs were reportedly scarce in New Mexico in 1803 (Baxter 1987:69) and remained so in 1849 (Carroll and Haggard 1942:103). They were expensive to keep because there was little mast available for feed, so they had to be fed corn (Crass and Wallsmith 1992:12).

In his 1803 report to his superiors in Chihuahua, Governor Fernando de Chacón laments that there was an abundance of skins from small animals, elk, deer, mountain sheep, buffalo, bear, mountain lion, wolf, fox, and coyote, but the trade was not practiced due to lack of ability and inclination among the inhabitants of the province (Simmons 1985:86). Hunting small mammals and birds and fishing was of little importance, but big game hunting, especially of bison, was more important due to the meat and value of their hides (Carroll and Haggard 1942:99). In general, settlers relied on bartering with Indians for wild animal meat and hides, except for bison (Scurlock 1998a:119).

Faunal Analytic Methods

Preliminary indications from testing suggest that LA 4968 will produce large amounts of bone during data recovery. If sampling is necessary, proveniences analyzed will include not only those with the potential to contribute the most high-quality data on availability and consumer choice but also those that will inform on site structure. This should include most, it not all, of the eighth-inch-screened stratigraphic samples and flotation samples from thermal features. In addition, an effort will be made to collect age and metric data from the unanalyzed portion of the assemblage. This type of data is relatively sparse but can add considerably to information on age selection and the potential breeds of animals represented.

Specimens from proveniences chosen for analysis will be identified using the OAS comparative collection supplemented by those at the Museum of Southwest Biology, when necessary. Recording will follow an established OAS computer coded format that identifies the animal and body part represented, how and if the animal and part was processed for consumption or other use, and how taphonomic and environmental conditions have affected the specimen.

Most variables will be used to address more than one of the research issues within the suggested framework (Table 21). Each data line will be assigned a lot number that identifies a specimen or group of specimens that fit the description recorded in that line. Lot numbers also allow for retrieving an individual specimen if questions arise concerning coding or for additional study. A count will also be included to identify how many specimens are described in a data line.

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

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

Table 21. Relationship between variables recorded and problem domains

Variable	Availability	Consumer Choice	Site Structure
Taxon	X	X	X
Element (body part)	X	X	X
Side	X	X	
Portion present	X	X	X
Completeness (%)	X	X	X
Age	X	X	X
Environmental alteration			X
Animal alteration			X
Thermal alteration		X	X
Processing type	X	X	X
Processing location		X	X
Recovery technique	X	X	X
Element measurements	X	X	

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

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

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

Burning, when it occurs after burial, is also a taphonomic process. Burning can occur as part of the cooking process, part of the disposal process, when bone is used as fuel, or after it is buried. Here, the color, location, and presence of cackling or exfoliation will be recorded. Burn color is a gage of burn intensity. A light tan color or scorch is superficial burning, while bone becomes charred or blackened as the collagen is carbonized. When the carbon is completely oxidized, it becomes white or calcined (Lyman 1994:385, 388). Burns can be graded over a specimen, reflecting the thickness of the flesh covering portions of the bone when burned. Dry burned bone is light on the exterior and black at the core or has been burned from the interior. Graded burns can indicate roasting. Completely charred or calcined bone and dry burns do not occur as part of the cooking process. Uniform degrees of burning are possible only after the flesh has been removed and generally indicate a disposal practice (Buikstra and Swegle 1989:256).

Evidence of butchering will be recorded as various orientations of cuts, grooves, chops, abrasions, saw cuts, scrapes, peels, and intentional breaks. This type of evidence is much less ambiguous in historic assemblages where metal knives, axes, and cleavers leave more distinct marks than stone tools. The location of butchering will also be recorded. Additional detail will be obtained by indicating the exact location on diagrams of the body parts.

Fauna recovered from historic sites is typically so fragmented that few attempts have been made to collect measurement data. Yet this information has the potential to differentiate varieties of sheep and goat, perhaps distinguish beef from draft cattle, and differentiate species of equids, along with the social and economic consequences thereof. Because this data has such potential, all possible measurements will be taken on domestic fauna. Measurements will be taken following von den Driesch (1976), who provides a comprehensive list of measurements for virtually every element. While these sites may not provide enough data to confidently answer questions concerning the varieties represented, they will begin to build a data base for comparisons with earlier and later sites.

Research Questions

The framework that will be used for analyzing the faunal data from these sites is based in part on one outlined by Huelsbeck (1991:62) that focuses on availability and consumer behavior. It will emphasize the impact of social and economic forces on the acquisition and consumption of animal products, as well as on aspects of site structure. Comparisons with faunal assemblages representing demonstrably different types of sites, such as isolated homesteads and urban Santa Fe, those from other areas but the same time period, those generated by different ethnic and social groups, and those from before and after are our best means of evaluating the collections from these sites as part of the New Mexican frontier adaptation. Without a broader context, the data are merely descriptive.

Availability refers to the range of animals available to the household and the community. This will depend, at least in part, on the range and kinds of contacts site inhabitants had with those outside the immediate area. Location on or near communication and trade corridors should increase the variety of animals available as well as the likelihood that site inhabitants participated in and were influenced by market forces. For example, an assemblage from a group who raised animals simply for household and community consumption should differ from one that also raised animals for export. When animals were raised for export, there should be differences based on whether they were raised for food or for other products, such as wool. Beyond simple availability, acquisition by purchase or trade raises questions of form (e.g., live animals, cuts of meat, etc.) and concerning the respective relationship between parties (family, community, patron and peon, alliance maintenance with other groups) and the quality of the product available.

Consumer choice addresses what species and portions were chosen for consumption or use. By looking at the cuts represented and the age of animals selected, we may be able to determine the status of the consumer. Animal selection also informs on the role of the animals themselves. Was there selection for certain age and sex groups that make better eating, or were older individuals culled when their usefulness as draft or transportation animals declined? Seasonality also plays a part. Before refrigeration, larger animals like cows were either divided among many or butchered during the cold season. Choice of preparation method can be indicative of group size and composition. Dietary preferences and butchering practices also provide information on ethnicity.

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

The tested sites contain early Santa Fe Trail period deposits. LA 160 is largely outside the right-of-way and produced no faunal material during testing. Trash areas were defined along with a possible trash pit and could produce faunal remains during data recovery. Such a sample could provide limited information on site structure, trash disposal, species utilization, and processing methods.

A good sample of bone was recovered from LA 4968 (n=971). Preliminary examination indicates that sheep or goat (n=147 and sheep/goat size n=613), cattle (n=67 and n=144 cow-size), and a small amount of bird (n=2 bones and 10 eggshell) are present in the testing sample. No native animals were observed. Of 68 provenience units, 47 have more sheep/goat or sheep/goat-size bone than cow or cow-size, while only 17 have more cow or cow-size bones. Burning is rare, less than 10 percent overall. The lower levels of 554N/582E display more burning than most (16.7 to 23.3 percent), suggesting there is spatial variability within the site.

Because LA 4968 contains several structural mounds, a possible root cellar, and subsurface deposits and features, it has much more potential for examining change in household and community economics and site structure. Preliminary counts indicate that larger numbers of sheep or goats were used at the site, but there is a wide range of variability in the density of faunal remains, the relative proportion of sheep and cow-sized animals, and burning.

Fauna recovered from these sites will be used to address problems related to the period of occupation and changes in household and community economics. As the background material suggested, churro sheep and Spanish goats should dominate the faunal assemblage. Both varieties were used primarily for food at the household and community level, but large numbers could have been raised for export. By 1870, the market was for wool, and larger, heavy-set merino sheep were crossed with local stock to increase wool production. A similar change in goat variety occurred after 1872, when angora goats were introduced. The size and age structure of cattle remains could provide information on whether they were used primarily for food or as draft animals. The simple presence of transportation species-–horses or mules--would suggest more active participation in regional markets.

While the ethnicity of site occupants is not an issue, interaction with other groups is. Providing food resources for Anglos and trading for food items with Pueblos and Anglos could be reflected in the faunal assemblage. For example, after the Civil War, U.S. citizens (presumably Anglos) preferred pork, followed by beef or veal, poultry, offal, fish, lamb, and mutton (Crass and Wallsmith 1992). Thus, large numbers of pigs or cattle could suggest that site residents were raising stock for an Anglo market, and the presence of certain cuts might indicate purchase from Anglo merchants.

Patterns of butchering could also differ. The American butchering pattern used after the Civil War for cattle and sheep entailed the selection of young animals. Limbs were removed at the joints, usually with a saw, turning the carcass into sides of meat by sawing down either side of the vertebral column. Commercial cuts removed from beef sides included short loin, sirloins, round, chuck, and short plate; cuts from lamb or mutton included loin, leg, breast, shoulder, and other cuts suitable for stewing (Crass and Wallsmith 1992:16-17). Spanish sites display a slightly different pattern of butchering. Axes, cleavers, and knives were the most commonly used tools for this purpose. The basic pattern was to remove the head and detach the mandible. The vertebral column was cut into segments, rather than sides, and ribs into slabs. Limbs were separated at the joints with very little evidence of processing (Akins in prep.). The presence of cut marks near the ends of long bones probably results from stripping meat, rather than disarticulation. Similar patterns were observed for sites along Alameda Boulevard, just north of Albuquerque (Brown 1997:247-253).

Exchange of wild animal products with Pueblo or nomadic Indians could be indicated if processing patterns differ significantly from those found in the domestic fauna. Similarly, processing in larger groups could involve different tools and species along with uniformity in distribution of choice or not-so-choice parts.

Euroamerican Artifacts

Euroamerican artifacts will be examined using a standardized analysis format (OAS 1994c). The main emphasis will be the identification of artifact function. One of the major benefits of this type of analysis is that "the various functional categories reflect a wide range of human activities, allowing insight into the behavioral context in which the artifacts were used, maintained, and discarded" (Hannaford and Oakes 1983:70). It also avoids some of the pitfalls of an analytic framework that focuses on categorizing artifacts by material type. Material-based analyses frequently include attributes that are appropriate for only some of the functional categories that might be included in a single material class. For instance, variables that are often chosen for analysis of glass artifacts are usually appropriate for glass containers but may be inappropriate for flat glass, decorative glass, or items like headlights.

This analytic framework was designed to be flexible, which hopefully enables it to avoid these and other problems. The function of each artifact is described by a hierarchical series of attributes that classifies it by functional category, type, and specific function. These attributes are closely related and provide a chain of variables that will specify the exact function of an artifact, if known.

Analysis Methods

Eleven functional categories will be used in this analysis, including economy/production, food, indulgences, domestic, furnishings, construction/maintenance, personal effects, entertainment/leisure, communication, and unassignable. Each category encompasses a series of types and includes classes of items whose specific functions may be different but are related. An example is a pickle jar and a meat tin, both of which would be included in the food category, but which are made from different materials and had different specific functions.

The exact use to which an artifact was put will be recorded as a specific function within a type. In essence, this attribute represents a laundry list of different kinds of artifacts that may be familiar to most analysts and is the lowest level of the identification hierarchy. Other variables are recorded to amplify the hierarchy of functional variables and provide a more detailed description of each artifact that warranted such treatment. Included in this array of attributes are those that provide information on material type, dating, manufacturer, and what part(s) are represented. Chronological information is available from a variety of attributes, as are data on manufacture and physical descriptions.

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

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

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

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

In addition to most of the attributes already discussed, several others will be used to provide a more comprehensive description of each artifact. *Fragment/part* describes the section of artifact represented. Artifacts or fragments of artifacts within a single excavation unit whose functions and descriptions are identical will be recorded together, and the number of specimens present will be listed under *count*.

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

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

Research Questions

The Euroamerican assemblage will provide information in several critical areas, including chronology, activities performed at these sites, site functions, trade contacts, and social standing. As discussed in the previous section, this analysis should be able to provide critical temporal information concerning the timing and length of occupation of LA 160 and LA 4968. The range of artifacts recovered will give us an idea of the types of activities performed at the sites and should allow us to gauge how these sites functioned in the settlement-subsistence system. The sources of various artifacts may provide an idea of the scale of the mercantile system site occupants were tied into. Types and amounts of imported goods may reveal information on the relative wealth of site occupants, especially when compared with data from sites of similar date in northern New Mexico.

Beyond these areas of interest, analysis of the Euroamerican assemblage should allow us to examine how imported goods were used to augment and replace traditional or locally manufactured products. What types of imported ceramic vessels were favored, and did they replace those used for storage and cooking, or were they mostly used for serving and consuming food? Metal tended to be expensive and difficult to acquire in Spanish Colonial New Mexico. Did metal continue to be hoarded and reused in the early Santa Fe Trail period, or did it become a more expendable commodity? Do the Euroamerican artifacts reflect the beginning of acculturation to the Anglos who were starting to move into New Mexico? Were traditional goods imported from Mexico replaced by imports from the eastern U.S., or were they merely augmented by them?

Botanical Remains

Along with faunal remains, botanical materials recovered from sites provide direct evidence of subsistence practices. Charred seeds can tell us what plants were included in the diet, both domestic and wild. Charcoal from hearths and trash deposits can be used to examine wood gathering activities. Floral materials contained in adobe bricks can be used to augment other types of botanical data, and samples from corrals provide information on the diet of their livestock. These types of data not only tell us what plant foods site occupants were gathering, growing, or trading for, they also provide important information on what the local environment might have looked like. Good botanical information is also critical to our examination of frontier processes at these sites.

Analysis Methods

Botanical studies of archeological deposits at LA 160 and LA 4968 will include flotation analysis of soil samples, species identification, morphometric measurement of macrobotanical specimens (where appropriate), and species identification of wood specimens from both flotation and macrobotanical samples. Flotation is a widely used technique for separation of floral materials from the soil matrix. It takes advantage of the simple principle that organic materials (and particularly those that are nonviable or carbonized) tend to be less dense than water and will float or hang in suspension in a water solution. Each soil sample is immersed in a bucket of water. After heavier sand particles settle out, the solution is poured through a screen lined with "chiffon" fabric (approximately 0.35 mm mesh). The floating and suspended materials are dried indoors on screen trays, then separated by particle size using nested geological screens (4.0, 2.0, 1.0, and 0.5 mesh), before sorting under a binocular microscope at 7 to 45X.

This basic method was been used as long ago as 1936, but did not become widely used for recovery of subsistence data until the 1970s. Seed attributes such as charring, color, and aspects of damage or deterioration are recorded to help in determining cultural affiliation versus postoccupational contamination. Data on the relative abundance of insect parts, bones, rodent and insect feces, and roots help to isolate sources of biological disturbance in the ethnobotanical record.

All macrobotanical remains collected during excavation will be examined individually, identified, repackaged, and catalogued. Condition (carbonization, deflation, swelling, erosion, damage) will be noted as clues to cultural alteration or modification of original size dimensions. When less than half of an item is present, it will be counted as a fragment; more intact specimens will be measured as well as counted. Corn remains will be treated in greater detail. Width and thickness of kernels, cob length and midcob diameter, number of kernel rows, and several cupule dimensions will be measured following Toll and Huckell (1996). In addition, the following attributes will be noted: over-all cob shape, configuration of rows, presence of irregular or undeveloped rows, and postdiscard effects.

Research Questions

Floral studies provide direct evidence of the patterning of daily economic activities, contributing an informative layer of details to the emerging picture of historic occupation in the northern Rio Grande Valley. Multiple questions at issue during the nineteenth century in the Rio Grande Valley can be addressed by examining associated plant remains. With colonization and trade along the Santa Fe Trail, Old World plants were available, as well as maize, beans, and squash of the New World. Comparing floral assemblages across time can produce information about changing dependence on cultigens and wild plants, and the integration of Old and New World plants in the diet of Hispanic and Anglo settlers. Horses and wagons provided access to a wider range of choices in foods, medicinals, construction materials, and firewood. Archeobotanical studies can help define household function and organization by delineating spatial components of specific food processing and preparation tasks. By extension, apportionment of activities within specific areas of a community can be explored: did certain areas or structures in the community have specific functions, or did similar activities take place at all site components?

Chronometric Samples

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

Several categories of chronometric data are potentially available from these sites, including dateable artifacts, documentary sources and local informants, radiocarbon samples, archaeomagnetic samples, and tree-ring samples. Each of these categories can provide useful and important temporal information, but there are also problems associated with each.

Dateable Artifacts

At least two categories of artifacts have the potential to provide dates: Euroamerican artifacts and native ceramics. Only Euroamerican artifacts with known dates of production have good potential for providing accurate chronometric information. Native pottery can be used to provide broad date ranges or relative dates, but historic types from this area are woefully lacking in good chronological controls (Moore 1998).

As shown by the testing results presented in this report, Euroamerican artifacts can often provide fairly precise dates for a site. In particular, flat glass and ceramics imported from the eastern U.S. can be very sensitive temporal indicators. Mexican majolicas and other earthenwares often have very long temporal spans and do not provide accurate dates. However, the presence of this type of artifact in relatively high percentages is indicative of a pre-1850 date, and a few types have fairly limited production spans and can provide temporal data as accurate as those available from other Euroamerican wares. Bottle glass and certain classes of metal artifacts may also be useful, but these types of artifacts also often had very long production ranges which only allow the derivation of relative dates.

Native ceramics can also be used to provide temporal information, but again, types often have very long temporal ranges that only allow the derivation of relative dates. While specific types do not appear to have a great degree of temporal sensitivity, changing patterns of ware use through time do seem to provide good relative information that can be used to augment other sources of temporal data.

Documentary Sources and Local Informants

Probably the most useful temporal information will come from these sources. Documents can be particularly productive sources of temporal information and yield data on site occupants, when they arrived in the area, when they left, how they lived, and their relative social position. Unfortunately, documentation is not always available for a site. Many documents were inadvertently (or purposely, in some cases) destroyed during the American Territorial and early Statehood periods. A search for potential documents pertaining to LA 160 and LA 4968 will be launched as fieldwork proceeds to attempt to provide the types of information listed above. This will include a search for historic maps, which may show our sites.

In addition to a documentary search, an ethnohistorian will conduct interviews with local inhabitants. This type of approach is particularly useful when descendants of site occupants can be located and interviewed. Information obtained in this manner is often an important adjunct to documentary sources because informants may know details that do not appear in public records. This type of approach can also uncover local legends about sites, which many times prove to be fanciful. Hopefully, this approach will allow us to duplicate Peckham's interview information, which referred to LA 160 as the post office for Valdez, New Mexico, and to explore this possibility in detail.

Radiocarbon Dating

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

A more serious problem is encountered when wood or wood charcoal is submitted for dating (Smiley 1985). Only the outer parts of trees continue to grow through the life of the plant, hence only the outer rings and bark absorb carbon. Samples of wood submitted for dating may contain numerous rings, each representing growth in a different year. Thus, rather than measuring a single event (when the tree died or was cut down), the dates of a series of growth years are averaged. This often tends to underestimate the age of the material. Smiley (1985:385) notes that a large error in age estimation can occur in arid or high altitude situations, where tree ring density may be high and dead wood can preserve for extremely long periods of time. Disparities as large as 1000+ years were found in dates from Black Mesa, and there was an 80 percent chance that dates were overestimated by over 200 years, and a 20 percent chance that the disparity was over 500 years (Smiley 1985:385-386).

The disparity in dates was even greater when fuel wood rather than construction wood was used for dating (Smiley 1985:372). This is because wood can be preserved for a long time in the Southwest, even when it is not in a protected location. Thus, wood used for fuel could have been lying on the surface for several hundred years before it was burned. Again, the event being measured is the death of the plant, not when it was used for fuel.

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

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

We will only obtain radiocarbon samples in certain circumstances. Samples of fuel woods will not be submitted. Construction wood is considered the best type of material for radiocarbon dating, especially if it comes from small elements like latillas and lintels. Large elements, like vigas, can also be sampled, but it must be remembered that they were often salvaged from earlier structures and reused. Thus, they may be dating the occupation of another structure and not the one being investigated. Construction wood will be sampled as outlined above. Only bark (if available) and outer rings will be obtained. In general, these materials are more accurately dated by dendrochronology. However, deteriorated wood often does not survive the process of removal in good enough shape or with enough rings to make that type of analysis possible. It is in those cases that radiocarbon samples will be obtained. The only other samples that will be considered for radiocarbon analysis are those that contain materials from annuals, or twigs and leaves from trees. Since radiocarbon dating is less sensitive than many of the other methods potentially available to us, they will only be submitted for processing if those other methods fail to provide accurate dates for the occupations of these sites.

Archaeomagnetic Dating

Archaeomagnetic dating analyzes the remnant magnetization in materials that have been fired. Those materials must contain particles with magnetic properties (ferromagnetic minerals), usually iron compounds like magnetite and hematite. Ferromagnetic minerals retain a remanent, or permanent, magnetization, which remains even after the magnetic field that caused it is removed (Sternberg 1990:13-14). When ferromagnetic materials are heated above a certain point (which varies by the type of compound), the remanent magnetization is erased and particles are remagnetized

(Sternberg 1990:15). Samples of that material can be analyzed to determine the direction of magnetic north at the time of firing. Since magnetic north moves over time, and the pattern of its movement has been plotted for about the last 1,500 years in the Southwest, comparison of a sample with the archaeomagnetic plot can provide a reasonably accurate date. However, it should be remembered that only the last event in which the material was heated to the point where remagnetization could occur is being dated. Thus, a feature could have been in use over a span of decades, but only the last time it was fired to the proper heat can be dated by this method.

Unfortunately, the archaeomagnetic curve for the Southwest is not well defined after A.D. 1500, because not enough samples have been examined for this period to accurately extend the curve (Jeff Cox, personal communication, 1999). Thus, we cannot expect accurate dates for our sites from this method. However, by collecting any such samples that are available, the process of providing sufficient data from the historic period can be continued and augmented. Thus, archaeomagnetic samples will be taken whenever possible. In most cases it is likely that only hearths will provide materials amenable to this type of analysis.

Tree-Ring Dating

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

Because the reuse of wooden roof beams was common in the Southwest, it is not always possible to determine whether a date derived from a viga is related to the construction of the structure within which it was found, or a previous use. Clusters of similar dates in roofing materials are usually, but not always, a good indication that the approximate date of construction is represented. Isolated dates may provide some information, but are often of questionable validity.

Another problem associated with tree-ring dating concerns the condition of the sample being analyzed. In order to apply an accurate date to a specific event (in this case, the year in which a tree stopped growing), the outer surface of the tree is needed. An exact date can be obtained only when the outer part of a sample includes the bark covering of the tree, or rings that were at or near the tree's surface. In addition, enough rings must be present to allow an accurate match with the master sequence. It is often possible to date samples containing only inner rings, but this does not provide a cutting date.

Even considering the potential problems associated with this technique, it represents the best method available for dating sites in the Southwest. Samples of construction materials that appear to contain enough rings for analysis will be collected. Latilla fragments would probably be the best types of specimens for collection, since it is less likely that they were salvaged from earlier dwellings and reused. Unfortunately, the results of testing suggest that few wooden architectural elements will be available from these sites. Thus, few or no tree-ring samples may be taken.

Research Questions

As stated earlier, accurate chronometric data are critical to this study. In order to examine the effects of trade over the Santa Fe Trail on the New Mexican frontier we must be able to establish that these sites actually date to the period suggested by our preliminary examination. At a more fine-grained level, it would be very useful to establish the chronological sequence of structure construction and trash deposition within sites. Were all structures within project limits at LA 4968 built at the same time? Do some of the trash deposits and structures at this site predate the Santa Fe Trail, and if so, by how long? For LA 160 we must determine whether the three trash areas defined during testing represent a single period of rubbish disposal or whether different periods are represented. Can dates derived for this part of the site be compared with those for the structure excavated by Peckham, and if so, do they represent occupations during the same or different periods?

Analysis of Architectural Materials

Analysis of the techniques and materials used to build a structure can provide interesting and potentially important data concerning basic construction technology and occupational history. Certain samples may also help date the period of initial construction, while others could provide information on subsistence activities. A study of construction techniques is integral to providing basic site descriptive information. We feel that it is not enough to simply characterize how a structure looked, archaeologists should also collect information on how structures were built, the types of materials used in construction, and modifications made during occupation.

Collection and Analysis Methods

We will collect a series of standard samples and observations to enable us to analyze construction methods and structure use. Plans and profiles will be drawn for every feature and structure investigated. When possible, perpendicular profiles will be drawn, preferably showing north to south and east to west cross sections, or those that present the greatest amount of information. All such drawings will be tied into the grid systems imposed over these sites. Standard forms will be completed for each feature, room, and structure excavated. They will include information on contents, construction techniques, and associated artifacts and samples.

In order to gather as much information as possible on building techniques, structures will be partly dismantled after they are photographed, plans are drawn, and associated features are excavated and documented. We will cut through walls and floors in order to determine their original configuration. Samples of adobe will be obtained from each room, and from associated features when deemed necessary. While it is possible that not all samples will be processed because of time and financial constraints, they will be available for future research. Whenever possible, approximately 2 liters of material will be obtained. Specimens will be as large as possible when this is not feasible. Samples of native soils will be taken as controls, allowing us to compare them with the adobe used in construction.

Samples will also be taken from floors. If multiple floors are encountered, each will be sampled separately. If possible, specimens of wall plaster will also be collected. Individual features will be sampled when they evidence remodeling. Samples of artificial fill under floors will be collected, if present, for comparison with native soils. Analyses of these materials will be comparable to those conducted during the study of a historic Spanish site near Abiquiu (Boyer in prep.). Variables that will examined include color, particle size distribution, plasticity, and soluble salts. These analyses should provide information that will allow us to assess similarities and differences between samples, and determine whether soil from on-site was used for construction. If so, these studies may provide data on how they were altered by the addition of other materials to achieve the proper amount of plasticity. They will also allow us to look at remodeling episodes (if any are reflected in the construction sequence) and determine whether there are temporal relationships between episodes of feature or floor modification.

Wooden architectural elements will be sampled and described, if encountered. Diameter measurements will be taken for all wooden building elements found, focusing on those with relatively intact cross sections. If suitable specimens are available, we will collect samples. Analysis of these specimens will be aimed at identifying the types of woods used for building and collection of chronometric data. The latter will consist of cross sections of tree rings and suitable radiocarbon samples, as discussed in the section in the section on chronometrics.

Research Questions

The main area of interest to this study is the methods of construction at LA 4968, since there are no structural remains within proposed project limits at LA 160. Were building materials obtained from onsite or nearby? Can we trace the construction sequence, and perhaps link episodes of remodeling or reconstruction in different rooms or structures? These data will also be used to augment the chronometric data and hopefully provide a clearer picture of the construction sequence at LA 4968.

Human Remains

As discussed earlier, the probability of locating and recovering human remains at LA 160 and LA 4968 is very low. If any human remains are recovered, the sample should be extremely limited. Under such circumstances, it will not be possible to establish that they are representative of the human biological populations that created the sites. The main goal of skeletal analysis will therefore be a nondestructive study of the remains in order to add to our general knowledge of historic human populations, rather than to address specific questions raised in the research design. This nondestructive approach will include standard metric studies, aging and sexing of the remains, and documentation of pathologies.

Research Results

The final data recovery and analysis report will be published in the Office of Archaeological Studies' Archaeology Notes series. The report will present all important excavation, analysis, and interpretive results and will include photographs, site and feature plans, and data summaries. Field notes, maps, analytic notes, and photographs will be deposited with the Archaeological Records Management System of the State Historic Preservation Division, located at the Laboratory of Anthropology in Santa Fe.

If human remains are recovered, their disposition will be based on consultations carried out in accordance with state regulations. This process will include the Catholic Archdiocese descendants (if any are identified), and other concerned parties. Other artifacts will be submitted to the MNM Archaeological Research Collection for storage, unless ownership is retained by private land owners, in which case materials will be returned to them.

CONCLUSIONS AND RECOMMENDATIONS

Testing was conducted at two historic sites. LA 160 is a large complex site, and only a small part of the site is within proposed project limits. That area contains three sheet trash deposits and a probable trash pit. LA 4968 is a large multistructural site containing at least eight structures, a well, sheet trash deposits, and at least one trash pit. Except for three structures, all are within the proposed right-of-way. While only about 10 percent of LA 160 is within proposed project limits, at least 70 percent of LA 4968 is within this area. The structure of artifact assemblages at both sites and dates provided by diagnostic artifacts at LA 4968 suggest that both sites were occupied during the early Santa Fe Trail period, ca. 1821 to 1850+.

Structures and/or features and buried cultural deposits were found at both sites, indicating that they have the potential to provide information on local history. This suggests that a more intensive phase of data recovery is necessary at LA 160 and LA 4968. A plan for recovering that information has been developed and is incorporated into this report. The plan includes a research design, outlining questions that will be addressed with information recovered during more intensive investigations, and the field and analytic procedures that will be followed. The general analytic framework will address these sites as representative of the New Mexican frontier and will continue investigations begun at several other historic sites in northern New Mexico. We feel that they can provide important information concerning life on the New Mexican frontier, as well as economic and social changes caused by the dropping of trade barriers during the Mexican Territorial period and the influx of goods and immigrants from the eastern U.S. over the Santa Fe Trail.

REFERENCES CITED

Adams, E. Charles
1979 Cold Air Drainage and Length of Growing Season in the Hopi Mesas Area. *The Kiva* 44:285-296.

Adams, Eleanor B., and Fray Angélico Chávez
1956 *The Missions of New Mexico, 1776: A Description by Fray Francisco Atanasio Dominguez, with other Contemporary Documents*. University of New Mexico Press, Albuquerque.

Akins, Nancy J.
in prep.
Fauna. In *Valencia: A Spanish Colonial and Mexican Period Site along NM 47 in Valencia County, New Mexico*, edited by Nancy J. Akins. Archaeology Notes 267. Museum of New Mexico, Santa Fe.

Alexander, Robert K.
1993 *A Cultural Resource Survey of Southern Portions of the Pojoaque Pueblo Grant*. Dames and Moore, Albuquerque, New Mexico.

Anderson, H. Allen
1985 The Encomienda in New Mexico, 1598-1680. *New Mexico Historical Review* 60:353-377.

Anschuetz, Kurt F.
1986 *Archaeological Excavation of Two Human Burials within the U.S. 285 Right-of-Way at Pojoaque Pueblo, Santa Fe County, New Mexico*. Laboratory of Anthropology Notes 353. Museum of New Mexico, Santa Fe.

Anschuetz, Kurt F., Timothy D. Maxwell, and John A. Ware
1985 *Testing Report and Research Design for the Medanales North Project, Rio Arriba County, New Mexico*. Laboratory of Anthropology Notes 347. Museum of New Mexico, Santa Fe.

Athearn, Frederic J.
1974 *Life and Society in Eighteenth-Century New Mexico, 1692-1776*. Ph.D. dissertation, Department of History, University of Texas at Austin. University Microfilms International No. 74-24, 825, Ann Arbor.

Ayer, Mrs. Edward E. (editor)
1916 *The Memorial of Fray Alonso de Benavides, 1630*. Privately printed. Copyright to Edward E. Ayer, Chicago.

Bannon, John Francis
1963 *The Spanish Borderlands Frontier, 1513-1821*. Holt, Rinehart, and Winston. New York (1974 edition by University of New Mexico Press, Albuquerque).

Barnes, Mark P.
1980 Mexican Lead-Glazed Earthenwares. In *Spanish Colonial Frontier Research*, edited by H. Dobyns, pp. 92-110. Spanish Borderlands Research, No. 1. Center for Anthropological Studies, Albuquerque, New Mexico.

Barnes, Mark R., and Ronald V. May
1972 *Mexican Majolica in Northern New Spain*. Pacific Coast Archaeological Society Occasional Papers No. 2.

Batkin, Jonathan
1987 *Pottery of the Pueblos of New Mexico, 1700-1940*. Taylor Museum of the Colorado Springs Fine Arts Center. Colorado Springs.

Baxter, John O.
1984 *Spanish Irrigation in the Pojoaque and Tesuque Valleys in the Eighteenth and Early Nineteenth Centuries*. Office of the State Engineer, Santa Fe, New Mexico.

1987 *Las Carneradas: Sheep Trade in New Mexico, 1700-1860*. University of New Mexico Press, Albuquerque.

1993 Livestock on the Camino Real. In *El Camino Real de Tierra Adentro*, compiled by G. Palmer, pp. 101-120. Bureau of Land Management, Cultural Resources Series No. 11. Santa Fe.

Baydo, Gerald Robert
1971 Cattle Ranching in Territorial New Mexico. Ph.D. dissertation, Department of History, University of New Mexico, Albuquerque.

Bennett, Merrill K.
1970 Aspects of the Pig. *Agricultural History* 44:223-235.

Billington, Ray A.
1963 *America's Frontier Heritage*. Holt, Rinehart, and Winston, New York (1974 edition by University of New Mexico Press, Albuquerque).

Boyer, Jeffrey L.
1992 La Puente: Eighteenth Century Hispanic Village Life on the Rio Chama Frontier. In *Current Research on the Late Prehistory and Early History of New Mexico*, pp. 227-237, edited by B. Vierra. New Mexico Archaeological Council Special Publication 1. Albuquerque.

in prep.
An Archaeological Perspective on Adobe: Analysis of Building Materials from the Trujillo House. In *Adaptations on the Anasazi and Spanish Frontiers: Excavations at Five Sites near Abiquiú, Rio Arriba County, New Mexico*, by J. Moore, J. Boyer, and D. Levine. Archaeology Notes 187. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Boyer, Jeffrey L., and Linda J. Goodman
in prep.
The Vigil-Torres Site: Archaeological and Ethnohistorical Investigations along NM 518, Talpa, Taos County, New Mexico. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Boyer, Jeffrey L., and James L. Moore (editors)
in prep.
A Manual for Investigations at Archaeological Sites. Office of Archaeological Studies,

Museum of New Mexico, Santa Fe.

Bray, Warwick
1968 *Everyday Life of the Aztecs*. Dorsett Press, New York.

Brown, Marie E.
1997 Archaeofaunal Analysis. In *Data Recovery along the Alameda Boulevard Improvement Project, Bernalillo County, New Mexico*, by M. Brown, pp. 195-259. Office of Contract Archeology, University of New Mexico, Albuquerque.

Buikstra, Jane E., and Mark Swegle
1989 Bone Modification due to Burning: Experimental Evidence. In *Bone Modification*, edited by R. Bonnichsen and M. Sorg, pp. 247-258. University of Maine, Orona.

Cantu, Caesar C.
1966 *Cortes and the Fall of the Aztec Empire*. Modern World Publishing, Los Angeles, California.

Carlson, Alvar Ward
1969 New Mexico's Sheep Industry, 1850-1900: Its Role in the History of the Territory. *New Mexico Historical Review* 44:(1)25-49.

Carrillo, Charles M.
1987 Pottery of the Abiquiu Reservoir Area. In *Archaeological and Historical Research at the Abiquiu Dam Reservoir, Rio Arriba County, New Mexico*, vol. 1, assembled by Kenneth Lord, Nancy Cella, and Jack Bertram. Chambers Group, Albuquerque.

1988 *Santa Rosa de Lima de Abiquiú*. Ms. on file at the Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

1997 *Hispanic New Mexican Pottery: Evidence of Craft Specialization, 1790-1890*. LPD Press. Albuquerque, New Mexico.

in prep.
A History Of Santa Rosa de Lima de Abiquiú. In *Adaptations on the Anasazi and Spanish Frontiers: Excavations at Five Sites near Abiquiu, Rio Arriba County, New Mexico*, by J. Moore, J. Boyer, and D. Levine. Archaeology Notes 187. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Carroll, H. Bailey, and J. Villasana Haggard
1942 *Three New Mexico Chronicles*. Quivira Society, Albuquerque, New Mexico.

Casagrande, Joseph B., Stephen I. Thompson, and Phillip D. Young
1964 Colonization as a Research Frontier: The Ecuadoran Case. In *Process and Pattern in Culture: Essays in Honor of Julian H. Steward*, edited by R. Manners, pp. 281-325. Aldine Publishing, Chicago, Illinois.

Chance, David H., and Jennifer V. Chance
1976 *Kanaka Village/Vancouver Barracks, 1974*. Office of Public Archeology Reports in Highway Archaeology No. 3. University of Washington, Seattle.

Chapin, Charles E., and William R. Seager

1975 Evolution of the Rio Grande Rift in the Socorro and Las Cruces Areas. In *Guidebook of the Las Cruces Area*, edited by W. Seager, R. Clemons, and J. Callender, pp. 297-321. Twenty-Sixth Field Conference, New Mexico Geological Society.

Cohen-Williams, Anita G.
1992 Common Majolica Types of Northern New Spain. *Historical Archaeology* 26:119-130.

Connor, Seymour V., and Jimmy M. Skaggs
1977 *Broadcloth and Britches: The Santa Fe Trade*. Texas A & M University Press, College Station.

Cordell, Linda S.
1975 Predicting Site Abandonment at Wetherill Mesa. *The Kiva* 40:189-202.

Covey, Cyclone (editor)
1990 *Adventures in the Unknown Interior of America*. University of New Mexico Press, Albuquerque. Originally published 1961.

Crass, David Colin, and Deborah L. Wallsmith
1992 Where's the Beef? Food Supply at an Antebellum Frontier Post. *Historical Archaeology* 26(2):3-23.

Deagan, Kathleen
1983 *Spanish St. Augustine: The Archaeology of a Colonial Creole Community*. Academic Press, New York.

1987 *Artifacts of the Spanish Colonies of Florida and the Caribbean, 1500-1800*. Smithsonian Institution Press, Washington, D.C.

Dean, Jeffrey S., and Gary S. Funkhouser
1995 Dendroclimatic Reconstructions for the Southern Colorado Plateau. In *Climate Change in the Four Corners and Adjacent Regions: Implications for Environmental Restoration and Land-Use Planning*, edited by W. Waugh, pp. 85-104. Mesa State College, Grand Junction, Colorado.

Dick, Herbert W.
1968 Six Historic Pottery Types from Spanish Sites in New Mexico. In *Collected Papers in Honor of Lyndon Hargrave*, edited by A. H. Schroeder, pp. 77-93. Papers of the Archaeological Society of New Mexico 1. Museum of New Mexico Press, Santa Fe.

Dike, Sheldon
1958-1959 The Territorial Post Offices of New Mexico. *New Mexico Historical Review* 33(4)-34(4).

Doolittle, Grayson
1973 Culture and Environment in the Cumberland Frontier. In *Papers in Anthropology* 14(1):31-43. University of Oklahoma, Norman.

Dozier, E P.
1970 *The Pueblo Indians of North America*. Case Studies in Cultural Anthropology. Holt, Rinehart, and Winston, New York.

Duffus, R. L.
1930 *The Santa Fe Trail*. University of New Mexico Press (1972 edition), Albuquerque.

Ellis, Florence H.
1987 The Long Lost "City" of San Gabriel del Yunque, Second Oldest European Settlement in the United States. In *When Cultures Meet: Remembering San Gabriel del Yunque Oweenge*, pp. 10-38. Sunstone Press, Santa Fe, New Mexico.

Ellis, Richard N. (editor)
1971 *New Mexico Past and Present*. University of New Mexico Press, Albuquerque.

Espinosa, J. Manuel
1988 *The Pueblo Indian Revolt of 1696*. University of Oklahoma Press, Norman.

Evaskovitch, John
1991 *A Cultural Resources Inventory of Approximately 12.5 Miles of Fiber Optic Line Right-of-Way, Santa Fe County*. Report No. 636. Mariah Associates, Albuquerque, New Mexico.

Fenneman, Nevin M.
1931 *Physiography of the Western United States*. McGraw-Hill Inc., New York.

Fiero, Kathleen
1978 *Prehistoric Garden Plots along the Lower Rio Chama Valley: Archeological Investigations at Sites LA 11830, LA 11831, and LA 11832, Rio Arriba County, New Mexico*. Laboratory of Anthropology Notes No. 111E. Museum of New Mexico, Santa Fe.

Folks, James L.
1975 *Soil Survey of Santa Fe Area, New Mexico: Santa Fe County and Part of Rio Arriba County*. Department of Agriculture, Soil Conservation Service, Cartographic Division, Washington, D.C.

Forbes, Jack D.
1960 *Apache, Navajo, and Spaniard*. University of Oklahoma Press. Norman.

Frank, Larry, and Francis H. Harlow
1990 *Historic Pottery of the Pueblo Indians 1600-1800*. 2d ed. Schiffer Publishing, West Chester, Pennsylvania.

Frank, Ross H.
1992 *From Settler to Citizen: Economic Development and Cultural Change in Late Colonial New Mexico, 1750-1820*. Ph. D. dissertation, Department of History, University of California at Berkely. University Microfilms International, Ann Arbor, Michigan.

Futch, T. G., III
1995 *An Archaeological Survey at Rancho de Cuyamungue for Robert F. Boissiere*. American Studies Foundation, Alcalde, New Mexico.

Gabin, Vickie L., and Lee E. Lesperance
1977 *New Mexico Climatological Data: Precipitation, Temperature, Evaporation, and Wind Monthly and Annual Means, 1850-1975*. W. K. Summers and Associates, Socorro, New Mexico.

Gade, Daniel W.
1987 The Iberian Pig in the Central Andes. *Journal of Cultural Geography* 7(2):35-49.

Glover, Vernon J., and John McCall
1988 The Santa Fe Railway. In *Pecos: Gateway to Pueblos and Plains*, edited by J. Bezy and J. Sanchez, pp. 112-117. Southwest Parks and Monuments Association, Tucson, Arizona.

Gregg, Josiah
1844 *The Commerce of the Prairies* (1954 edition, edited by M. Moorhead). University of Oklahoma Press, Norman.

Grubbs, Frank H.
1960 Frank Bond: Gentleman Sheepherder of Northern New Mexico, 1888-1915. *New Mexico Historical Review* 35(3):169-199.

Habicht-Mauche, Judith A.
1988 *Historic Artifact Analysis: Hubbell Trading Post National Historic Site*. Southwest Archaeological Consultants, Santa Fe, New Mexico.

Hackett, Charles W. (editor)
1937 *Historical Documents relating to New Mexico, Nueva Vizcaya, and Approaches Thereto, to 1773*, vol. 3, translated by A. Bandelier and F. Bandelier. Carnegie Institution, Washington, D.C.

Haecker, Charles M.
1987 *Cultural Resource Survey of the Proposed Truck Weigh Station at Cuyamungue, Project No. SP-F-051-1(207)*. Environmental Section/Technical Support Bureau, New Mexico State Highway and Transportation Department, Santa Fe.

Hallenbeck, C.
1918 Night Temperature Studies in Roswell Fruit District. *Monthly Weather Review* 46:364-373.

Hallenbeck, Cleve
1950 *Land of the Conquistadores*. Caston Printers, Cladwell, Idaho.

Hammond, George P., and Agapito Rey
1953 *Don Juan de Oñate, Colonizer of New Mexico, 1595-1628*. Vols. 1 and 2. University of New Mexico Press, Albuquerque.

1966 *The Rediscovery of New Mexico 1580-1594: The Explorations of Chamuscado, Espejo, Castaño de Sosa, Morlete, and Leyva de Bonilla and Humana*. University of New Mexico Press, Albuquerque.

Hannaford, Charles A., and Yvonne R. Oakes
1983 Historic Artifacts. In *The Ontiberos Site: A Hispanic homestead near Roswell, New Mexico*. Laboratory of Anthropology Notes 311. Museum of New Mexico, Santa Fe.

Harlow, Francis H.
1973 *Matte-Paint Pottery of the Tewa, Keres, and Zuni Pueblos*. Museum of New Mexico Press, Santa Fe.

Hohmann, John W., Margaret Davis, Joel D. Irish, Donald C. Irwin, and Christine H. Virden
1998 *Phase I (Class III) Archaeological Survey of 22.4 Kilometers (14 Miles) along U.S. 84/285, Santa Fe to Pojoaque, Santa Fe County, New Mexico*. Cultural Resource Group Clearance Report No. 48. Louis Berger and Associates, Santa Fe.

Huelsbeck, David R.
1991 Faunal Remains and Consumer Behavior: What *Is* Being Measured? *Historical Archaeology* 25:62-76.

Hurt, Wesley R.
1939 Indian Influence at Manzano. *El Palacio* 46:245-254.

Hurt, Wesley R., and Herbert W. Dick
1946 Spanish-American Pottery from New Mexico. *El Palacio* 53:280-288, 307-312.

Hyams, Edward, and George Ordish
1963 *The Last of the Incas: The Rise and Fall of an American Empire*. Dorsett Press, New York.

Ivey, James E.
1993 Seventeen Century Mission Trade on the Camino Real. In *El Camino Real de Tierra Adentro*, compiled by G. Palmer, J. Piper, and L. Jacobson, pp. 41-67. New Mexico Bureau of Land Management Cultural Resources Series No. 11. Albuquerque.

Kelley, Vincent C.
1979 Geomorphology of the Española Basin. In *New Mexico Geological Society Guidebook: Santa Fe Country (30th Field Conference)*, pp. 281-288. University of New Mexico, Albuquerque.

Kinnaird, Lawrence
1958 *The Frontiers of New Spain: Nicolas de Lafora's Description, 1766-1768*. Quivira Society Publications 13, Berkeley, California.

Kopytoff, Igor
1987 The Internal African Frontier: The Making of African Political Culture. In *The African Frontier: The Reproduction of Traditional African Societies*, edited by I. Kopytoff, pp. 3-84. Indiana University Press, Bloomington.

Kristof, Ladis K. D.
1959 The Nature of Frontiers and Boundaries. *Annals of the Association of American Geographers* 49:269-282.

Lang, Richard W.
1997 Ceramics from Archaeological Sites in the Vicinity of the Jemez Mountains: The Ole Corridor. Vol. 2, *Artifacts*, edited by J. Acklen, pp. 231-276. Public Service Company of New Mexico, Albuquerque.

Levine, Daisy F.
1990 Tewa or Hispanic Manufacture? Pottery from 18th and 19th Century Spanish Sites near Abiquiu. In *Clues to the Past: Papers in Honor of William M. Sundt*, edited by M. Duran and D. Kirkpatrick 173-183. Archaeological Society of New Mexico, Albuquerque.

Levine, Frances E., John C. Acklen, Jack B. Bertram, Stephen C. Lent, and Gale McPherson
1985 *Archeological Excavations at LA 16769*. Public Service Company of New Mexico Archeological Report No. 5. Public Service Company of New Mexico, Albuquerque.

Lewis, Kenneth E.
1973 An Archaeological Consideration of the Frontier. In *Papers in Anthropology* 14(1):84-103. University of Oklahoma, Norman.

1977 Sampling the Archeological Frontier: Regional Models in Historical Archeology. In *Research Strategies in Historical Archeology*, edited by S. South, pp. 151-201. Academic Press, New York.

Lucas, Mary Beth
1984 Norton-Tesuque 115 Kv Transmission Project Earth Resources Technical Report. Ms. on file, Public Service Company of New Mexico, Albuquerque.

Lyman, R. Lee
1994 *Vertebrate Taphonomy*. Cambridge University Press, Cambridge.

Maker, H. J., H. E. Dregne, V. G. Link, and J. U. Anderson
1974 *Soils of New Mexico*. New Mexico State University Agricultural Experiment Station Research Report No. 285. Las Cruces.

Martin, Paul S.
1963 *The Last 10,000 Years*. University of Arizona Press, Tucson.

Mera, H. P.
1939 *Style Trends of Pueblo Pottery in the Rio Grande and Little Colorado Cultural Areas from the 16th to the 19th Century*. Memoirs of the Laboratory of Anthropology 3. Museum of New Mexico, Santa Fe.

Miller, Robert Ryan (translator)
1975 New Mexico in Mid-Eighteenth Century: A Report Based on Governor Vélez Cachupín's Inspection. *Southwestern Historical Quarterly* 79:166-181.

Moir, Randall W.
1982 Windows to Our Past: A Chronological Scheme for the Thickness of Pane Fragments from 1635-1982. Ms. on file at the Department of Anthropology, Southern Methodist University, Dallas, Texas.

Moore, James L.
1989 *Data Recovery Plan for LA 160, a Spanish Colonial Site at the Pojoaque Port of Entry along U.S. 84, Santa Fe County, New Mexico*. Laboratory of Anthropology Notes No. 473. Museum of New Mexico, Santa Fe.

1992 Spanish Colonial Stone Tool Use. In *Current Research on the Late Prehistory and Early History of New Mexico*, edited by B. Vierra, pp. 239-244. New Mexico Archaeological Council Special Publication 1. Albuquerque.

1998 *The Pedro Sanchez Site: Identifying a Spanish Colonial Rancho Using Documentary and Archaeological Evidence*. Paper presented at the 1998 joint annual meeting of the Historical

Societies of New Mexico and Arizona, Santa Fe.

in prep. a (editor)
Prehistoric and Historic Occupation of Los Alamos and Guaje Canyons: Data Recovery at Three Sites near the Pueblo of San Ildefonso. Archaeology Notes 244. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

in prep. b
Historic Occupation of the Glorieta Valley in the Seventeenth and Nineteenth Centuries: Excavations at LA 76138, LA 76140, and LA 99029. Archaeology Notes 262. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Moore, James L., Jeffrey L. Boyer, and Daisy F. Levine
in prep.
Adaptations on the Anasazi and Spanish Frontiers: Excavations at Five Sites near Abiquiú, Rio Arriba County, New Mexico. Office of Archaeological Studies, Archaeology Notes 187. Museum of New Mexico, Santa Fe.

Moorhead, Max L.
1958 *New Mexico's Royal Road: Trade and Travel on the Chihuahua Trail*. University of Oklahoma Press, Norman.

Noël Hume, Ivor
1962 *Here Lies Virginia*. Alfred A. Knopf, New York.

NPS (National Park Service)
1990 *Santa Fe National Historic Trail Comprehensive Management and Use Plan*. USDI National Park Service. Government Printing Office, Washington, D.C.

Noyes, Stanley
1993 *Los Comanches: The Horse People, 1751-1845*. University of New Mexico Press, Albuquerque.

OAS (Office of Archaeological Studies)
1994a *Standardized Lithic Artifact Analysis: Attributes and Variable Code Lists*. Archaeology Notes 24b. Office of Archaeological Studies Museum of New Mexico, Santa Fe.

1994b *Standardized Ground Stone Artifact Analysis: A Draft Manual for the Office of Archaeological Studies*. Archaeological Notes 24a. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

1994c *Historic Artifact Analysis: Standardized Variable and Attribute Codes*. Archaeological Notes 24d. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Olinger, Bart
1988 Pottery Studies Using X-Ray Fluorescence. Part 3: The Historic Pottery of the Northern Tewa. *Pottery Southwest* 15(4).

Pilz, Wayne B.
1984 Norton-Tesuque 115 Kv Transmission Project Biotic Resources Technical Report. Ms. on file, Public Service Company of New Mexico, Albuquerque.

Porter, Valerie
1991 *Cattle: A Handbook to the Breeds of the World*. Facts on File, New York.

Pratt, Boyd C., and David H. Snow
1988 *The North Central Regional Overview: Strategies for the Comprehensive Survey of the Architectural and Historic Archaeological Resources of North Central New Mexico.* Vol. 1. New Mexico Historic Preservation Division, Santa Fe.

Preucel, Robert W.
1987 Settlement Succession on the Pajarito Plateau, New Mexico. *The Kiva* 53:3-33.

Quintana, Frances Leon, and David H. Snow
1980 Historical Archeology of the Rito Colorado Valley, New Mexico. *Journal of the West* 19(3):40-50.

Reeve, Frank D.
1960 Navajo-Spanish Diplomacy, 1770-1790. *New Mexico Historical Review* 35:200-235.

Reitz, Elizabeth J., and Stephen L. Cumbaa
1983 Diet and Foodways of Eighteenth-Century Spanish St. Augustine. In *Spanish St. Augustine: The Archaeology of a Colonial Creole Community*, by K. Deagan, pp. 151-167. Academic Press, New York.

Reynolds, S. E.
1956 *Climatological Summary, New Mexico: Temperature 1850-1954; Frost 1850-1954; and Evaporation 1850-1954*. Technical Report 5. New Mexico State Engineers Office, Santa Fe.

Roenke, Karl G.
1978 *Flat Glass: Its Use as a Dating Tool for Nineteenth Century Archaeological Sites in the Pacific Northwest and Elsewhere*. Northwest Anthropological Research Notes Memoir No. 4. Moscow, Idaho.

Sando, Joe S.
1979 The Pueblo Revolt. In *Handbook of North American Indians,* vol. 9, edited by A. Ortiz, pp. 194-197. Smithsonian Institution Press, Washington, D.C.

Schlegel, Alice
1992 African Political Models in the American Southwest: Hopi as an Internal Frontier Society. *American Anthropologist* 94:376-397.

Schoen, Christopher M.
1990 Window Glass on the Plains: An Analysis of Flat Glass Samples from Ten Nineteenth Century Plains Historic Sites. *Central Plains Archaeology* 2:57-90.

Scholes, Frances V.
1930 The Supply Service of the New Mexico Mission in the Seventeenth Century. *New Mexico Historical Review* 5:93-115, 186-210, 386-404.

1935 Civil Government and Society in New Mexico in the Seventeenth Century. *New Mexico Historical Review* 10:71-111.

Schroeder, Albert H.
1979 Pueblos Abandoned in Historic Times. In *Handbook of North American Indians,* vol. 9, edited by A. Ortiz, pp. 236-254. Smithsonian Institution Press. Washington, D.C.

Scurlock, Dan
1998a *From the Rio to the Sierra: An Environmental History of the Middle Rio Grande Basin*. U.S.D.A. Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RMRS-GTR-5, Fort Collins, Colorado.

1998b A Poor Man's Cow: The Goat in New Mexico and the Southwest. *New Mexico Historical Review* 73(1):7-24.

Simmons, Marc
1969 Settlement Patterns and Village Plans in Colonial New Mexico. *Journal of the West* 8(1):7-21.

1977 (translator and editor)
Father Juan Augustín de Morfi's Account of Disorders in New Mexico, 1778. Historical Society of New Mexico, Isleta.

1979 History of Pueblo-Spanish Relations to 1821. In *Handbook of North American Indians,* vol. 9, edited by A. Ortiz, pp. 178-193. Smithsonian Institution Press, Washington, D.C.

1985 The Chacón Economic Report of 1803. *New Mexico Historical Review* 60(1):81-88.

Simmons, Marc, and Frank Turley
1980 *Southwestern Colonial Ironworking*. Museum of New Mexico Press, Santa Fe.

Smiley, Francis E., IV
1985 *The Chronometrics of Early Agricultural Sites in Northeastern Arizona: Approaches to the Interpretation of Radiocarbon Dates.* Ph.D. dissertation, University of Michigan. University Microfilms International (8520986), Ann Arbor.

Snow, David H.
1965 The Chronological Position of Mexican Majolicas in the Southwest. *El Palacio* 72:25-35.

1973 Some Economic Consideration of Historic Rio Grande Pueblo Pottery. In *The Changing Ways of Southwestern Indians; A Historic Perspective, El Corral de Santa Fe, Westerners Brand Book*, edited by A. Schroeder, pp. 55-72. Rio Grande Press, Glorieta, New Mexico.

1982 The Rio Grande Glaze, Matte Paint, and Plainware Tradition. *Arizona Archaeologist* 15:235-278. Arizona Archaeological Society, Phoenix.

1983 A Note on Encomienda Economics in Seventeenth Century New Mexico. In *Hispanic Arts and Ethnohistory in the Southwest*, edited by M. Weigle, pp. 347-357. Ancient City Press. Santa Fe, New Mexico.

1984 Spanish American Pottery Manufacture in New Mexico: A Critical Review. *Ethnohistory* 31(2):93-113.

1993 Purchased in Chihuahua for Feasts. In *El Camino Real de Tierra Adentro*, compiled by G.

Palmer, J. Piper, and L. Jacobson, pp. 133-146. New Mexico Bureau of Land Management Cultural Resource Series No. 11. Albuquerque.

Spivey, Janet
1998 Ethnohistory of the Romero Homesite: LA 6579. Ms. on file, Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Steffen, Jerome O.
1980 *Comparative Frontiers: A Proposal for Studying the American West*. University of Oklahoma Press, Norman.

Sternberg, Robert S.
1990 The Geophysical Basis of Archaeomagnetic Dating. In *Archaeomagnetic Dating*, edited by J. Eighmy and R. Sternberg, pp. 5-28. University of Arizona Press, Tucson.

Suess, Hans E.
1986 Secular Variations of Cosmogenic C14 on Earth: Their Discovery and Interpretation. *Radiocarbon* 28:259-265.

Swagerty, William R.
1988 Indian Trade in the Trans-Mississippi West to 1870. In *Handbook Of North American Indians*, vol. 4, edited by W. Washburn, pp. 351-374. Smithsonian Institution Press, Washington, D.C.

Thomas, Alfred B.
1932 *Forgotten Frontiers: A Study of the Spanish Indian Policy of Don Juan Bautista de Anza, Governor of New Mexico, 1777-1787*. Reprint edition, 1969. University of Oklahoma Press, Norman.

1940 *The Plains Indians and New Mexico, 1751-1778*. University of New Mexico Press, Albuquerque.

Toll, Mollie S.
1985 An Overview of Chaco Canyon Macrobotanical Materials and Analyses to Date. In *Environment and Subsistence of Chaco Canyon, New Mexico*, edited by F. Mathien, pp. 247-277. Publications in Archeology 18E, Chaco Canyon Studies. USDI. National Park Service, Albuquerque, New Mexico.

Toll, Mollie S.
1987 Plant Utilization at Pueblo Alto: Flotation and Macrobotanical Analyses. In *Investigations at the Pueblo Alto Complex, Chaco Canyon*, vol. 3, pt. 2, edited by F. Mathien and T. Windes, pp. 691-788. Publications in Archeology 18F, Chaco Canyon Studies. USDI National Park Service, Santa Fe, New Mexico.

Tuan, Yi Fu, Cyril E. Everard, Jerold G. Widdison, and Ivan Bennett
1973 *The Climate of New Mexico*. Rev. ed. New Mexico State Planning Office, Santa Fe.

Utley, Robert M.
1988 Indian-United States Military Situation, 1848-1891. In *Handbook Of North American Indians,* vol. 4, edited by W. Washburn, pp. 163-184. Smithsonian Institution Press, Washington, D.C.

Van Ness, John R.
1980 The Juan Bautista Grant: Was It a Community Land Grant? In *Spanish and Mexican Land Grants in New Mexico and Colorado*, edited by J. Van Ness and C. Van Ness, pp. 107-116. Center for Land Grant Studies, Santa Fe, New Mexico.

von den Driesch, Angela
1976 *A Guide to the Measurement of Animal Bones from Archaeological Sites*. Peabody Museum Bulletin 1. Harvard University, Cambridge.

Warren, A. Helene
1979 Historic Pottery of the Cochiti Reservoir Area. In *Archaeological Investigations in Cochiti Reservoir, New Mexico*, vol. 4, edited by J. Biella and R. Chapman, pp. 235-245. Office of Contract Archeology, University of New Mexico, Albuquerque.

Wilson, C. Dean
in prep.
Ceramic report, Nambe Project. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Windes, Thomas C., and Dabney Ford
1991 The Chaco Wood Project: The Chronometric Reappraisal of Pueblo Bonito. Chaco Wood Project Series 1. Ms. on file, Division of Cultural Research, National Park Service, Southwest Regional Office, Santa Fe, New Mexico.

Winship, George P.
1896 *The Journey of Coronado, 1540-1542*. Reprint edition 1990. Golden, Colorado.

Winther, Oscar Osburn
1964 *The Transportation Frontier: Trans-Mississippi West, 1865-1890*. Holt, Rinehart, and Winston, New York.

Wiseman, Regge N.
1992 Early Spanish Occupation of Santa Fe: Excavations at the La Fonda Parking Lot. In *Current Research on the Late Prehistory and Early History of New Mexico*, pp. 207-214, edited by B. J. Vierra. New Mexico Archaeological Council Special Publication 1, Albuquerque.

Woosley, Anne I., and Bart Olinger

1990 Ethnicity and the Production of Micaceous Ware in the Taos Valley. In *Clues to the Past: Papers in Honor of William M. Sundt*, edited by M. Duran and D. Kirkpatrick, pp. 351-372. Archaeological Society of New Mexico 16. Albuquerque.

APPENDIX 2: POLICY ON COLLECTION, DISPLAY, AND REPATRIATION OF CULTURALLY SENSITIVE MATERIALS

I. INTRODUCTION

The policy of the Museum of New Mexico is to collect, care for, and interpret materials in a manner that respects the diversity of human cultures and religions.

Culturally sensitive materials include material culture as well as the broader ethical issues which surround their use, care, and interpretation by the Museum. The Museum's responsibility and obligation are to recognize and respond to ethical concerns.

II. DEFINITIONS

A. "Culturally sensitive materials" are objects or materials whose treatment or use is a matter of profound concern to living peoples; they may include, but are not limited to:

   1. "Human remains and their associated funerary objects" shall mean objects that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed with individual human remains either at the time of death or later;

   2. "Sacred objects" shall mean specific items which are needed by traditional religious leaders for the practice of an ongoing religion by present-day adherents;

   3. Photographs, art works, and other depictions of human remains or religious objects, and sacred or religious events; and

   4. Museum records, including notes, books, drawings, and photographic and other images relating to such culturally sensitive materials, objects, and remains.

B. "Concerned party" is a museum-recognized representative of a tribe, community, or an organization linked to culturally sensitive materials by ties of culture, descent, and/or geography. In the case of a federally recognized Indian tribe, the representative shall by tribally authorized.

C. "Repatriation" is the return of culturally sensitive materials to concerned parties. Repatriation is a collaborative process that empowers people and removes the stigma of cultural paternalism which hinders museums in their attempts to interpret people and cultures with respect, dignity, and accuracy. Repatriation is a partnership created through dialogue based upon cooperation and mutual trust between the Museum and the concerned party.

D. The Museum of New Mexico's Committee on Sensitive Materials is the committee, appointed by the Director of the Museum of New Mexico, that shall serve as the Museum of New Mexico's advisory body on issues relating to the care and treatment of sensitive materials.

III. IDENTIFICATION OF CONCERNED PARTIES

A. The Museum shall initiate action to identify potentially concerned parties who may have an interest in culturally sensitive material in the Museum's collections.

B. The Museum encourages concerned parties to identify themselves and shall seek out those individuals or groups whom the Museum believes to be concerned parties.

C. The Museum's sensitive materials committee shall review all disputed individual claims of concerned-party status in consultation with the tribe, community, or organization which the individual(s) claim to represent.

The Museum's sensitive materials committee shall assist, when necessary, in designating concerned parties who have an interest in culturally sensitive materials contained in the collections of the Museum of New Mexico.

D. The Museum shall provide an inventory of pertinent culturally sensitive materials to recognized concerned parties.

E. The Museum shall work with concerned parties to determine the appropriate use and care of and procedures for culturally sensitive materials which best balance the needs of all parties involved.

IV. IDENTIFICATION AND TREATMENT OF CULTURALLY SENSITIVE MATERIALS

A. Within five years of the date of adoption of this policy, each Museum unit shall survey to the extent possible (in consultation with concerned parties, if appropriate) its collections to determine items or material which may be culturally sensitive materials. The Museum unit shall submit to the Director of the Museum of New Mexico an inventory of all potentially culturally sensitive materials. The inventory shall include to the extent possible the object's name, date, and type of accession, catalogue number, and cultural identification. Within six months of submission of its inventory to the Director of the Museum of New Mexico, each Museum unit shall then develop and submit a plan to establish a dialogue with concerned parties to determine appropriate treatment of culturally sensitive items or materials held by the unit.

B. As part of its treatment plans for culturally sensitive materials, the Museum reserves the right to restrict access to, or use of, those materials to the general public. The Museum staff shall allow identified concerned parties access to culturally sensitive materials.

C. Conservation treatment shall not be performed on identified culturally sensitive materials without consulting concerned parties.

D. The Museum shall not place human remains on exhibition. The Museum may continue to retain culturally sensitive materials. If culturally sensitive materials, other than human remains, are exhibited, then a good-faith effort to obtain the advice and counsel of the proper concerned party shall be made.

E. All human skeletal remains held by the Museum shall be treated as human remains and are *de facto* sensitive materials. The Museum shall discourage the further collection of human remains; however, it will accept human remains as part of its mandated responsibilities as the State Archaeological Repository. At its own initiation or at the request of a concerned party, the Museum may accept human remains to retrieve them from the private sector and furthermore may accept human remains with the explicit purpose of returning them to a concerned party.

IV. REPATRIATION OF CULTURALLY SENSITIVE MATERIALS

A. On a case-by-case basis, the Museum shall seek guidance from recognized concerned parties regarding the identification, proper care, and possible disposition of culturally sensitive materials.

B. Negotiations concerning culturally sensitive materials shall be conducted with professional discretion. Collaboration and openness with concerned parties are the goals of these dialogues, not publicity. If concerned parties desire publicity, then it will be carried out in collaboration with them.

C. The Museum shall have the final responsibility of making a determination of culturally sensitive materials subject to the appeal process as outlined under Section VII A.

D. The Museum of New Mexico accepts repatriation as one of several appropriate actions for culturally sensitive materials only if such a course of action results from consultation with designated concerned parties as described in Section III of this policy.

E. The Museum may accept or hold culturally sensitive materials for inclusion in its permanent collection.

F. The Museum may temporarily accept culturally sensitive materials to assist efforts to repatriate them to the proper concerned party.

G. To initiate repatriation of culturally sensitive materials, the Museum of New Mexico's current deaccession policy shall be followed. The curator working with the concerned party shall complete all preparations for deaccession through the Museum Collections Committee and Director before negotiations begin.

H. Repatriation negotiations may also result in, but are not limited to, the retention of objects with no restrictions on use, care, and/or exhibition; the retention of objects with restriction on use, care, and/or exhibition; the lending of objects whether permanently or temporarily for use to a community; and the holding in trust of culturally sensitive materials for the concerned party.

I. When repatriation of culturally sensitive materials occurs, the Museum reserves the right to retain associated Museum records but shall consider each request for such records on an individual basis.

VI. ONGOING RECOVERY OR ACCEPTANCE OF ARCHAEOLOGICAL MATERIALS

A. In providing sponsored archaeological research or repository functions, the Museum shall work with agencies that regulate the inventory, scientific study, collection, curation, and/or disposition of archaeological materials to ensure, to the extent possible under the law, that these mandated functions are provided in a manner that respects the religious and cultural beliefs of concerned parties.

B. When entering into agreements for the acceptance of, or continued care for, archaeological repository collections, the Museum may issue such stipulations as are necessary to ensure that the collection, treatment, and disposition of the collections include adequate consultation with concerned parties and are otherwise consistent with this Policy.

C. In addition to the mandated treatment of research sites and remains and in those actions where treatment is not mandated, defined, or regulated by laws, regulations, or permit stipulations, the Museum shall use the following independent guidelines in recovering or accepting archaeological materials:

1. Prior to undertaking any archaeological studies at sites with an apparent relationship to concerned parties, the Museum shall ensure that proper consultation with the concerned parties has taken place.

2. When so requested by concerned parties, the Museum shall include an observer, chosen by the concerned party, in the crew of an archaeological study.

3. The Museum shall not remove human remains and their associated funerary objects or materials from their original context nor conduct any destructive studies on such remains, objects, and materials except as part of procedures determined to be appropriate through consultation with concerned parties, if any.

4. The Museum reserves the right to restrict general public viewing of in situ human remains and associated funerary objects or items of a sacred nature and further shall not allow the public to take or prepare images or records of such objects, materials, or items, except as part of procedures determined to be appropriate through consultation with concerned parties. Photographic and other images of human remains shall be created and used for scientific records only.

5. The Museum reserves the absolute right to limit or deny access to archaeological remains being excavated, analyzed, or curated if access to these remains would violate religious practices.