PUEBLO ON THE PLAINS: THE SECOND SEASON OF INVESTIGATIONS AT THE MERCHANT SITE IN SOUTHEASTERN NEW MEXICO Volume 1

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PUEBLO ON THE PLAINS: Volume 1

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BUREAU OF LAND MANAGEMENT

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Carlsbad Field Office
Permian Basin Programmatic Agreement
BPA Project No. 10

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Prepared for:
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CONTRACT DATA

This report was prepared under Permian Basin Programmatic Agreement (PBPA) Blanket Purchase Authority (BPA) Contract No. L15PA00001, Task Order No. 140L0618F0383, "BPA 10 Additional Investigations at the Merchant Site (LA 43414) and TRU Survey at 51 Sites near the Carlsbad Field Office," administered by the Carlsbad Field Office, Bureau of Land Management, 620 E. Greene Street, Carlsbad, New Mexico.

ABSTRACT

This report presents the results of the second season of investigations at the Merchant village site (LA 43414) in southeastern New Mexico. The excavations and analyses were sponsored by the Carlsbad Field Office (CFO) of the Bureau of Land Management and funded under the Permian Basin Programmatic Agreement. Excavations focused on sections of room blocks in two areas of the main village, the agricultural fields, and midden deposits.

ACKNOWLEDGMENTS

The 2014–2015 and 2019 investigations of the Merchant site involved a multidisciplinary team of field archaeologists, laboratory analysts, remote sensing specialists, geoarcheologists, and specialists in the analysis of subsistence samples and material culture. The investigations and the results reported herein are also the product of a long-term, cooperative, and dedicated effort among many archaeologists from southern New Mexico. First and foremost, the Carlsbad Field Office deserves credit for developing the project under the Permian Basin Programmatic Agreement and for its support and encouragement during the course of the project. Martin Stein, Elia Perez, and Bruce Boeke deserve credit, and without their support it would not have been possible to produce this report.

I also wish to thank the CFO and the Historic Preservation Division, New Mexico Department of Cultural Affairs for their insightful comments, as well as the fast review of the 709 page draft report.

As always, I feel that the result of any excavation project is only as good as the quality of the information recorded by the field crew. And, as always, Tim Graves deserves enormous credit for the success of both seasons of fieldwork at the Merchant site. Tim's ability to deal with the subtleties of architecture and stratigraphy and his mandate that excavations be accurately and properly documented were the basis for the outstanding results seen throughout this report and the 2016 report. Archaeologists familiar with the site and its history of massive strip-looting and potholing were, quite frankly, astounded at Tim's ability to tease out the remnants of walls, floors, and rooms in the eastern room block. Tim also compiled the databases and data tabulations used throughout the report and completed the lithic analysis and UVF studies.

Tim was assisted by a field crew who provided an exemplary level of documentation on such a difficult and complex site: Juan Arias, Trevor Lea, Scott Kachelries, and Tabor Vess. The photographic record of the fieldwork was managed by Juan Arias, who also assisted with the total station mapping of the site.

The document could not have been produced without the support and assistance of numerous supervisory and support staff of Versar. Michelle Wurtz (Operations Manager) enthusiastically supported the project. Additional office and management support was provided by Peter Condon. Butch Fries edited the 500+ pages of text. Lillian Ponce served as laboratory manager and did a fantastic job of cataloging the thousands artifacts. Lillian also provided much help and assistance in locating samples to submit to laboratories and finding artifacts for study or documentation. Photographs of the artifacts collected during the 2019 fieldwork were taken by Juan Arias of the El Paso office.

Feature planviews and profiles and site maps were produced by Amanda Maldonado. Mark Willis produced the extensive aerial imagery of the site and surroundings. Katherine Jones produced the geographic information system (GIS) site maps. All of the figures required several modifications and corrections to meet my standards and to reflect the accompanying text discussions. Amanda, Katherine, and Mark never grew impatient with my requests for changes, additions, and deletions. I am grateful for their efforts and dedication to produce graphics of the highest quality and accuracy.

Several specialists contributed to the study of the natural setting and remote sensing studies. Charles Frederick conducted the geomorphic investigations of the agricultural fields and eolian deposits north of the village area. His contributions and insights are a critical component of the discussions regarding those features. Chet Walker conducted the remote sensing survey of

extramural areas to search for pits or other features. As with so many of our excavation and rock art documentation projects of the past 20 years, Mark Willis merits particular commendation for the aerial photographic and photogrammetric surveys of the village excavations, agricultural fields, and surrounding areas of the site. The imagery collected during the two seasons proved to be an essential component for analyses of the agricultural fields, architecture, and site layout.

In a similar fashion, the specialists in the identification and analysis of subsistence remains deserve credit: Phil Dering, Susan Smith, Jeremy Loven, John Speth, Crystal Dozier, and John Jones. Jeremy analyzed several thousand animal bones. Phil Dering and Susan Smith analyzed the flotation and pollen samples recovered from pit structures, agricultural features, and other contexts. As always, they were open to discussion and debate regarding the interpretation of the results, and their counsel and insights are greatly appreciated. Each of them took an active interest in the site and put in extra time and effort to parse out the subsistence record, including traveling to the site during the heat of July to obtain an on-site impression of the village, agricultural fields, and surrounding natural landscape. A noteworthy example is Susan's attempt to use a more refined pollen extraction method, which resulted in the identification of maize pollen in samples from the agricultural fields. Crystal Dozier analyzed residues on a sample of Ochoa ware sherds, and John Jones analyzed the phytolith samples from the agricultural fields and bedrock mortars.

The specialists in geochemical sourcing and petrography deserve credit. For several years, I have enjoyed collaborating with Jeff Ferguson of MURR during efforts to classify and identify production areas using neutron activation analysis (NAA) data on ceramics from the southern Southwest, including Ochoa wares from the Merchant site. I appreciate his extra effort to identify compositional groups among the samples submitted during this and previous projects. Mary Ownby's detailed petrographic analysis provides additional insights into the composition and origin of Ochoa ware ceramics. Darrell Creel and Luis Alvarado shared their NAA data for Ochoa ware samples from west Texas. Steve Shackley performed the X-ray fluorescence analysis of obsidian artifacts. I also thank Chris Lintz for identifying the opalite material in the lithic assemblage and Geoff Cunnar for the insight into the role of polishing stones.

I also wish to thank the chronometric specialists who helped me refine the chronology of the features and natural strata at LA 43414. Mark Bateman of the University of Sheffield provided the optically stimulated luminescence (OSL) dates for Charles Frederick's geomorphological and geoarchaeological review of the stratigraphy at the Merchant site and elsewhere on the Mescalero Plain. James Feathers of the Luminescence Dating Laboratory, University of Washington, provided luminescence dates on a sample of Ochoa ware ceramics collected from rooms and midden deposits.

Other specialists provided expertise on critical components of the research at the Merchant site. Amanda Castañeda, Mark Willis, and Juan Arias documented the bedrock grinding features near the village site. Genevieve Woodhead examined a sample of Ochoa Indented Corrugated ceramics and offered critical insights on the technological and social contexts of the ware. I also wish to acknowledge Sunday Eiselt for generously sharing her archive of publications on Southwestern agricultural fields that spared me a substantial amount of time that otherwise would have been spent searching the Internet.

Last but not least, as with the first season of investigations, John Speth's counsel and contributions are much appreciated, as was his visit to the site during the span of 100+ degree temperatures in July of 2019. His interest, experience, and affection for the archaeology of southeastern New Mexico were apparent throughout the project, and he provided many insights on the material culture and the broader implications of what we found during our fieldwork. John was always willing to provide a comment or a source of information for a question regarding the architecture and material

culture, even when the question arrived via a late-night e-mail. John also reviewed several draft chapters and provided insights and editorial comments.

I appreciate the counsel, contributions, insights, and support of everyone who contributed to the realization of this report.

Finally, Robert Leslie and the members of the Lea County Archaeological Society deserve mention and commendation. Robert "Bus" Leslie, John Corley, John Runyan, Calvin Smith, and several unnamed members of the society spent five years excavating the site during their weekends and other free time. They did so while the site was being pillaged and looted and still managed to document critical architectural and stratigraphic features and the material culture of the site. In my opinion, their work was commensurate with much of the professional and academic work conducted during the late 1950s and early 1960s, and without their dedicated and remarkable efforts to document the archaeology of southeastern New Mexico, the Merchant site would have been lost to looting. As with the 2016 report, this report is dedicated to their memory and to their work.

Myles R. Miller
October 2021

Project Participants

Name	Position
Martin Stein	Carlsbad Field Office, Point of Contact (retired)
Elia Perez	Carlsbad Field Office, Point of Contact
John Speth	Faunal analysis, consultations on southeast New Mexico prehistory, technology, and editorial content, University of Michigan
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Butch Fries	Editor, Versar
Lillian Ponce	Laboratory Supervisor, Versar
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Katherine Kit Jones	GIS, Versar
Charles Frederick	Geomorphology and geoarchaeology
Mark Willis	Remote sensing and aerial photography
Chet Walker	Remote sensing, AGA
J. Phil Dering	Macrobotanical analysis
Susan J. Smith	Pollen analysis
Jeremy Loven	Faunal analysis
Crystal Dozier	Ceramic residue analysis, Wichita State University
John G. Jones	Phytolith analysis, ACS
Genevieve Woodhead	Ochoa ware analysis, University of New Mexico
Jeffrey Ferguson	NAA compositional analysis, MURR
Mary Ownby	Petrographic analysis, Desert Archaeology, Inc.
James Feathers	Ceramic luminescence dating, Luminescence Dating Laboratory
Mark Bateman	OSL dating, Sheffield Luminescence Dating Laboratory
Steven Shackley	Obsidian XRF sourcing

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Chapter 1

Introduction to the 2019 Field Season at the Merchant Site

The Merchant site is a fourteenth and early fifteenth century pueblo settlement located in the far southeastern corner of New Mexico, near the boundary where the basin-and-range region merges with the southern Plains. The Merchant site is representative of the Ochoa phase, a poorly understood period of southeastern New Mexico dating from around A.D. 1300/1350 to 1450. The Ochoa phase was contemporaneous with the El Paso phase of the Jornada Mogollon region to the west and the Lincoln phase of the Roswell Oasis to the northwest, the Pueblo IV period of the greater Southwest, the Medio Period of the Casas Grandes region, the Antelope Creek phase of the southern Plains, and the Toyah phase of central Texas. As such, Merchant and other Ochoa phase settlements were part of the widespread patterns of population aggregation, migrations, and diasporas and accompanying developments in social and ritual organization that occurred throughout the Southwest, northern Mexico, and southern Plains during the fourteenth and fifteenth centuries.

Even though it is often and undeservedly relegated to a peripheral status, southeastern New Mexico was an integral part of the broader Pueblo IV world (Clark and Speth 2022; Miller et al. 2016, 2019). The prehistoric societies of southeastern New Mexico did not exist in a social vacuum apart from the rest of the Southwest and southern Plains. The presence of ceramics, obsidian, shell, and other materials from distant regions attests to the fact that prehistoric groups in the region had far-flung economic and social relationships. Southeastern New Mexico offers important insights into how the profound demographic and settlement changes of the fourteenth and fifteenth centuries involved much larger geographic and social scales than were previously understood.

The Merchant site was first investigated by members of the Lea County Archaeological Society (LCAS) between 1959 and 1965. Robert Leslie of the LCAS published a brief paper on the site in the 1965 *Transactions of the First Regional Archaeological Symposium for Southeastern New Mexico and Western Texas.* Since that paper was published, the Merchant site attained a somewhat mythical status in the archaeology of southeastern New Mexico. This status was based on the fact that the LCAS excavations and Leslie's 1965 publication gave tantalizing details on rooms with formal stone foundation walls (or cimientos), two large and deep pit structures that were called rooms or pithouses but showed intriguing similarities to civic-ceremonial rooms of prehistoric and historic Southwestern cultures, thousands of projectile points and formal tools, a new and indigenous ceramic ware called Ochoa Indented, and ceramics and marine shell obtained from distant sources. The mythical status also arose because the abovementioned details were known among the avocational and professional archaeological communities of southeastern New Mexico, but aside from Leslie's brief and basic overview, little was truly known of the site beyond an amalgamation of hearsay and oral traditions. The site had also suffered from rampant looting, and it was difficult to isolate details of the architecture and site layout because of the widespread destructions of deposits and contexts.

John Speth mapped, tested, and screened backdirt from the LCAS excavations at the Merchant site in 1984, and the site was recorded and mapped during surveys of several seismic lines during the 1990s. One such survey combined the LCAS excavation area with several other sites and artifact scatters into a larger entity designated LA 43414. Two studies of specific aspects of the material culture from Merchant were completed during the 2000s, including a study of chipped stone raw materials (Gregory 2006) and neutron activation analysis (NAA) of a sample of Ochoa Indented ceramics (Alvarado 2008). Despite these research and survey efforts, the fundamental nature of the site, its architecture, material culture, and subsistence base remained for the most part unknown.

In order to remedy this situation, the Carlsbad Field Office of the Bureau of Land Management developed Blanket Purchase Authority (BPA) 4 under the Permian Basin Programmatic Agreement (PBPA) that dedicated funding to the remedial mitigation and investigation of the Merchant site. As implied by the phrase "remedial mitigation and investigation," the project was primarily intended to remediate the damage done by the looting of the site and attempt to clarify and stabilize the excavations by the LCAS between 1959 and 1965. Fieldwork took place during several months of 2014 and 2015. The investigations included several research pursuits such as an analysis of animal bone, chronometric dates, and general reviews of the ceramic, groundstone, and chipped stone collections. The results were reported in *The Merchant Site: A Late Prehistoric Ochoa Phase Settlement in Southeastern New Mexico* (Miller et al. 2016).

The 2014-2015 fieldwork and 2016 report of investigations clarified several issues. One of the two large and deep pit structures was identified as a kiva. Midden deposits and artifact densities were documented, and the material culture recovered during the 2015 excavations was compared with that reported by Leslie and the LCAS. However, as often happens with archaeological investigations, as many questions were raised as were answered by the field and laboratory studies. The layout of the room blocks remained uncertain, as did the architectural attributes of the rooms. One of the most intriguing – and controversial – discoveries of the fieldwork was the identification of possible agricultural cobble-bordered fields or mulch fields along a swale north of the pueblo.

In light of the new series of questions regarding this fascinating site, the CFO developed a second BPA under the PBPA for additional investigations of the Merchant site as well as other Formative Period sites across the Mescalero Plain. The results of the second season of excavations in the room blocks, middens, and suspected agricultural fields of the Merchant site are described in this report.

Scope of the Project

The BPA 10 contract issued by the CFO in September 2018 contained 52 tasks designed to investigate Ochoa phase villages and other Formative Period settlements across the Mescalero Plain of southeastern New Mexico. Tasks 1 through 15 were grouped under the general research domain: Excavation and Analysis of the Merchant site.

The research design and work plan proposed by Versar, Inc. and its team members John Speth, Charles Frederick, Phil Dering, Susan Smith, Chet Walker, Mark Willis, Jeff Ferguson, Mary Ownby, Jeremy Loven, and Amanda Castañeda, build upon the previous excavations at the site conducted between 2014 and 2016 (Miller et al. 2016). The plan integrated several field studies, including excavations, pedestrian survey, geomorphology and geoarchaeology, ground-penetrating radar (GPR) survey, unmanned aerial vehicle (UAV) photogrammetry, and spatial and geographic information systems (GIS) spatial analysis. The material culture and samples collected during the project were analyzed through a variety of techniques ranging from conventional artifact attribute analysis to neutron activation analysis.

Other components of the BPA 10 Scope of Work (SOW) included a broader geographic study of Ochoa phase settlement. *Part II, Survey, Testing, and Evaluation of Sites in the Vicinity of the Merchant Site* involved the intensive archaeological survey of 1,257 acres around the Merchant site and terrain surrounding the playa to the west (Graves et al. 2021a). *Part III, Survey and Testing of 33 Ochoa and Possible Ochoa Phase Settlements on the Mescalero Plain* included intensive survey and testing of a final total of 35 sites (Graves et al. 2021b). These surveys and small-scale test excavations were intended to help place the Merchant site in a broader temporal and spatial context. The results of the Merchant Vicinity survey and Mescalero Plains survey are reported in Graves et al. (2021a and 2021b). Another study examined the nature and function of bedrock mortars, including clusters of such features near the Merchant site (Castañeda and Willis 2021).

Location of the Project Area

The project area is within Lea County, the southeastern most county of New Mexico, 45 miles east of the City of Carlsbad (Figure 1.1). Its location at the margins — or what should more fittingly be considered the boundaries and frontiers — of several prehistoric culture regions of the eastern and southeastern Southwest and the southern Plains is the focal point of archaeological inquiry and the foundation of the research design for the investigations.

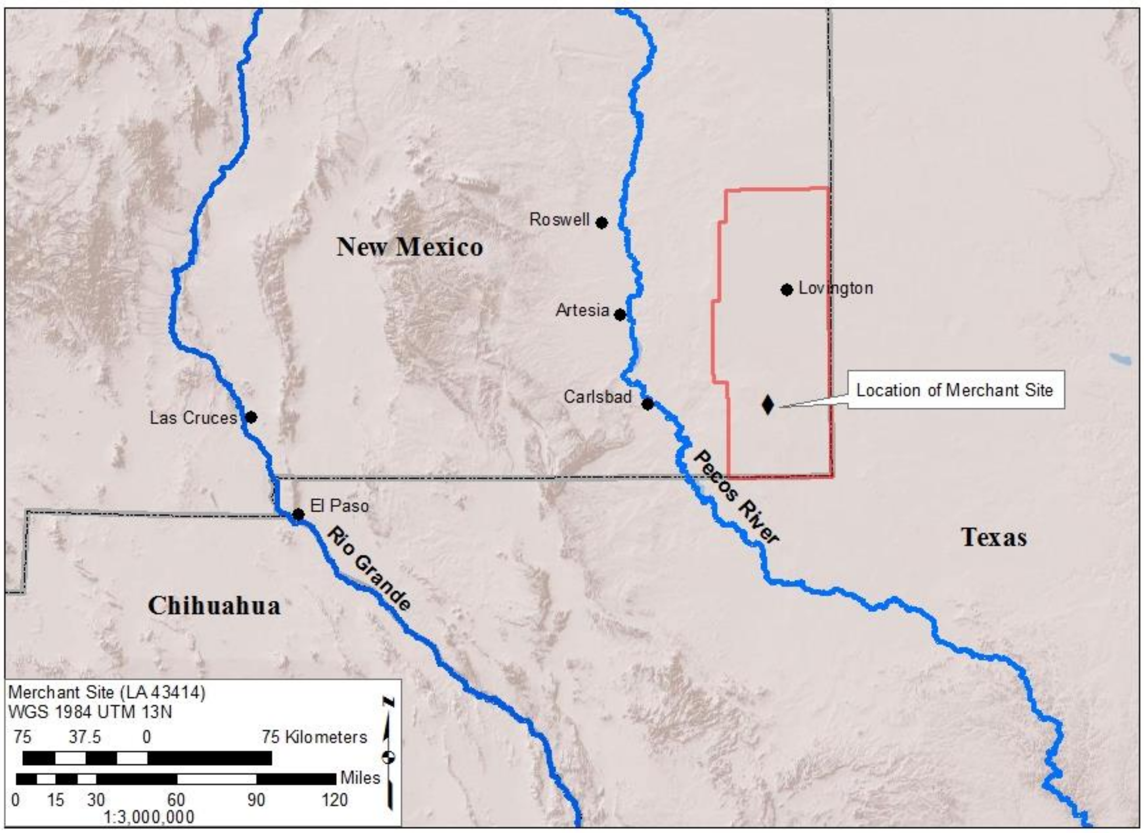

Figure 1.1. The project area in Lea County (red boundary) of southeastern New Mexico.

Regulatory and Contractual Background

The second season of archaeological investigations at the Merchant site was initiated at the request of the BLM-CFO under PBPA BPA Contract No. L15PA00001, Task Order No. 140L0618F0383 "BPA 10 Additional Investigations at the Merchant Site (LA 43414) and TRU Survey at 51 Sites near the Carlsbad Field Office." The research design was accepted in September 2017 and

Archaeological Resources Protection Act Permit 103-8152-19-7 was received on 21 February 2019.

Versar, Inc. performed the work to assist the BLM in compliance with Sections 106 and 110 of the National Historic Preservation Act of 1966 (as amended through 1992) and the Advisory Council on Historic Preservation's implementing regulations as set forth under 36 Code of Federal Regulations Part 800, and the goals set forth under the PBPA.

Results of the Project

The primary goals of the 2019 fieldwork were fivefold: (1) expose and define the architecture and construction details of the rooms and room blocks; (2) explore and characterize the midden deposits in Areas B and C; (3) determine if agricultural fields are present north of the village; (4) clarify aspects of material culture, technology, and subsistence practices; and (5) increase public awareness of and interest in the prehistory of southeastern New Mexico.

The excavations in the heavily looted eastern area of the primary village were surprisingly productive, exposing the remnants of several contiguous rooms. The rooms, and their interior deposits and floor features, had been damaged to some extent by pothunting, but enough remained intact so that critical information on wall segments, abutments, and floor features was documented. For the first time since the LCAS work in the early 1960s, the construction and the architectural details of the Merchant site have been revealed.

Excavations in Midden Area B provided some of the most useful artifact samples for analysis, particularly for Ochoa ware ceramics, as the largest and more numerous samples were obtained from the midden deposits. Excavations in Midden Area C on the eroded slopes of the terrace below the village were less informative. Leslie had identified stratified deposits in this area, but our excavations found only a shallow deposit with few artifacts.

Of all the revelations and interpretations from the 2014–2015 investigations, the most controversial interpretation was that the massed, patterned distributions of caliche along a shallow swale north of the village site were agricultural fields. A more intensive series of studies were conducted during the 2019 fieldwork, including the excavation of large-scale exposures, aerial mapping, additional geomorphological analysis, and intensive sampling for pollen and phytoliths. Excavations revealed patterned distributions of caliche cobbles similar to gridded or cobble-bordered field arrangements, and intensive pollen sampling and extraction methods identified a few grains of maize pollen in samples collected from the gridded areas.

Aside from basic descriptive accounts of lithic, groundstone, and ceramics, little was known of the technologies of the Merchant inhabitants. Technological analyses of these artifact classes generally confirmed the earlier impressions of a combined hunting, gathering, and agricultural focus of technological design. However, new insights into the origins of lithic and ceramic materials were obtained. Examination of the lithic assemblages under ultraviolet light identified distant sources of stone materials used to manufacture projectile points and processing tools. Compositional analysis of Ochoa ware determined that there are very few production areas for this distinctive ceramic ware, and there apparently was little inter-village exchange of Ochoa wares. The Merchant site is one production area, and a second is probably located in the southwestern Panhandle of Texas, perhaps at the Andrews Lake sites (Collins 1968). These findings are intriguing because they mirror the results of the intensive surveys of the Merchant vicinity and Mescalero Plains conducted as part of BPA 10 (Graves et al. 2021a, 2021b). A surprisingly small number of Ochoa phase components was identified among the 46 sites and 3,060 acres surveyed during these investigations.

Additional information on the subsistence practices was obtained, although there are still several unanswered questions. The 2014–2015 excavations in the large communal structure had recovered substantial counts of maize remains in flotation samples from floor features. In stark contrast, no maize remains at all were identified in dozens of flotation samples collected from rooms, middens, and extramural areas during the 2019 investigations, while mesquite seeds and plant parts were commonly identified.

Of equal importance to the technical findings reviewed in this report are the public education and awareness components of the project. The Merchant site and other Ochoa phase settlements across the Mescalero Plain are a fascinating example of human migration into a new homeland and the technological and social adaptations that were required to successfully live in that new home. Accordingly, a significant component of the proposed work plan includes ways to inform the general public of the Merchant site and how studies of prehistoric archaeological sites and human adaptations can provide insights into our modern human condition. A popular booklet and poster presentation were produced for distribution by the CFO. Additionally, the results of the project were presented to the Hopi Cultural Preservation Office.

Chapter 2

Environmental and Geoarchaeological Background

Tim Graves and Charles Frederick

The Merchant site is located at the edge of the southern Plains in west-central Lea County, New Mexico. The region of southeastern New Mexico encompassing the site lies within the Pecos Valley section of the Southern Great Plains physiographic sub-province (Gustavson et al. 1991:477). At a more localized scale of reference, the site and its environs are located on the Mescalero Plain (Hogan 2006:2.3), a pediment surface that slopes from the base of the Mescalero Ridge westward to the Pecos River Valley (Figure 2.1). The Mescalero Plain extends southward from the Portales Valley to the New Mexico-Texas border. The only significant drainage of the Mescalero Plain is Monument Draw in far southeastern Lea County. Otherwise, 80 percent of the Mescalero Plain is mantled by the Mescalero Dunes. Small ephemeral drainages and sinks, ridges and swales, and rock outcrops provide most of the topographic relief (Reeves 1972).

Regional Geomorphology

Hall (2002) identifies the Mescalero Plain as an eolian sand sheet and adopts the term "Mescalero Sands" to characterize the surficial geology of the region. The sand sheet is partially stabilized by Shinnery oak that promotes the formation of parabolic coppice dunes where the sand is thick. Surficial deposits on the Mescalero Plain also include eolian sands of Holocene to Pleistocene age, isolated patches of recent alluvium, older Pleistocene alluvium, and red beds of the Triassic Chinle and Permian Artesia Groups.

Hall (2002) developed a map of geoarchaeological units in southeastern New Mexico. He identified five surficial mapping units (IA, IB, IIA, IIB, and III). The Merchant site is located within Unit IIB and Unit III. Unit IIB surfaces are complexes of young and old deposits that are predominantly older than the archaeological record. Hall states these deposits are mostly colluvial and eolian in origin and include large areas of Pleistocene eolian sand deposits and sediments with calcic paleosols. Archaeological sites of all ages occur within this mapping unit. Most are surficial and are heavily bioturbated. Unit III includes deposits of Pleistocene age or older. The escarpment edge location of the Merchant site village is on the surface of the Unit III mapping unit. The northeastern parts of the site are within the IIB unit, although it is clear that recent eolian deposition and mesquite parabolic dunes are present throughout this area.

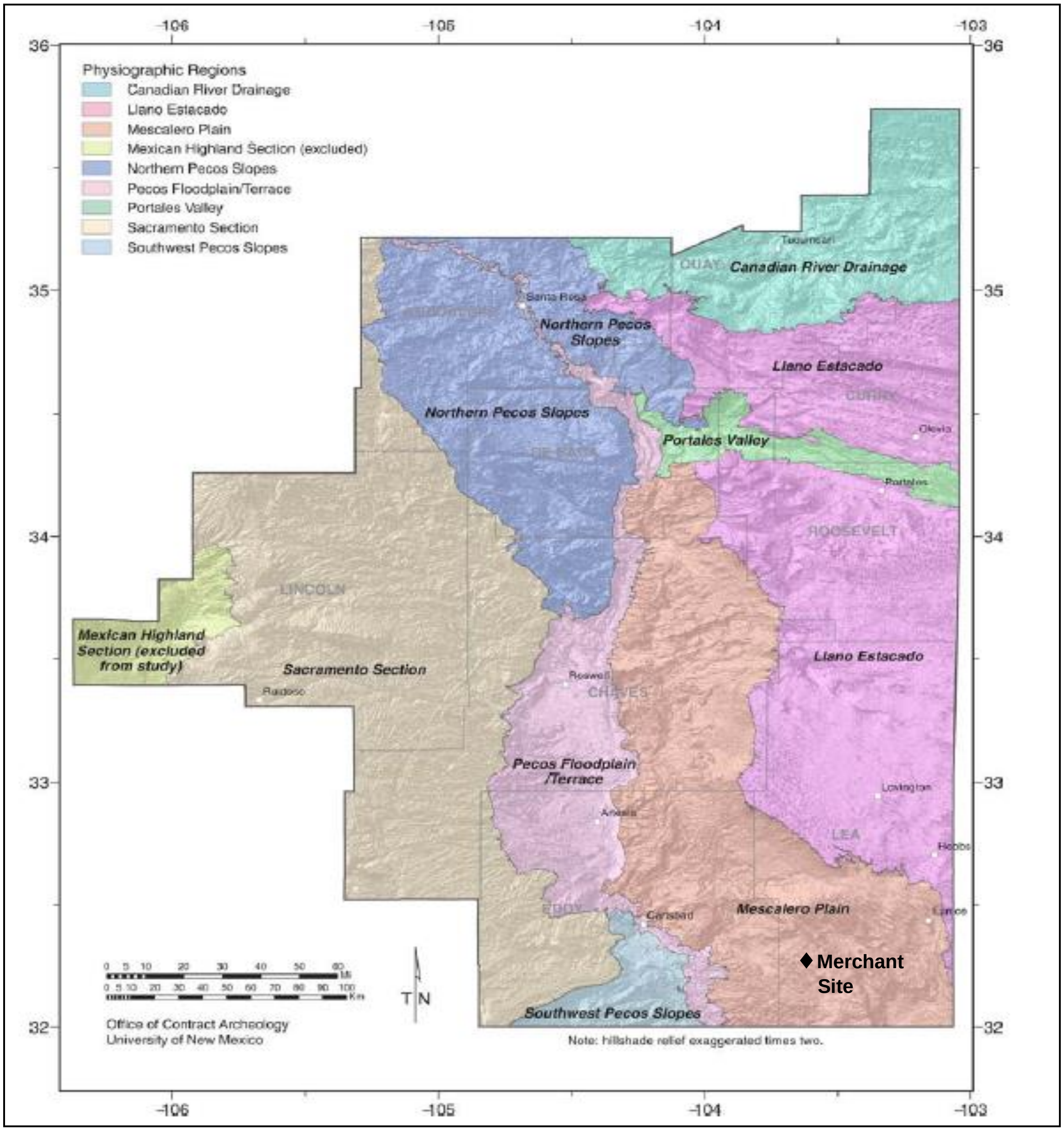

Figure 2.1. Physiographic regions of southeastern New Mexico (adapted from Hogan 2006:2-2).

Topography

The Merchant site lies in rolling dissected land about 2.1 kilometers (km) south-southwest of Grama Ridge and about 2.7 km southwest of the San Simon Ranch headquarters (Figure 2.2). This region is locally referred to as the San Simon Swale (Nicholson and Clebsch 1961:8; Figure 3), which is a large, southeastern trending depression about 100 square miles in area that lies below and is bordered by Grama Ridge. The San Simon Swale as well as the San Simon Sink, which is the lowest part of the swale and lies within it, are both thought to be collapse features created by dissolution of Permian-age soluble salt beds in the subsurface (cf. Ege 1984:4–5; Nicholson and Clebsch 1961:45–46). The San Simon Sink lies about 7 km southeast of the site. Grama Ridge, which borders the northeast side of the San Simon Swale, is a southwestward facing scarp that is the western flank of an outlier of the Ogallala Formation and the Southern High Plains surface, sometimes locally referred to as the Grama Ridge Area (Figure 2.3). Although this feature is somewhat ill-defined on this map, a more recent geologic map of this area (New Mexico Bureau of Mines and Mineral Resources 2003) provides a more distinct boundary for the Grama Ridge Area as an outcrop of the Ogallala Formation.

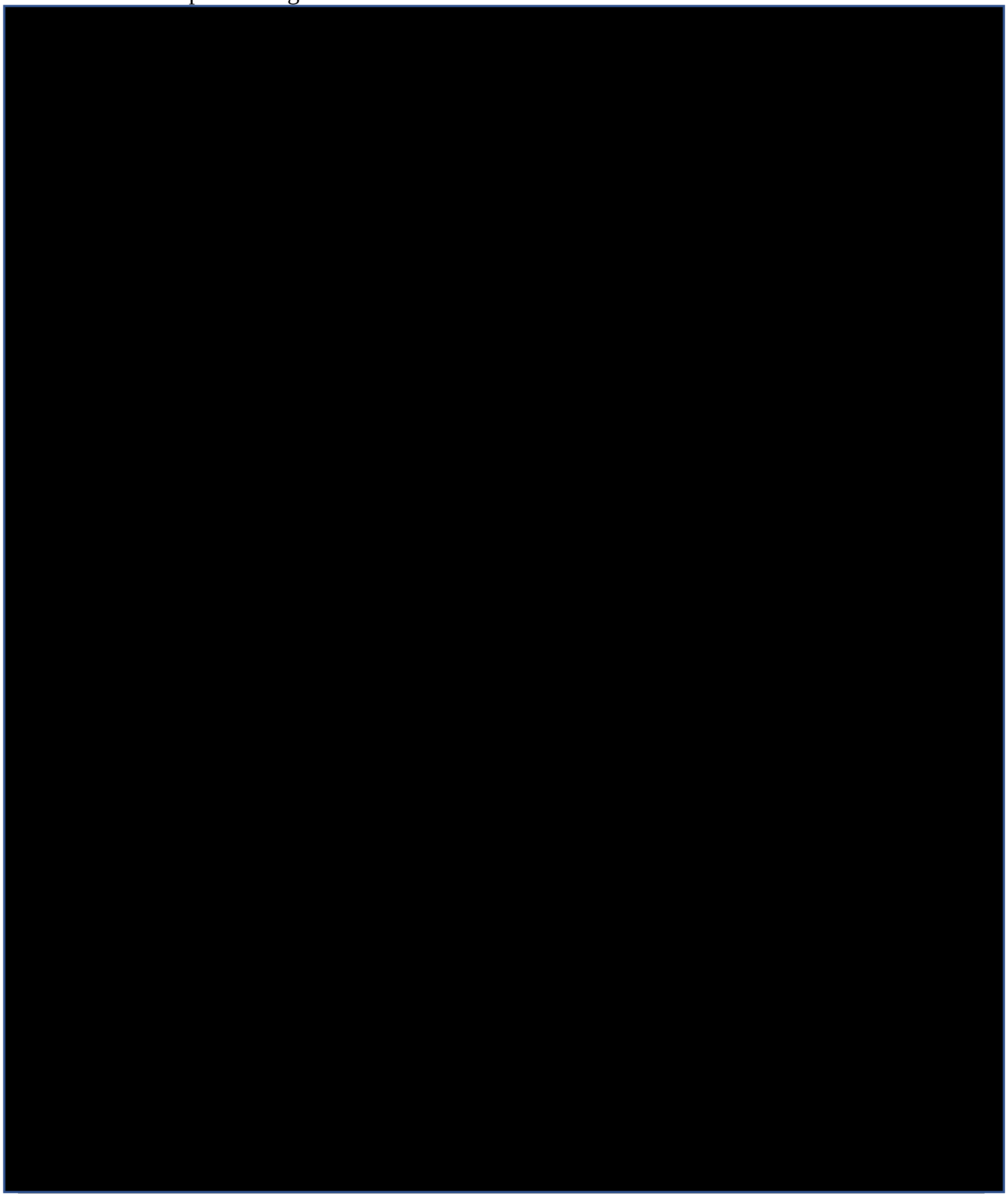

Figure 2.2. Map of local physiographic features in proximity to the Merchant site (redrawn from Nicholson and Clebsch 1961:Figure 3).

[redacted]

Figure 2.3. Digital elevation model image showing the location of the Merchant site in relation to local topographic features.

Some of the previously recorded information concerning the site (Leslie 1965a; see also the updated site form in Schultheis and Baunstein 2009) mistakenly places the Merchant site on Grama Ridge, but that scarp is clearly denoted on the local U.S. Geological Survey (USGS) topographic maps north of the Merchant site. Although the west-facing ridge where the site is situated is similar in some respect to Grama Ridge, the geologic contexts of the two ridges are completely different. As noted previously, Grama Ridge is the southwestern edge of the Ogallala Formation and borders an outlier of the Southern High Plains surface. The ridge upon which the Merchant site is situated is underlain by a caliche, but it is much younger and thinner than the Caprock Caliche that armors the Southern High Plains surface. Unfortunately, the association of the Merchant site and Grama Ridge have become entrenched in the literature.

The escarpment where the village area of the Merchant site is located is a prominent feature on the landscape (Figure 2.4), rising 20 to 50 feet above the San Simon swale and providing a vantage point and view shed of several hundred square miles of the surrounding plains (Figure 2.5). The elevation of the site is 3,540 feet above mean seal level (amsl) at the southern end and 3,570 feet amsl at the northern end. The elevation of the San Simon swale below the escarpment averages 3,510 feet amsl. A shallow drainage crosses the site from the northwest through the east-central boundary. The drainage is less than a meter or so wide at its origin but widens to nearly 3 meters at the eastern site boundary. A small playa lakebed is present in the swale around 100 meters (m) west of the escarpment and may have held water for brief periods after summer rains.

Environment

Climate

The present climate of the Chihuahuan desert of southern New Mexico is a semiarid mesothermal regime characterized by hot daytime temperatures, relatively cooler nights, and low humidity. Thirty years of data collected at the Eunice, New Mexico, weather station — the closest such station to the Merchant site — reports an annual precipitation of 15.61 inches, with the majority of the rainfall occurring between May and October. A few miles farther to the south, the Jal station reports an annual rainfall of 14.61 inches.

Precipitation in the region comes from two major seasonal movements of air masses (Bomar 1983). Winter moisture is associated with the southerly deflection of polar Pacific air that delivers a generally prolonged, low-intensity winter precipitation to the area. During the summer months, beginning at the end of May and lasting through mid-October, convective cells are formed by the intersection of moist tropical air from the Gulf of Mexico with local air masses uplifted by intense surface heating (Tuan et al. 1973). The resulting summer precipitation is localized and generally concentrated in short, high-intensity thunderstorms in the mid-afternoon and evening that often produce substantial runoff water in arroyo drainages and standing pools of water in playa depressions. More than 50 percent of the total annual precipitation in southeastern New Mexico occurs in a 3-month period from July through September.

Mean monthly temperatures range from a low of 29º F in January to 67º F in July, with high temperature ranging from 57º F to 94º F for the same months. Summer temperatures often exceed 100° F, and freezing temperatures may occur during the late winter months. Relative humidity in the area is quite low, averaging from 10 to 14 percent during the winter and spring and 22 to 24 percent in the fall months (Ruffner and Blair 1987). The number of frost-free days in the southern portion of Lea County ranges from 190 to 205 days per year. However, the agricultural and biomass productivity of the regional environment is primarily tied to moisture availability rather than growing season temperature (Ludwig 1986, 1987; Ludwig and Whitford 1981).

Figure 2.4. Photographs of the escarpment taken by Robert Leslie in 1960. The cluster of bedrock mortars in the center of the bottom photograph were documented during the BPA 10 project (Castañeda and Willis 2021).

Figure 2.5. Views facing west of the San Simon Swale and southeastern New Mexico plains from the Merchant site escarpment in 1960 (upper panel) and 2015 (lower panel). The view has not changed appreciably during the 50 year-long period between when the photographs were taken.

Soils

The Merchant site and the larger area subsumed within LA 43414 are located on the edge of an escarpment ridge and extend across the sloping terrain to the east. A variety of soils and surfaces are present across the area. Surfaces closest to the escarpment edge are dominated by a thin veneer of a sandy loam with moderate to high densities of caliche nodules. These surfaces are classified as a component of the Midessa Series soils and are specifically assigned to the Midessa-Wink fine sandy loam (Turner et al. 1974:Sheet 140–141). The Midessa soils are classified as a dark grayish-brown loam (Turner et al. 1974:27). The surfaces located east and northeast of the escarpment edge are dominated by light brown sands with traces of caliche and are classified as Wink fine sands (Turner et al. 1974:41–42). Mesquite coppice dunes with heights reaching up to two meters are present in these areas, and interdunal areas have sheet sand deposits or deflated areas. Caliche surfaces reaching several feet in thickness are exposed along the edge of the escarpment edge and overlie a layer of dark reddish clay loam. These and other soils exposed along the slopes of the escarpment on the lower slopes are assigned to the Pyote Series (Turner et al. 1974:Sheet 140–141). The specific sediments around the Merchant site are described as Pyote and Maljamar fine sands. The Pyote soils are light brown sands, and the Maljamar sands are yellowish red sand to loamy sand (Turner et al. 1974:25, 33).

Vegetation

The modern vegetation of southeastern New Mexico is included within the Chihuahua Desert Biotic province and the Desert Grassland ecotone. The Merchant site is situated within the Palin-Mesa Shrubland zone (Dick-Peddie 1993; Resource Geographic Information System, Earth Data Analysis Center 1997). Vegetation within this zone (see Brown 2004; Dick-Peddie 1993:106–107, 116–120) consists of the signature grassland and shrub communities of creosotebush (*Larrea tridentata*) and a variety of grasses including dropseed (*Sporobolus* sp.), Black and Side oats grama grass (*Bouteloua eriopoda* and *curtipendula*), fluff grass (*Erioneuron pulchellum*), tobosa (*Hilaria mutica*), burrograss (*Scleropogon brevifolius*), bushmuhly (*Muhlenbergia porteri*), and Indian ricegrass (*Oryzopsis hymenoides*).

Common shrubs and trees include Shinnery oak (*Quercus havardii*), honey mesquite (*Prosopis glandulosa*), whitethorn (*Acacia constricta*), Mormon tea (*Ephedra torreyana*), broom snakeweed (*Gutierrezia sarothrae*), fourwing saltbush (*Atriplex canescens*), rabbitbrush (*Chrysothamnus nauseosus*) and tarbush (*Flourensia cernua*).

Several cactus species are common in the area, including prickly pear cactus (*Opuntia* spp.), pencil cholla (*Opuntia leptocaulis*), yucca (*Yucca* spp.), horse crippler cactus (*Homalocephala texensis*), and rainbow cactus (*Echinocereus dasyacanthus*). Forbs include burweed (*Ambrosia acanthicarpa*), gourds (*Cucurbita* spp.), fleabane (*Erigeron* sp.), and red globemallow (*Sphaeralcea coccinia).*

The flora obscures roughly 30 percent of the site during the winter months. During the spring, the bloom of perennial plants can be quite dense and obscure more than 60 percent of site surfaces. Mesquite coppice dunes ranging in size from 20 centimeters (cm) to 2 meters are present across the northern and northeastern parts of the site (Figure 2.6).

Several studies have provided evidence of substantial transitions in regional vegetation from Pleistocene to historic times in the northern Chihuahuan Desert (Betancourt et al. 1990; Freeman 1972; Van Devender 1990). These studies have identified cyclical periods of increased or diminished precipitation that resulted in the expansion of grassland or desert shrub communities. This phenomenon has been demonstrated in historic times, as overgrazing and drought during the latter part of the nineteenth and early twentieth centuries resulted in severe soil degradation and radically altered vegetation patterns throughout much of southern New Mexico and west Texas, the most visible change being the widespread expansion of mesquite shrub communities (Buffington and Herbel 1965; Dick-Peddie 1975; Gardner 1951; York and Dick-Peddie 1969).

Figure 2.6. Mesquite coppice dune terrain present across the northern and northeastern parts of LA 43414.

Fauna

A variety of fauna are present in the northern Chihuahuan Desert and southern Plains, many of which were hunted and trapped by the prehistoric inhabitants of the region. A list of common fauna in the region is provided in Brown (2004) and Findley et al. (1975). Mammals found in the area during the past and present times are associated with the Desert Grassland and Chihuahuan Desert Scrub. These mammals include the mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), bison (*Bison bison*), desert cottontail (*Sylvilagus audubonii*), blacktailed jackrabbit (*Lepus californicus*), spotted ground squirrel (*Spermophilus spilosoma*), woodrat (*Neotoma* spp.), coyote (*Canis latrans*), badger (*Taxidea taxus*), and a variety of rodents. Bison are now extinct in the region unless they have been re-introduced by modern ranchers.

Various birds such as the scaled quail (*Callipepla squamata*), mourning dove (*Zenaida macroura*), prairie falcon (*Falco mexicanus*), roadrunner (*Geococcyx californianus*), raven (*Corvus* sp.), burrowing owl (*Athene cunicularia*), and hawks are common in the region. The western rattlesnake (*Crotalus viridis*), coachwhip (*Masticophis flagellum*), bullsnake (*Pituophis melanoleucus)*, western box turtle (*Terrapene ornata*), Great Plains toad (*Bufo cognatus*), and various lizards are among the reptiles and amphibians present. Three native unionid bivalves (mussels) were once native to the lower Pecos River of southeastern New Mexico, but only the Texas hornshell (*Popenaias popeii*) is still extant in the area, occurring as far north as Chaves County (Howells 2003:62; Lang 1996).

Stone Resources

The Ogallala and Chinle Formations provide accessible sources of sandstone, chert, and quartzite for tool production. The exposures of Upper Chinle sandstone along the base of the escarpment provided a readily accessible source of material for groundstone tools. The caliche and Ogallala formations underlying the site contain chert and quartzite gravels that were used for flaked stone tools and hammerstones. The Mescalero caliche formation provided a source of material for cookstones and the foundation walls of houses. Additional sources of raw materials for ground and flaked stone tools are reviewed by Gregory (2006) and Kremkau et al. (2013).

Exposed bedrock formations and exfoliating layers of sandstone, limestone, and caliche found throughout terrace exposures in the area were used as sources of temper for the production of Ochoa wares. Clay deposits derived from shale or other sedimentary materials were also exploited for ceramic production.

Geomorphological Context of the Merchant Site

At a local scale, the Merchant site is situated on an elevated piece of land, locally referred to as the mesa, that is tilted gently to the southeast and that is bordered on the west by an abrupt southwestward to westward facing scarp (Figure 2.7). This scarp is the eastern edge of a roughly elliptical basin, the center of which lies about 0.5 mile (0.8 km) southwest of the core of Merchant site and lies about 90 feet (27 m) below the highest part of the basin rim. This basin is oriented south-southeast and is drained by two ephemeral streams, one that exits the basin almost due south and that drains the east side of basin, and a second that flows out of the basin on its southwest side. These two streams flow around either side of a broad hill (about 0.6 mile [1 km] at its widest extent) that forms the southern side of the basin and then join on its south side, about 1.5 miles (2.5 km) south-southwest of the core of the Merchant site. This stream then ends in a broad fan on the floor of San Simon Swale about 0.7 mile (1 km) south of their confluence. The floor of the basin lies about 3,480 feet amsl and is an alluvial flat that has been referred to as a dry lakebed or playa, but there is no evidence in the field that this feature held ponded water for significant periods of time. Aerial images of the basin floor exhibit an area of low albedo that is formed by more dense vegetation on the basin floor, which today forms the drainage divide between the two ephemeral streams that drain the basin. Between the mesa edge and the basin floor is a dissected slope or beveled base, which consists of a thin mantle of colluvium resting upon highly erodible Permian-Triassic red beds that have been dissected by numerous small channels and gullies. The abrupt edge, flat floor, and general shape of this basin suggest it may be a solution collapse feature that has been subsequently altered by erosion.

The mesa on the east side of the basin, where the site is situated, ranges from about 3,570 feet amsl at the north end of the site to about 3,540 feet amsl at the south end of the site. The surface of the mesa is a gently concave or water-gathering slope than drains to the southeast. The scarp forming the western edge of the mesa ranges from a short (<2 m) vertical cliff to a steep rounded shoulder slope. Bedrock (caliche) dominates the ground surface right at the edge, and a short distance to the east this surface becomes mantled with a thin veneer of eolian sand. This drape of windblown sand generally thickens across the mesa and appears to be notably thicker east of the drainage that occupies the center of the slope. The thickest part of the eolian veneer is formed by mesquite coppice dunes that are taller and more coalesced on the east side of the mesa.

[redacted]

Figure 2.7. Map of the landscape features in proximity to the Merchant site.

Geology

The geology of this region has only been mapped at a broad level (1:500,000 scale) by the New Mexico Bureau of Mines and Mineral Resources (2003), and the entire site is identified as eolian and piedmont deposits (Qep) that range in age from Holocene to middle Pleistocene. About 2 km north of the site lies an outcrop of the Ogallala Formation, the southwestern edge of which is defined by Grama Ridge, and this surface includes a wide range of cover sediments and calcic soils present on the High Plains (for example, Map Unit Qoa of New Mexico Bureau of Mines and Mineral Resources 2003). Reconnaissance of the site identified four geologic deposits present (from oldest to youngest): (1) Permian/Triassic sandstone and shale, (2) Tertiary/Quaternary Caliche conglomerate within which a petrocalcic horizon had formed, (3) Late Pleistocene and Holocene alluvium and colluvium, and (4) Holocene eolian sand. The four deposits are visible on the aerial drone image of the site obtained by Mark Willis (Figure 2.8).

Figure 2.8. Aerial image of the Merchant site showing the major geologic deposits. The vehicles are parked at the village location.

Permian/Triassic Sandstone and Shale: Although not specifically mapped in this region by the New Mexico Bureau of Mines and Mineral Resources, the bedrock exposed at the site and vicinity are most likely members of the Triassic age Upper Chinle Group, which includes the Garita Creek, Trujillo, Bull Canyon and Redonda Formations that compose most of the larger exposures of Permian/Triassic rocks in this region (New Mexico Bureau of Mines and Mineral Resources 2003). Nicholson and Clebsch (1961:33–34) describe the geology of this region in some detail, and they refer to these deposits as Permian or Triassic Redbeds, undifferentiated.

These deposits are exposed on the basin slope immediately west of the mesa, and three units are present: (1) a light gray to light greenish gray sandstone, (2) pale green muds, and (3) dusky red muds. The pale green muds are separated from the dusky red muds by a ledge-forming bed of sandstone and siltstone that dips gently to the southeast.

Caliche: The top of the mesa is underlain and armored by a calcium carbonate cemented conglomerate that is composed primarily of rounded to subrounded clasts of reworked caliche as well as a few siliceous clasts. The appearance and composition of this deposit suggest it was derived from erosion of the Ogallala Formation caprock caliche. A petrocalcic horizon has formed within this deposit, and the top of this unit comprises a very undulate laminar calcic horizon, which grades downward to a carbonate cemented conglomerate (a Stage IV Calcic Horizon). The character of this deposit is shown in Figure 2.9.

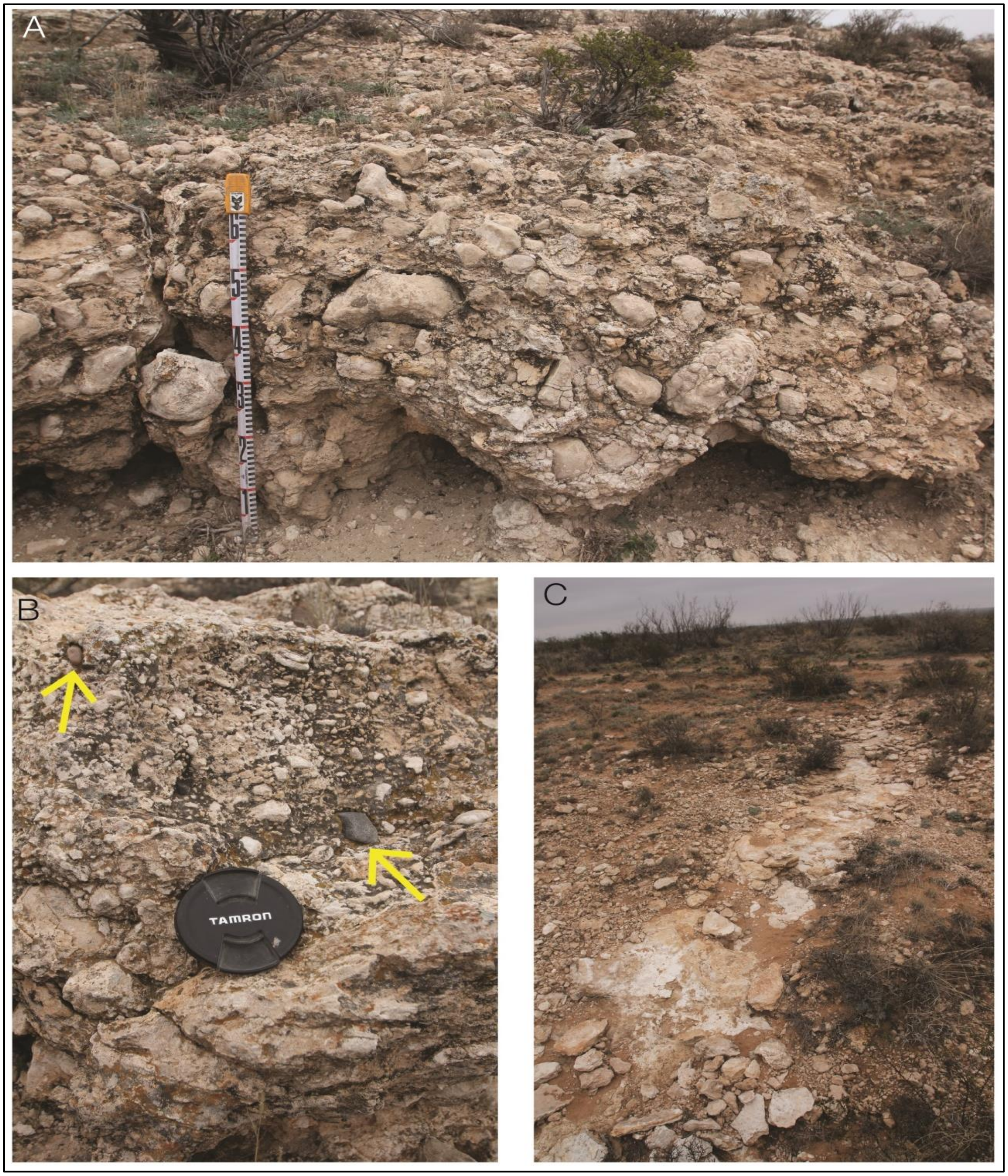

Figure 2.9. Photographs of the caliche that lies beneath the eolian sand on the mesa and on top of the Triassic sandstone and shale: (A) a clear illustration of the conglomeratic nature of the caliche exposed in the western escarpment of the mesa; (B) closeup photo of a fine gravel facies within the caliche showing several siliceous clasts (arrows); (C) photograph of the outcrop of the caliche on the surface at the western edge of the mesa showing the laminar cap (the brighter white line) and a thin cover of loose caliche gravels on top. The Holocene eolian sand buries the caliche just before the two track road visible at the back of this photo.

This deposit is locally referred to as the Mescalero Caliche (Bachman 1984; Kennedy 1997), and its stratigraphic position on a surface below the outcrop of the Ogallala Formation suggests that it is a remnant of the Gatuña Formation, which is the name given to terrestrial deposits that began to fill the Pecos River valley after it had been formed by erosion (Hawley 1993; Powers and Holt 1993). The deposits within which the petrocalcic horizon has formed on the site are not typical of the Gatuña Formation but are consistent with this origin. The Mescalero paleosol, as described by Hall and Goble (2006) appears to have formed between approximately 620,000 and 90,000 years B.P. based on the presence of the Lava Creek B tephra within the Gatuña Formation and the oldest optically stimulated luminescence (OSL) age obtained by Hall and Goble (2006) for the eolian sediments covering the paleosol. The Mescalero Caliche or paleosol observed at the Merchant site and described regionally by Kennedy (1997) is a considerably more advanced calcic horizon (typically a Stage IV to VI calcic horizon) than that described as the Mescalero paleosol by Hall and Goble (2006:300-302), which they describe as a Stage II to III. A loose cover of caliche gravel and cobbles rests on top of the laminar cap of the Mescalero Caliche across the mesa at the site.

Quaternary Alluvium and Colluvium: The slope that separates the mesa from the basin is traversed by a network of drainage channels that converge as the gradient of the slope declines toward the basin floor. The steeper slopes between these channels is mantled with a thin (<0.5 m) veneer of colluvium. As the slope gradient declines to the west, isolated patches of alluvial sediment start to appear and gradually become more frequent toward the basin floor, where the fragments coalesce to eventually dominate the basin. The alluvial deposits share the dusky red color of the Permian/Triassic sandstone and shale but contain coarse fragments mostly derived from the caliche as well as the more resistant sandstone.

Eolian Sand: The top of the mesa is draped by a veneer of eolian sediment that appears to consist of two deposits previously described by Hall and Goble (2006): the Upper Eolian Sand and the modern eolian sand within which the coppice dunes have formed and that hereafter will be referred to as the Recent Eolian Sand. The eolian cover sands are absent at the western edge of the mesa and begin to mantle the caliche first as a thin sand sheet, gradually turning to a field of mesquite coppice dunes; their size (both height and width) gradually increases across the mesa to the east and north.

The Upper Eolian Sand

Hall and Goble (2006, 2011) report the Upper Eolian Sand is the main component of the Mescalero Sands and ranges up to 4 to 5 m thick. This sand was deposited between approximately 5,000 and 9,000 years B.P. as determined by single aliquot OSL dating.

The Upper Eolian Sand is present across the mesa, but in most locations it was noted to be less than 25 cm thick and rests directly upon the Mescalero Caliche. In such exposures, a well-developed A horizon (presumably the Loco Hills Paleosol) has formed through the deposit, and this unit is a brown (7.5YR3/3) fine sand to loamy fine sand with between 0.6 and 1.4 percent organic matter and between 0.6 and 1.1 percent calcium carbonate.

The thickest exposure of this deposit was uncovered in an off-site control exposure immediately north of the site but south of the pipeline that borders the site to the north. This exposure was excavated into the side of a coppice dune and exposed 55 cm of the Upper Eolian Sand. Here, the Loco Hills Paleosol consisted of a 34-cm-thick very faintly melanized brown (7.5YR5/4) Ab horizon that in turn rested on a light brown (7.5YR6/4) AC horizon.

Recent Eolian Sand (post-Upper Eolian Sand)

Hall (2002) and Hall and Goble (2006, 2011) have not named the younger of the two eolian deposits at the Merchant site, but it comprises the sand associated with the coppice dunes that are a ubiquitous component of the modern landscape. The age of this deposit is assumed by Hall and

Goble (2006) to be Historic, but only one single aliquot OSL date has been obtained from this deposit by Hall and Goble (2011; from the "post-Upper Eolian Sand") and the cited age of 620±40 years (UNL-2623) was determined using a minimum age model that excluded older aliquots from the age calculation. The same sample yielded an age of 1430±130 years B.P. when all of the aliquots were included. If the coppice dunes are as young as Hall and Goble (2006) advocate (presumably less than 150 years), then the age obtained for this sample is too old, most likely caused by post-depositional bioturbation mixing of the Recent Eolian Sand with the underlying Upper Eolian Sand. Single aliquot OSL dates on mixed grain age samples are known to yield unreliable ages (cf. Bateman et al. 2007a, 2007b). Only single grain OSL dating will yield reliable ages to avoid such problems in settings where post-depositional pedoturbation has occurred.

The Recent Eolian Sand is thickest (approaching a meter) where found with mesquite coppice dunes, but most of the coppice dunes are less than 50 cm tall (Figure 2.10). Between the coppice dunes, the Recent Eolian Sand is present everywhere across the mesa as a thin (2 to 10 cm) sand sheet deposit. This deposit is a brown (7.5YR4/4) fine sand, with between 0.5 percent and 1 percent calcium carbonate and organic matter content ranging from values similar to that obtained from the Loco Hills Paleosol beneath it (around 1 percent; but lacking any evidence of melanization) to about half that amount (about 0.5 percent at its lowest). The greatest organic matter content value obtained in the laboratory work came from the top 5 cm of a coppice dune which had more than 1.2 percent, despite no visible darkening of the deposit nor obvious macro-organic remains. Deep deposits of Recent Eolian Sand are present at the northeastern margins of LA 43414. Additional insights into the geomorphology of this unit are provided in Chapter 5.

Figure 2.10. Deep deposits of eolian sand over caliche exposed in Backhoe Trench 1 north of the Merchant village locality.

Chapter 3

History and Background of the Investigations

The investigations at the Merchant site add to a number of past and present studies of village occupations in southeastern New Mexico, including Boot Hill (Brown 2011; Corley and Leslie 1960), Laguna Plata (Brown 2010; Lea County Archaeological Society 1971), Henderson pueblo (Clark and Speth 2022; Rocek and Speth 1984; Speth 2004a), Bloom Mound (Clark and Speth 2022; Kelley 1984; Speth 2008, 2021; Speth and Newlander 2012), Fox Place (Wiseman 2002), and Rocky Arroyo (Wiseman 1985). Additionally, several large and complex village settlements were surveyed and tested during Parts II and III of BPA 10 (Graves et al. 2021a, 202b), including LA 121668 in the Custer Mountain area, LA 55902 along Cedar Canyon, LA 20166 next to Walter Lake, and LA 32222, LA 32225, and LA 32228 (Indian Hill site) located 30 to 60 km north and northeast of the Merchant site. One of the more significant discoveries of these surveys was that Ochoa phase components were rare to non-existent among those village complexes.

The following chapter establishes the background of the Merchant site investigations. A brief review of the culture history of the region is provided first, followed by a summary of the history of investigations at the Merchant site.

Prehistory and Early History of Southeastern New Mexico

A brief overview of the prehistory and early history of southeastern New Mexico is provided here. Several recent overviews have been produced that offer more detailed discussions of the prehistoric and historic cultural sequences. The two most relevant sources are the Regional Research Design (Hogan 2006) and 2016-2026 Regional Research Design (Railey 2016) developed under the PBPA. Railey (2015, 2018) has also published regional overviews that incorporate analysis of radiocarbon dates and site locational information (see also Railey et al. 2009, 2011). Two additional sources are Miller and Kenmotsu (2004), who review cultural developments, and Miller (2018), who reviews the Archaic Period sequence in the neighboring Jornada and Trans-Pecos regions, much of which is related to those in southeastern New Mexico. Table 2.1 lists the primary cultural periods of interest in the following discussion.

Table 2.1. Prehistoric and early historic chronology

Period	Phase	Time Span
Paleoindian		11,500 to 7000 B.C.
Archaic		7000 B.C. to A.D. 500
Formative-Ceramic		A.D. 500 to 1450
	Ochoa Phase	A.D. 1300 to 1450
Protohistoric		A.D. 1450 to 1527
Early Historic		A.D. 1528 to 1865

Paleoindian Period

Although new discoveries and ensuing debates over the earliest presence of humans in North America have been a common feature of archaeological and popular reports of the past two decades, the earliest firmly-documented occurrence of human groups in southeastern New Mexico dates to the Paleoindian tradition.

The Paleoindian period is divided into three subperiods reflecting changing environmental conditions, hunting practices, and associated technologies and projectile point forms: Clovis (11,500–10,800 B.C.), Folsom (10,800–9800 B.C.), and Late Paleoindian (9800–7000 B.C.). Hunting practices focused on large game such as mammoth, mastodon, and bison, but plant collecting also played a role in Paleoindian subsistence. Large, well-made lanceolate spear points were the signature diagnostic items of the period. Formal bifacial tools and retouched end scrapers reflect a mobile hunting tradition.

Archaic Period

The advent of the Archaic period took place as the Pleistocene epoch changed to the warmer and drier climate of the Holocene around 7000 B.C. Prehistoric groups inhabiting southeastern New Mexico had to adapt to the changing environment, including different game sources and distributions of plant foods and water. New technologies appeared such as plant baking pits, grinding tools, and a variety of tool forms. The long Archaic interval is conventionally subdivided into three subperiods: Early (7000–3200 B.C.), Middle (3200–1800 B.C.), and Late (1800 B.C.–A.D. 200/500). The dating of these subperiods varies among publications within southeastern New Mexico and surrounding regions but generally follows the outline listed above.

The Early Archaic period is one of the most poorly known periods across all of southern New Mexico and western Texas (Miller 2018; Miller and Kenmotsu 2004; Railey 2015). The archaeological period is contemporaneous with the paleoenvironmental Altithermal period, an extremely warm and dry period of the Holocene. As water sources dried up or became increasingly restricted and unreliable, prehistoric groups moved away from much of the Chihuahua Desert lowlands. A few sites of this period are known from the diagnostic stemmed projectile points such as Jay and Bajada, but the numbers of recorded Early Archaic sites in southeastern New Mexico, as well as adjacent areas of west Texas and northern Chihuahua, are fewer than the preceding Paleoindian period.

The first half of the Middle Archaic period appears similar to the Early Archaic, characterized by warm and dry environmental conditions of the Altithermal and low population densities. During the latter half, between 2500 and 2200 B.C., the first constellation of traits marking a consistently identifiable Archaic settlement adaption and technological tradition appears in southern New Mexico and western Texas. Notably, this interval coincides with the beginning of the Late Holocene wet period. Village settlements, contracting stem dart points, agave baking pits, and large communal plant baking pits appear at this time. There is new evidence for the appearance of maize to the west in the Jornada region, although no evidence of Middle Archaic horticulture has yet been found in southeastern New Mexico. The first well-dated rock art also occurs during this interval (Loendorf et al. 2016). As noted by Miller (2018), the first widespread evidence of placemaking on the landscape and communal gatherings occurs during the latter half of the Middle Archaic, and it is during this period that several trends in social organization, landscape use, and technology are established that persist throughout the next 4,000 years of the Archaic and Formative/Ceramic periods.

The Late Archaic begins at circa 1800 B.C. and is marked by widespread changes in land use, settlement intensity, and a diversity of technological adaptations. A widely noted aspect of Late Archaic tool technology is the diversification of projectile point types, although most points have hafted forms with side or corner notching and convex or flat bases. Maize agriculture is known from the Sacramento/Sierra Blanca/Capitan highlands to the north and the Jornada region to the west, but no clear evidence of Late Archaic agriculture has been found in southeastern New Mexico. The presence of house structures, storage facilities, and dense refuse areas suggests that an increase in the duration of settlements took place, along with a corresponding reduction in mobility. The increasing numbers of radiocarbon dates and radiocarbon-dated contexts reflect both a population increase and a more widespread use of environments during the period (Railey 2015). It is likely the social and technological developments of the preceding Middle Archaic period continued to evolve, as well as expanding into a greater variety of environmental niches.

Formative-Ceramic Period

Conventionally, the end of the Archaic in the Southwest is demarcated by the appearance of ceramic containers and the bow and arrow, and on these criteria the Jornada Archaic comes to a close sometime between 1700 and 1500 cal. B.P. (A.D. 300 and 500). A somewhat bewildering assortment of phase sequences has been proposed for the Formative period across southern New Mexico (see Miller 2005 and Railey 2015). For convenience, we follow Railey (2015) and review developments in southeastern New Mexico under two temporal segments: Early Formative (A.D. 500–1150) and Late Formative (A.D. 1150–1450).

The Early Formative period is marked by the appearance of new technologies such as ceramics and the bow and arrow that also denote significant changes in adaptation and lifeways. The first undecorated brownwares appear at around A.D. 500. The appearance of the bow and arrow is marked by the smaller size of projectile points such as Bonham, Scallorn, and Livermore types. Despite the occurrence of ceramics, settlement mobility remained relatively high and settlements were of short duration. The most common architectural forms were small brush huts and small, shallow pit structures. In contrast to areas to the north and west, there is little evidence of agriculture in the lowlands of southeastern New Mexico. A pronounced increase in radiocarbon dates and dated contexts occurs at around A.D. 600 (Railey 2015; Railey et al. 2009, 2011), a similar pattern observed across the southern and northern Southwest. However, based on the paucity of agricultural settlements, it is likely that southeastern New Mexico was peripheral to — but not unaffected by — such demographic and subsistence changes, although they may have occurred later in time during the Late Formative.

The most pronounced and archaeologically visible settlement, subsistence, and social developments took place during the Late Formative. A variety of decorated ceramic wares are present at sites of this period, including types manufactured in adjacent regions such as Chupadero Black-on-white, Three-Rivers Red-on-terracotta, Lincoln Black-on-red, El Paso Polychrome, Ramos Polychrome, and Rio Grande Glazewares, as well as new and distinctive locally produced types like Ochoa Indented Corrugated.

By the fourteenth century, numerous large, permanent villages had been established. Settlement types include pueblos and pithouse villages, and examples of civic-ceremonial architecture (also called kivas or communal rooms) have been recorded at several such villages, including the deep kiva room with a horned serpent painted on the plastered walls at the Fox Place site near Roswell (Wiseman 2002). However, despite the presence of permanent village settlements, the number of radiocarbon dates declines during this period, though this pattern may not apply to the Mescalero Plain and the Roswell Oasis. Late Formative subsistence practices continue to be debated. Whether maize-based farming contributed a substantial part of the prehistoric diet remains uncertain, especially in light of evidence for increased big game hunting during this time.

One of the hallmarks of the Late Formative was that the Southwestern world was one of movement: movement of people, food, trade goods, socially valued items, and ideas. The prehistoric societies of southeastern New Mexico, once somewhat peripheral to such things, were now an active participant and likely an active protagonist in movements of goods and people.

The *Ochoa Phase of A.D. 1300–1450:* Amidst several phases characterized for the Late Formative period in southeastern New Mexico and adjoining areas, the Ochoa phase is of primary interest for the present study. While the Ochoa phase is part of the local tradition of southeast New Mexico, it is important to place the phase and the settlements of this period within a broader geographic context. The Ochoa phase, and the El Paso and Late Glencoe phases of the Jornada Mogollon region to the west, are contemporaneous with the Pueblo IV period of the greater Southwest, the Antelope Creek phase of the southern Plains, and the Toyah phase of central Texas. Ochoa phase settlements were part of the widespread patterns of population aggregation, migrations, and diasporas, and the accompanying developments in social and ritual organization that occurred throughout the Southwest, northern Mexico, and southern Plains during the fourteenth and fifteenth centuries. Settlements of the Ochoa phase are located 150 km from the Jornada El Paso phase pueblos of the Roswell Oasis and 200 km from those of the southern Sacramento Mountains, yet constitute a unique geographic and temporal entity.

The Ochoa phase was defined on the results of the LCAS excavations at the Merchant site (Leslie (1965 [2016]; hereafter cited as Leslie 2016a). Leslie (2016b) also described additional Ochoa phase sites in the region, and Michael Collin's 1968 unpublished thesis provided additional details on the Salt Cedar site in nearby Andrews County, Texas. However, these studies were conducted more than 50 years ago. Based on the fragmentary information available at the time, Ochoa phase settlements were interpreted as short-term occupations by mobile populations with limited emphasis on agriculture and hunting, similar to the adaptations that had been inferred to have dominated much of southeastern New Mexico for several preceding millennia. Yet, considering that the geographic definition of the Ochoa phase straddled one of the presumed corridors of economic and social interaction between the southern Plains and Southwest during the fourteenth and fifteenth centuries led to certain questions of whether Ochoa phase sites were some form of fossilized, isolated hunter-gatherer settlements or were more substantial and sedentary village occupations.

Protohistoric Period

The Protohistoric Period begins with the widespread abandonment of village settlements, and indeed most settlements, across southeastern New Mexico and the southern Plains around A.D. 1450. The decline in the numbers of radiocarbon-dated contexts and numbers of sites identified through survey (Railey 2015) are not restricted to southeastern New Mexico but reflect a much broader geographic phenomenon across the southern Southwest and northern Chihuahua (Miller 2001, 2021).

Sites of this period are difficult to identify because of the lack of diagnostic ceramics, tool forms, architectural forms, and even settlements. Regional ceramic production ceases, and it also appears that exchange of ceramics from settlements in northern New Mexico also ends. Rock rings marking the locations of structures (wikiups, tipis) have been assigned to this period, but they often lack secure associations with dates and diagnostic artifacts and cannot be conclusively identified as dating to the Protohistoric interval. In fact, the numbers of sites and instances of material culture are exceptionally rare, and this paucity of archaeological evidence is reflected in the radiocarbon record that shows a dramatic decline in dates after A.D. 1450. In the plains to the east, village groups may have shifted to a more nomadic adaptation based on bison hunting. However, the abandonment of the Permian basin and other regions to the west does not appear to reflect such a shift and instead seems to have been a regional depopulation and perhaps a migration. It is unknown whether the inhabitants migrated to the plains, to the clusters of huge Pueblo V period pueblo settlements in the northern Rio Grande region, to the mountains of northern Chihuahua, or perhaps all three regions.

Early Historic Period

The Early Historic period, also known as the Spanish Colonial period, is marked by the entry of Spanish explorers, colonists, and priests into northern Mexico and the American Southwest. Early expeditions included Álvar Núñez Cabeza de Vaca (1528–1536), Francisco Vásquez de Coronado (1540–1542), Chamuscado and Rodriguez (1580–1581), Antonio de Espejo (1582–1583), and Gaspar Castaño de Sosa (1590) (Hammond and Rey 1966). The early entradas documented native nomadic groups subsisting on cacti and bison. Colonization began in 1598 with the expedition of Juan de Oñate and the establishment of the first mission settlement in what is now Ciudad Juarez, Chihuahua. The Salinas missions were established in the early 1600s, and the Pueblo Revolt of 1680 led to the establishment of mission settlements in the Rio Grande Valley south of El Paso. Throughout this period, the relations between the Spanish and pueblo inhabitants fluctuated from mutual interaction to outright hostility.

History of Investigations at the Merchant Site

The Merchant site, the Type Site defining the Ochoa phase, has been the subject of avocational and professional archaeological interest since the late 1950s. Unfortunately, it was also of interest to looters and arrowhead collectors and suffered considerable damage from uncontrolled excavations beginning with its discovery in the late 1950s and through the ensuing two or three decades. The 57-year-long history of excavations, surveys, research studies, and looting is critical to understanding the nature of the site, the present condition and data potential of its features and deposits, and for the design of fieldwork.

The Merchant site is known by several temporary and provisional site numbers assigned by federal and state agencies, archaeological surveyors, and avocational archaeologists. In a general approximation of the historic sequence, the numbers include LCAS Site E-4, Bureau of Land Management (BLM) Site AR-30-6-31, and Laboratory of Anthropology Site number LA 43414.

1959–1965: Robert "Bus" Leslie and the Lea County Archaeological Society

Robert "Bus" Leslie, an enthusiastic and dedicated avocational, first visited the Merchant site in 1959. He was guided to the site by two members of the newly formed Lea County Archaeological Society who, along with other local amateurs and artifact collectors, had been digging and screening midden mounds that had gained a reputation for having exceptionally rich artifact deposits. Upon viewing the destruction and disorder caused by uncontrolled looting, Leslie attempted to impose some degree of organization and archaeological structure at the site, organizing numerous weekend excursions to excavate several of the more prominent and significant features. He first visited the site with his children, excavating Rooms 3 and 4 and exploring various locations. Beginning in 1960 or 1961, a rather consistent group of LCAS members and Lovington Junior Archaeological Society members numbering from six to 20 would work at the site (Figure 3.1). Excavations continued through 1965, when it was felt that a majority of the major features had been excavated. Several of the early luminaries of southeastern New Mexico archaeology, including John Corley, John Runyon, and Calvin Smith, participated in the excavations (Figure 3.2).

Figure 3.1. LCAS members excavating the Merchant site in 1964. Upper panel, LCAS crew excavating domestic rooms; lower panel, LCAS members Calvin Smith and Roy Blizzard excavating Pit Structure 2.

Figure 3.2. Lea County Archaeological Society and Lovington Junior Archaeological Society members at the Merchant site in 1963. The upper photograph was taken by Calvin Smith and the lower photograph by John Corley. The identifications are courtesy of Calvin Smith.

Leslie and the LCAS did a commendable job of controlled excavations in units and levels, describing stratigraphy and architectural features, and collecting and proveniencing artifact assemblages. The efforts are even more admirable in light of the fact that features and deposits across the site were being actively looted between and even during the LCAS excavations. Leslie, in his unpublished manuscript and via the photographic record of his visits to the site, documents the struggle to maintain consistent excavations against a constant onslaught of looting and artifact mining.

The membership of the LCAS consisted of several energetic and dedicated amateur or avocational archaeologists. Several of the members — Robert "Bus" Leslie, John Corley, John Runyan, and Calvin Smith — produced the bulk of the archaeological knowledge and publications for southeastern New Mexico prior to the 1980s. Unfortunately, other members of the society were energetic and dedicated artifact collectors. Both the avocational and collector factions participated in the early investigations of the Merchant, Laguna Plata, and Boot Hill sites, and it appears that there was some form of détente between the two groups, and certain parties were allowed to dig in certain areas and retain the artifacts they recovered. Several passages in Robert Leslie's unpublished manuscript on the Merchant site also refer to "diggers" that apparently were a third group of much more zealous and destructive looters that destroyed large parts of the Merchant site at the same time that the LCAS was attempting to conduct some form of controlled excavation. It is unknown if the more fervent looters were affiliated with the society, but it seems unlikely because they often looted the site when the LCAS members were absent.

Leslie first brought attention of the Merchant site to a broader audience by summarizing the discoveries in a 1965 paper published in the *Transactions of the First Regional Archaeological Symposium for Southeastern New Mexico and Western Texas* sponsored by the Southwest Federation of Archaeological Societies (SWFAS) founded in the fall of 1964 by Corley, Leslie, and Smith. The report included a site map (Figure 3.3) and plan maps of the two surface rooms and deep pit structures, as well as photographs and descriptions of projectile points and ceramics. Seven surface rooms with stone foundation walls were excavated, and several more rooms were probed or described. Thousands of artifacts, including more than 1,500 projectile points, were mentioned in the brief site report.

For the next 50 years, the SWFAS article served as the primary source of information on the Merchant site. A comprehensive report of the LCAS excavations was written by Bus Leslie but never published (Leslie 1965b). Leslie gave a copy of the report to John Speth in 1984. Speth gave Versar, Inc. a copy of the manuscript and the collection of Leslie's slides and photographs of the LCAS work in southeastern New Mexico. The unpublished manuscript was typeset and formatted and was included as Appendix A in the 2016 report of investigations (Miller et al. 2016).

The manuscript included an updated site map (Figure 3.4) that differs in several ways from the map in the 1965 article, incorporating new insights from his continued visits to the site and reconsideration of certain aspects of the LCAS excavations. For 50 years, the fragmentary and tantalizing information in the 1965 report was part of the legend and lore of southeastern New Mexico prehistory.

The Merchant site manuscript provided additional details on the 21 surface rooms, two pit structures, refuse areas, bedrock mortar clusters, and other details of the site. The manuscript also included discussion and images of artifacts that have proven invaluable since all the collections were lost after Leslie's death. His collection of slides and black-and-white contact sheets were an invaluable contribution to the study of the architectural and stratigraphic details of the site as well as the history of the LCAS fieldwork.

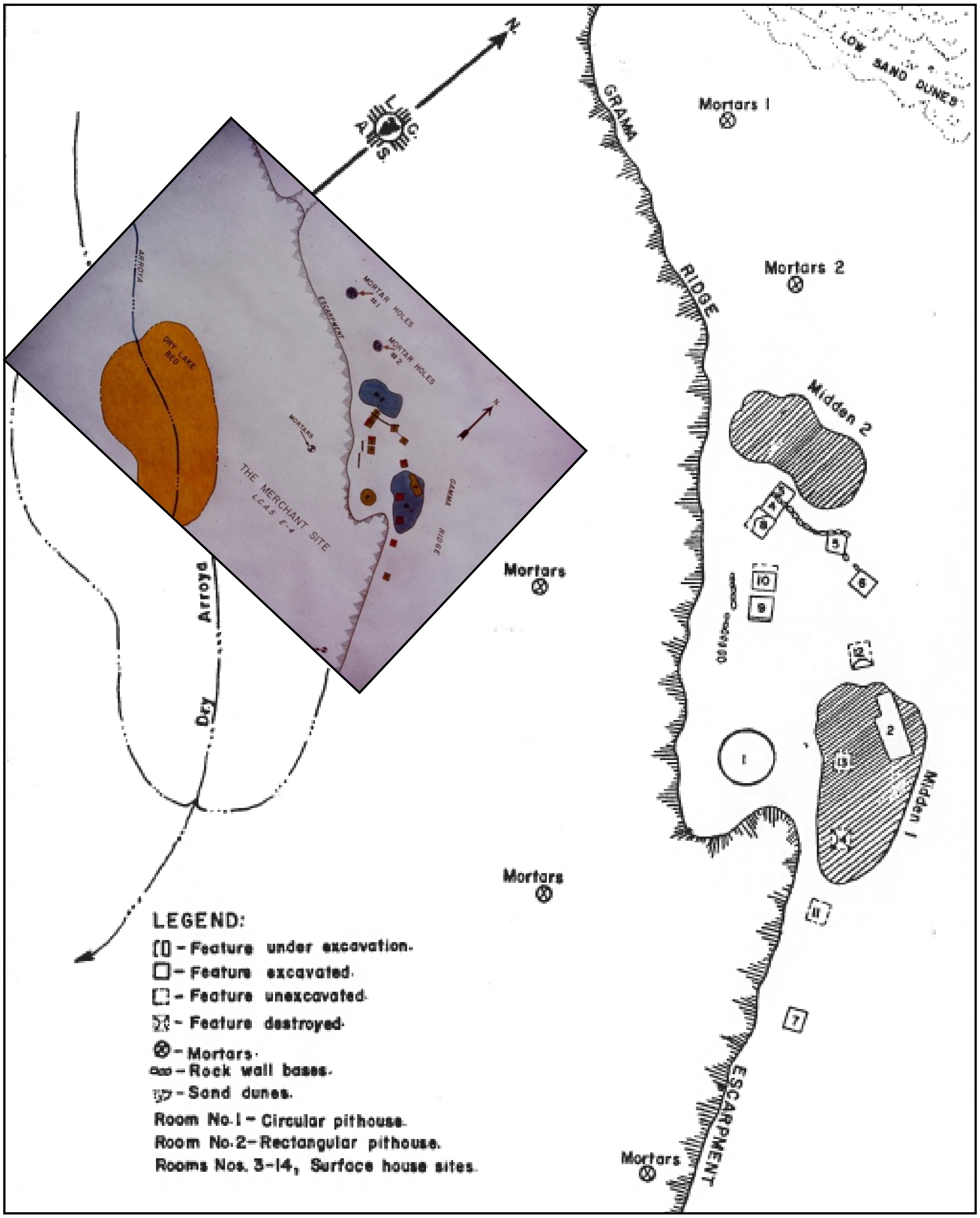

Figure 3.3. Map of the Merchant site from Leslie's 1965a paper. Inset shows a colored version (at a smaller scale) of the map found among his collection of color slide photographs.

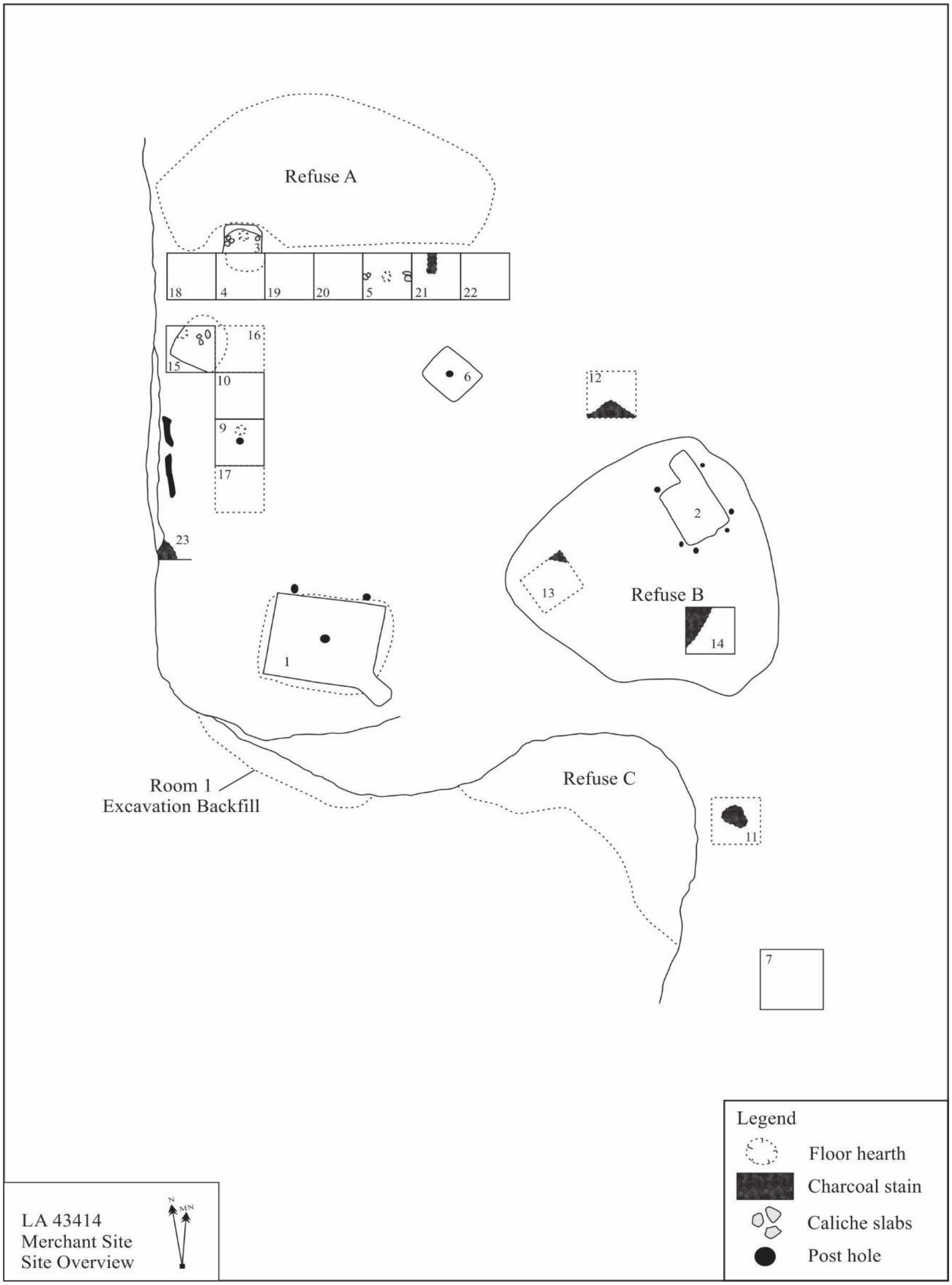

Figure 3.4. Map of the Merchant site in Leslie's unpublished 1965 report on the Merchant site. Several aspects of the map differ from his earlier version (Figure 3.3) and reflect later visits to the site.

Several of Leslie's photographs are labeled as having been taken in 1976 and 1984, showing that he continued to visit the site for 20 years or more after the excavations were completed in 1965. It is also likely that looters and artifact collectors continued to pick through the deposits and backdirt piles, but for the most part no professional and avocational work took place at the Merchant site for the following two decades.

1984: Fieldwork by John D. Speth

For several days in 1984, John Speth of the University of Michigan, together with his father Alfred A. Speth, visited the site. They were joined by Bus Leslie, who graciously answered many questions about the original excavations, the fate of the various artifacts and faunal remains, whether the LCAS excavators had observed any charred corn or other cultigens, the possible locations of other structures on the site, and so forth. A permanent datum was established, and one of the more accurate site maps was produced (Figure 3.5). The open LCAS excavations and features and overall state of the site were documented. A test unit was excavated in a suspected pithouse, and a sample of the backdirt surrounding the two open pit structure excavations was screened. The test unit (Unit 84-1) measured 0.5 m by 2.85 m and was excavated to a depth of 30 cm below surface. The excavation revealed a probable pithouse structure. The datum established by Speth was located during the 2014–2015 fieldwork and was the basis for the grid system used during those and the 2019 investigations.

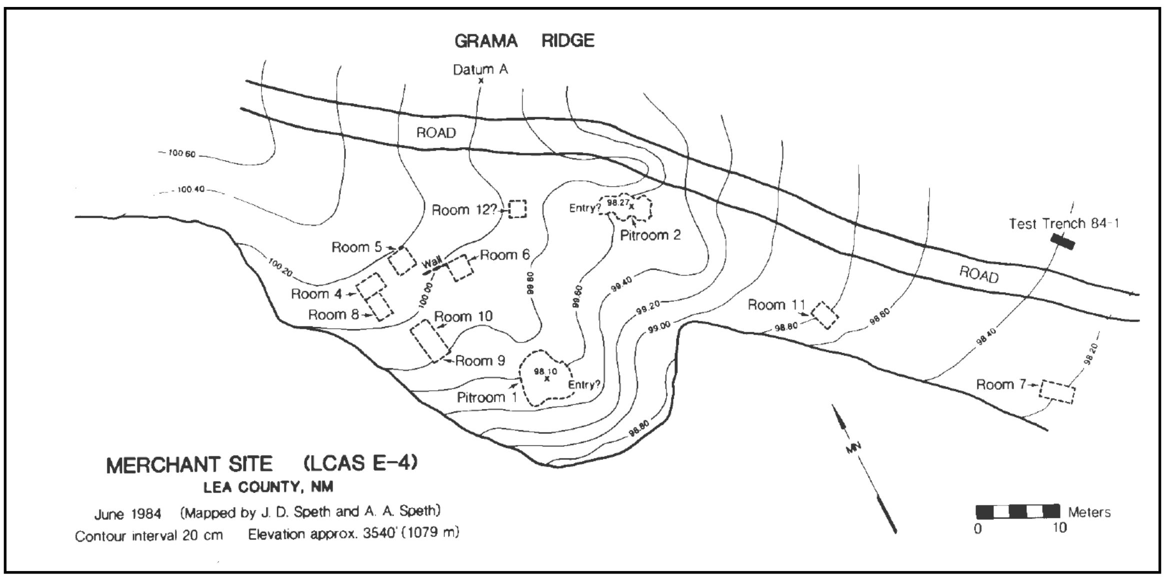

Figure 3.5. Map of the Merchant site by John Speth and Alfred A. Speth.

1983–2009: Cultural Resource Management Surveys

The resurgence of oil and gas exploration throughout the Permian Basin during the early 1980s and the requirements of Section 106 of the National Historic Preservation Act (NHPA) to identify and manage cultural resources on federal (BLM) lands led to a new series of field investigations at the Merchant site. Archaeological surveys of seismic oil and gas exploration lines, pipelines, roads, and other developments provided new information and updates on the status of the Merchant site (Gregory 2001, 2006) as well as several sites within a distance of 0.5 km of the village (Hankins and Proper 1983; Hunt 1983, 1990; Hunt and Martin 1987). Gregory mapped the site in 1999 and a second time in 2001 (Figures 3.6 and 3.7). The positions and orientations of some of the domestic rooms were revised and a new series of room numbers was assigned.

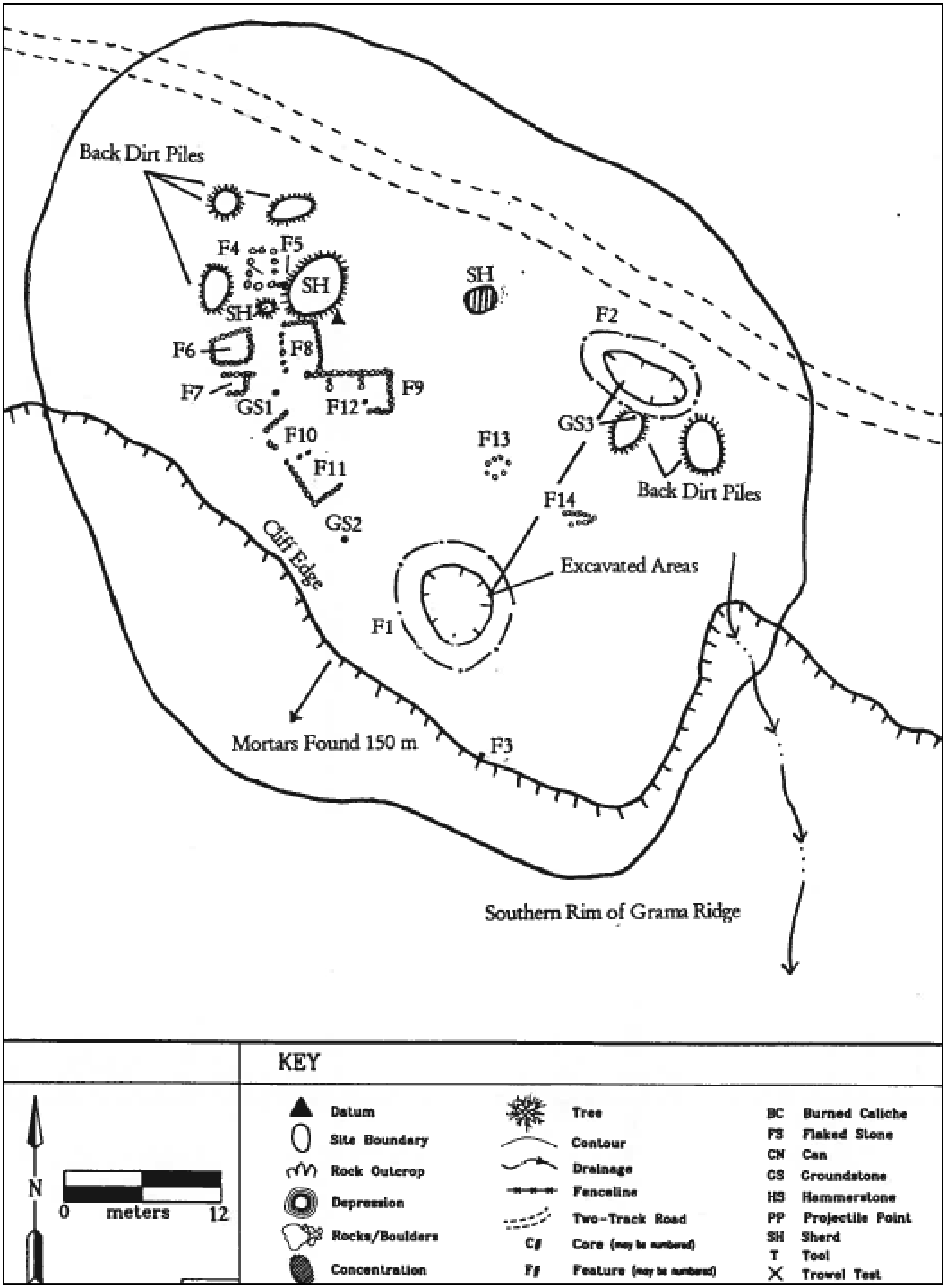

Figure 3.6. Map of the Merchant site recorded in 1991 (Gregory 2001:19).

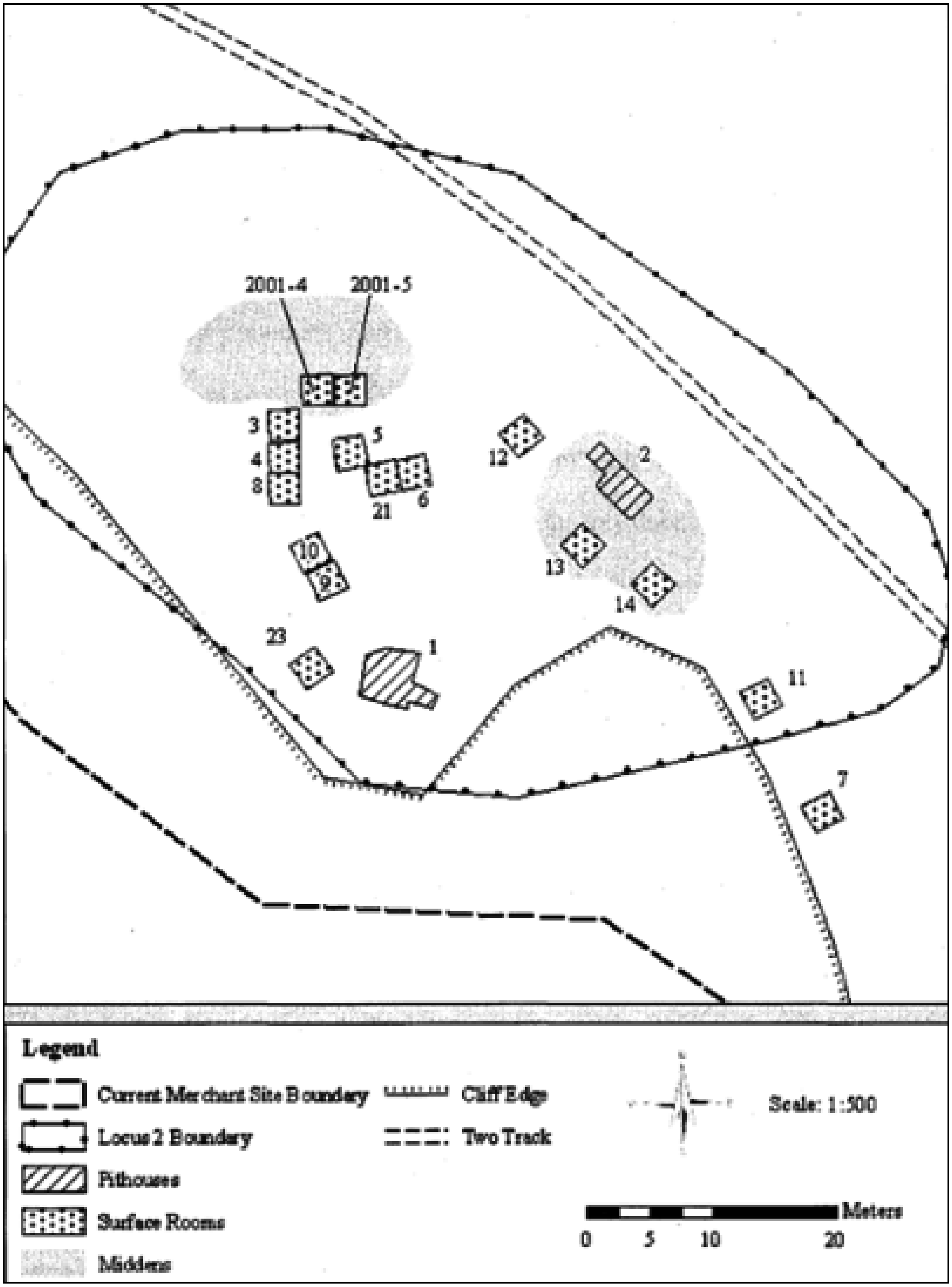

Figure 3.7. Revised map of the Merchant site (Gregory 2006:145).

The Merchant site and nearby sites were again surveyed and evaluated in advance of planned seismic surveys in 2001. At this time, the original designation of LA 43414 was expanded to subsume the two previously recorded sites LA 43416 and LA 65936 and three newly defined areas of surface artifacts and features located within 300 m of the village (Seymour 2001). The aggregate site area was expanded to 875 m by 625 m and six loci were defined (Figure 3.8). The most recent survey took place in 2009 (Allison et al. 2009), when the six loci and aggregate site boundary of LA 43414 established during 2001 survey was confirmed.

Other Research Projects

The Merchant site has continued to be of interest to several researchers. Daniel Gregory, who supervised the seismic surveys in 2001, completed his M.A. thesis at Eastern New Mexico University on the chipped stone raw materials used by the inhabitants of the Merchant site and other Ochoa phase settlements (Gregory 2006). Luis Alvarado (2008, 2009) included 28 sherds of Ochoa Indented Corrugated obtained from John Speth's 1984 collections at the Merchant site in his neutron activation analysis study of corrugated wares in southeastern New Mexico. The results are published in his 2008 M.A. thesis from Texas State University. The chemical data from that study have been combined with the NAA data obtained during the present study.

Radiocarbon samples were collected from three features by the CFO in 2011. The samples were collected as part of a larger Permian Basin research project designed to improve the chronology of southeastern New Mexico (Cummings and Kováčik 2013). Two radiocarbon samples were obtained from a small hearth, one sample was collected from a large stain thought to be the pithouse tested by John Speth in 1984, and one sample was retrieved from a small shovel test in the backdirt surrounding the open LCAS excavation of Pit Structure 1.

2014–2016: Remedial Mitigation and Other Investigations

Under BPA 4, the CFO funded a survey and remedial mitigation work at the Merchant site. A Transect Recording Unit (TRU) survey and aerial drone mapping survey of an 86-acre parcel was completed to confirm the previous combination of multiple sites into the aggregate LA 43414 site (Seymour 2001). Topographic and electronic distance measuring (EDM) mapping of the village area were completed, and a remote sensing survey was conducted to determine if buried houses could be located. Remedial excavations focused on the two deep pithouses excavated by the LCAS, screening of backdirt deposits around those structures, mapping room walls, and backfilling the deep structures with sterile caliche. Analysis of faunal collections revealed a predominance of bison and other large and medium mammal bones and very few rabbit or other small mammal remains. The results of these investigations were reported in Miller et al. (2016).

The 2019 BPA 10 Merchant Vicinity Survey

Part II of BPA 10 funded the intensive TRU survey of a 1,257-acre parcel surrounding LA 43414, excluding the 86-acre parcel that was surveyed in 2014. The survey encompassed LA 43414 and 19 other previously recorded sites distributed around the small playa west of the Merchant village site (Graves et al. 2021a). A continuous distribution of artifacts and features was identified around the entire margin of the playa and connecting with the Merchant site, leading to the definition of a large site consisting of multiple village and camp localities. Figure 3.9 displays one of the results of the survey, the distribution of fire-cracked rock and burned caliche across the 1,257-acre parcel. Almost all of the 19 previously recorded sites were subsumed within a new definition of LA 43414 that surrounds the entire playa and consists of dozens of small village and camp occupations. The Merchant Vicinity survey parcel has been recommended as eligible for designation as a National Register of Historic Places District.

[redacted]

Figure 3.8. LA 43414 as defined during the second seismic survey (Seymour 2001).

[redacted]

Figure 3.9. Results of the Merchant Vicinity TRU survey showing TRU cells with fire-cracked rock and burned caliche (from Graves et al. 2021a: Figure 25). The location of the Merchant village is shown in relation to the new definition of LA 43414.

Chapter 4

Theory, Analysis, and Field Methods

The Merchant site is a fourteenth to early fifteenth century village in southeastern New Mexico. The site was first investigated by the LCAS between 1959 and 1965 (Leslie 1965a, 2016), but as also the subject of rampant uncontrolled looting before, after, and even during the LCAS excavations, and the condition of the features suffered accordingly. To make matters worse, the LCAS artifact collections were lost when Robert Leslie's artifact collections and archives were disposed of after his death. Until the 2016 report of investigations on the BPA 4 project, the architecture and material culture of the site, as well as its social and economic role in the prehistory of southeastern New Mexico and the greater Southwest and southern Plains, remained poorly-known.

The combination of the LCAS and 2014–2015 investigations concluded that the pueblo settlement consisted of numerous contiguous surface rooms and at least one deep pit structure interpreted as a kiva. The presence of community architecture at the Merchant site has important implications for social organization, settlement function, and connections with, or origins from, areas to the west. The ceramic assemblage consisted of locally manufactured Ochoa wares and several imported types such as El Paso Polychrome, Chupadero Black-on-white, Three Rivers Red-on-terracotta, Lincoln Black-on-red, Ramos Polychrome, Gila Polychrome, Rio Grande Glaze A, Playas Incised, Roswell Brown, and an unidentified polished and incised black ceramic.

Leslie notes that several thousand projectile points were recovered by the LCAS and looters. Leslie (2016a) identified 13 types among the collection. Other artifacts include groundstone, a variety of formal unifacial and bifacial flaked stone tools, *Olivella* shell beads, carved and notched bone, and stone, shell, and ochre pendants.

Massive quantities of bison, antelope, and deer bone were recovered from midden deposits (see Miller et al. 2016). One of the more intriguing finds was the 12-inch layer of large mammal bones deposited in the fill of Pit Structure 1 that was interpreted as a kiva. Refuse deposits usually have bone, ceramics, and other materials mixed throughout the layers, but in this case the presence of such a dense and discrete deposit suggests it may have been deposited after a feast or during the ritual retirement and termination of the kiva (which may have involved a communal feast). Maize was recovered from the subfloor features of the kiva. In contrast to the mass quantities of large mammal bone, leporids (rabbits) were curiously under-represented in the faunal collections, despite the systematic screening of all deposits. The rarity of leporid remains at the Merchant site presents a major and significant contrast to faunal assemblages of village settlements throughout the prehistoric U.S. Southwest and Mexican Northwest, where rabbit bones are abundant.

The Theoretical Background of the Merchant Site Investigations

The Merchant site and Ochoa phase have been considered in several studies and regional syntheses (Boyd 1997; Corley 1965; Speth and Newlander 2012; Wiseman 2000, 2009, 2019), including the

Permian Basin Regional Research Design (Hogan 2006). All who have been involved with the Merchant project over the past six years recognize the significance of the Merchant site for understanding Late Prehistoric adaptation and social evolution on the southern Plains. The data on architecture and material culture offer critical insights for debates over whether certain cultural "complexes" in southeastern New Mexico, the Texas Panhandle, and central Texas reflected hunter-gatherers adopting Southwestern agricultural and technological practices, or migrants from the Southwest moving to the Plains and adopting hunting strategies and associated tool technologies from extant Plains groups. Or perhaps something more complex took place, involving movement of groups into multi-ethnic communities that forged new forms of social identity. These related questions were in the forefront during the fieldwork, laboratory studies, and production of this report, and are reviewed in greater depth in the summary chapter.

The general theoretical perspective guiding the archaeological investigations at the Merchant site was one expressed by Miller and Church (2009) for broader application throughout the Jornada region of southern New Mexico. It is essentially an integration of several theoretical perspectives rather than a focus on a single explanatory approach. This view is based on the recognition that no single theory can achieve the goal of explaining prehistoric human behavior, social dynamics, ecological adaptation, or cultural change and evolution, and that multiple perspectives can enhance our understanding of the prehistoric settlement and material remains at the Merchant site. Schiffer (1999: 167) perhaps best expresses this sentiment:

> Given the wide range of current questions, we must acknowledge that theories from diverse programs are needed to help answer them….No theoretical program in archaeology – or elsewhere in the sciences – is comprehensive when it comes to explaining variability and change in *human* behavior. [Emphasis in original]

The research perspective advocated for the Merchant site investigations derived many of its foundational concepts from Processual archaeology. Behavioral archaeology formed another critical component. The study of abandonment processes and ritual behavior in certain modes of abandonment also provided several concepts for interpreting the archaeological remains at the Merchant site. Social factors — long neglected by the focus on processual and cultural-ecological models in the Jornada region and southeastern New Mexico — have been placed at the forefront; concerns with social power, ritual, and internal social dynamics have been fully incorporated into the processual agenda of culture change and adaptation, or what Hegmon (2003) refers to as "processual plus." It is an explicitly pragmatic approach and one that best incorporates the extensive information on the ecological, behavioral and, more recently, the social dimensions of prehistory as summarized below:

> … to deny the role of environmental and ecological foundations of human technology and social organization would be unrealistic. In turn, to gloss over or discount the influence of human agency on culture change would be equally unwise. It is the dynamic interplay between environment, ecology, and human agency that perhaps best reveals the underlying processes of culture change and should thus be the focus of analysis.
>
> Recalling Schiffer's admonition that no one theory can adequately explain the totality of human culture and behavior, it is suggested that the most productive means of advancing archaeological theory and method in [southeastern] New Mexico would involve the adoption of several perspectives. These would be used to mutually reinforce and support each other rather than to critique and discredit each other. The research agenda envisioned under these criteria is best described as follows: a scientific processual program, with its foundational archaeological observations and assumptions strengthened by behavioral archaeology and human behavioral ecology, along with an explicit

> consideration of the transformative role of social and ideological formations in culture change and evolution [Miller and Church 2009:4–15, brackets added].

Another specific theoretical perspective guided one component of the research. Contemporary archaeological theory on movement, migration, and coalescent communities was considered, using the studies, models, and interpretations presented by Clark (2001), Duff (2001), Lyons (2003), Mills et al. (2011), and Ortman and Cameron (2011), to cite just a small sample of the representative literature on the subject. It is possible that the structural remains and material culture at the Merchant site reflect migration from pueblo settlements to the west, or a Plains group from the east, or reflects an indigenous population strongly influenced by social conventions of the Southwestern pueblo world, or a combination of the two with a pueblo population merging with a resident hunter-gatherer group of the southern Plains. All of these situations would have involved a high level of group movement.

One more perspective merits discussion: the role of public education and outreach. While more of a contemporary concept rather than an anthropological/archaeological theory, it is still an important issue. It is a contemporary idea regarding the relevance and importance of archaeology, prehistory, and cultural resources management to the public and other stakeholders in the Section 106 process, and the critical role of public outreach and engagement to demonstrate such relevance and to "spread the gospel" to a broader range of interested parties and stakeholders. Several tasks set forth on the request for proposals (RFP) issued by the CFO involve public and professional lectures and publications. Summaries of these tasks are reviewed below.

The Merchant Site and the Prehistory of Southeast New Mexico

The Merchant site is representative of the Ochoa phase (A.D. 1300–1450) and represents a typical residential settlement in southeastern New Mexico, a region once thought to have been dominated by mobile hunter-gatherer groups. That perspective has changed over the past decade with a greater appreciation of the complex variety of mobility patterns adopted by the past inhabitants of the region. A mosaic of settlements and settlement strategies is reflected in the archaeological record of the region, some reflecting greater mobility and others greater residential stability organized by place and season, and by ethnicity too.

The presence of such a site gives rise to several research questions. The research questions involve multiple scales ranging from human adaptations to the local environment of southeast New Mexico to the nature of the social groups that inhabited the site and their relationships to broad patterns of social and economic interaction that took place across the southern Southwest and southern Plains during the fourteenth and fifteenth centuries. There appears to be a distinctive blend of Plains and Southwest material culture, technology, and social organization at the Merchant site. There is a strong hunting tradition evident in the chipped stone tools and technology, while there are also intriguing architectural hints suggesting social organization based on Southwestern traditions of communal architecture. Ceramics and marine shell indicate economic and social contacts with groups to the west in the Jornada and Salinas region. The possibility that the site represents a migration of people must be considered given our current knowledge of widespread population movements across the Southwest.

Investigating Plains-Pueblo Interaction during the 14th and Early 15th Centuries

The nature of Plains-Pueblo interaction (perhaps better phrased as Plains-Southwest interaction) has long been of interest to researchers in the U.S. Southwest and southern Plains (Clark and Speth 2022; Habicht-Mauche, 1991, 2000; Kidder 1932; Lintz 1991; Speth 2004b, 2004c; Speth and Newlander 2012; Speth and Staro 2012; Spielmann 1989, 1991, 1996; Spielmann et al. 1990). The topic has received renewed interest over the past few years, as indicated by the publication of symposium proceedings, monographs, and edited volumes (Nash and Baxter 2021; Ortman 2019).

The studies have mostly focused on the post- A.D. 1450 prehistory and history of the northern Rio Grande region and adjacent Plains of New Mexico, Kansas, Oklahoma, and the Texas Panhandle. In light of this revived consideration of Plains-Pueblo relationships among Southwestern and Plains archaeologists, the investigations at the Merchant site and sites of similar age in the region (see Clark and Speth 2022) are of even greater significance because it is a significant example of such interaction taking place a century or two earlier, during the 1300s and early 1400s.

Unfortunately, while it is relatively easy to theorize about such interaction, it is much more difficult to find the data to support or refute such theories. Much of the evidence for exchange and movement involved perishable or intangible items that left no trace in the archaeological record. For example, it has long been known through ethnohistoric research that buffalo hides were a primary trade item from the Plains to the pueblos, and it is hypothesized that such exchange practices existed in prehispanic times (Creel 1991), but hides do not preserve in the record and thus evidentiary support of such trade can seldom be found. However, a few analyses may be attempted that could provide proxy data to estimate or evaluate the nature of interaction between the Merchant site inhabitants and pueblos to the west and hunters to the east, or at least estimate the magnitude of such interaction (Speth and Newlander 2012). Compositional and sourcing analyses, including NAA and petrographic analysis of ceramics, examination of lithic artifacts under ultraviolet light, and X-ray fluorescence (XRF) analysis of obsidian were integrated into a consideration of the magnitude and distance of exchange relationships.

The Origins of the Merchant Site: Migration, Emulation, Coalescence, or Conflict?

The subject of human movement and migration and the resulting effects on social integration, hybridity, and conflict are one of the pressing issues of modern times (Lyons 2003). Prehistoric societies grappled with similar problems, and the topic of migration and social interaction has been one of the primary research topics in the prehistoric Southwest for the past two decades.

Several key and highly visible attributes of the architecture, communal rooms, and ceramics of the Merchant site are reminiscent of settlements and technologies of the U.S. Southwest (Miller et al. 2016). The migration of a Southwestern community serves as a viable means of explaining how those attributes came to be on the terrace of Grama Ridge in the far southeastern corner of New Mexico. However, there are also hints of Plains hunting practices and technologies, and after the 2016 report was completed, we could not state with certainty that those attributes were the result of migration from an as-yet unknown location in the Southwest or were a form of emulation of Southwestern residential settlements and ceramic technologies by a Plains society, or perhaps a hybrid combination of traits resulting from co-habitation of groups from both regions.

The Merchant site may provide further insights into the social processes of cooperation, interaction, and mediation required for a migrant population to survive in a new homeland. It is equally possible that the key attributes of the Merchant site may lead to a broader understanding of how and why certain groups emulated the practices of societies in neighboring regions (Clark and Reed 2011; Reed 2011; Mills et al. 2018; Ortman and Cameron 2011). It is also possible that the evidence of conflict and warfare noted at the Ochoa phase Andrews Lake sites (Collins 1968) are examples of what took place when territorial conflicts could not be resolved. The ultimate objective of the integrated research design is to illuminate what the architecture, site occupation history, ritual spaces and retirement of those spaces, subsistence economy, the organization of hunting, and the interaction of Ochoa phase communities among each other and with other groups across the southern Plains and Southwestern pueblos can tell us about the mosaic of communities on the southern Plains during the Late Prehistoric period.

A key component of this research domain involves the production, technology, style, and origin of Ochoa ware ceramics. Miller (2016:405) observes that the Ochoa ware ceramic tradition was a signature development of the inhabitants of the Merchant site and other Ochoa phase settlements across southeastern New Mexico and the southern Texas Panhandle. Referencing theoretical concepts of cultural hybridity and social identity, Miller suggests the creation of this visually and texturally distinctive ware was a "visible and prominent identifier of the new social identity of the Ochoa phase migrant communities." However, many significant questions remain unexplored when it comes to this ceramic tradition. Corrugated ceramics are a Southwestern ceramic technological and stylistic expression (Pierce 1999), and thus the question of how a Southwestern technology and style developed locally on the southern Plains remains unresolved. To address these and other questions, a technological, compositional, functional, and stylistic analysis of Ochoa ware was conducted.

Thirty-one Ochoa Indented Corrugated sherds were submitted for NAA as part of Luis Alvarado's (2008, 2009) study of 95 plain and corrugated brownwares from southeastern New Mexico. The sample included 28 sherds from the Merchant site and three sherds collected as isolated finds in Crane County, Texas, approximately 80 miles southeast of Merchant. Five compositional groups were identified among the 95 samples, of which the Ochoa ware sherds from Merchant were assigned to Group 1 (Alvarado 2008; Ferguson and Glascock 2007). Alvarado's Ochoa ware samples and other types were included in a comprehensive classification of NAA data from south-central New Mexico, southeastern New Mexico, and Trans-Pecos Texas (Miller and Ferguson 2014). The Ochoa ceramics were assigned to Group 91, one of the most chemically distinct compositional groups identified among the 2,151 NAA samples of the 2014 analysis

A robust geochemical compositional profile has been established for Ochoa wares from the Merchant site, but two issues have yet to be addressed: the petrographic aspects of the ware were poorly known, and it was unknown if other production areas of Ochoa ware existed that might have a slightly different geochemistry. Three analyses were proposed to further clarify these issues. First, additional samples of Ochoa ware ceramics recovered from the Merchant site investigations were submitted for compositional analysis using NAA. Second, a broader geographic sample of Ochoa ceramics was analyzed. The third component of the compositional analysis was petrography. A sample of 10 Ochoa ware sherds that were assigned to robust chemical compositional groups was submitted for petrographic analysis. The thin-section petrographic analysis was intended to establish whether Leslie's (1965b) original description of crushed caliche temper is accurate, or if another material is present. The integrated compositional analysis would help to identify the production source or sources of Ochoa ceramics, verify their manufacturing ingredients, and provide insights into vessel movement and exchange among Ochoa phase villages on the Mescalero Plain and beyond.

The construction of Ochoa Indented Corrugated vessels was based on coil-and-scrape construction. Corrugated surfaces were created by leaving exterior construction unsmoothed and manipulating the coils to produce various textures. Leslie (1965b) characterized four subtypes of Ochoa ware: Ochoa Indented Corrugated, Ochoa Indented Corrugated Smudged, Ochoa Plain Brown, and Ochoa Plain Corrugated. The existence of the subtypes has not been verified.

Corrugated ceramics are a Southwestern innovation and technology. Unfortunately, the origin and function of corrugated ceramic traditions remain poorly known outside the northern Southwest, mostly owing to the fact that ceramic studies have focused on the more appealing painted polychrome traditions across the U.S. Southwest and Mexican Northwest. One manner of potentially linking Ochoa ware to other southwestern traditions is through an analysis of manufacturing production steps. Specifically, the sequence of coiling, exposing coils, and manipulating coils can be examined and those production steps can be compared with other corrugated wares of the Southwest. For example, Ochoa Indented and Plain corrugated sherds were examined to determine if corrugations were created through interior overlap or exterior overlap coils (Hensler and Blinman 2002).

Little is known regarding the functional roles of Ochoa ware. From visual inspection of sherds at the Merchant site and various photographs, it appears that some degree of discoloration and residue accumulations from use as cooking pots is present. While it is reasonable to assume that Ochoa jars were used as cooking, storage, and water transport vessels and that bowls were used for mixing and serving, other functional uses should be considered. Sherd interiors and exteriors were examined for evidence of use alteration, including wear, abrasion, pitting, and sooting. Jar interiors were examined for evidence of pitting and etching that might indicate fermentation, and jar exteriors were examined for sooting from cooking fires. Bowl interiors were examined for striations resulting from serving. The presence of food residues was noted.

Several possible stylistic variants of Ochoa ware have been identified in sherd collections. It is often difficult to parse the distinctions between style and function. As noted above, several researchers have commented on the functional advantages of corrugation. In stylistic or functional terms, fully corrugated vessels such as Ochoa ware represent the final stage in the evolution of corrugation in the Southwest that began with neck-corrugated vessels followed by elaborated neck-banded corrugations (Pierce 1999). Beyond the basic differences between neck corrugated and fully corrugated vessels, the question of whether variations in corrugations, such as obliterated corrugated, indented corrugated, or clapboard corrugated were stylistic choices reflecting practice and habitus (after Bourdieu 1977) have yet to be fully addressed. Variations in corrugation were recorded among the samples of Ochoa ware rim and body sherds.

These and other questions ultimately lead to the question of origins of Ochoa textured and plain wares. Despite their common secondary status in relation to painted polychrome traditions, the manufacture of corrugated ceramics required a unique skill set. At the present time, we understand that Ochoa is an indigenous ware, manufactured, distributed, and utilized by the inhabitants of the Merchant site and other Ochoa phase settlements across the Mescalero Plain and adjacent counties of Texas. Yet, again noting the southwestern origin of corrugated ceramic vessels, the most intriguing and critical question is: from where and from whom was the concept of Ochoa corrugated ceramics derived? It is hoped that an integrated consideration of Ochoa ware ceramics gained through the multiple technical, functional, compositional, and stylistic studies described in this section will provide new insights into the origins and development of corrugated pottery technology. In doing so, it may be possible to resolve, or at least narrow down, the origins of the Merchant site migrant population.

The Organization and Spatial Dimension of Hunting Strategies

The 2015 excavations discovered that unprecedented quantities of bison, antelope, and deer bone were deposited in middens. When considered with the fact that thousands of projectile points and hide and processing tools were recovered by Leslie and the LCAS, it is evident that game hunting was a major component of subsistence and social organization among the inhabitants of the Merchant site. However, large quantities of projectile points may have also been required for other matters, such as warfare or a response to the threat of warfare. Arrow points found in chest cavities of two human burials at the Salt Cedar site in west Texas (Collins 1968) confirm that Ochoa phase settlements were not immune to social conflict and violence. Given the vast numbers of projectile points at the site reported by Leslie (2016a), it is even conceivable that there were craft specialists at the Merchant village who were producing projectile points for exchange with other communities and mobile groups across the region.

The seasonality of hunting strategies practiced by the Merchant site inhabitants is critical to understanding whether bison and antelope hunts were opportunistic encounters or large-scale communal hunts and whether bison and antelope were hunted locally or involved long-distance treks. Seasonality can be addressed by examining sex ratios among assemblages of bison bone. A predominance of males suggests spring hunting, while greater proportions of females points to the fall (Speth 1983). Unfortunately, the analysis of sex ratios and seasonality at the Merchant site is limited by the fact that few of the thousands of bones recovered during the 2015 excavations could be sexed.

Samples were collected for several studies that will be funded through future PBPA projects. Samples of large mammal bone were collected during excavation of midden deposits and domestic rooms for future stable isotope and DNA analysis. Special collection procedures were implemented, such as wearing gloves and placing the specimens in sterile containers.

In the absence of sexed specimens, seasonality may be identified through various technical analyses. One option is the analysis of oxygen stable isotope values in micro-samples obtained from molars (Widga et al. 2010). However, this method may also be impractical because very few molars were recovered during the excavations (probably because the low-value skulls were not transported back to the village).

A second approach to determining sex and seasonality is to analyze DNA in a representative sample of bison bone (Speller and Yang 2016). This method would provide relatively robust and consistent sex identifications among a representative sample of bones. However, it is a new and experimental method and the time, cost, and sample sizes are uncertain. A laboratory specializing in DNA extraction and analysis is required and, to further complicate matters, it may be necessary to have the DNA specialists present during fieldwork to properly collect samples to prevent contamination.

Seasonality and bison migration may also be examined through stable isotopes (Hamilton et al. 2018; Hoppe and Koch 2007). Stable isotope data can also provide insights into past climate. Through the analysis of stable isotope data from dated bison bone in central Texas, Lohse and others (2018) were able to correlate the presence of bison herds with wet and cold periods and thus with intervals of stable grasslands. Stable isotope data from dated bison bones from the Merchant site could be integrated with such data to evaluate whether the founding and settlement of the Merchant site occurred during such a favorable period for bison hunting.

Calibrating paleoenvironmental data with the occupations of the Merchant site can lead to important insights, such as the relative spread of bison herds on the southern Plains, precipitation and drought related to maize farming, and other factors. Stable isotope analysis of samples of bison bone or the small numbers of rabbit bone (Munoz et al. 2011) can be used to estimate paleoclimatic conditions in the project area. There is a large and growing body of stable isotope measurements on rabbit bone for the Plains and Southwest (Somerville et al. 2018), and data from the rabbit bone at Merchant could be integrated with these and other data. This integration would be part of a broader study involving rabbit bone from earlier and later contexts in southeastern New Mexico to provide comparative data. The environmental data potentially revealed through isotope data may help explain the near absence of rabbits in the Merchant faunal collections, an exceptionally unusual finding for any prehistoric site across the Southwest.

These analyses are not included in the present study. The Scope of Work issued by the CFO required that inventories of bison and rabbit bone samples suitable for isotope and DNA analysis be compiled and submitted as a project deliverable, presumably for future analyses funded under the PBPA. The compilation of rabbit and bison bone include samples collected for collagen dating to provide a secure chronological context for the stable isotope measurements.

Regional Research Design Questions

The Regional Research Designs (RRD) for southeastern New Mexico (Hogan 2006; Railey 2016) set forth six research domains: Chronology and Culture History, Subsistence Strategies, Settlement Systems/Mobility Strategies, Environment, Lithic Assemblage Variability, Ceramics, and Religion and Ritual Behavior. The information obtained during the 2014–2015 and 2019 investigations at the Merchant site were applied to these domains. Despite the unfortunate history of looting, under-documented avocational work, and lost artifact collections, the Merchant site retained significant data potential and the excavations yielded substantial data to address each of the major research domains.

Chronometric analysis is one of the keys to understanding the structure and occupation history of the Merchant site. The chronology of the site was examined through radiocarbon age estimates obtained from a variety of features and contexts. However, radiocarbon dating is hindered by the shape of the calibration curve and the presence of a large inversion at circa A.D. 1400 that tends to spread calibrated age ranges across 100 to 150-year-long intervals that span most of the A.D. 1300–1450 Formative period time frame, even when Bayesian modeling is attempted (see Miller et al. 2016). This problem in dating accuracy and precision is a major obstacle to determining if the Merchant site was settled in the early 1300s, late 1300s, or early 1400s – each of which has implications for understanding broader patterns of migration and interaction across the southeastern Southwest and southern Plains.

Two methods were proposed to circumvent the issues with radiocarbon dating and calibration. A selection of 15 Ochoa ware sherds from room floors and stratified layers in middens was submitted for luminescence dating. Ceramic luminescence dating often lacks the precision of radiocarbon dating (see comparative study in Miller et al. 2009), but it avoids the issues of radiocarbon calibration that also result in poor precision and poor chronological resolution for the A.D. 1300–1450 period.

The sampling design considered the relationship between the dated event and the target event using Dean's (1978) critical review of chronometric design and interpretation and focused on dating two target events: (1) the manufacture of Ochoa ware vessels at the Merchant site, and (2) the time that structures were burned and abandoned at the Merchant site (if burned structures were encountered). In some cases, the target and dated events of ceramic luminescence dates and radiocarbon dates can be modeled and one age estimate can be used to constrain the other using a Bayesian analysis (Miller et al. 2009). The sample selection criteria for ceramic luminescence samples and radiocarbon samples will attempt to find such contexts for modeling and reducing the overall age ranges.

The dated event of luminescence dating is the final heating of the ceramic sherd or vessel, typically the firing event during manufacture of a vessel. However, if a sherd or vessel is subjected to an equivalent temperature through exposure to fire, such as on the floor of a burned house or through deposition as a scoop in or near an agave baking pit and then deposited in the pit, the luminescence signal will be reset and the dated event shifts from the firing of the vessel to the last time of burning. Sherds recovered from fill and floor contexts of unburned rooms, middens, or activity areas were selected to date the target event of Ochoa vessel manufacture. In addition to the ceramic sherd, luminescence dating requires an associated soil sample to measure the background radiation dose (termed the annual dose) and soil sample in immediate association was collected during field collection of luminescence sherd samples.

A second alternative is to obtain highly purified collagen dates from animal bone. The process involves XAD-extraction of highly purified collagen that is less subject to contamination and thus yields more accurate age estimates (Stafford et al. 1988, 1991). In addition to the increased accuracy of the bone dates, the use of new AMS dating facilities such as the Pennsylvania State University Radiocarbon Laboratory, may also provide increased precision. If the measurement errors of XAD-purified collagen dates on bison and antelope are sufficiently precise (for example, ± 20 years), it may be possible to separate contexts dating from around A.D. 1400 to 1450 from those dating to A.D. 1300–1400 along the calibration curve. In a similar fashion to the requirement to provide lists of rabbit and bison bone for stable isotope and DNA analysis, the CFO required samples of bison bone be carefully collected in the field and curated for possible future analysis.

Subsistence was examined via a detailed study of faunal remains recovered during fieldwork. The study established patterns of faunal exploitation, diet breadth, and hunting strategies. Plant resources exploited by the inhabitants were identified in flotation, pollen, phytolith, and residue analyses and studies of the agricultural fields and bedrock mortars. These studies evaluated the relative contributions of hunting, gathering, and agriculture to the subsistence economy of the Merchant site residents.

Settlement, mobility, and interaction were examined by a review of ceramic wares and chipped stone material types, in addition to inferences regarding settlement duration, connections and movement of the resident population, and logical patterns of hunting. Lithic and ceramic assemblages were examined through attribute and compositional analyses.

Five general classes of flaked stone artifacts were identified: projectile points, formal tools, informal tools, battered tools, and debitage. Specific types were assigned within these classes, but these classes formed the basis of the raw material analysis. Differences in proportional distributions of raw materials among the classes can offer key insights into mobility, hunting ranges, and the resident population of the site. The raw material analysis included a particular emphasis on identifying signature materials with known source locations (Gregory 2006; Kremkau et al. 2013). Were the majority of flaked stone artifacts made from local Upper and Lower Pecos Group gravels, or were certain classes or types of flaked stone artifacts made from distant source material? For example, the presence of numerous projectile points made of distant Alibates, Tecovas, or Edwards Plateau material would indicate some form of travel to, or contact with, those regions, perhaps via long distance hunting forays.

In addition, the generally nondescript collections of brown, tan, and gray chert unmodified debitage and tools will be examined under shortwave and longwave ultraviolet (UV) light to determine if any material fluoresces in the orange/yellow spectra, thus identifying it as Edwards chert from the Edwards plateau of Texas (Frederick et al. 1994; Hofman et al. 1991). Stone materials from the Tecovas and Alibates sources also have distinctive reactions to shortwave UV light, fluorescing in the light to dark green spectra (Hofman et al. 1991; Speth and Newlander 2012). The collections of projectile points and formal tools will also be examined under UV light spectra to determine if some of the points were made of stone from those sources. Projectile points will receive particular attention and will be examined under strict typological criteria partially based on Leslie's original morphological typology, but with additional detail paid to extra-regional type names and traditions. Material variation among the projectile points will include particular emphasis on identifying non-local and distant raw materials, including UV light analysis. The identification of source areas for projectile points and other stone tools will also provide insights into the nature bison hunting ranges.

A sample of 20 Chupadero Black-on-white sherds was submitted for compositional analysis through INAA analysis. Chemical profiles were assigned to geochemical compositional/provenance groups identified by Darrell Creel and Tiffany Clark (Clark 2006; Creel, Clark, and Neff 2002; see also Stewart et al. 1990). The critical component of this analysis was to determine if Chupadero Black-on-white ceramics were obtained from the Capitan Mountains region, the more distant Salinas pueblos, or perhaps if they represent a closer production area reflected by one or two of the compositional groups with as yet unidentified provenances (Clark 2006). It is noteworthy that rather large proportions of the Chupadero Black-on-white NAA samples from Jornada pueblos could not be assigned to clear compositional groups. For example, 67 percent of the samples from the Bonnell site, 37 percent at Henderson, 27 percent at Bloom Mound, and 50 percent at Sacramento Pueblo were unassigned to any of the Chupadero Black-on-white compositional groups (Clark 2006:152, Table 6.3; Miller and Graves 2012). Additionally, Subgroup 2f identified by Clark (2006:134, Table 6.1) is present in relatively high proportions at sites in the Roswell Oasis and lower Rio Hondo, leading Clark to suggest this area may have been another production zone. Identifying the compositional group and production area of Chupadero Black-on-white at the Merchant site may clarify whether the inhabitants were communicating and exchanging goods with the settlements in the Roswell Oasis or had more distant contacts with the Salinas and Capitan regions.

In a related study, the obsidian artifacts recovered during excavations were submitted for chemical compositional analysis and source identification through XRF. Seven obsidian artifacts were submitted from the 2014–2016 investigations (Miller et al. 2016:390; see also Appendix C.4). Of the five samples with identified sources, three were assigned as Cerro Toledo rhyolite (Obsidian Ridge) and two as Valles Rhyolite (Cerro del Medio). The latter source does not erode into the Rio Grande drainage system and thus cannot be attributed to exchange of Rio Grande gravel sources from the Jornada region to the west. Although the sample is small, the primary source of obsidian, along with the primary source of non-local ceramics (Chupadero), appears to be central New Mexico. It is curious that all obsidian from 2015 fieldwork was recovered from the backdirt fill deposits around LCAS Pit Structure 1 (the kiva). Whether that pattern was the result of sampling bias or reflects some status association with obsidian is speculative at the present time. The recovery and source identification of additional samples will clarify this question, as well as providing further insight into the social and exchange relationships of the Merchant site inhabitants. A maximum of 20 samples of sufficient size for XRF analysis was to be submitted, although only six obsidian artifacts were recovered.

Fieldwork Plan

The following section describes the fieldwork plan that guided the archaeological excavations at the Merchant village site and the suspected agricultural fields to the north of the village. The research design and work plan were developed by Versar, Inc. staff members Myles Miller and Tim Graves and team members John Speth, Charles Frederick, Mark Willis, Jeremy Loven, Phil Dering, Susan Smith, Jeff Ferguson, Mary Ownby, Chet Walker, and Amanda Castañeda. The work plan built on the previous excavations at the site conducted between 2014 and 2015 (Miller et al. 2016) and integrated several components, including intensive excavations, pedestrian survey, geomorphology and geoarchaeology, ground-penetrating radar survey, and UAV photogrammetry. The material culture and samples collected during the project were analyzed through a variety of techniques ranging from conventional artifact attribute analysis to neutron activation analysis.

The 2019 fieldwork was envisioned as a comprehensive and integrated study. While conventional analyses of house form, subsistence, artifacts, and other pursuits were outlined in the program, the main intent was to present these and other studies as an integrated whole. As one example of the integrated approach, a primary goal was to determine whether the Merchant site room blocks were constructed through a planned or random process. This information could then be used to infer the abandonment mode of the individual rooms, which in turn was related to whether the settlement was a planned settlement occupied and abandoned by a multi-family group, or a haphazard aggregation of family groups coming and leaving. These, in turn, are related to the nature of Ochoa ware ceramics, and whether the construction, technology, and style of Ochoa ceramics can be linked with a geographic origin somewhere in the Southwest, or if the technology is purely a local development and variation of corrugated pottery. Continuing this thread of inquiry, the geographic range of bison hunting forays identified in lithic raw material analysis may illuminate how the new migrants established and maintained contact with groups in the southern Plains. Conversely, the relationships with Plains groups may have been confrontational and the change in projectile point types and retirement of civic-ceremonial Structure 1 with a mass layer of bison bone may reflect a population replacement.

The excavations were intended to provide an integrated picture of architectural form, room block construction planning, construction and abandonment modes, the structure of refuse deposits, and whether dedicated storage facilities were used – in other words, a comprehensive vision of site formation, site structure, living and ritual spaces, and occupation history that can be used to help interpret the nature of settlement and the nature of the resident social group or groups at the Merchant site. These and other topics were be examined through the integrated research design.

Other components of the BPA 10 SOW issued by the CFO include a broader geographic study of Ochoa phase settlement, including the immediate area around the Merchant site and surveys of sites of similar age across the Mescalero Plain, the results of which are reported in Graves et al. (2021a, 2021b). These surveys were intended to place the Merchant site in a broader temporal and spatial context. The proposed neutron activation analysis of Ochoa ware ceramics from the Merchant site and other Ochoa phase sites would help determine the level of village interaction and integration across the Mescalero Plains and the southern Panhandle Plains of Texas.

Another study examined the nature and function of bedrock mortars (Castañeda and Willis 2021). The function of these ubiquitous yet enigmatic features remains mostly conjectural. They likely served multiple functions for grinding and mashing various plants, pods, and seeds and even as water catchments.

Defining the Architecture and Nature of Domestic Rooms

Robert "Bus" Leslie and the LCAS excavated seven domestic rooms and tested several more at the Merchant site (Leslie 1965a, 2016). The quality of the excavations varies considerably, as does the quality of the LCAS documentation for those excavations. Some rooms were fully excavated and had intact walls, while other rooms were either disturbed by looters or were poorly excavated. As a result, the morphology and variability of domestic rooms remained unclear. A small number of walls were exposed; however, the line drawings of the wall segments often do not match photographs of those segments. Floor and subfloor features are particularly sketchy, and it is possible that inexperienced LCAS excavators missed many of the subtle indicators of subfloor pits and postholes. It is also possible that the house structures were simple constructions and the floor features typically found at other southwestern pueblos were absent.

Both pithouses and surface rooms are present (note that at least one of the two large "pithouses" was determined to be a kiva [Miller et al. 2016]). Leslie's (2016) notes and manuscripts document the presence of 21 domestic structures, of which only seven were excavated. Surface mapping in 2015 found that some of the domestic rooms appeared to have been unexcavated by the LCAS and to have escaped disturbance by looters. An additional 13 possible domestic rooms were documented during the 2014–2015 fieldwork. Figure 4.1 presents the results of the 2014–2015 mapping and excavation efforts at the Merchant site.

The original plan was to investigate an approximate 25 percent sample (n=7) of the 21 known and 13 known or suspected domestic rooms identified during the 2014–2015 fieldwork. The sampling distribution was intended to investigate four rooms in the northern room block, two of the isolated rooms around the kiva, and one of the structures located 80 to 100 m south of the primary village area. The specific rooms were selected in the field based on preservation, integrity, and data potential. However, Room 13 was selected as one of the two rooms in the kiva area. This room was tested by Leslie and the LCAS and burned remnants of the superstructure were observed. The room appeared to be in good condition and excavation of a burned structure would provide critical data on the nature of structural abandonments. It was also suggested that Room 7 would be the most suitable candidate for the southern rooms. It was visible on the surface and was well-preserved (and thus also vulnerable to looters), while other rooms in the southern area were identified through GPR survey and remained buried and protected.

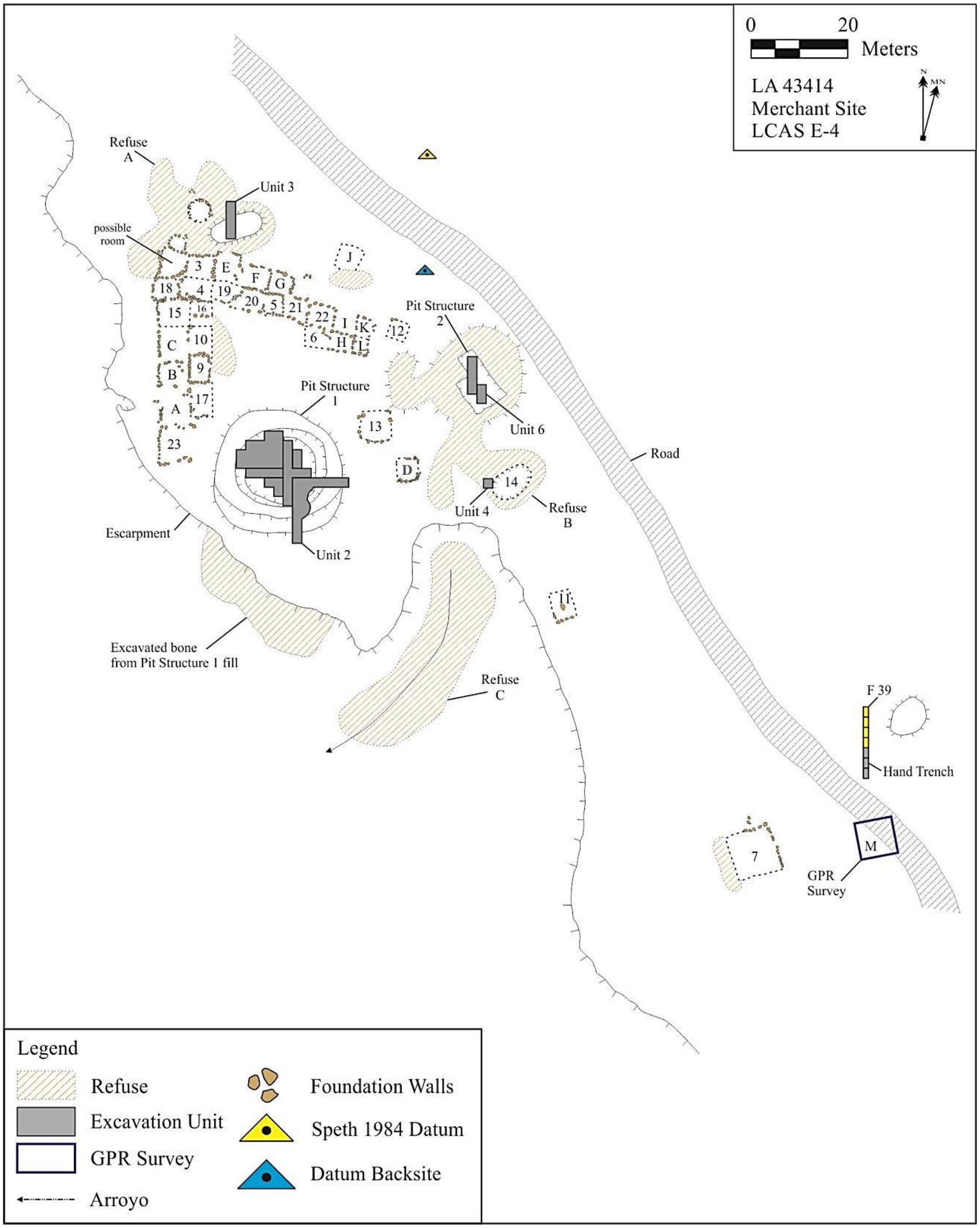

Figure 4.1. Map of the primary village area of the Merchant site based on the combination of aerial photography, EDM, mapping and various image processing procedures from the 2014–2015 fieldwork. The arrangement of room blocks, rooms, and major features is illustrated. Rooms 8 and 14 are not shown because they could not be identified through surface inspection.

As often happens, once excavations began the plan had to be modified. Excavations in the northern room block began with Rooms 6 and 13, but the discovery that an intact suite of contiguous rooms connected to Room 13 necessitated a change in plan. A sample of contiguous rooms was exposed and excavated, and wall segments of several adjoining rooms were exposed and mapped. A segment of seven rooms was fully excavated and another 11 rooms were partially exposed. In the southern room block, Room 7 was found to be contiguous with another room (Room 24) and both were exposed and excavated.

If deep and stratified interior fill deposits were found within a room, it was proposed that the project geoarchaeologist would conduct a micromorphological analysis on a baulk left in place in the room fill and floor and a thin section of the baulk would be encased in resin and extracted for additional analysis. It was hoped that the information gained from this study would provide insights into the nature of the floor, roof fall, and fill. However, interior fill deposits in all rooms were very shallow and were often disturbed by pothunting.

Define Room Block Construction and Growth

A critical architectural aspect of prehistoric and historic southwestern pueblos involves whether they were constructed and expanded through "ladder" or "agglomerative" processes. Victor Mindeleff observed these differences in pueblo construction methods and growth patterns during his first field investigations during the 1880s (Mindeleff 1891), and similar patterns have been documented throughout the Southwest (Adams 2002; Ferguson and Mills 1987; Mills 1998). Ladder constructions involved one or two axial (or long-axis) foundation walls forming the common walls for a series of linear rooms. The rooms were generally built at the same time and had roughly similar sizes and orientations. Ladder construction was an efficient and quick means of establishing a common, multi-room residence and was often associated with larger social groups establishing a new settlement. The construction required a coordinated communal effort and suprahousehold organization. Since they required planned and organized construction, ladder room block designs are thought to have resulted from communal migrations.

In contrast, agglomerative growth patterns involved the somewhat random and disorganized additions of rooms with different wall angles, sizes, gaps between rooms, and a generally more haphazard appearance. Agglomerative constructions may have begun with a small number of households and did not require suprahousehold or community-level cooperation, but instead grew and expanded through the construction of single rooms by families or extended households. Agglomerative construction can more easily accommodate and integrate small immigrant families or households into the community.

There is a tendency for prehistoric western pueblos to have agglomerative construction modes, while the eastern pueblos were constructed through the ladder method (Mills 1998). This distinction might provide some insight into the origin of the resident group at the Merchant site, but in fact there was quite a bit of regional variability, depending on regional histories of migration or stability.

The population and settlement implications of these construction and growth modes for understanding the settlement history of the Merchant site are readily apparent. Did the design and construction of the room block result from a group migration, or was Merchant founded by one or two household groups and the settlement grew as additional families moved to the location? Viewing the layout and organization of the Merchant site as defined through the 2014–2015 investigations (see Figure 4.1), it appears that the room blocks were built using ladder-type construction. However, owing to the extensive disturbance of the site surface, the exact nature of the construction mode, walls, and room layouts is poorly understood, and it is possible that some of the rooms were not contiguous at all.

To better define the construction and growth history of the Merchant room blocks, it was originally proposed that a series of five hand-excavated wall exploration units would be excavated in the primary village area. The wall exploration units would measure 0.5 m in width by 10 to 12 meters in length and would have involved shallow excavations intended to identify and trace wall segments along and across multiple rooms. Wall bonding and abutment patterns would be recorded to document the growth and construction history of the room block and to determine if the axial walls represent single construction events with added rooms.

We proposed this excavation method because we had no idea whether any substantial remnants of rooms or walls remained intact after the years of extensive looting across the main village area. However, after an intact series of contiguous rooms was discovered at the eastern side of the pueblo, we found that all the necessary information on wall abutments and construction sequences could be obtained from broad exposures of those rooms. Accordingly, the 25 square meters of proposed excavations were reallocated toward excavating complete rooms and adjoining wall segments.

Remote Sensing Survey for Storage Features

A critical issue involving site permanence, site structure, and subsistence involves the nature of food surplus production and food storage. If the presence of agricultural fields was confirmed, it would have been likely that the inhabitants of the Merchant site produced food surpluses. Such surplus food production may have required storage facilities, including ceramic storage containers or subsurface storage pits. Even without the production of large food surpluses, storage facilities are common at prehistoric village sites across southern New Mexico (Whalen 1994).

The LCAS excavations did not extend far beyond the walls of rooms. Moreover, any pit features near rooms may have been disturbed or obscured by the extensive stripping and looting of areas around and between the rooms. Because of the lack of extramural excavations, it was unknown whether storage pits were present at the Merchant site.

Extramural areas outside rooms were explored in tandem with the excavation of domestic rooms. Two methods were proposed to locate storage pits. A GPR survey of areas around domestic rooms or between blocks of rooms was completed. GPR survey around Room 7 in the less-disturbed southern part of the site identified four possible pit features positioned within 3 meters of two domestic rooms (Miller et al. 2016:72–75), and it is likely that most domestic storage pits will be positioned within 3 to 5 meters from room walls. The GPR survey around Room 7 identified pits northeast of the two houses, but whether or not that is a consistent pattern for domestic spaces at the Merchant site was uncertain.

The GPR survey focused on the extramural plaza area west and north of the excavated rooms, and several other strips were surveyed near the margins of room blocks. A total area of approximately 250 square meters was be surveyed. If suspected pits were located through the GPR survey, they were to be exposed through excavations using 1-x-1 or 2-x-2-meter units placed over the pits. If the GPR survey was inconclusive, a 3-x-5 meter strip was to be excavated adjacent to some of the houses. A sample of five pit features identified through these methods were to be tested to assess their function, but only a few minor pits were encountered.

Investigation of Midden Deposits

Midden deposits were sampled during the 2014–2015 fieldwork, recovering unprecedented counts of artifacts and animal bone. The majority of the midden material was obtained from LCAS backdirt around Structure 1, but unfortunately the material culture associated with refuse deposition could not be separated from material associated with the closure deposit of Zone E in Structure 1. Ideally, stratigraphic artifact and sample data should be obtained from intact midden formations, but unfortunately it is unknown which midden areas have been compromised and which areas might have intact prehistoric stratigraphy. The extensive looting and widespread mixing of prehistoric refuse middens with 1960s backdirt (as demonstrated in excavation of Refuse Area A; Miller et al. 2016:134–138) made such investigations risky in terms of the cost of excavation versus the reliability of the data obtained.

A careful search for intact midden deposits was conducted because midden formations offer the most productive contexts for obtaining stratified material culture and large quantities of subsistence data. As noted above, the main mounds of Midden Area A were determined to be modern spoil piles from the LCAS excavations. Midden Area B appears to have some intact stratigraphy based on the findings of Unit 4 (Miller et al. 2016:141–143), where a layer of midden material 14 cm to 18 cm deep was identified over what appeared to be a baking pit or hearth feature. Midden Area C was formed through long-term refuse dumping in a drainage channel at the edge of the terrace. According to Leslie, this area may be the best-preserved midden, and Leslie's profile drawing shows several stratified natural and cultural units to a depth of 1.15 m.

Exploratory 1-x-1 m test units were placed in Middens (Refuse Areas) B and C to identify productive excavation contexts. Midden deposits of sufficient depth and integrity were identified in Midden B and an additional unit was excavated. If Refuse Area C contained deeply stratified cultural and natural deposits, it could offer a critical context to address the issues of site formation and occupation history. However, the 1-x-1 m unit determined that the deposit retained little to no depth and had poor artifact recovery rates.

Room fills are often another context for refuse deposits. The use of abandoned pithouses and pueblo rooms as refuse disposal areas was a common practice in the prehistoric Southwest, but it is unclear if abandoned rooms at the Merchant site were used in such a manner. The presence of trash in abandoned rooms offers important clues into the site structure, abandonment modes, and occupation history. Sadly, no such dense refuse deposits were found while excavating the rooms.

Investigations of Possible Agricultural Features

One of the most significant findings – as well as one of the most contentious and unresolved aspects of the 2014–2015 investigations of LA 43414 — was the discovery of possible agricultural features in an area north of the main village (Miller et al. 2016). These patterned caliche outcrops were interpreted as possible agricultural gridded fields, cobble-bordered fields, or mulch fields, although the combination of archaeological, geoarchaeological, and palynological data was not strong enough to make a conclusive statement on the matter.

Additional excavations were conducted to determine whether Southwestern dryland agricultural fields are present at this location, or if the features are simply an unusual natural patterning of exposed caliche outcrops. Two broad horizontal area of patterned caliche cobbles were hand excavated. The units measured 8 m by 4 m (32 square meters) and exposed as much of the caliche alignments and intervening and adjacent space as possible. A single 10-m-long backhoe trench was excavated at the edge of one unit to expose the underlying cultural and natural stratigraphy. An off-field or off-site control trench was also excavated, profiled, and sampled to provide comparative data on soil chemistry, micromorphology, and pollen content.

Susan Smith, the project palynologist, provided on-site consultations on the systematic sampling of features and locations for pollen and phytoliths. An issue with the previous pollen sampling of the 2014–2015 fieldwork is that the sampling locations may have been too deep. Among grid and mulch fields in the Rio Grande Valley, most economic pollen has been recovered from the upper 20 cm of the fields (Smith 2008). Control samples were also collected from locations outside the suspected field areas.

Excavation Methods

Excavations in the village area included two large block exposures over contiguous rooms, two small excavation units in midden deposits, and a small unit placed over a GPR anomaly (Table 4.1). Two block exposures were excavated in the agricultural fields. Nearly 200 square meters of site surface was explored and nearly 22 cubic meters of sediment was excavated and screened.

Standard excavation methods for southern New Mexico pueblo rooms and pithouses were implemented. Fill deposits, stratigraphy, and floor assemblages were documented to identify abandonment modes. Wall construction (foundation trenches, and nature of masonry) was documented as were wall abutment and bonding patterns. It was proposed to excavate a small test unit below the floor of each room to search for evidence of remodeling, earlier floors, or ritual ash deposits between floors, but this was seldom possible since the floors were usually resting on bedrock.

Table 4.1. Summary of excavations at LA 43414

Excavation Area	Context	Overall Dimensions	Area Exposed (m^2)	Volume Excavated (m^3)	Number of Features
Village Area					
1	Southern room block	8 m x 7 m	34	2.33	Rooms 7 and 24
2	Eastern room block	19 m x 12 m	93	15.76	Rooms 6, 13, 25-36
3	Midden B	1 m x 2 m	2	1.55	Feature 110
4	Midden C	1 m x 1 m	1	0.20	Feature 412
5	GPR anomaly	1 m	2	0.33	No feature
Agricultural Fields					
6	Agricultural field	8 m x 4 m	32	1.01	Feature 82
7	Agricultural field	8 m x 4 m	32	0.67	Feature 91
Total			**196**	**21.85**	

Floor and subfloor features were documented, including the deep excavation of primary postholes to identify basal support stones, possible dedication objects, and if any remnant roof support posts remained *in situ*. Floor pits were examined for the presence of cached objects and, if underlying floors were found, the entire floor was removed to search for sealed subfloor pits. Finally, evidence of ritual closure or other abandonment modes was documented. Leslie excavated one possible ritual deposit at the Merchant site (Miller et al. 2016:145), and Collins (1968) describes several caches from the Andrews County sites, although the relationship between those caches and architectural contexts is unclear. At any rate, the presence of caches and other dedicatory and abandonment deposits will further link the Merchant room block construction to southwestern traditions.

The excavations utilized a standard 1-x-1-m provenience unit except for two 1-x-2-m units excavated in Midden B and placed over a GPR anomaly. All room fill was excavated and was screened through a ⅛ inch mesh. Arbitrary levels were maintained within room fills. Level 1 consisted of the few cm of natural or mixed cultural and natural sediments over rooms and were removed to expose the upper portions of walls and the interior fill. Level 2 was used to define the walls and, in some rooms, to expose an upper floor. In most cases, the fill deposits were a homogeneous cultural and natural deposit or consisted of backdirt from excavations by looters in the 1960s. The final level was excavated as a single unit to the or lower floor, leaving the floor assemblage intact. The floor was photographed and floor artifacts were piece-plotted. Flotation, pollen, phytolith, and special samples such as bone DNA specimens, bone collagen dating specimens, and Ochoa sherds with sediment for luminescence dating, were collected using appropriate methods to guarantee the integrity of the samples.

Midden deposits were excavated in 5 or 10 cm arbitrary levels or natural and cultural stratigraphic levels, if such deposits were present. Sediments were screened through ¼ inch mesh, except for a 25 percent sample of the unit screened through ⅛ inch mesh to recover representative samples of small debitage and animal bone.

Several excavation methods were used to explore the agricultural fields north of the village. The methods were designed to maximize the exposure of the fields while also providing detailed excavation data and sample contexts for pollen and phytoliths.

The areas were surveyed to identify productive locations for excavation. The margins of the field locations were explored with 10-m-long backhoe trenches, with an additional deep control trench in the deep eolian deposits located at the far northeastern edge of the site. Two locations were selected for hand excavation. Vegetation was carefully and gently removed by hand to prevent any disturbance to the patterns of caliche cobbles demarcating the fields. A planview map was drawn and photos were taken from a ladder and using a drone aerial platform. Two 4-x-4-m areas in both field locations were hand scraped and brushed to expose additional caliche cobbles. Usually only around 1 cm of eolian deposits was removed, but in some areas a few cm of accumulated aeolian sands had to be scraped and brushed off. The cleared features were then photographed a second time.

A 1-x-1-m unit was then excavated in the center of each 4-x-4-m exposure. The units were excavated to the caliche bedrock to measure the depth of sediments and expose the underlying organic-rich deposits. The fill from the exposures and units was screened through ⅛ inch mesh and artifacts were collected.

The broad exposures and test units were thoroughly and systematically sampled for pollen and phytoliths. Samples were collected from the center and the four sides of each location and from various depths within the test units. The project palynologist, Susan Smith, supervised the collection of samples and selected additional locations, such as the corners where alignments of cobbles joined.

All excavations, GPR survey parcels, surface collections, and features identified during fieldwork at the Merchant site were plotted with a total station and referenced to the master site datum established by John Speth in 1984 and located and reinforced during the 2014–2015 fieldwork. The corners of excavation units were shot in with an EDM transit from that primary site datum. The field coordinates were corrected to the New Mexico UTM base coordinates and all data was georeferenced to the master BLM TRU grid. A master map was produced linking the current excavations and features to those mapped during the 2014–2016 and 1984 fieldwork.

Stabilizing and Backfilling Excavations

Excavations in the village area and agricultural fields larger than 30 cm square and deeper than 10 cm were backfilled with sterile caliche obtained from a BLM caliche pit and covered with screened soil from excavations. Smaller excavations were covered with sifted backdirt or culturally sterile soil obtained off the site.

Public Outreach and Education

The final series of tasks were designed to increase public awareness of the site, the Permian Basin program, and the issues surrounding looted sites on public lands. The Merchant site and other Ochoa phase settlements across the Mescalero Plain are a fascinating example of human migration into a new homeland and the technological and social adaptations that were required to successfully live in that new home. Accordingly, a significant component of the proposed work plan includes ways to inform the general public of the Merchant site and how studies of prehistoric archaeological sites and human adaptations can provide insights into our modern human condition.

A glossy booklet was produced for public distribution. The nature of the Merchant site, the past and present investigations, and the things we were able to learn about prehistoric lifeways in southeast New Mexico from these investigations were presented in the brochure. In addition, the brochure fully acknowledged and credited the CFO and PBPA for their support. The booklet also included a subtle and non-confrontational discussion of the damage resulting from uncontrolled and illicit looting of sites. As recommended by the CFO, the discussion addressed the topics of looting, the loss of artifacts and context, and ultimately how we lose a piece of our past and history that belongs to all citizens. A professional poster was prepared for use by the CFO, and several conference presentations are planned.

In January 2016, Mr. Miller presented the results of the 2014–2015 fieldwork to the Hopi Cultural Preservation Office in Kykotsmovi, Arizona. Because of the COVID-19 pandemic, it was not possible to make a second visit in 2021 to present the results of the 2019 fieldwork. Instead, an on-line meeting and presentation was arranged in October of 2021.

Curation and Digital Files

All artifacts, samples, field notes, photographs, and maps were curated at the Laboratory of Anthropology in Santa Fe. A digital copy (PDF or other format) of the final report and the final approved public education booklet was filed with the Digital Archaeological Record (www.tDAR.org). The digital copy was redacted so that locational information on the Merchant site was removed.

Chapter 5

Overview of the Merchant Site

The common perception of the Merchant site is that of an isolated village located on the terrace of Grama Ridge on the plains of southeastern New Mexico. This notion is rather misleading. The Merchant site is surrounded by, and situated within, a vast and varied archaeological landscape of substantial complexity and considerable time depth.

The original LCAS village excavation is part of a larger archaeological site designated as LA 43414. More than two dozen archaeological surveys conducted since the LCAS excavations have identified distributions of features and artifacts to the north, south, and east of the escarpment edge where the village is located. Accordingly, the original site of LA 43414 has been remapped and redefined several times during the past 40 years of cultural resource management work. The Laboratory of Anthropology site number, LA 43414, was first assigned to LCAS Site E-4, the village area investigated by the LCAS between 1959 and 1964. During the oil and gas boom of the 1990s and 2000s, the site boundary was expanded to encompass several nearby sites and artifact scatters recorded during Cultural Resource Management (CRM) surveys (Allison et al. 2009; Seymour 2001) and those boundaries were confirmed during the 2015 TRU survey of the area (Miller et al. 2016).

As part of the current project, a TRU survey was conducted of a 5.1 square kilometer area surrounding the Merchant site and the ponding area to the west (Graves et al. 2021a). As a result of that survey, LA 43414 is presently defined as an aggregate TRU site measuring 2.8 by 1.2 km that subsumes most of the terrain of Grama, Antelope, and San Simon ridges that surround the ponding area and drainage of San Simon swale. Nearly 800 features and more than 34,000 artifacts were recorded on the surface of the survey area, and these counts reflect only a small fraction of the features and artifacts that remain buried below eolian and alluvial deposits. Age estimates provided by radiocarbon dating, ceramic types, projectile points, and historic items revealed a landscape occupied for a span of more than 6,500 years from the Early Archaic period through recent Historic use of the area for ranching and oil and gas extraction.

The Merchant site is more concisely and appropriately understood as part of this varied cultural landscape. The local contexts of the Merchant village are examined at several scales in the following chapter, beginning with the five square-kilometer archaeological landscape around the site, then narrowing the focus to the immediate area of the Merchant village and associated features, and closing with an introduction to the spatial layout and excavations of pit structures, rooms, and middens within the village proper.

Several aspects of this landscape approach will prove to be of relevance for the discussions of architecture, agricultural fields, and material culture presented in later chapters. For example, the nearly continuous distribution of material culture across the five square-kilometer area surrounding the village and suspected agricultural fields, most of which is associated with earlier exploitation and occupation of the terraces, is an important point for understanding the widespread presence of artifacts in and around the suspected fields.

Grama Ridge, Antelope Ridge, and San Simon Swale

One component of BPA 10 was a high-resolution TRU survey of a 1,257 acre (5.1 square kilometer) parcel surrounding the Merchant village site. The 2015 fieldwork completed under BPA 4 included a TRU survey of an earlier, 144-acre definition of LA 43414 that included the Merchant village locality and several previously recorded sites within a 200 to 400 m distance of the village. The 2019 survey was a much larger effort, encompassing 1,257 acres of BLM and New Mexico State Land Office lands around the San Simon swale, the water ponding area (often called a playa) and its drainage leading toward the south, and the surrounding elevated landforms of Grama, San Simon, and Antelope Ridge (Figure 5.1).

Various segments, sections, and linear corridors within the 1,257-acre parcel had been the subject of 29 archaeological surveys conducted between 1982 and 2017 (see Graves et al. 2021a). All of the surveys were conducted under Section 106 of the National Historic Preservation Act in response to oil and gas exploration and development in the Permian Basin. Twenty prehistoric and historic sites, including LA 43414, were recorded during those surveys (Figure 5.2). Several parcels and sites had been surveyed multiple times, resulting in multiple overlapping and inconsistent site boundaries, differences in feature and artifact counts, and errors in site location[1].

TRU Survey

As with the earlier survey of LA 43414, the Merchant Vicinity survey utilized the high-resolution TRU method to document features and artifact distributions. The TRU method is an intensive and comprehensive 100 percent inventory of survey parcels developed and refined at Fort Bliss Military Reservation in south-central New Mexico and far western Texas (for early examples of the development of the method see Graves et al. 2002; Kludt et al. 2007; Lukowski and Stuart 1996; O'Leary et al. 1997). The TRU method uses global positioning system (GPS) units to position and maintain the locational accuracy of survey cells along transects. Transect lines are oriented along the north-south axis of the survey parcel. The grid system is positioned so that the southwest corner of the transect grid is placed on the southwest corner of a Universal Transverse Mercator (UTM) coordinate. The transect recording unit cell on BLM lands measures 10 m by 10 m. Each TRU (or cell) along a contiguous transect line is examined by a crew member assigned to that transect. Each crew member is equipped with a hand-held data entry and GPS unit to document cultural and natural observations within the TRU cell. The field supervisor is equipped with a high resolution and high-accuracy Trimble GEO-XT handheld GPS unit to ensure that crew members maintain consistency and accuracy in transect coverage and field documentation.

Features and architectural remains are measured and all artifacts within each TRU cell are tallied by class. Features are assigned a number and the locality is plotted with a GPS unit. In addition to prehistoric attributes, the immediate environment, including geomorphic setting, surface exposure, vegetation, and modern impacts are assessed. Obstacles that can obscure the discovery of cultural resources, such as dense vegetation or recent alluvium, are also noted. The information on cultural materials and features and natural attributes is recorded and saved.

[1] These problems in survey redundancy and inconsistency, manifested at broader scales across southeastern New Mexico, are one of the fundamental issues that inspired development of the Permian Basin Programmatic Agreement (see Schlanger et al. 2013).

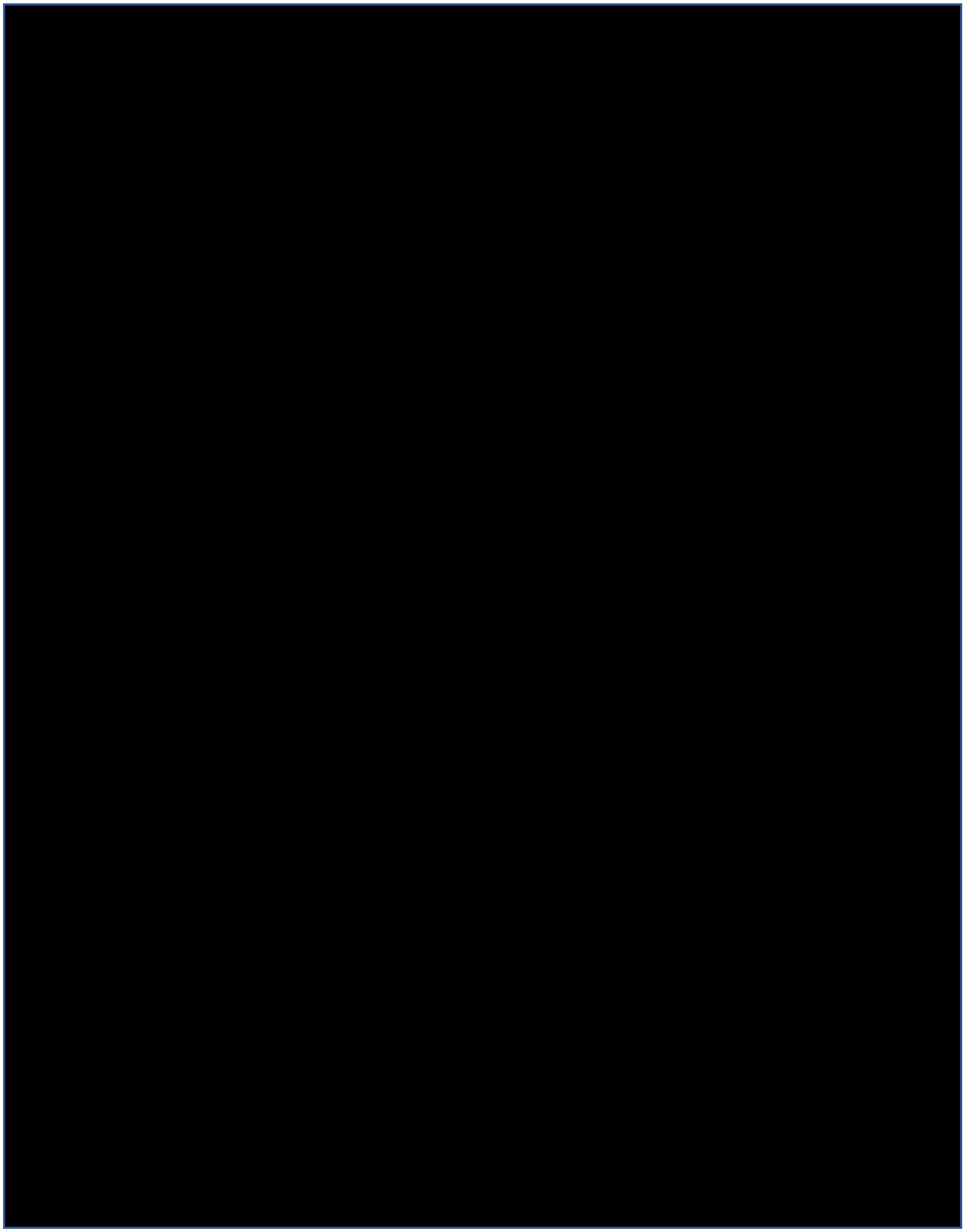

Figure 5.1. The geographic and topographic setting of the Merchant village within the 2019 TRU survey parcel. The boundary of LA 43414 established in 2015, including the Merchant village site and agricultural fields, is plotted on Grama Ridge northeast of a small playa that is part of the San Simon swale. The 1,257-acre survey parcel includes the playa and the surrounding terraces and ridges. The square areas cleared of vegetation are oil and gas fracking wells.

[redacted]

Figure 5.2. The 14 previously recorded site boundaries now subsumed within aggregate site LA 43414.

An important aspect of the method is that sites are not defined in the field but instead are defined in the office and laboratory by processing the spatial data through GIS subroutines. Sites are defined through specific density and distance criteria. The raw TRU cell data are processed through a series of Boolean statements and site-positive TRU units (cells that met criteria for artifact counts) are established. Sites are defined on a uniform distance criterion based on a set buffer between positive cells. Once sites are defined, the boundaries and other TRU information are converted to GIS shapefiles for further analysis and evaluation. The combination of standardized field recording methods and GIS site definition serve to reduce considerably the subjective and ambiguous nature of site boundary definition. Site boundaries were defined on the basis of a standardized distance criterion of 20 m as required by the BLM. The effects of idiosyncratic and biased site definitions are considerably reduced and, in some cases, eliminated by the use of GIS-based site definitions based on standard distances between positive TRU cells.

Based on the TRU survey and GIS distance criterion, 14 of the previously recorded sites, including the previously defined area of LA 43414 of the 2015 TRU survey, were combined into a single, large aggregate site (Figure 5.3). Per the State of New Mexico site guidelines, this aggregate site was also designated LA 43414, which can result in some confusion because the number was also assigned to the small, 1-acre area of the original Merchant site (LCAS E-4) located at the northeastern corner of the aggregate site.

Eight new sites were defined during the survey, and two previously recorded sites could not be located. A total of 370 isolated manifestations were also documented. In addition to the survey, several features were tested to characterize their function and obtain samples for radiocarbon dating and macrobotanical analysis.

The Archaeological Landscape of LA 43414

The 2019 Merchant Vicinity survey identified an extensive cultural landscape encompassing the terraces and ridges surrounding the water ponding area and along the San Simon swale drainage. The combined 2015 and 2019 surveys documented 772 surface features. Major feature categories included 103 architectural features (surface rooms, pithouses, and circular rock alignments), 308 hearths and baking pits, 13 refuse middens, 17 possible agricultural fields and check dams, and 12 miscellaneous features such as cairns, activity areas, and possible rock art. Ninety bedrock grinding features and 225 bedrock cupules were recorded at eight outcrops of sandstone along the lower slopes of Grama Ridge. Two historic oil wells and well pads were also recorded.

The 768 prehistoric features are distributed across most of the areas of LA 43414, with the exception of the central ponding area and the sloping surfaces of Pleistocene clays and bedrock leading from the terraces to the ponding area. For the most part, the highest densities of features correspond to the locations of previously recorded sites and the highest concentration of features within the entire survey parcel is located in and around the Merchant village locality as originally defined by the LCAS. Almost all the surface rooms are located in this area. Pithouse stains were recorded in other locations throughout the area. Several of the midden features are located within the village area, but other midden areas are present near clusters of pithouses, hearths, and baking pits.

More than 34,000 surface artifacts were recorded within the boundaries of the newly defined LA 43414, and several thousand more were present in the surrounding sites and isolated manifestations. Slightly over 70 percent of the artifacts were cookstones in the form of fire-cracked rock (FCR) consisting of limestone and sandstone or burned caliche (BC). FCR and BC were recorded in most of the site areas defined in the survey parcel, as well as the individual TRU recording cells comprising those sites (Figure 5.4).

[redacted]

Figure 5.3. The TRU-defined boundaries of LA 43414 and 10 individual sites recorded in the Merchant Vicinity survey parcel.

[redacted]

Figure 5.4. Distribution of TRU cells with fire-cracked rock and burned caliche.

The class of chipped stone artifacts totaled 6,187 items, including nearly 700 tools and 21 projectile points. The small number of projectile points is remarkable when contrasted against the thousands of points recovered from the Merchant village, although the low recovery rate is probably biased by decades of uncontrolled surface collections by avocational archaeologists and artifact collectors. The projectile points include types assigned to the Early Archaic through Ceramic and Protohistoric periods. The presence of 100 items of historic glass, metal, ceramic, and wood construction materials is evidence of more recent use of the landscape for ranching and oil and gas exploitation. The groundstone artifacts numbered 2,137 items and included a considerable variety of mano and metate forms as well as pestles, anvils, and polishing stones. Stone balls and fragments of palettes – artifact types rarely found on survey in southeastern New Mexico – were also recorded. A total of 1,463 animal bones and 18 freshwater mussel shell fragments were observed in midden deposits.

One of the more perplexing results of the survey was the low number of 288 ceramic artifacts within the area of LA 43414, a surprisingly small count for a large site consisting of several residential areas. The low ceramic counts across the site, including the Merchant village locality, are most likely biased by past surface collecting by avocational members of the LCAS and other artifact collectors, as noted at several large village sites on the Mescalero Plains (Graves et al. 2021b). Despite the low counts, the surface ceramic assemblage is thought to be proportionally representative of the variety of major types once present across the area. Nearly half (47 percent) of the surface assemblage was identified as Ochoa ware, almost all of which was concentrated in the Merchant village locality. El Paso brownware and El Paso Polychrome represented 18 percent of the assemblage. Jornada Brownware comprises slightly over 13 percent of the ceramics, and Chupadero Black-on-white represents another 13 percent. Eleven sherds of Agua Fria Glaze-on-red were found, representing 3.8 percent of the ceramics, although most were part of a single bowl sherd. The remaining 5 percent of the surface ceramics consists of small numbers of Lincoln Black-on-red, Three Rivers Red-on-terracotta, Mimbres Black-on-white, Chihuahuan Medio Period polychromes, and several unidentifiable sherds.

In addition to survey, several features were tested to characterize their function and obtain a chronological profile of the large, aggregate site. Seventeen radiocarbon dates were obtained. The calibrated ages range from 4375–4260 B.C. to A.D. 1665–1950 and corroborate the Early Archaic through Protohistoric occupation range of the projectile point types. It is also worth noting that the local radiocarbon chronology is mirrored by the 5,800 years of eolian and cultural deposition documented through OSL dating of deposits in Trench 2019-1.

Data collected from the combination of intensive surveys and excavations provide a much broader perspective on the archaeological landscapes around the Merchant village. The terraces surrounding the water ponding area and drainages of the San Simon swale were a primary focus of prehistoric settlement for much of the prehistory and early history of the region. The aggregate site of LA 43414 consists of a highly varied and complex assortment of occupations, features, technologies, and adaptations. It is a composite landscape formed through a succession of occupations and use episodes, all of which reflect the broader adaptations and settlement patterns present across southeastern New Mexico.

A surprising result of the Merchant Vicinity survey, however, is that evidence of Ochoa phase occupations is almost non-existent beyond the original boundaries of the Merchant village defined by Leslie and the LCAS in the early 1960s. Few surface ceramic concentrations were identified in the survey parcel and even fewer Ochoa ceramics were recorded. A few possible jacal wall foundations were noted, although it is difficult to confirm the features because of the extensive surface disturbances. Most of the structural features were associated with ceramics other than Ochoa ware, including El Paso and Jornada brownwares, Three Rivers Redwares, Chupadero Black-on-white, and Agua Fria Glaze-on-red. The production periods of several of these types are contemporaneous with the Ochoa phase, but no settlement areas with the combination of contiguous room jacal architecture and Ochoa ware ceramics similar to the Merchant village were found in the survey parcel.

The Merchant Village and Its Environs

The Merchant village is situated along the escarpment of Grama Ridge. The village has been the main focus of interest since the LCAS investigations of the 1960s, but other significant features such as cairns, bedrock grinding features and cupule boulders, and suspected fields, exist within a half kilometer distance of the village. Small groups of domestic structures are also located along the escarpment edge to the northwest, and artifacts are scattered across the entire terrace.

The 2014–2015 field investigations included aerial photography and photogrammetry, TRU survey, and site mapping. Versar and Mark Willis and Chet Walker of Archaeo-Geophysical Associates (AGA) conducted an intensive, low-altitude, high-resolution aerial photography and three-dimensional contour mapping of the 86-acre area defined as LA 43414 during the CRM

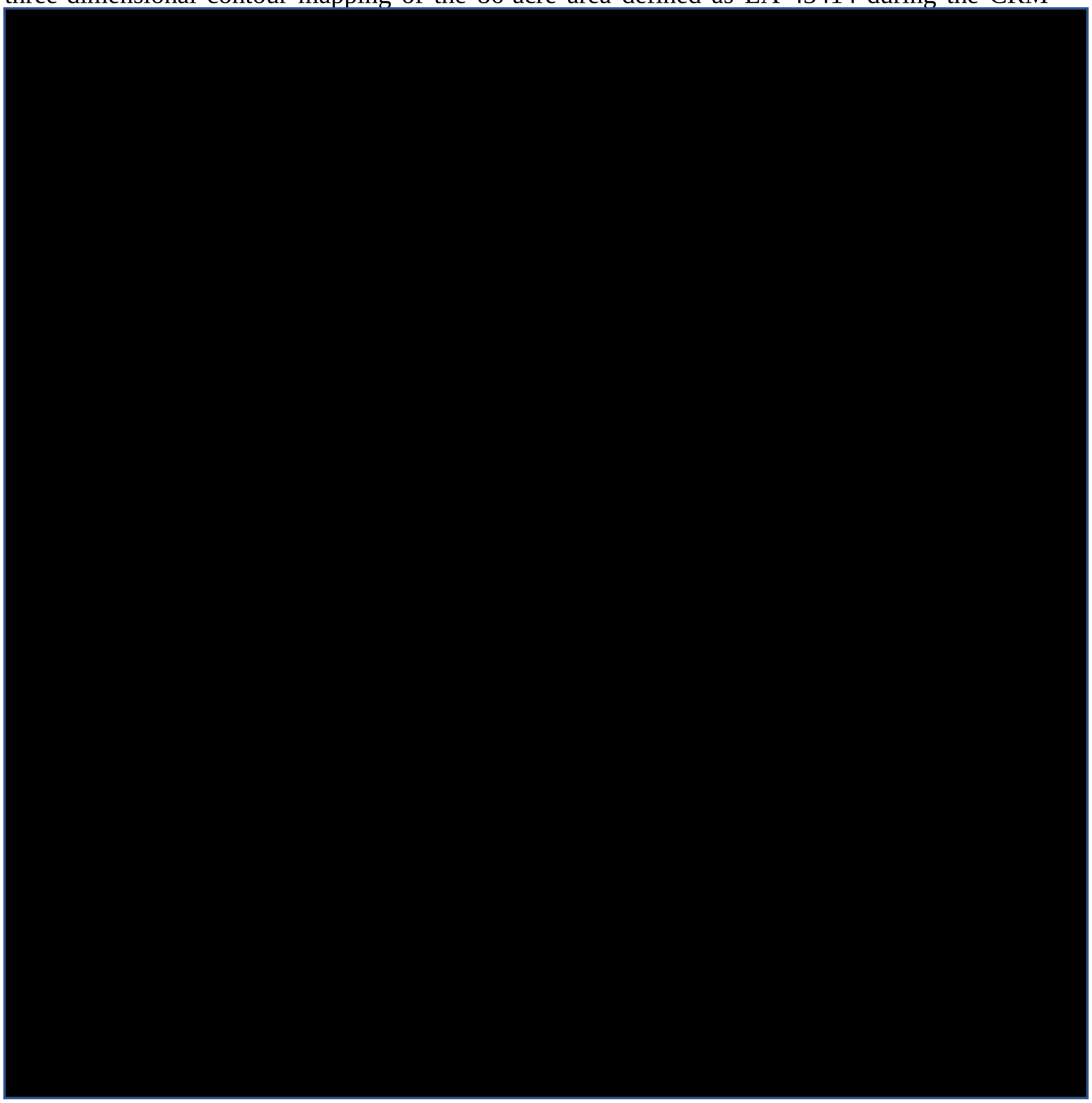

Figure 5.5. Aerial image of the 2015 boundary of LA 43414 produced by Mark Willis, showing features discussed in this section.

The Agricultural Fields

Extensive, patterned distributions of caliche cobbles oriented from the northwest toward the southeast were observed along the margins of the drainage channel traversing the northern half of LA 43414 during previous surveys. The possible check dams consisted of two to five linear alignments of caliche positioned across drainages and spaced 4 m to 6 m apart. Four of the agricultural features and the check dams were investigated through combinations of aerial mapping, hand excavations, and geomorphological analysis of backhoe trench profiles. The results of these investigations are presented in Chapter 10.

Bedrock Grinding Features and Cupules

An often overlooked and understudied component of the prehistoric landscape of LA 43414 and the Merchant site is the hundreds of bedrock grinding features found among outcrops of sandstone along the lower slopes and base of the caprock escarpment. More than 300 bedrock features, including 88 bedrock mortars, were documented across the entire Merchant Vicinity survey parcel (Graves et al. 2021a) and 262 features were mapped within the boundaries of aggregate TRU-site of LA 43414. The common presence of these features, as well as their locations and morphological variation, indicate they were an important component of prehistoric food production and perhaps ritual and social engagement. During the LCAS work in the 1960s, members of the society uncovered two groupings of bedrock features on the escarpment north of the pueblo. Leslie's 1965 article and manuscript (Leslie 2016a) describe several locations of bedrock mortars, bedrock metates or slicks, and cupules (Figure 5.6).

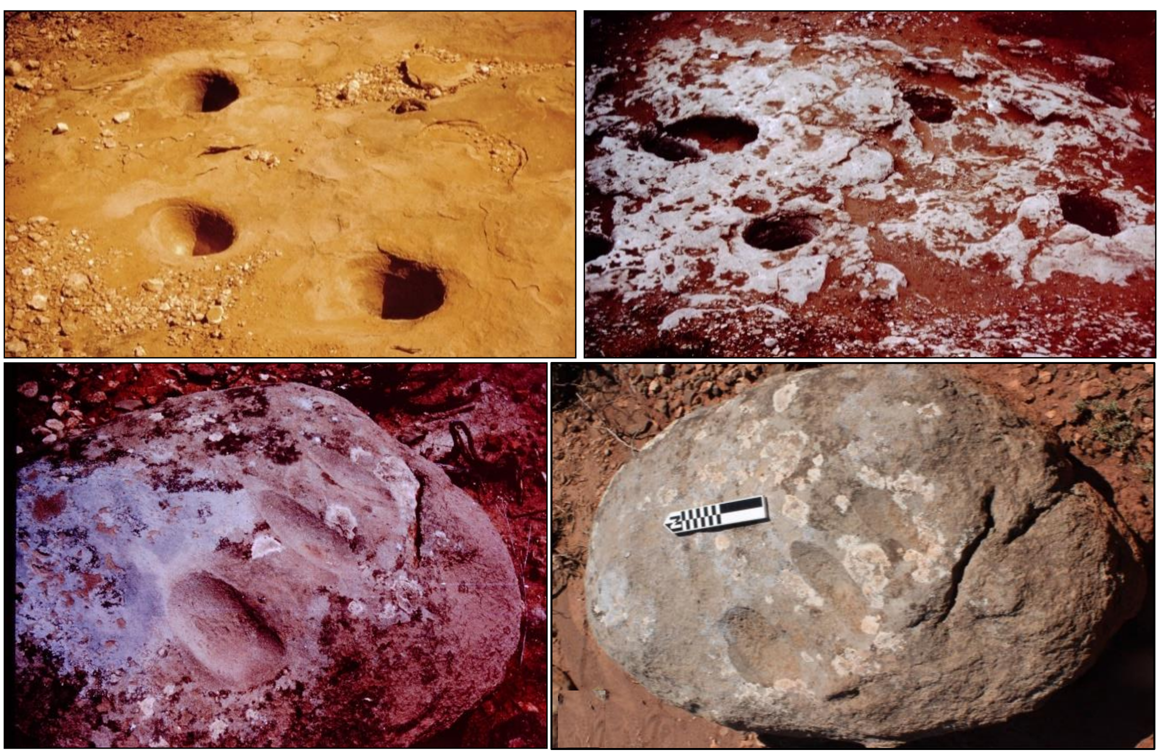

Figure 5.6. Bedrock grinding slicks and mortars photographed by Leslie in the 1960s: (upper panels) Group 1 and Group 2 mortars located north of the village, the locations of which were buried by eolian sands and have not been located; (lower panels) grinding slick located at the base of the escarpment. Photograph at the left was taken by Leslie, the image at the right shows the same bedrock feature documented in 2019 as M09 in Area 3.

Leslie mapped two clusters of bedrock mortars, designated Group 1 and Group 2, north of the LCAS village area, and several other mortars were mapped along the base of the escarpment. Leslie's photographs show that LCAS members had exposed the features of Groups 1 and 2 by removing 30 or 40 cm of eolian deposits. When Versar began work at the Merchant site in 2014 and 2015, the bedrock features were no longer visible on the surface, presumably backfilled by LCAS members or gradually filled in and buried by eolian deposition. At the time of fieldwork in July 2019, these features remain under the wind-blown sediments north of the village and were not recorded. However, other bedrock features photographed by Leslie in the 1960s were located during the 2019 surveys (see Figure 5.6, lower right).

Eight clusters of bedrock grinding features were mapped during the 2019 TRU survey, seven within the boundaries of LA 43414 (Figure 5.7). The features are found on free-standing boulders and bedrock outcrops of Upper Chinle formation sandstone exposed along the lower flanks and base of the escarpment, as shown in the examples of Area 3 (Figure 5.8). The features were drawn, measured, and documented by Amanda Castañeda and photographed using an aerial pole platform and processed using 3D modeling by Mark Willis. The results of this study are presented in a separate report (Castañeda and Willis 2021).

In total, 262 individual bedrock features were recorded across 34 discrete locations that were grouped within seven spatially segregated areas located to the west and south of the village. Fifty-seven bedrock mortars, including several morphological variants such as circular, oval, and boat-shaped forms, were found in clusters and as individual features on boulders and rock outcrops (Figure 5.9). Other bedrock grinding features included 141 shallow grinding slicks or basins, 63 cupules, and one large "tub" grinding feature.

A few bedrock features consisted of grinding slicks and cupule boulders (Figure 5.9), the latter presenting an interesting analog to directional shrines in the northern Rio Grande region (Anschuetz 1998; Duwe 2016; Fowles 2009; Jeançon 1923). Another unique bedrock feature was in Area 3 south of the village. A line of 17 tiny cupules were pecked in a north-south arrangement across the surface of the M30 boulder (Figure 5.10). The significance and function of this pecked feature remain conjectural, but it clearly did not serve a utilitarian function for grinding or processing seeds, pods, or other plant parts.

Cairns

Another unique and significant group of features within the boundaries of LA 43414 is the cluster of three cairns, designated Feature 93, located 225 m north of the village and at the northern edge of the agricultural fields. Each cairn consists of approximately 30 to 300 caliche slabs stacked to heights of 20 to 30 cm and measuring from 3 to 5 m in diameter (Figure 5.11). The cobbles were clearly size-selected and stacked upon each other, and therefore the features are considered cultural in origin. Similar features in the western Jornada and Big Bend regions are often associated with human burials or caches (Beckes 1977; Mallouf 1987; Miller 1990; Miller et al. 2012). Whether the features at LA 43414 cover burials or caches, or perhaps were another form of village shrine, remains uncertain.

The bedrock mortars, grinding slicks, cupules, cupule alignments, and cairns are important components of the landscape surrounding the Merchant village. Some features, such as the bedrock mortars, probably served utilitarian functions for processing acorns, mesquite beans, and other foods. Cupule boulders and cairns are a different thing, and their presence marks a larger social and ritual engagement with the landscape.

[redacted]

Figure 5.7. Distribution of bedrock grinding features at LA 43414.

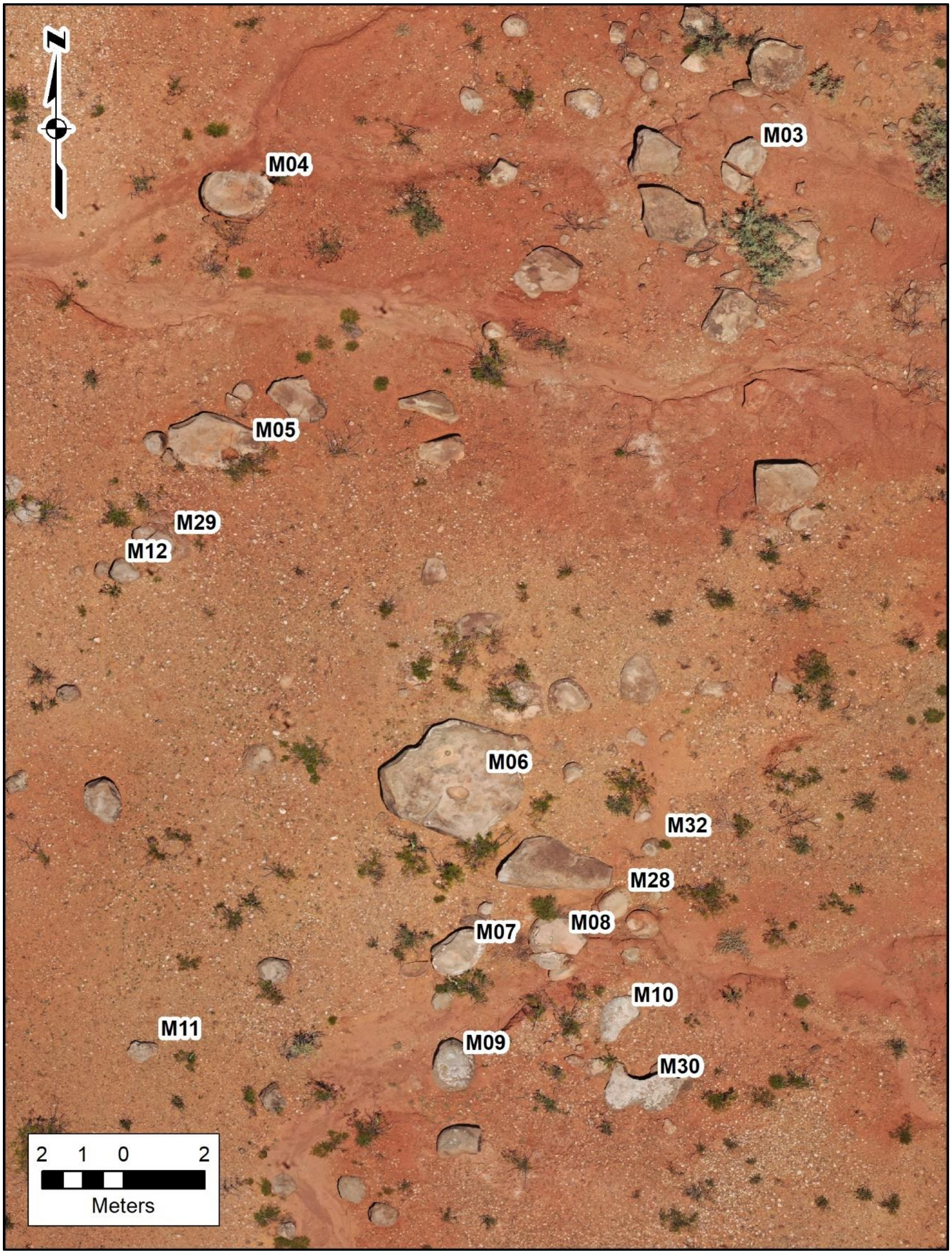

Figure 5.8. Aerial map of bedrock features in Area 3 below the Merchant village.

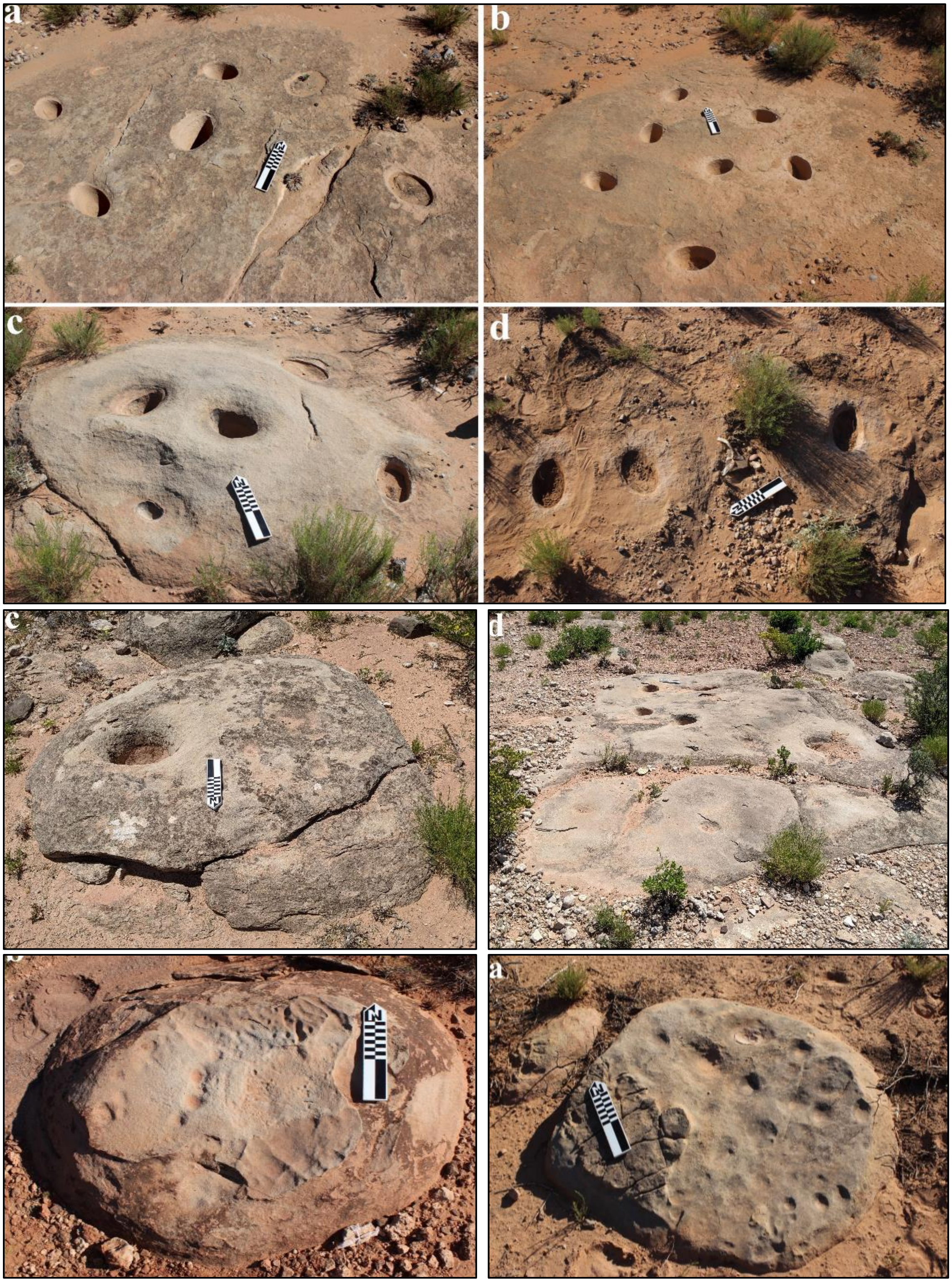

Figure 5.9. Bedrock grinding features located near the Merchant village (from Castañeda and Willis 2021): (first and second center panels), examples of bedrock mortars in Area 7; (third panel) ground stone bedrock features in Area 6; (lower left) grinding slick and cupules of Feature M15 in Area 5; (lower right) multiple cupules on boulder surface of Feature F145 in Area 8.

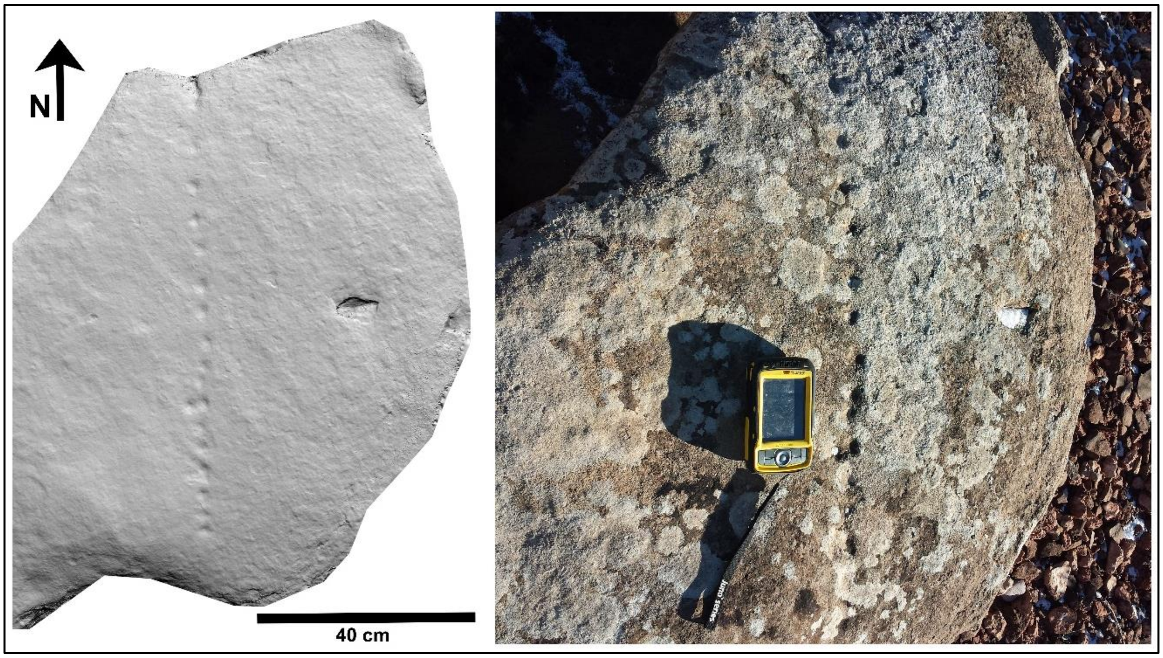

Figure 5.10. Seventeen cupules in a linear arrangement on Feature M30 of Area 3 as shown by a shaded relief map (left) and a photo taken in early morning (right).

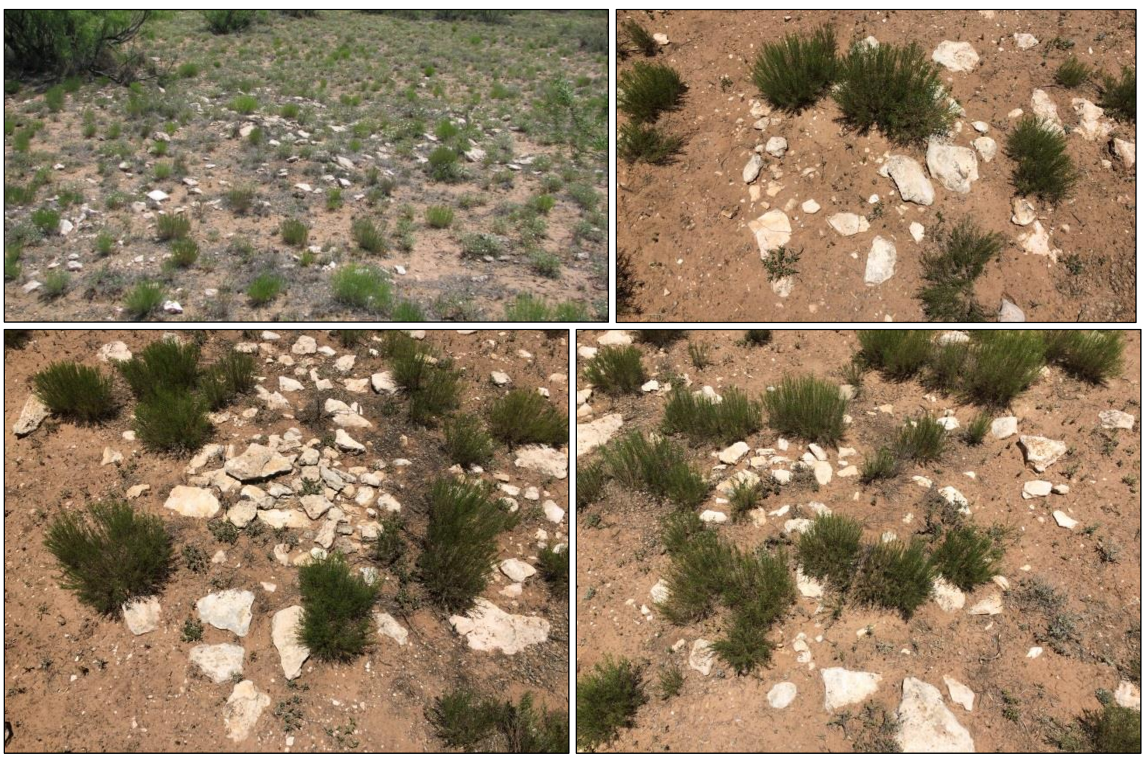

Figure 5.11. Feature 93, a cluster of three rock cairns at LA 43414.

TRU Survey and Spatial Analysis

The TRU survey fieldwork of LA 43414 was completed during two days of November of 2014. The area within the boundaries defined in 2001 (Seymour 2001) was examined as well as a 100-m buffer beyond. A total of 5,282 10-m by 10-m TRU cells (528,200 square meters or 144 acres) were examined and documented. Of those 5,282 TRU cells, 459 were positive for surface artifacts or features. A count of 4,075 surface artifacts was recorded in the positive TRU units. The most common artifact classes accounting for nearly 82 percent of the total were fire-cracked rock/caliche and animal bone, most of which was recorded in the LCAS village area.

The surface rooms, two deep pit structures, middens, and open LCAS excavation units of the Merchant village were mapped during the TRU survey. Additional possible surface rooms and a possible small room block were identified along the escarpment to the north, although excavations will be required to confirm those structures. Four pithouse depressions were also mapped along the northern terraces. Hearths and baking pits with burned caliche and limestone cookstones were distributed throughout the site. Most of the 22 hearths were isolated features distributed across the northwest and southern areas.

Incorporating the TRU cell data into GIS routines, cell count and kernel density maps were created for major artifact classes. Cell count maps simply show the counts of certain artifact types within the TRU cells. Kernel density estimation (KDE) is a non-parametric technique to measure artifact density (Conolly and Lake 2006). The purpose of using a KDE is to smooth the data in such a way that visual displays of artifact populations can be created, allowing for the locations of clustered and random distributions to be identified. Higher KDE values indicate non-random clustering of artifacts, while lower values represent random distributions.

Cell count and KDE plots of three artifact classes are provided in Figures 5.12 through 5.17 (additional plots are in Miller et al. 2016:81–90). Most plots display similar patterns, showing the Merchant village having much higher artifact densities and degrees of clustering than surrounding areas. The plots and density maps for ceramics show a restricted distribution within the village. These plots establish that the pueblo room blocks and pit structures were the dominant settlement location of this part of Grama Ridge. Yet, several less prominent but equally significant patterns provide insights into the nature of settlement across the prehistoric landscape of LA 43414.

The plot of TRU cell counts for lithic artifacts is displayed in Figure 5.12 and the KDE is shown in Figure 5.13. Lithic artifacts are widely distributed across the site, with the interesting exception that most of the cells in the vicinity of agricultural features have few items. The greatest densities are centered on the Merchant village area, a pattern that is repeated among all artifact classes. A few minor dense areas are evident, most of which correspond to locations of habitation structures identified through TRU mapping as well as during earlier seismic line surveys.

The distribution and density plots of groundstone artifacts (Figures 5.14 and 5.15) are one of the more surprising findings. As with the above-mentioned distributions, the highest density of groundstone tools and fragments is centered on the village. However, positive TRU cells for groundstone items are present across almost the entire northern two-thirds of the site, and many TRU cells contain multiple groundstone artifacts. Also noteworthy is that, as noted for lithics and ceramics, many of the TRU cells where agricultural features were plotted lack groundstone items.

The TRU and kernel density plots for burned rock, including burned limestone and caliche, are illustrated in Figures 5.16 and 5.17. Burned rock is widely distributed across the site, and, unsurprisingly, the distributions mirror the locations of burned rock features. The greatest densities are in the village area and a few isolated locations near habitation structures to the northwest. As with other artifact classes, few TRU cells with burned rock were recorded in the areas of TRU cells where agricultural features had been plotted.

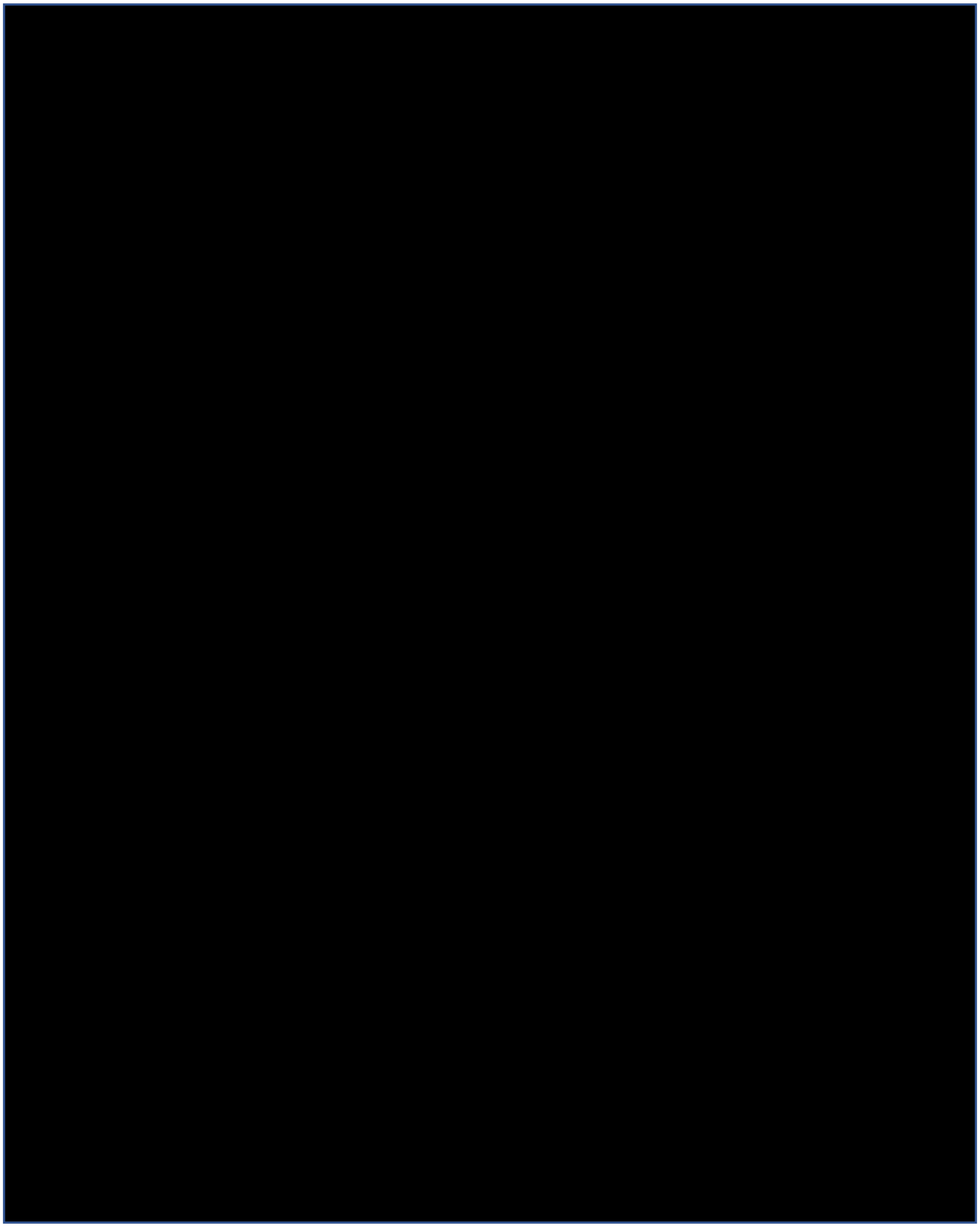

Figure 5.12. Distribution of TRU cells with lithic artifacts at LA 43414 (no cells had counts of 14, 15, or 16 artifacts).

[redacted]

Figure 5.13. Kernel density map of lithic artifact distributions at LA 43414.

[redacted]

Figure 5.14. Distribution of TRU cells with groundstone artifacts at LA 43414.

[redacted]

Figure 5.15. Kernel density map of groundstone artifact distributions at LA 43414.

[redacted]

Figure 5.16. Distribution of TRU cells with burned rock at LA 43414.

[redacted]

Figure 5.17. Kernel density map of burned rock distributions at LA 43414.

Several cells with burned rock are present in the southern one-third of the site. These locations match the plots of burned rock hearths and a burned rock midden feature. The absence or scarcity of other artifact classes in association with these features is of interest. Ceramics and groundstone are mostly absent across areas south of the village. The absence of these artifact types in the southern one-third of the site may indicate that the isolated hearths in this area represent a different adaption or temporal component, a premise supported by the Protohistoric or early Historic radiocarbon date obtained from hearth Feature 64 in this area (see Miller et al. 2016).

The TRU survey and GIS spatial mapping revealed several important aspects of the prehistoric landscape in the vicinity of the Merchant village. A wide range of features, artifacts, and occupation areas are reflected in the distributions, and some corroborate the interpretations of certain features or areas, such as the different ages and functions of burned rock features in the southern third of the survey area. One of the most noteworthy findings was the relative absence of surface lithic, ceramic, and groundstone artifacts in TRU cells among the suspected agricultural features. It should be noted that subsequent excavations in these features during the 2015 and 2019 fieldwork recovered all three artifact classes from subsurface contexts. Nevertheless, when viewed in terms relative to the rest of the site, the surface densities are probably related to subsurface densities, and thus the areas of possible agricultural features may indeed have much lower artifact counts compared with habitation areas of the site.

The combined 2015 and 2019 mapping and survey efforts revealed a vast and varied cultural landscape across Grama Ridge and neighboring terraces surrounding the San Simon swale. The survey and excavation efforts revealed what is primarily a horizontal record of archaeological remains distributed across the terrace, but the prehistory of the Grama Ridge terrace is also reflected in the vertical record of Trench 2019-1 that was placed at the eastern margins of the agricultural fields. Originally opened to provide a control sample of natural eolian deposits to compare against the stratigraphic and soil record in the agricultural fields, the trench revealed a 1.7-m-deep depositional history of buried occupations and eolian deposits (Figure 5.18).

Figure 5.18. Trench 2019-1 at the eastern margins of the agricultural fields. Note buried deposits of carbonaceous eolian sands exposed in the profile.

Results of the Geomorphological Analysis of Trench 2019-1

The trench exposed a 40-cm-thick layer of modern and historic eolian deposits overlying three zones of eolian and organic deposits that together were 1 m thick and extended along the length of the trench. The sterile caliche layer was exposed at 1.5 m below the surface. Hearth and baking pit features were present in two locations along the trench.

Stratigraphy

Examination of the profile of this trench revealed the presence of effectively five strata (Figures 5.19 and 5.20). The results of the soil analyses are presented in Table 5.1. The top of the sequence was capped by the Historic coppice dune sediment (Zone 1), and at least three such dunes were sectioned by the trench. This deposit ranged between about 10 cm and 40 cm thick within the trench and was a reddish brown (5YR4/3) to brown (7.5YR4/3) sand that was notably redder and contained much less organic carbon than the underlying strata (except for the very top sample, which contained abundant organic matter; see Table 5.1). There was no clear evidence of sedimentary structures or lamination within the coppice dunes, but there was clear post-depositional disturbance of this deposit by small, burrowing animals in some places. Unlike the underlying deposits, the coppice dunes contained no matrix-supported caliche fragments.

The deposit upon which the coppice dunes rest exhibited elevated organic carbon that was widely dispersed in the profile, and two distinct zones were identified: Zone 2 (30 to 82 cm below surface [bs]) and Zone 3 (~82 to 129 cm bs). In the field, the organic matter appeared, on the basis of degree of melanization (or darkening), to be concentrated in Zone 3. Therefore, this zone was not a single eolian deposit with a soil A horizon formed at the top because the organic carbon appeared to increase with depth, and not decrease with depth as occurs in normal soil profiles. Analysis of samples collected from this profile and shown in Figure 5.21 confirm that Zone 3 exhibits a small but distinctly greater amount of organic carbon (presented as percent loss-on-ignition or LOI) as compared with Zone 2. The loss-on-ignition values for Zone 2 were similar to the coppice dune, but the field appearance of these two deposits was distinctly different (Figure 5.20).

Zone 2 ranged between 20 cm and 40 cm within the trench and consisted of a dark brown (7.5YR3/2) sand to loamy sand. It exhibited numerous krotovina and a few (1 to 3 percent) widely dispersed matrix-supported fine gravel-sized rounded fragments of caliche gravel. Zone 3, on the other hand, was overall slightly finer textured (sand to loamy sand) and ranged in color from a dark reddish brown (7.5YR2.5/2 to 5YR3/2) to dark brown (7.5YR3/2). Like Zone 2, this deposit also exhibited a small amount of matrix-supported fine gravel-sized rounded caliche fragments, but the frequency here was about twice that of Zone 2, somewhere between 3 percent and 7 percent. Zone 3 also exhibited slightly elevated magnetic susceptibility and loss-on-ignition values as compared with Zone 2. A burned rock feature was noted within Zone 3 between meter markers 12 and 13 on the west wall (see Figure 5.19), and a pit feature composed primarily of charcoal-stained earth was present immediately opposite this feature on the south wall. This feature (F.482 (Tr.2019-1) was identified as a baking pit and was inset into Zone 3, but the origination surface could not be determined. A piece of charcoal from this feature returned an age of 2860±30 years B.P. (Beta 555833; calibrated mean probability age of 2978 year B.P.).

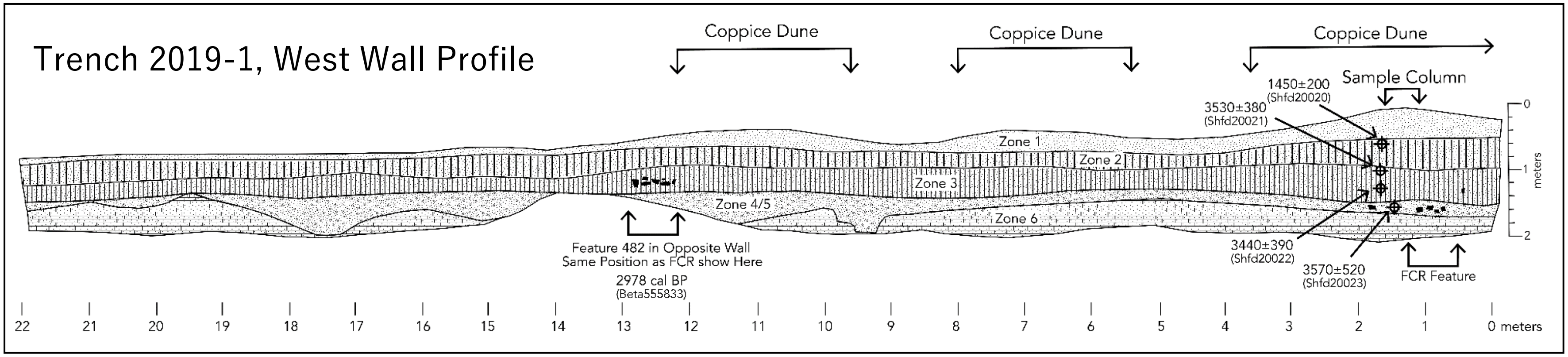

Figure 5.19. Profile drawing of the west wall of Trench 2019-1, showing the major stratigraphic units, archeological features, and the location of the column sampled, the results of which are shown in Figure 5.20 below.

Table 5.1. Soil analysis for Trench 2019-1

Sample Field ID	Zone	Depth (cm)	Sand (%)	Silt (%)	Clay (6 μm) (%)	USDA Texture Class	Mean (phi)	Median (phi)	Deviation (phi)	Skewness (phi)	Kurtosis (phi)	LOI (%)	Xlf ($10^{-8}m^3kg^{-1}$)	Xfd (%)	Munsell (dry)
1	1	5	89.6	6.5	3.9	Sand	2.71	2.63	1.51	0.12	3.05	1.25	23.49	2.11	7.5YR4/3
2	1	10	92.5	3.91	3.59	Sand	2.66	2.59	0.85	0.38	1.86	0.79	18.37	0.35	5YR3/3
3	1	15	91.3	4.93	3.77	Sand	2.71	2.61	0.86	0.39	1.67	0.78	20.04	1.20	7.5YR4/3
4	1	20	90.1	5.78	4.12	Sand	2.72	2.60	1.06	0.46	2.18	0.85	21.70	1.30	7.5YR4/3
5	1	25	93	3.63	3.37	Sand	2.37	2.31	0.96	0.20	1.79	0.93	19.57	-0.23	5YR4/3
6	1	29	92.7	4.1	3.2	Sand	2.50	2.42	0.87	0.26	1.60	0.85	19.76	2.11	7.5YR3/2
7	2	35	93.4	3.61	2.99	Sand	2.59	2.52	0.76	0.24	1.36	0.89	23.67	1.02	5YR4/3
8	2	40	80	11.1	8.9	Loamy Sand	3.55	2.66	2.00	0.66	2.12	0.80	19.54	-0.29	5YR3/3
9	2	45	83.7	7.83	8.47	Loamy Sand	2.76	2.44	1.60	0.54	2.46	0.97	15.41	-1.49	7.5YR3/2
10	2	50	93.9	3.39	2.71	Sand	2.43	2.37	0.79	0.20	1.48	0.79	20.70	2.40	7.5YR3/2
11	2	55	92.2	4.5	3.3	Sand	2.61	2.54	0.87	0.26	1.56	0.84	22.27	0.98	7.5YR3/2
12	2	60	92.1	4.85	3.05	Sand	2.53	2.45	0.87	0.27	1.63	0.79	20.70	0.59	5YR3/3
13	2	65	92.8	3.75	3.45	Sand	2.37	2.30	0.97	0.29	1.79	0.75	21.14	-0.42	5YR4/3
14	2	70	90.9	3.82	5.28	Sand	2.49	2.40	1.32	0.41	2.88	0.84	18.73	0.00	7.5YR3/2
15	2	75	95.1	2.27	2.63	Sand	2.32	2.28	0.71	0.16	1.40	0.98	24.36	-3.21	7.5YR3/2
16	2	80	92.8	4.22	2.98	Sand	2.45	2.38	0.90	0.25	1.60	0.89	22.74	0.60	7.5YR4/2
17	3	85	94.8	2.68	2.52	Sand	2.27	2.23	0.76	0.19	1.43	0.95	27.81	1.87	7.5YR3/2
18	3	90	91.7	4.13	4.17	Sand	2.46	2.37	1.11	0.36	2.13	0.91	22.13	0.00	5YR4/3
19	3	95	81.2	12.44	6.36	Loamy Sand	3.00	2.57	1.62	0.55	2.05	0.90	23.34	-2.31	7.5YR3/2
20	3	100	88.4	5.91	5.69	Sand	2.55	2.42	1.40	0.44	2.84	0.96	19.13	2.16	5YR2.5/2
21	3	105	89.2	6.46	4.34	Sand	2.61	2.49	1.24	0.41	2.46	1.03	22.63	-1.69	7.5YR3/2
22	3	110	82	9.47	8.53	Loamy Sand	3.00	2.64	1.60	0.58	2.47	0.96	22.58	0.92	5YR3/2
23	3	115	89.1	5.46	5.44	Sand	2.54	2.41	1.33	0.46	2.83	0.97	22.34	1.76	5YR3/2
24	3	120	82.1	10.73	7.17	Loamy Sand	2.92	2.57	1.83	0.41	2.69	1.07	25.39	2.71	7.5YR3/2
25	3	125	78.7	11.91	9.39	Sandy Loam	3.32	2.61	1.93	0.64	1.98	0.93	22.50	-0.22	7.5YR4/2
26	4	130	89.7	6.14	4.16	Sand	2.63	2.51	1.19	0.40	2.30	0.97	26.75	1.61	5YR4/3
27	4	135	85.5	8.9	5.6	Loamy Sand	2.70	2.48	1.46	0.47	2.34	0.88	25.74	0.22	5YR4/3
28	4	140	70.9	14.2	14.9	Sandy Loam	3.98	2.75	2.45	0.66	1.12	0.87	24.37	2.38	5YR4/3

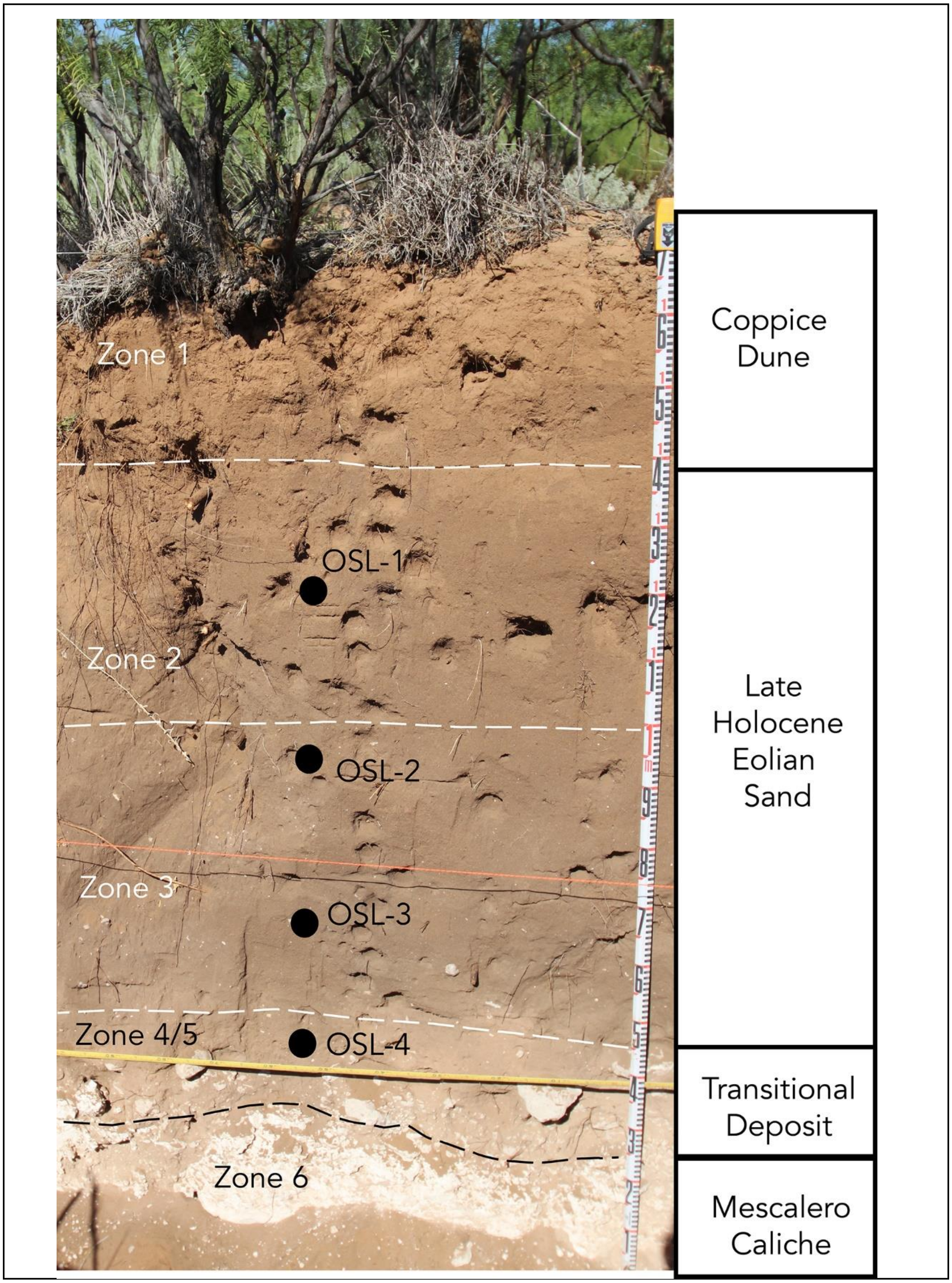

Figure 5.20. Photograph of the profile of Trench 2019-1 where the bulk and OSL dating samples were collected. Note the distinctly darker color of Zones 2 and 3, as compared with Zone 1.

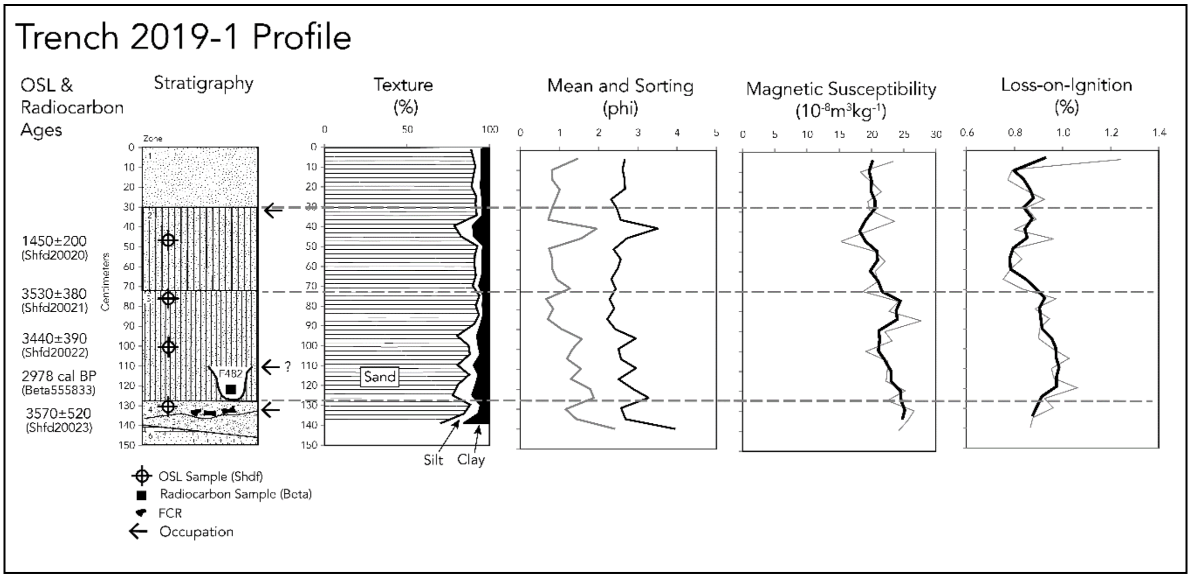

Figure 5.21. Plot of the lab data collected from a sample column at the northwest end of Trench 2019-1. The OSL ages shown are the dominant modes derived from the finite mixture model. The age for the radiocarbon date from Feature 482 (Beta 555833) is the mean probability in years B.P. calibrated with Calib 8.2 using the IntCal20 data set (Stuiver et al. 1993).

Beneath Zone 3 was a deposit that was described in the field as two zones (Zones 4 and 5) but functionally are a transitional stratum between the top of the Mescalero caliche (Zone 6) and the overlying eolian sand. This body of sediment contained a considerable amount (15 to 30 percent) of rounded caliche gravel suspended within a matrix of brown (5YR4/3) loamy sand. Elsewhere within the trench, this deposit contained much more gravel (more than 50 percent) but was primarily fine gravel with a few larger clasts. Interestingly, the gravelly deposit in this trench did not bear much resemblance to the gravel alignments observed within the presumed agricultural fields. A burned rock feature was noted in the top half of this deposit where profile 1 was collected, and it comprised at least five 7- to 10-cm-diameter pieces of burned rock that were entirely coated in calcium carbonate. The base of the trench exposed the Mescalero caliche. The white stage III-IV calcrete exhibited a platy fabric in this trench.

Examination of the trench exposure revealed prehistoric cultural material in three stratigraphic positions: (1) near the top of Zone 2; (2) near the base of Zone 3; and (3) within Zone 4/5. Within the dunes, there is a light scatter of cultural material that was observed eroding from around the base of the coppice dunes, and much of this scatter appeared to be roughly contemporaneous with the overall Merchant occupation, consisting primarily of Chupadero Black-on-white sherds. Feature 482 was observed on both walls of the trench near the base of Zone 3. Presumably, this feature was a pit, but the origination surface could not be determined from the field exposures. Finally, a cluster of FCR was exposed in Zone 4 where the profile was described and sampled near the northwest end of the trench. These rocks were completely coated with calcium carbonate, and no radiocarbon age was obtained for the feature.

Optically Stimulated Luminescence (OSL) Dating

All of the OSL dates obtained by Steve Hall and Ron Goble in the various incarnations of their southeastern New Mexico work have been done with the single aliquot OSL method (cf. Hall and Goble 2016). The clear evidence of post-depositional disturbance seen in most profiles in this region indicates that this method is incorrect to use given that it has been demonstrated that single aliquot ages from mixed grain age sand populations yield erroneous dates that are typically too old

(Bateman et al. 2003, 2007a, 2007b; Gliganic et al. 2016; Rink et al. 2013; Wilder et al. 2006, 2007)

Evidence of post-depositional disturbance in deposits such as these can be subtle. Presumably, most eolian sediments deposited in dunes were originally laminated, but thinner deposits like sand sheets cannot be assumed to have been disturbed merely on the basis of an absence of sedimentary structures, as sand sheet deposits are typically massive. Direct evidence of post-depositional disturbance can be found in the form of trace fossils of animal and plant activity such as burrows, root molds and insect galleries, and all of these were noted in the Trench 2019-1 exposure. These features were generally consistent with similar structures identified by Johnson (1997) at Fort Bliss, although there was less evidence of large mammal disturbance such as might be created by badgers. Finally, the last piece of evidence that would indicate post-depositional disturbance of the deposits is the wide dispersion of materials that were not originally deposited with the eolian sand: caliche gravel and organic matter. In the case of the eolian sediments examined here, nearly all of the strata (except the coppice dunes) exhibit a small amount of widely dispersed matrix-supported gravel. These clasts are too large to have been deposited by wind and are therefore presumed to be an artifact of post-depositional mixing. They derive from either Zones 4/5 or the caliche. It was noted in the field that the frequency of gravel increased with depth, which may simply reflect the stratigraphic origin of these clasts, or it may also provide a proxy for the degree of post-depositional disturbance. The other post-depositional material, organic carbon, is presumed to have been largely contributed by human agency, but the depth distribution is not what one would expect of pedogenesis. The organic carbon within Zones 2 and 3 appears to be relatively well-mixed into the sand over a meter of deposit and paradoxically increases in frequency with depth, which is completely opposite of what one would expect of a natural soil and is in direct contrast to the Eddy paleosol documented by Hall and Goble (2016), which is typically thin and not deeply dispersed downward.

Four OSL samples were collected from the thickest exposure of the deposits in this trench, near the northwest end (see Figures 5.20 and 5.21). One was collected from the middle of Zone 2, two were collected from Zone 3, and a fourth was collected from Zone 4/5 about the same stratigraphic position of a burned rock feature. The results of these analyses are presented in detail in Bateman (2020; see also Appendix A.1) and confirm the field interpretation of significant post-depositional mixing.

None of the samples presented narrow, unimodal normal grain age distributions that are common of well-reset or bleached eolian sand. Instead, nearly all of the samples exhibited fairly broad grain age distributions that become increasingly broad with depth. It is common with single grain dating that when the overdispersion of the De values (effectively the age of the dated grains) is large, then the results are examined by means of finite mixing modeling (FMM). This analysis statistically identifies age components within the grain age data and calculates the proportion of the dated grains that contributes to each age component. It is commonly assumed when working with disturbed deposits that the youngest age mode is often an artifact of bioturbation, and that the dominant component, the one comprising the greatest proportion of dated grains, represents the transportation age of the sediment (cf. Gliganic et al. 2015; 2016). Bateman (2020) presents the result of the work in this manner and identifies between two and three different age components in each sample he dated. Table 5.2 shows the dominant FMM component age for each dated sample.

Table 5.2. Dominant FMM components of the four OSL samples

Sample (Shfd No.)	Zone	Depth (cm)	Zero Dose Grains	Saturated Grains	Dominant FMM Component and % of Grains Represented	Most Logical Depositional Age and % of Grains Represented
1 (Shfd20020)	2	50	18	0	290±50 (80%)	1450±200 (20%)
2 (Shfd20021)	3	75	3	1	500±100 (41%)	3530±380 (30%)
3 (Shfd20022)	3	100	7	3	1510±150 (67%)	3440±390 (31%)
4 (Shfd20023)	4	125	0	3	3570±520 (38%)	3570±520 (38%)

Examining Batemans's results closer reveals that there is a remarkable similarity in the FMM component ages in many of these samples. These can be lumped into four broad temporal groups: (1) 290–500 years B.P.; (2) 1210–1510 years B.P.; (3) 3440–3570 years B.P.; and (4) 7830 years B.P. All four samples exhibit grains that date to 1210–1510 years B.P. period, and three exhibit grains that date to the 3440–3570 years B.P. period. Only the top two samples exhibit the youngest period (290–500 years B.P.) and only the lowest sample exhibits grains contributing to the oldest mode (7830 years B.P.).

At this point, one is confronted with an interpretive challenge. If the OSL data were all that could be used to assess these dates, then one would likely select the dominant FMM component as the depositional age. But Trench 2019-1 exposed two features and one was radiocarbon dated. Charcoal from the roasting pit, Feature 482, returned an age of 2860±30 years B.P. (Beta 555833), which yields a calibrated mean probability age of 2978 year B.P. This feature occurred near the base of Zone 3, at about the same stratigraphic position as OSL sample 3 (Shfd20022). This OSL sample exhibited two age modes, the dominant of which represents 67 percent of the grains and dated 1510 years B.P., and the second mode dating to 3440 B.P. represented 31 percent of the grains. If one assumes that this charcoal age is accurate, then it nudges us toward accepting the older component given that the pit is inset into Zone 3.

And therefore the degree of post-depositional disturbance becomes apparent, because if we assume the sequence described above is correct, it is likely than this eolian deposit was emplaced around 3,400 to 3,500 years ago, but grains of this age only comprise about 30 percent of those in this deposit. The majority of the dated grains in all but the lowest sample are younger and most likely an artifact of bioturbation. Hence, it is likely that this deposit is consistent with the Late Holocene Eolian Sand, the deposition of which Hall and Goble (2016) bracket to the period 6,000 to 2,000 years ago.

Other evidence of post-depositional bioturbation can be found in the depth distribution of grains that have been effectively reset in the last 10 years, which are called zero dose grains (ZDG). As is common, the frequency of ZDG decreases with depth. Alternatively, grains in a state of saturation are grains that are too old to date with OSL and most likely derive from the Mescalero Caliche. There were none of these in the uppermost sample, and the frequency of these grains increases downward, which is toward their presumed source.

Summary

Overall, the deposits exposed in Trench 2019-1 revealed a number of interesting insights. First, the east side of the mesa appears to be dominated by a late Holocene eolian deposit around 1 m thick that exhibits a considerable amount of organic carbon that is most likely anthropogenic in origin. This deposit was most likely deposited around 3,400 to 3,600 years ago. At least three prehistoric occupation components were noted in Trench 2019-1: contemporaneous with the Merchant site, one dated to about 2978 cal B.P., and a third dating to around 3570 years B.P. This eolian sediment is draped by the most recent eolian sand and dotted with coppice dunes. Second, the eolian deposits here exhibit extensive evidence of post-depositional bioturbation and suggest that the single aliquot OSL dates compiled by Hall and Goble (2016) could be reevaluated. Third, the base of the eolian sequence in this trench did not exhibit rock piles on top of the Mescalero Caliche, as are common in the area of presumed agricultural fields. The interface is dominated by a transitional sediment that contains primarily small, rounded caliche gravels with a few larger clasts, but no piles of larger rocks. This composition lends weak support to the idea that such structures in the areas where the eolian cover is thin may more likely be anthropogenic constructs.

OSL dating determined that the deposits have been bioturbated and sand grains are mixed and redeposited throughout the profile. Nevertheless, a general record of continual eolian aggradation and deposition of wind-deposited carbonaceous sediments was documented. A sample of mesquite charcoal from baking pit Feature 482, positioned 50 to 70 cm below the surface and 30 cm above the sterile caliche horizon, yielded an age estimate of 2860 ± 30 B.P. (cal 1120–930 B.C.). While it is difficult to determine the precise chronology of the deposits in the trench, it is evident that they span a considerable period of time from Middle Archaic to Protohistoric that reflects the chronology of the surrounding terrace landforms of Grama and Antelope ridges.

The Merchant Village Locality and History of Excavations

The Merchant village, the original Site E-4 investigated by the LCAS in the 1960s, is a roughly 1,700-square-meter area situated against the edge of the caprock escarpment of Grama Ridge. When the Versar field crew first arrived at and viewed the site in 2014, the first impressions were of a rather chaotic mass of cobbles, middens, and excavation scars, indicating that the Merchant site was a heavily disturbed settlement (Figure 5.22). The wooden frame remnants of screens left by looters still remained in place resting against the slopes of backdirt piles.

The site was mapped using an EDM total station during the 2015 fieldwork. The map produced from those efforts was the most recent in a series of site maps beginning in 1965 (Leslie 1965a), continuing through the early 1980s (Leslie 2016a; Speth 1984), with the most recent maps produced during the surveys of the early 1990s (Gregory 2001; Seymour 2001). Speth's 1984 rebar datum was found intact. It was buttressed with two additional rebar and a rebar backsite datum was established 20 m true south across the dirt road. Both datum points were geo-referenced and tied to the UTM coordinates of the TRU survey, the aerial drone surveys, the surface collection grid, and the GPR survey parcel. All subsequent mapping and excavation tasks of the 2015 and 2019 seasons were referenced to the Speth 1984 datum.

Architectural features such as wall foundation segments and the open LCAS excavations in the two pit structures, refuse areas, hearths, and other features were mapped. The backdirt piles from the LCAS investigations were also mapped. Locating and mapping the surface rooms excavated and mapped by Robert Leslie proved a difficult and often frustrating endeavor. The locations and plots of Pit Structures 1 and 2 were not a problem since the large pits of the LCAS excavations remained open. The location of Room 7 was easily identified through wall foundations exposed on the surface. A common wall segment of Rooms 9 and 10 was also visible on the surface, as were foundation segments of some of the isolated rooms, including a well-preserved set of four walls located around 15 meters north of the Pit Structure 1 excavation pit (Figure 5.23).

Figure 5.22. View of the northern block of surface rooms as it appeared in 2015. The view is facing east and shows the disturbed and scattered construction cobbles from Rooms 3, 4, 19, and 20. The mound of Refuse Area A and remnants of a wood screen frame can be seen at the left center of the photograph.

It was difficult to identify most of the individual rooms based on surface evidence. The room blocks and individual rooms observed in 2015 and 2019 were in generally poor condition. A substantial amount of the surface architecture was disturbed, obscured, or in some cases destroyed by pothunting and the LCAS excavations. The shallow depressions of some LCAS room excavations could be seen in 2015 (Figure 5.24), and a few wall segments remained intact or could be estimated from linear rock arrangements or through inspection of aerial images, but the majority of walls and rooms were heavily disturbed. Cobbles from wall foundations were scattered throughout and beyond the room blocks. Accordingly, the locations of some rooms had to be inferred from linear patterns of disturbed cobbles and were somewhat conjectural. The walls of the isolated rooms to the south were in better condition and could be identified in the high-resolution aerial photographs and inspection of the site surface. It is likely that some rooms, such as Room 14, were completely destroyed, while others appeared to retain some degree of integrity.

Comparing the upper panel and lower panels of Figure 5.24, it also became apparent that some amount of the backdirt and displaced cobbles from room excavations was backfilled into the excavated rooms, resulting in artifact mixing and other problems that were confronted during mapping and excavation. Some photographs show LCAS members screening fill from one house inside an adjacent house. A substantial amount of mounded backdirt was located north of the room block and around Pit Structures 1 and 2. It was difficult to differentiate between looted or excavated backdirt deposits and intact prehistoric midden areas, and it was apparent that cultural deposits inside structures and in extramural refuse areas had been mixed with modern backdirt and spoil piles to varying degrees.

Figure 5.23. Aerial view of the Merchant village as it appeared in April of 2015. The two open pit structure excavations and LCAS backdirt and looting piles are visible. The hand-excavated trenches in the central fill and backdirt ring of Pit Structure 1 are visible.

While some rooms could be identified, additional problems arose while attempting to link Leslie's maps and other maps of the rooms to our surface observations. Leslie's two maps vary considerably in the locations of the pit structure and rooms (Figure 5.25 and 5.26). Both show contiguous and isolated rooms, the contiguous rooms arranged within two or three small linear room blocks, one oriented north-to-south and the second roughly oriented east-to-west. Five isolated rooms (one destroyed by looters) were identified south and southwest of the room blocks. Rooms 7 and 14 were mapped a few meters south of the main habitation area.

However, his early map of the site (Leslie 1965a) positions Pit Structure 1 approximately 10 meters south of its true location, although both pit structures are accurately plotted in his manuscript map. Room 7 is incorrectly plotted by 15 meters in the 1965 map and by almost 30 meters in his manuscript map. No information is provided in Leslie's manuscript on how distances and directions were determined, such as through compass and pace or by using measuring tapes. The most troublesome problem is that both the locations and the orientations of the surface rooms and room blocks change rather substantially from one map to the other. The differences in Leslie's maps, including the critical observation that the North arrows of the two maps vary by over 30 degrees, lead to the conclusion that he may have reconstructed the locations of the surface rooms in one or both maps from memory and the plots may not be accurate.

Figure 5.24. Views of the northern tier of surface rooms excavated by Leslie, facing toward the west: (upper panel) view of Leslie’s and LCAS excavations in 1960; (lower panel) view of the same location and rooms in 2015. Shallow depressions remaining from the excavation of Rooms 3 and 4 can be seen in the center background.

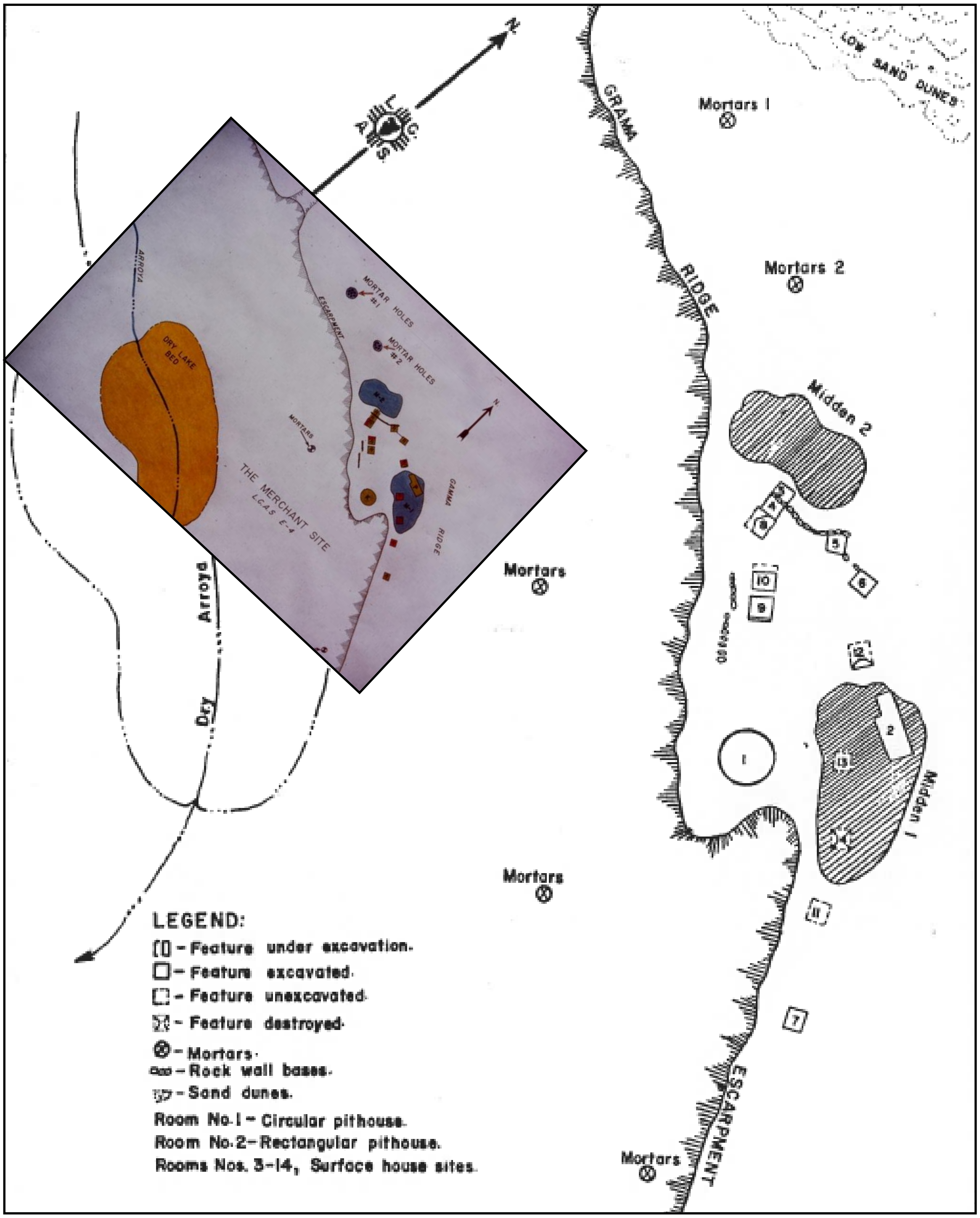

Figure 5.25. Map of the Merchant site from Leslie's 1965a paper. Inset shows a colored version (at a smaller scale) of the map found among his collection of color slide photographs.

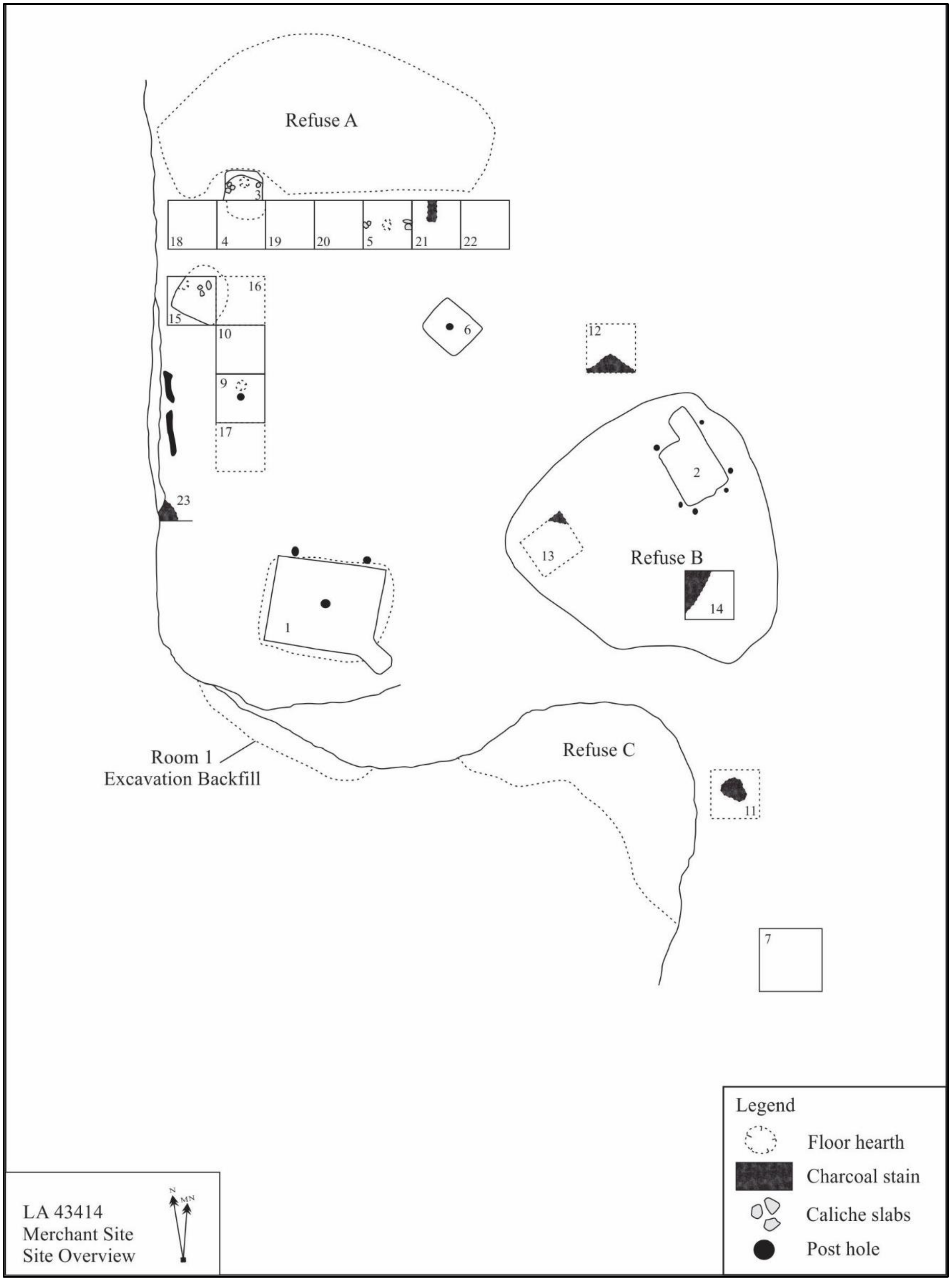

Figure 5.26. Redrafted version of Leslie's map of the Merchant site from his unpublished manuscript, showing arrangement of rooms, pit structures, and refuse areas based on the LCAS excavations of 1960–1963.

Acknowledging this suite of difficulties, the approach of the 2015 mapping effort was to begin anew and attempt to map the site without using a template or preconceptions regarding the locations of rooms and room blocks. The only structures that could be both identified and positioned with complete confidence were Pit Structures 1 and 2, the excavations of which had been left open since the mid-1960s, and Room 7 at the far southern margin of the Merchant village. These structures served as the "anchor" points for EDM mapping of the site.

Aerial photography and surface mapping identified additional rooms and revised the locations of most of the previously mapped rooms. The two room blocks were found to connect at the northwestern corner and form a single block in the shape of an inverted "L." The locations or suspected locations of 12 new rooms (Rooms A through L) were mapped and established that the northern and western room blocks consist of two tiers of rooms. Two new isolated rooms were mapped (Rooms D and J), but the remnants of Leslie's Room 14 could not be identified among the disturbed midden deposits west of Pit Structure 2. Room 7 was plotted 130 m south of the main room block, and additional habitation structures were identified in this area during the GPR survey. A few segments of foundations walls remained intact, of which Rooms 9 and 10 of the western room block were the best preserved examples (Figure 5.27). Several more subtle wall segments and partially exposed alignments of cobbles were detected on the surface.

A revised EDM map of the site was created through a combination of a detailed inspection of the high resolution aerial imagery provided by Mark Willis, ground inspection by Tim Graves and the field crews, and the GPR survey (Figure 5.28). The individual rooms were then correlated with Leslie's site maps and room planviews. The solution was not perfect and questions remained over the locations of several rooms. Broad-scale excavations would be required to resolve the matter and develop an accurate map of the rooms at the Merchant site. Therefore, the 2015 site map served as the basis for the design and plan of the 2019 investigations.

Figure 5.27. Aerial view of Rooms 9 and 10 in 2015 showing the exposed western and southern wall foundations.

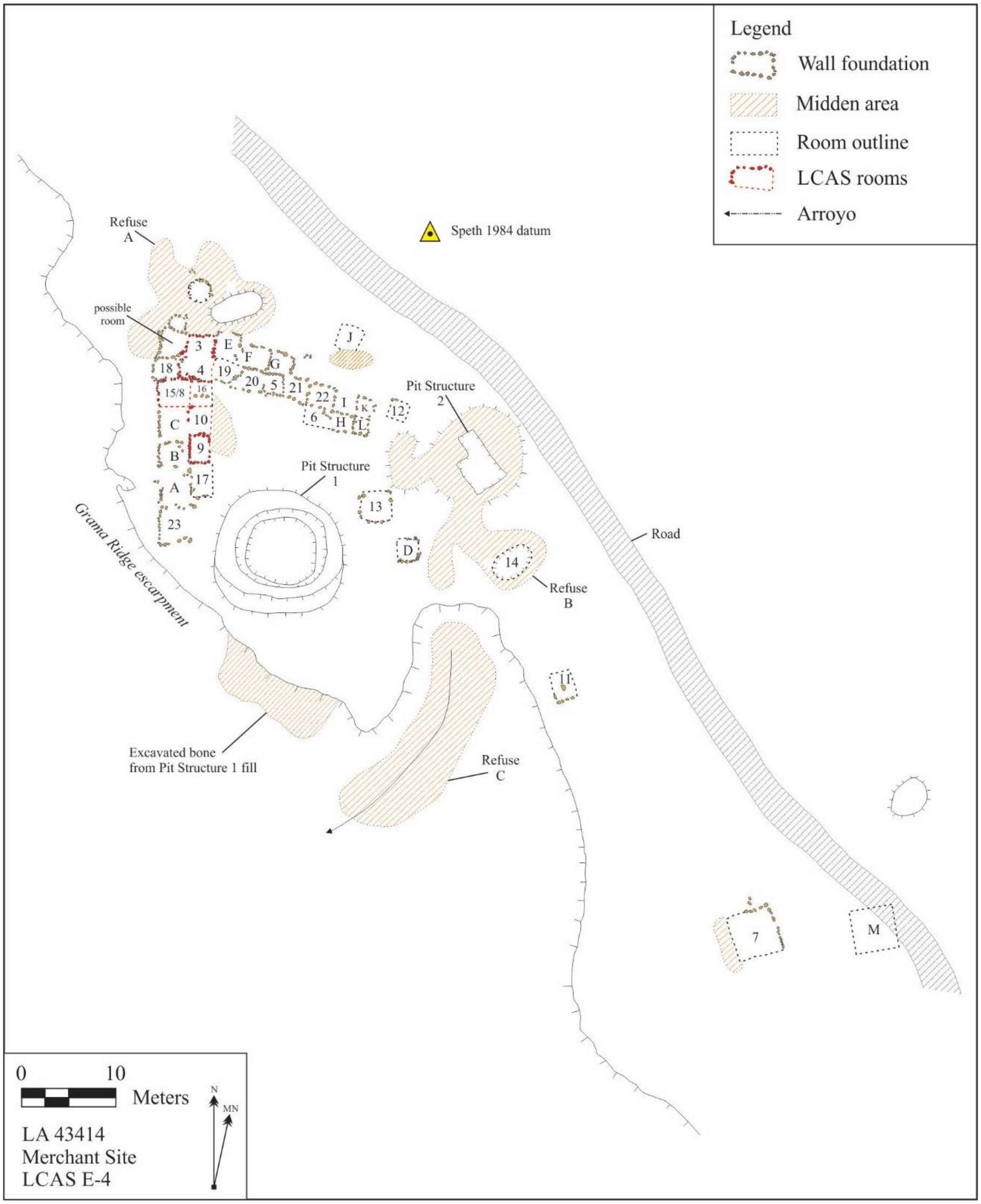

Figure 5.28. 2016 map of the primary village area of the Merchant site based on the combination of aerial photography, EDM mapping, and various image processing procedures and showing arrangement of room blocks, rooms, and major features. Rooms excavated by Leslie and the LCAS are outlined in red.

1959-1965 LCAS Excavations

Robert Leslie and the LCAS documented 21 surface domestic rooms, two deep pit structures, and three refuse areas at the Merchant site. The two pit structures and a sample of seven rooms were excavated between 1959 and 1965. Rooms 3, 4, 5, 6, 8, 9, and 10 were excavated by Robert Leslie or by Leslie and members of the LCAS (see Figure 5.25). With the exception of Room 11, the other 13 rooms were probed, tested, or upper fill deposits were excavated. Small test units were placed against a wall edge and dug to the floor of some rooms, while in other rooms the floor was not encountered or, if it was, it was not documented. The walls and interior of Room 7 were completely exposed, but the excavations extended only to the top of the roof fall layer. The LCAS excavations of domestic rooms are summarized in Chapter 6.

Leslie's notes and manuscript describe a continual destruction of rooms and deposits by looters. Some rooms were first exposed in potholes left by looters and were cleaned and documented by Leslie and LCAS members, while other rooms in the process of being excavated were damaged by looters while LCAS members were away from the site. The uncontrolled excavations loosened and displaced the cobbles of room walls and often penetrated through floors, making it difficult for the LCAS excavators to recover architectural information. Room 14 was almost completely removed during excavations of prehistoric midden deposits west of Pithouse 2 and only a small 6-square-foot (75 by 75 cm) remnant could be documented. Room 11 had been pothunted during the 1960s, leaving a 1-meter-diameter pothole in the center. Leslie backfilled the hole, but during a visit to the site in 1975 found that the room had been pothunted again, a testament to the fact that looting continued for many years after the end of the LCAS investigations. Leslie noted the looter pits had filled with natural sediments by 1984.

Pit Structures 1 and 2 were excavated by the LCAS, although the work was continually thwarted by the rampant looting. The structures appeared to be square or rectangular, although the walls and sides were often destroyed by the extensive looting. The history of investigations of these structures is thoroughly reviewed in Miller et al. (2016) and is summarized in Chapter 8. The LCAS crews also tested the midden deposits surrounding domestic rooms. The 2015 and 2019 excavations in midden areas is described in Chapter 9.

Brief Summary of the 2015 and 2019 Work

Aside from continued looting and collecting at the site, and occasional visits by archaeologists, the Merchant site remained open and mostly ignored by professional archaeologists for 20 years until John Speth's 1984 efforts to map the site and test Feature 39. The site was surveyed and mapped during several CRM projects in the 1990s and 2000s, and ceramics and flaked stone artifacts collected during those and other investigations in southeastern New Mexico were the subject of two M.A. thesis efforts (Alvarado 2008; Gregory 2006).

In 2014, the CFO contracted Versar to perform remedial investigation at the Merchant site. The scope of the 2014–2015 investigations was indeed primarily remedial – designed to document, evaluate, and to stabilize the site and its cultural deposits. The fieldwork involved TRU survey and mapping the 144-acre area around the village, mapping the architectural features and middens in the village area, and remedial work to salvage information from the two pit structures. The open pit structure excavations would then be sealed with a cap of sterile caliche. The discovery of possible agricultural fields north of the village led to a contract modification for additional archaeological and geomorphological work in those features.

The 2015 fieldwork led to a successful resolution of several long-standing mysteries and questions regarding the architecture and material culture of the Merchant site. As so often happens with archaeological excavations, however, the work generated a host of new questions involving chronology, subsistence, technology, mobility, the organization of bison hunting, the relative formality of the domestic architecture, the origins and function of Ochoa ware ceramics, and several other research issues.

The 2019 fieldwork was designed to address several of these questions. As described in the chapters to follow, additional excavations were conducted in domestic rooms, midden areas, and the agricultural fields. Table 5.3 summarizes the level of effort of the excavations completed in 2015 and 2019. Slightly over 269 square meters of hand excavations have been completed and 51.67 cubic meters of deposits and sediments have been screened. Breaking down these totals by major provenience, it is calculated that 179.5 square meters (48.07 cubic meters) has been excavated within and surrounding architectural features and midden deposits, 80 square meters of area (2.3 cubic meters) has been exposed in agricultural fields, and 9.7 square meters (1.3 cubic meters) of peripheral features and GPR anomalies has been explored. Additional fieldwork involved 269 square meters of GPR surveys and 88 linear meters of backhoe trenches.

Table 5.3. Summary of excavations at the Merchant site, 2015 and 2019

Year	Area	Length (m)	Width (m)	Area (m^2)	Volume (m^3)	Features
2015	Pit Structure 1	14.0	1.0	14.3	2.37	LCAS backdirt ring
2015	Pit Structure 1	4.6	4.5	20.7	18.80	Feature 1 and subfeatures
2015	Pit Structure 2	5.0	1.0	5.0	3.40	Feature 2 and subfeatures
2015	Midden A	4.0	1.0	4.0	1.20	Feature 104
2015	Midden B	2.0	1.0	2.0	1.00	Feature 110 and B1
2015	Fields	3.0	3.0	8.0	0.30	Feature 108
2015	Fields	4.0	2.0	8.0	0.30	Feature 95
2015	South room block	7.0	0.5	3.5	1.40	Feature 39
2015	Southern periphery	9.0	0.5	6.0	0.80	Feature 52
2015	Southern periphery	0.4	0.4	0.2	0.05	Feature 64
2015	Isolated	3.0	0.5	1.5	0.15	Feature 109
Total				73.2	29.77	
2019	South room block	8.0	7.0	34.0	2.30	Room 7 and 24
2019	Eastern rooms	19.0	13.0	93.0	15.80	Room 6, 13, 25, 36, 37, 38, 39
2019	Midden B	2.0	1.0	2.0	1.60	Feature 110
2019	Midden C	1.0	1.0	1.0	0.20	Feature 412
2019	GPR anomaly	2.0	1.0	2.0	0.30	None
2019	Fields	8.0	4.0	32.0	1.00	Feature 82
2019	Fields	8.0	4.0	32.0	0.70	Feature 91
Total				**196.0**	**21.90**	

Eleven domestic rooms were fully excavated, providing a detailed picture of the Merchant site architecture, its construction methods, and abandonment modes. Additional work in the agricultural fields added further clarity to the nature of those enigmatic features. The excavations in midden deposits were limited in area, but nonetheless provided stratified samples of artifacts, subsistence data, and chronometric dates. The laboratory component of the 2019 project involved a more expansive series of technical analyses, including dating methods (OSL, ceramic TL, and radiocarbon), subsistence studies (analysis of flotation, pollen, and phytolith samples; faunal analysis; and ceramic residues), ceramic analysis (NAA and petrography), and lithic material sourcing (UV light analysis).

The Current View of the Merchant Village Site

Figure 5.29 illustrates the Merchant site as presently understood through two seasons of intensive mapping and excavation efforts. The spatial layout of rooms and room blocks, the two pit structures, and the midden areas are shown on the map, and the locations of the 2015 and 2019 excavations within these features are also indicated.

Three major differences are apparent when the current map is compared with the previous version illustrated in Figure 5.28. The most prominent and significant change is the definition of the eastern room block leading from the northern suite of rooms and extending to the escarpment edge. Previous mapping efforts had identified a couple of isolated rooms in this area, but it is now certain that those rooms were part of a larger room block. Another notable difference is that the existence of a second room block was verified to the south around Room 7 and 24 and perhaps extending east to link with wall foundations of Rooms 56 and 57 observed eroding from the two-track road. The final noteworthy revision is that inspection of the site surface between the northern and southern room blocks found evidence that additional rooms are present between the two areas, and that perhaps the northern and southern rooms form a single, continuous room block of over 150 m length.

Fifty-five rooms are present within these room blocks ("Rooms" 1 and 2 were assigned to Pit Structures 1 and 2 by the LCAS), and it is likely that additional rooms remain undetected, particularly south of Midden B. It is possible that the overall room count exceeds 75 rooms, a count that would place the Merchant site among the largest pueblos in southern New Mexico. Descriptions of the 55 known rooms are provided in Table 5.4. The 11 fully excavated rooms of the 2019 field season, some of which had two floors, are indicated in bold font. The dimensions and floor areas of the rooms are quite small compared with those of pueblos in the Jornada region to the west and the Salinas region to the northwest, as well as most pueblos of the U.S. Southwest.

Pit Structure 1, determined to be a communal structure (kiva) by the 2015 excavations, is positioned near the center of the U-shaped room block. Pit Structure 2 is located east of the newly defined eastern room block.

The room blocks and two pit structures are surrounded by several large areas of prehistoric midden deposits and modern backdirt deposits. These deposits were formed through a complex history of prehistoric refuse disposal, modern backdirt accumulations, and mixing of both deposits through looting.

Two seasons of fieldwork at the Merchant site have revealed a village settlement of substantial size and complexity in terms of room counts, communal features, and midden deposits. The layout of the site is also important because of its similarities to pueblo settlements to the west. These issues are explored in later chapters of the report. The next five chapters describe the investigations of architecture, middens, and agricultural fields.

Figure 5.29. The revised map of the Merchant village based on the integrated results of the 2015 and 2019 fieldwork.

Table 5.4. Descriptions of domestic rooms at the Merchant site (boldface denotes rooms excavated in 2019)

Room	Feature	Status	Length (m)	Width (m)	Depth (cm)	Floor Area	Hearths	Postholes	Comments
LCAS 3	3	Excavated	2.59	2.13	30.5	5.5 m^2	1	0	Excavated by Leslie 1960
LCAS 4	4	Excavated	2.59	2.44	25.4	6.3 m^2	0	0	Excavated by Leslie 1960
LCAS 5	5	Excavated	2.74	2.49	35.6	6.8 m^2	1	0	Excavated by LCAS 1963-1964
LCAS 6	**6**	E and E	2.54	2.13	20.3	5.4 m^2	1	0	[Chapter 6] Cleared floor by LCAS 1963; excavated 2019
LCAS 6	**6**	E and E	2.32	2.28	35.0	4.8 m^2	1	0	[Chapter 6] Test by LCAS 1963; excavated 2019
LCAS 7	**7**	E and E	3.35	3.05	>12.7	10.2 m^2	1	0	[Chapter 7] Tested by Leslie 1963; excavated in 2019
LCAS 8	8	Excavated	2.49	2.18	50.8	4.3 m^2	1	0	Excavated by LCAS 1964
LCAS 9	9	Excavated	2.90	2.74	20.3	7.9 m^2	1	1	Excavated by LCAS 1964
LCAS 10	10	Excavated	2.79	2.74	20.3	7.7 m^2	1	0	Excavated by LCAS 1964
LCAS 11	11	Tested	2.74	2.44	unk	6.7 m^2	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 12	12	Tested	2.34	unk	unk	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 13	**13**	T and E	unk	unk	76.0	unk	unk	unk	[Chapter 6] Tested by LCAS 1963; excavated in 2019
LCAS 14	14	Tested	unk	unk	25.4	unk	unk	unk	Mapped by LCAS 1963; mostly destroyed
LCAS 15	15	Tested	2.59	2.44	12.7	6.3 m^2	0	0	Mapped by LCAS 1963 and Versar 2015
LCAS 16	16	Tested	unk	Unk	unk	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 17	17	Tested	unk	Unk	15.2	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 18	18	Tested	unk	Unk	15.2	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 19	19	Tested	unk	Unk	8.0	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 20	20	Tested	unk	Unk	20.3	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 21	21	Tested	unk	Unk	unk	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 22	22	Tested	unk	Unk	unk	unk	unk	unk	Mapped by LCAS 1963 and Versar 2015
LCAS 23	23	Tested	5.80	>2.90	15.2	>15.0 m^2	unk	unk	Mapped by LCAS 1963 and Versar 2015
24	**400**	Excavated	3.10	2.90	0.17	8.99 m^2	1	0	[Chapter 7]
25 (D)	**113**	Excavated	2.76	2.44	0.39	6.26 m^2	1	0	[Chapter 6] Upper floor
25 (D)	**113**	Excavated	2.76	2.44	0.39	6.26 m^2	3	1	[Chapter 6] Lower floor
26	**402**	Excavated	2.92	2.44	0.25	6.07 m^2	1	1	[Chapter 6]
27	**406**	Excavated	2.92	2.20	0.15	4.34 m^2	2	4	[Chapter 6]
28	**407**	Excavated	2.65	2.59	0.11	6.86 m^2	1	0	[Chapter 6] Upper floor
28	**407**	Excavated	2.20	2.20	0.22	4.84 m^2	1	3	[Chapter 6] Lower floor

Room	Feature	Status	Length (m)	Width (m)	Depth (cm)	Floor Area	Hearths	Postholes	Comments
29	**410**	Excavated	2.40	2.32	0.26	5.57 m^2	1	1	[Chapter 6]
30	403	Tested	2.10	Unk	unk	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
31	401	Tested	2.80	Unk	unk	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
32	414	Tested	unk	Unk	unk	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
33	417	Tested	2.50	Unk	unk	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
34	411	Tested	2.00	Unk	unk	unk	unk	Unk	[Chapter 6] partially exposed in eastern excavation block
35 (H)	117	Mapped	3.00	1.75	unk	unk	unk	Unk	[Chapter 6] partially exposed in eastern excavation block
36 (I)	118	Mapped	2.25	2.00	unk	unk	unk	Unk	Versar 2015; Wall remnants on southern, western, and eastern
37 (K)	120	Mapped	1.50	1.50	unk	unk	unk	unk	Versar 2015; Wall remnants on all sides
38 (L)	121	Mapped	2.25	2.25	unk	unk	unk	unk	Versar 2015; Walls on the western and southern sides
39 (A)	111	Mapped	3.75	2.75	unk	unk	unk	unk	Versar 2015; Wall remnants on the southern and western
40 (B)	103	Mapped	2.98	2.75	unk	unk	unk	unk	Versar 2015; Leslie noted a faint wall. Western and northern
41 (C)	112	Mapped	3.75	2.88	unk	unk	unk	unk	Versar 2015; Wall remnants on the southern and western
42	183	Mapped	2.00	2.00	unk	unk	unk	unk	Versar 2015;
43 (E)	114	Mapped	2.75	2.25	unk	unk	unk	unk	Versar 2015; Wall remnants on the eastern and western sides
44 (F)	115	Mapped	3.25	2.25	unk	unk	unk	unk	Versar 2015; Wall remnants on all sides
45 (G)	116	Mapped	2.25	1.75	unk	unk	unk	unk	Versar 2015; Wall remnants on all sides
46	498	Tested	2.76	2.50	unk	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
47	497	Mapped	2.80	2.40	unk	unk	unk	unk	[Chapter 6] visible after heavy rains east of Room 31
48 (J)	119	Mapped	2.00	2.00	unk	unk	unk	unk	Versar 2015; Possible room clearing next to Refuse Area A
49	413	Tested	unk	Unk	0.26	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
50	502	Mapped	3.00	2.00	unk	unk	unk	unk	Mapped 2019
51	503	Mapped	2.80	2.40	unk	unk	unk	unk	Mapped 2019
52	499	Tested	2.60	2.60	unk	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
53	500	Mapped	2.60	2.30	unk	unk	unk	unk	Mapped 2019
54	501	Mapped	3.00	2.60	unk	unk	unk	unk	Mapped 2019
55	405	Tested	unk	2.20	unk	unk	unk	unk	[Chapter 6] partially exposed in eastern excavation block
56 (M)	495	Mapped	3.30	2.20	unk	unk	unk	unk	Versar 2015; Structure identified in road during GPR survey
57 (M)	495	Mapped	3.30	2.20	unk	unk	unk	unk	Versar 2015; Structure identified in road during GPR survey

Chapter 6

The Domestic Architecture of the Merchant Site: Excavations in the Eastern Room Block

The excavations in the eastern area of the Merchant village proved to be one of the most surprising and rewarding of the investigations completed during both seasons of fieldwork. The eastern areas of the site had been extensively disturbed by the LCAS excavations in Pit Structure 2 and, to a much greater extent, the rampant strip mining of the site by looters. As illustrated in Figure 6.1, the eastern area of the site was systematically looted by shoveling broad swaths across the cultural deposits, leaving deep furrows dug into the deposits that were trailed by masses of dirt, charcoal, rocks, and discarded artifacts that no longer retained their primary context. Some intact midden deposits were encountered in a test unit placed at the southern edge of Refuse Midden B during the 2014–2015 fieldwork, but it was felt that most of the architecture in the area had been destroyed.

Figure 6.1. View of damage caused by looters to the eastern area of the village. Note the strip looting throughout the area as indicated by the deep furrows dug into deposits at the center right of the image and the spoil piles in the center of the image. A 2015 excavation unit was located next to the LCAS site marker.

The original fieldwork plan (see Chapter 4) was to investigate an approximate 20 to 25 percent sample (n=7) of the 21 known and 13 suspected domestic rooms identified during the 2014–2015 fieldwork. The distribution of rooms selected for excavation was designed to sample four rooms in the northern and western areas of the primary room block, two of the isolated rooms east of the kivas that apparently survived the looting of Refuse Area B, and one of the structures located 80 to 100 m south of the primary village area. The specific rooms were to be selected in the field based on their preservation and data potential.

Room 7 was considered the most suitable candidate among the southern rooms for excavation. It was visible on the surface and was well-preserved (and thus also vulnerable to looters), while other rooms in the southern area were identified through GPR survey and remained buried and protected. The excavations in this area are described in Chapter 7.

In the eastern area, the fieldwork was intended to explore one or two isolated house structures first mapped by Robert Leslie and the LCAS in the 1960s (Figure 6.2). One of the structures, designated as Room 13, was tested by Leslie (2016a), who described fill deposits of up to 50 cm deep and burned construction material (roof *latillas* or *jacal* sticks) on the floor. The room appeared to be in good condition, particularly compared with other rooms in the northern and western areas. Parts of the walls were visible and the interior deposits appeared to have escaped the looting that had damaged much of the eastern site area. Furthermore, the excavation of a burned structure would provide critical data on architecture and the nature of structure abandonments at the Merchant site. Accordingly, the excavation of rooms in the northern village area began with Room 13.

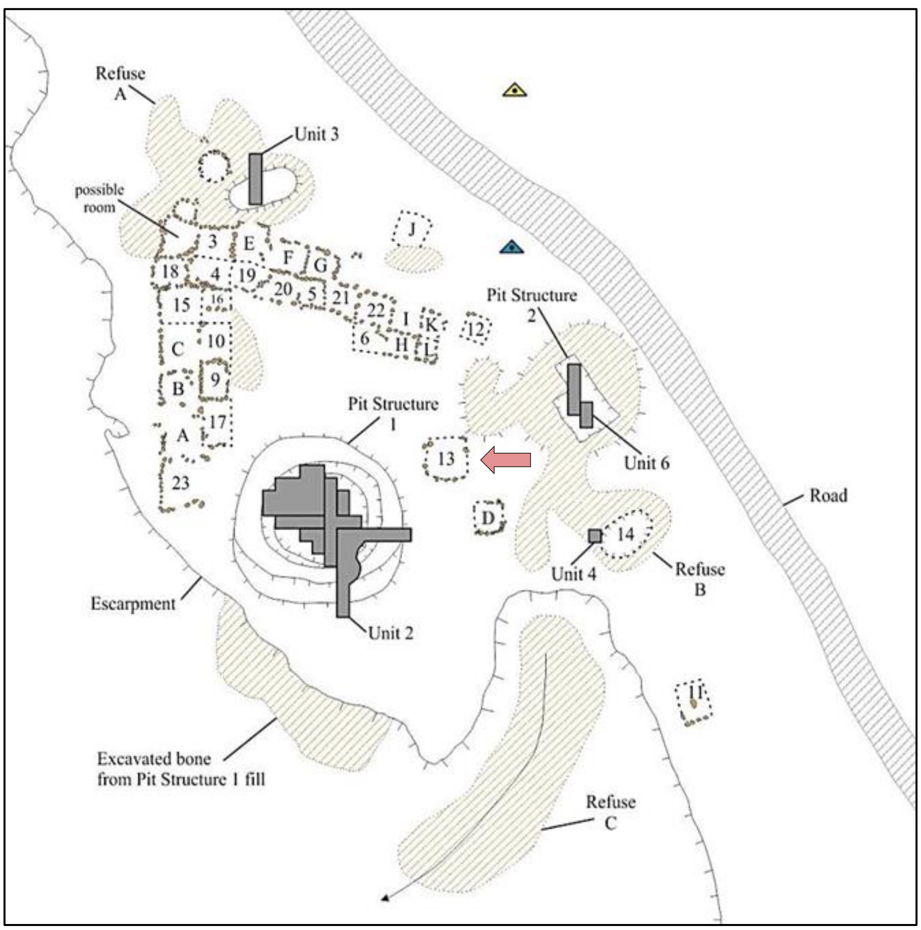

Figure 6.2. Map of the main Merchant village site based on the 2014–2015 investigations. Note the location of Room 13, the initial focus of the 2019 room excavations.

As often happens during archaeological fieldwork, once excavations began, the original work plan had to be modified. Excavations in the northern room block began with Room 13, but the discovery that an intact suite of contiguous and relatively well-preserved rooms was connected to Room 13 necessitated a change in plan. The research goals of room excavations at the Merchant site were to define the attributes of domestic architecture, the nature of the floor features and floor assemblages, the abandonment mode of the rooms, and whether the room blocks were constructed and expanded through ladder or agglomerative processes. Each of these goals could be met through excavation of the contiguous set of rooms discovered during exposure of Room 13.

Ultimately, a segment of seven contiguous rooms was fully excavated and adjacent areas or wall segments of another 11 adjoining rooms were partially exposed and mapped. Since the rooms in the eastern room block were contiguous and in relatively good condition, the research issues of architectural description, construction history, and abandonment mode were fully addressed. Accordingly, no excavations were conducted in the northern or western room blocks, nor were the 0.5-x-10-m wall exploration units considered necessary.

In the southern room block, Room 7 was found to be contiguous with another room (Room 24) and both were excavated, bringing the total of excavated rooms to nine. It is difficult to calculate what the count of nine rooms represents in terms of a sample proportion for the entire site. Several previously unknown rooms were discovered around Room 13 in the eastern part of the village, and additional rooms and suspected rooms were identified to the south. The exact count remains unknown but is estimated at somewhere between 60 and 80 rooms, and thus the nine rooms represents a 10 to 15 percent sample.

Ultimately, a 93-square-meter exposure was opened over the rooms, seven contiguous rooms were excavated, and small sections or wall segments of 11 adjacent rooms were defined. A total of 15.76 cubic meters of fill was screened and 5,308 prehistoric artifacts were recovered. The count includes 3,593 chipped stone artifacts, 829 ceramic sherds, 90 groundstone items, 737 fragments of animal bone, and 59 miscellaneous items of pigment and freshwater shell fragments. Also recovered were 228 historic items, almost all of which date to the 1950s and 1960s and were associated with the modern LCAS excavations and looting of the site.

The Domestic Architecture of the Merchant Site

The excavation of Room 13 revealed the presence of contiguous rooms to the north and south. The excavations were expanded to encompass the group of three rooms, thus revealing wall segments leading to the north, east, and west. It became apparent that an entire room block of over 20 m length and 8 m width was present, leading from the edge of the caprock escarpment to join with the eastern rooms of the northern room block mapped by the Robert Leslie in the 1960s and during the 2015 fieldwork.

An aerial image of the completed excavations is shown in Figure 6.3; a drafted planview map is provided in Figure 6.4.

Details of the walls, floors, room orientations, floor assemblages, subfloor features, and other characteristics of the domestic architecture were revealed and documented in the seven rooms, as well as the two rooms excavated in the southern area (see Chapter 7). A summary review of the Merchant site architectural details is provided below, followed by individual descriptions of the seven excavated rooms and 11 partially exposed rooms. The final section of the chapter reviews the limited excavations of extramural spaces along the western margins of the rooms.

Figure 6.3. Aerial view of the excavations in the eastern room block created by Mark Willis.

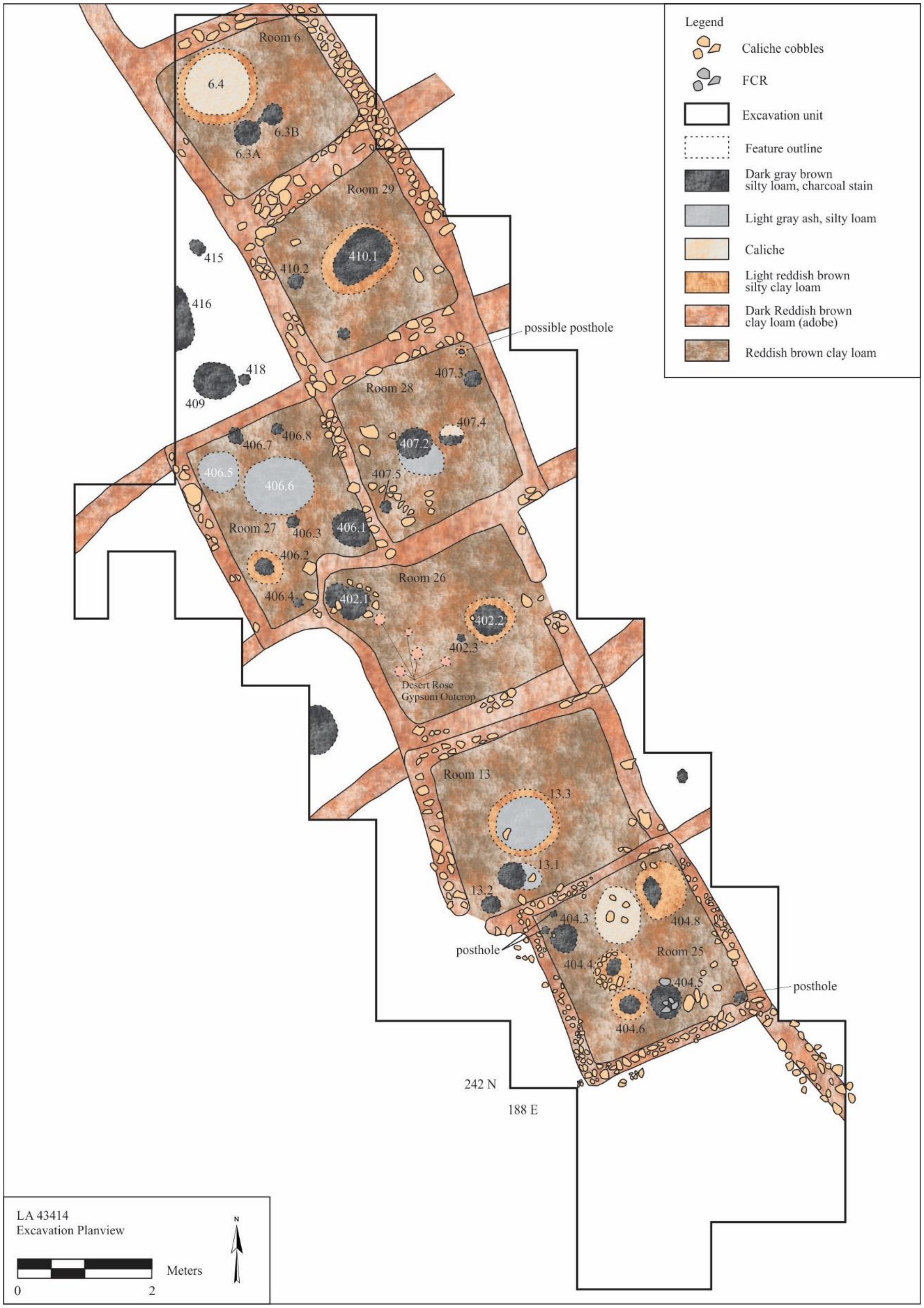

Figure 6.4. Planview of the excavations in the eastern room block.

Foundations, Room Dimensions, and Floor Areas

The "walls" of domestic rooms exposed through excavation and illustrated in Figures 6.3 and 6.4 are actually the foundations, or *cimientos*, of walls that were probably jacal constructions (wattle and daub). Robert Leslie's (2016; see also Miller et al. 2016) documentation of room excavations at the Merchant site revealed a somewhat confusing assortment of foundation types in terms of construction methods, material selection, and morphology. One of the questions arising from a review of his documentation was whether the wide range of variation among foundation walls was real or was the result in some part of the effects of looting and the inexperience of the LCAS excavators. The 2019 excavations mostly confirmed Leslie's observations. The foundations, or cimientos, of domestic rooms were quite variable.

It should be noted that almost all of the foundation walls were disturbed to various degrees and in many cases it was difficult to differentiate the original locations of foundation cobbles from disturbed locations. The combination of looting, constant and uncontrolled foot traffic across the site, and natural processes had resulted in the widespread displacement of foundation cobbles. This displacement is perhaps best illustrated by Rooms 6 and 29 (Figure 6.5), where almost equal numbers of construction cobbles were scattered throughout the upper room fills and the wall exteriors as were defined within the actual wall foundations through excavation. In some rooms, the foundation stones were entirely missing and the positions of walls were either inferred through differences in soil texture or extrapolated based on the locations of adjoining wall segments.

Figure 6.5. Views of the walls of Room 6 and Room 29 when first cleared (left) and after interior fill deposits were removed (right).

Several intact foundation segments were revealed through excavation. There appears to have been little regularity or standardization in how foundations were built or in the sizes and shapes of caliche cobbles selected for use in the foundations. As illustrated in Figure 6.6, foundation variants include a mass layer of flat cobbles, two rows of flat cobbles, a row of upright slabs (often dividing rooms), and parallel rows of tabular cobbles. Some foundations appeared to have been a simple, discontinuous line of rocks or cobbles, although it is possible that they were disturbed and displaced. Additional evidence of the informal and inconsistent nature of wall foundation construction is that none of the 11 excavated rooms had a single type of wall foundation. At least two foundation types were observed in each of the 11 rooms, and some may have had three types if the discontinuous lines of cobbles are considered a foundation type.

Some walls, such as those separating Room 28 and 29, were found to consist of two lines of cobbles separated by 15 to 20 cm. Faint outlines of clay daub could be seen surrounding the cobbles with a small gap between. This observation indicates that Rooms 28 and 29 and perhaps Rooms 29 and 6 had separate, abutting walls rather than a shared common wall.

Figure 6.6. Variations in foundation construction: layer of flat cobbles (upper left), rows of flat cobbles (upper right), upright tabular slabs between rooms (lower left), parallel rows of tabular cobbles (lower right).

The domestic rooms of the Merchant site are relatively small constructions. Based on the sample of nine rooms, the lengths of the foundation walls range from 2.04 to 3.16 m with a mean of 2.54 m. The two southern rooms have significantly longer foundation walls (t = -2.666, df = 34, p = 0.12, equal variances assumed) with an average length of 2.78 m versus 2.47 m for the eastern rooms (Figure 6.7, upper figure).

Floor areas of the nine rooms range from 4.34 to 8.99 square meters, with a mean of 6.09 square meters. As would be expected based on the presence of longer wall segments, the southern rooms have greater floor areas of 7.69 versus 5.69 square meters. (A t-test was not performed because the sample size of the southern rooms is too small.) The eastern rooms are also slightly smaller than the rooms in the northern and western areas excavated by the LCAS, but we caution that the measures of wall lengths and floor areas for those rooms are imprecise. At any rate, the room sizes and floor areas of any subarea of the Merchant village are small compared with, for example, the typical sizes of pueblo rooms in the Jornada region to the west (Figure 6.7, lower panel).

Room Orientations

Room orientations reflect the angle measured along the southern wall of each room (Figure 6.8). Rooms 13, 25, 26, 27, and 28 were oriented at azimuth of 66 degrees. Room 29 was oriented at 58 degrees. Room 6 in the eastern room block and Rooms 7 and 24 in the southern area were oriented at 48 degrees. There appears to have been little standardization among orientations, but an important observation is that there is a shift in orientations between the two rooms to the north (6 and 29) and the series of rooms located south of Room 29 that indicates those southern rooms were built at a later time.

The orientations of the nine excavated rooms in the eastern and southern areas also differ from those in the northern and western room blocks. Rooms along the western side of the room block are mostly oriented on the east-west cardinal direction at 85 to 90 degrees. Measuring the orientations of northern rooms is hindered by the widespread disturbances and the fact that room excavations were not backfilled by the LCAS, thus leaving room foundations to the mercy of erosion and foot traffic. The rooms appear to be oriented along a general east-west alignment, although some appear to tilt southwards at approximately 100 degrees azimuth.

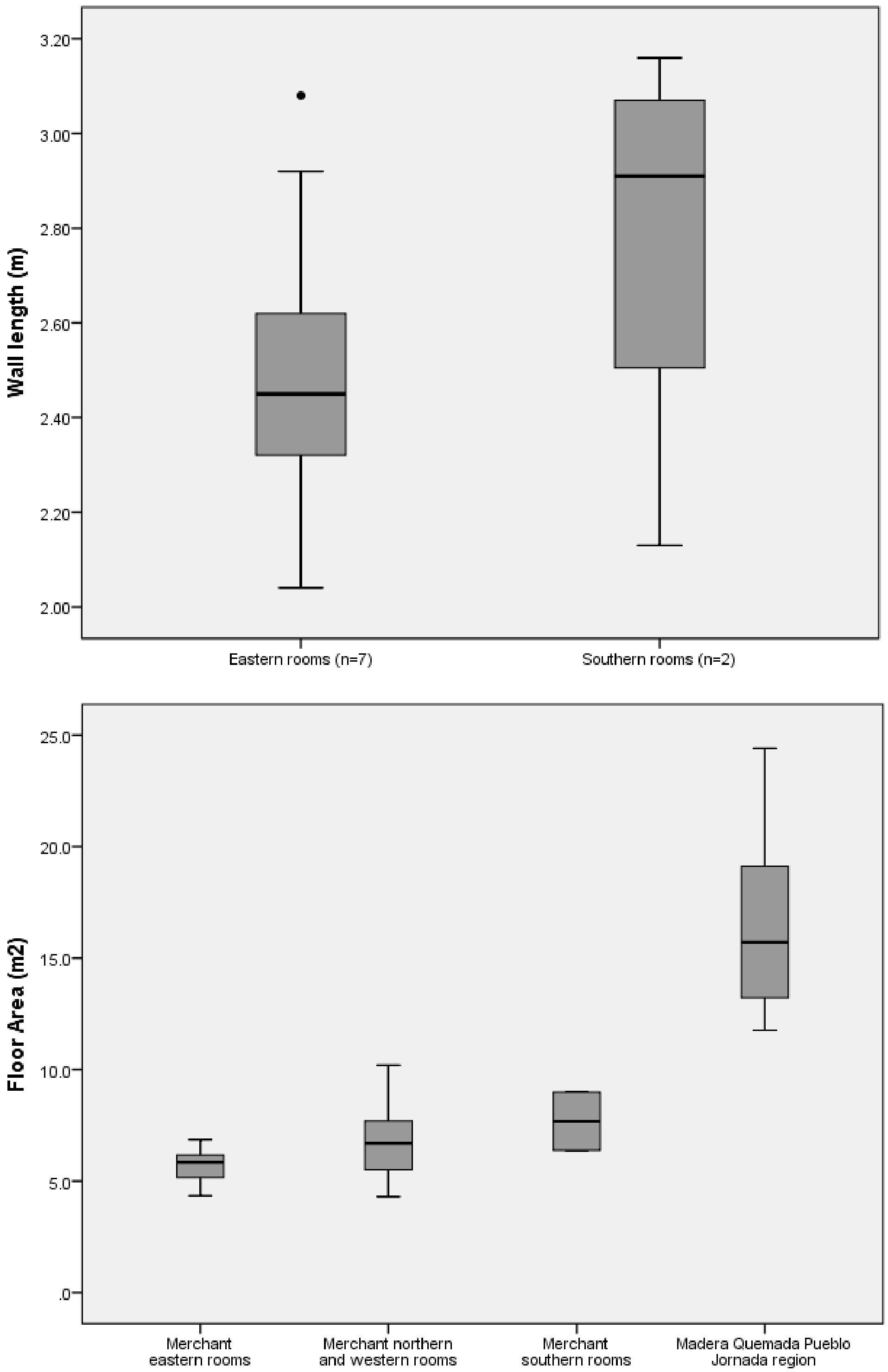

Figure 6.7. Median boxplots comparing wall lengths of the eastern and southern rooms (upper panel) and comparing floor areas of rooms at the Merchant site with Madera Quemada pueblo.

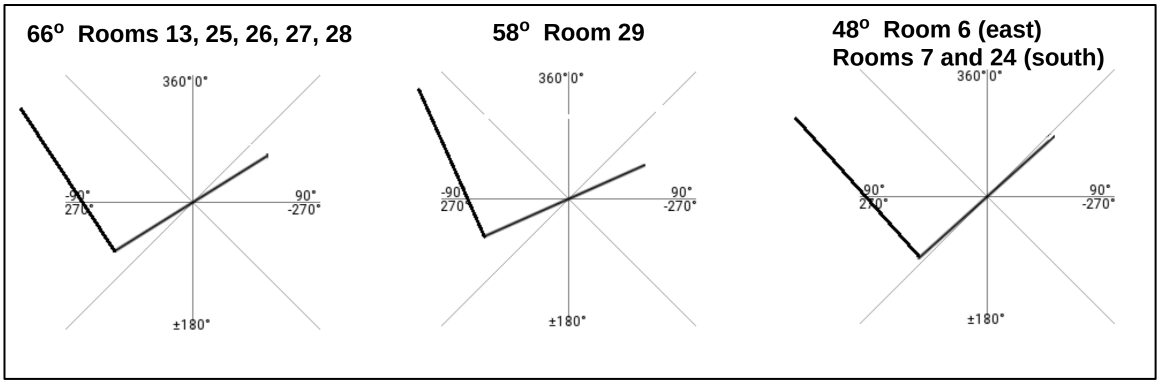

Figure 6.8. Orientations of excavated rooms at the Merchant site.

The meaning of these orientations remains speculative. Jornada pueblos of south-central New Mexico are conventionally oriented at 77 degrees azimuth, which approximates the spring equinox (Brook 1979; Miller and Graves 2012). In the case of the Merchant site, the orientations of the founding series of contiguous rooms may have simply followed the contour of the terrace, with the orientations of subsequent rooms determined by the location of the kiva and connections with other rooms. Also of interest is that orientation of Pit Structure 1 is similar to the orientation of rooms in the western arm of the room block, while the rooms of the eastern arm are oriented in a similar manner to Pit Structure 2. Apparently, however, there was no need to match the orientation of the southern rooms to an existing layout, and thus the angled orientation of Rooms 7 and 24 appears to have been intentional. Therefore, it is possible that the orientations of some rooms were related to periodic solar phenomena.

Fill Deposits

For the most part, the interior fills of the rooms consisted of natural sediments mixed with artifacts, charcoal, and other material from floors and perhaps later occupations. The fills consisted of brown and grayish-brown silty clay loams with quantities of natural calcium carbonate-coated pebbles, rocks, and some cobble-sized material. The color of the fill depended on the amount of intermixed charcoal sediments and ranged from the tan or light brown color of natural deposits to dark grey carbonaceous sediments.

No clear evidence of jacal construction material in the form of wall fall, roof fall, or burned daub was found in the fills. A few small superstructure elements were found in Room 1, but otherwise there was little evidence of jacal material. All of the rooms had been damaged by looting, past foot traffic, and eolian erosion, and several cm of overlying sediments and fill had disappeared during the 56 years since the site was investigated in the 1960s. There is little to no evidence in the fills that the rooms had been burned.

Evidence of looting was observed in the fills of several rooms. A noteworthy finding was that most rooms had a large looter pit in the center of the fill. The looter pits removed large sections of the fill, damaged the floors and floor features, and in some cases destroyed foundation walls (Figure 6.9). Historic artifacts from the 1960s were consistently recovered from the disturbed fills of the pits, including the seemingly intentional placement of tin cans.

The consistent position of the looter pits is curious and leads to the conclusion that the walls of the rooms must have been exposed and visible on the site surface during the era of looting between the late 1950s through the 1960s. With the exception of Room 13, Leslie did not map or mention a room block or any rooms in the eastern area of the site, and it appears that the rooms may have been pothunted and covered by backdirt before Leslie and the LCAS arrived and imposed some sort of controlled excavations in 1961. John Speth observed remnants of cimientos while mapping the site in 1984, which suggests that much of the erosional damage to the village occurred after the mid-1980s.

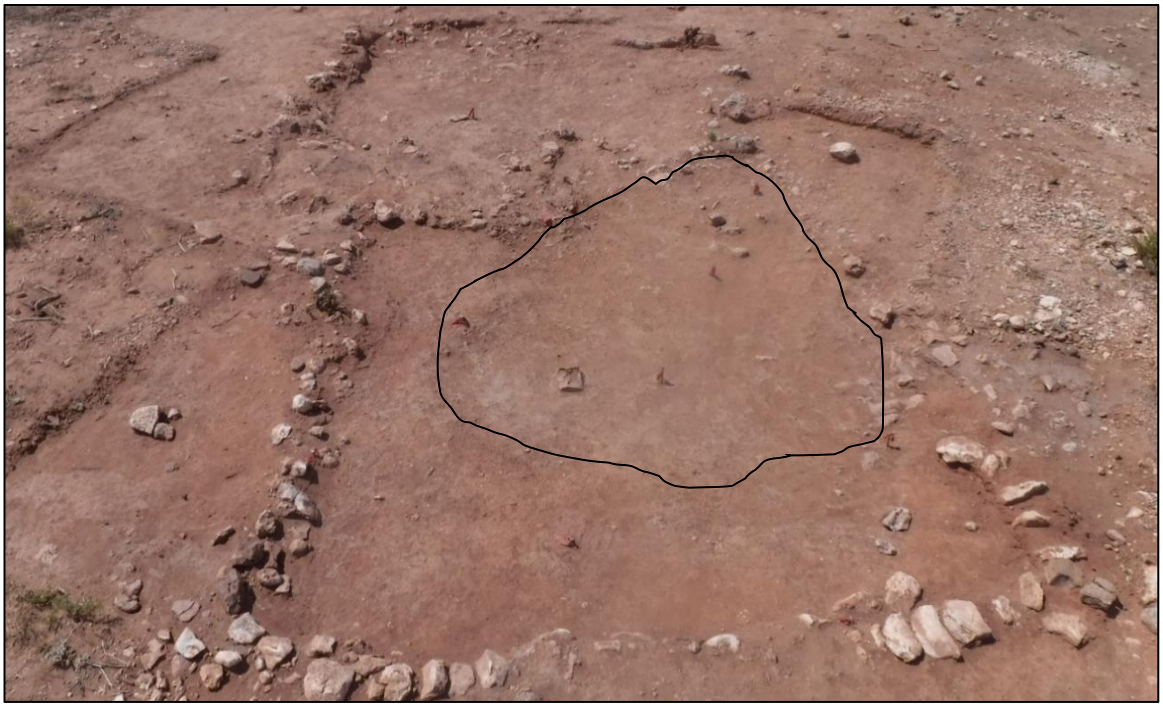

Figure 6.9. Looter pit in Room 25 that removed much of the fill in the center and northeast corner of the room and portions of the northern and eastern walls.

Floors

Floors were simple constructions of compacted layers of the silty loam comprising the natural soil substrate at the site. Only one example of a layer of caliche or daub plaster was noted in Room 28. Some floors had a higher clay content, indicating that clay was added to the silty loam sediments. In the eastern area, the upper floor of Room 28 had a denser composition and higher clay context than surrounding rooms. Room 7 in the southern room block also had some clay incorporated into the floor and walls, as revealed by the DStretch-enhanced image in Figure 6.10.

Rooms 6, 25, and 28 had two floors, and it is likely that Rooms 8 and 15 described by Leslie were two floors in a single room. It is suspected that two floors may have been present in other rooms, but the combined effects of erosion and looting had either disturbed the evidence of a second floor or had removed the floor entirely. Several looter pits that disturbed the interior fills also penetrated and removed portions of upper floors. It should be noted that most of the rooms had greater depths than rooms in the northern and western areas described by Leslie (2016a), and in the case of Room 6, a second, deeper floor was encountered below the floor exposed by Leslie in 1963.

Walls and Roof

Little evidence of the walls, roof, or other elements of the superstructure was preserved among the sample of eastern and southern rooms excavated in 2019, nor was evidence of superstructures found during the LCAS excavations in the northern and western rooms during the 1960s. Inferences regarding the nature of the superstructure of Merchant domestic rooms is based more on the absence or rarity of certain attributes rather than their presence. In this case, the absence of intact wall remnants and thick layers of wall or roof melt combined with the rarity of roof support postholes lead to the conclusion that the walls of domestic structures at the Merchant site were constructed using *jacal*, or wattle-and-daub methods. Moreover, the walls were probably thin *jacal* constructions consisting of a single layer of sticks covered by an exterior layer of clay daub.

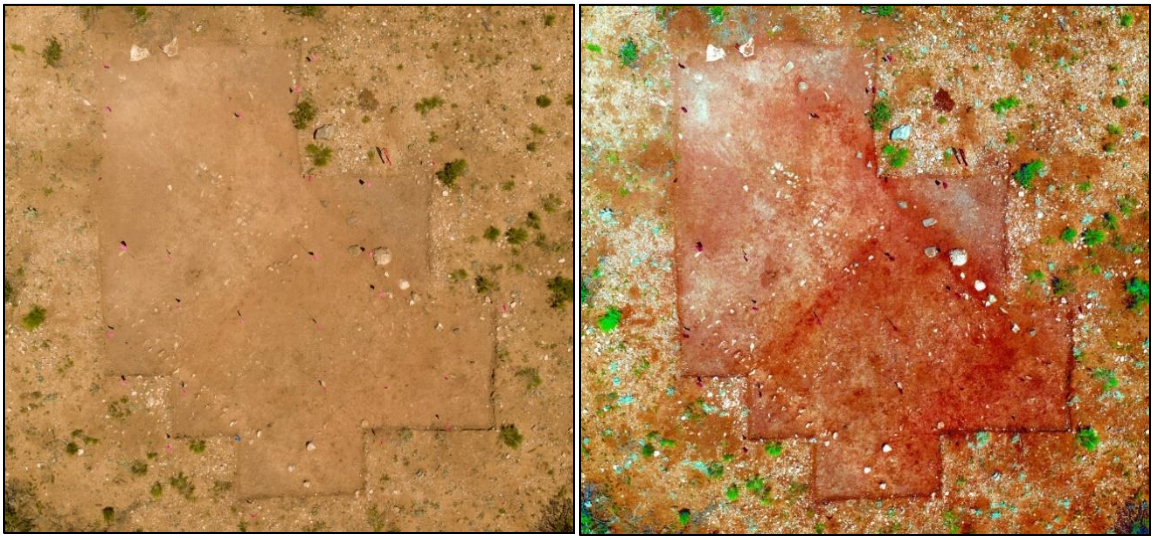

Figure 6.10. True color (left) and DStretch-enhanced (right) views Rooms 7 and 24, showing the presence of clay sediments outlining floors and walls of Room 7 and the western wall of Room 24.

No segments of upper *jacal* walls remained intact, and it appears that almost all evidence of walls was erased by the combination of erosion, bioturbation, and modern human disturbances (looting and constant foot traffic). Notably, Rooms 7 and 24 in the less-disturbed southern room block retained some evidence of walls in the form of clay daub deposits within the wall melt (see Figure 6.10). There was little to no daub roof and wall fall in the fills or mounded around the exteriors of wall foundations, even in the relatively well-preserved rooms of the southern room block. Leslie (2016a) mentions finding pieces of daub with stick impressions, but no such pieces of hardened or burned daub were recovered during the 2019 excavations.

One key to the nature of the walls and roof is the rarity of interior roof support postholes. Rooms 6, 13, and 24 (south room block) lacked any interior roof support postholes and Rooms 7 (south), 25, 26, and 29 had only a single support posthole that was usually located near a wall foundation. Central support posts may not have been necessary owing to the small size of the rooms. Multiple small support postholes were found in Rooms 27 and 28, most of which were positioned near the wall foundations. Historic and prehistoric jacal constructions usually have primary support posts at corners and midpoints, and often have secondary support posts along the wall foundations. The single posthole in Room 25 was located within a corner of the foundation wall, but otherwise no such features were detected in the floors or foundations of the other Merchant houses, including the segments of walls with missing foundation stones where postholes would have been clearly visible. However, several rooms had postholes adjacent to the foundations, which may have served as buttresses for walls or roof segments.

The construction of roofs is mostly conjectural. The absence of primary roof supports indicates that roofs were probably not substantial and weighty constructions typical of adobe or masonry pueblos, typically consisting of primary beams, cross-members, *latillas*, and closing material such as thatch and adobe, daub, or mud (see definitions in Ferguson 1959). The roofs of domestic rooms at the Merchant site were probably simple pole and thatch constructions.

Evidence of the wood used in the construction of walls or roofs was rarely encountered. Leslie (2016a) noted the presence of burned *jacal* wall sticks or perhaps roof *latillas* in Room 13. The 2019 excavations in Room 25 encountered several small, burned fragments of mesquite wood that were probably part of the *jacal* wall (Figure 6.11, upper panel). The segments measured 6 to 8 cm in length, 2 to 3 cm in diameter, and were located adjacent to the wall foundations. Some of the sticks may have measured up to 40 cm in length. They were very fragmentary and could not be recovered, but sections were collected for wood species identification and possible radiocarbon dating. Burned grass culms and stems identified in the flotation samples from Room 25 were probably part of the roof thatching. Another probable section of the superstructure, a 7-cm-long burned mesquite log, was found on the floor of Room 26 (Figure 6.11, lower panel). The burned log was located above floor hearth Feature 402.1, and it is possible that the specimen was a fragment of fuel wood used in the hearth.

Figure 6.11. Remnants of mesquite *jacal* construction material: (upper panel) remnants of small sticks on the floor of Room 25; (lower panel) 7-cm-long section of mesquite wood wall or roof element on floor of Room 26 above floor hearth Feature 402.1.

Entries

Few unambiguous examples of entryways were found in the 11 excavated rooms. Room 26 has an apparent entry in the eastern wall leading to an adjoining room. A slight gap or depressed area is present in the southern wall of Room 25 and might reflect a southern entryway. The widespread displacement of foundation cobbles probably hindered the identification of entries in some rooms, but even intact walls seemed to lack evidence of an opening. Historic photographs of *jacal* structures show entries that are flush with the ground surface, and perhaps entryways at Merchant were simply opened over an existing wall foundation segment. It is unlikely that roof entries were used because of the flimsy nature of roof construction among the domestic rooms.

Subfloor Features

Excluding postholes described above, the domestic rooms at the Merchant site are notable for having relatively few subfloor features and a limited variety of subfloor feature types. Small ash disposal pits were noted in Rooms 6 and 25, but aside from this minor feature only two other types were encountered in domestic rooms – floor hearths and pits. At least one floor hearth was present in each room, including the upper and lower floors of rooms with two floors. Two hearths were present in the floors of some rooms, indicating that some remodeling or rearrangement of interior space took place. In most cases, one or both hearths are positioned in the approximate center of the room.

The floor hearths range in diameter from 24 to 72 cm and are rather shallow constructions averaging 14 cm deep. From the examples illustrated in Figure 6.12, it might appear that floor hearths were intentionally lined with flat cobbles, but the presence of those cobbles is a natural occurrence. The terrace landform underlying the room block is a caliche conglomerate that exfoliates into rock fragments, and the rooms were constructed on a shallow layer of silty loam above the bedrock. Subfloor hearths and pits could be dug only to a shallow depth below the floors until they encountered the rocky substrate, and the natural layer of rocks was then incorporated into the bases and sides of the hearths.

The hearths were easily differentiated from pits and other features because the natural rock linings were darkened through exposure to fire and charcoal. An additional attribute is that the margins of floor hearths were often oxidized by contact with heat.

While much of the domestic architecture of the Merchant site is rather nondescript, it is noteworthy that the hearths in Rooms 6, 25, 27, and 28 were collared varieties with slightly raised clay collars around the central pit. Leslie (2016a) describes collared hearths in Rooms 3, 5, 8, and 10, with a prominent raised collar in the floor of Room 9 (Figure 6.13). Collared floor hearths are a distinctive architectural trait and their presence lends some insight into the origins of the inhabitants of the Merchant site.

The other common floor feature is a shallow pit. The pit features are similar in size and depth to the floor hearths but lack burned fill deposits and fire-darkened rocks. Fill deposits were the same silty loam sediments with various discarded artifacts as found in the room fills. Analyses of macrobotanical and pollen samples from the fills did not yield much insight into the function of the pits and whether they served as food storage facilities or served some other role.

Figure 6.12. Floor hearths in domestic rooms.

Figure 6.13. Leslie's photograph of the collared floor hearth of Room 9. Also note the groundstone tools placed upright against the northern wall.

De Facto Floor Assemblages and Termination Mode

The thin layers of trash on or just above room floors appear to mostly consist of secondary refuse similar to the materials in overlying fill deposits. An occasional small ceramic sherd, animal bone, or lithic flake was found on floors, but very few artifacts could be identified as *de facto* items (after Schiffer 1987) intentionally deposited or left on floors. Projectile points were found on the floors of Rooms 25 and 29, but the frequency of points on floors is surprisingly low compared with the counts recovered from middens, fills, and other contexts. A fragment of a stone palette was found on the lower floor of Room 6. The most unusual floor artifact of the 2019 fieldwork was the five specimens of gypsum "Desert Rose" concretions left on the floor on Room 26 (Figure 6.14).

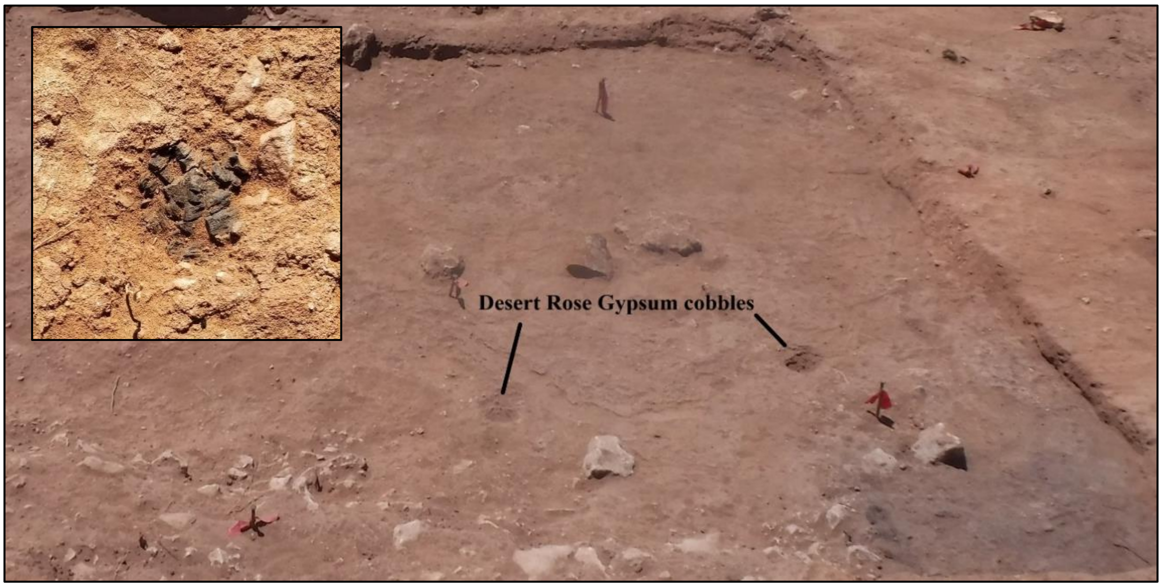

Figure 6.14. Gypsum Desert Rose concretions left on the floor of Room 26.

The 2019 excavations again corroborated and confirmed Leslie's descriptions of excavations in domestic rooms. Leslie's excavations of rooms in the northern and western areas encountered few items left on floors. The only clear examples of *de facto* items included a cache of Chupadero Black-on-white sherds derived from several vessels found on the floor of the southeast corner of Room 4, three groundstone tools placed upright against the wall of Room 9 (see Figure 6.13), and a few additional grinding tools in various rooms.

Several rooms were remodeled with the addition of a second floor. Very few artifacts were found on the lower floors, and no evidence of an ash layer, a common means of ritual closure or domestic rooms in the neighboring Jornada region (Walker and Berryman 2021), was noted. These observations suggest that remodeling of rooms at the Merchant site was a planned process and that the rooms continued to be occupied afterwards.

Other Noteworthy Attributes of Domestic Rooms, Present or Absent

One of the primary goals of the domestic room excavations was to determine if groups of contiguous rooms were constructed and expanded through "ladder" or "agglomerative" processes (Adams 2002; Ferguson and Mills 1987; Mills 1998; Mindeleff 1891). Ladder constructions involved one or two axial (or long-axis) foundation walls forming the common walls for a series of linear rooms. The rooms were generally built at the same time and had roughly similar sizes and orientations. In contrast, agglomerative growth patterns involved the somewhat random and disorganized additions of rooms with different wall angles, sizes, gaps between rooms, and a generally more haphazard appearance.

Ladder construction was an efficient and quick means of establishing a common, multi-room residence and was often associated with larger social groups establishing a new settlement. Agglomerative constructions often began with a small number of households and did not require suprahousehold or community-level cooperation, but instead grew and expanded through construction of single rooms by families or extended households.

As noted throughout the preceding discussions, the 2019 excavation of domestic rooms served to confirm several of the architectural attributes revealed during the 1960s excavations and described by Leslie (2016a). Based on his descriptions and photographs, combined with the results of mapping rooms completed during the 2015 fieldwork, it was thought that the room blocks were constructed using a ladder process. This conclusion, however, was not confirmed by the 2019 fieldwork. A review of the aerial image and plan view of Figures 6.3 and 6.4 reveals that the seven contiguous rooms of the eastern area have different wall angles and orientations and lack a single common axial foundation wall. Groups of two or three rooms appear to have been added on in a haphazard manner. The implications of these construction and growth pattern are explored in the report summary.

Another contrast to the typical pueblo settlements of the Jornada, Mimbres, Roswell Oasis, and Chupadera Mesa-Salinas regions to the west and northwest is that little evidence of ritual dedicatory or closure deposits or object placement was noted among the domestic rooms of the Merchant site (Creel and Anyon 2003; Kelley 1984; Miller and Graves 2009; Speth 2004a, 2008), the possible exception being the gypsum desert roses on the floor of Room 26 that may have been a form of termination object. Ash was sometimes used to seal floors and structures in the Southwest (Adams and Roth 2021), but if ash deposits were present, they were probably destroyed by looting and erosion. The domestic rooms appear to have undergone a planned abandonment with little evidence of ritualized closure practices, although there is evidence that the kiva west of the rooms was ritually terminated (Leslie 2016a; Miller et al. 2016).

A seemingly minor detail is that the postholes in room floors are shallow and lack the rocks or fragments of groundstone placed as basal supports and shims that are commonly found in pueblo rooms to the west (Miller and Graves 2009). This detail is further evidence of the comparatively informal nature of the *jacal* architecture of the rooms. Leslie (2016a) also describes the presence of "flagstones" surrounding hearths in a couple of rooms, but it is more likely that those are the natural caliche cobble slabs found everywhere below rooms.

Individual descriptions of the seven rooms of the eastern room block are provided below. This discussion is followed by brief summaries of the small portions of adjacent rooms revealed during excavation and definition of room walls. Six of the seven rooms excavated by Bus Leslie and the LCAS in the 1960s are described (the LCAS excavations of Room 6 are included with the 2019 excavations), followed by a summary of looted and tested rooms.

Room 25 (Feature 404, Room D)

Room 25 was the southernmost of the series of rooms defined in the eastern area. Another room may have adjoined the southern wall of Room 25, but this area near the edge of the caliche caprock escarpment was heavily eroded and disturbed and no wall segments could be identified. Much of the central fill and portions of the northern and eastern walls were disturbed by a larger looter pit, and tin cans, bottle glass, and other metal objects had been tossed in the pit. Nevertheless, two floors were identified, one positioned a few cm below the surface and a second floor resting on the caliche bedrock (Figures 6.15 and 6.16). Room 25 was one of the few rooms with some evidence of the superstructure on the floor.

Dimensions:	north wall 2.36 m
	south wall 2.44 m
	east wall 2.76 m
	west wall 2.46 m
Floor area:	6.26 square meters
Orientation:	66° / 156°
Floors:	two floors
Floor hearths:	one in upper floor (404.1) and two in lower floor (404.4 and 404.5)
Pits:	one in upper floor (404.3)
Postholes:	one primary support (404.7)
Other features:	ash pit (404.6); bedrock feature (404.8); 1960s looter pit (404.2)

Fill and Stratigraphy: The fill in Room 25 consisted of a dark brown (Munsell 10YR3/2) silty loam with a high density of caliche nodules. The central and northeastern areas of the fill and segments of the northern and eastern walls were removed by looters (see Figure 6.8). The pit (designated Feature 404.2) penetrated to the floor at a depth of 29 cm in the northeastern corner of the room, and shovel grooves could be seen at the base. The pit had infilled with eolian sand intermixed with surrounding fill deposits. Artifacts dating to the 1960s, including metal sanitary cans, clear bottle glass, and crown top bottle caps, were recovered from the mixed fill of the looter pit. Two floors were identified in the room.

Artifacts in Level 1 included areas within and slightly outside the walls. Totals of 215 lithics, 7 groundstone items, 38 Ochoa ware sherds, 41 bone fragments, and 1 fragment of mussel shell were recovered. Recovered from Level 2 within the room was 229 lithics, 7 Ochoa ware sherds ceramics, 8 bone fragments, and 1 mussel shell fragment. Four projectile points were recovered. The third level exposed the superstructure elements and floor. The items from this level included 246 lithics, 2 groundstone, 17 Ochoa ware sherds, a Chupadero Black-on-white sherd, 30 bone fragments, and 2 pieces of limonite. Historic materials were distributed throughout the disturbed fills.

Walls: The wall foundations ranged from 16 to 28 cm in width, with the widest sections found along the southern and western walls. The eastern 1.4 m segment of the northern wall and the northern 2.0 m of the eastern wall were displaced or destroyed by looters, but sections of the base of the eastern wall could be discerned above the bedrock. Intact sections of foundations were 14 to 21 cm above the lowermost floor and consisted of assorted sizes and shapes of cobbles, except for the southern foundation that was constructed of slab-shaped cobbles placed in rows.

Entry: No clearly defined entry was observed in the intact segments of walls. A small gap in the center of the southern foundation might have served as an entry.

Figure 6.15. View of the lower floor of Room 25 after excavations had been completed.

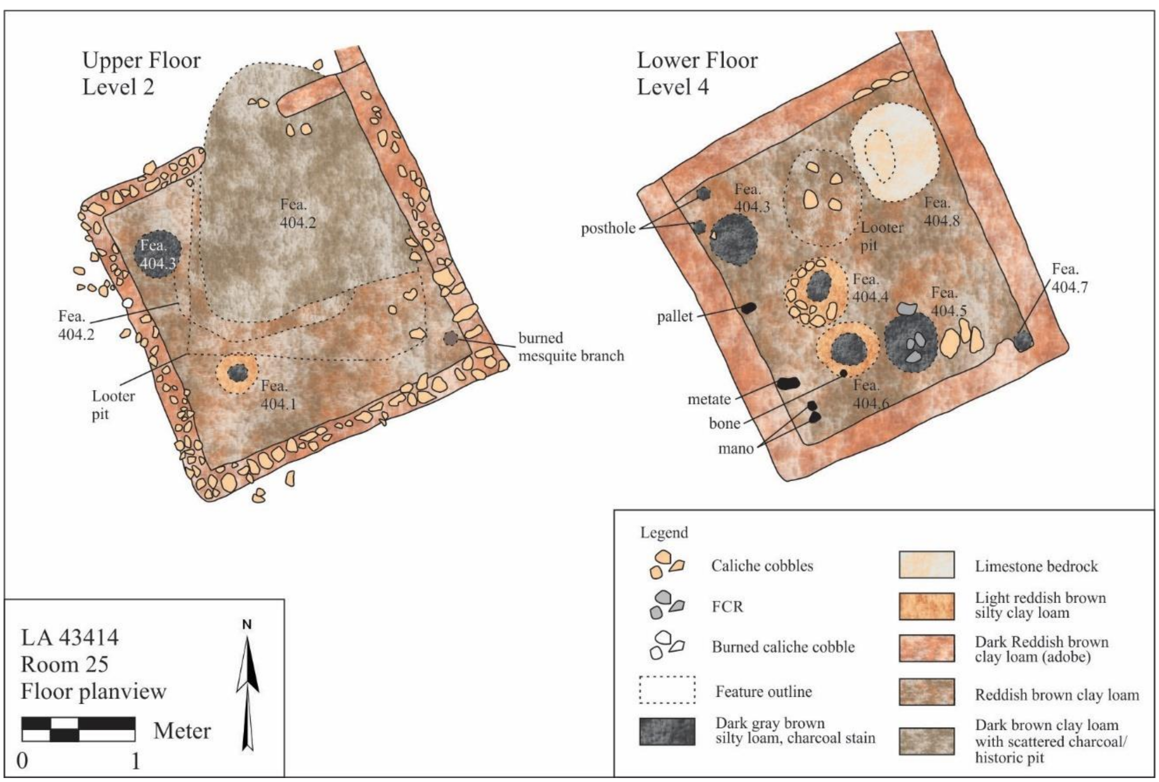

Figure 6.16. Planview drawings of Room 25.

Floor: Two floors were present. The upper floor was approximately 10 cm above the lower floor and was identified by the presence of a small, collared hearth (Feature 404.1) and storage pit (Feature 404.3). The floor was compacted earth with a slightly higher clay content than the fill above and below but did not appear to have been a prepared surface. No artifacts were present on the intact sections of the floor, although a significant portion had been removed by looters.

The lower floor was clearly defined outside the looter pit in the southern and western parts of the room as dark red brown silty clay loam. Large calcium carbonate coated cobbles are below the fill and represent the natural bedrock. In one area, the bedrock forms a circular basin depression (similar to Feature 6.4 in Room 6) and appears to have been used as a work area. The floor was nearly level with a maximum of 5 cm decline from the wall margins toward the center.

Superstructure: Burned remnants of the superstructure were encountered on the lower floor. The remnants beams were very friable and could not be collected. The dimensions were estimated by observing their imprints in the fill and among the few small samples that could be collected. The segments measured 2 to 3 cm in diameter and 6 to 8 cm in length, with combined lengths of up to 40 cm. The fragments were located adjacent to the wall foundations. None originated within or near a posthole, suggesting that the fragments were either part of the *jacal* walls or were secondary elements and closing material from the roof.

The beams were identified as monocot stems (probably mesquite [*Prosopis* sp.]). Burned grass culms and stems were also identified in flotation samples and may have been part of roof thatching. No daub with wood or branch impressions was observed, indicating that the daub layer of the jacal walls may have been thin and that the roof was not plastered with adobe.

Floor and Subfloor Assemblages: No artifacts were present on the upper floor. Several groundstone fragments were plotted on the lower floor near the western foundation wall. A complete chopper tool was recovered from the base of the small pit (Feature 404.3) and would have been associated with occupation of the upper floor.

Subfloor Features: The upper floor features included a floor hearth (Feature 404.1) in the southwest and a cylindrical pit (Feature 404.3) in the northwest (Figure 6.17).

The floor hearth had a thin adobe collar around an interior pit measuring 14 cm by 16 cm and 6 cm deep. A single complete Harrell-style projectile point was present in the fill. The collar was slightly oval-shaped and measured 46 cm by 38 cm in diameter, was only 2 to 3 cm thick, and was oxidized from heat. The cylindrical pit measured 44 cm by 42 cm and was 15 cm deep. A unifacial cobble "chopper" tool was present on base of the pit.

Figure 6.17. Features in the upper floor of Room 25: (left) the collared floor hearth after bisection; (right) cylindrical pit with cobble tool placed at the base.

Hearth features in the lower floor (Figure 6.18) included a primary floor hearth (Feature 404.4) and a secondary hearth (Feature 404.5). The primary hearth of the lower floor is similar to the hearth in Room 24 in the southern room block (see Figure 8.8). The feature was ringed by a raised collar with fire-cracked rock except along the north and east sides that were destroyed by the looter pit. The hearth measured 60 by 68 cm and was 23 cm deep. A shallow, 10-cm-deep ash pit (Feature 404.6) was present south of the pit.

A second floor hearth or ash pit (Feature 404.5) was located in the south-central area. The hearth pit was circular, measured 40 cm by 37 cm, and was 6 cm deep. The fill consisted of a charcoal-stained stain silty loam with large charcoal chunks and small branch fragments. Ash was present and the base and sides were oxidized red (Figure 6.18, right).

Figure 6.18. Floor hearths in Room 25: (left) Feature 404.4 and ash pit Feature 404.5; (right) Feature 404.7.

A primary posthole (Feature 404.7) was found within the margins of the foundation wall in the southeast corner. The feature was 20 cm in diameter and was 28 cm deep (Figure 6.18, left). The location of this posthole indicates that primary wall and roof supports of houses at the Merchant were positioned along corners and walls, similar to *jacal* constructions documented elsewhere in North America.

The final floor feature is an unusual natural bedrock basin in the northeast corner (Feature 404.8). The basin was roughly circular in shape, measured 0.85 m by 0.75 m, and was 14 cm deep (Figure 6.19, right). It appears that construction of the floor may have incorporated this natural surface as a work area.

Figure 6.19. Posthole in the southeast corner of Room 25 (left) and bedrock basin feature (right).

Discussion: Evidence of superstructures was rarely encountered among the 11 excavated rooms, and most of the details were found in Room 25. Remnants of burned jacal or roof sticks, possible thatching, and a corner posthole were identified. The room was remodeled and had two floors, and the lower floor may have incorporated a natural bedrock basin as a work area.

Room 13 (Feature 13)

During the 2014–2015 fieldwork, Room 13 was identified as one of the rooms partially excavated by Leslie and the LCAS in the 1960s. The room was identified as Room 13 based on its location in relation to Pit Structure 1, as indicated on site maps published by Leslie. However, the 2019 excavations found no evidence of the hand trenches described by Leslie in Room 13, nor was evidence of trenches identified in the other eight excavated rooms. Moreover, the 2019 excavations found no evidence of the burned roof beams described by Leslie. The room number designation has been maintained for consistency, but it is noted that the location of Leslie's Room 13 remains uncertain.

Room 13 shared common walls with Room 25 to the south and Room 26 to the north. Rooms were also identified to the east and west. The southeastern corner of the room was damaged by the same looter pit that had damaged much of the fill, floors, and walls of Room 25. After the upper fill had been cleared, the room seemed to have a "L" shape, but further excavation determined that the foundation stones of the southeastern wall had been displaced by a looter pit (Figures 6.20 and 6.21). Only one floor was defined, although the identification of floors was hindered by erosion and disturbances to the fill.

Interior dimensions:	north wall 2.60 m
	south wall 2.60 m
	east wall 2.32 m
	west wall 2.32 m
Floor area:	6.03 square meters
Orientation:	66° / 156°
Floors:	one floor
Floor hearths:	two floor hearths (13.1 and 13.2)
Pits:	one pit (13.3)
Postholes:	None

Fill and Stratigraphy: The fill in Room 13 consisted of a dark gray brown (Munsell 10YR3/2) silty clay loam with a high density of caliche nodules. Intermixed throughout this fill were areas of reddish brown silt loam (Munsell 5YR4/4) and charcoal-stained sediments. A section of the southeastern fill and walls were disturbed by the larger looter pit in Room 25.

Artifacts in Level 1 included areas within and slightly outside the walls. Totals of 122 lithics, 10 groundstone items, a palette fragment, 52 Ochoa ware sherds and a Chupadero Black-on-white sherd, 14 bone fragments, and 1 fragment of mussel shell were recovered. Three projectile points were recovered. Recovered from Level 2 within the room was 166 lithics, three projectile points, 23 Ochoa ware sherds ceramics, a Lincoln Red-on-black sherd, and 102 bone fragments. The third level exposed the floor and consisted of only 1 to 2 cm of fill. The items from this level included 2 lithics, 2 projectile points, groundstone, 6 Ochoa ware sherds, and an unusually high count of 512 bone fragments. The floor sediments had high densities of calcium carbonate-coated cobbles from the underlying bedrock. As with other room fills, historic artifacts were found throughout the upper fill layers.

An elevated area that might have been a bench or second floor was noted against the north wall. It was a 30-cm-wide area of dark reddish-brown (Munsell 5YR3/3) clay sediments and was 13 cm thick. Some stained areas and a metate broken into several fragments were present at the same elevation in the fill, indicating that a second floor might have been present. However, erosion and disturbances had destroyed most of the evidence for a second floor.

Figure 6.20. View of Room 13 after excavations were completed.

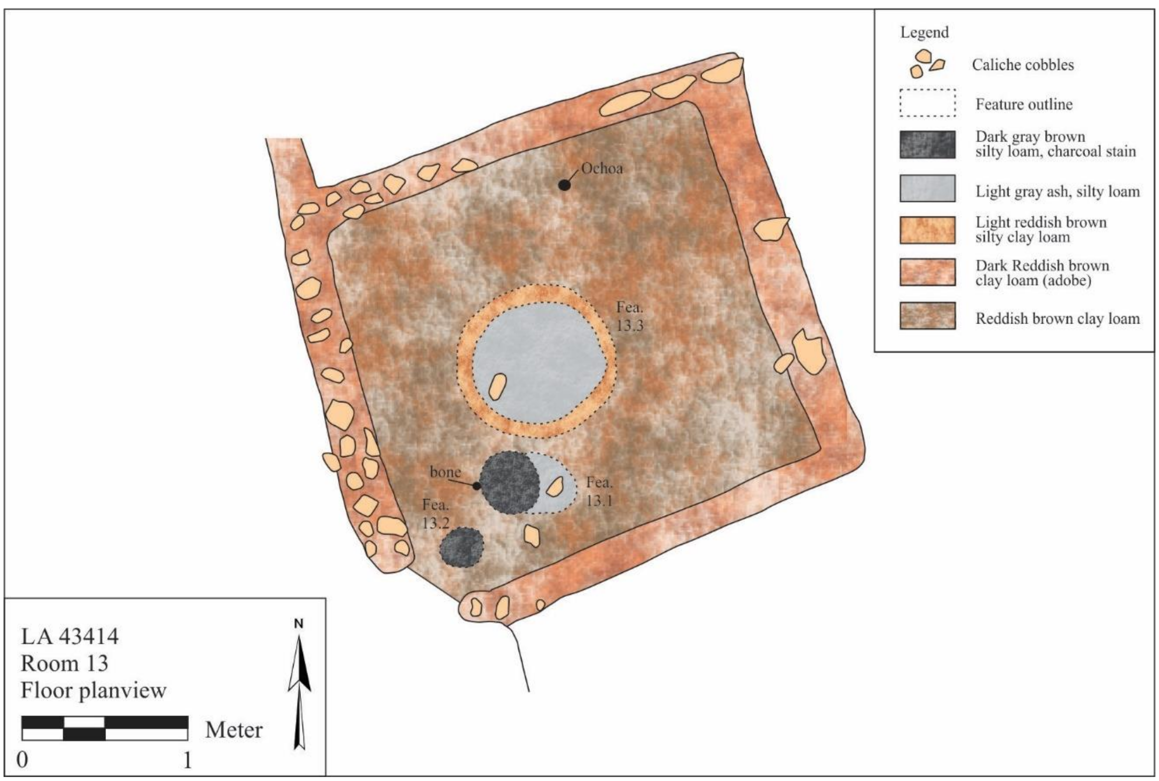

Figure 6.21. Planview drawing of Room 13.

Walls: The wall foundations were in poor condition and only the western wall, part of the southern wall, and three upright slabs marking the northern wall remained intact. Foundation stones comprising the eastern half of the southern wall shared with Room 25 had been displaced for a distance of nearly 1 m by the large looter pit in Room 25. When the room was first defined in the upper fill levels, the room appeared to have an "L" shape because of the displaced wall segment (Figure 6.22). The intact segments of foundations were 28 to 32 cm wide. Only around 4 cm of foundation and wall remained intact, except along the northern wall that retained 24 cm of height. The foundation and wall matrix consisted of a light brown silty loam to a reddish-brown silty clay loam.

Figure 6.22. View of Room 13 showing the upper levels of fill exposed in Level 2. The foundation stones along the southern wall were displaced by the looter pit, resulting in the irregular appearance of the wall and apparent "L" shape of the room. Upper levels of floor features 13.1 and 13.2 can be seen in the southwestern quadrant.

Entry: No clearly defined entry was observed in the intact segments of walls. Several gaps are present that might have served as an entry.

Superstructure: No evidence of the superstructure remained intact. Leslie (2016a) describes several burned roof beams in Room 13, but it uncertain whether this room is the same structure tested by Leslie.

Floor: The room had one clearly defined earthen floor with three floor features. The floor was nearly level and consisted of a reddish-brown silty clay loam with caliche nodules.

Floor and Subfloor Assemblages: An Ochoa ware sherd was the only artifact found on the floor.

Subfloor Features: Floor features included a collared floor hearth in the southwest portion of the room (Feature 13.1), a hearth or ash pit at the edge of the floor hearth (Feature 13.2), and a large floor hearth or pit feature (Feature 13.3).

One floor hearth (Feature 13.1) was a circular pit measuring 60 cm in diameter with a slightly raised collar (Figure 6.23). The hearth was 9 cm deep and the fill had large chunks of charcoal. The collar surrounding the pit was 5 cm wide, 2 to 3 cm high, and was oxidized. A 24 cm half-circle area of discarded ash and stained sediment was present at the southeastern edge of the hearth. Feature 13.2 was located 20 cm southwest of Feature 13.1. The feature was a circular pit measuring 44 cm diameter and was 9 cm deep (Figure 6.23). The fill was a dark gray charcoal-stained silty loam and the upper margins were oxidized. The feature could be a floor hearth or ash discard pit.

Figure 6.23. Floor features in Room 13: Feature 13.1 (left) and Feature 13.2 (right).

Feature 13.3 was a large oval pit (Figure 6.24) measuring 1.0 m by 0.88 m. The pit was 16 cm deep to the point where the base of the pit contacted the underlying caliche cobble bedrock. The sides and base were slightly reddened through oxidation and the fill consisted of a dark brown silty loam with scattered charcoal. The feature appears to have been a floor hearth located in the approximate center of the room as found in other rooms.

Figure 6.24. Feature 13.3 exposed on the floor (left) and after excavation (right).

Discussion: Room 13 was one of the more poorly preserved of the excavated rooms and provided little insight into architecture, occupation, and abandonment. The most interesting detail of the room was the upright slabs forming part of the northern foundation.

Room 26 (Feature 402)

Room 26, along with Rooms 13 and 25, comprised the southern group of rooms that shared a common wall alignment that was offset from the alignment of the rooms to the north. The north-south walls of Room 26 aligned with the centers of Rooms 27 and 28 to the north (see Figures 6.3 and 6.4), indicating that the southern rooms were constructed at a different time. The room had the usual looter pit in the center, but unlike other rooms, the looter pit of Room 26 was small and did not penetrate the floor, and thus the floor and floor features were mostly intact.

Room 26 was unusual in there appears to have been a small alcove with a large floor hearth in the northwest corner (Figures 6.25 and 6.26). It is unclear if the room was constructed in this manner, or if the hearth was intrusive or an earlier feature. The foundations of the room were mostly missing and the locations of walls were mainly determined by the presence of daub. No evidence of a wall was found between the feature and interior of Room 26. Another unique aspect of Room 26 was the presence of five gypsum desert rose concretions that had been placed in the floor of the western half of the room.

Interior dimensions:	north wall 2.92 m
	south wall 2.50 m
	east wall 2.04 m
	west wall 2.44 m
Floor area:	6.07 square meters
Orientation:	66° / 156°
Floors:	Single floor
Floor hearths:	one hearth (Feature 402.1)
Pits:	one pit or plastered floor hearth (Feature 402.2)
Postholes:	one primary (Feature 402.3)

Fill and Stratigraphy: The fill in Room 26 consisted of a dark gray brown to dark brown (Munsell 10YR3/2) silty loam with scattered charcoal and caliche nodules. The fill in the center of the room was disturbed by a looter pit measuring 1.84 m by 1.72 m that removed around half the fill but did not penetrate to the floor (Figure 6.27). The pit had infilled with eolian sand intermixed with surrounding fill deposits. Numerous artifacts dating to the 1960s, including metal cans and lids, crown bottle caps, and .22 caliber cartridges, were recovered from the mixed fill of the looter pit. One floor was identified in the room.

Artifacts in Level 1 included areas within and slightly outside the walls. Totals of 253 lithics (5 projectile points), 4 groundstone items, 30 Ochoa ware sherds, 1 Chupadero Black-on-white sherd, 78 bone fragments, and 3 fragments of mussel shell were recovered. Thirty historic items were recovered from the disturbed fill of the looter pit. Recovered from Level 2 within the room was 59 lithics, 7 groundstone, 8 Ochoa ware sherds and an unidentified whiteware, and 18 bone fragments. Thirteen historic items were collected from disturbed fill contexts. The third level was 2 to 9 cm thick and exposed the floor. Items from this level included 32 lithics, 8 Ochoa ware sherds, a Chupadero Black-on-white sherd, 15 bone fragments, and 3 historic items. Fragments of gypsum desert rose that had exfoliated from the concentrations on the floor were found in the overlying fill.

Walls: The wall foundations ranged from 20 to 36 cm in width, with the widest sections found along the southern and northern walls. The eastern 1.4-m-long segment of the northern wall and the northern 2.0-m-long segment of the eastern wall were destroyed by looters, but sections of the base of the eastern wall could be discerned above the bedrock. Intact sections of foundations were 14 to 21 cm above the lowermost floor and consisted of assorted sizes and shapes of cobbles, except the southern foundation that was constructed of slab-shaped cobbles placed in rows. Many of the wall segments were traced by the presence of daub.

Figure 6.25. View of Room 26 after excavations were completed.

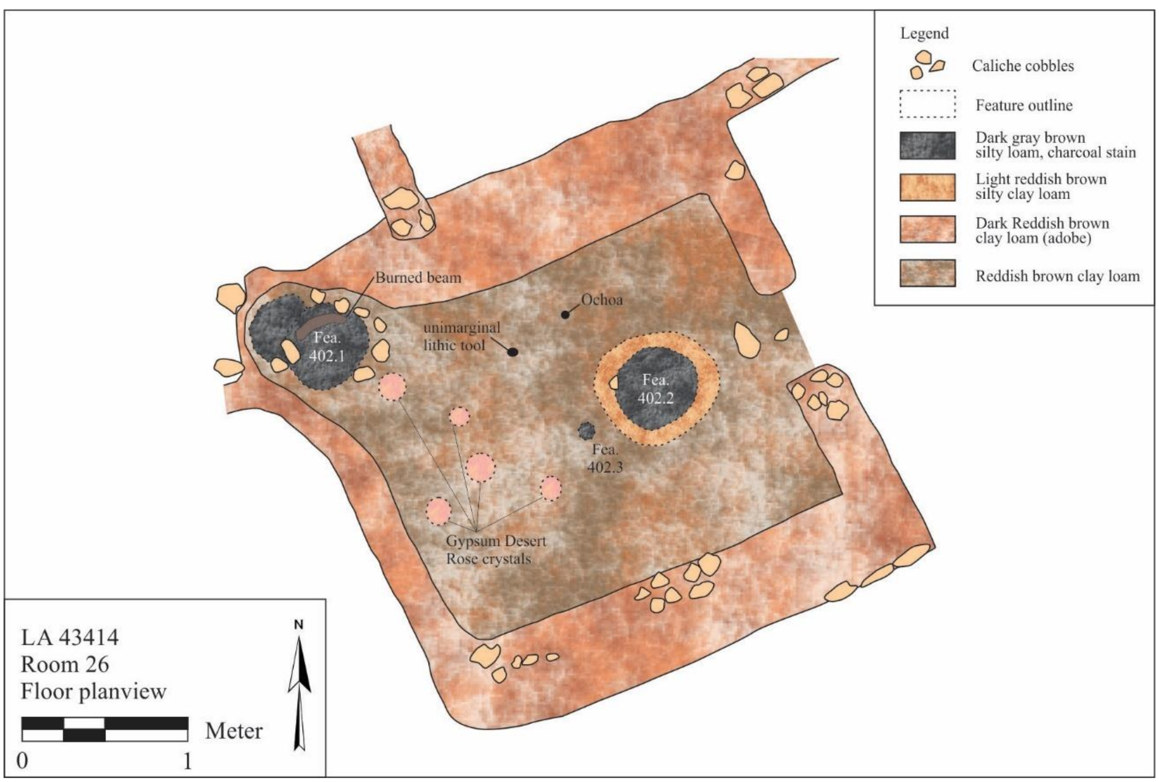

Figure 6.26. Planview drawing of Room 26.

Figure 6.27. Looter pit in Room 26: outline of pit visible in Level 1 (left); pit in Level 2 with tin can left in the fill.

Entry: Room 26 was one of the few rooms with a clearly defined entry. A 50-cm-wide gap was present in the center of the eastern wall shared with Room 32.

Floor: A single floor was present at 21 cm below the surface. The floor was compacted silty loam and did not have evidence of a formally prepared surface. The location of the floor was confirmed by the presence of floor features. It was mostly level except for a slightly upwards slope near the walls.

Superstructure: The only evidence of a superstructure was a single posthole.

Floor and Subfloor Assemblages: Room 26 had a unique floor assemblage of five gypsum desert rose concretions that were partially exposed at the level of the floor and extended below the floor, indicating that the concretions were intentionally placed in the floor (Figure 6.28). The concretions ranged from 10 to 20 cm in diameter. One was placed near Feature 402.1, and four had been placed in the floor of the western half of the room (see planview map of Figure 6.26). A retouched lithic tool and Ochoa ware sherd were also present on the northern area of the floor.

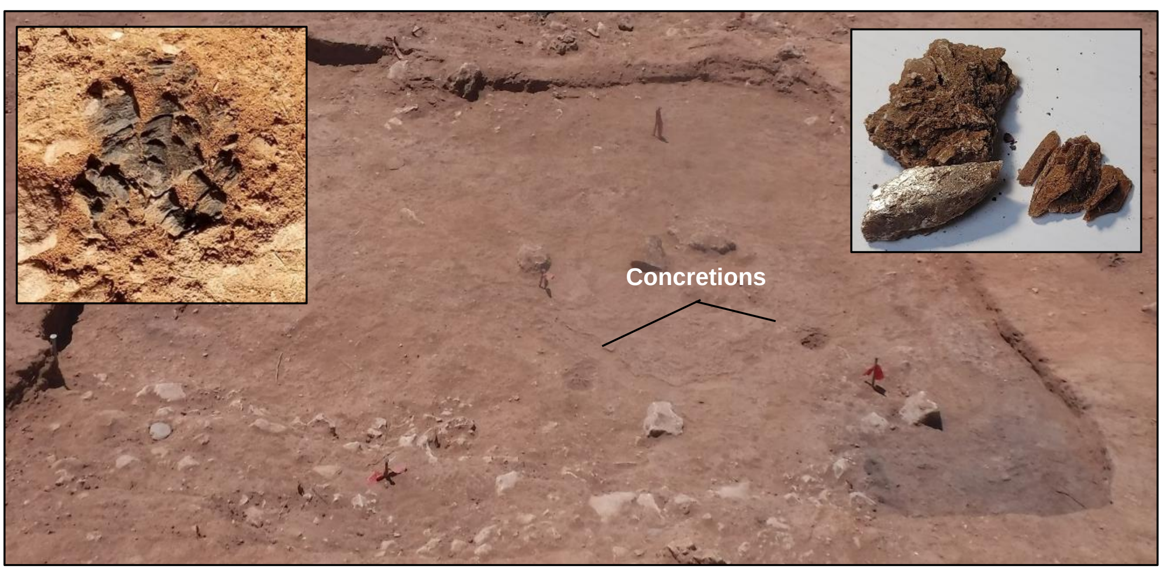

Figure 6.28. Gypsum desert rose concretions in the floor of Room 26. Inset at left shows a closeup view of one of the concretions in the floor; inset at right displays one of the excavated examples.

Gypsum is present throughout the geologic deposits of southeastern New Mexico (Kremkau et al. 2013), and it is relatively certain that the concretions were obtained from one of the gypsum salt pans that dot the landscape of the region. It does not occur naturally in the caliche conglomerate or Pleistocene deposits below or within the vicinity of the Merchant site, and the concretions are clearly manuports brought to the site.

Subfloor Features: Floor features include the distinctive hearth in the northwest alcove of the room (Feature 402.1), and oval pit or hearth (Feature 402.2) and single posthole (Feature 402.3) in the center of the room. The alcove does appear to have been an extension of the room to encompass Feature 402.1. The hearth was circular and measured 58 cm in diameter and was 18 cm deep (Figure 6.29, left). As with other floor hearths, the natural cobbles served as a lining for the pit, although in the case of Feature 402.1 some fire-cracked rock was also present in the fill. Several burned mesquite wood branches were in the upper 10 cm of the fill. The remainder of the fill was a dark gray charcoal stained silty loam. The basal sediments and cobbles were oxidized. Several burned mesquite seeds were recovered from the fill and flotation sample

Feature 402.2 is an oval floor pit similar to those found in other rooms. It was positioned just west of the entry. The pit measured 1.05 m by 0.76 m and was a basin shape with a depth of 14 cm (Figure 6.29, right). The margins of the pit were oxidized, indicating the feature was probably a floor hearth. Fill was a dark gray charcoal-stained silty loam with scattered pieces of charcoal.

A single posthole (Feature 402.3) was exposed in the center of the room. The posthole measured 12 cm diameter and extended 13 cm below the floor.

Figure 6.29. Floor hearths in Room 26: Feature 402.1 (left; note the wall of Room 26 around the feature); Feature 402.2 hearth or pit (right).

Discussion: Room 26 was one of the more unusual and significant rooms exposed in the eastern area of the Merchant village site. The alcove hearth feature is an unusual architectural addition, and the room had one of the few examples of an entryway. Also significant is the presence of five gypsum desert rose concretions that were intentionally placed in the floor. The meaning of this form of object placement is uncertain, but it is possible the items were a form of dedication or a termination object.

Also notable is the architectural relation of Room 26 with Rooms 13 and 25 to the south. Room 26 marks the point where the common or axial walls of groups of rooms shifts, indicating that Room 26 and adjacent rooms to the south were a different construction episode than Rooms 27 and 28 and their neighboring rooms to the north.

Room 27 (Feature 406)

Room 27 is an unusual room with multiple large pits or floor hearths (Figures 6.30 and 6.31). The room shares a wall with Room 28 to the east and has a common northern wall that extends farther to the east, indicating another room is present beyond the limits of the excavation block. Four large pits present in the floor take up most of the floor space. Foundation walls were defined around three sides of the room, and the presence of postholes indicates the space was covered by a superstructure and roof. The room may have been an extramural activity area built over by a room, or was a dismantled room converted to an activity area, or perhaps served as a special purpose room.

Interior dimensions:	north wall 2.20 m
	south wall 2.04 m
	east wall 2.60 m
	west wall 3.08 m
Floor area:	4.34 square meters
Orientation:	66° / 156°
Floors:	one floor
Floor hearths:	two hearths (Features 406.1 and 406.2)
Pits:	two storage pits (Features 406.5 and 406.6)
Postholes:	four (Features 406.4, 406.7, 406.8, 406.3)

Fill and Stratigraphy: The fill of Room 27 was a dark grayish brown to dark brown (Munsell 10YR3/2) charcoal-stained silty loam with scattered charcoal down that overlaid an undulating floor. There was no clear evidence of a looter pit, although a few historic cartridges dating to the 1960s were recovered from the upper fill deposits.

Level 1 items included 168 lithics (1 projectile point), 20 Ochoa ware sherds, 1 unknown ceramic and 1 unidentified whiteware sherd, 356 bone fragments, and one mussel shell fragment. Eight historic items, mostly .22 caliber shell casings, were also recovered. Level 2 was the lower few cm to the floor, and 62 lithics (1 projectile point), 1 groundstone, and 10 Ochoa ware sherds were collected from this level. The Level 3 excavations were restricted to subfloor features.

Walls: The walls ranged from 14 to 32 cm wide. The eastern and western walls were defined by remnants of foundation stones, while the northern and southern walls were thinner areas mostly defined by remnants of daub (Figure 6.32). Only the lowermost 5 cm of basal elements of the foundations remained intact. Most of the southern wall had been removed, either by the prehistoric inhabitants or the looters of the 1960s. The southern wall of Room 27 bends around the alcove and hearth feature of Room 26. Remnants of reddish clay daub were intermixed with the foundation stones in some sections of the eastern wall shared with Room 28.

The presence of wall remnants confirmed that the area was a room at one time, either before or during the use of the interior pits.

Entry: No entry was identified among the disturbed and intact wall segments.

Floor: The remnants of the floor were a dark reddish-brown silty clay loam with a moderate density of caliche nodules. As with other rooms, the floor was a simple construction of compacted earth with no evidence of formal plastering or surfacing. The floor undulated quite a bit and the southern part of the floor was 14 cm lower than the northern section. Much of the southern floor had been disturbed by pits and by rodent burrows.

Figure 6.30. View of Room 27 after excavations had been completed. Note the linear remnants of daub comprising the northern walls.

Superstructure: Evidence for a superstructure and roof consisted of four postholes (Features 406.3, 406.4, 406.7, and 406.8). Some scattered charcoal on the floor of the room might have been part of the closing material of the roof. Two postholes were positioned against the northern wall, one was in the center of the floor, and one was against the south wall. The postholes were probably secondary posts to buttress the wall or support sections of the roof.

Floor and Subfloor Assemblages: No artifacts were found on the floor or that could be confidently provenienced to the floor.

Subfloor Features: Much of the floor area within of Room 27 was taken up by four large pits and four postholes. Two of the large pits were floor hearths and two may have been storage pits, and it is possible that the features were used during different occupations

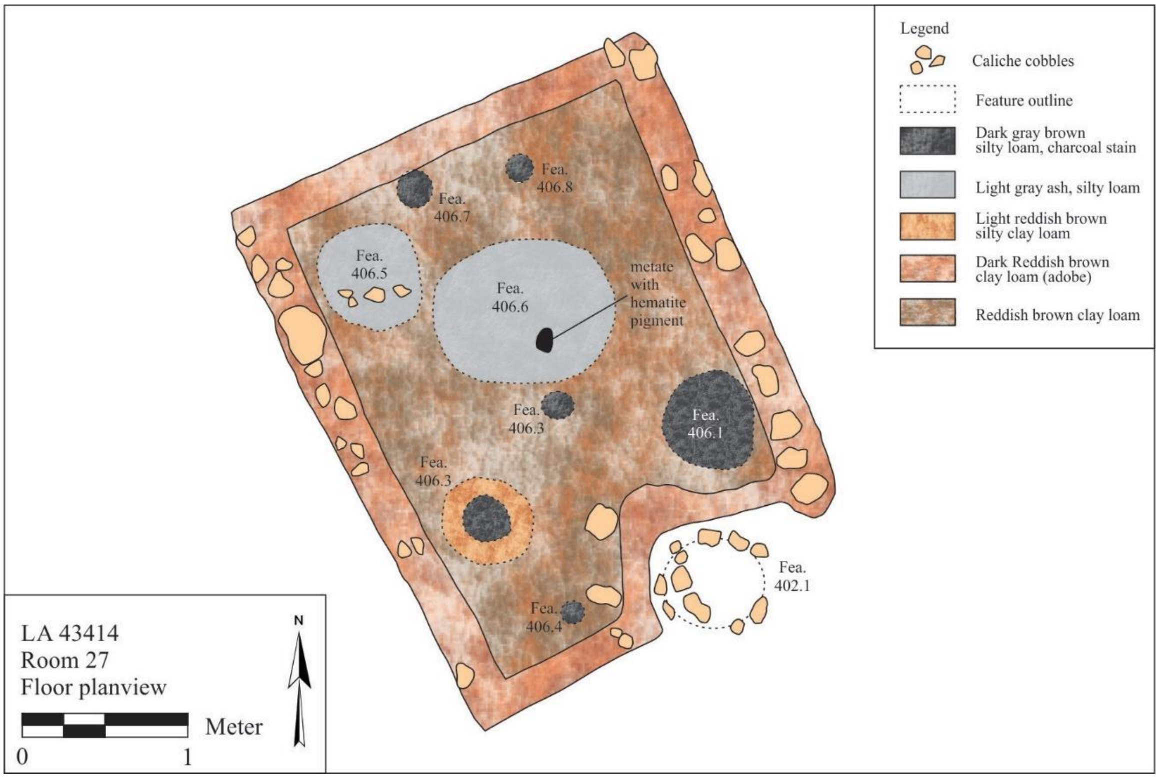

Figure 6.31. Planview drawing of Room 27.

Feature 406.1 was located in the southeastern floor and was a deep and intensively used feature similar to the nearby hearth Feature 402.1 of Room 26. The feature measured 56 cm in diameter and was 20 cm deep (Figure 6.33, top left). The fill was a dark gray to black charcoal-stained silty loam and the base was the natural cobbles darkened by fire and charcoal. The flotation sample from this feature yielded 21 charred mesquite seeds.

Feature 406.2 was a collared floor hearth in the southwestern floor (Figure 6.33, top right). The pit measured 24 cm in diameter and was 16 cm deep and was surrounded by a 2- to 3-cm-thick clay collar that was 52 cm in diameter and was oxidized. The fill was a brown to dark brown charcoal-stained silty loam with scattered charcoal. As with other pit features, the base was the natural caliche cobble matrix and was oxidized and darkened by heat.

Two pits lacked oxidized or burned linings and are classified as storage facilities. Feature 406.5 was in the northwestern floor. It was a circular pit measuring 67 cm by 60 cm and was 18 cm deep (Figure 6.33. lower left). The fill consisted of a dark brown silty loam with scattered charcoal and the base was the natural caliche cobble substrate. The fill was similar to the overlying room fill.

Feature 406.6 was a larger pit that was oval and measured 1.16 m by 0.90 m and was 17 cm deep. The fill was a dark brown silty loam with scattered charcoal and the base was the caliche substrate (Figure 6.33, lower right). As noted for the other pit, the fill of Feature 406.6 was similar to the overlying room fill.

Figure 6.32. Views of the wall segments of Room 27: (upper panel) view facing west of the initial exposure at Level 1, showing the intact eastern wall shared with Room 28, the southern remnant of the western wall, and the lower foundation stones of the northern wall; (lower panel) view facing north of wall segments at Level 2 showing eastern and western wall segments and the few intact stones of the northern wall. The lowermost remnants of the daub of the northern wall are evident.

Figure 6.33. Pit features in Room 27: (upper left), Feature 406.1 floor hearth; (upper right), Feature 406.2 collared floor hearth; (lower left), pit Feature 406.5; (lower right), pit Feature 406.6.

The four postholes varied in size and depth. The smaller holes (Features 406.3 and 406.4) were in the southern and center of the room (Figure 6.34, upper row). Feature 406.3 was 12 cm in diameter and 9 cm deep with a fill of dark gray charcoal-stained silty loam. Feature 406.4 was also 12 cm diameter and was 8 cm deep with a fill similar to the overlying room fill. A cobble shim was present in the side.

The two postholes against the northern wall were larger and deeper. Feature 406.7 was 25 cm in diameter and 12 cm deep (Figure 6.34. lower left); Feature 408.8 was 28 cm in diameter and 22 cm deep. The fill in both holes consisted of material washed in from overlying fill deposits. Cobble shims were present in the wall of 406.8 (Figure 6.34, lower right).

Discussion: Room 27 is an unusual room – or possibly a dismantled room or later room addition – with four large pits and floor hearths that take up most of the interior floor space. Foundation walls were defined around three sides of the room and four interior postholes were identified, indicating that at one time or another the space was sheltered by walls and a roof. Because of the usual disturbances caused by looters and natural processes, the construction sequence and relationships of the room and pits could not be clearly defined. It appears that the room may have been dismantled and used as an extramural activity area, but it is also possible that the pairs of pits and floor hearths represent two occupations and the later, upper floor had been mostly destroyed. It is also possible that the room had been built over an existing activity area. It is also possible that the construction scenarios outlined above took place when the new suite of rooms was added to the south.

Figure 6.34. Postholes in Room 27: (upper left) Feature 406.3; (upper right), Feature 406 .4; (lower left) Feature 406.7; (lower right) Feature 406.8 with shim in the wall.

Room 28 (Feature 407)

Room 28 was adjacent to Room 27 and the axial walls of the rooms were offset from those to the south. Two floors were identified (Figures 6.35 and 6.36) and the fill above the upper floor lacked the charcoal-stained silty loam sediments typical of other rooms and also had a high clay content, giving it a reddish hue (thus leading to the room being called the "Red Room").

Interior dimensions:	north wall upper floor 2.48 m, lower floor 2.20 m
	south wall upper floor 2.82 m, lower floor 2.20 m
	east wall upper floor 2.52 m, lower floor 2.20 m
	west wall upper floor 2.66 m, lower floor 2.20 m
Floor area:	upper floor 6.86 square meters; lower floor 4.84 square meters
Orientation:	66° / 156°
Floors:	two floors
Floor hearths:	three hearths (Feature 407.1 upper and Features 407.2 and 407.4 lower)
Pits:	none
Postholes:	two (Features 407.3 and 407.5)

Fill and Stratigraphy: The upper fill was unique among the sample of excavated rooms, consisting of a reddish-brown (Munsell 5YR4/4) silty clay loam with a high density of caliche nodules. A few pieces of charcoal were distributed throughout the fill but the extensive staining with charcoal fragments typical of other room fills was absent in the upper fill. The only areas of charcoal-stained sediments were disturbed contexts within the 1960s looter pits in the southeast and northeast corners.

Figure 6.35. Views of the floors of Room 28: (upper panel) the upper floor exposed in Level 2 showing the unexcavated floor hearth and daub foundations of the southern and northeastern walls; (lower panel) the lower floor with excavated floor features.

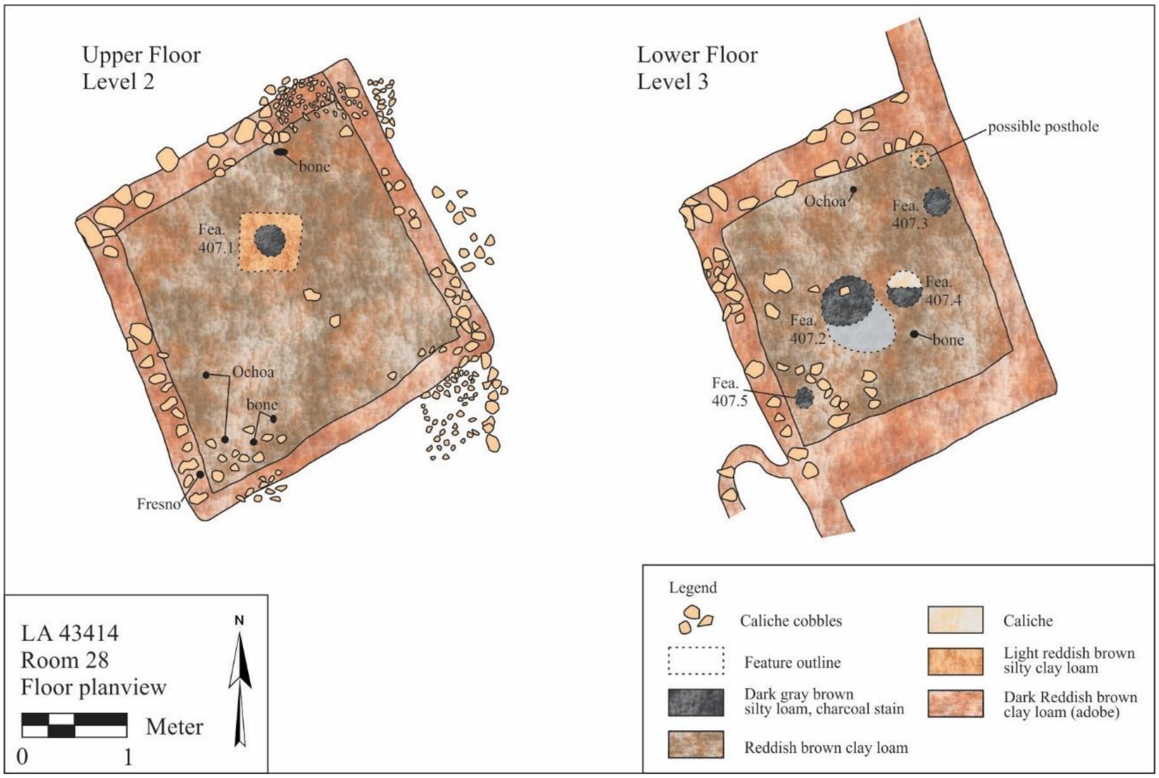

Figure 6.36. Planviews of upper and lower floors of Room 28.

Artifacts recovered from the upper fill (Level 1) included 113 lithics (1 projectile point), 12 Ochoa ware sherds, one unknown ceramic sherd, and 141 bone fragments. Eighteen historic artifacts, mostly .22 caliber cartridges, were collected from the disturbed fill of the looter pits. Artifacts from the lower fill and contact with the upper floor (Level 2) included 98 lithics (two projectile points), 27 Ochoa ware sherds, one Chupadero Black-on-white sherd, a polishing stone, and 166 bone fragments. Six historic artifacts were found in the disturbed looter pits and, as with Level 1, they were mostly .22 caliber shell casings. Level 3 was the fill between the two floors. Artifacts from this level included 46 lithics (3 projectile points), 11 Ochoa are sherds, a polishing stone, a palette fragments, and 45 pieces of bone.

Walls: The wall foundations ranged from 28 to 60 cm wide. The southern and northern foundations were the widest. The western and northern foundations incorporated large, irregular-shape cobbles (Figure 6.37); the cobbles of the eastern and southern walls had been displaced, although a few small cobbles were noted at the base of the eastern wall. Sections of the southern and eastern walls had also been removed by the looter pits. The foundation remnants ranged from 5 to 10 cm in height above the upper floor and 12 to 16 cm above the lower floor. An interesting aspect of the southern foundation and northern segment of the eastern foundation is that they retained the daub portion of the foundation and could be easily traced and defined (see Figure 6.35).

Entry: No entry was defined in the foundation walls leading to the upper or lower floor. Small gaps are present in the stone and daub foundations, but no entry could be identified with confidence.

Floor: The upper floor was identified through the presence of a square collared floor hearth in the north-central area (see Figures 6.35 and 6.36). The floor was a similar composition as the fill above, a reddish-brown silty clay loam with caliche nodules. The floor was difficult to define in the southern half of the room because of erosion and damage by looting. This floor was compacted earth and had no evidence of plastering or polishing.

Figure 6.37. View of the western foundation wall of Room 28.

The lower floor was around 10 cm below the upper floor and consisted of compacted reddish-brown silty clay loam. There was some evidence that the floor may have been finished with a layer of plaster or clay. The lower floor was mostly level with a slight slope of 2 to 6 cm from the walls to the center.

Superstructure: Evidence of a superstructure consisted of two postholes and some scattered charcoal that might have been burned closing material from the roof. The postholes were probably secondary posts to buttress the wall or support sections of the roof.

Floor and Subfloor Assemblages: Few distinctive artifacts or tools were left on the floor of Room 28. One bone fragment was plotted on the upper floor and an Ochoa ware sherd, a few lithic flakes, and several large animal vertebra were on the lower floor.

Subfloor Features: A single collared floor hearth was present in the upper floor in the north-central part of the room. It is possible that other features were present in the southern part of the room but were removed by erosion and looting. The floor hearth (Feature 407.1) was unusual because it had a square collar measuring 60 cm wide and 2 to 4 cm thick (Figure 6.38). The interior pit measured 35 cm diameter, was 9 cm deep, and had a fill of dark gray-brown charcoal-stained sediment. The base of the hearth was 5 cm above the lower floor.

Figure 6.38. Feature 407.1, the collared hearth in the upper floor of Room 28. Note the square coping around the hearth pit. Inset shows the bisected pit of the hearth.

Two hearths were present in the lower floor, including a rare example of a caliche-capped feature. Feature 407.2 was positioned in the west-central area of the room and was a circular pit measuring 46 cm diameter and 16 cm deep (Figure 6.39, left). A 50 cm area to the northeast served as an ash disposal area. The fill was a light gray ash and dark grayish brown charcoal-stained silty loam and numerous small fire-cracked rocks were present in the fill. Feature 407.4 was positioned a few cm east of 407.2. It was a 34-cm-diameter pit with a depth of 10 cm and a fill of dark gray-brown charcoal-stained silty loam with charcoal. A notable aspect of this feature was that it had been capped with caliche (Figure 6.39, right).

Figure 6.39. Hearths in the lower floor of Room 28: (left) Feature 407.2; (right) Feature 407.4 after bisection showing the caliche cap over the pit.

Two small, circular postholes were defined in the northeast and southwest corners of the lower floor (Figure 6.40). Feature 407.3 measured 25 cm diameter and extended 9 cm below the floor. Feature 407.5 was 16 cm in diameter and 12 cm deep. The fill of both holes was dark gray silty loam, and charred mesquite seeds were recovered from the flotation sample of Feature 407.5.

Figure 6.40. Postholes in the lower floor of Room 28: (left) Feature 407.3; (right) Feature 407.5.

Discussion: Room 28 provided important details on the remodeling of rooms at the Merchant site. Two floors with distinct floor features were defined, and unusual details such as square adobe collars and caliche caps were identified among the floor hearths. The evidence of remodeling indicates that some rooms were occupied for relatively long periods.

Room 29 (Feature 410)

Room 29 was a relatively well-preserved room with mostly intact wall foundations and floor (Figures 6.41 and 6.42). As found in the other rooms of the eastern area, part of Room 28 was disturbed by a looter pit and some of the foundation stones were displaced from walls, but compared with other rooms, the floor and walls were nicely preserved. The western, northern, and eastern walls were easily defined by the presence of intact foundations stones. Many of the displaced cobbles had ended up in the interior fill.

Interior dimensions:	north wall 2.32 m
	south wall 2.40 m
	east wall 2.32 m
	west wall 2.40 m
Floor area:	5.57 square meters
Orientation:	58° / 148°
Floors:	one floor
Floor hearths:	one (Feature 410.1)
Pits:	none
Postholes:	one (Feature 410.2)

Fill and Stratigraphy: The fill of Room 29 was a reddish brown (Munsell 5YR4/4) to brown (Munsell 7.5YR6/4) silty loam with a moderate amount of caliche gravels. Cobbles displaced from the wall foundations were scattered throughout the fill (Figure 6.43, top). The southeastern corner of the fill was disturbed by a rectangular 1960s looter pit measuring 1.80 m by 60 cm (Figure 6.43, bottom). The pit removed the fill, penetrated the floor, and also removed a section of the eastern wall, and contained screened deposits with high numbers of gravels. Aside from the 1-square-meter looter pit, the remainder of the room fill was intact.

Figure 6.41. Photograph of Room 29 after excavations had been completed.

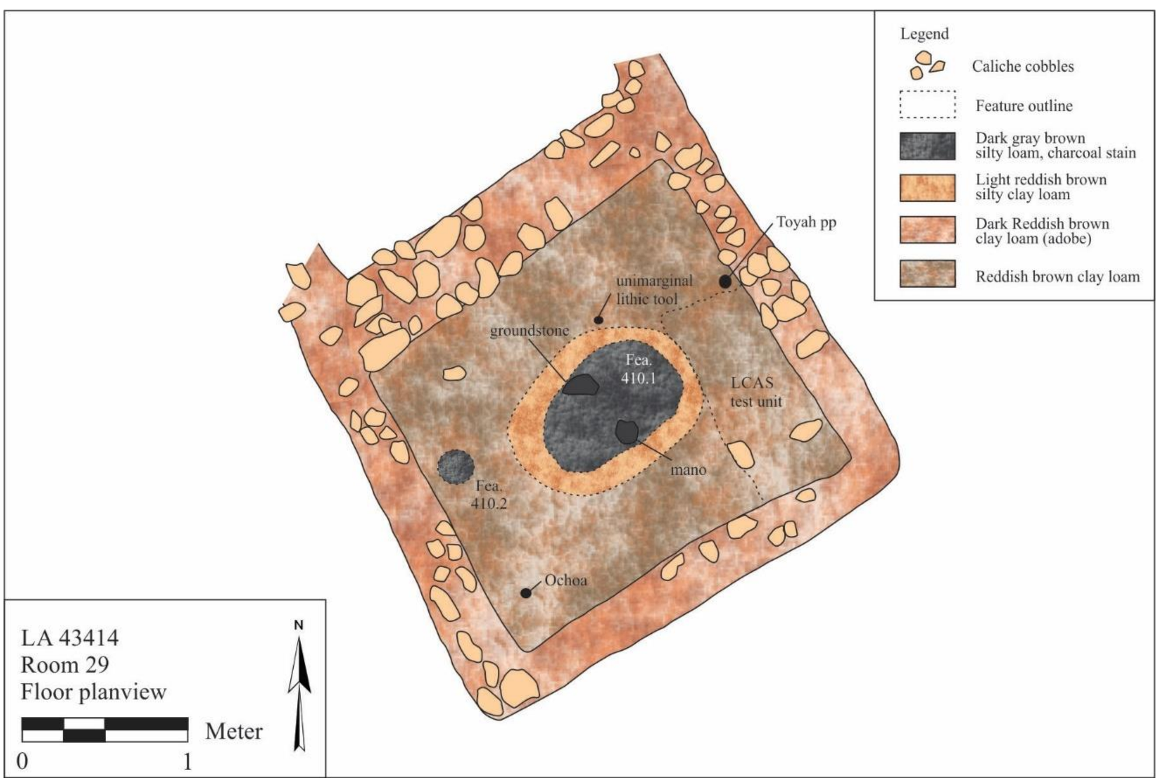

Figure 6.42. Planview of Room 29.

Level 1 was the upper fill, and artifact recovery included 34 lithics (1 projectile point), 11 Ochoa ware sherds, and 88 bone fragments. Five .22 caliber shell casings were in the disturbed area of fill. Level 2 was the middle layer of fill. Artifacts from this level included 51 lithics (3 projectile points), 10 Ochoa ware sherds, and 62 bone fragments. Fourteen historic items were found in disturbed fill deposits.

Level 3 was the lowermost few centimeters to the floor. A rather diverse assortment of artifact types was recovered, indicating that some materials may represent *de facto* refuse left on the floor. Four projectile points were recovered, including one that was clearly on the floor. A unimarginally flaked tabular tool (agave knife) and shell fragment were also recovered. Other artifacts include 48 lithics, 25 Ochoa ware sherds, 3 groundstone, and 34 bone fragments. Thirteen fire-cracked rock pieces weighing 2.5 kilograms (kg) were also present. As the level progressed deeper in the area of the looter pit, the count of historic artifacts increased. Forty-six pieces of glass and five pieces of metal (probably tin cans) were recovered from the area of the looter pit.

Walls: The wall foundations of Room 29 were among the better preserved examples of the eastern room block. They ranged in width from 30 to 54 cm and at least a few intact foundation stones were present in each (Figures 6.41, 6.42, and 6.43), although most of the stones in the southern wall were displaced. The cobbles used in the foundations were irregular sizes and shapes.

The composition of the daub was a reddish-brown silty clay loam, although some segments were more of a brown silty loam. The difference in color and texture of the wall sediments compared with the fill deposits was readily apparent (Figure 6.44). The southeastern corner was eroded to the base and extended only 7 cm above the floor, but most segments were 13 to 26 cm above the floor.

A significant aspect of the well-preserved foundations is that the wide examples of the northern and especially the southern walls were two separate walls. The southern foundation (Figure 6.45) consists of two lines of cobbles separated by 20 cm. Faint outlines of clay daub can be seen surrounding the cobbles, with a small gap between. This observation indicates that Rooms 28 and 29 had separated, abutting walls rather than sharing a common wall.

Entry: Despite the good preservation of the foundations, no clearly defined entry was noted in Room 29. Several small gaps in the foundation stones were present, but none could be conclusively identified as an entrance.

Floor: The well-preserved floor was a compacted earthen surface of reddish-brown silty clay loam. No evidence of plastering or polishing was noted. The floor was nearly level with only a slight slope of 5 cm from north to south.

Superstructure: Evidence of the superstructure was a single posthole (Feature 410.2) near the center of the western wall. Scattered charcoal throughout the fill might be burned remains of jacal sticks and thatching.

Floor and Subfloor Assemblages: Artifacts on the floor included a mano, a groundstone fragment, a unimarginally retouched tool, an Ochoa sherd, and a projectile point near the eastern wall (Figure 6.46). A slab metate fragment with a hematite-coated surface was plotted at the edge of the floor hearth.

Figure 6.43. Views of the fill of Room 29: (upper panel) Level 2 showing displaced foundation cobbles throughout the fill and looter pit in the southeast corner; (lower panel) Level 3 cleared to the floor showing the looter pit in the southeast corner that penetrated the floor and displaced the southern half of the eastern wall.

Figure 6.44. The reddish clay loam sediments comprising the wall of Room 29 compared with the interior fill.

Figure 6.45. The southern wall of Room 29 and northern wall of Room 28. The rooms may have been separated by two abutting walls rather than a single shared wall.

Figure 6.46. Projectile point on the floor of Room 29.

Subfloor Features: A single floor hearth, Feature 410.1, was present near the center. The pit had two levels – a lower firepit and an upper ash disposal pit. The firepit measured 44 cm in diameter and was 18 cm deep to a flat base (Figure 6.47, left). A broad adobe collar almost 20 cm wide was present around the central pit. The fill was a dark gray charcoal-stained (10YR3/1) silty loam with a high density of charcoal and ash. The underlying cobble matrix was burned. Several lithics, bone fragments, a complete mano, and a projectile point were recovered from the fill.

The single posthole (Feature 410.2) was positioned near the center of the western wall. It was a circular pit measuring 20 cm diameter and 11 cm deep below the floor (Figure 6.47, right). The fill was secondary deposits of dark gray-brown sediments and scattered charcoal. A few cobble shims were present. A projectile point was recovered from the fill.

Figure 6.47. Room 29 floor features: (left) Feature 410.1 floor hearth; (right) Feature 410.2 posthole.

Discussion: Room 29 was one of the better-preserved rooms in the eastern room block, and excavations provided several insights into the jacal architecture of the Merchant site. Important details include the possible abutting walls with adjacent rooms, the mostly intact floor, evidence for a few artifacts left on the floor during abandonment, and the unusual floor hearth with adjacent ash pit.

Room 6 (Feature 6)

Room 6 was the northernmost of the seven rooms excavated in the eastern room block. We are confident that the room excavated in 2019 is the Room 6 that was partially exposed by LCAS members during a single weekend in February of 1963. The location of the room is confusing, as Leslie's manuscript (2016a) places the room 3.7 m southeast of Room 5 and isolated from other rooms. However, a 1963 photograph shows Room 6 sharing a common wall with Room 22 and perhaps the southeast corner of Room 21 (Figure 6.48). The identification of Room 6 and its location are important because the surface-visible foundation walls of the room often served as the "anchor" point for orienting Leslie's site maps and correlating Leslie's rooms during several site mapping efforts of the 1980s through the 2019 fieldwork.

Leslie was not present during the excavation, and his description of the room is based on accounts provided by the LCAS excavators. The room was square and measured 2.54 m by 2.13 m with a floor area of 5.41 square meters. The fill of Room 6 was very shallow compared with other houses in the northern room block and a collared floor hearth was present in the center of the room below a couple centimeters of fill (Figure 6.49). Several heating stones were present in the fill of the hearth. No other floor features or artifacts were present. A thin layer of natural sediment was present over a thin layer of wall or roof melt and a thin lens of trash was above the dark red clay floor.

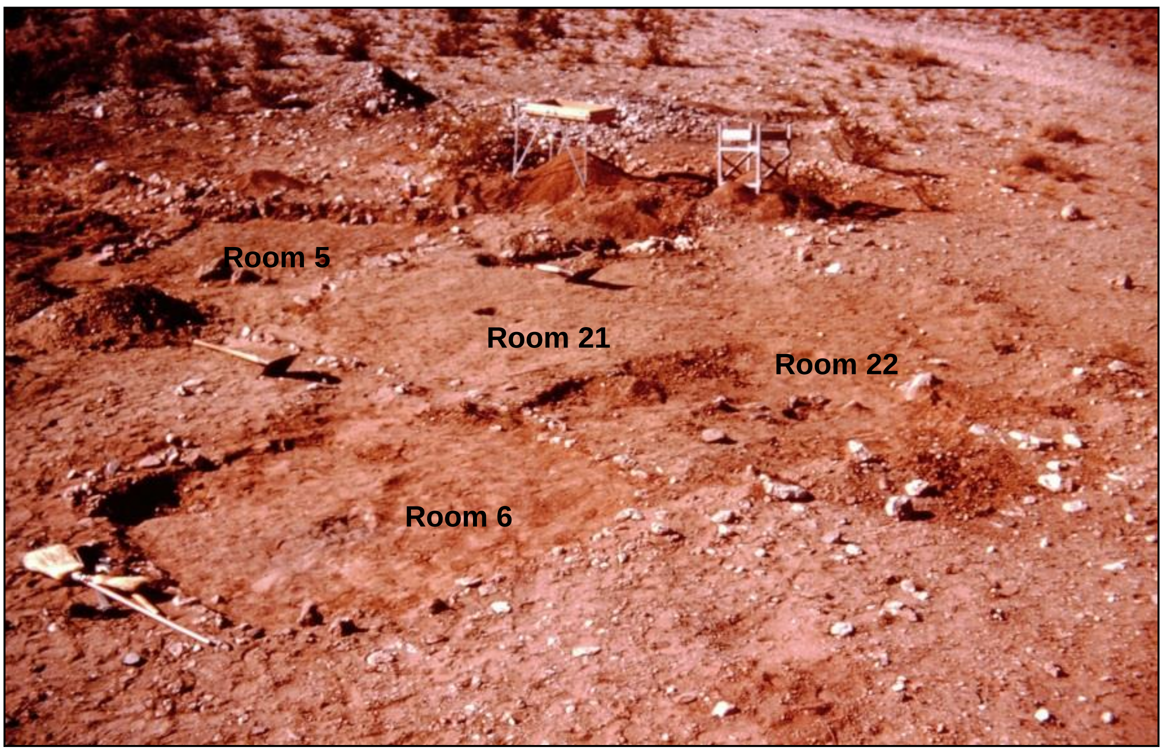

Figure 6.48. The excavation of Room 5 and Room 6 in early 1963 (from Miller et al. 2016). The excavation of the deep fill of Room 5 can be seen in the upper left and most of the floor of Room 6, including the collared floor hearth, is visible in the lower left foreground. The oval marks what appears to be the southern foundation wall of Rooms 22 and 21 that was shared with Room 6, although Leslie notes that the rocks were placed there by children playing at the site. Note also the backdirt mounds where Midden A was located.

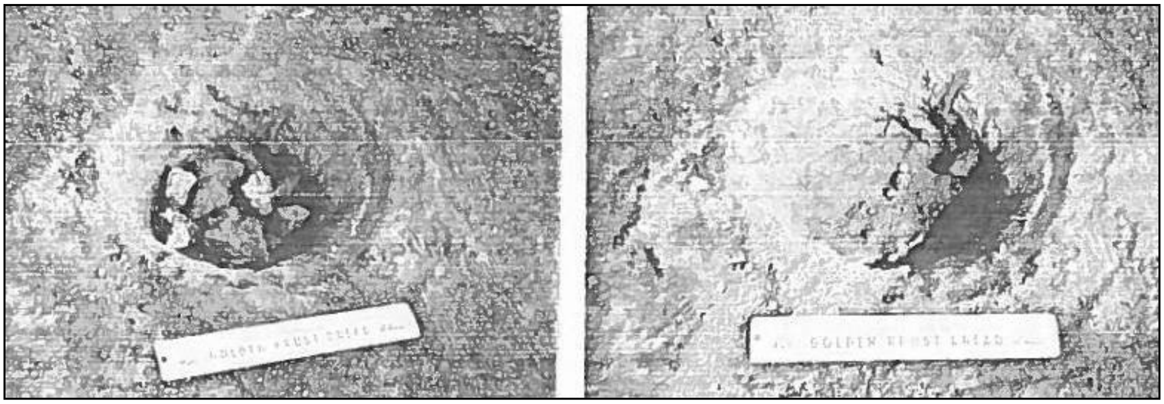

Figure 6.49. Photograph from Leslie's manuscript (2016a) of the collared floor hearth in Room 6 with heating stones in place and after removal of the stones. Scale is a 12-inch ruler.

The planview map of Figure 6.50 shows that the room was bounded by a single row of caliche foundation cobbles except in the northwest corner, where a possible entryway was located. However, as seen in the photograph of the room in the lower panel of Figure 6.50, the only intact wall foundations are along the eastern wall, southeastern corner, and a small segment of the northern wall. The lines of foundation stones along the northern, southern, and western walls are apparently reconstructions added by the LCAS excavators.

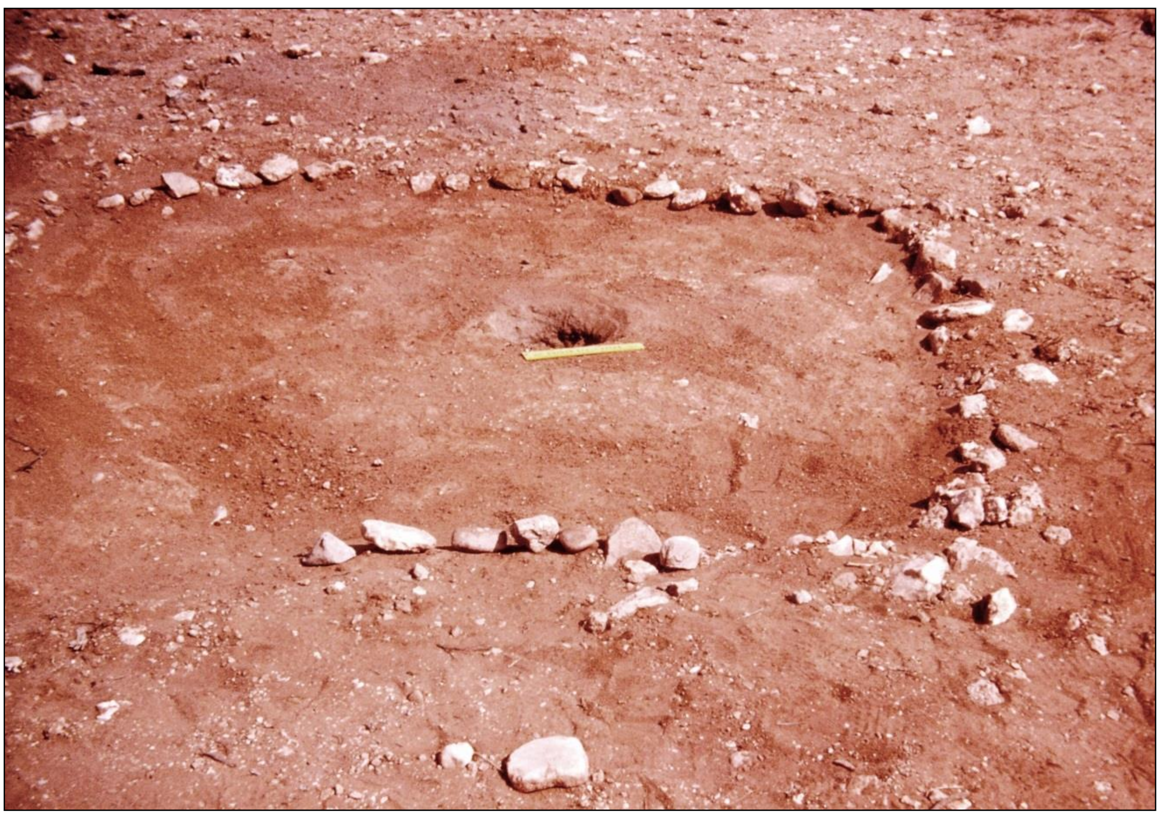

Figure 6.50. The LCAS excavations of Room 6. View facing toward the northwest of Room 6 after LCAS excavations had been completed in 1963. Note the displaced foundation cobbles and the shallow fill. Scale is a 12-inch ruler and is not oriented north-south.

The 2019 Excavation of Room 6

Room 6 was the northernmost room of the excavation exposure in the eastern room block that began with Room 13, 10 meters to the south. Although we are confident that the room excavated in 2019 is the Room 6 described by Leslie, as with most issues at the Merchant site, we are not entirely certain. The location of the room and its relation to other rooms mapped by Leslie in 1963 seemed to match the location of a room identified during the 2015 and 2019 surface surveys (Figure 6.51, upper panels). However, Leslie's photograph of the excavated upper floor shows the surface and surrounding area almost completely cleared of foundation cobbles (see Figure 6.50 above). The 2019 exposure of the upper levels of the room encountered quite a few cobbles scattered throughout the interior of the room (Figure 6.51, lower panel). These cobbles may have been the lines of loose rocks that the LCAS excavators used to form the artificial wall outlines visible in the 1963 photograph that were displaced throughout the room during the ensuing 50 years of erosion and foot traffic. Moreover, the sections of intact foundation walls revealed in 2019 appear to match those defined by the LCAS. The final clue is that one of the lowest artifact counts of the 2015 and 2019 excavations was documented in Level 1 within the interior of the room, indicating that the location had indeed been the subject of an earlier excavation.

The 2019 excavations identified a floor positioned well below the floor and collared hearth excavated by the LCAS (Figures 6.52 and 6.53). A single floor hearth was present. An unusual natural or cultural feature consisting of an exceptionally hard layer of caliche in a round shape was encountered on the lower floor. The feature encompassed the northwest quadrant of the room.

Interior dimensions:	north wall 2.64 m
(upper floor 1963)	south wall 2.64 m
	east wall 2.13 m
	west wall 2.13 m
Interior dimensions:	north wall >1.88 m (estimated 2.28 m)
(lower floor 2019)	south wall 2.28 m
	east wall 1.88 m
	west wall >1.6 m (estimated 2.32 m)
Floor area:	LCAS upper floor 5.63 square meters; lower floor 4.68 square meters
Orientation:	48° / 138°
Floors:	two floors (upper floor exposed in 1963 and lower floor defined in 2019)
Floor hearths:	4 hearths: collared hearth in upper floor; Features 6.1 and 6.2 in fill (probably LCAS floor hearth); Feature 6.3 in lower floor
Pits:	one unusual natural or cultural pit (Feature 6.4)
Postholes:	none

Fill and Stratigraphy: The Level 1 fill was of a reddish brown (Munsell 5YR4/4) silty clay loam with a moderate density of gravels. A few large cobbles that were probably former foundation stones were scattered throughout the fill. As noted above, the artifact count from Level 1 was unusually small, with only 22 lithics, 2 Ochoa ware sherds, 1 groundstone, and 15 bone fragments recovered. Several historic items, including crown bottle caps, were also recovered. The fill of Level 2 changed to a dark gray-brown (Munsell 10YR3/2) silty loam in the southwest and northern areas and a light brown cobbly loam in the southeast and northeast areas. Level 2 constituted the intermediate fill to the floor. The lithic artifact count increased sixfold over that recovered from Level 1, with 132 items collected, including six projectile points. Other artifacts included 28 Ochoa ware sherds, 5 groundstone, 109 bone fragments, and 1 shell fragment.

It is notable that no projectile points were found in Level 1 while six points were recovered from Level 2. Moreover, no historic artifacts were found in Level 2 while a few were present in Level 1. The different recovery rates of these items indicate that Level 1 consisted of deposits excavated and screened by the LCAS in 1963 while Level 2 was intact cultural fill below the upper floor.

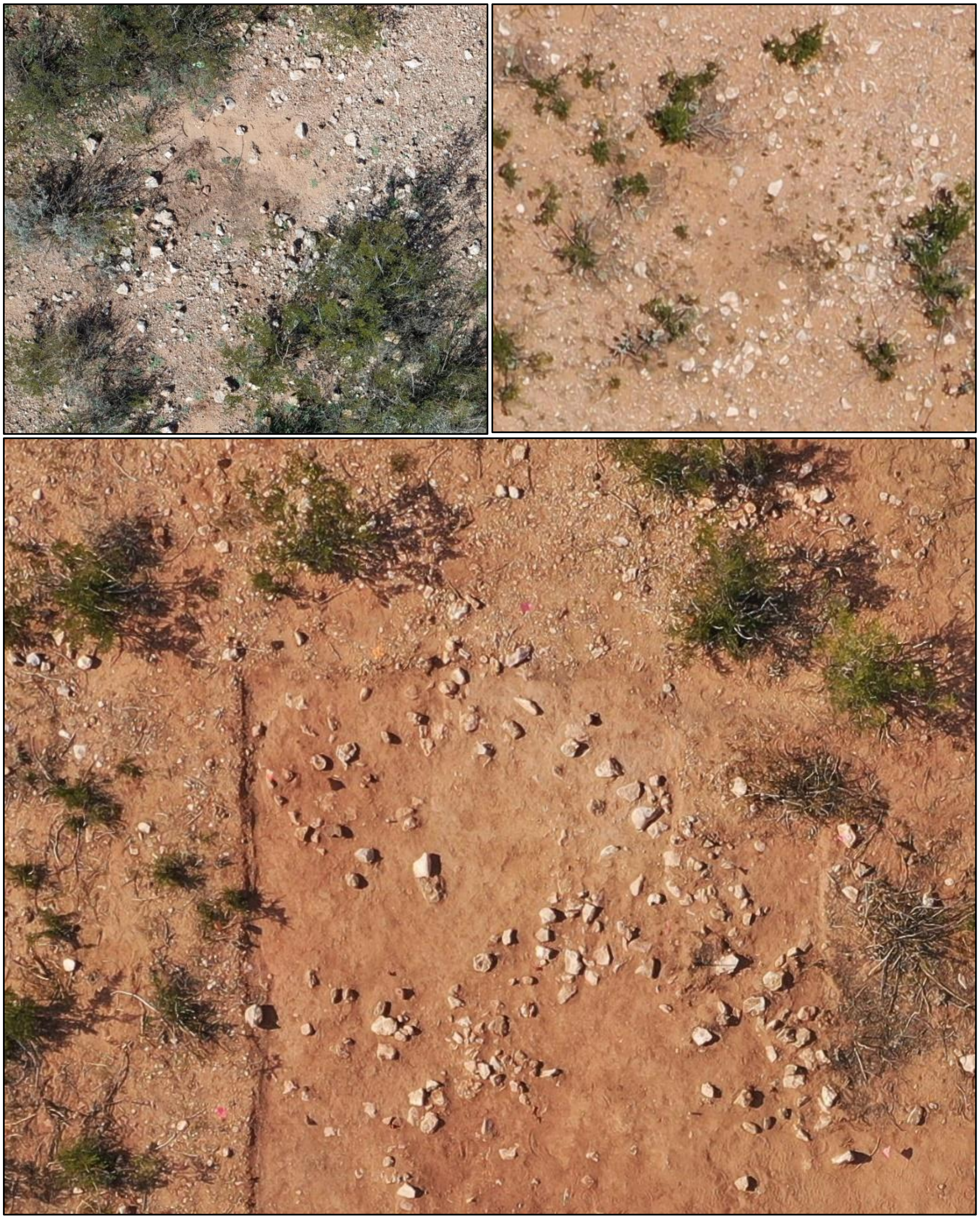

Figure 6.51. Aerial views of Room 6: View of the room in 2015 (upper left) and in 2019 (upper right); lower panel shows interior of room after clearing Level 1. Room 29 adjoins Room 6 to the south.

Figure 6.52. Room 6 after excavations had been completed of the lower floor: (upper panel) view of the room facing north; (lower panel) aerial image of the completed excavations.

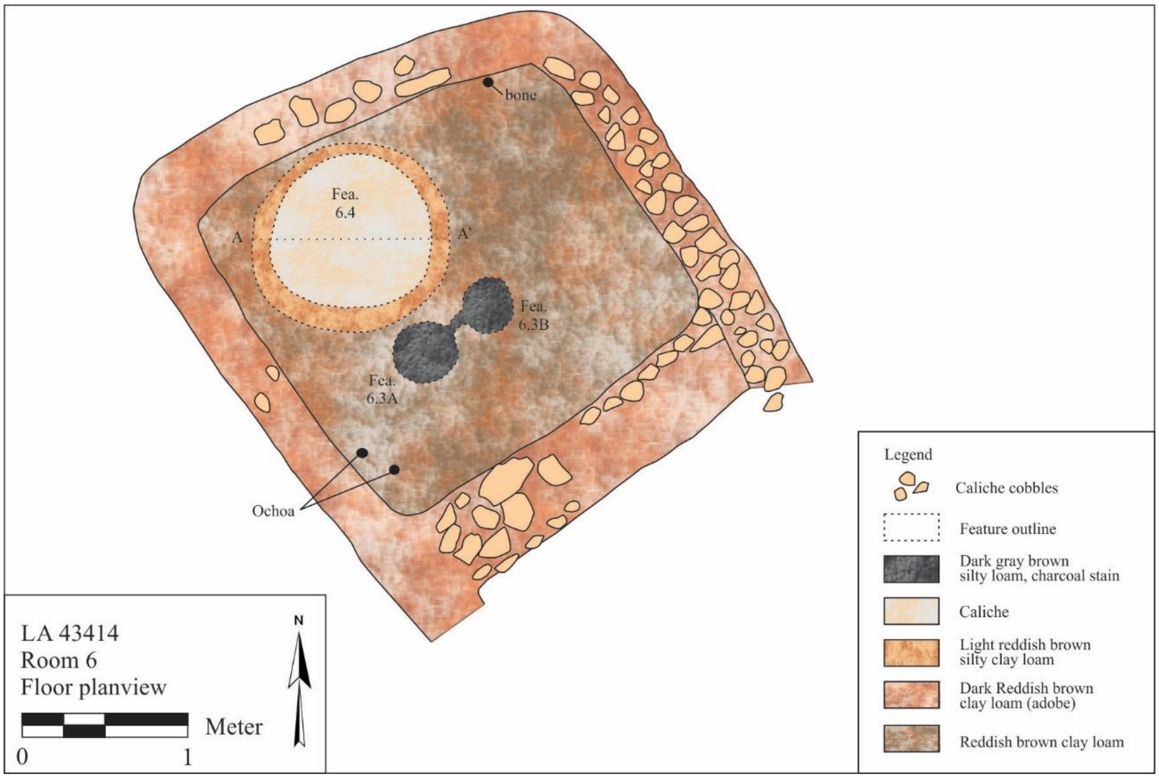

Figure 6.53. Planview of Room 6, lower floor.

Walls: The wall foundations defined in 2019 ranged from 32 to 54 cm wide. The southern wall appears to be the widest but, as noted in the description of Room 29, it is likely that Rooms 6 and 29 were separated by two individual, abutting walls rather than sharing a common wall. The eastern foundation was the best preserved and consisted of two layers of irregular-shaped slabs and cobbles. Part of the southern foundation remained intact and also was constructed of large cobbles of varying shape and size. Only a small part of the northern wall remained in place and no evidence of the eastern foundations remained intact. The new definition of walls resulted in a slightly smaller wall lengths and a reduced floor area from those measured in 1963. The remnant foundations rose from 11 cm to 33 cm above the lower floor.

Entry: Leslie (2016a) suggested that a 75-cm-wide gap in the foundation cobbles at the northwestern corner represented an entry. No evidence of an entry was detected at this location or elsewhere in the wall foundations during the 2019 excavations.

Floor: The upper floor was exposed in 1963 by the LCAS. Leslie (2016a) describes the floor as "Only a thin layer of weathered fill was above the roof-wall clay especially along the center of the room and over the fire pit where it was right at surface level (about 6 inches thick). A thin layer of trash lay on the floor which was a darker red than that in the fill."

The lower floor had a slight slope of 2 to 10 cm toward the room center. The floor was located 17 to 27 cm below the modern ground surface. The floor was compacted reddish-brown silty clay loam with no evidence of formal preparation through polishing or plastering.

Superstructure: No postholes were identified in either floor or around the margins of the foundation walls. The primary wall and roof supports were probably built into the jacal walls, and evidence no longer exists because only the lowermost foundations remain intact.

Floor and Subfloor Assemblages: Few items were found on either floor. A single Ochoa ware sherd and two bone fragments were plotted on the lower floor. A stone palette fragment was plotted on the floor near the wall of the northeast corner (Figure 6.54).

Figure 6.54. Fragmentary palette on the lower floor of Room 6.

Subfloor Features: The LCAS excavators exposed a collared floor hearth with fire-cracked rock in the upper floor (see Figure 6.48). Leslie (2016a) described the hearth as a "fire pit located in the center; about 12 inches in diameter and 7 inches deep. A clay rim about 1 inch high (2.54 cm) was present. Clay lined and filled with burned rock and ashes."

Two small, partially overlapping rings of charcoal and white ash were encountered 7 to 12 cm above the lower floor. Feature 6.1 was slightly above Feature 6.2 (Figure 6.55, right). The features were positioned slightly northeast of the center of the room. Both measured 32 cm in diameter and were 4 to 5 cm deep. The fill was a reddish brown silty clay loam with dense charcoal and some ash, and the base of each feature was a 3-cm-thick layer of oxidized sediment.

Based on the presence of fill between the features and the lower floor, it is certain that they are not associated with occupation of the lower floor. It is possible that the features were associated with another floor surface positioned between those excavated in 1963 and 2019. However, a more likely scenario is that one or perhaps both of the small, shallow basins are the basal remnants of the collared floor hearth of the upper floor. Unfortunately, the interpretation of the hearths is further complicated by the fact that the two mesquite wood samples from Feature 6.2 yielded modern (bomb carbon) dates, and it is also possible that it is a modern hearth.

Feature 6.3 is two pits (designated 6.3A and 6.3B) in the southwestern quadrant of the lower floor (Figure 6.55, right). Feature 6.3A was slightly oval in shape, measured 43 by 37 cm, and was 14 cm deep. The fill was charcoal-stained dark gray (Munsell 10YR3/1) silty loam and the base was the natural layer of caliche cobbles. The cobbles were darkened by fire and the sides of the pit were oxidized. A 20-cm-wide groove led to Feature 6.3B, a small basin measuring 30 cm diameter and 8 cm deep. This feature lacked an oxidized lining and probably served as an ash pit.

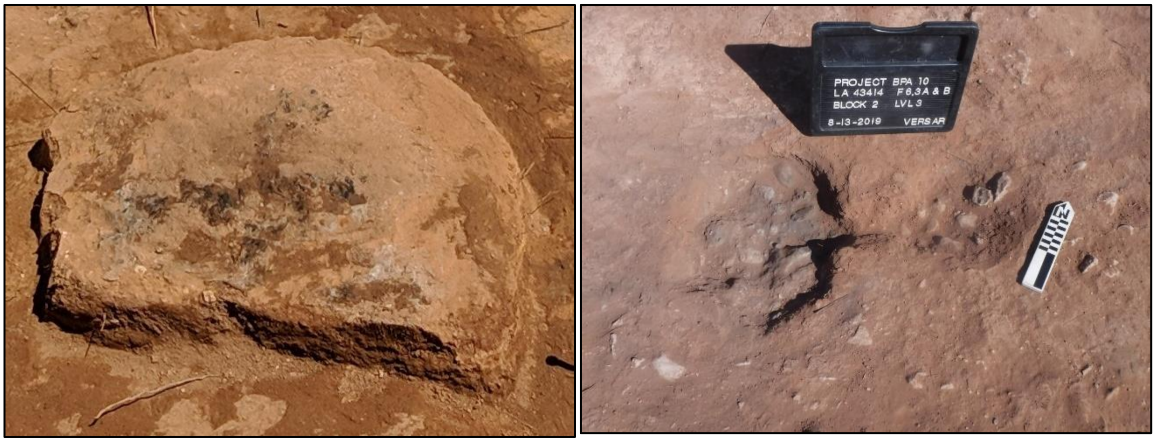

Figure 6.55. Features in Room 6: (left) Features 6.1 and 6.2 pedestaled in room fill above the lower fill; (right) Features 6.3A and 6.3B after excavation.

Feature 6.4 was the most unusual feature encountered among any of the excavated domestic rooms or communal structures at the Merchant site. Located in the northern corner of Room 6, the “feature” was a large, circular layer of indurated caliche measuring 1.26 m diameter (Figure 6.56, upper left) and that took up approximately 25 percent of the interior space of the room. It first appeared as a circular ring of pinkish white (Munsell 7.5YR8/1) caliche, but removal of a few cm of silty fill revealed a circular deposit with a shallow basin shape (Figure 6.56, upper right).

Figure 6.56. Feature 6.4, the unusual deposit within Room 6: (upper left) feature when first exposed in the floor; (upper right) shallow basin revealed after bisection and removal of fill; (lower left) initial excavation exposing some cobbles; (lower right) lack of penetration of the deposit after using a metal digging bar.

It was thought that the feature might be a caliche-capped burial pit. However, the deposit was exceptionally hard and dense and attempts to excavate or even penetrate the layer with trowels, shovels, and a steel digging bar could penetrate only a couple cm of the hardened caliche (see Figure 6.56, lower panels). The "feature" is probably a natural caliche pipe or channel. A similar feature (Feature 404.8) was encountered in Room 25, but that example was a thin layer of limestone or caliche bedrock.

Discussion: Room 6 was partially excavated in 1963 by the LCAS, revealing a shallow room with a collared floor hearth. The 2019 excavations may have found the basal remnants of the hearth, but no evidence of the upper floor remained intact. The LCAS excavations were not covered or backfilled, and therefore it is likely the past 56 years of exposure to erosion, cattle trampling, foot traffic, and bioturbation removed most of the walls and upper floor. The lower floor was in relatively good condition and had a floor hearth and ash pit. The unusual natural caliche surface may have been part of the floor but appears to have been a natural feature rather than a cultural pit.

Partially Exposed Rooms

Several segments of wall foundations and small sections of rooms were exposed in the excavation block beyond the limits of the seven excavated rooms (Figure 6.57). These foundations revealed the presence of additional rooms east and west of the excavated rooms and that, in some places, the eastern room block may be three to four houses wide. Each room was assigned a number and feature number (Table 6.1). Excavations in the adjacent rooms were mostly limited to a single level, although in some areas a second level was excavated to better define the wall foundations.

Rooms 30, 49, and 55 were partially exposed along the eastern side of the excavated rooms (Figure 6.58). Walls and foundations were incompletely exposed in Level 1 and consisted of a few cobbles in line or faint outlines of daub and clay. Rooms 49 and 27 bounded the southern edge of an extramural activity area of hearths and pits. The communal structure (Feature 1) was a few meters farther west of the rooms.

Room 30: About half of the upper fill of Room 30 was defined between two foundation segments leading from Rooms 26 and 27. Artifacts recovered from the fill included 17 lithics (3 projectile points), 6 Ochoa ware sherds, 10 bone fragments, and 4 historic items. A small pit (Feature 403.1) was partially exposed at the edge of the excavation block and the feature was bisected (Figure 6.59, left). The pit measured 36 cm wide and 8 cm deep and had a fill of dark brown (Munsell 10YR3/3) silty loam with a slightly oxidized lining. The feature may have been a floor hearth in an upper floor.

Table 6.1. Rooms partially exposed in the eastern room block

Room	Feature	Adjacent Excavated Rooms
30	403	Room 26 to east
31	401	Room 13 to west
32	414	Room 26 to west
33	417	Room 28 to west
34	411	Room 29 to west
35	117	Room 6 to west
46	498	Room 25 to west
47	497	None
49	413	Room 27 to east
52	499	Room 25 to northwest
55	405	Room 13 to east

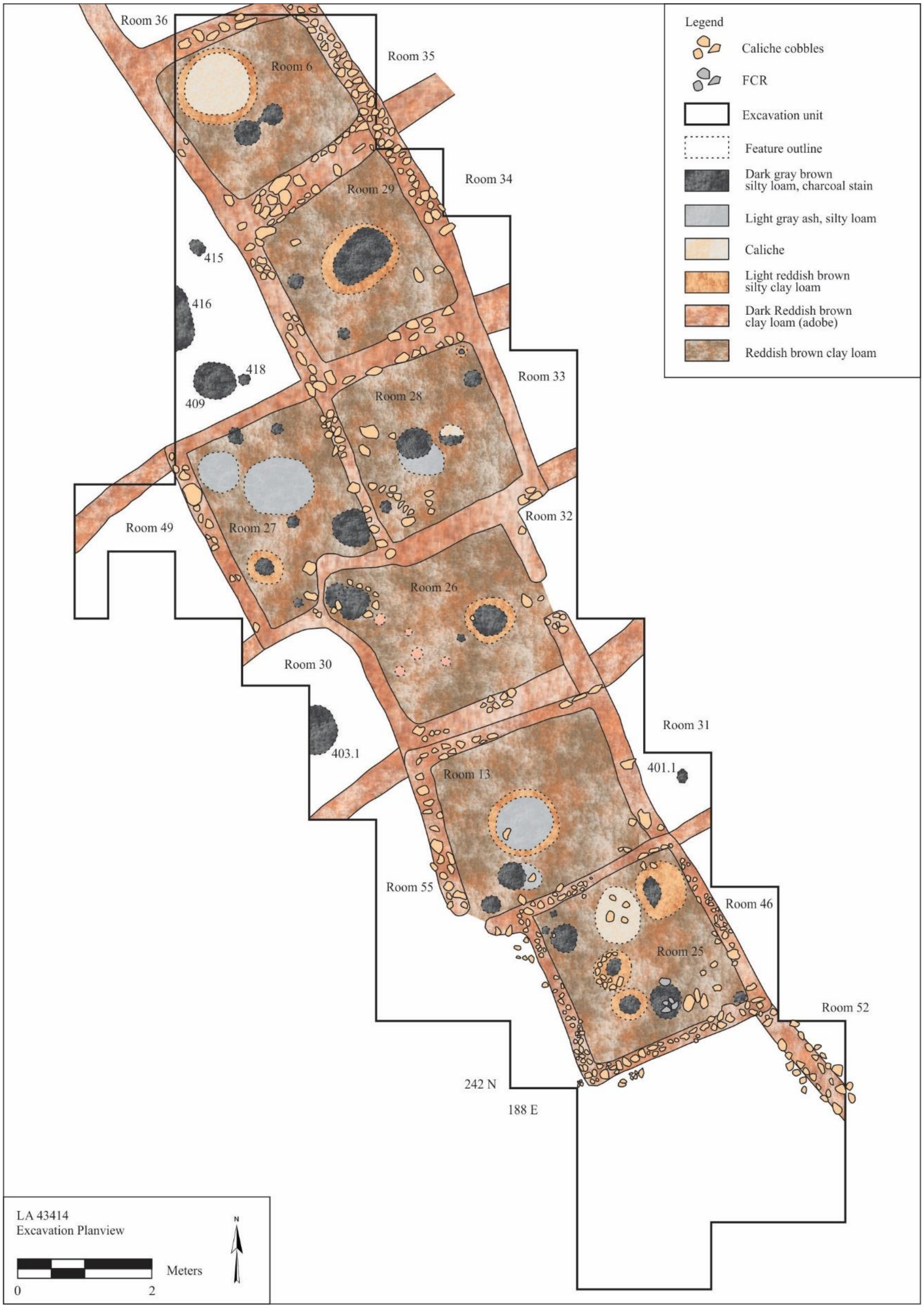

Figure 6.57. Partially exposed rooms in the eastern room block.

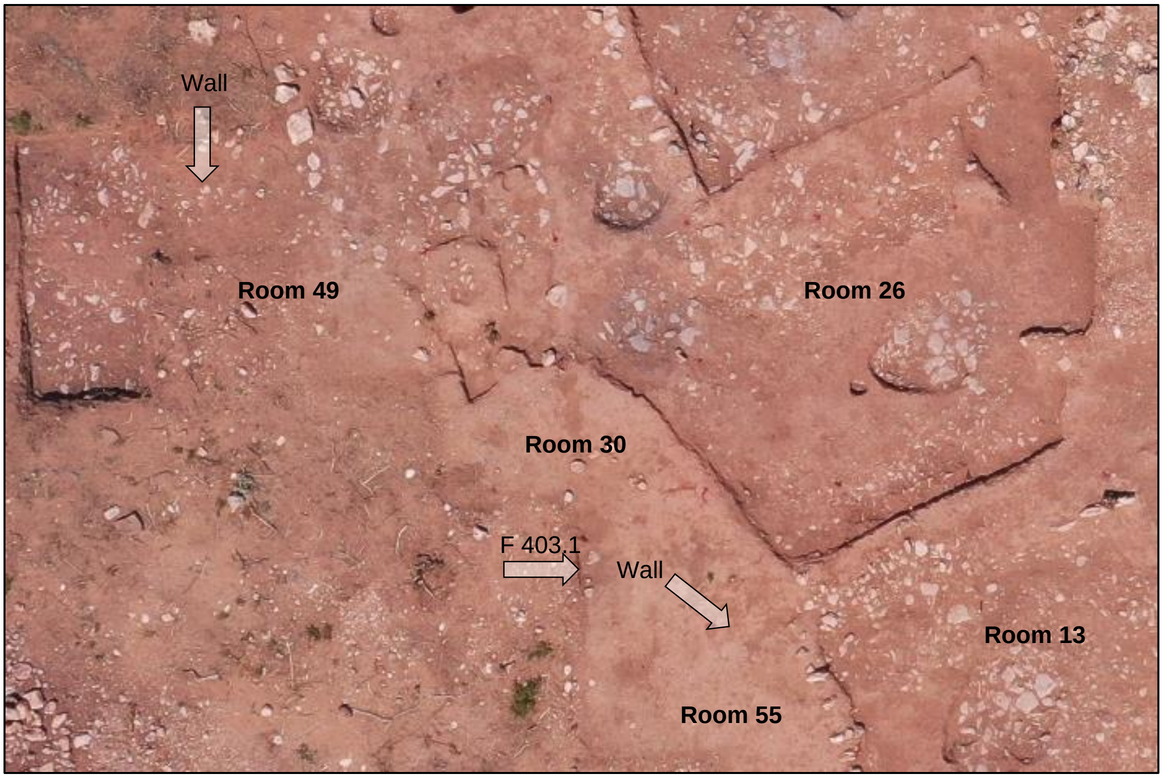

Figure 6.58. Partially exposed rooms along the eastern side of excavated Rooms 13 and 26.

Room 49: A 1-x-2-m unit opened over a GPR anomaly exposed part of a floor and the northern foundation of Room 29 (Figure 6.59, left). The GPR survey identified a possible buried room corner. The corner was not located, but segments of a wall foundation and floor were revealed. No floor features were revealed in the small section of the room, but comparatively high artifact counts of 45 lithics (5 projectile points), an agave knife, 2 groundstone, 2 polishing stones, 82 Ochoa ware sherds and a whiteware sherd, 545 bone fragments, and 10 historic items were recovered from the limited excavation.

Figure 6.59. (left) Feature 403.1 in the fill of Room 30; (right) Feature 401.1 in floor of Room 31.

Room 55: Two faint lines of daub foundations were visible in the upper fill of the excavation exposure to the east of Room 13. The room was not excavated.

Rooms 31–35, 46, 47, and 52 were defined along the eastern side of the excavated rooms. These rooms were defined by tracing foundation wall cobbles on the surface combined with identifying short segments of walls extending from the excavated rooms.

Room 31: A pit feature (Feature 401.1) was exposed within the limited area of Room 31. It was a circular pit measuring 34 cm diameter and 8 cm deep (see Figure 6.59, right). Based on the elevation, the feature would be positioned 6 to 10 cm above the floor in the adjacent Room 13 and therefore might be associated with a second floor in Room 31. The fill was a dark brown (Munsell 10YR3/3) silty loam. A partial collar measuring 3 cm wide was noted around the pit. Artifacts from the limited excavations included 59 lithics (1 projectile point), 10 Ochoa ware sherds, 3 groundstone, 25 bone fragments, and 2 historic items.

Room 32: Room 32 is located west of Room 26 and shares a common wall. A small section of the room was excavated to define the entry. The floor of Room 32 was 4 cm higher than the floor in Room 26 and was a compacted earthen construction of reddish-brown silty clay loam. Artifacts included 17 lithics (2 projectile points), 10 Ochoa ware sherds, 25 bone fragments, and a piece of historic glass.

Room 47 was defined entirely by tracing foundation wall cobbles on the surface (Figure 6.60). The areas excavated within these rooms was limited to 1- or 2-square-meter areas adjacent to the excavated foundation walls and therefore few details on architecture, floor features, and fill deposits could be documented.

Figure 6.60. Foundation wall stones of Room 47 visible on the site surface east of Rooms 13 and 31. Despite being covered with plastic, water had ponded in the rooms after an afternoon summer monsoon rainfall, apparently a result of the impermeable layer of caliche conglomerate below the settlement.

LCAS Room Excavations

Leslie's field notes and manuscript (see Leslie 2016a) provide descriptions of 21 surface rooms. As with all the features and contexts at the Merchant site, Leslie describes the continual destruction of rooms and deposits by looters. Some rooms were first exposed in potholes left by looters and were cleaned and documented by LCAS members, similar to the finding of looter pits in most of the seven rooms excavated in 2019. Other rooms in the process of being excavated by the LCAS were damaged by looters while LCAS members were away from the site. The uncontrolled excavations loosened and displaced the cobbles of room walls and often penetrated through floors, making it difficult for the LCAS excavators to recover architectural information.

Rooms 3 and 4 were excavated by Leslie and his family members; Rooms 5, 6, 8, 9, and 10 were excavated by Leslie and members of the LCAS. Room 6 was partially excavated by the LCAS and was described above. Brief descriptions of the other six excavated rooms are provide here.

Room 3: Room 3 was excavated by Robert Leslie and his children in 1960. It was described as a buried room measuring 2.1 m by 2.6 m with a floor area of 5.5 square meters (Figure 6.61). It was positioned below and extends beyond the northern wall of Room 4 and was an example of a stratified occupation in the LCAS village area. According to the notes and cross-section, a thin layer of refuse fill separated the floors of Rooms 3 and 4. The fill included a 15 to 17.5 cm layer of weathered natural fill (after the room was abandoned) over an 8 cm layer of reddish clay consisting of wall and roof melt. A 5 cm layer of trash and numerous artifacts was present above the floor. The roof was surmised to have been constructed of brush and clay because of the excessive amount of clay above the floors.

Room 3 had an unprepared earthen floor of compact reddish clay with a single floor hearth that measured 38 by 28 cm and was 18 cm deep. The field notes describe a raised collar 2.5 to 5.1 cm above the floor (Figure 6.62). The hearth fill consisted of ashy sediments. No entry was detected. Aside from the floor hearth, several flat caliche slabs, called "flagstones" in the field notes, were located near the eastern and western walls in line with the central floor hearth. These flagstones were also described as possible support pads for roof support posts or as supports for ceramic pots. A small pit designated as Refuse Area D was located just outside the eastern wall of Room 3.

Room 4: Room 4 was also excavated in 1960. It was a square surface room between unexcavated Rooms 18 and 19 and was constructed over Room 3 and its extramural pit, Refuse D (Figure 6.61). Leslie describes the room as measuring 2.59 m east/west by 2.44 m north/south with a floor area of 6.3 square meters. Fill deposits included a 10 cm layer of weathered natural fill (after the room was abandoned) over a 15-cm layer of reddish clay consisting of wall and roof melt. A 5 cm layer of trash and numerous artifacts was present above the floor. The roof was surmised to have been constructed of brush and clay because of the amount of clay in the layer of roof and wall melt.

The western and eastern foundation walls consisted of a single row of caliche cobbles, while the northern and southern foundations consisted of a double row of caliche slabs and cobbles in alternating orientations. These walls were 25 to 30.5 cm thick, 25 cm high, and were cemented with caliche mortar. An entryway was present in the western wall shared with Room 18. Room 4 was the only room excavated by Leslie and the LCAS that lacked a floor hearth.

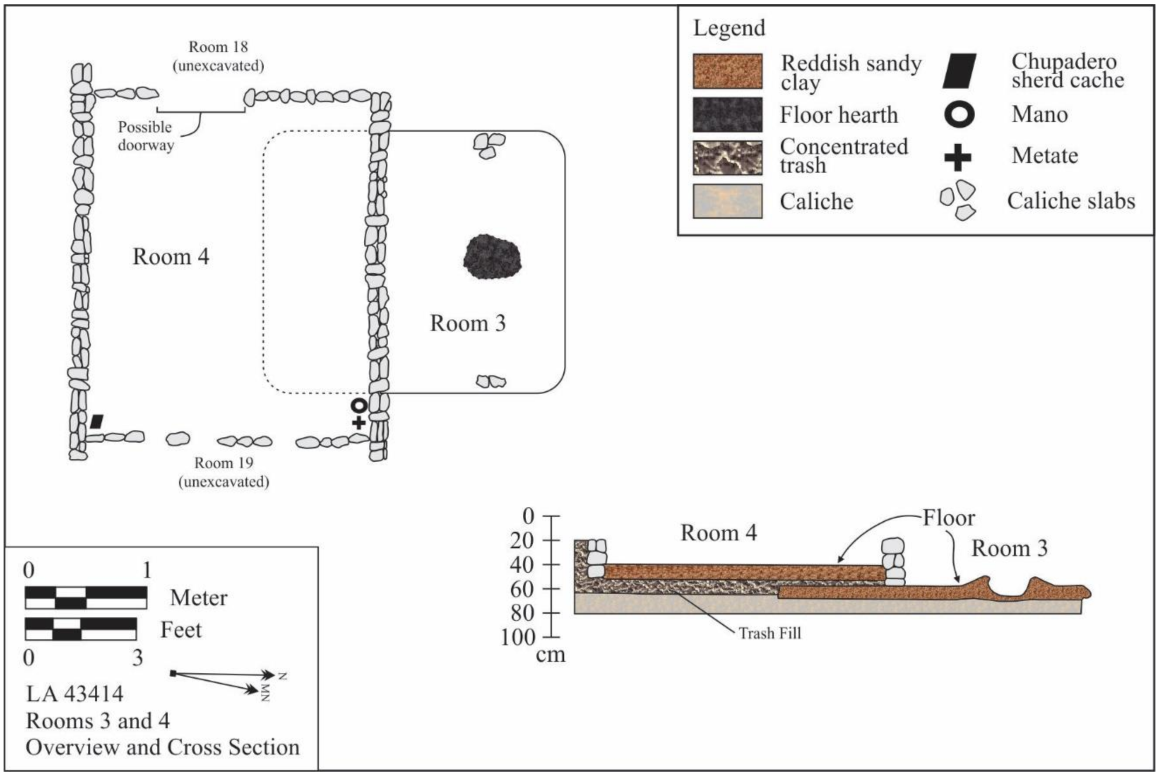

Figure 6.61. Planview and cross-section of Rooms 3 and 4.

Figure 6.62. Views of Room 3 during the 1960 excavations: (a) upper fill of Room 3 showing charcoal-stained sediments; (b) outline of the floor. The collar around the floor hearth can be seen in this view.

Disappointingly, few photographs of Room 4 are available. The only useful image is shown in Figure 6.63 that shows the partially excavated room with the northern wall exposed and the northern half of the fill cleared. Despite the absence of a floor hearth, Room 4 was one of the few rooms with *de facto* artifacts on the floor. A cache of Chupadero Black-on-white bowl sherds (Figure 6.64) were piled on the southeastern corner of the floor, and a mano and metate were lying on the northeastern corner on the floor.

Figure 6.63. View of Room 4 during excavation. Cindy Leslie is kneeling in the center of partially excavated Room 4. Room 3 is in the foreground and exterior pit of Room 3 (“Refuse D”) can be seen below the wall of Room 4.

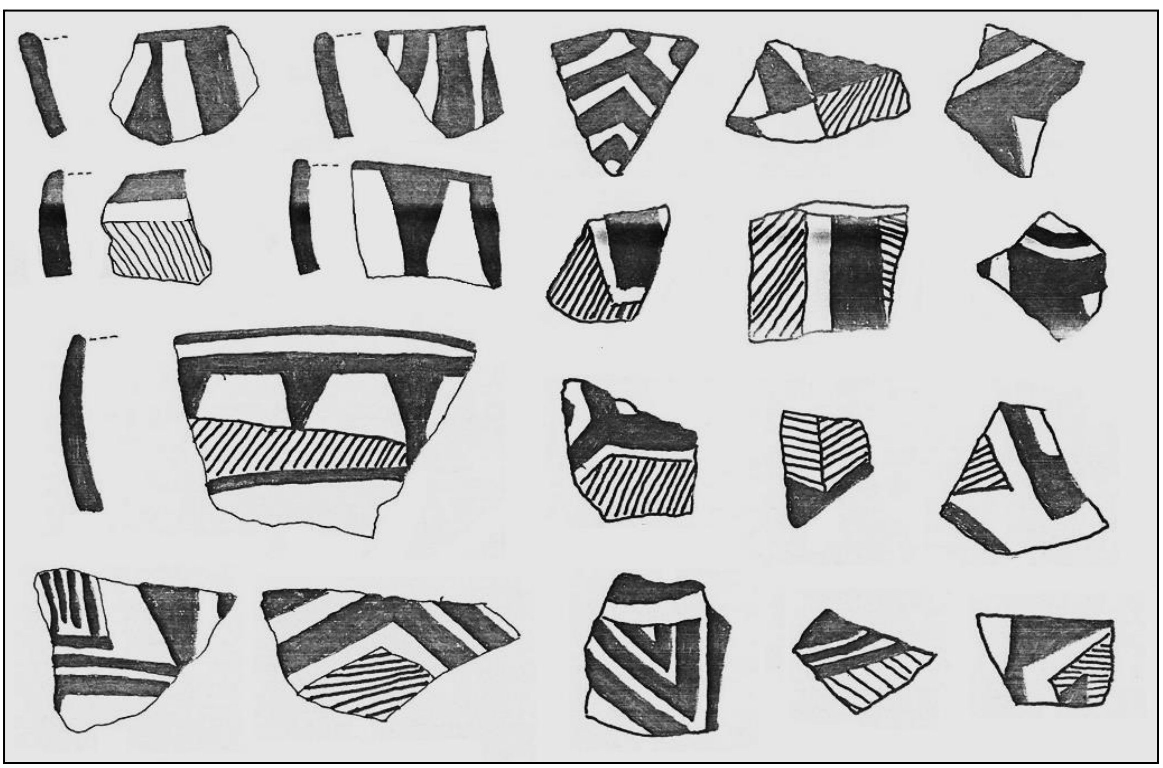

Figure 6.64. Cache of Chupadero Black-on-white bowl sherds found on the northeast corner of the floor of Room 4.

Room 5: Room 5 was excavated by LCAS members and individually by Leslie over a period of two years. The upper fill, thought to be the floor by LCAS members, was excavated in February of 1963. Leslie concluded that the LCAS members had exposed the layer of roof and wall fall and returned 18 months later in September of 1964 to complete excavation of the remainder of the fill and floor features. The final definition and documentation took place in March of 1965 and was Leslie's final excavation work at the site.

Room 5 was the deepest and best preserved of the domestic rooms at the Merchant site. Leslie defined Room 5 as a square surface room measuring 2.74 m east/west by 2.49 m north/south with a floor area of 6.8 square meters (Figure 6.65). Fill deposits included a layer of weathered natural fill of unknown depth over a 13 cm layer of reddish clay consisting of wall and roof melt. A thin layer of trash and artifacts was present above the floor.

The northern, western, and part of the eastern foundation walls were of double-coursed caliche cobbles and slabs placed in alternating directions. The northern wall was 25 cm wide and 31 to 35 cm high. The eastern and western walls were 20 cm wide and 25 cm high. The southern half of the eastern wall was a series of parallel caliche slabs (Figures 6.65 and 6.66). Only a few scattered cobbles marked the southern wall and a possible entryway in the southeast corner. All of the walls were cemented with a caliche and clay mortar.

A collared floor hearth was present in the center of the room. In a manner similar to Room 3, Leslie notes that flat caliche slabs had been placed within the floor on opposite sides of the hearth next to the eastern and western walls. It is likely that those slabs were the cobble substrate found below most of the rooms during the 2019 excavations.

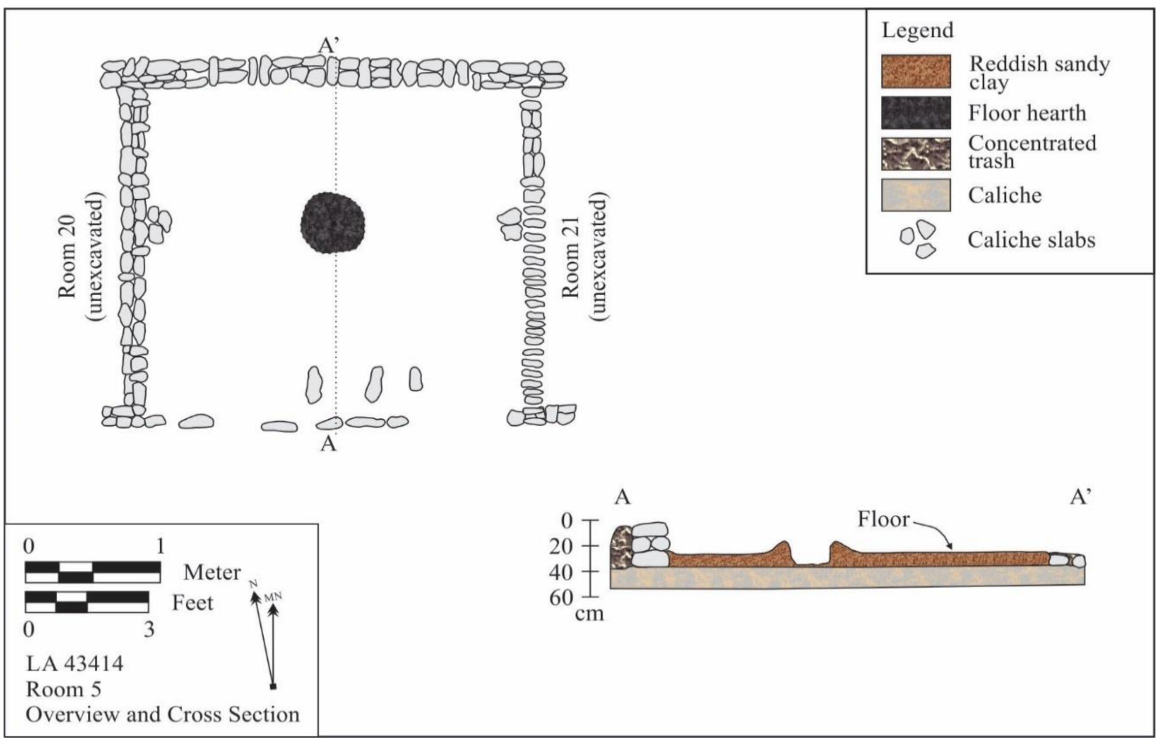

Figure 6.65. Planview and cross-section of Room 5.

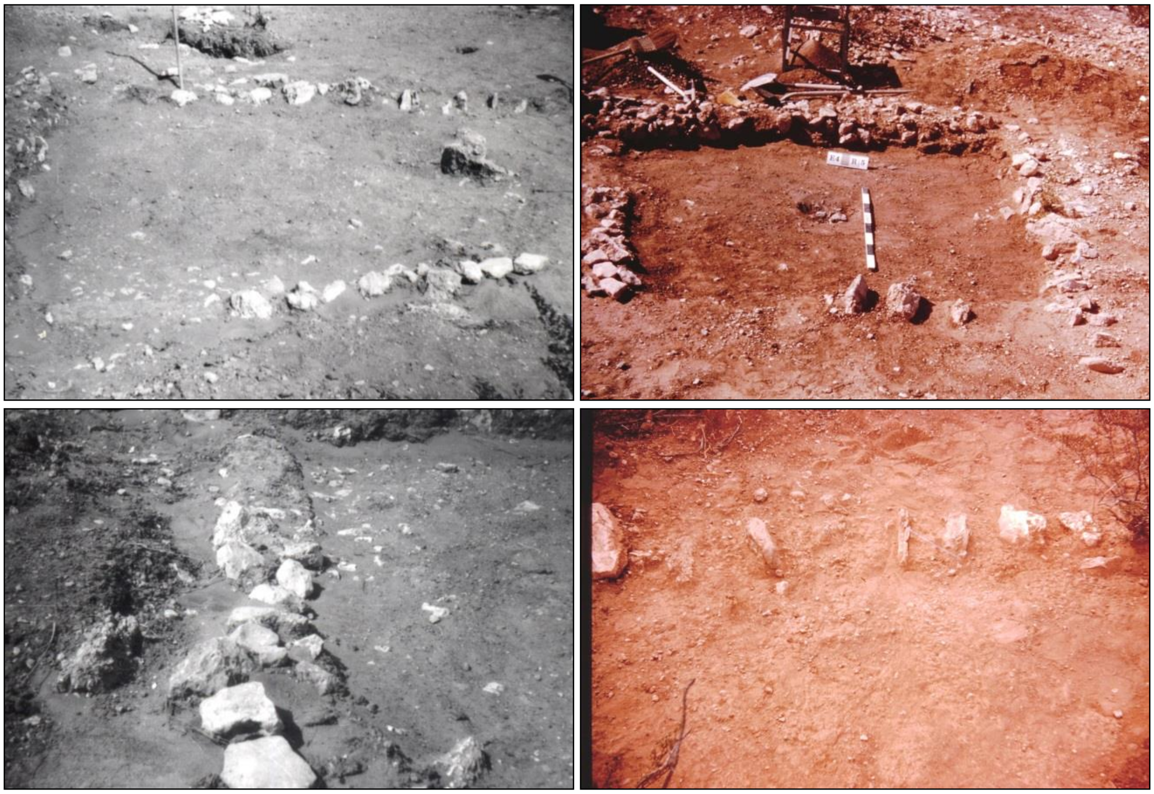

Figure 6.66. Views of Room 5 in 1963 and 1964: (upper left) view after 1963 excavations with roof fall fill stratum and walls exposed; (upper right) 1964 photograph of excavated room facing north; (lower left) segment of the western wall showing alternating orientation of foundation stones; (lower right) parallel foundation stones forming portion of eastern wall.

Room 8: Rooms 8, 9, and 10 are part of the western room block and were excavated by Leslie and the LCAS during a couple of weekends in the fall of 1964. Room 8 appears to have been a deeper pit room, while the other rooms were typical surface rooms. As seen in the photograph of LCAS members excavating Room 8 (Figure 6.67), the surface rooms had the typical wall foundations constructed using rough and irregular-shaped caliche cobbles.

Room 8 was discovered in July 1964 when Leslie and LCAS members found that a looter's pit at the edge of the escarpment had exposed cultural deposits that were deeper than had been noted in the surrounding site area. Further exploration discovered that the looter's pit had revealed a deep pithouse and had also penetrated through an overlying surface room (Room 15).

It is unclear if the entire subsurface room was excavated. The feature had been cut into the caliche bedrock and was approximately 51 cm below the surface. The walls of the structure were defined in the southwest corner. Measurements of the room were taken off the plan map (Figure 6.68). The structure appeared to be an irregular or perhaps oval-shaped house measuring 2.49 m along the long axis from the southwest to the northeast and 2.18 m along the shorter axis and having a floor area of at least 4.3 square meters.

Leslie describes a 5- to 8-cm-thick clay floor above the caliche bedrock. A thin layer of ash, burned soil, and artifacts was present on the floor. The fill consisted of an 8 cm layer of roof or wall melt below a 5 to 8 cm deposit of natural light red eolian sand. The uppermost stratum consisted of 10 to 13 cm of sediments mixed with small caliche rocks. The floor of Room 15 was positioned above that layer.

Figure 6.67. LCAS members excavating the western room block in 1964. View is facing south. Previously excavated Room 4 is in the foreground below the screened backdirt pile. The individual taking a photograph is standing at the edge of Room 8 within surface Room 15, and the young boy is kneeling in Room 16 with Rooms 10 and 9 beyond. The large circular mound of backdirt around Pit Structure 1 can be seen in the far left background.

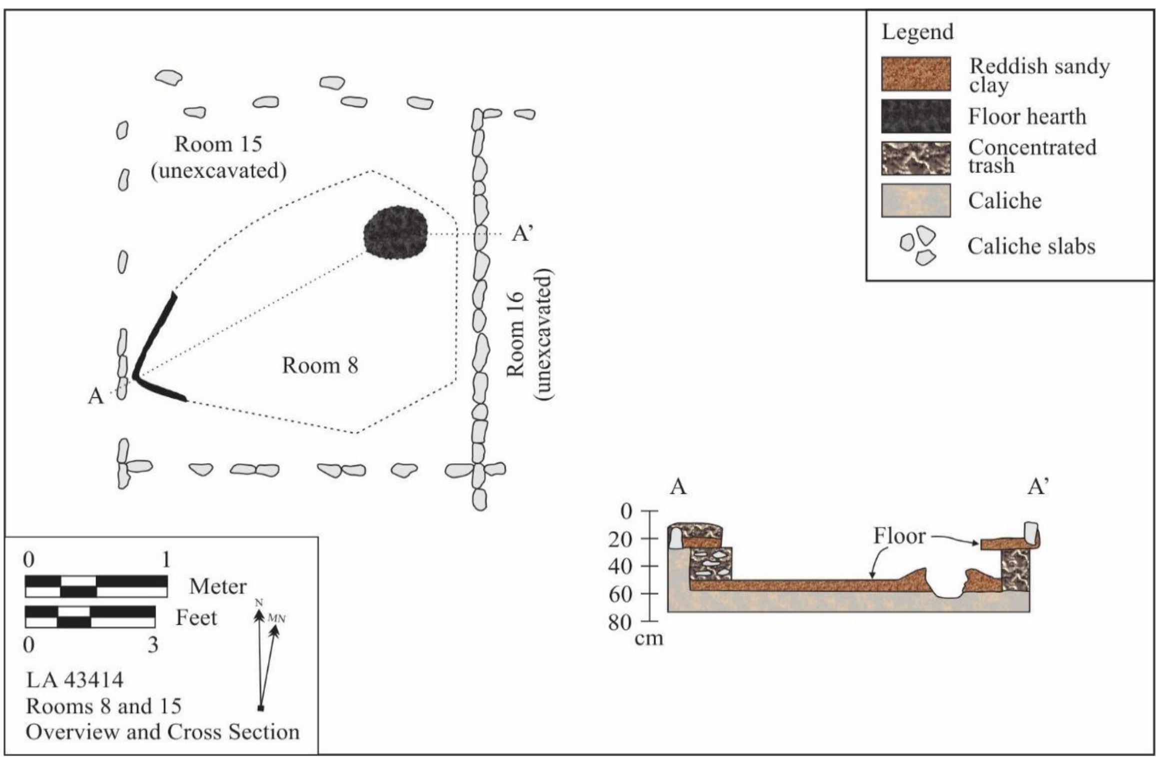

Figure 6.68. Planview and cross-section of Room 8 within Room 15.

A floor hearth was present in the northeastern corner. The floor was removed, revealing that the floor hearth had been cut into the underlying caliche bedrock (Figure 6.69). Leslie notes that most of the materials recovered during the excavation of Room 8 may have been associated with Room 15. Based on the 2019 excavations, we interpret Room 8 as a lower floor within Room 15.

Figure 6.69. Caliche bedrock below the floor of Room 8 showing the firepit that had been cut into the caliche (the room number was mislabeled in the original photograph).

Room 9: Room 9 was excavated over a weekend in August of 1964. Leslie notes that foot traffic and erosion resulting from five years of work at the site had exposed the walls of Room 9, leading to further investigations of the western room block. The room was defined as a square construction measuring 2.90 m north/south by 2.74 m east/west with a floor area of 7.9 square meters (Figure 6.70). The northern and southern wall foundations were among the best preserved examples at the site and consisted of double courses of caliche slabs placed in parallel lines and measuring 15 to 25 in width (Figure 6.70). A deposit of clay mortar was noted between the courses. The northern and southern walls were single lines of caliche slabs. A 76-cm-wide gap was present in the eastern wall and may have been an entryway.

The caliche rocks forming the walls were rectangular in shape and extended 20 cm above a red clay floor. A 2.5- to 5-cm-thick layer of refuse was above the floor and was covered by a thin layer of reddish to light tan find sands. The roof and wall melt appeared to be mounded in the central part of the room.

Two floor features and several artifacts were present on the floor (Figure 6.70). A 46-cm-diameter floor hearth with a prominent collar was present in the north-center of the room. A 12.7-cm-diameter post mold was located adjacent to the floor hearth. The decomposed remains of a wood support post were found inside the small posthole. A flat caliche rock 25 cm wide had been set into the floor next to the hearth and was interpreted as a pot rest. Two quartzite hammerstones were found on the northwest corner of the floor and a cluster of two manos and a basin metate were propped against the northeast wall.

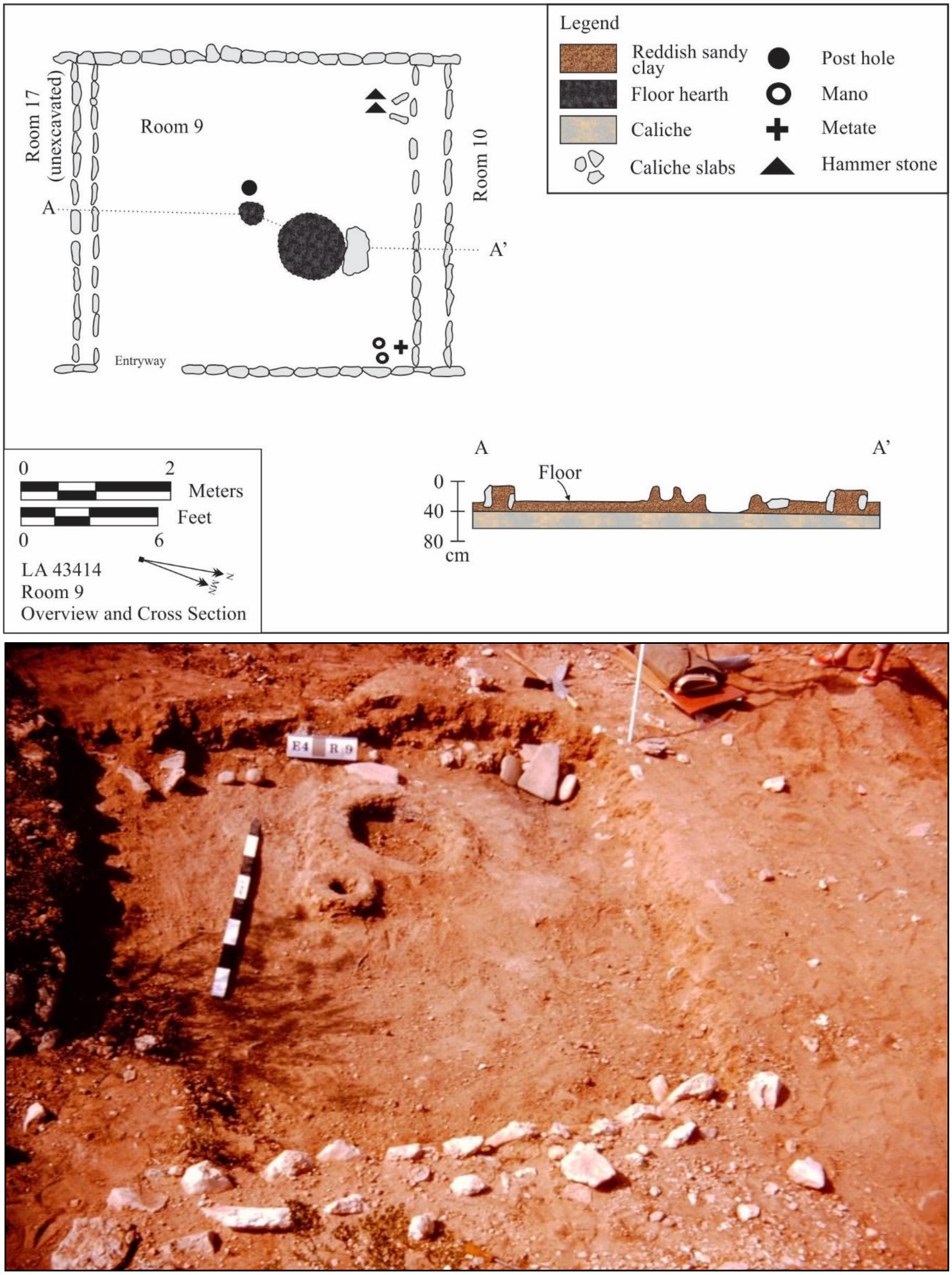

Figure 6.70. Views of Room 9: (upper panel) planview and cross-section; (lower panel) view of the excavated room in 1964 showing floor features and wall construction.

Room 10: Room 10 was excavated during the same weekend in 1964 as Room 9. The room was first observed as a few continuous caliche rocks adjacent to Room 9. Excavations revealed a square surface room measuring 2.74 m north/south by 2.79 m east/west with a floor area of 7.7 square meters (Figure 6.71). The room fill consisted of 2.5 to 5 cm of cultural debris (flakes, ceramics, and bone slivers) and ash and charcoal above the 10-cm-thick clay floor. Above the floor trash was an 18 to 20 cm layer of wall and roof melt.

The southern wall was shared with Room 9 and had the double-course construction of caliche slabs. A northeastern remnant of the northern wall appeared to have the same construction, while the eastern and western walls consisted of single courses of rectangular caliche slabs. A 76-cm-wide entryway was present in the northern part of the western wall. Large flat caliche slabs measuring 60 by 30 cm had been set in the floors on each side of the entryway.

A 46-cm-diameter collared floor hearth was present in the northeast corner of the room. Artifacts on the floor included a basin metate, a small mano, a grooved abrader, and a bone awl. Apparently either no photographs were taken, or the photographs were misplaced, because Leslie does not include a photo of the room in his manuscript.

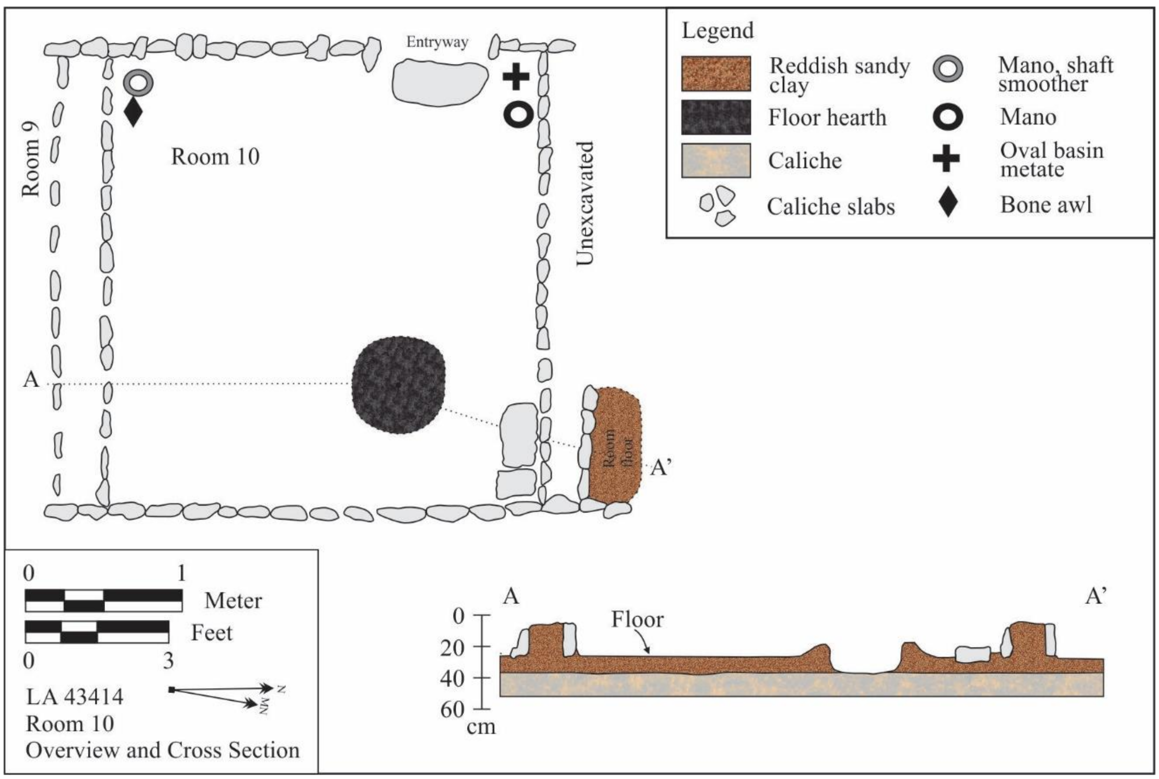

Figure 6.71. Planview and cross-section of Room 10.

Partially Excavated and Looted Rooms

The majority of the domestic rooms at the Merchant site were partially excavated. Some of the excavations were conducted by Leslie and LCAS members to examine damaged rooms after looters had exposed portions of walls or fills. Other excavations were more exploratory in nature and involved clearing the upper fill to define the boundaries of the room or small units dug into the fill to find floors and artifacts. With the exception of Room 7, none of the rooms were photographed or mapped, and the only documentation on the rooms is provided in Leslie's manuscript.

Room 11: Room 11 is an isolated room located near the edge of the escarpment about 20 m south of Refuse Area B. Erosion had exposed the four walls of the structure, and approximately two-thirds of the interior was "potted" between 1965 and 1976. The potholes penetrated through the floor and even penetrated to the caliche bedrock in one part of the room. The walls were not disturbed, allowing for the dimensions to be estimated. The walls were not measured, but Leslie provides estimates that the room was 2.44 m north/south by 2.75 m east/west with a floor area of 6.7 square meters. No cultural materials were formally collected from the room, and Leslie notes that the potholes had infilled by 1984.

Room 12: Room 12 was located at the far eastern edge of the northern room block. Leslie's map places the room a bit north of Pit Structure 2 and several meters south of the northern room block. The room was partially excavated by an LCAS member after erosion had exposed the southern wall as well as the southern segments of the eastern and western walls. The exposed southern part of the room measured 2.34 m in width, but the length was not measured. Leslie's notes state that an LCAS member began the excavation but failed to complete the work. Leslie noted a clay floor in the room, but no further information was available.

Room 13: Room 13 was an isolated room located at the edge of the refuse deposits between Pit Structures 1 and 2. While excavating along the western margins of Refuse Area B, Leslie encountered a deeper stratum with a clay floor approximately 50 cm below the surface. He excavated a 60 cm trench along the northern edge and a 76 cm trench along the eastern wall, defining a pithouse structure. The room is notable as the only example that had burned construction material (roof *latillas* or jacal sticks) on the floor. The series of burned wood branches were positioned 2.5 to 5 cm above the floor, spaced at 5- to 10-cm intervals, and were 1 to 3.5 cm in diameter. The branches were found within a layer of burned clay (daub?) and organic material. Burned branches and branch impressions were observed in some of the fragments, along with burned lines or "streaks" that Leslie surmised might be burned grass thatching. A few items were recovered from the room, including a mano and two large rim sherds from an Ochoa indented jar.

According to Leslie's manuscript, the room was reburied. The room was selected as the first room to be excavated in 2019. No evidence of the previous excavations, floor, or burned superstructure was found. It is possible that the room was looted after Leslie backfilled it.

Room 14: Room 14 was found during excavations of Refuse Area B south of Pit Structure 2. The room was not discovered until most of the structure was removed during excavation of a midden, and all that remained intact was a 0.6-square-meter remnant of the floor and a 76 cm segment of the northern wall.

Room 15: Room 15 was a square surface room at the northern edge of the western room block. The majority of the room was removed during excavation of the underlying Room 8 and only the walls were documented. The eastern wall was a solid line of caliche cobbles mortared with clay 13 cm above the clay floor (Figure 6.72). A single line of cobbles formed the southern wall, and the western and northern walls retained only a few cobbles. The room measured 2.44 m east/west by 2.59 m north/south with a floor area of 6.3 square meters. The fill was a 10 to 13 cm layer of soil with few artifacts. It is likely that Room 8 was a lower floor of Room 15.

Room 16: Room 16 adjoined the eastern wall of Room 15 at the northern end of the western room block. The presence of the room was suggested on the basis of small test excavations around Rooms 8 and 10 and small wall stubs leading from the eastern wall of Room 15. The room was not excavated and the size and depth and other attributes remain unknown, although Leslie includes some artifacts from the room in his site description.

Figure 6.72. View of the southern and eastern walls of Room 15 bordering the deeper excavation of Room 8 (mislabeled as Room 4 in the photo).

Room 17: Room 17 was located at the southern end of the western room block and was identified in a small test unit placed south of Room 9. The size of the test excavation was not described, other than noting it was placed along the southern wall of Room 9. The floor of the room consisted of a dark red clay and was encountered 13 to 15 cm below the surface. No foundation walls were described in Leslie's manuscript.

Room 18: Room 18 was located at the west side of Room 4. Eolian erosion had exposed the southern wall, and LCAS members excavated a 60-x-60-cm unit in the southeastern corner. A floor was contacted at 15 cm below the surface and consisted of a dark red clay that could be easily differentiated from the lighter fill above. Much of the room had been covered by backdirt during excavation of adjacent rooms. The room was not excavated.

Room 19: Room 19 adjoined the eastern wall of Room 4 and shared a common southern fountain wall with Rooms 4, 5, 20, 21, and 22. Leslie excavated two areas in the room and encountered a dark red clay floor in both locations, one along the northern wall and the second in the southwest corner. The depths of the fill and floor were not described, and the only artifacts were from a small pocket of refuse near the northern wall. The only information on walls is from the shared wall with Room 4.

Room 20: Room 20 adjoined the western wall of Room 5 in the northern room block. A 60-x-60-cm unit was placed along the center of the eastern wall, exposing a 20-cm-thick layer of roof and wall melt. Several artifacts were found on the floor below the fill.

Room 21: Room 21 adjoined the eastern wall of Room 5 and the shared common wall and southern foundation wall were apparent to Leslie during the excavations. A 46-cm-wide by 1.20-m-long trench was excavated from the northern wall to the southwest corner of the room. The fill consisted of weathered natural deposits overlying a layer of roof and wall melt with a thin layer of trash and a floor below. The remainder of the room was not excavated.

Room 22: Room 22 was located next to Room 21 and adjoins the northern wall of Room 6. The presence of the room was unknown until 1965 and was one of the places where LCAS members parked their vehicles during excavations. No formal excavations were conducted in the room.

Room 23: Room 23 was located as the southernmost room of the western room block at the southwest corner of Room 17. A 90-cm-long section along the southeastern corner was cleared exposing several cobbles. A floor was contacted 14 cm below the surface. Only the southeastern corner was exposed and the size of the room could not be determined.

Extramural Features of the Eastern Room Block

The excavations in the eastern room block were limited to a few meters beyond the walls of the seven excavated rooms and a 1-x-2-m unit placed over a GPR anomaly north the entire village area. Most of these excavations revealed additional rooms as described in the preceding section, but a small area west of Rooms 6 and 29 revealed portions of an exterior activity area with several pit and hearth features (Features 409, 415, 416, and 418). Additionally, a midden area, Feature 408, was identified between the southern edge of the room block and escarpment edge.

Four pit features were exposed in the 6.25-square-meter area west of Rooms 6 and 29 and north of Room 27. Lithic, ceramic, fragmentary groundstone, and bone fragments were present in each pit. A few historic items had worked into the upper fills. A piece of limonite and several small fire-cracked rocks were recovered from Feature 416.

The southern pit in this group (Feature 409) was a circular 66-cm-diameter and 20-cm-deep basin pit (Figure 6.73). The fill was a dark gray ashy charcoal sediment and the sides were slightly oxidized, indicating the feature was a hearth. A quantity of large mammal bone was present in the uppermost fill, but most disintegrated during excavation. Fifteen charred mesquite seeds were recovered from the flotation sample. Feature 418 was a small and shallow (14 cm diameter and 3 cm deep) pit next to Feature 418. The feature may have been an ash pit or perhaps a shallow posthole that supported an exterior ramada.

Feature 415 was a small 29-cm-diameter and 7-cm-deep pit. The fill was a very dark gray-brown charcoal stain (Munsell 10YR3/1). The function of this feature is unknown.

Feature 416 was another large pit and appears to have functioned as a small baking pit (Figure 6.73). The section of the feature within the excavation block measured 1.2 m in diameter and was 21 cm deep. The fill was a dark gray-brown (Munsell 10YR3/2) charcoal-stained silty loam with scattered charcoal and some slight oxidation was noted at the base.

The final extramural excavation area was a 1-x-2-m unit opened over a GPR anomaly located 8 m beyond the northern boundary of the room block and near the northern edge of Midden A. The feature was thought to be an extramural pit based on the size of the GPR anomaly. The unit was excavated in a single level that varied from 15 to 18 cm below the surface and 0.33 cubic meter of sediment and rock was screened. The fill was a brown (Munsell 7.5YR5/6) extremely cobbly silty loam over caliche bedrock (Figure 6.74). No pit, hearth, or structure was encountered and it appears that the anomaly was a dense, natural layer of rocks over the underlying bedrock. Artifact recovery included 14 Ochoa ware sherds, 1 flake, 1 mano fragment, and 1 historic .22 cartridge. The density of 48.5 artifacts per cubic meter is low compared with most of the other excavations within the village area.

Figure 6.73. Extramural features: (left) Features 409 and 418; (right) Feature 416 (photo board incorrectly lists Feature 116).

Figure 6.74. View of the excavation placed over the GPR anomaly. Note the number of large cobbles piled left of the unit that were removed during excavation.

Summary

One of the primary goals of the 2019 excavations in the Merchant village area was to resolve and clarify the details of architecture, room construction, room block growth, and abandonment mode. In this light, perhaps the most noteworthy overarching observation derived from the preceding descriptions of rooms and architectural details is the degree to which they corroborate and confirm the descriptions of rooms and architecture provided by Leslie and the LCAS from their work conducted more than 50 years earlier. We have previously expressed our appreciation and admiration of the excavation and documentation of the Merchant site provided by Leslie and the LCAS members (see for example Miller et al. 2016:379–381), and the results of the 2019 excavations are a further testament to the dedication and abilities of the LCAS.

It was thought that the LCAS members might have overlooked postholes, confused floors and artifacts on floors as opposed to lower fills and missed subtle hints indicating the locations of foundations and walls. Informally constructed walls, postholes, and subfloor pits of adobe pueblos are often difficult to identify in the best of circumstances and by experienced excavators. Those doubts and suspicions were proven baseless. The rarity of postholes and floor artifacts, the missing wall segments, and the difficulties in identifying floors were all repeated in the 2019 excavation sample. The details of room construction, occupation, and abandonment obtained through the 2019 fieldwork in the eastern and southern areas of the village can now be combined with the LCAS record of work in the western and northern areas to arrive at a comprehensive perspective on the nature of settlement at the Merchant site.

Chapter 7

Domestic Rooms of the Southern Room Block

Room 7 was the southernmost isolated room at the Merchant village site identified by Robert Leslie and the LCAS, located approximately 70 m from the primary room blocks. The room was partially excavated in February of 1963 (Leslie 2016a). Leslie removed the upper layer of natural fill using a broom and exposed the reddish layer of wall and roof melt but did not excavate any farther into the fill (Figure 7.1). He exposed small segments of the northern and eastern foundation walls and noted that additional cobbles had been displaced around the structure. The presence of ash deposits in the center of the fill indicated that a central floor hearth was present. The room measured 3.35 m north/south by 3.05 m east/west and had a floor area of 10.2 square meters. It was the largest of the domestic rooms investigated by Leslie and the LCAS.

The 2015 field investigations of the Merchant site included a GPR survey around Room 7 (Miller et al. 2016). A 5-m by 20- parcel beginning around Room 7 and extending northwest to another possible room partially exposed in the road was cleared of vegetation and surveyed (Figure 7.2). The GPR survey identified several anomalies that, based on size, were characterized as two probable structures and several possible pit features. The easternmost anomaly matched the buried outline of Room 7.

Room 7 was selected for excavation during the 2019 fieldwork. The investigation of the southernmost area of the site was intended to explore whether there might be temporal or social differences between the southern and northern room blocks. Leslie identified Room 7 as a distant, isolated room, but the remote sensing survey in 2015 and surface mapping in 2019 had identified additional rooms and wall segments, indicating that either a second room block was present 50 to 60 m south of the main village or that an even larger pueblo was present. We also selected the room because it appeared to be in relatively good condition compared with the looted rooms of the northern village. Despite the absence of looting, however, we feared that the room was being impacted by the widespread eolian erosion we have observed across large areas of the Merchant site and the surrounding terraces. It was apparent that erosion had removed 10 to 15 cm of topsoil covering the room since it was first exposed in 1963.

As suspected, the excavation of Room 7 revealed evidence of a southern room block. Room 7 was found to share two continuous walls with Room 24 to the north. Additional walls were found in the road cut 10 m to the east, and it is likely that additional buried rooms exist between the two locations. Feature 39, the buried deposit explored by John Speth in 1984, may be a midden or trash-filled room at the easternmost edge of the room block.

Figure 7.1. Views of Room 7 and 24: top panel, view facing northeast of the 1963 LCAS excavation of the uppermost few cm of natural fill in Room 7. Portions of the eastern and northern foundation walls are exposed, but most of the walls remained buried; lower panel, view facing southeast of the excavation block placed over Room 7 prior to excavation. Note that the large grey rock above the sign board in the bottom photo is the same partially exposed at the far right center of Leslie's photo of Room 7.

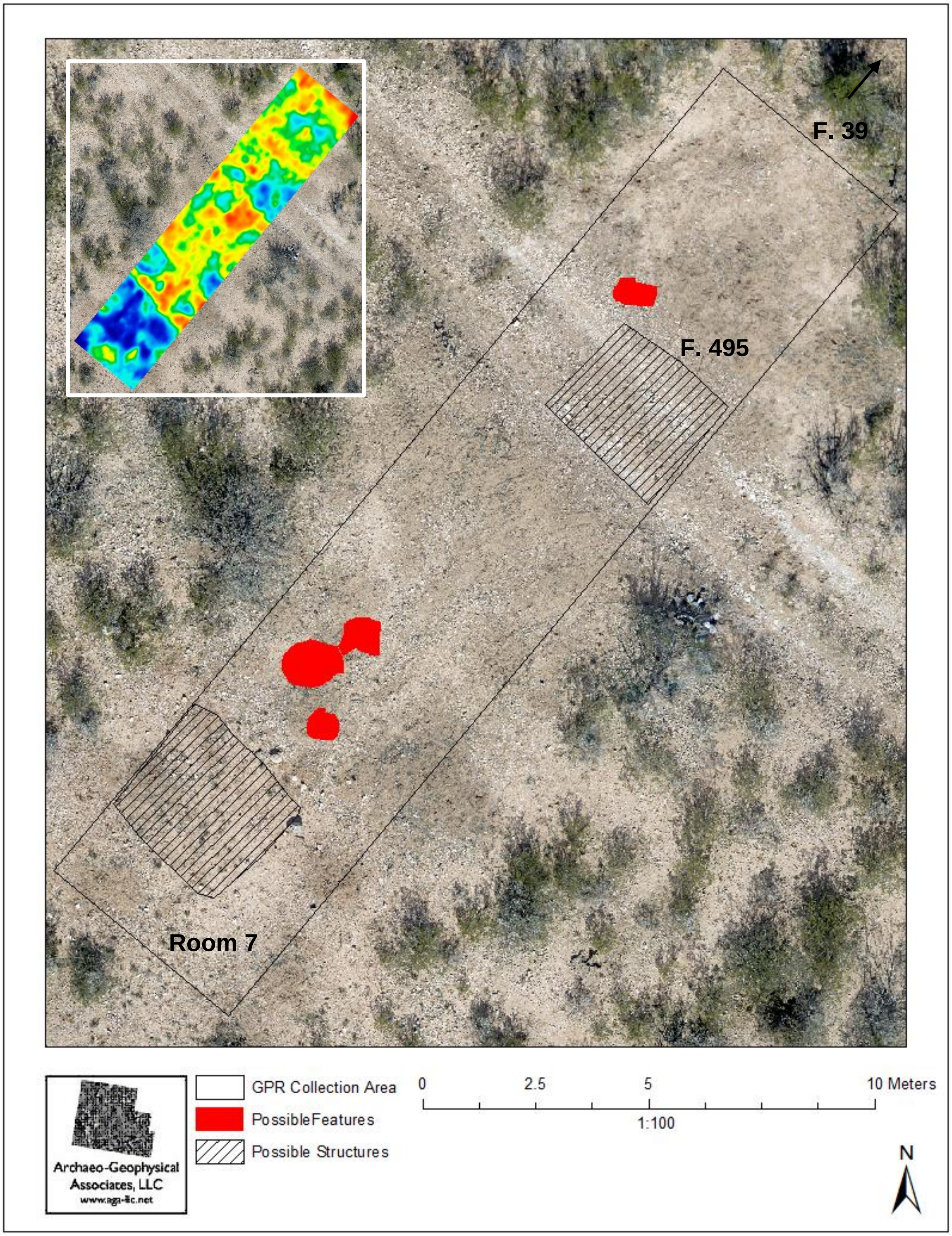

Figure 7.2. Results of the 2015 GPR survey of Room 7 and areas to the northeast. Inset shows the GPR slice at 0-20 cm below surface.

An excavation block was established over Room 7 to explore the eastern wall of the house that was visible on the surface (Figure 7.3). The final size of the excavation block was 8 m east/west by 7 m north/south and a total of 34 1-x-1-m units were excavated (34 square meters). A total of 2.33 cubic meters of sediment was screened through 1/8 inch mesh.

The excavation revealed a long continuous wall that is likely the western foundation wall for at least two contiguous rooms (Figures 7.4 and 7.5). The wall was constructed in two parallel rows of relatively elongated caliche cobbles. In contrast, the eastern wall is an alignment of larger, irregularly sized cobbles. Room 7 is the southern room, and the adjacent northern structure was designated Room 24. The foundation stones forming the wall between the two rooms appear to have been mostly removed or displaced. However, a distinctive linear deposit of red clay sediments extends from wall to wall across the midpoint of the two rooms that marks the location of a former jacal wall (Figure 7.4). Similar red clay sediments can be seen along segments of walls with intact foundation stones. Most of the foundation stones of the southern wall of Room 7 also appear to have been displaced. Two small wall segments extend south from Room 7 to the limits of the excavation exposure, indicating another room is present south of Room 7.

The long axis of the two-room section of the room block is oriented at an azimuth of 320 or 140 degrees; the short axis is aligned at 45 degrees (Figure 7.5). Midden deposits, designated Feature 399, were encountered at the eastern and southern margins of the excavation block. The midden deposits were exposed in the unit but were not excavated any further.

Figure 7.3. View facing north of the excavation block established over Room 7 prior to excavation. The eastern wall is visible as a linear arrangement of cobbles to the right of the sign board. Vegetation was removed from the location in 2015 for the GPR survey.

Figure 7.4. View facing toward the northwest of Rooms 7 and 24 after walls and floors had been exposed. Room 7 is in the foreground. Note the red clay sediments marking the locations of jacal walls.

Room 7 (Feature 7)

Excavation revealed only a few cm of cultural fill with a cobbly natural matrix below. The floor was earthen. The basal elements of the walls were clearly defined and three floor features were present (Figure 7.5).

Interior dimensions:	north wall 3.10 m
	south wall 2.90 m
	east wall 2.13 m
	west wall 2.13 m
Floor area:	6.38 square meters
Floor hearths:	2 floor hearths (RF 7.1 and 7.2)
Pits:	None
Postholes:	1 primary (RF 7.3)
Orientation:	48° - 228°/ 138° - 318°

Fill and stratigraphy: The shallow fill of Room 7 consisted of a reddish brown (Munsell 5YR4/4) silty loam with a moderate density of caliche nodules. The fill averaged 6 cm in depth. A 1-x-1-m unit was excavated in the southwestern corner to verify that no additional fill deposits or floors existed below the defined floor. The fill of the unit was a reddish brown to tan silty loam with extremely high quantities of calcium carbonate-coated cobbles and was culturally sterile. Fill outside Room 7 to the east consisted of a dark brown (Munsell 10YR3/2) charcoal-stained silty loam with caliche nodules and was designated a midden deposit (Feature 339).

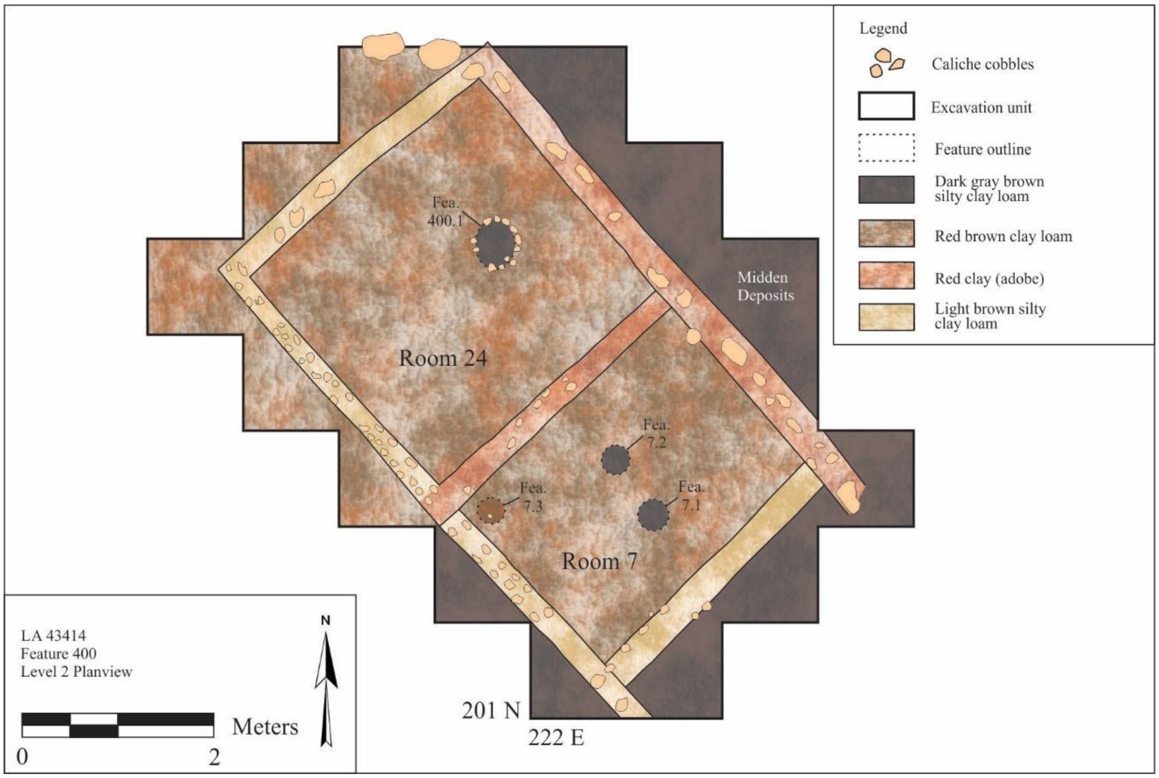

Figure 7.5. Planview of the southern excavations of Rooms 7 and 24.

Comparing the depth of the fill documented during the 2019 excavations with the photograph of the room taken in 1963, it is obvious that much of the fill and walls have eroded during the 56 years since the house was first exposed. It is estimated that 10 to 15 cm of deposits have eroded away. Artifacts recovered from the fill included 17 Ochoa ware sherds (Figure 7.6), 23 flakes, one utilized flake, three unimarginally retouched tools, two unifaces, one hammerstone, one mano fragment, and three slab metate fragments.

Walls: The western wall averaged 30 cm in width and consisted of parallel rows of slightly tabular cobbles (see Figures 7.4 and 7.5), although it appears that cobbles had been displaced from the southern 1/3 of the wall. The wall lacked the red clay jacal content of other walls but could be clearly defined from the interior and exterior fills. The eastern wall averaged 35 cm in width and consisted of two lines of irregularly sized and shaped cobbles. The cobbles were embedded in a dark reddish-brown (Munsell 5YR3/3) silty clay. Several cobbles could be matched with those exposed by Robert Leslie in 1963 (see Figure 7.1 where several small cobbles were exposed along the east side of the room).

Most of the northern wall separating Room 7 from Room 24 was also missing, and only four or five cobbles forming the southwestern segment of the southern wall remained intact. The dark red clay remnants of jacal daub were visible where the walls once stood. It is estimated that these walls were 30 cm wide. The east and west walls of Room 7 continued south to the edge of the excavation exposure and mark the location of another room. The wall segments could be traced on the site surface for 70 cm beyond the excavation limits.

The cimiento remnants were only a few cm high, and it is certain that the walls and adjacent deposits have eroded since 1963. It is estimated the wall foundations of the room were probably no greater than 30 cm in height.

Entry: No evidence of an entryway was identified in the shallow remnants of the wall foundations. Entries are often located in the wall closest to the floor hearth, and thus it is possible an entry was located in the southern wall of the room leading to the adjacent room. Rooms of the northern room block tended to have northern entries.

Floor: A single floor was present and consisted of similar sediments of the fill. The floor was identified by the vertical position of two floor hearths and the presence of sterile carbonate-coated deposits below.

Superstructure: No evidence of the superstructure was found, aside from the single roof support posthole. The primary roof supports may have been embedded in walls or corners of the house.

Floor and subfloor assemblages: No floor assemblage was present.

Subfloor features: Two informally constructed floor hearths and one posthole were present (Figure 7.6). Feature 7.2 was positioned in the center of the room, and Feature 7.1 is located closer to the southern wall. Each was a small floor hearth around 0.3 m in diameter and 6 to 12 cm deep. Caliche cobbles were present around the base and lower sides, but it is uncertain whether the cobbles were an intentional lining or simply part of the dense cobble substrate below the floor. The fills were silty loams with small charcoal flakes. A flake was recovered from Feature 7.1, and a flake and utilized flake were found in the fill of Feature 7.2. Only one posthole was identified (Feature 7.3) in northwestern corner of the room. The posthole was circular and measured 0.33 m in diameter and was 0.17 m deep.

Figure 7.6. Floor features and artifacts of Room 7: upper left, Feature 7.1; upper right, Feature 7.2; lower left, posthole Feature 7.3; lower right, Ochoa ware sherd from fill near the floor.

Discussion: As with the rooms of the northern room block, Room 7 proved difficult to excavate owing to the combination of informal construction, shallow deposits, cobbly soils, and other factors. The floor was in poor condition and could be differentiated from underlying fill only on the basis of the vertical position of floor features and the underlying carbonate-coated cobbly deposits. Most of the fill that was present in 1963 had eroded. The large cobble that was mostly buried in the room fill as seen in the 1963 photograph was entirely exposed on the site surface in 2019. Nevertheless, the majority of the walls and overall size and floor area of the room could be defined.

Critical details of the room include the absence of a floor assemblage, lack of evidence of intensive occupation that would result in heavily burned hearth linings and a compacted, charcoal-stained floor, and absence of remodeling episodes.

Room 24 (Feature 400)

Room 24 was discovered when it was found that the eastern wall of Room 7 continued several meters to the north. The excavation block was expanded to the west and northwest to expose the room. Room 24 was relatively intact, although as noted for Room 7, most of the fill had been eroded away. Excavation revealed only a few cm of cultural fill with a cobbly natural matrix below. The floor was earthen. The basal elements of the walls were clearly defined and one floor feature was present (see Figure 7.5).

Interior dimensions:	north wall 3.16 m
	south wall 3.04 m
	east wall 2.88 m
	west wall 2.92 m
Floor area:	8.99 square meters
Floor hearths:	1 hearth (Feature 400.1)
Pits:	None
Postholes:	None
Other features:	None
Orientation:	48° - 228°/ 138° - 318°

Fill and stratigraphy: Two sediments were observed in the shallow fill in Room 24. The predominant deposit was a reddish brown (Munsell 5YR4/4) silty loam with a moderate density of caliche nodules. A slightly darker and discontinuous layer of brown (Munsell 10YR3/2) silty loam was present in the southern units and might represent a small remnant of the original cultural fill. As noted in Room 7, the fill below the floor was a reddish brown to tan silty loam with extremely high quantities of calcium carbonate-coated cobbles and was culturally sterile. Exterior deposits to the east of Room 24 consisted of a dark brown (Munsell 10YR3/2) charcoal-stained silty loam with caliche nodules and was designated a midden deposit (Feature 339). The exterior deposits north of the room were the same natural cobbly silty loam that was present below the floor.

Items recovered from the fill to the floor included 21 Ochoa ware sherds, two pieces of angular debris, one tested pebble, 18 flakes, two utilized flakes, two projectile points, one hammerstone, one indeterminate groundstone fragment, one piece of limonite, and three small bone fragments.

Walls: The western wall of Room 24 was continuous with the western wall of Room 7 and was mostly intact. It averaged 30 cm in width and consisted of parallel rows of slightly tabular cobbles (Figure 7.7). Rooms 24 and 7 also had a continuous eastern wall averaging 35 cm wide and constructed using large, irregularly shaped cobbles placed in two rows, although some of the central segment had been displaced. The cobbles were embedded in a dark reddish-brown (Munsell 5YR3/3) silty clay.

Figure 7.7. Views of Room 24 after excavations had been completed: upper panel, view facing north of the room showing the walls and floor; lower panel, aerial view after floor hearth was excavated.

The western half of the northern wall consisted of four large, flat cobbles but the cobbles of the eastern half appeared to have been displaced. Two large cobbles from the wall were positioned a few cm north of the wall and at a slightly higher elevation, indicating they were once part of the foundation stones but had been displaced. The southern wall is the shared northern wall of Room 7 and most of the foundation stones were missing, but the characteristic reddish clay soil of the wall could be traced across the units. The reddish clay deposit was absent along the western and northern walls.

Entry: No evidence of an entryway was identified in the shallow remnants of the wall foundations. Entries are often located in the wall closest to the floor hearth, and it is possible that the gap in the eastern wall was the location of an entry.

Floor: A single floor was present and consisted of similar sediments of the fill. The floor was identified by the vertical position of the floor hearth and the presence of sterile carbonate-coated deposits below. The floor had a slight slope from north to south of 10 cm.

Superstructure: No evidence of the superstructure was found. The primary roof supports may have been embedded in walls or corners of the house.

Floor and subfloor assemblages: No floor assemblage was present.

Subfloor Features: One informally constructed floor hearth was present and was designated Feature 400.1 (Figure 7.8). The feature was marked by a semi-circular arrangement of 14 small pieces of burned caliche that were visible on the surface. The hearth was positioned in the east-central area of the floor and was 20 cm deep. A single fire-cracked limestone rock was present near the base and one projectile point, seven flakes, and one Ochoa ware sherd were recovered from the fill.

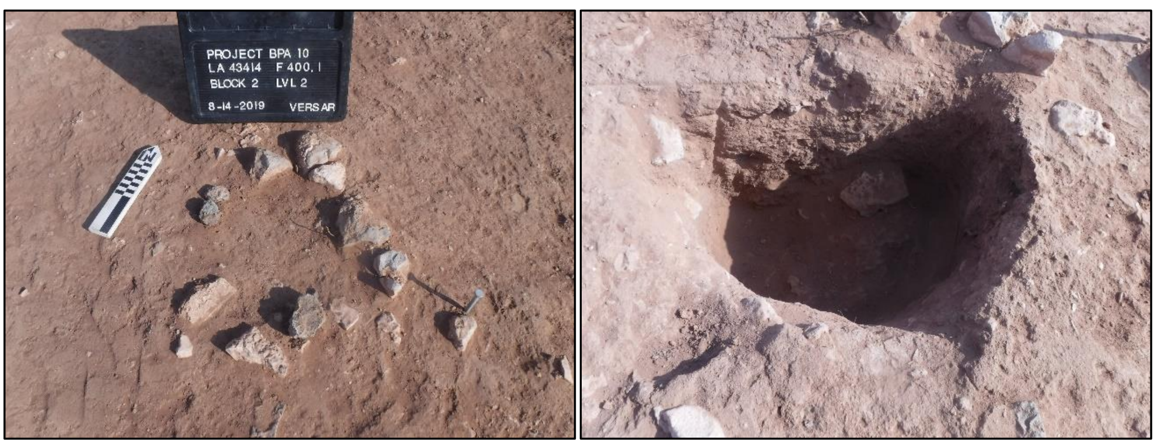

Figure 7.8. Floor hearth Feature 400.1 before excavation (left) and after bisection (right).

Discussion: Room 24 was relatively well-preserved compared with most of the excavated rooms at the Merchant site. The walls were mostly intact and the overall size and floor area of the room could be defined. Critical details of the room include the well-preserved walls, the absence of a floor assemblage, the lack of evidence of intensive occupation that would result in heavily burned hearth linings and a compacted, charcoal-stained floor, and the absence of remodeling episodes.

Summary

Two rooms at the southernmost limits of the Merchant village were investigated. Rooms 7 and 24 comprise a room block of at least three rooms, with an unexcavated room located next to the southern wall of Room 7. There is some surface evidence that a fourth room may abut the northern wall of Room 24, but excavations are needed to confirm this observation.

Ten meters northeast of Rooms 7 and 24, two rooms were noted in the road cut and during an earlier GPR survey, and Feature 39, the large pithouse or midden area tested by John Speth in 1984, is located just 5 m east of those rooms. A review of surface sediments and faint surface alignments of cobbles indicates that these rooms may be connected to additional rooms extending all the way north to the primary room block.

Artifact recovery rates from the excavation block were not particularly high, with a total of 216 artifacts collected from the two rooms and limited extramural exposures. The lithic artifact count was 164 and included debitage, cores, tools, and projectile points. Forty-two Ochoa ware sherds were recovered along with five groundstone fragments, a polishing stone, a piece of limonite pigment, and three animal bones. One radiocarbon date was obtained from each room and several Ochoa ware sherds were submitted for compositional analysis.

Chapter 8

Communal Structures

Among the many and varied features at the Merchant site, the most intriguing and significant were the large and deep pit structures investigated by Robert Leslie and the LCAS from 1959 to 1964. The structures, designated as Rooms 1 and 2 by Leslie and the LCAS, were located south and east of the main room block. The structures are referred to here as pit structures. "Pit structure" is a relatively neutral term describing an architectural structure constructed as a pit or within a pit. We avoid the use of the terms "pithouse" and "room" since they tend to assign or connote a domestic function to the structure. When these structures are compared with the domestic rooms described in previous chapters, it is clear that they represent a much different form of construction and function.

To anyone familiar with prehistoric and historic Southwest settlements, Pit Structure 1 is clearly a kiva or similar form of communal architecture. Domestic structures are rarely as large as Structure 1, nor are domestic structures typically excavated through nearly a meter of carbonate-cemented caliche conglomerate and indurated caliche. Pit Structure 2 was a much more enigmatic feature, and its identification and function remain uncertain. Both structures appeared to be square or rectangular, although sections of the walls and sides of Pit Structure 1 were destroyed by looters.

A brief summary of the excavations and the nature of features is provided in the following chapter. The 1959–1964 LCAS excavations of the two structures and the Versar remedial excavations completed in 2015 are described in much greater depth and detail in the 2016 report of investigations (Miller et al. 2016). The two pit structures are discussed in sequence. For each structure, the LCAS excavations are reviewed first, followed by the 2015 re-excavation efforts to remove backwashed refuse deposits and identify any remnants of floors and floor features. Interpretations regarding the form and function of the structures are presented in the chapter summary.

The unfortunate effects of looting and artifact collecting are also reviewed. Leslie describes a constant struggle to maintain consistent excavations and provenience and document the architecture of the two pit structures against a constant onslaught of looting and artifact mining throughout the interior deposits. In one passage, he describes how the LCAS attempted to excavate a particular location in stratigraphic levels, being careful to screen the dirt outside the structure. When he returned to the site, Leslie found that looters had undermined part of their excavation and had left screened backdirt inside the structure and spread across their excavation area. He noted that the backdirt contained many bone and chipped stone artifacts, and thus it was apparent that the fill had been mined for the artifacts, "goodies and pretty items" as he called them. The ability to interpret the form and function of the two structures as well as their remodeling and abandonment histories are, in a large part, contingent on how badly certain fill strata and architectural attributes were damaged by looting.

Pit Structure 1

When he first arrived at the Merchant site in 1959, Leslie noted that a large area of midden deposits and artifacts near the edge of the escarpment was being looted (Figure 8.1). Leslie and several members of the LCAS decided to salvage what information was possible from the site before it was destroyed by looters and collectors. The following Saturday, the LCAS crew returned to the site and began working in what was designated "Room 1." The excavations continued sporadically over the following 12 months with LCAS crews ranging from two to six members. The LCAS crew first expanded the excavation around the two pits and observed that the fill had a clearly defined stratigraphy and that what appeared to be a floor surface could be seen in the walls at a depth of around one meter.

Figure 8.1. Pit Structure 1 during Leslie's first visit in 1959. The two large looter pits were designated Pit 1 and Pit 2 (not to be confused with Pit Structure 1 and Pit Structure 2).

Stratigraphy of Pit Structure 1

Leslie examined the strata exposed in the profiles of the LCAS excavation units and looter pits in Pit Structure 1 and defined nine strata he designated as "zones" as well as two floor surfaces (Figure 8.2; Table 8.1). Leslie provided detailed and often insightful descriptions of the strata, including measurements, soil descriptions, and artifact counts. Unfortunately, very few photographs of the LCAS excavations clearly show the stratigraphy of the undisturbed fill deposits or walls of looter pits. A particular loss is that there are no photographs of the massive bone deposit of Zone E, including either images of the bones in situ or of the masses of bone removed from the layer.

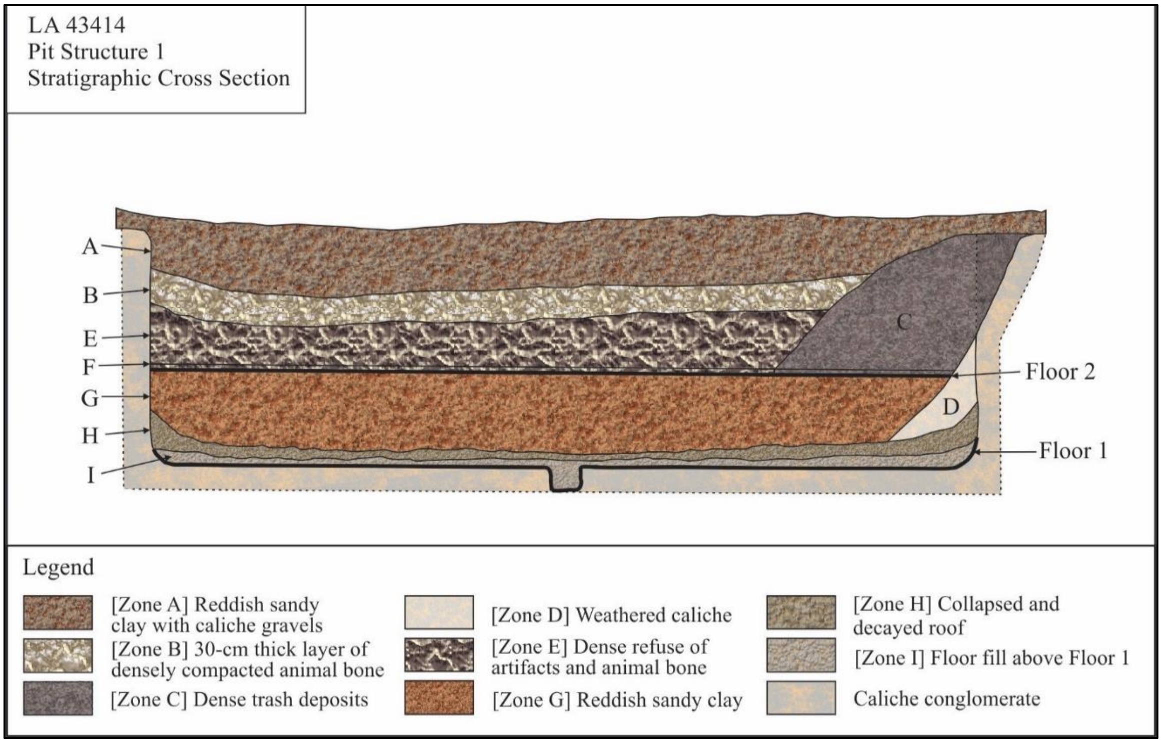

Figure 8.2. Stratigraphic cross-section of Pit Structure 1.

Table 8.1. Stratigraphic zones of Pit Structure 1

Zone	Thickness	Description	Artifacts	Origin	Comments
A	15 to 45 cm	Reddish sandy clay with deteriorated caliche	A few burned caliche cobbles	Eolian and alluvial	Deep in center, thinner at margins
B	15 to 25 cm	Sand and ashes	Dense refuse	Refuse	Thin in center and deeper at margins
C	.91 to 1.29 m	Sloping deposit of sand, ash, and refuse	Refuse of small bones, sherds, lithic tools	Trash deposited	91 cm deep at west edge
D	Not provided	Caliche	No artifacts	Eroded from walls	Deposited before second floor
E	38 cm	Solid layer of bone in matrix of sandy clay	Many large mammal bones and large tools	Ritual?	Possible closure or feasting deposit
F	0 to 15 cm	Reddish sandy clay	Upper 10 cm sterile, lower 5 cm of trash	Natural fill + refuse	Natural fill above floor
Floor 2	1 to 2 cm	Reddish clay	See Zone F	Cultural	Upper (second) floor
G	46 cm	Reddish sandy clay	Charcoal and a few small flakes but mostly sterile	Eolian	Between upper floor and roof fall of lower floor
H	At least 8 cm	Deeper red clay with some caliche eroded from walls	Several small burned caliche rocks	Colluvial	Collapsed roof with latillas and thatch impressions in clay
I	5 cm	Caliche	Numerous ceramic and lithic artifacts	Natural fill + refuse	Thin layer of refuse on lower (first) floor
Floor 1	Unknown	Caliche and reddish clay	See Zone I	Cultural	Lower (first) floor

The nine strata include natural deposits of eolian and backwashed sediments or caliche eroded from the conglomerate layer, refuse deposits, floor fill, and roof fall. The strata and floors reflect two periods of use that were followed by periods of disuse. Zones I, H, and G were associated with the first floor and subsequent disuse or temporary closure; Zones E, C, B, and A occurred after use of the second floor ended. Zone C appears to be a major episode or interval of trash dumping along the eastern wall that was soon followed by another major depositional event represented by the mass of faunal remains comprising Zone E. According to the cross-section, Zone D was a stratigraphic unconformity as it appears to cut through the second floor, but it is likely that construction of the second floor simply ended at the point where the builders encountered the mass of caliche.

Zone A: Zone A was the uppermost layer of natural fill consisting of accumulations of eolian sediments and clay and caliche sediments washed in from the surrounding ground surface. It ranged in thickness from 45 cm in the center of the structure to 15 cm around the edges. Artifact counts were considerably lower than in underlying refuse layers, with comparatively small counts of 50 projectile points and 81 ceramics recovered. The deposit was cemented by caliche and clay, was very hard to excavate, and was easily differentiated from the softer and more friable deposits of Zone B below. Figure 8.3 shows several solid masses of Zone A deposits that had fallen into the room after looters had undermined the stratum by digging into the artifact-rich Zone B refuse deposits. The photograph also provides some idea of the dimensions and depth of the structure.

Zone B: Zone B was a 15- to 25-cm-thick deposit of refuse consisting of many large and small bone fragments, ceramics, chipped stone, sand, and some ash. Leslie notes that Zone B differed from Zone C by having greater numbers of large bone fragments and from Zone E in having artifact refuse, while Zone E was almost entirely faunal remains. Leslie suggests that the stratum was a mix of refuse, bone from Zone E, and natural sediments from Zone A. Artifact counts increased slightly from the mostly natural deposits in Zone A, with totals of 71 projectile points and 491 ceramics collected.

Zone C: Zone C consisted of a dense trash deposit that covered the eastern end of the room from a point about 15 cm below the surface and sloping toward the upper floor for a distance of 1.5 m from the east wall. The stratum was thickest near the wall and measured 90 cm at that point. Dense concentrations of artifacts and faunal remains were found throughout the deposit. Although the volume of Zone C was less than several other zones, the highest count of projectile points (244) and second-highest number of ceramic sherds (1,383) were recovered from the deposit. Unlike other strata throughout the structure, Zone C was mostly undisturbed by looters and offers a relatively unbiased assemblage. The zone could be interpreted as a refuse deposit, but the high number of projectile points indicates it may have been part of the closure deposit overlying the mass of faunal bone in Zone E.

Zone D: Zone D was a small layer of caliche weathered from the top of the walls and deposited along the eastern side of the pit structure. Leslie interprets the deposit as forming after first abandonment of the structure since the roof fall associated with the first floor was stratigraphically positioned below the caliche. Leslie also notes that the second floor was built over the caliche, but his profile shows the second floor abutting the upper part of Zone D. No artifacts or faunal remains were recovered from the level.

Zone E: Zone E was the most interesting stratum and one of the most significant of all the deposits excavated at the Merchant site. It measured 38 cm in thickness and consisted almost entirely of a mass of large and medium animal bone. The majority of the bone was described as large animals that Leslie tentatively identified as bison, deer, and antelope. A minor quantity of small bones from rabbits and other small mammals was present. The bone was mixed within a matrix of sandy clay. While the deposit contained thousands of animal bones, the count of 18 projectile points is lower and the count of 124 ceramics is only slightly higher than the numbers recovered from the natural deposits of Zone A. The low number of points compared with the overlying Zone C is of interest and, as noted in the discussion of Zone C, may indicate that the closure deposit of Zone E was also covered with a layer of artifacts and soil, including a substantial quantity of points.

Figure 8.3. Sections of Zone A deposits collapsed into Pit Structure 1 after looters had dug out the underlying Zone B and C refuse deposits. Mark Leslie serves as a scale, allowing the size and extent of the disturbances to be estimated.

Zone F: Zone F was a 15-cm-thick layer of sediment and artifacts lying on the uppermost of two floors in the structure. The upper 10 cm consisted of reddish sandy clay that was sterile. The lower 5 cm in contact with the floor had several trash areas with moderate artifact densities. Totals of 92 projectile points and 531 sherds were recovered from the lower 5 cm.

Floor 2: The second of two floors was positioned below Zone F and above Zone G. No description of the floor was provided in the site manuscript, but one photograph shows the floor as a smooth and level 2 cm thick surface of compact clay.

Zone G: Zone G was an almost entirely sterile deposit situated below the upper floor and the roof fall stratum associated with the lower (first) floor. The deposit averaged 15 cm in thickness, consisted of loose reddish clay, and was completely sterile. Leslie suggested that Zone G was wind-deposited sediments accumulated after abandonment of the first floor.

Zone H: Zone H was a layer of roof fall associated with the occupation of the lower floor. Some burned caliche and unburned caliche gravels were present in the upper part of the stratum, and the lower portion appeared to consist of reddish roofing clay. No wood construction elements remained intact, but Leslie states that they noticed a couple of areas of soil with a different color that may have been caused by decayed construction wood. Remnants of the clay roof were found at the eastern edge of the deposit below the Zone D caliche. The roof fragments were 8 cm thick and were up to 20 cm in diameter. Impressions of latillas and possibly small cross-section branches were visible on one side of the roof fragments. The reverse sides had numerous small streaks that resembled impression left by grass thatching. Few artifacts were recovered from Zone H, and Leslie combined the artifacts from this stratum with the inventory of material recovered from Zone I.

Zone I: Zone I is the lowermost floor with approximately 5 cm of floor contact artifacts and refuse on the floor. The highest count of ceramics (1,691) and second-highest count of projectile points (102) were recovered from the combined Zones H and I. An inverted sandstone metate with a mano underneath was found in Zone I on the floor.

Floor 1: The first and lowermost of the floors was positioned below Zone I and the caliche conglomerate substrate. The floor was described as a smooth surface of compacted soil consisting of a mix of caliche and clay that was exceptionally hard when mixed with water.

Leslie's Documentation of the Stratigraphy of Pit Structure 1

Leslie's description of the stratigraphy of Pit Structure 1 is perhaps his most important contribution to the archaeology of the Merchant site. A series of stratigraphic zones associated with, or post-dating, two occupational floors were documented: strata include deposits of natural eolian and water-borne sediments (Zones D and G), dense trash fills (Zones A, B, and C), and fills directly on or above the two floors (Zones F and H–I). The most important stratum is Zone E, a 30-cm-thick layer of animal bone.

Unfortunately, few photographs of the stratigraphy are available, and the schematic cross-section is the only illustration. The lack of detailed documentation can lead to some doubt or question regarding the certainty of the stratigraphic zones. A careful review of the photographs and notes conducted as part of the 2014–2015 investigations concluded that the descriptions were fundamentally sound, although there was some concern regarding how the uppermost two or three zones were differentiated.

To further explore the stratigraphic sequence, the projectile point and ceramic totals reported by Leslie (2016a) for each stratigraphic zone were tabulated (Figure 8.4; see Miller et al. 2016 for additional details). Projectile point and ceramic counts are positively correlated (r = .790, r^2 = .623), although inspection of the residuals found that there was a disproportionate number of ceramics in Zone H-I and a disproportionate number of projectile points in Zone C, an observation that proved of interest for discussions of site formation. No artifacts were tabulated for the natural deposits in Zones D and G.

Despite the mass of animal bone in Zone E, few artifacts were present, which further testifies to the distinctiveness of that stratum. Additional confirmation for the presence of the mass bone deposit is provided by the fact that thousands of animal bones were recovered from the backdirt in the structure, and it is estimated that tens of thousands of bones remain in the unexcavated backdirt deposits. According to John Speth, Leslie told him that when LCAS members dug the layer, bone was so dense that they dumped wheelbarrow loads over the edge of the nearby bluff (as noted in Chapter 9, the location of this dump was found during the 2015 fieldwork). The final observation is that the highest artifact counts are associated with stratigraphic zones described as consisting of dense refuse deposits. In addition to the photographic and documentary evidence, the artifact counts clearly support the stratigraphic sequence. The overall conclusion is that the stratigraphic sequence in Structure 1 can be used to derive and support inferences regarding the nature of the pit structure and meaning of its fill deposits.

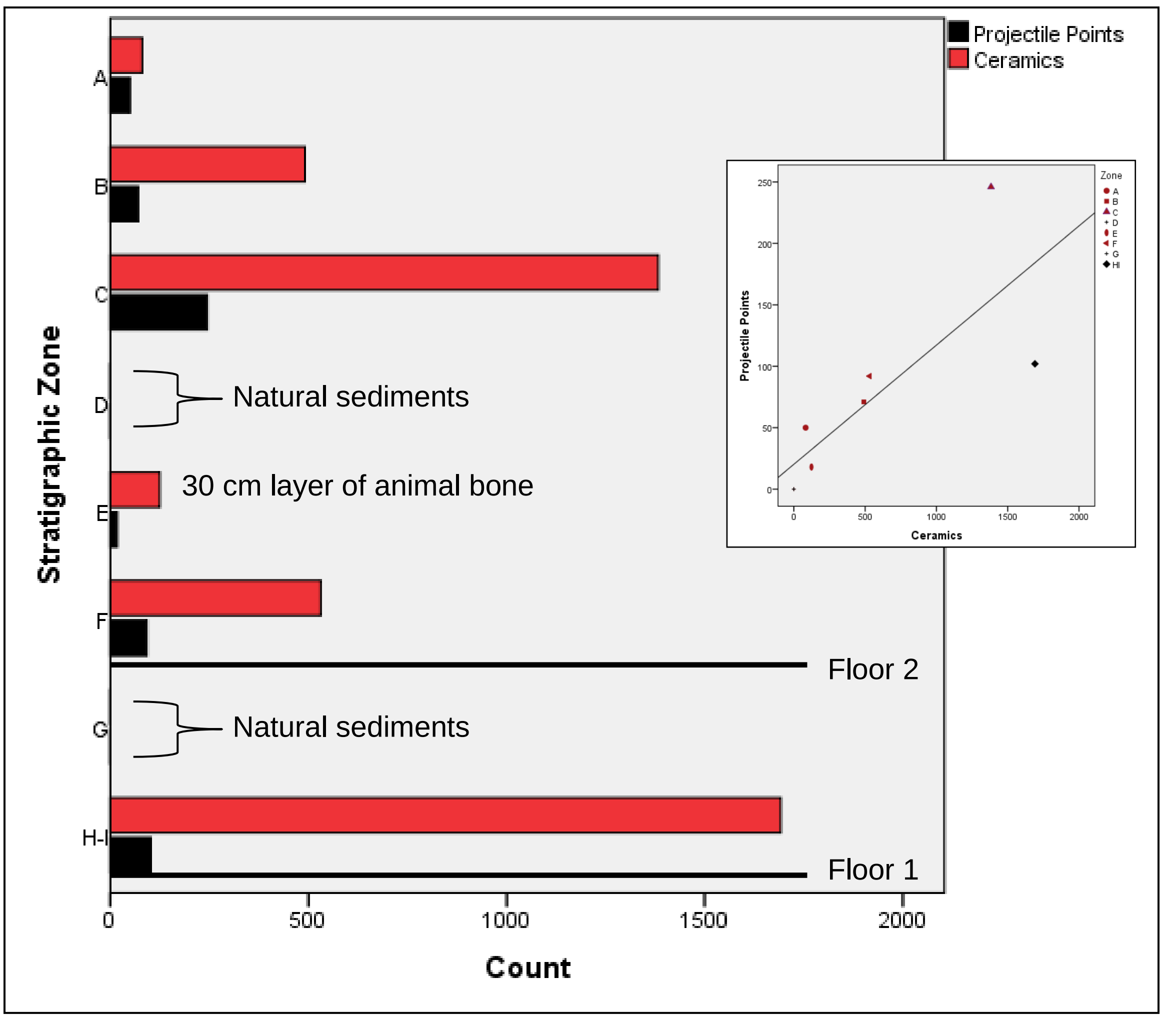

Figure 8.4. Schematic illustration of the stratigraphic sequence of Pit Structure 1 with the associated counts of projectile points and ceramics. The regression scatterplot (inset) shows the correlation of counts.

LCAS Excavation of Pit Structure 1

Leslie and the LCAS worked in Pit Structure 1 while it was being continually looted. The looters often caused substantial damage. Leslie describes how looters would follow a layer of refuse (a productive context for projectile points and other collectible artifacts) like miners, digging sloping shafts and adits into the sides of the exposed refuse deposits. The holes would then collapse, leaving large chunks of fill and debris inside the rooms. Attempting to identity and trace walls proved futile under such circumstances, and the size of the structures had to be estimated from the partial floor surfaces exposed in units.

Realizing that they were competing for time against several looters, Leslie and the LCAS developed a strategy of excavating small units, 12 inches wide (30.5 cm), through the meter of fill deposits to the floor. The reasoning was that it would be futile to attempt to remove the entire fill level by level given that large areas of the fill and stratigraphy could be destroyed by looting during any weekend that the LCAS was not working at the site, and thus it would be best to obtain stratigraphic data from one small section at a time. Deposits were screened through ¼-inch mesh, except for certain features or unusual areas that were screened through ⅛-inch mesh. Artifacts were bagged and labeled according to unit and level or stratum.

A floor was encountered after the overlying refuse deposits of Zone E and Zone C had been removed (Figure 8.5). The floor (later designated as Floor 2 after the deeper floor was found) was a compacted layer of dark reddish brown clay similar to the deposits of Pleistocene-aged clay exposed along the flanks of the escarpment. The floor was cleaned and examined for subfloor features. Figure 8.6 shows the floor and a schematic of the various fill excavations to reach the floor (controlled excavations in zones, and looted deposits). Two floor hearths were recorded along the central east-west axis of the room, each approximately 1 meter from the eastern and western walls. The eastern hearth was intact and consisted of a ring of caliche slabs or cobbles with an exterior diameter measuring 40 cm and an interior pit measuring 25 cm in diameter. A dark layer of soil was present on the interior at floor level. The western hearth retained only a small arc of rocks, with the remainder scattered across the floor. It had a similar construction to the eastern hearth but with a slightly larger pit of 33 cm. Each hearth was positioned atop the floor, and the pits did not penetrate below the floor. A suspected entry ramp extended from the southeastern corner.

Two circular posthole stains were found approximately 60 cm from the northwestern and northeastern corners, each measuring approximately 20 cm in diameter. During later excavations of the underlying fill and Floor 1, examination of the underlying fill discovered a third posthole in the southwest corner and found that the holes extended from 25 to 36 cm deep. The size and depth of the postholes in Pit Structure 1 correspond to that of primary roof support posts in Jornada pueblos (Miller and Graves 2009).

After Floor 2 had been completed, Leslie and the crew believed that the excavation of the room was complete and that all the floor features had been excavated. They planned to return to the site and Pit Structure 1 a final time, clean the floor and walls, and complete a thorough photographic documentation of the structure. All of the screened backdirt piled around the sides of Pit Structure 1 was then dumped over the escarpment to the south.

Again, however, the looters struck during their absence. When he returned to the site in 1963, Leslie found that looters had continued digging in the structure and had penetrated through the upper floor, revealing additional deposits and another floor surface below. The structure was filled with screened dirt, and most of the walls had been destroyed by the looters, who apparently did not recognize the walls or limits of the structure. Examination of the looter pits dug through parts of the northern and southern fills and floors noted that a floor was present 60 cm below Floor 2 and separated by a layer of roof fall and trash from the first floor.

Figure 8.5. Excavations in the upper fill deposits and Floor 2. Mark Leslie is digging in the trash deposits of Zone C. The smooth, compacted surface of Floor 2 is visible and a collection of bone fragments collected from Zone C is visible at the lower left.

The fill deposits between the two floors were designated as Zone G and Zone H and were excavated over the course of several weekend sessions. Aside from the looter pits, most of the fill deposits comprising these zones was systematically excavated and screened. Zone G was mostly natural sediments, and Zone H consisted of floor fill.

Most of Floor 1 was intact and documented. The floor was a compacted layer of fine caliche mixed with reddish brown clay that formed a hardened layer when moistened. Figure 8.6 shows the floor and a schematic of the fill excavations. A single floor hearth was present along the central east-west axis about 60 cm from the western wall. The hearth was constructed in the same manner as the two hearths in Floor 2, with a ring of caliche cobbles measuring 45 cm on the outside and an interior pit measuring 30 cm diameter. A small layer of ash and burned soil was present inside the hearth. A primary posthole measuring 30 cm in diameter and 28 cm deep was present in the center of the floor. A sloping entry ramp extended from the southeastern corner but was not excavated. Three exterior postholes were found in contexts outside the limits of the floor.

The Dimensions of Structure 1 based on the LCAS Excavations: Pit Structure 1 appears to have been square. The size, depth, and floor area of the structure are difficult to determine because looting destroyed portions of the walls. Leslie notes that most of the walls were disturbed by looters at various times during the 4 years the structure remained open, and Leslie included few details on the construction and attributes of the walls in his manuscript. Leslie calculated the room dimensions on the basis on the exposed floor surfaces. Floor 2 (the upper floor) measured 4.9 m (16 feet) north-south and 5.5 m (18 feet) east-west for a floor area of 26.9 square meters. The dimensions of the lower floor (Floor 1) were approximately the same as the upper floor, although Leslie's plan map shows the north-south length at approximately 5.8 m (19 feet). Floor 2 was 1.52 m below the surface and Floor 1 was the deepest part of the structure at 1.83 m.

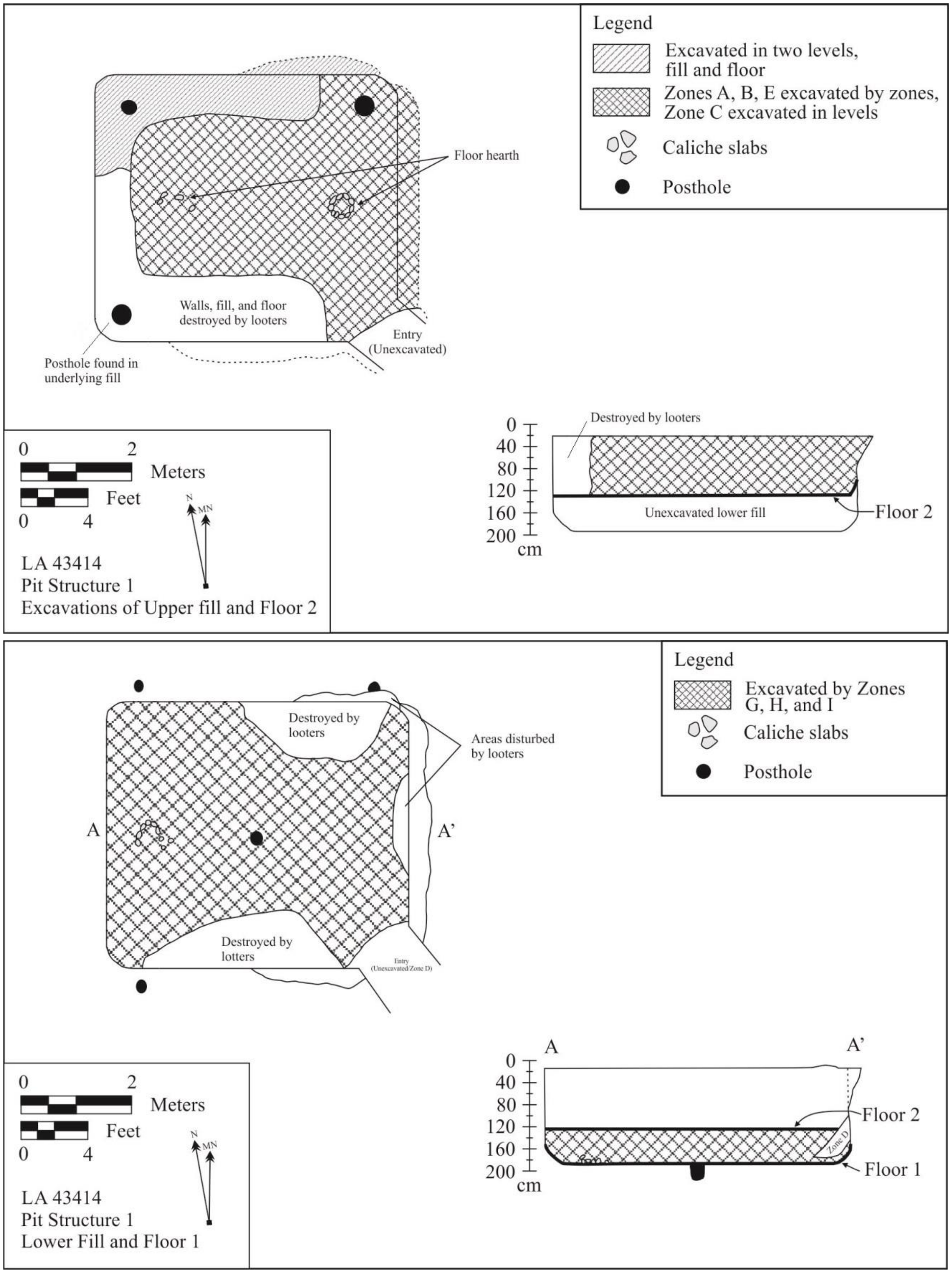

Figure 8.6. Leslie's plan and cross-section maps of Floor 2 (upper panel) and Floor 1 (lower panel) in Pit Structure 1.

The 2015 Excavation of Pit Structure 1

Pit Structure 1 had been left as an open excavation since the final fieldwork was completed in 1964 (see photographs in Miller et al. 2016). The contours of the upper levels of the exposed caliche sides of the excavation unit walls were smoothed by erosion and sediment, caliche gravels, and screened backdirt had eroded into the exposed excavation.

Versar began remedial excavations in Pit Structure 1 in March 2015. The first step was to remove the dense vegetation growing inside the open excavation and across the ring of backdirt (Figure 8.7). After vegetation was cleared, a 2-x-2-m collection and excavation grid was established and tied to the UTM coordinates of Speth's 1984 datum. The removal of vegetation allowed the dimensions of the backdirt ring and depth of the excavation to be estimated. The cleared backdirt ring measured approximately 18 m by 18 m. Subtracting the 124 square meters of LCAS excavations inside the structure, the backdirt ring covered an area of approximately 200 square meters. The mounds ranged in height from 17 to 30 cm above the original ground surface, with most measuring around 30 cm. The open excavation area measured 11.2 by 11.0 m and at its deepest point was 1.63 m below the ground surface.

Figure 8.7. High-resolution aerial image of the initial excavations in Pit Structure 1 in 2015 showing the area of cleared vegetation and initial excavations in the backdirt and interior of the structure. The LCAS and looter backdirt forms a mounded ring around the open excavation. Sediments from the 2015 excavations were screened over plastic sheets to preserve the integrity of the underlying cultural deposits.

Surface collections were conducted over the entire backdirt mound and open excavation area and a sample of the LCAS backdirt was excavated and sampled. A 1-x-7-m unit was placed across the width of the southern side of the backdirt ring and a 1-x-5-m unit was established across the eastern side (Figure 8.7). The results of the surface collections and excavations are described in Chapter 9.

Excavation of the interior backdirt deposits within the open excavation of Pit Structure 1 began with a 1-m by 7-m north-south hand trench traversing the eastern half of the structure. The excavation reached a depth of 70 cm and as noted in the exterior backdirt mounds, the interior fill contained exceptionally high artifact counts. A second trench was excavated across the east-west axis of the structure, revealing a similar series of deposits to depths reaching 82 cm. Three strata of infilled deposits, some with laminated layers, were observed in the profiles, indicating that the backwashed fill had been deposited over the course of many erosional episodes during the past 50 years. Modern artifacts from the late 1950s and early 1960s were recovered throughout the three strata, confirming that all were of modern origin. As documented elsewhere in midden and backdirt deposits, the material culture densities of the interior deposits were exceptionally high, and, again, the nature of the assemblages reflected the fact that the deposits had been screened and selectively collected for projectile points and other prominent artifacts.

The outstanding discovery of the 2015 excavations was that, despite the history of excavation and looting, an intact plastered floor and several floor features were revealed in the exploratory trench excavations (Figure 8.8). The floor consisted of compacted clay around 5 mm thick with a caliche-plastered surface. A complete bifacial mano was found on the floor against one of the floor features. The presence of such a collectible artifact verified that the floor and its features were intact, since Leslie and the LCAS crews documented and collected any whole groundstone tools found on room floors.

Figure 8.8. View of the floor and floor features when first exposed: (upper left) plastered floor and floor features below layer of backwashed fill and caliche debris; (upper right) two subfloor pits; (lower left) bifacial mano resting on plastered floor; (lower right) compacted floor with remnants of caliche plaster.

Fourteen floor features were exposed and excavated, including two floor hearths, one pit, two ash pits, and six postholes. Artifacts and groundstone tools were present in the fills of several features. Macrobotanical and pollen remains of several plant species were identified in samples collected from hearth and pit fills, including many fragments of charred corn and cattail and honeysuckle pollen.

The completed excavation of the fill and exposed floor surface of Pit Structure 1 is shown in Figure 8.9. The damage and pitting of the walls caused by looters is clearly evident in the photographs of the completed remedial excavations, and the walls were further impacted by 50 years of erosion within the open excavation. The shape of the structure has proven difficult to reconstruct.

Figure 8.9. View of the completed 2015 excavations in Pit Structure 1 showing damaged walls and remnants of plastered floor (dark grey areas). View faces toward the west.

The apparent square shape (and larger dimensions) seen in the aerial view of the open LCAS excavation (see Figure 8.7) is misleading when compared with the 2015 excavations (Figure 8.10). Only the segments of the uppermost caliche surface surrounding the open excavation retained what appears to be a square shape. As evident in Figure 8.9, the caliche conglomerate below the uppermost level was a very irregular and sloping surface to the depth of the floor. Leslie's planviews and manuscript describe the structure as square, and in later conversations with John Speth he claimed that the apparent round configuration was an artificial creation resulting from the extensive damage to walls and interior surfaces by the looters (John Speth, personal communication 2016). We note that Leslie had a good eye for strata and features and paid attention to the detail of his excavations. While our excavation data cannot confirm or refute his statements regarding the shape of Pit Structure 1, we also have no reason or evidence to disregard his interpretation that the structure was square.

The dimensions of the lower floor are 4.56 m north-south by 4.48 m east-west. These are more than a meter smaller than Leslie's measurements of 5.8 m by 5.5 m. Based on the measurements from the 2015 excavations, the floor area is 20.4 square meters as opposed to Leslie's area of 31.9 square meters. It is felt that the 2015 measurements are more realistic given that the caliche conglomerate "walls" surrounding the floors were mostly destroyed by looters and erosion.

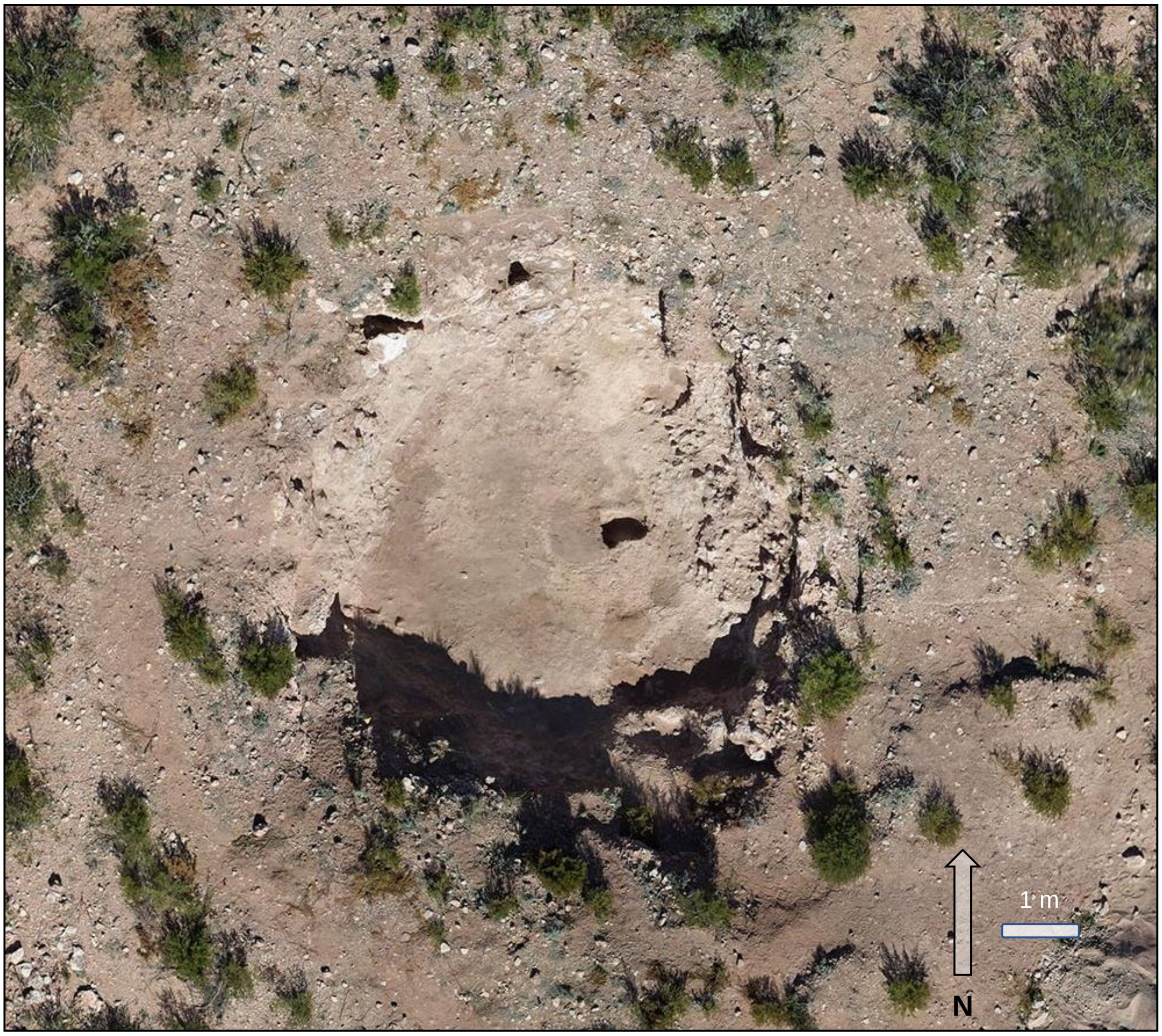

Figure 8.10. Aerial view of the completed 2015 excavations in Pit Structure 1 illustrating the problem of determining the shape of the pit structure.

Pit Structure 2

Pit Structure 2 is located at the southern margins of Midden B approximately 6 m east of Room 25. The documentary and photographic records for Pit Structure 2 are less complete and extensive than those available for Pit Structure 1. While it was challenging to decipher the sequence of excavations, looting events, and the cultural strata of Pit Structure 1, it proved even more difficult to unravel the excavations and function of Pit Structure 2.

LCAS Excavation of Pit Structure 2

Leslie and the LCAS had suspected that a structure of some kind existed near the northeastern margins of Refuse Area B because the looting and artifact mining in that location had encountered deposits that extended much deeper than other parts of the midden, which generally encountered caliche bedrock at a depth of 30 cm. Some of the potholes in the area extended to depths of 2 feet (60 cm). Leslie and the LCAS crew decided to explore the newly disturbed areas and spent 2 days in 1960 excavating a portion of the fill and interior features.

The LCAS crew first cleared and screened the looter backdirt in and around the looter pit, noting that only bone slivers and sherds were recovered. Following the edge of a suspected wall exposed by the looters, they traced the walls by removing the overlying backdirt and approximately 30 cm of soils and midden deposits down to the caliche conglomerate. By exposing the upper caliche surface and the "walls" formed by the conglomerate bedrock, the outlines of the structure were revealed. Looters had dug through the southern part of the structure and uppermost floor surface (Figure 8.11). The southern wall was destroyed by looters and some wall segments had collapsed into the fill, but much of the eastern wall remained relatively intact. At this point, the structure measured 3.66 m north-south by 2.44 m east-west. The eastern wall extended another 1.83 m to form a 1.07-m-wide feature that was thought to be an antechamber or entryway. Further excavation of this feature found it was a ramped entry that sloped from a few centimeters below the caliche to a point 30 cm above the lower of two floors in the structure.

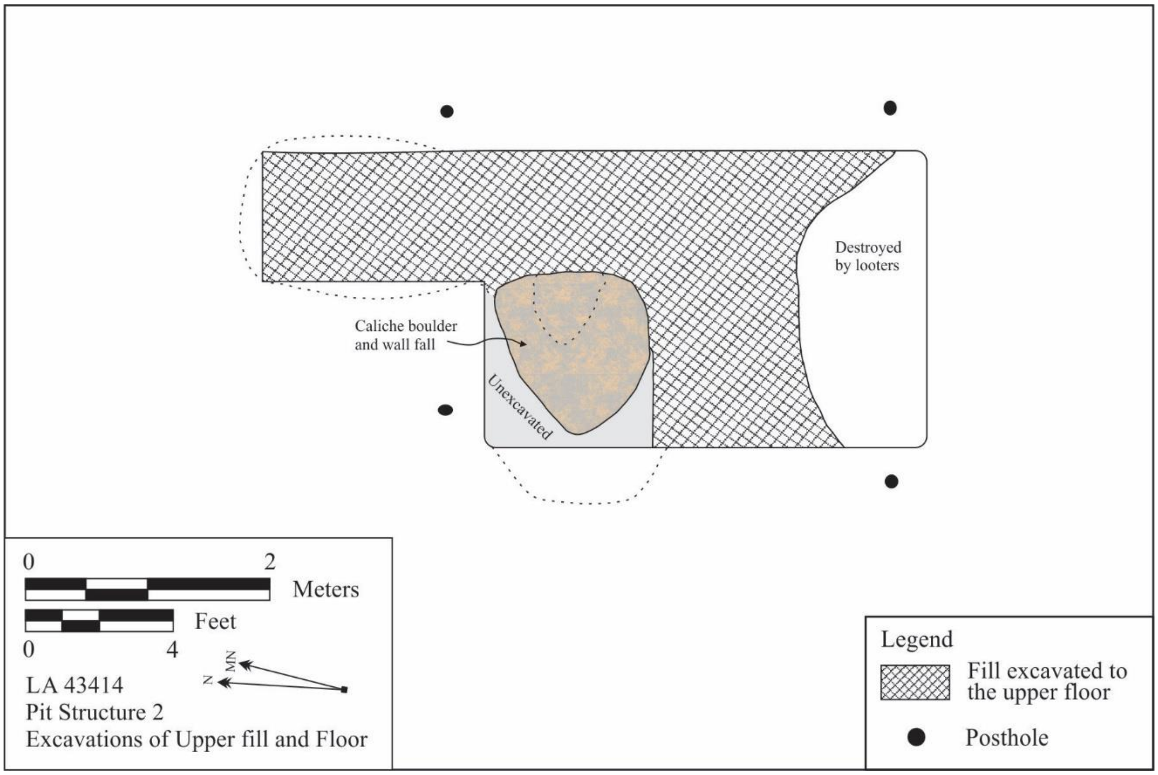

Figure 8.11. Leslie's plan map of the outline of Pit Structure 2 defined by tracking the upper caliche walls and excavating the upper fill.

The stratigraphy of the upper fill was difficult to define because of disturbances from the uncontrolled excavations across Midden B, but some basic stratigraphic zones were described. The stratum above the structure consisted of midden deposits that ranged from 30 to 45 cm in depth. The interior fill consisted of a deposit similar to Zones B and C of Pit Structure 1. The fill was a mix of eolian and clay sediments with large numbers of artifacts, animal bone, and pockets of ash or concentrated masses of bone. Burned caliche rocks were common, as were natural caliche pebbles and gravels eroded from the surrounding conglomerate. A section of the caliche conglomerate forming the western "wall" had broken off and was found within the upper fill. The caliche boulder was encountered in a small unit and was initially thought to be bedrock, but further excavation determined it was a fragment of the surrounding conglomerate.

Around 8 cm below the boulder a floor was encountered. The floor was a surface of dark red clay positioned approximately 107 cm below the ground surface. Approximately 30 percent of the floor in the southern part of the room had been destroyed by looting, but the remainder was intact. Leslie states that the floor was not examined for the presence of interior postholes or floor features. A review of the photographic record discovered that a collared floor hearth or primary posthole is clearly visible in an enhanced slide photograph of the floor (Figure 8.12). In his SW Federation article, Leslie (1965a:27) mentions that hearths were present in both of the "pit rooms," but no further information on the provenience of the hearths is provided.

Figure 8.12. Filtered and enhanced version of Leslie's underexposed slide E4_134. The upper floor of Pit Structure 2 is shown (facing northwest), including the caliche conglomerate "boulder" wall segment found resting a few centimeters above the floor. A collared floor hearth or primary posthole can be seen to the right of the boulder.

The LCAS crew removed more of the overburden deposits around the edges of the structure, revealing several exterior postholes in the caliche conglomerate (Figure 8.13). Six postholes were present around 30 cm from the wall edges on the eastern, western, and southern walls. The postholes averaged 20 cm in diameter and had been cut 25 to 30 cm deep into the caliche.

After clearing the floor surface, Leslie did no more work in Pit Structure 2, devoting his attention to Structure 1 and the domestic rooms. The room remained open for the next four or five years, until the spring of 1964 or 1965 when looters dug through the floor and screened additional fill deposits found below the floor. Leslie obtained two bags of bones and artifacts, but little of the artifact content could be described. He also obtained a basic description of the floor and fill associated with the earlier occupation of the structure that he included in his cross-section maps (Figure 8.13). It is important to note that the cross-sections and descriptions of the lower floor and fill are based on an interview with the unnamed excavators and that Leslie did not witness the actual excavation. According to the excavators, the floor was a surface of hard, smooth caliche encountered around 1.8 m below the surface. No floor features were described. The overlying fill was similar to the strata observed above Floor 1 of Pit Structure 1, consisting of an upper layer of somewhat sterile eolian sand and a lower 30 cm of trash and caliche debris mixed with the sandy sediments.

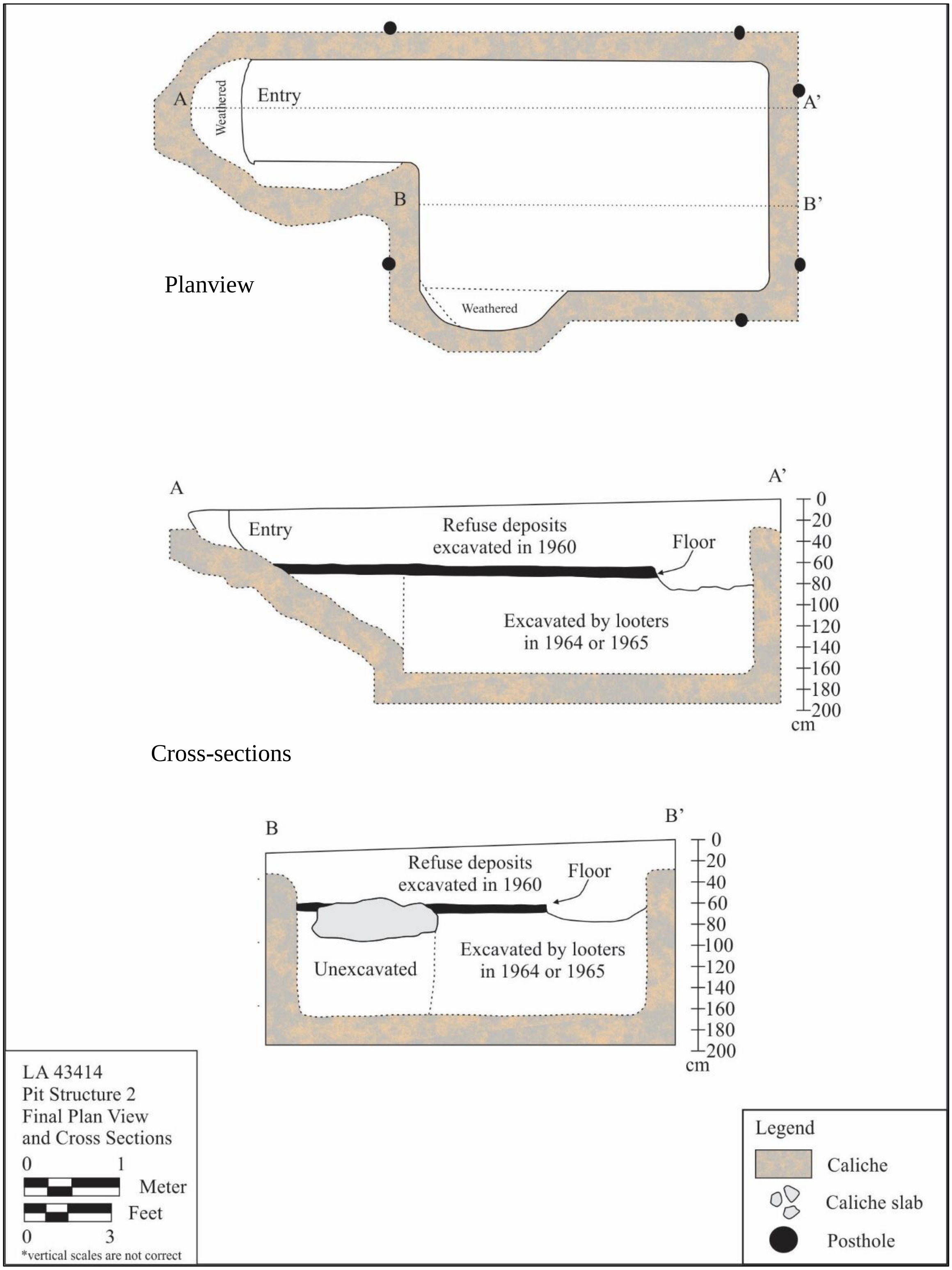

Figure 8.13. Final planview (upper drawing) and cross-sections (middle and lower drawings) of Pit Structure 2 from Leslie's 2016 manuscript.

Leslie was unable to describe the stratigraphic sequence of artifacts and artifact types from Pit Structure 2 as thoroughly as he did for Pit Structure 1. The upper fill and floor contact deposits yielded 57 projectile points, 1,050 ceramic sherds, and a mussel shell pendant. A collection of miscellaneous chipped and groundstone artifacts is mentioned, as well as quantities of animal bone, but as happened elsewhere across the site, these artifact classes were not collected in a systematic manner. Apparently, the lower fill and floor were mined for projectile points and other noteworthy artifacts, and Leslie could only report a ceramic count of 900 sherds.

The 2015 Excavation of Pit Structure 1

As with Pit Structure 1, Pit Structure 2 had been left as an open excavation since the last episode of fieldwork in 1964 or 1965. The same effects of five decades of exposure and erosion were visible: the ring of backdirt surrounding the structure had leveled a bit and spread out horizontally, and quite of bit of the backdirt had washed into the interior of the structure. Versar began remedial excavations in Pit Structure 2 by first removing the dense vegetation growing inside the open excavation and across the ring of backdirt. No excavations were conducted in the backdirt mounds surrounding the structure. Excavation of the interior backdirt deposits within the open excavation began with a 1-m-wide north-south hand trench that crossed from the southwest to northeast corner (Figure 8.14).

Figure 8.14. View of excavation trench in Pit Structure 2 facing south. Note the caliche debris throughout the fill and the deep excavation at the southwest corner.

Excavations began in the northern three 1-m by 1-m subunits in an attempt to find the floor encountered by the LCAS. A wall area was found, and accordingly the southern subunits were excavated, revealing a wall on the other side. Having defined the walls on two sides, another series of units was opened toward the southern wall. The two adjacent trenches defined the major wall areas originally cleared by Leslie and the LCAS, as well as tracing the underlying conglomerate bedrock. No remnants of either the upper or lower floors described by Leslie were identified in the severely disturbed structure.

The interior stratigraphy and fill deposits were similar to those of Pit Structure 1. Profiles show a primary stratum of dark brown sandy loam with charcoal and moderate densities of caliche gravels overlying a layer of laminated light tan to brown sandy loam (Figure 8.15). Gravels and cobbles eroded from the surrounding caliche conglomerate were present around the sides of the interior fill, and it even appeared as if the western margins of the pit were actually an area of caliche conglomerate collapsed into the structure, of which the large caliche boulder would have been a part. The base of the trench and conglomerate bedrock surface was very uneven. No floor surface could be seen in the profiles, but a basin-shaped depression with a possible subfloor pit was observed in the western profile. Another noteworthy aspect is that the southwestern corner of the unit extended more than a meter below the bedrock across the room.

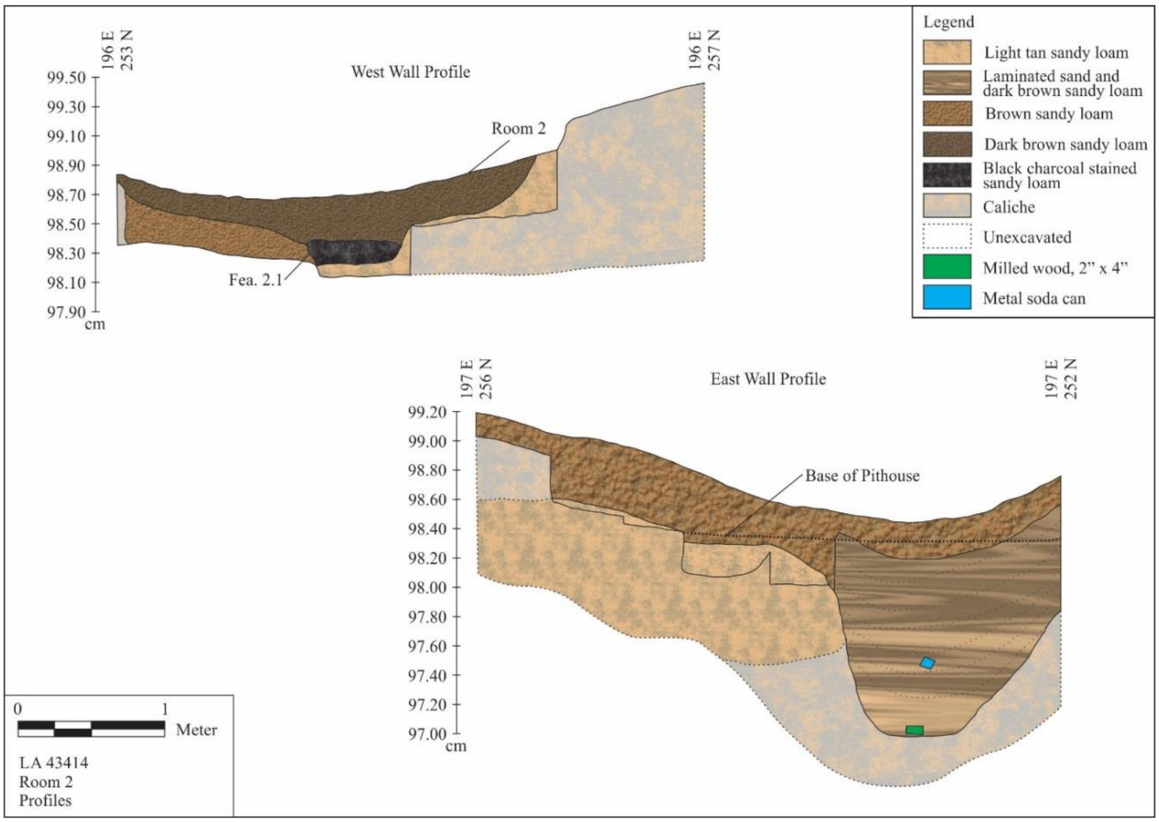

Figure 8.15. Profiles of the west and east walls of the excavation trench across Pit Structure 2.

The material culture densities inside Pit Structure 2 were not as high as those observed for Pit Structure 1 and other refuse areas, but relatively high numbers were recovered. The nature of the assemblage, such as the low projectile point numbers, reflect the fact that the deposits had been screened and selectively collected for projectile points and other prominent artifacts. Numerous modern artifacts, including metal soda cans and containers, nails, wire, and other objects were found throughout the deposits, verifying that the interior fill was modern backdirt from the surrounding mounds.

No remnants of the two floor surfaces described by Leslie and the LCAS excavators were found. The upper floor had been entirely removed by the two unnamed LCAS excavators in 1964 or 1965. If a lower surface existed, it had also been destroyed, leaving an uneven and pitted caliche bedrock surface. While the upper floor surface was missing, the basal remnants of a possible floor feature was defined in the 2015 excavation trench. Feature 2.1 was a possible subfloor feature exposed at a depth of 105 cm below the surface in the trench in the northwestern quadrant of the structure. It was a shallow basin-shaped surface measuring 66 cm in diameter and 14 cm in depth. The fill consisted of a dark brown sandy loam with scattered charcoal and some gravel inclusions. No artifacts were present, but a charcoal sample was collected from the fill.

Deep Deposits in the Southwestern Corner: In the introduction to his discussion of Pit Structure 2, Leslie makes a passing statement about their decision to explore the deep midden deposits in Refuse Area B: "…so we spent the next two days trying to establish if this was a room or just a fault in the caliche trash filled (sic)."

Several unusual features and contexts were encountered during the excavations at the Merchant site conducted in the 1960s, 2015, and 2019, but the most perplexing feature of all was the deep pit encountered in the southwestern corner of Pit Structure 2. The pit extended far below the elevations where the LCAS excavators had reported floor surfaces. The pit was filled with multiple layers of natural fine-grained and coarse-grained sediments (Figure 8.16). Modern artifacts were found throughout the layers, establishing that the entire fill sequence was modern in origin. A Grape Nehi soda can was found at a depth of 1.1 m below the interior fill surface (see Figure 8.15) and a modern milled lumber 2-by-4 beam was found at the bottom of the pit at the rather astonishing depth of 1.6 m below the level of the interior fill and 2.2 m (nearly 7 feet) below the original ground surface.

Figure 8.16. Base of the excavation of Pit Structure 2. A modern 2-by-4 wood beam was found at a depth of 1.6 m below the surface of the interior fill and 2.2 m below the original ground surface.

A possible explanation is that the deep pit was a natural fissure in the caliche conglomerate. Such natural fissures, or "pipes," are a common feature of karst landforms such as the caliche and caliche conglomerate geomorphological units across southeastern New Mexico and west Texas. A similar trash-filled pipe was identified in a backhoe trench at LA 99437 (Heilen and Murrell 2015:69–72) where a natural pipe more than a meter in depth had been used as a storage feature. Leslie's comment regarding the possibility that the deep refuse in Area B was a trash-filled "fault" in the caliche suggests that he had encountered such features somewhere else in southeastern New Mexico. The looters of Pit Structure 2 followed the artifact deposits within the pit to a depth of nearly 7 feet below the surface and afterwards left a 2-by-4 wood beam at the base of the pit.

There is no mention of the pit in Leslie's paper or draft manuscript. It is somewhat puzzling how this feature escaped his detection. He surely would have noticed such a deep pit during the LCAS excavations of 1964–1965 or during one of his many return visits to the site between 1965 and 1984. The laminated sediments and modern artifacts in the fill offer some clues. The darker coarse-grained sediments with small caliche gravels represent relatively high-energy sediments deposited during periods of heavy rainstorms. The lighter fine-grained sediments were probably a combination of eolian and eroded clay sediments. Artifacts, including prehistoric materials ignored by the collectors and historic items discarded by the looters, were backwashed into the fill and incorporate into the laminated deposits.

Floor Surfaces of Pit Structure 2: The attempt to define the dimensions, depth, and architectural attributes of Pit Structure 2 during the 2015 excavations was mostly unsuccessful. Most of the walls, the floor surfaces, and even the subfloor basal substrate had been severely disturbed by looters, and whatever features had been exposed by Leslie and the LCAS in the upper fill and floor had been dug through by looters or by a pair of careless LCAS members in 1964 or 1965. Photographs show that even the dense caliche "walls" bounding the structure were full of holes and pits dug by looters. Whatever lower floor or surface had been encountered by the excavators was also mostly gone, and we question whether a lower floor actually existed.

The remnants of the straight eastern wall seen in the LCAS photographs and 2015 exposures indicate that some form of formal pit structure or the beginnings of such a structure had been cut through the caliche conglomerate. The 1960 LCAS excavations established that the structure had a prepared floor and at least one major floor feature. However, defining the actual shape, dimensions, and floor of the pit structure has proven to be difficult based on the LCAS documentation, and the 2015 excavations of the fragmentary remnants of the structure did little to clarify the situation. It is possible that the irregular shape of the structure resulted because it was not completed. It is also plausible that the structure was not expanded to a full, square shape because a particularly hard and dense area of caliche was encountered. There is precedent for such a thing at the Merchant site in the form of the circular caliche deposit in the floor of Room 6 that could not be penetrated more than a couple centimeters using a pointed steel digging bar.

Based on the partial caliche "walls" exposed in the 2015 units, the structure measured 3.0 m in width and up to 3.6 m in length for an approximate floor area of 10.8 square meters. These dimensions roughly match those reported by Leslie, although he describes a smaller width by around 60 cm. The difference in widths is probably caused by the extensive disturbance of the walls and basal surfaces across the western half of the structure. The structure is quite narrow for a typical communal feature, but as noted above, it is possible the structure could not be expanded or was not completed.

Because no remnant floor surfaces were identified, it was difficult to reconstruct the positions and depths of the upper and lower floors from the 2015 excavation data. It is estimated that the upper floor was positioned between 85 and 100 cm below the ground surface. While the position of the upper floor can be reconstructed with an acceptable degree of error, the lower floor presents a different set of problems. According to Leslie's LCAS sources, the depth of the lower floor was 1.8 m below the surface. The 2015 excavations found little fill below the estimated position of the upper floor and the very uneven layer of caliche conglomerate bedrock below. It was concluded (see Miller et al. 2016:188-190 for more details) that the verbal account of the fill deposit and lower floor surface provided by the unnamed LCAS informants refers to the excavation of the laminated sediments filling the caliche pipe in the southeastern corner of the room.

Although the excavators mention two floors, our conclusion is that Pit Structure 2 had a single floor. Unlike Pit Structure 1, there is no evidence of remodeling and constructing a second floor. The shape and dimensions of the structure are troublesome, and the 2015 excavations were unable to resolve the atypical shape of the walls and the position of the entryway. Pit Structure 2 had the same conditions of heavily disturbed walls and deeply pitted caliche conglomerate surfaces around the interior perimeter as observed for Pit Structure 1, and the original shape and dimensions could not be determined, but one wall was very straight and indicates that perhaps the structure could not be completed.

What Were Pit Structures 1 and 2?

Two of the most intriguing and significant features at the Merchant site are the large and deep pit structures investigated by Robert Leslie and the LCAS in the early 1960s. The 2015 excavations were designed to establish whether any architectural attributes or features remained intact, to clarify the size, depth, and shape of the structures, to examine the nature of the fill and backdirt deposits, and to obtain chronometric and subsistence samples. In turn, these studies would contribute to interpretations of the social function of the structures, their life histories (after Walker 1995, 2002), and evidence of ritual closure or termination. The 2015 re-excavation efforts removed the backwashed refuse deposits and traced remnants of floors and floor features. The results of these excavations were then correlated with the LCAS investigations in an attempt to reconstruct the morphology, life history, and function of the two pit structures. The ability to interpret the form and function of the two structures and their remodeling and abandonment histories was partially contingent on how badly certain fill strata and architectural attributes were damaged by looting.

Pit Structure 1 was clearly a form of communal or civic-ceremonial architecture, or perhaps even a kiva. Pit Structure 2 is an enigmatic structure that apparently was built over a caliche pipe or fissure and may have been a second civic-ceremonial structure that was not completed or could not be expanded to a standard size and shape.

In the opening to his classic treatment of Southwestern kivas, Watson Smith (1952:154) observed: "There are many pitfalls for the unwary Southwesternist, but perhaps the easiest to fall into and most difficult to climb out of is that of the kiva." The pitfalls mentioned by Smith are magnified considerably for anyone attempting to drag the concept of a kiva across the southeastern Plains of New Mexico. The differentiation of kivas and protokivas from pit structures was the subject of a long and somewhat still simmering debate (Blinman 1989; Lekson 1988, 1989; Wilshusen 1986, 1988, 1989), and the range of forms and expressions of kivas are still uncertain in some regions.

The intent here is not to debate the nature of, or the existence of, kivas per se, but rather to explore the possibility, or more truthfully the probability, that one and perhaps both of the deep structures excavated by the LCAS and re-excavated in 2015 were a form of civic-ceremonial architecture at the Merchant site. Leslie (1965a; 2016) refers to the two structures as rooms or pithouses, and those terms have been repeated wherever the Merchant site has been referenced (see for example Boyd 1997:352; Gregory 2006:7). However, several individuals familiar with the site, as well as Calvin Smith who participated in the 1959 and 1960 excavations of the two structures, expressed their opinion that the two deep structures were something analogous to kivas. In the present report, the generic term "pit structure" was deliberately used when referring to the structures, thus avoiding any connotations or preconceptions that might have resulted from the use of the terms "pithouse," "civic-ceremonial structure," or "kiva." In the following discussion, the case for interpreting the two features as civic-ceremonial structures or kivas is presented.

The term "civic-ceremonial structure" is used here as a generic descriptive term for several forms of specialized civic architecture that was constructed and used for various social and ritual practices. Kivas, communal rooms, communal pithouses, socio-religious rooms, shrine rooms, and even rock-lined dance circles can be considered variants of civic-ceremonial structures. The term is preferred for the two Merchant site structures because it avoids the specific architectural attributes and social/ritual functions associated with use of the term *kiva* in Southwestern pueblo settlements. Pit Structures 1 and 2 at the Merchant site may very well have been formal Southwestern kivas, but until another example of such a structure is documented through controlled excavations it is perhaps best to use a less value-laden term.

Putting aside the terminological issues, there are several lines of evidence that individually and collectively indicate that Pit Structures 1 and 2 had a special function apart from that of domestic rooms. First and foremost, the most compelling fact is the Pit Structure 1 is positioned in the center of the plaza area formed by the U-shaped arrangement of room blocks, precisely where such a communal structure would be expected to be located among such an arrangement of domestic rooms, most or all of which were contemporaneous. Pit Structure 2 is positioned adjacent to the eastern arm of the room block and is oriented at roughly the same azimuth as those eastern rooms. As indicated by the interior stratigraphy, artifacts, floors, and closure deposits, the use lives of the two structures differed, and it is relatively certain that Pit Structure 2 was a later addition that probably served the added population residing in the eastern and perhaps the southern rooms.

The most visible and striking physical aspect of the structures is that the construction process involved digging through almost 2 feet (60 cm) of caliche conglomerate and indurated calcrete, a difficult feat to accomplish even using modern tools. The presence of large stone mauls with heavily battered edges is a testament to the work involved[2] to excavate the pits. A significant labor investment — far beyond that required to build a small domestic room — was required to dig through the caliche, dig another meter or more through clays and loams, prepare a floor, and construct the superstructure. It is unlikely that a single family or extended family would have expended the effort, and it is assumed that construction of the structures was organized at the suprahousehold level and involved the inhabitants of several rooms.

The two structures are significantly deeper than any of the domestic rooms. The lower floor surface of Pit Structure 1 was at least 1.7 m below the surface. The single floor of Pit Structure 2 was approximately 1.0 meter below the ground surface. In contrast, the lower floor of Room 15 (identified as Room 8), the deepest of the excavated rooms, was only 50 cm to the floor, and most of the rooms averaged 30 cm in depth.

The results of macrobotanical and pollen analysis provide additional insights. Maize was identified in 10 of the 11 flotation samples from floor features and fill of Pit Structure 1, yielding a remarkable sample ubiquity value of 91 percent. As reviewed in Chapter 12, this value contrasts markedly with the complete absence of maize remains in dozens of samples collected from domestic rooms. The macrobotanical results are corroborated by the pollen analysis, with three out of three samples having significant counts of maize pollen. Maize pollen is notoriously difficult to recover from

[2] Leslie makes an interesting observation regarding the stone mauls recovered at the Merchant site. He notes that prior to the availability of pneumatic tools, the historic ranchers and settlers of SE New Mexico dug water wells much in the same manner as the prehistoric inhabitants of the Merchant site dug the pit structures: using dense and heavy tools to break up and break through the caliche caprock.

sites in southern New Mexico and is often found in ritual contexts (see for example Miller and Graves 2009).

Perhaps more significant is the identification of pollen from two unusual plant species. Along with maize, honeysuckle and cattail pollen was found in a soil sample brushed from a mano fragment on the lower floor of Pit Structure 1. Cattail (*Typha latifolia)* pollen has been recovered from several plant baking pits in the Sacramento Mountains, and Miller et al. (2011) provide a review of ritual uses of this plant. The Mescalero Apache applied cattail pollen in a cross-shaped design to selected mescal (agave) crowns before placing them in baking pits (Castetter et al. 1938). Cattail pollen is documented as both a ritual and food item among several southwestern groups (Moerman 1998; Rea 1997). Cattail pollen and occasionally pine pollen are second only to maize pollen in the frequency of mention in ethnographic and ethnobotanical accounts. Moreover, the use of cattail pollen likely predates the use of maize pollen in the Southwest by a millennium or more and may have abstract and metaphorical allusions to the watery underworld that was ultimately derived from Mesoamerica. For example, Cushing (1896, 1988) and Stevenson (1904) note that the presence of cattail reeds around springs is viewed as a connection to supernatural origins and the use of cattail pollen serves as a reference to a cosmological point of origin.

The sample from Pit Structure 1 is the first time honeysuckle pollen has been identified in southern New Mexico. Ethnographic accounts document use of honeysuckle bark, twigs, and leaves to concoct strong medicines for a variety of skin conditions and sores (Moerman 1998). Neither plant species grows in the vicinity of the Merchant site, and the presence of these plants along with corn pollen suggests that something other than mundane, domestic behavior took place in association with the lower floor.

It is acknowledged that some attributes, or absence of attributes, argue against a special function or social role for the two structures. It is somewhat puzzling that large primary support postholes were missing in Pit Structure 2 and Floor 1 of Pit Structure 1, although small roof support postholes were found in the upper floor (Floor 2) of Pit Structure 1. This is probably a matter of the small size of the structures and that it is likely they were jacal construction similar to the domestic rooms. Large primary posts were not necessary to support a relatively light and thin roof.

A more substantial issue is that none of the special floor or subfloor features typical of Southwestern kivas (Wilshusen 1989) were found during the 2015 excavations. Such features were present in the floor of the outstanding civic-ceremonial structure of the Fox Place (Wiseman 2002) near Roswell, New Mexico, and their absence among the Merchant site structures is troubling – if one considers the kiva at Fox Place with its unusual wall paintings to be a typical kiva structure. One explanation is that the subtle floor grooves, small sipapu pits, and other such features were destroyed by looters or overlooked by the LCAS excavators. Indeed, few floor features of any type, including primary roof support postholes and storage or dedicatory pits, were found by the LCAS crews. However, two seasons of modern excavations have confirmed to a remarkable degree the field observation talents of Bus Leslie and the LCAS crews. If such formal features were present in the floors of the structures, it is likely that they would have been noticed.

On the other hand, keeping in mind that the Merchant structures are considered a variant of civic-ceremonial structures as opposed to truly formal Southwestern kivas, it is perhaps unwarranted to apply the excessively stringent criteria used to classify Southwestern kivas to less formal civic-ceremonial structures found in peripheral regions such as southeastern New Mexico. It should be noted that special floor features are usually absent in the civic-ceremonial structures of pueblos in the western Jornada (Lowry 2005; Miller and Graves 2009; O'Laughlin 2001).

The most direct and conclusive evidence of a special function of Pit Structure 1 is the 30 cm layer of animal bone of Zone E. John Speth (personal communication, 2016) recalls a conversation with Bus Leslie regarding the nature of the deposit and bone contained within. Leslie noted that the bones appeared to have been intentionally placed in the deposit one piece over another and not tossed in haphazardly as typically found among the refuse deposits at the site. Moreover, Loven and Speth's analysis of the faunal remains from the 2015 excavations found that 12 or 13 dog bones were recovered from the backdirt of Pit Structure 1, and it is possible that some or all of the specimens were once part of Zone E. Speth (2004b; see also Bigelow and Speth 2004) suggests that dogs were a valued food source during communal feasts and ceremonies at Henderson Pueblo, and they could have served a similar function at Merchant.

The mass bone deposit in Zone E was a form of ritual deposit associated with a feasting event or the ritual closure of public architecture, and it is possible that the two events were essentially one and the same. Several studies of the past decade have illuminated the ritual closure or termination of public architecture or spaces in the Southwest (Adams 2016; Creel and Anyon 2003), including the western Jornada and the Roswell oasis (Miller and Graves 2009; Moore 1946; Speth 2004c).

Pit Structure 2 is more difficult to interpret. A similar labor investment to that of Pit Structure 1 was required to excavate the structure through the caliche conglomerate, even though it might not have been completed or properly shaped. Otherwise, the shape of the structure is highly irregular, the fills and walls were affected by intensive looting, and the LCAS excavation was much less detailed than for Pit Structure 1. No bone layer is mentioned by Leslie, and the absence of such a deposit is corroborated by the lower numbers of animal bone recovered during the 2015 excavations. No unusual artifacts, plant species, or anything else of note was identified among the material culture from the structure, although most of the floor and subfloor features that would yield such data were destroyed. The only unusual aspect of the structure is the deep hole or fissure in the southwest corner. Whether or not that feature was of some significance in relation to the location of the structure is an intriguing question. Was Pit Structure 2 deliberately built over a fissure or pipe in an act of placemaking that recreated the underworld emergence feature of kivas, the sipapu? If so, the feature would be another example of several distinctive Southwestern practices reflected in the architecture and material culture of the Merchant site.

Chapter 9

Middens and Backdirt Deposits

Refuse disposal areas are common features of sedentary villages, and several such areas were present around the room blocks of the Merchant site. Robert Leslie and the LCAS mapped and documented four areas described as refuse areas. Refuse Areas A, B, and C were broad distributions of artifacts, bone, and other trash deposits. Refuse Area D was a small trash pit or dedicatory deposit outside Room 3 and overlaid by the wall of Room 4. Refuse Area A was located north of the northernmost rooms and Refuse Area B was a broad area of sheet middens and low mounds around Pit Structure 2 and west and south of the structure. Refuse Area C was a layer of trash spread along the gully cutting into the escarpment at the southern edge of the village area. The refuse and backdirt mounds are summarized in Leslie's manuscript (Leslie 2016a).

These refuse areas, or middens, as well as additional areas of prehistoric refuse and modern backdirt deposits were mapped and recorded during the 2015 and 2019 fieldwork. Mapping and test excavations found that the LCAS practice of screening fill deposits excavated from rooms and deep pithouses adjacent to the structures resulted in a situation where the prehistoric refuse deposits were mixed with and buried under piles of screened backdirt. In fact, a test unit in a mounded deposit of Refuse Area A found plastic sheet that had been laid down in the 1960s, confirming that the overlying deposits were backdirt from the LCAS excavations in adjacent rooms.

In many locations, and particularly Refuse Area A, it was difficult to distinguish between the prehistoric midden deposits and the modern backdirt deposits. It might be possible to differentiate between sterile screened deposits and artifact-rich prehistoric midden deposits if most artifacts had been collected from the screened deposits. However, excavations in areas that were clearly modern backdirt piles recovered thousands of artifacts, confirming that only select artifacts like projectile points, formal tools, decorated ceramics, and complete groundstone tools were collected from the screened cultural deposits. Leslie also noted that some of the prehistoric refuse areas were mounded, but again, it was difficult to differentiate prehistoric refuse mounds from the extensive backdirt mounds across the site. The situation was further complicated by the rampant looting of the site, particularly throughout the area of Refuse Area B.

Additional areas of modern LCAS backdirt were mapped during the 2015 investigations. Most were located next to excavated rooms. These deposits were originally the interior fills and overlying deposits of house structures excavated by the LCAS. The ring of backdirt surrounding Pit Structure 1 presented another unique situation. This deposit consisted of ritual closure deposits (Zone E) and refuse layers that comprised several strata within the fill of the structure. The fill deposits were both removed by looters and were excavated with some control by the LCAS, and the deposits were screened around the perimeter of the structure. As with other looted and excavated cultural deposits throughout the site, the "collectable" artifacts were removed and the masses of animal bone, flakes, informal and broken tools, and small sherds were discarded along with the screened soils.

Leslie (2016a) also describes how the mass of animal bone recovered from Zone E, the closure deposit of Pit Structure 1, was dumped off the edge of the escarpment west of the structure. This area was surveyed in 2015, and hundreds of large and medium mammal bone fragments were identified across the surface of the sloping terrace.

It is evident that the "refuse" areas at the Merchant site were formed through complex combinations of past discard behaviors, practices of ritual deposition, and modern looting and avocational excavations. The various types of midden deposits are illustrated in Figure 9.1 and described in Table 9.1.

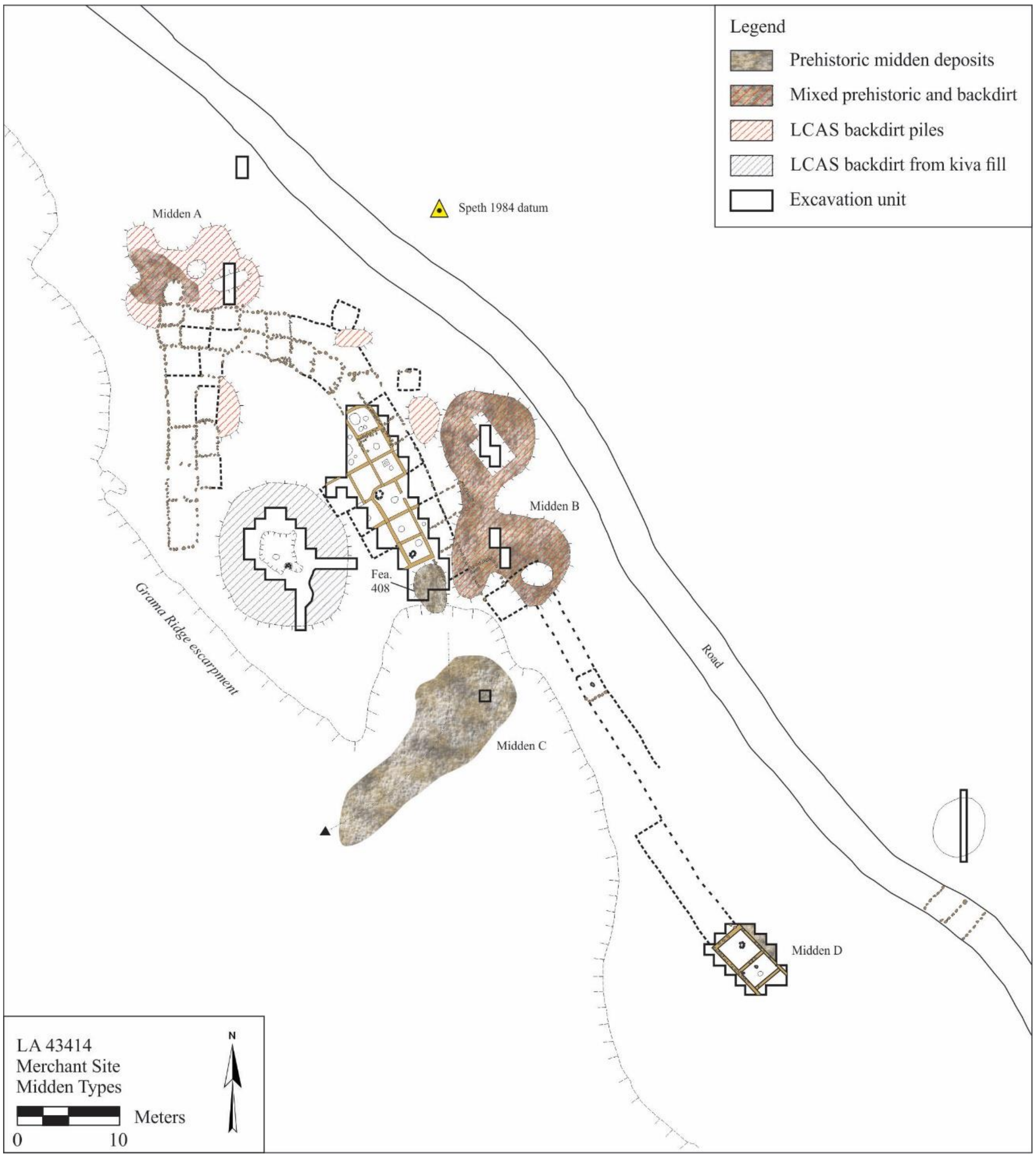

Figure 9.1. Midden deposits at the Merchant village site.

Table 9.1. Descriptions of middens and backdirt deposits

Area	Size	Area (m^2*)	Depth (cm)	Volume (m^3)	Comments
Mixed prehistoric midden, LCAS backdirt, and looter spoil					
Midden A	14.6 m by 10.0 m	92	40	18.6	Average depth of 20 cm. Tested in 2015
Midden B	19.2 m by 12.1 m	98	60	38.2	Average depth of 39 cm. Tested in 2015 and 2019
Prehistoric midden					
Midden C	33.5 m by 8.0 m	299	10	0.3	Eroded and mostly surface deposits. Tested in 2019
Rooms 7 and 24	Unknown	----	5	---	Exposed in excavation block, 2019
Feature 408	4.0 m by 3.7 m	14.8	>4	n/a	Southern edge of room block at the escarpment
Midden and closure deposits					
Pit Structure 1	18.0 m by 18.0 m	200	30	30.5	Average depth of 17 cm. Fill of structure excavated by LCAS and looters. Backdirt mounds partially excavated in 2015
LCAS excavation backdirt					
Near Feature 105	4.0 m by 4.0 m	13	20	1.3	Average depth of 10 cm
Near Room 10	5.1 m by 2.8 m	10	10	0.5	Average depth of 5 cm
Near Room J	4.6 m by 1.9 m	7	10	0.3	Average depth of 5
Near Room 7	4.3 m by 0.9 m	3	5	0.1	Average depth 2.5 cm

* Square meter area calculated on digitized area within the irregular boundaries of refuse areas

Middens are often overlooked because of the common focus on architecture and room assemblages during excavations of village settlements across the western U.S. This lack of focus is unfortunate because refuse middens are often among the most productive contexts for several types of analyses involving site formation and material culture. They also provide important information on occupational intensity, artifact discard rates, food remains, and material culture that is seldom recovered from rooms and extramural spaces. In many cases, the only robust sample sizes of certain artifact classes are obtained from middens. For example, certain site formation processes – the reuse of sherds, foot traffic, compression, and other cultural and natural transformations – reduce ceramic sherds in rooms and extramural areas into increasingly smaller and analytically challenging fragments. In contrast, ceramics from middens are less subject to such transforms and often have greater analytical potential for studies of vessel form and shape, design elements, and use alteration. Food remains are often well-represented and preserved in midden deposits, and there is also the potential for stratification and artifact seriation, something that is rarely possible at sites situated in the shallow sediments of southern New Mexico. The main problem, of course, is that the food remains and artifacts are all from secondary contexts.

Middens were one of the primary excavation contexts during the 2015 and 2019 fieldwork at the Merchant site. Because of the complex formation and disturbance histories of middens described above, however, the investigation of midden deposits was confusing and frustrating. Nevertheless, the excavations determined that intact prehistoric refuse deposits do exist and are usually overlain by backdirt from excavations and spoil piles from the strip looting of the site. Prehistoric midden deposits can often be differentiated from the modern backdirt and spoil deposits. Backdirt and spoil mounds in Refuse Areas A and B contain dense quantities of caliche and limestone pebbles, nodules, and cobbles. Many of the cobbles were probably construction elements of wall foundations that were carelessly stripped by looters or inadvertently removed by LCAS excavators.

Midden excavations are reviewed in the following chapter. The 2015 and 2019 excavations are included to provide a comprehensive overview of refuse deposits at the site. Basic information on artifact content is reviewed. The artifact counts and densities are reviewed in greater depth in the interpretive discussions of the summary chapter.

Midden A (Feature 104)

Leslie identified an area along the northern edge of the northern room block and around the northwestern corner of Room 3 as Refuse Area A, and his map shows a 22.9 m east/west by 9.1 to 12.2 m north/south midden area. The deposit ranged from 46 to 51 cm in depth in the center and thinning toward the margins. Leslie found no evidence of mounded deposits but noted that the area had been heavily disturbed by looters and collectors. Two LCAS members stated that a shallow mound was once visible.

During the LCAS excavations of the northernmost rooms, the fills from room interiors and extramural areas were screened over this refuse area, forming several large mounds of soil and debris that are visible today. The deposits extend over an irregular area measuring 14.6 m east/west by 10.0 m north/south and covering approximately 92 square meters. The mounds range from 20 to 40 cm in height and consist of dark charcoal-stained midden soils, artifacts, and some fire-cracked rock. The deposits also contained large quantities of caliche cobbles that were probably disturbed components of foundation walls found in fills and outside rooms that were tossed on top of the backdirt piles (Figure 9.2).

Figure 9.2. View of the eastern area of Midden A showing the mound of soils, debris, and caliche cobbles forming one of the mounded areas.

Midden A was tested during the 2015 fieldwork. A 1-x-4-m unit was placed across one of the larger mounds in the eastern half of the refuse area (see Figure 9.1). The sediments consisted of a uniformly dark and charcoal-stained deposit of reddish-brown sandy loam with moderate amounts of natural gravels and numerous caliche cobbles. A surprising find was a sheet of black plastic encountered at the base of the excavation unit. The plastic marked the boundary between the backdirt deposits and an underlying stratum of sterile reddish-brown sandy loam (Figure 9.3). Leslie does not mention any practice of placing sheet plastic before or during excavations but based on several lines of evidence it was concluded that the sheet was used during some aspect of the LCAS or looter excavations, perhaps to cover a house or sort artifacts or provide shade. The sheet was discarded and subsequently buried by the uncontrolled excavations in the surrounding refuse areas and by backdirt from the LCAS excavation of adjacent rooms.

Figure 9.3. Photograph of the profile of the 2015 excavation of Midden A. Note the black plastic left by the LCAS excavators in the early 1960s. The stratum of reddish-brown soil below the plastic sheet was culturally sterile.

The majority of the refuse deposit was screened through a ¼-inch wire mesh, with a small sample screened through ⅛-inch mesh. Extremely high counts of small tertiary thinning flakes were recovered from the sample screened through the smaller mesh, a finding that is consistent with the high numbers of projectile points recovered from the Merchant site. Aside from the tertiary flakes, the excavation recovered 822 items, including 355 chipped stone artifacts, 5 projectile points, 47 groundstone items, 167 ceramic sherds, 247 bones, and 1 piece of pigment. Additionally, 245 small fire-cracked rock fragments weighing 15.1 kg were noted in the unit.

A more detailed consideration of material recovered from the midden led to the realization that the counts and densities of certain artifact classes were biased as a result of the uncontrolled excavations of the 1960s. The most conspicuous evidence of assemblage bias was the fact that only four projectile points were recovered, a total representing less than 0.5 percent of the artifacts from the unit and far below the count of 433 projectile points reported by Leslie for the uncontrolled excavations in Refuse Area A. Very few sherds measuring over four or five cm in diameter were present, and few formal chipped stone tools or complete groundstone tools were recovered. The fill also contained numerous fragments of clear and amber bottle glass and one Budweiser beer can.

The mounded deposits of Refuse Area A and perhaps most of Midden A consist of a mix of disturbed prehistoric midden deposits mixed with backdirt from adjacent rooms. Based on the presence of the black plastic sheet overlying sterile soils, it is apparent that the much of the deposit is a mixed modern formation. Both the prehistoric midden and room fills had been screened by collectors and LCAS members, and projectile points, large sherds, whole groundstone tools, and certain formal chipped stone tools were selectively removed. Animal bone, broken groundstone, fire-cracked rock, and most of the chipped stone debitage was ignored and returned to the deposits.

Midden B (Feature 110)

Midden B was the subject of excavations during the 2015 and 2019 field seasons. Leslie identified Refuse Area B southeast of the eastern edge of the room block and surrounding the feature designated as Pit Structure 2. His map shows a 15.2 m east/west by 18.3 m north/south area of midden deposits that averaged 60 cm deep in the center and thinned toward the margins to depths of around 15 cm. Leslie found no evidence of mounded deposits but noted that the area had been heavily disturbed by looters and collectors.

Some areas of Refuse Area B were excavated by the LCAS while most of the deposit was intensively strip looted, and the same practices of uncontrolled excavation and backdirt dumping observed in Midden A also took place in Midden B. During the LCAS excavations of Pit Structure 2 and Room 14, a large quantity of backdirt was spread over portions of Midden B, forming several large mounds of soil and debris that are visible today (Figure 9.4).

Figure 9.4. View of Midden B in 2015 showing the mounded deposits and mass of caliche cobbles. The ring of backdirt around Pit Structure 1 is visible in the right background.

The deposits were mapped during the 2015 fieldwork and found to extend over an irregular area measuring 19.2 m east/west by 30 m north/south and covering approximately 500 square meters. The deposits included the ring of backdirt around Pit Structure 2 and extended 12 m westward to the edge of the northern room block and almost 20 m to the south around Room 14. The mounds averaged 40 cm in height and reached nearly 60 cm around the structure and consisted of dark charcoal-stained midden soils, artifacts, and fire-cracked rock. As noted for Midden A, the deposits contained large quantities of caliche nodules and cobbles, many of which were probably parts of house foundation walls.

A 1-x-2-m unit was placed in one of the larger mounds near the southern edge of the refuse area (see Figure 9.1). The unit was excavated in two levels. The sediments consisted of a uniformly dark and charcoal-stained deposit of reddish-brown sandy loam with moderate amounts of natural gravels and caliche cobbles. Level 1 was terminated at 20 to 60 cm below the surface (depending on the slope of the mound) because intact prehistoric midden deposits were encountered at that depth (Figure 9.5). Level 2 was excavated another 14 to 18 cm until it reached a sterile layer of sandy loam and caliche nodules. The upper portion of a baking pit feature was encountered in the northeast corner of the unit (Figure 9.5). Several large cobbles lined the perimeter of this feature, designated as B.1, and had and an interior of dark gray charcoal-stained sediments. The feature was not excavated but was sampled for radiocarbon and provided an inception date for the overlying midden deposits.

The deposits of Midden B were screened through ¼-inch wire mesh and recovered 1,304 items, including 537 chipped stone artifacts, 5 projectile points, 34 groundstone items, 243 ceramic sherds, and 485 bones. Additionally, 147 small fire-cracked rock fragments weighing 12 kg were recorded. As noted for Midden A, these counts and densities were biased as a result of uncontrolled excavations and collecting. Again, the low projectile point counts are conspicuous. Only 5 projectile points were recovered, representing less than 0.4 percent of the artifacts recovered during the 2015 excavation. Leslie noted that the LCAS recovered at least 219 points from the area. Modern trash was found throughout the upper level but was absent from the lower level, again indicating that upper deposits were mixed but that intact prehistoric deposits exist below the zone of modern disturbance.

Another noteworthy modern intrusion in the unit was a horizontal metal bar found in the eastern profile wall near the northeastern corner of the unit. Based on the location of the unit in relation to the dirt road, midden boundaries, and mounded areas in the midden, we are confident that the metal bar is the lower remnants of the metal post that once held the LCAS site marker "LEA COUNTY ARCHAEOLOGICAL SOCIETY PROJECT E-4" that was posted in Refuse Area B next to the road in the early 1960s (see Figure 6.1 for a photograph of the marker). The identification of this physical landmark allowed us to place the exact location of the 2015 excavation unit among the disturbed deposits of Midden B photographed in the 1960s.

The results of the 2015 excavations were confirmed during the 2019 fieldwork. The 2019 excavations in Midden B focused on an area 8 m to the south and directly east of rooms discovered in 2019. The unit was originally intended to be a 2-x-2-m exposure to recover artifact and subsistence samples but was reduced to a 1-x-2-m unit based on the density of materials recovered and the time investment needed to excavate and screen the dense deposits. The unit was placed in the highest mound in the southern area of Midden B.

Six levels were excavated. The first level removed the mantle of caliche cobbles and from 20 to 40 cm of deposits. Five 10-cm levels were excavated until the underlying midden fill until sterile deposits was encountered 90 cm below the surface (Figure 9.6).

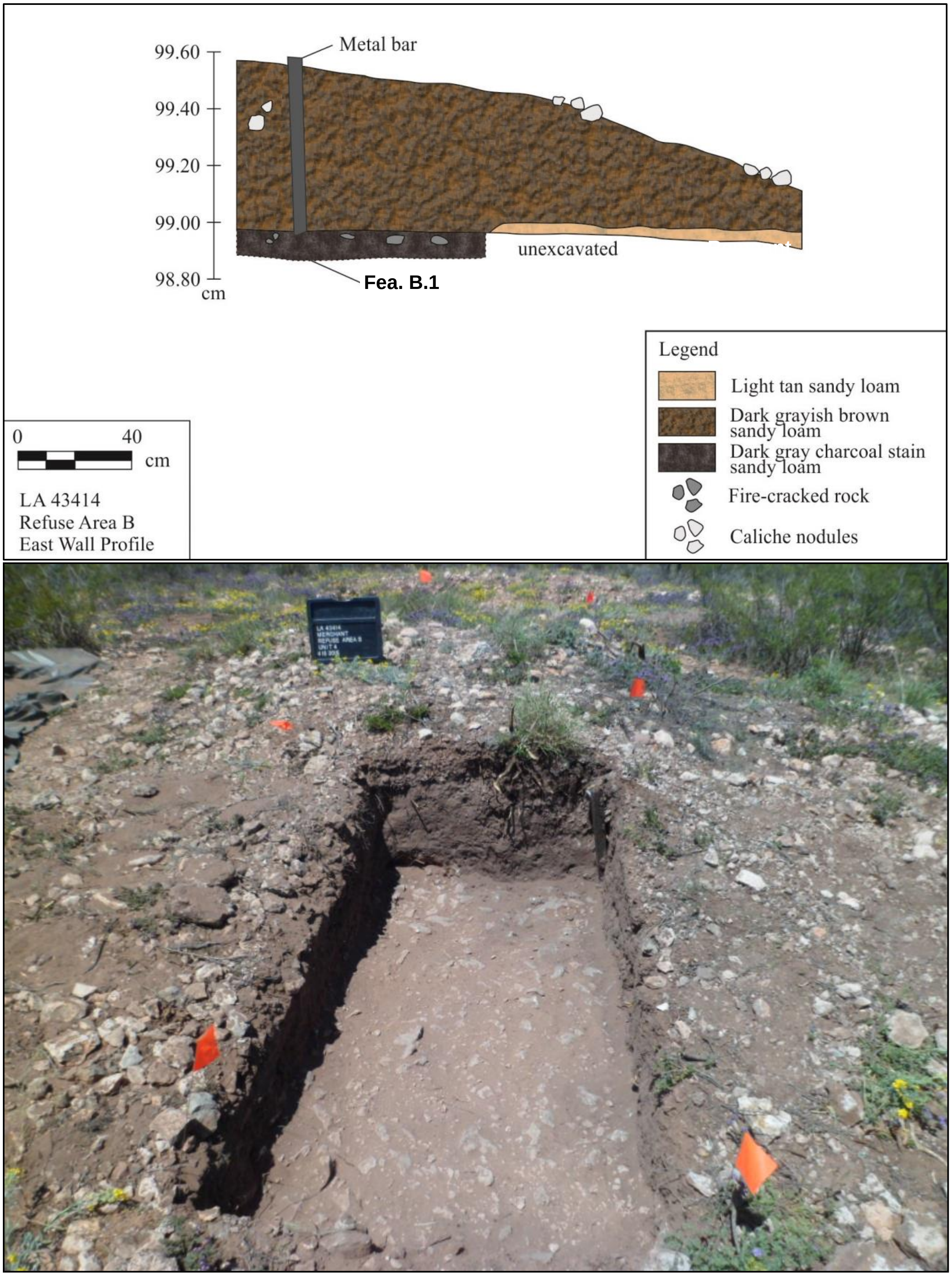

Figure 9.5. East wall profile (upper panel) and photograph (lower panel) of 2015 excavations in Midden B. Baking pit Feature B.1 is visible at the base of Level 2, and the lower remnant of the metal post for the LCAS site marker can be seen in the eastern unit wall.

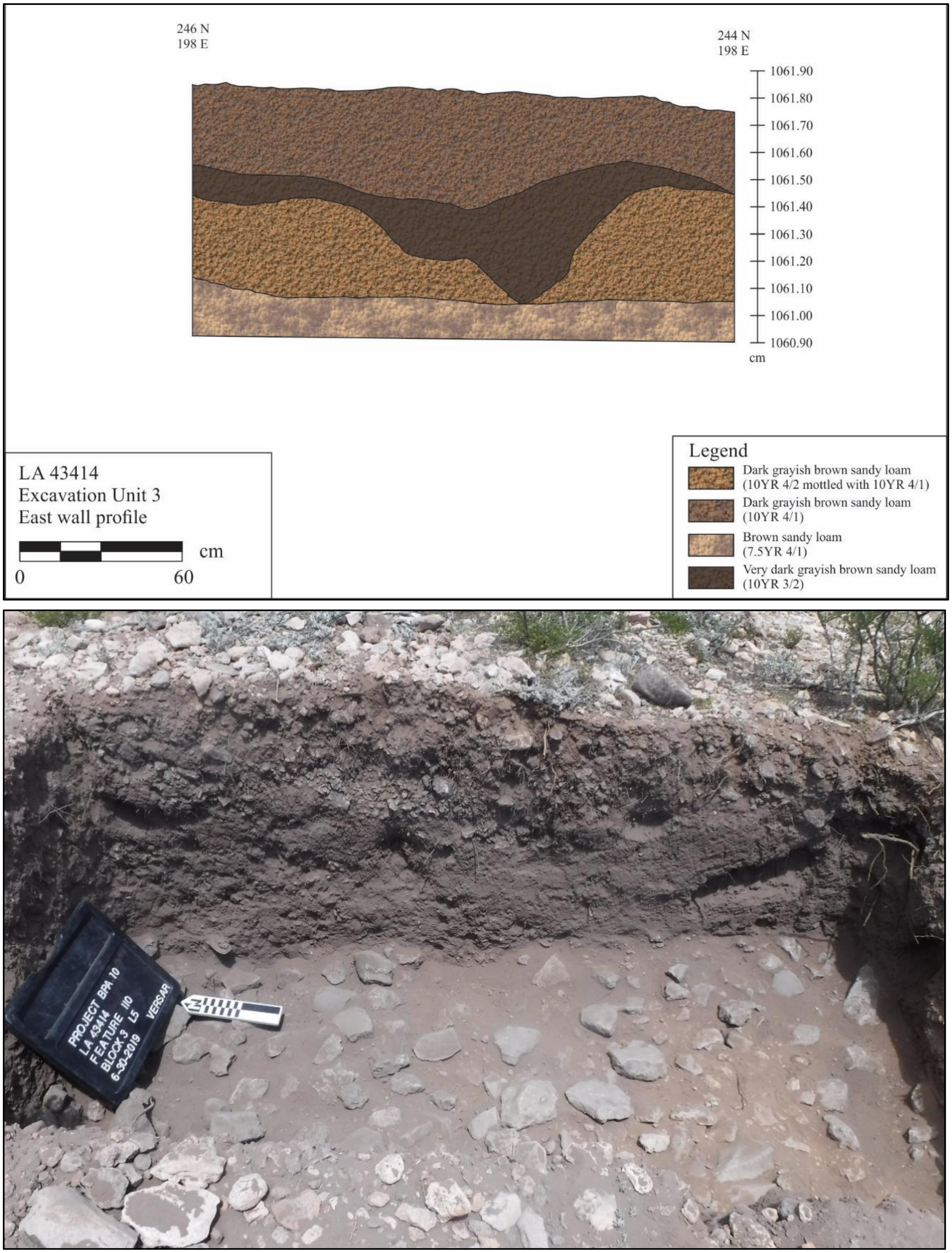

Figure 9.6. Profile and photograph of the 2019 excavation unit in Midden B after excavations had been completed at Level 6: (upper panel) drawing of the eastern profile; (lower panel) view of the profile and the sterile natural deposits encountered at the base of Level 6. Note the upper stratum of redeposited backdirt and looter spoil as opposed to the intact prehistoric midden strata below.

The upper 25 to 35 cm of the unit consisted of an undulating layer of dark gray-brown (Munsell 10YR4/2) to black (Munsell 10YR3/1) charcoal-stained silty loam with moderate to high densities of caliche gravels, pebbles, and cobbles and some rodent burrowing. High counts of artifacts were recovered from the upper level, as were historic bottle glass fragments and metal items. Four percent of the artifacts from Level 1 were historic items from the 1960s. Between 30 and 40 cm below the surface, the fill changed to a finer-textured, dark gray-brown (Munsell 10YR3/2) sediment with noticeably fewer gravels and pebbles. Sediments in the lowermost layer were a brown (Munsell 7.5YR4/2) silty loam with slightly less charcoal content.

Artifact counts include 605 lithic artifacts, 333 ceramics, 8 groundstone, 975 bone, 2 pieces of shell, 61 chunks of clay, 1 piece of limonite pigment, and 22 historic items. Artifact counts and densities varied by level. The numbers of ceramic and groundstone artifacts declined rather drastically from Level 1 to Level 6; the counts of chipped stone and bone artifacts also show a general decline by level but fluctuate, with some higher counts present in deeper levels. Historic materials were present only in Level 1, as were the masses of intrusive caliche gravels, pebbles, and cobbles, confirming the that upper layers of Midden B consist of deposits of looter and excavation backdirt and prehistoric artifacts that overlay deeper, intact prehistoric midden deposits of up to 35 cm depth.

Midden C (Feature 412)

A wide gully cuts into the escarpment 22 m southeast of Pit Structure 1. Leslie noted the area was a favored area for trash disposal and designated the location as Refuse Area C. He noted that a looter had dug a few potholes in the area, exposing dense and deep midden deposits. Leslie (2016a) excavated a 3 by 6-foot (90 by 180-cm) unit to a depth of 115 cm below the sloping surface, at which point the sterile Pleistocene-age red clay substrate was encountered (Figure 9.7). His profile shows several angled and alternating layers of refuse and natural deposits that are parallel to the slope and contours of the gully. Leslie noted that collections from Refuse Area C may be the best preserved of the middens. He also hinted that material from earlier occupations may be present in stratified contexts below materials deposited during later occupations.

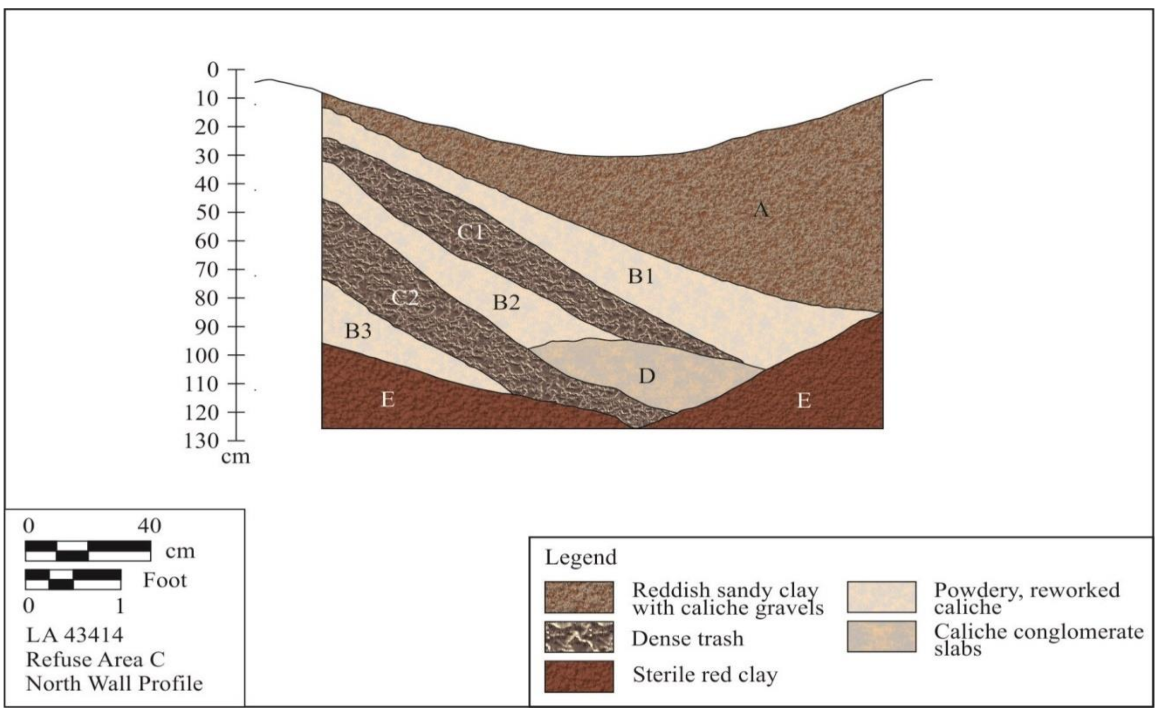

Figure 9.7. Redrafted version of Leslie's profile of test unit placed in Refuse Area C (from Miller et al. 2016).

The entire gully was examined during the 2015 and 2019 fieldwork and no evidence of these deep, stratified deposits could be found. Fifty years of wind and water erosion had altered the surface of the area, and it appeared that much of the original stratigraphy and organic sediments had been washed away, leaving only a scatter of artifacts and discontinuous charcoal-stained sediments spread across the Pleistocene clay strata. The artifact scatter extended over an area measuring 8 m within the width of the gully and 33.5 m from the caliche caprock to the base of the terrace. The depth of the deposits were estimated to be less than 0.1 m. No evidence of Leslie's 0.9- by 1.8-m unit was found during the survey.

It was possible, however, that some remnants of the prehistoric midden remained intact and was buried by a thin mantle of alluvial sediment. To explore this possibility, a test excavation unit was opened in the center of the gully during the 2019 fieldwork (Figure 9.8). The excavation was a single 1-x-1-m unit on the slope below the caliche caprock and was excavated to a depth of 20 cm. Caliche bedrock deposits were encountered at this depth, with the exception of the southern downslope edge of the unit where another 3 to 5 cm of deposits were present. Sediments in the unit were a dark gray brown and very gravelly to cobbly silty loam. Charcoal flecks were scattered through the fill.

Sediments were screened through ⅛-inch mesh. Artifacts recovered from Level 1 included 14 Ochoa ware sherds, 14 lithics, a complete slab metate, 209 bone fragments, 2 1960s historic artifacts, and 23 pieces of FCR. The shallow nature of the deposit was demonstrated by the decline in artifact counts from Level 1 to Level 2, as only 9 Ochoa ware sherds, 3 flakes, 83 bone fragments, a polishing stone, and 4 pieces of FCR were recovered. Except for bone, the artifact recovery rates were low compared with other midden deposits. No evidence of the deeply stratified deposits described by Leslie was found, and the location of those deep midden deposits remains unknown. It is possible that 56 years of eolian and sheetwash erosion have removed most of the prehistoric deposits along the terrace.

The LCAS Excavation Backdirt of Pit Structure 1 (Kiva)

The LCAS excavations of Pit Structure 1 had been left open since fieldwork was completed in 1964. Leslie visited the site several times over the following two decades and took pictures of certain excavation areas. The photograph displayed in the upper panel of Figure 9.9 shows how the open structure appeared in 1976, 12 years after the LCAS excavations.

Archaeologists from the CFO visited the site in 2012. The intent of the visit was to inspect and evaluate the condition of the site, as well as to collect radiocarbon and subsistence samples as part of Permian Basin Memorandum of Agreement Task Order 10 (see Cummings and Kováčik 2013:65). A small shovel test was placed along the western side of the backdirt ring and artifact and organic samples were collected. A radiocarbon age estimate was obtained from a sample of mesquite wood charcoal, providing the first absolute chronometric age estimate for the Merchant site.

One component of the remedial excavations in Pit Structure 1 undertaken in 2015 was to excavate and document what remained intact of the structure, including the massive ring of LCAS backdirt surrounding it. After vegetation had been cleared, a 2-x-2-m collection and excavation grid was established across the area and tied to the UTM coordinates of Speth's 1984 datum. The vegetation removal also allowed the dimensions of the backdirt ring and depth of the excavation to be estimated (Figure 9.9, lower panel). The cleared backdirt ring measured approximately 18 m by 18 m. Subtracting the 124 square meter LCAS excavation unit, the backdirt ring covered an area of approximately 200 square meters. The mounds ranged in height from 17 to 30 cm above the original ground surface, with most of the mounds measuring around 30 cm. Based on the depth and size, it is estimated that the backdirt ring consisted of 30.5 cubic meters of screened fill deposits from the LCAS and looter excavations.

Figure 9.8. Views of excavations in Midden C: (upper panel) surface of the unit in the gully below the caprock; (lower panel) completion of excavations at Level 2 in the shallow deposits.

Figure 9.9. Views of the LCAS backdirt mound surrounding Pit Structure 1: (upper panel) photograph taken by Robert Leslie in 1976 of the open excavations and backdirt mounds; (lower panel) view of the backdirt mound after vegetation was removed during the 2015 excavations.

Surface collections were conducted over the entire backdirt mound and open excavation area within 53 2-x-2-m units. Only five units lacked artifacts, and four of those were inside the structure in locations buried by recent eolian sediments. The 48 positive units yielded a total of 1,865 artifacts for an average density of 9.7 items per square meter. The artifact total included 1,415 bone fragments, 214 chipped stone and 7 projectile points, 123 ceramic sherds, and 106 ground or battered stone items. The surface artifact densities were quite unexpected and established that the LCAS backdirt contained substantial quantities of artifacts and unprecedented quantities of animal bone.

The initial strategy guiding the remedial investigations of the backdirt mound was to excavate the ring in four quadrants along the southern, northern, eastern, and western sides of the open excavation. Removal of one quadrant would provide a space to screen the sediments from the interior of the structure. A 1-m by 7-m unit was placed across the width of the southern side of the backdirt ring (Figure 9.10). At the northern end of the unit, another 1-m by 5-m unit was established to cross the eastern side of the ring. These units would provide the first exposure of the southeastern quadrant. Since the deposits had been thoroughly mixed and disturbed during the excavations and looting of the 1960s, there was no need to maintain vertical provenience and the deposits were excavated and screened as a single level to the sterile substrate. Approximately half of the fill was screened using ⅛-inch mesh screen and half through ¼-inch mesh.

Figure 9.10. Aerial image of the initial excavations in Pit Structure 1 showing the area of cleared vegetation and initial excavations in the backdirt ring and interior of the structure. Fill from the 2015 excavations was screened over plastic to preserve the integrity of the underlying cultural deposits.

The backdirt deposit was a homogenous layer of dark brown sandy loam with varying quantities of natural caliche gravels. A brown sandy loam of intact prehistoric deposits was encountered below the backdirt near the eastern edge of the unit. The maximum depth ranged from 22 to 30 cm (Figure 9.11).

Figure 9.11. Profile of the southern quadrant of backdirt exposed in the excavation trench.

A total of 14.3 square meters was excavated and 2.37 cubic meters of fill was screened evenly using ¼- and ⅛-inch mesh. An exceptionally high count of 5,141 artifacts was recovered from the sample excavation of the LCAS backdirt. The count includes 3,739 bone fragments, 1,082 chipped stone items, 16 projectile points, 54 ground or battered stone items, 243 sherds, and 7 miscellaneous objects. The ceramics were mostly Ochoa varieties, but apparently a small number of decorated sherds (and the projectile points) had been overlooked by the looters and LCAS excavators. Miscellaneous artifacts include five polishing stones, two fragments of freshwater shell, a piece of what looked like plaster, and a modern shotgun shell.

Based on the total volume of the backdirt ring, it was estimated that at least 18,056 artifacts and 48,000 fragments of animal bone are present within the deposit. The statement of work for the Merchant site remediation stipulated that all screened backdirt from the 1960 excavations around Pit Structure 1 was to be re-screened. Based on the results of the initial units, it was apparent that this task would be unrealistic given the labor and curation costs required to deal with so many artifacts. Consultation with the CFO resolved that the sample of the two units in the southeastern quadrant constituted a sufficient and representative sample of materials in the backdirt and that further excavations were unwarranted.

Feature 408 Midden Area

Feature 408 is an area of refuse and darkly stained soils at the southernmost edge of the eastern room block (Figure 9.12). The area was designated as a midden, although a room may have once been present as indicated by a faint line of rocks that may mark the location of a damaged or eroded wall segment. The midden has dark gray-brown (Munsell 10YR3/2) silty loam sediments with a high density of caliche nodules and measured 4 m east/west by 3.7 m north/south (14.8 square meters). The deposit has several centimeters of depth. The uppermost deposits were exposed in units opened to the south of Room 25, and a remarkably high count of 436 lithic artifacts was recovered, along with 61 Ochoa ware sherds, 2 groundstone, a shell fragment, and a piece of hematite.

Figure 9.12. Feature 408 midden deposits at the southern end of the eastern room block. The southern wall of Room 25 is visible in the center of the picture.

Room 7 and 24

A shallow layer of midden deposits was exposed along the eastern walls of Room 7 and 24 (see Chapter 7). The deposit was exposed only in a 2-m-wide strip of excavation units along the shared eastern wall of the two contiguous rooms; thus, the extent and dimensions of the midden deposit are unknown.

LCAS Backdirt Mounds and the Bone Dump along the Escarpment

The final areas to be described are modern creations. The LCAS excavation of Pit Structure 1 encountered a 30-cm-thick mass of faunal remains designated as Zone E. Leslie notes that the mass of bone removed from Zone E was dumped off the edge of the escarpment west of the structure. The nature of the bone in this deposit is a critical point of interest for interpreting what may have been an act of ritual closure of a kiva, a feasting deposit, or both. The escarpment slope was surveyed during the 2015 fieldwork and the location of the bone dump was identified (Figure 9.13). Bones were plotted for a distance of almost 25 meters, indicating that the large masses of bones from Zone E were discarded during several trips and at several locations along the terrace. A total of 431 large and medium mammal bone fragments were identified and collected for analysis.

Figure 9.13. Animal bone from Zone E of Pit Structure 1 discarded along the escarpment. The pinflags mark the locations of large and medium mammal bones collected during transect surveys across the terrace slope.

Four other areas of backdirt left by the LCAS during their excavations of rooms were mapped (see Figure 9.1 and Table 9.1). Three small backdirt mounds are near Rooms 7, 10, and J, and a fourth mound is at the northwestern edge of Midden A. The backdirt areas near rooms were small, thin mounds of screened room fill ranging from 3 to 16 square meters in area and 5 to 10 cm in height. The LCAS backdirt mounds were easily identified by the presence of mounded deposits containing high densities of caliche nodules and cobbles and fire-cracked rock that are typical of screened deposits. The mounds also contained quantities of animal bone, chipped stone debitage, and small sherds that were not collected by the LCAS crews.

Summary

Several deposits of artifacts, bone, and organic material in secondary context were identified across the Merchant village area. Two types of deposits were identified: prehistoric refuse middens, and modern backdirt deposits left by the LCAS excavators and looters. In some locations, and particularly Midden A, it may not be possible to differentiate the two types of deposits, as they appear to have been thoroughly mixed. Midden B also has mixed deposits to depths of 20 to 30 cm, but intact prehistoric midden strata have been identified below the mixed deposits in two units excavated in 2015 and 2019. The stratified deposits of Midden C observed by Leslie along the gully leading off the escarpment in the 1960s no longer exist.

The ring of deposits around Pit Structure 1 and backwashed into the interior of the structure are a special case. They consist of several interior strata of refuse, materials from floor and subfloor contexts, and the mass ritual closure deposit of large and medium mammal bone in Zone E, all of which were thoroughly intermixed by looting and the LCAS excavations when the interior fill was screened both within and around the margins of the structure.

Excavations in refuse and mixed refuse/backdirt deposits recovered 7,584 bone fragments and 4,799 lithic, ceramic, groundstone, and miscellaneous artifacts, representing 69 percent of the total bone and 40 percent of the total artifact count from two seasons of excavations in the village area. The densities of artifacts and comparative volumetric studies are reviewed later in the report. Considering that the midden excavations were the least extensive in terms of square meter exposure and cubic meter volume, it is evident that the majority of bone and artifacts were deposited in dedicated refuse areas or ritual closure deposits. However, the midden assemblages have several biases resulting from looters and the LCAS crews retaining certain "collectible" artifacts, such as projectile points and large, decorated ceramic sherds, while discarding other types such as animal bone and lithic debitage in the screened backdirt. Reviewing the counts and proportions of certain material classes and artifact types, Miller et al. (2016) detected several such collection biases in artifacts recovered during the 2019 excavations. Additionally, an unknown quantity of the animal bone from Zone E was discarded off the edge of the escarpment.

The presence of midden deposits reflects practices of structured and formalized refuse disposal associated with long-term habitation sites. Localized "drop and toss" zones of artifact loss and discard are characteristic of hearth-centered activity areas of hunter-gatherer camps (Binford 1978; Enloe et al. 1994; Vaquero and Pastó 2002). Longer-term and more intensive use of hearth activity areas results in the accumulation of various classes of debris, refuse, and discarded items. At camps occupied for longer durations, these areas are cleaned and debris is removed to the perimeter of the activity area, or what Stevenson (1991) terms the "displacement" zone. The ultimate expression of such discard patterns is the formation of formal trash middens at intensively occupied residential sites.

Ethnoarchaeological studies have identified selection biases among artifact discard and refuse disposal patterns. Artifacts deposited in displacement zones or formalized refuse areas tend to be larger or perceived as more hazardous (for example, cores and lithic tools with sharp edges, rotted bone scrap, heating stones, or broken ground stone), while smaller items such as small waste flakes tend to be overlooked and remain as primary refuse. This bias creates a clear sorting among artifact classes by size and type (O'Connell 1987; O'Connell et al. 1991). Similar patterns are evident in the Merchant site middens. Most of the discarded fire-cracked rock was recovered from midden deposits, and lithic cores were also common. However, the presence of large numbers of small lithic flakes in midden deposits indicates that the village residents cleaned room floors and maintained extramural spaces.

Chapter 10

Archaeological, Geoarchaeological, and Palynological Investigations of Agricultural Fields

Myles R. Miller, Tim Graves, Charles Frederick, Susan J. Smith, and Mark Willis

The 2015 fieldwork at the Merchant site and 2016 report describing those investigations presented several discoveries and new interpretations regarding the site and its domestic architecture, the function of the two large pit structures, and its material culture. Without doubt, the most controversial and contested interpretation was that the areas of massed, patterned distributions of caliche cobbles situated along a shallow drainage swale 175 to 225 m north of the village were agricultural features (Figure 10.1, upper panel). The TRU survey and aerial photography of LA 43414 identified linear concentrations and alignments of cobble- and pebble-sized caliche stones on the mesa surface surrounding the drainage. These features appeared to be linear alignments, less than 1 meter wide, that were partially visible between coppice dunes and vegetation. By comparison, areas between the linear concentrations were relatively clear of stone and appeared to be enclosed by the cobble alignments, although some locations were littered with cobbles. "Appear to be enclosed" is the operative description of the surface manifestations because the eolian dunes and sheet sands precluded a clear view of the features that would reveal their spatial patterning and organization.

Certain areas within the caliche concentrations appeared to have linear and rectangular boundaries, forming corners in some locations (Figure 10.1, lower panel). A significant attribute of the features is that their orientations were both parallel and perpendicular to the topographic contours of the swale. The occurrence of alignments in orientations other than perpendicular to downslope water flow suggested they were not a form of terracing, but instead were gridded fields.

Mark Willis, Charles Frederick, and other members of the project team with experience working with *ak chin* fields in Arizona, cobble terraces in Chihuahua, and grid or mulch fields in the river valleys of northern New Mexico suggested that the patterned distributions of cobbles resembled cobble-bordered fields, mulch fields, or another form of gridded field associated with agricultural settlements throughout the U.S. Southwest and northern Chihuahua (Doolittle 2000:239–253). Additionally, a series of parallel linear caliche mounds were arranged across the lower reaches of the drainage east of the massed cobble distributions. These features resembled check dams.

The survey impressions indicated that a landscape of intensive agricultural features may have existed north and northwest of the village (Figure 10.2). The reality became more apparent as the results of pollen and flotation analyses from Pit Structure 1 revealed that maize pollen and cupules, kernels, and cob fragments were present throughout the fill and floor features. The high counts and sample ubiquity measurements for maize plant parts and the presence of maize pollen confirmed that corn was grown somewhere in the vicinity of the Merchant site.

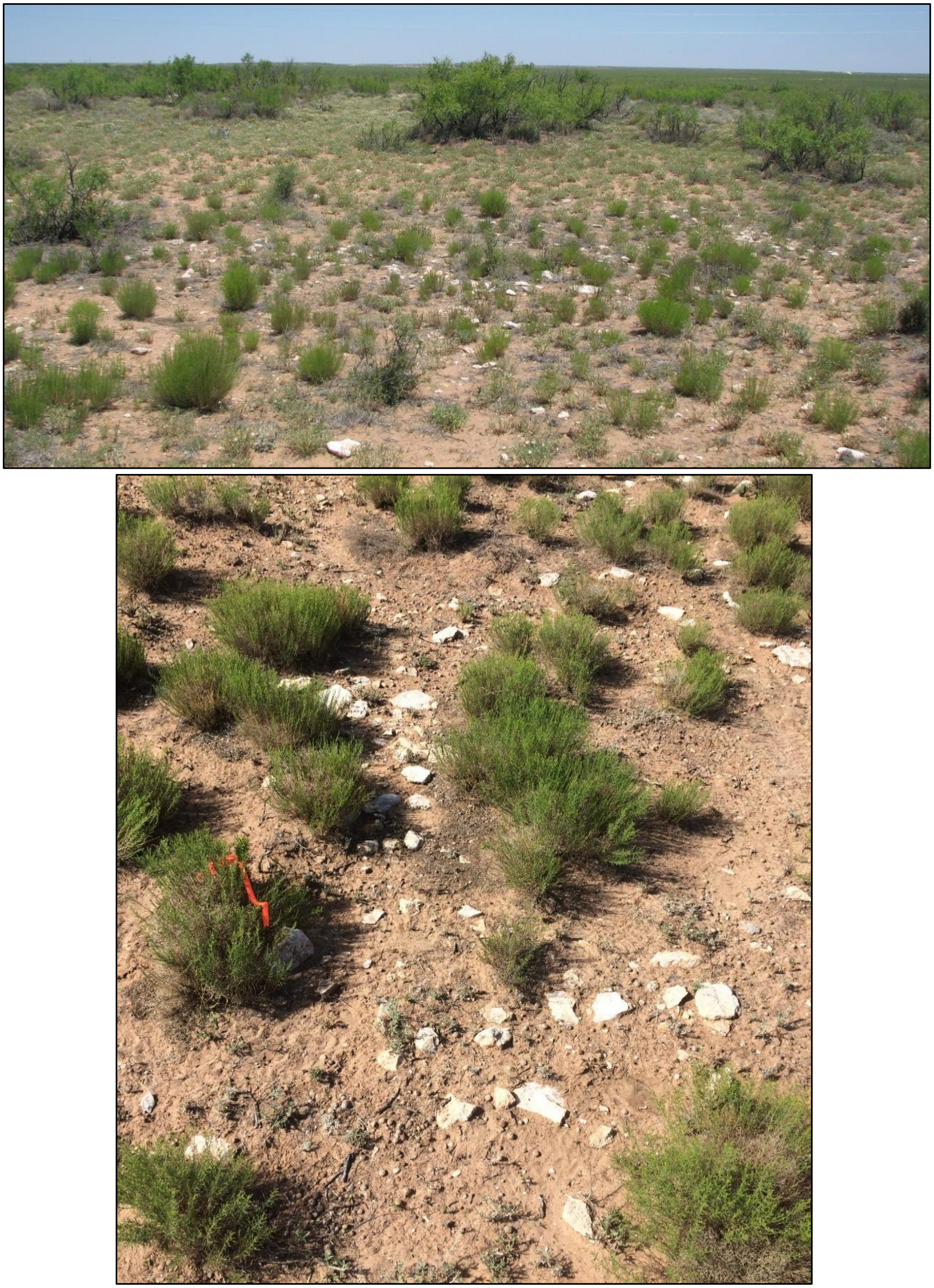

Figure 10.1. Views of agricultural features at LA 43414: (upper panel) Feature 90, showing the patterned concentrations of caliche cobbles thought to be agricultural features; (lower panel) cobble alignments forming a corner within Feature 82. Maize pollen was identified in a sample collected from this feature.

Figure 10.2. The locations of possible agricultural features in relation to the Merchant village.

If gridded fields or a similar form of dryland agricultural technology existed at LA 43414, they represented the easternmost expression of such intensive agricultural technologies in the U.S. Southwest (see Doolittle 2000:Figure 8.19), and their presence would add an entirely new dimension to our understanding of the Merchant site. Agricultural features have been a topic of considerable interest in New Mexico since Bandelier (1892) first identified cobble-bordered and gravel-mulched fields among the tributary drainages of the northern Rio Grande and associated the fields with nearby prehistoric Puebloan settlements. A substantial body of research has been conducted on their morphology, hydrological and soil characteristics, subsistence and economic function, and the larger roles that intensive agricultural systems played in the organization of northern Rio Grande pueblo societies (Anschuetz 1995; Bandelier 1892; Buge 1994; Camilli et al. 2012; Dominguez 2002; Eiselt and Darling 2017; Herhahn 1995; Hill 1998; Lightfoot 1993; Lightfoot and Eddy 1995; Maxwell 2000; Maxwell and Anschuetz 1992; Moore 2009, 2010; Wiseman and Ware 1996).

With these observations in mind, an integrated geomorphological and archaeological investigation of the features was proposed to the CFO and a contract modification and additional funding were granted in 2015 to study the features in greater detail. The work included geomorphological investigations of trench profiles excavated through segments of the features, manual excavation of two features, and analyses of a series of pollen, soil, and chronometric samples. The shallow ponding area (often called a playa) west of the escarpment was also trenched and examined for agricultural potential. The results of these field and laboratory studies are reported in detail in the 2016 report. Susan Smith and Phil Dering visited the field locations in July 2019 for a first-hand perspective on the features and assist in selecting the most productive locations for pollen sampling.

The features and the interpretations of their function as agricultural fields were not without controversy. During informal conversations with colleagues at conferences and other venues, several expressed their doubts over the reality of the fields. Even the excavators and project team members and specialists had some reservations owing to the ambiguities of the archaeological, chronometric, and palynological data. As noted in the report (Miller et al. 2016:389), team members were polled and confidence in the identification of the fields ranged from 30 to 70 percent — by no means a consensus vote of confidence.

Additional areas of possible fields were identified during the 2019 Merchant Vicinity survey (Graves et al. 2021a). All were positioned along gently sloping surfaces of 2 to 4 degrees with shallow drainages running through or along the ridges. As illustrated by the example of Feature 3 at LA 195367 located on Antelope Ridge 1.5 km southwest of the Merchant village, hundreds of caliche cobbles and tabular fragments were present on the surface of these locations, and distinct linear and gridded patterns were visible (Figure 10.3).

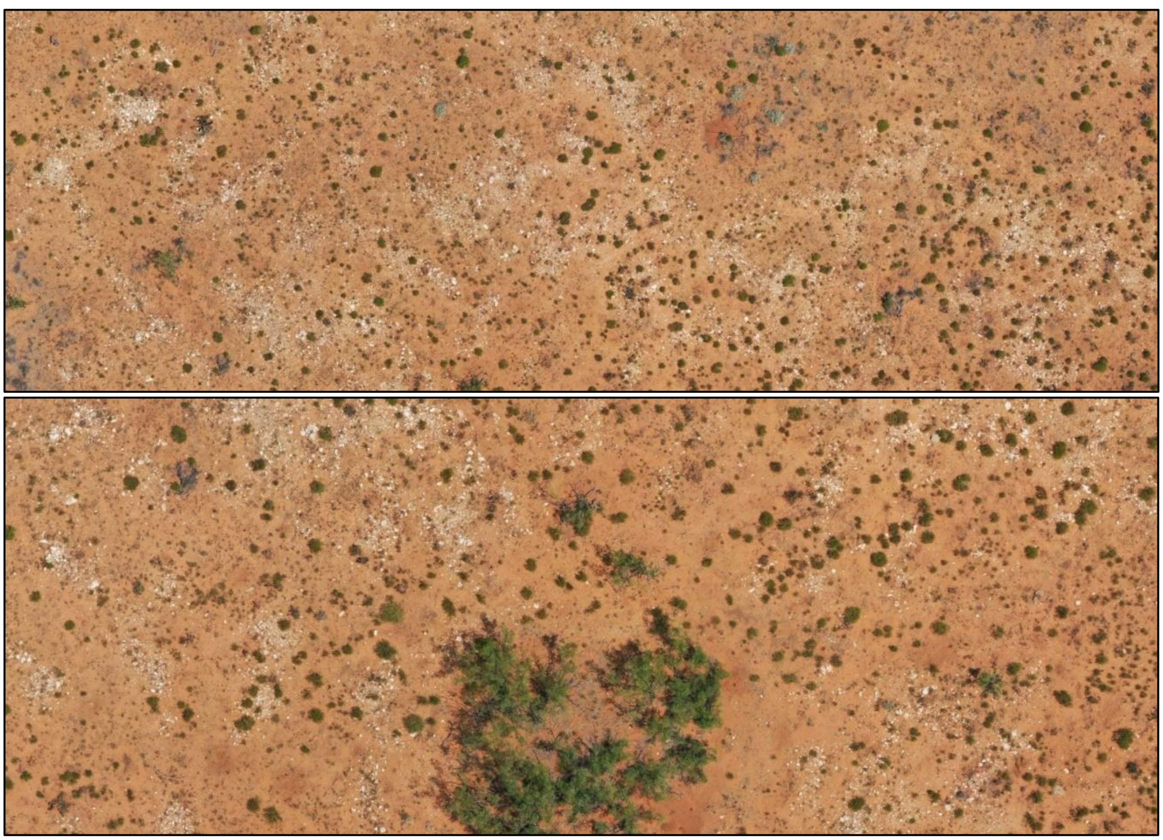

Figure 10.3. Aerial images of two sections of Feature 3 at LA 195367 on Antelope Ridge west of the Merchant village. Note the linear patterns of caliche cobbles that appear to bound small field plots (from Graves et al. 2021a).

Overview of the Agricultural Field Investigations

One of the primary goals of the second season of fieldwork at LA 43414 was to further explore and define the nature of the suspected fields and collect additional pollen and phytolith samples. The 2019 investigations, reviewed in following discussions, included aerial mapping, excavation of large-scale exposures, additional geomorphological analysis, and intensive sampling for pollen and phytoliths. Excavations revealed patterned distributions of caliche cobbles similar to bordered cobble fields, and intensive pollen sampling and extraction methods identified a few grains of maize pollen in samples collected from fields.

The 2019 field and laboratory work expanded on the efforts of the 2015 investigations, and summaries of the previous foundational work are included in the following discussions to provide a comprehensive review. Details on soil descriptions, soil chemistry, and geomorphological descriptions of trench stratigraphy are available in the 2016 report (Frederick et al. 2016).

Figure 10.4 illustrates the locations of excavation units in the locations of suspected agricultural fields and the backhoe trenches opened for geoarchaeological study during the 2015 and 2019 field seasons. The trenches and excavation units are described Table 10.1.

[redacted]

Figure 10.4. The 2015 and 2019 investigations of agricultural features.

Table 10.1. Summary of the 2015 and 2019 excavations in the agricultural features

Trench or Unit#	Size (m)	Average Depth (m)	Features
Trench			
2015-1	5.0 x 1.0	1.5	Playa to the west of the village
2015-2	12.2 x 1.0	0.3	Feature 95
2015-3	5.5 x 0.8	0.3	Feature 90
2015-4	2.0 x 0.8	1.0	Off-site control in eolian deposits
2019-1	32.5 x 1.0	1.3	Off-site control in eolian deposits
2019-2	11.2 x 1.0	0.7	Feature 82
2019-3	19.3 x 1.0	0.7	Feature 65
Unit			
2015-95	2.0 x 4.0	0.2	Feature 95
2015-108	3.0 x 3.0	0.1	Feature 108
2019-82	16.0 x 20.0 brushed / 4 x 8 cleared / 1.0 test unit	0.1	Feature 82
2019-91	14.0 x 24.0 brushed / 4 x 8 cleared / 1.0 test unit	0.1	Feature 91

Review of the 2015 Investigations

The 2015 investigations, including detailed discussions of soils and geomorphological analyses, are described in the 2016 report (Miller et al. 2016). The following presents a summary of the geoarchaeological trench studies and two excavation units.

Geoarchaeological Trench Studies

The 2015 geoarchaeological trenching study was designed to assess the environment around the Merchant site for places where agriculture could have been practiced by the site's inhabitants. Trench 2019-1 was placed at the margins of a suspected playa 698 m southwest of the Merchant village area. Trench 2019-2 and Trench 2019-3 were placed through sections of suspected agricultural Features 95 and 90. Trench 2019-4 was a small trench in eolian sheet sand and coppice dune deposits 40 m beyond the northern site boundary to provide a control profile and soil sampling column.

Trench 2015-1 was excavated into the basin floor in the vicinity of the dark area visible on aerial photographs of the Merchant vicinity (see Chapter 5). The trench excavated on the basin floor exhibited two alluvial deposits. The upper 16 cm (Zone 1) consisted of a silt loam to silty clay loam with a small amount of fine gravel, primarily redeposited caliche fragments, and within which a weak soil had formed. This horizon was inferred to be of recent age (most likely Historic) and was probably not present at the time the Merchant site was inhabited. Beneath this horizon was an alluvial deposit that appears to have begun deposition in the late Pleistocene and probably aggraded incrementally throughout the Holocene.

It was also determined that the term "playa" is not an appropriate description of the basin floor. Although the surface of the San Simon Swale in the region around the site exhibits many poorly drained depressions that are visible on aerial images, most are solution/collapse depressions that are internally drained. The depression is clearly drained by alluvial channels and is likely to have been the case for a considerable period of time. The dark area appeared to be caused by slightly denser vegetation, and there was no evidence on the surface of water ponding in this area. To be sure, these ephemeral channels that drain the north and east sides of the basin undoubtedly delivered abundant water to the basin floor at times in the past, and this landscape provides numerous small patches that would have been easily amenable to passive water harvesting techniques.

Two cobble alignments were investigated by opening shallow backhoe trenches placed transverse to the alignments. Trench 2015-2 was situated across a suite of approximately three of these alignments (see Figure 10.5).

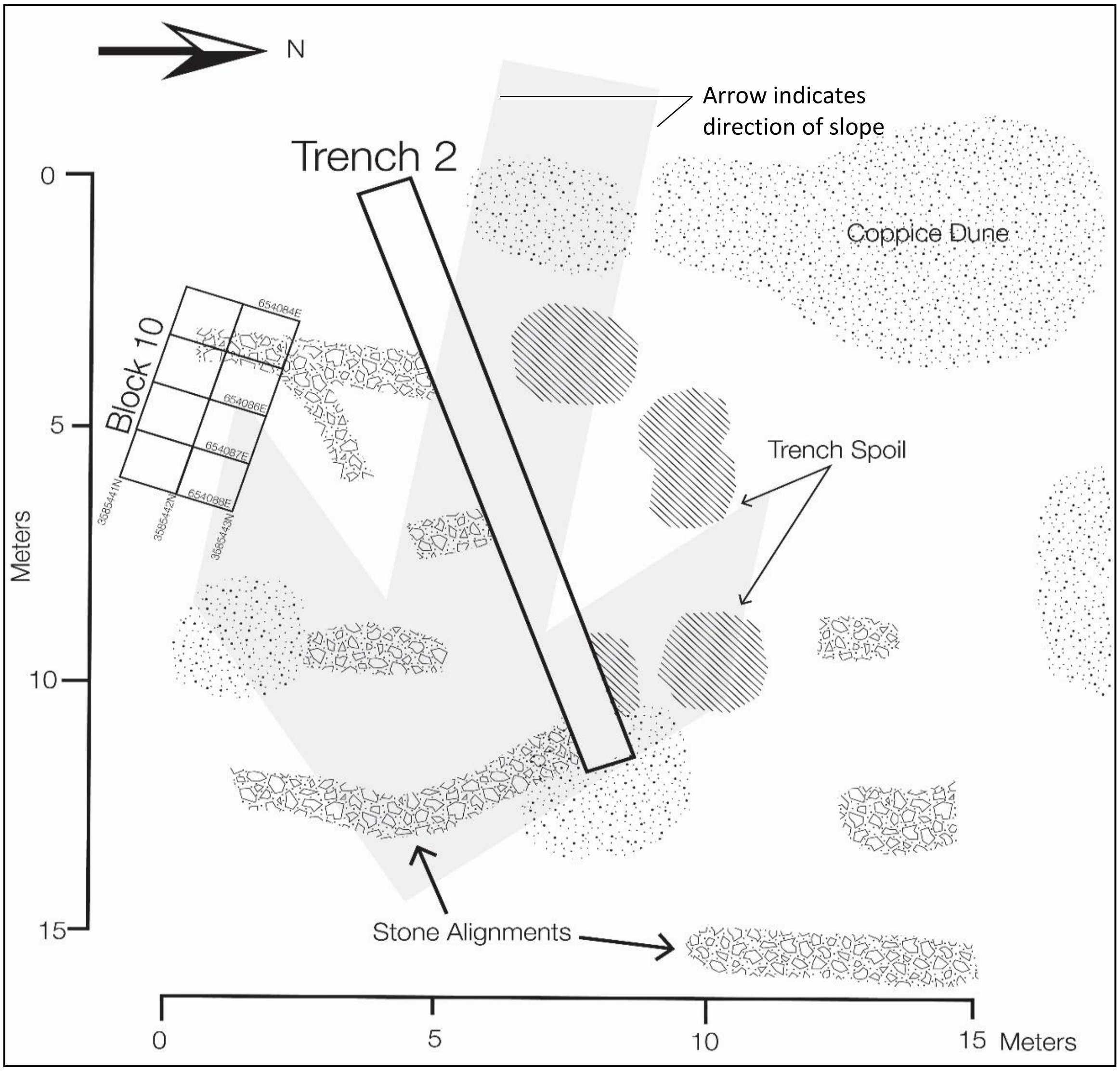

Figure 10.5. Sketch map of the excavations of Feature 95, including Trench 2015-2 and the excavation unit (labeled as Block 10). The locations of visible cobble alignments with respect to the location of the trench and the direction of the slope are indicated.

The trench provided several interesting observations (Figure 10.6). First, the deposits exposed consisted of a thin (less than 10 cm) drape of Recent Eolian Sand across the areas between the coppice dunes, and this deposit thickened considerably to form the coppice dunes. The Recent Eolian Sand rested unconformably upon an A-horizon formed in the Upper Eolian Sand. This deposit was generally less than 30 cm thick and rested unconformably upon the laminar cap of the Mescalero Paleosol/Caliche. In most places, the top of the calcrete was mantled with a scatter of loose rounded to subrounded calcrete cobbles and gravel, and some of the cobbles were also observed suspended in the eolian sand. The stone alignments appeared to clearly be places where these loose clasts were stacked (or at least multiple clasts resting one upon another).

Figure 10.6. Photograph of west wall of the southern half of Trench 2015-2.

Two such alignments are visible in the profile drawing of Figure 10.7, one at the left (south) end of the drawing, under the coppice dune, and another at the right (north side) of this drawing. The concentration of cobbles at the south end, beneath the coppice dune, appeared to coincide with an elevated part of the laminar calcrete, whereas the cobble concentration on the right side of the drawing was not associated with any significant variation in the calcrete surface. Between the two cobble stone alignments was a patch of relatively stone-free soil, where a small number of stones were suspended (highlighted by the brown tone on the profile).

Trench 2015-3 was excavated across another series of linear stone piles designated Feature 90 (see photograph of Figure 10.1), and a segment of this trench profile is profiled (Figure 10.8). The stratigraphy is similar to Trench 2015-2, with rocks visible on the ground surface that appear to represent clast-supported piles of rock separated by areas of sandy soil lacking many rocks (Figure 10.9). Unlike Trench 2015-2, however, the area of soil between the rock piles in this trench contained numerous rocks beneath the eolian sand resting directly upon the caliche, which is similar to the results obtained from the hand excavation of Feature 95 described below.

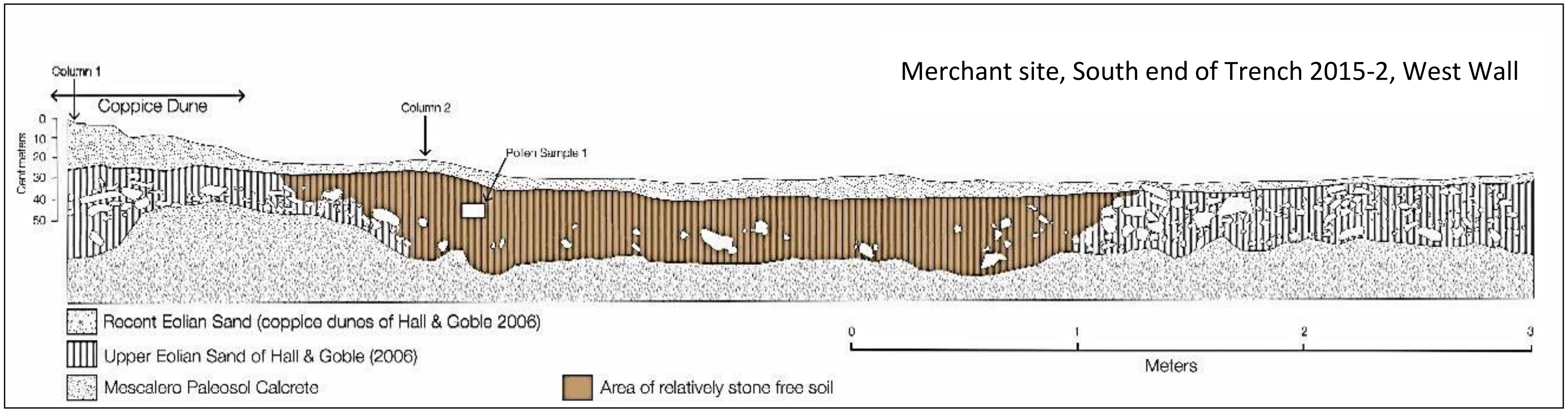

Figure 10.7. Profile drawing of the west wall southern half of Trench 2015-2, made from a photomosaic of the exposure. The trench exposed the Recent Eolian Sand as coppice dune (left side) as well as a thin drape of the entire ground surface. The brown tone highlights an area of relatively rock-free soil. Pollen Sample 1 is shown; sample 2 was taken from the northern trench and is not shown in this figure.

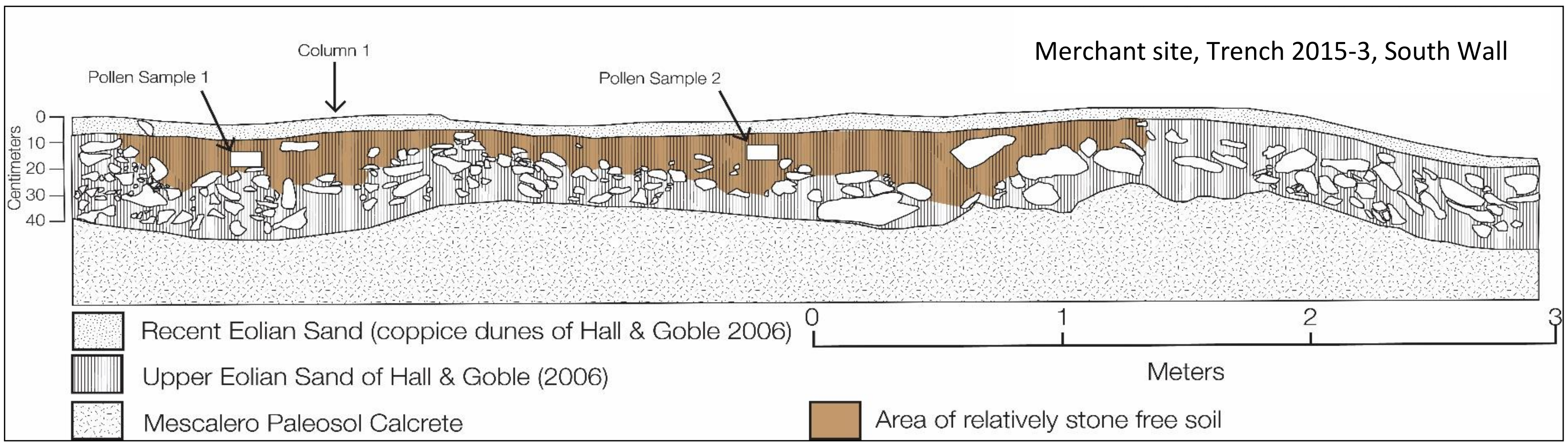

Figure 10.8. Drawing of the south wall of Trench 2015-3 compiled from a photomosaic. The figure shows the thin (5 cm) Recent Eolian Sand drape burying an A horizon formed in an eolian deposit presumed to be the Upper Eolian Sand. The brown tone depicts areas of relatively rock-free soil. Pollen Samples 1 and 2 are shown.

Figure 10.9. Photograph of west wall of the central part of Trench 2015-3 showing mounded caliche slabs.

In addition to the trench excavations focused on the presumed agricultural features, an informal excavation (Trench 2015-4) was made outside the site to expose a control profile that had been unaffected by prehistoric agriculture. Given the degree the coppice dunes obscure the ground surface in this area, it is impossible to be completely certain that this area was outside the area of potential cultivation. This resulting profile, termed the control profile, was excavated into the side of a coppice dune immediately south of the pipeline that lies immediately north of the site, and this excavated section exposed 95 cm of sand resting upon calcrete. The soil profile exposed exhibited a C-2Ab-2AC-3K soil profile where the C horizon at the top was composed of the Recent Eolian Sand, which was slightly less than 40 cm thick. The buried soil beneath the coppice dune was weakly expressed, 30 cm thick, and formed within the Upper Eolian Sand. This buried soil was significantly less melanized than the buried soil exposed by Trenches 2 and 3. A 25-cm-thick AC horizon separated the bottom of the buried soil from the top of the Mescalero calcrete.

Excavations

Small-scale excavation units were opened in Features 108 and 95. Feature 108 was located near the northeastern margin of the possible features and was situated among deep eolian sands and coppice dunes. Feature 95 was positioned along sloping terrain by the shallow drainage and was also explored by Trench 2015-2. Hand excavations were intended to expose portions of the linear cobble alignments in planview to complement the profiles exposed in geomorphological study trenches. The excavations provided contexts for additional pollen and radiocarbon sampling.

Feature 95 was recorded as four linear alignments of more than 5,000 caliche cobbles distributed across a 40m by 20-m area. As with other linear cobble alignments, the long axis of Feature 95 was oriented from the southeast to the northwest. The northeastern edge of the feature was exposed in Trench 2015-2 (see Figure 10.5). A 2-m by 4-m excavation was opened south of the trench to further expose one of the linear alignments seen in the trench profile. Excavation of two levels exposed a clearly defined linear mound of small caliche cobbles and pebbles (Figure 10.10) measuring 2.0 meters in width and at least 2.6 m in length. A key observation was that the cobbles were stacked upon each other forming a linear mound and that areas to the east and west were mostly devoid of cobbles. The alignment extended three to four meters to the north where it formed the mounded terrace feature mapped in the profile of Trench 2015-2.

Figure 10.10. Feature 95 exposed in Level 2.

Another key attribute of Feature 95 is that no charcoal-stained sediments or charcoal fragments were observed anywhere throughout the fill or among the mounded cobbles. While this observation provides a key point for interpreting the feature, it was not possible to obtain a radiocarbon date for the feature because of the absence of charcoal.

A 3-m by 3-m excavation was established over the northeastern corner of Feature 108 to examine a linear alignment of caliche cobbles. A single level of 3 to 10 cm of eolian sand was removed to expose the underlying layer of brown sandy loam and caliche cobbles, revealing a semi-circular alignment of caliche cobbles measuring 2.6 m in diameter. A small fragment of charcoal yielded a conventional radiocarbon age estimate of 1110 ± 30 B.P. that calibrates to A.D. 880–1010 at 2-sigma. The age estimate predates the Merchant village by a minimum of 300 years.

Sediments from each unit were screened through ⅛-inch mesh and moderate quantities of artifacts were recovered. Artifact totals for the Feature 95 excavation were 39 flakes, 1 uniface, 1 biface, 1 projectile point, a sandstone slab metate fragment, and 3 El Paso brownware sherds. Artifacts from Feature 108 included 89 debitage, 10 utilized flakes, 3 unimarginal core tools (chopper), 1 uniface, 1 biface, 4 projectile points, 1 core, 2 metate fragments, and 3 Jornada/Roswell Brown and two Ochoa Indented sherds. The artifact densities were unexpected for an area of agricultural fields. As discussed in the chapter summary, the results of the Merchant Vicinity survey helped clarify the presence of such quantities of artifacts.

The 2019 Excavations

The 2019 fieldwork was an expanded and more intensive version of the work conducted in 2015. Additional aerial mapping and geomorphological analysis were completed. Excavations focused on exposing broad areas of suspected field locations, and the locations were much more extensively and systematically sampled for pollen and phytoliths.

Feature 82

The first field clearance unit was established over the location of several linear caliche alignments, some of which were perpendicular to each other and linked to form corners. The general location of these features was designated as Feature 82 during the 2015 survey and mapping of the site. A 10-m-long backhoe trench was opened along the southern edge of some of the alignments, providing a profile of the shallow sediments and cobble alignments in this area.

A 16-m by 20-m (320 square meter) area north and west of the trench was cleared of broom snakeweed, grasses, and small shrubs to provide an exposure for aerial photography conducted by Mark Willis. A 4-x-8-m area in the southwestern part of the clearance was selected for excavation. The excavations involved removal of 1 to 4 cm of unconsolidated eolian deposits to expose the patterns and alignments of caliche cobbles comprising the suspected field area of Feature 82. The eolian sediments were a light brown (Munsell 7.5YR6/4) sand, and removal of that deposit exposed an underlying layer of semi-compact dark brown (Munsell 10YR3/3) sandy loam. A total of 1.01 cubic meters of fill was excavated and screened through 1/8-inch mesh. The materials recovered from the level include 199 flakes, 5 utilized flakes, 1 uniface, 2 cores, 7 groundstone fragments, 1 bone fragment, and 1 piece of limonite. Ochoa ware sherds were notable by their absence.

The excavations exposed two open areas delineated by linear arrangements of caliche cobbles (Figure 10.11). The western space was clearly bounded by linear scatters of caliche cobbles and measured approximately 3.9 m east/west by 3.28 m north/south for a gridded area of 10.12 square meters. The eastern space was a similar size and shape but was missing cobbles along the southern and southeastern margins. The gridded pattern continues north of the cleared area.

The excavations in Feature 82 clarified the patterning of dispersed alignments of cobbles around open spaces within one section of the suspected agricultural fields. The difference between the open space and peripheral cobble alignments is more distinct in the ground level view of the cleared excavation area (Figure 10.12). The open areas had been cleared of cobbles and the cobbles were then placed at the margins of the clearings.

There is quite a bit of disturbance among the alignments. Discrete linear alignments of mounded or piled cobbles are not evident in the excavated exposures, and some cobbles are scattered across the interior cleared areas. However, there are visible patterns in the densities of cobbles along the margins of the cleared areas as opposed to the interiors. The indistinct nature of the cobble alignments and presence of cobbles scattered across cleared areas is probably the result of cattle grazing and bioturbation, a point reviewed in greater depth in the chapter summary.

Another important observation is that the gridded spaces have similar alignments to the domestic rooms of the Merchant village (see Chapter 6). The scattered rocks comprising the boundaries of the grids make it difficult to measure exact orientations, but the angles of the open spaces and the cobble alignments generally range between 60 and 70 degrees azimuth. The orientations of seven rooms of the eastern room block of the Merchant village range from 58 to 66 degrees azimuth.

Figure 10.11. Aerial view of the cleared areas of Feature 82. The 1-x-1-m test unit is visible in the western open space.

Figure 10.12. Ground level view of the excavated surface of Feature 82 and 1-x-1-m test unit in the center.

A 1-m by 1-m hand unit was excavated near the center of the western open area to determine the depth of the sediments. The natural caliche conglomerate layer was at 7 to 9 cm below the cleared area of Level 1 (Figure 10.13). The fill was a dark brown to reddish-brown (Munsell 5YR5/6) sandy loam. The unit established that few artifacts were present in deposits below the 1 to 4 cm of surface deposits, as only two lithic artifacts and a fragment of FCR were recovered. No charred organic material was recovered during excavation or from the flotation sample. In an effort to date the feature, an uncharred seed fragment was submitted for radiocarbon dating. The species of the seed fragment could not be identified, but the δ13C measure of -13.5 ‰ indicates a C4 plant species, most likely Four-wing saltbush (*Atriplex* sp.). The sample yielded a modern (bomb carbon) date with an 84 percent probability of dating from 2004 to 2008.

Figure 10.13. The 1-x-1-m excavation unit in Feature 82.

Trench 2019-2 in Feature 82

Trench 2019-2 was positioned along the southern edge of several cobble alignments that were part of the Feature 82 field area. The trench was 11 m long and averaged only 70 cm in depth to the caliche conglomerate stratum. The trench exposed the southern margins of two cobble-bordered fields that were more clearly defined after the vegetation north of the trench was cleared and followed by a heavy rainfall (Figure 10.14). Sediments in the trench included an upper layer of eolian light brown sand over a thin organic-rich layer associated with the field. The eastern half of the trench appears to have paralleled and bisected the southern cobble border, and the mounded eastern cobble border is also visible in the profile.

Figure 10.14. Trench 2019-2 across the southern edge of Feature 82. Mounded cobbles of the southern cobble border are visible in the profile at lower right.

The results of the excavations of Feature 82 are illustrated in Figure 10.15. The figure shows the area cleared of vegetation and the excavations. The systematic pollen and phytolith sampling locations are also plotted. In July of 2019, Susan Smith conducted a systematic pollen sampling of the rock alignments and cleared spaces of Feature 82. Ten pollen samples and paired phytolith samples (labeled CN 401-410) were collected from the western cleared area, and four samples (2019-5, 6, 8, and 9) were collected from the cobble alignments north of Trench 2019-3 where certain alignments formed corners around cleared areas. The results are reviewed in the discussion of pollen and phytolith studies below. Intensive scanning procedures identified maize pollen in Sample 2019-6 collected from the edge of a cobble alignment (red symbol in Figure 10.15; see also Figure 10.14 above).

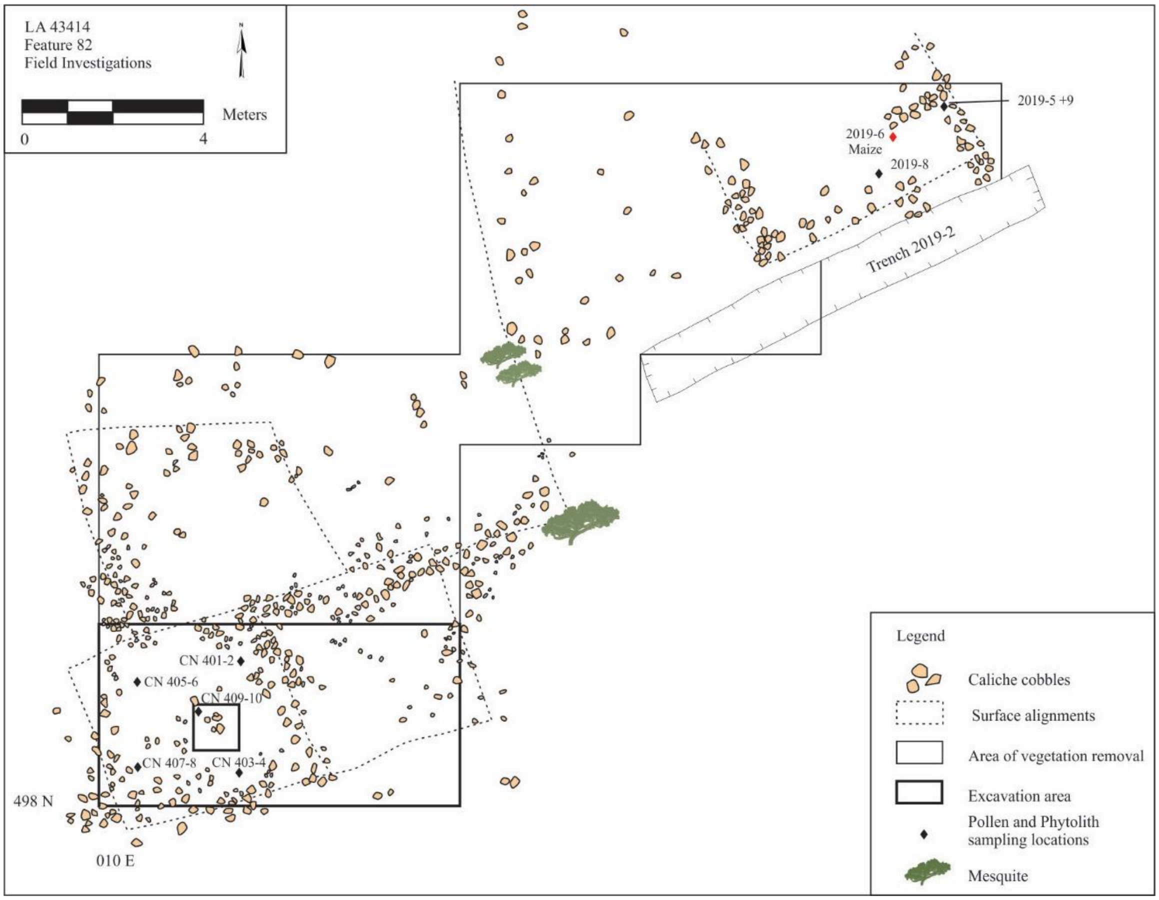

Figure 10.15. Plan map of the investigations of Feature 82, showing the area clear of vegetation, the excavated area and test unit, Trench 2019-2, and the pollen and phytolith sampling locations.

Feature 91

Feature 91 is located at the western edge of the field area. A 14- by 24-m (336 square meter) area was cleared of broom snakeweed and grasses to expose and clarify the patterning of caliche cobbles and provide an exposure for aerial photography (Figure 10.16). As with Feature 82, a 4-x-8-m section of the southern part of the clearance was selected for additional excavation. The excavations were completed within two 4-x-4-m subunits and involved removal of 1 to 4 cm of unconsolidated eolian deposits to expose the patterns and alignments of caliche cobbles comprising the suspected cobble-bordered field.

The upper 2 to 4 cm of eolian sediments were a light brown (Munsell 7.5YR6/4) sand, and removal of that deposit exposed an underlying layer of semi-compact dark brown (Munsell 10YR3/3) sandy loam. A total of 0.67 cubic meter of fill was excavated and screened through 1/8-inch mesh. The materials recovered from the level include 27 flakes, 3 utilized flakes, 1 uniface, 1 core, and 1 groundstone fragment. As with the Feature 82 excavation, ceramic sherds were notable for their rarity or absence, as only one El Paso brownware and one Ochoa ware sherd were recovered. In addition, 25 BC were documented in Level 1.

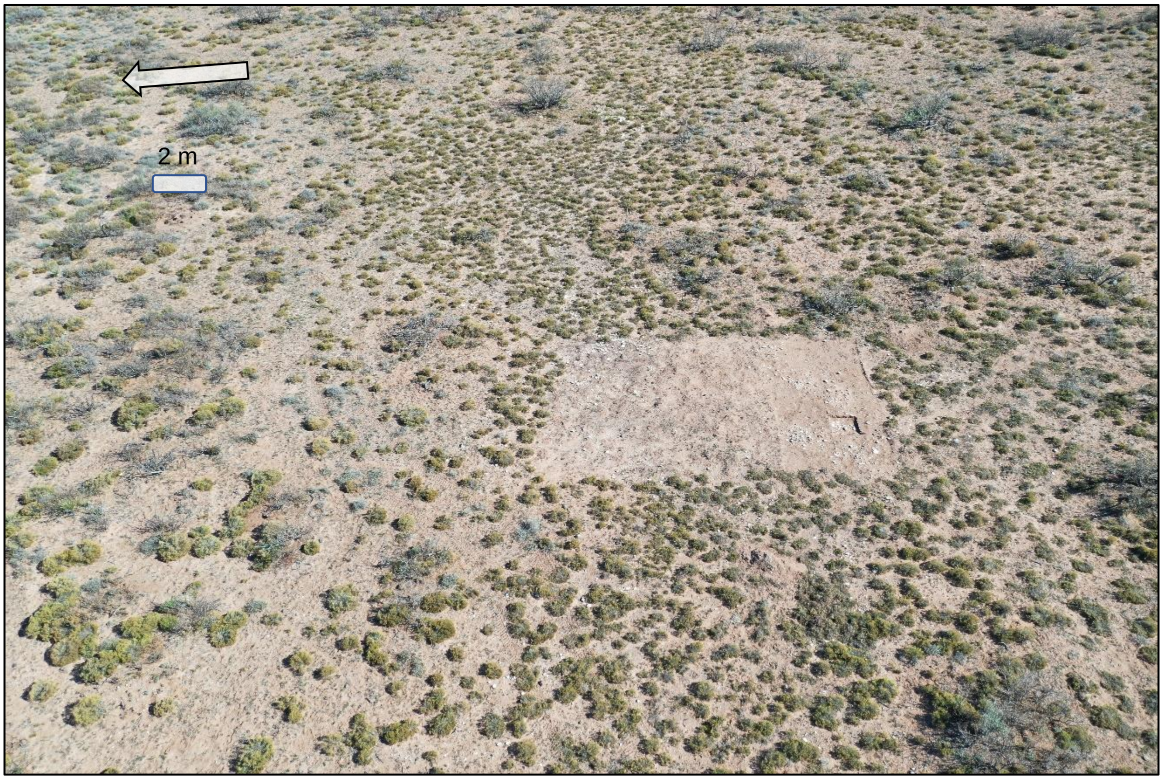

Figure 10.16. Area cleared of vegetation across Feature 91.

In a finding similar to Feature 82, the excavation of Feature 91 exposed two roughly rectangular open areas delineated by linear arrangements of caliche cobbles (Figure 10.17). The western space was bounded by caliche cobbles and measured approximately 3.0 m wide by more than 8.0 m long for a gridded area of approximately 24 square meters. The eastern space was a similar size and shape but was missing cobbles along the southern and southeastern margins. The gridded pattern continues north of the cleared area.

A 1-x-1-m hand unit was excavated in the western open area to determine the depth of the sediments and the morphology of one of the linear alignments of cobbles. The natural caliche conglomerate layer was encountered at a depth of 7 to 9 cm (Figure 10.18). The fill was a dark brown to reddish-brown (Munsell 5YR5/6) sandy loam down. The unit established that few artifacts were present in deposits below the 1 to 4 cm of surface deposits, as only 11 lithic artifacts, a sherd, and a fragment of FCR were recovered. No charred organic material was recovered during excavation or from the flotation sample.

Excavations in Feature 91 confirmed that the alignment of cobbles visible on the cleared surface was underlain by a mounded border of piled cobbles. Ten pollen/phytolith samples were collected from the corners of the field and the center of the test unit. The samples were curated for future analysis.

Figure 10.17. Ground level view of the excavated 4-x-8-m area of Feature 91.

Figure 10.18. The 1-x-1-m unit in Feature 91.

Feature 65

Trench 2019-3 was placed near Feature 65, a series of linear caliche cobble alignments that crossed the lower reaches of the drainage channel at the eastern margins of the field area (Figure 10.19). The features were identified as possible check dams during the 2015 survey and mapping efforts.

Feature 65 serves as an example of just how fragile and ephemeral certain features are on Grama Ridge. When they returned to the site in 2019, the field crew discovered that the linear cobble alignments had almost entirely disappeared during the four years since they were first documented in 2015. Heavy rains and floodwaters along the channel had washed away most of the features, leaving only a few scattered cobbles and two 20- to 30-cm-wide remnants of the alignments.

Trench 2019-3 was excavated about three meters south of, and parallel to, the drainage channel. The trench was 19.3 m long and 70 cm deep, exposing a layer of light brown sand over the caliche conglomerate. No evidence or remains of the original check dams was visible in the profile, but several undulating surfaces of mounded caliche were present (Figure 10.20).

Susan Smith collected five pollen samples from the remnants of the check dams and surrounding surfaces. Maize pollen was identified in Sample CN 454, collected to the side of one check dam location at a depth of 35 cm. Diatoms, including freshwater *Nitzschia* species, were abundant in the phytolith samples from the features in Trench 2019-3, indicating that the features did serve to retain water for periods of time.

Figure 10.19. Feature 65 as documented in 2015 (from Miller et al. 2016:Figure 4.8).

Figure 10.20. Profile of Trench 2019-3 adjacent to drainage where Feature 65 was located.

Discussion: The Case for Agricultural Fields

Adolf Bandelier (1892) first recognized the cobble-bordered grids on terraces above the river floodplains of north-central New Mexico as agricultural fields and associated them with the pueblo ruins nearby. Years later, Hewett (1906) and Greenlee (1933) also encountered gridded arrangements of cobbles near Abiquiú in the Chama Valley, but both identified them as "foundation type" ruins rather than fields owing to their similar dimensions to pueblo rooms. The conflicting interpretations of gridded features in the Chama and Rio Grande valleys that took place during the early twentieth century present an interesting historical analog to the present study of the early twenty-first century, as some sections of the Merchant fields were also identified as possible pueblo room blocks when they were first encountered during the seismic surveys of the 1990s.

The confusion over fields and rooms is easily understood by taking into account the nature of archaeological manifestations in southeastern New Mexico. Room blocks of jacal structures with stone wall foundations (cimientos) constructed using unmodified caliche cobbles have similar surface manifestations to gridded fields that were also created using unmodified caliche cobbles. The features are partially buried under eolian deposits and were disturbed by cattle trampling, animal burrowing, plant growth, and other natural forms of bioturbation. As a result of these factors, the cobble alignments of room foundations and fields are often discontinuous and scattered. Moreover, artifacts are present on the surfaces of the fields, giving the impression that the areas were locations of residential settlement. In fact, several areas of patterned cobbles on the terraces of Grama Ridge and Antelope Ridge identified during the Merchant Vicinity survey (Graves et al. 2021a) could not be classified as field, structure, or as natural caliche outcrops based solely on their surface manifestations

The field versus pueblo room problem of identification is just one of the issues of the Merchant fields. It has proven much more challenging to isolate and define conclusive evidence that the apparent linear patterns of caliche cobbles were formed through direct human action and agency as opposed to some combination of inherent natural processes particular to the caprock landforms of Grama Ridge and elsewhere across southeastern New Mexico. As one gazes across the caprock terraces surrounding the Merchant site (Figure 10.21), the location does not appear to be a propitious or sensible location for prehistoric intensive agricultural technologies. But such sentiments reflect our tendency to underestimate the inventiveness of past societies as well as our presumptive bias regarding the relationships of culture regions and agricultural adaptations. Noting the hazards of uncritically imposing templates linking specific agricultural adaptations and technologies with specific cultures or culture regions, Woosley comments:

> The danger in the implicit one-to-one mapping of a single kind of farming system to a geographical area and to the people who inhabited it, is that it may blind us to the variation which really existed in the archaeological record. The typical farmer of such agriculturally marginal lands as those of the Southwest is much more interested in how to get a decent crop from *this* particular plot in *this* particular year than he is in providing an easily interpreted archaeological record (Woosley 1980:317, emphases in original).

Figure 10.21. Aerial view of the excavations of Features 82 and 91 on the terrace landform of Grama Ridge.

In this light, it is worth noting that, until recently, the Merchant site and other villages of the late Prehistoric period of the southeastern New Mexico plains were thought to be non-agricultural. In other words, the construction, use, and maintenance of agricultural technologies were not remotely considered a possibility because most researchers did not even believe that plant cultivation was part of the subsistence base.

Woosley (1980:318) further comments that cultivation strategies and water and soil control technologies are designed responses to a variety of specific, local environmental factors that "have no simple correlation with other cultural variables." Environmental variables affecting agricultural adaptations range from topography, hydrology, and soil chemistry to rainfall, temperature, and growing season. Prehistoric farmers of the Southwest employed a sophisticated understanding of these environmental and landscape qualities to select among a variety of cultivation techniques and technological options to divert or capture water, conserve moisture, and accumulate and preserve soils. Water retention and conservation were paramount concerns, and methods of diverting and exploiting runoff and slowing evaporation rates were devised. Terraces, check dams, floodplain fields, runoff fields, irrigation channels, waffle gardens, cobble piles, stone-mulched fields, and bordered fields were among the set of strategies used to deal with patchy and unpredictable rainfall (Anschuetz 1995, 1998; Maxwell 2000; Maxwell and Anschuetz 1992; Vivian 1974; Woosley 1980). Soil properties and soil conservation were also critical factors in the location and design of agricultural fields (Dominguez 2002; Dominguez and Kolm 2005; Homburg et al. 2004, 2005, 2011; Sandor 1992, 1995; Sandor et al. 1990, 2008; Sullivan 2000).

Considering the extraordinary diversity of environments across the arid Southwest, it is evident that prehistoric farmers selected one or more specific agricultural techniques out of a broad spectrum of technological choices to best exploit local conditions. Moreover, it would also be expected that variations, modifications, and combinations of techniques would be applied, depending on local topographic, hydrologic, soil, and precipitation conditions, as well as the specific plants being cultivated. As argued by Woosley, these variations may not match preconceived expectations of what agricultural techniques and technologies should look like in different archaeological contexts, including the eolian terraces of far southeastern New Mexico.

With these thoughts at the forefront, the following summary discussions draw together the archaeological, geoarchaeological, and palynological data gathered and compiled during two seasons of investigations. As noted in Chapter 8, the presence of kivas or a related form of communal structure on the southern Plains might be a controversial proposition to some researchers, although most village settlements had some form or another of communal structure. However, if dragging the concept of kivas to the southeastern plains of New Mexico is fraught with pitfalls and dangers, then dragging the notion of Southwestern gridded agricultural fields across the plains is even more so. In another sense, however, this tendency is also a reflection of the unfamiliarity of Southwestern archaeologists with Plains cultures such as Antelope Creek, the Washita River phase, the Upper Republican phase, all of which were agricultural and sedentary or semi-sedentary.

In the 2016 report, we acknowledged that the subject of agricultural features at LA 43414 would be the most controversial topic of the project, and it is likely that the issue of agricultural fields in far southeastern New Mexico will continue to be the most controversial and debated conclusion of the present study. Yet, there was a fundamental shift in the perspectives of the project team between the 2015 and 2019 fieldwork and laboratory analyses. In 2016, an informal survey was conducted to gauge the confidence level of project participants and specialists that the agricultural features were valid and were correctly interpreted. The confidence levels ranged from highs of around 70 percent to a low of 30 percent, so, depending on one's personal bias and degree of optimism, there was a two-in-three chance of being right or a two-in-three chance of being wrong. A second survey was taken in 2019, and the results ranged from 70 to 95 percent confidence. Notably, the team member who was only 30 percent confident of the identification in 2016 had shifted to a 95 percent confidence as a result of the more intensive field and laboratory work of 2019. We are much more optimistic, both individually and collectively, that the interpretations presented in the following discussions are sound and defensible.

Chronology

Dating the fields and features has proven difficult, whether using chronometric or relative methods. It is reasonably assumed that the fields are associated with occupation of the Merchant village and therefore date to sometime between A.D. 1300 and 1450. Attempts to verify this age range through direct or relative dating were inconclusive.

Because of their function for growing crops, charred organic matter is rarely encountered from agricultural fields, and when it is found it usually originated from different occupations or sources. A testament is how rarely the terms “radiocarbon” or “^{14}C” are encountered among the numerous publications describing research among the agricultural fields of north-central New Mexico. In the present case, organic matter recovered during excavations of fields was associated with earlier or later occupations of the Grama Ridge terrace. As reviewed in Chapter 5, the long-term occupation of the terrace landforms within and around Grama Ridge left traces of earlier and later occupations throughout the field locations. Organic material and artifacts from earlier and later occupations were often intermixed through erosion and bioturbation, and modern use of the area for cattle grazing further contributed to the mixing of deposits.

These dating issues are is aptly demonstrated by the two radiocarbon dates obtained from two field locations: Features 82 and 108 (see discussion in Chapter 11). The date from a sample of wood charcoal collected from Feature 108 predates the presumed age of the fields by several centuries; a modern (bomb carbon) date was obtained from Feature 82 through a somewhat imprudent attempt to date an uncharred seed from the feature. Chronometrically dating the fields will require other methods, such as OSL dating of sediments or perhaps radiocarbon dating of maize phytoliths or phytoliths of other cultigens (Piperno and Becker 1996), should such phytoliths be recovered in sufficient quantity. It should also be noted that three maize cupules and kernels recovered from Pit Structure 1 at the Merchant village were dated.

Relative dating through associations with temporally diagnostic ceramic or projectile point types did not clarify matters. Reflecting the multi-millennial occupation of Grama Ridge, the excavations in Feature 108 recovered projectile points and ceramic types spanning the Late Archaic and Late Formative periods, each of which either predates or postdates the radiocarbon date. However, the presence of Ochoa ware and a Harrell projectile point do indicate the location was used during the Ochoa phase. An equally ambiguous assortment of temporally diagnostic artifacts was recovered from Feature 95, including a reworked Late Archaic point that may have been scavenged and recycled and El Paso brownware body sherds that could date anywhere from A.D. 500 to 1450. A single Ochoa ware sherd and El Paso brownware sherd were recovered from the broad excavation of Feature 91. No diagnostic artifacts were recovered from Feature 82. Given the extremely low ceramic counts from these features, it is perhaps notable that an Ochoa ware sherd was recovered from two of the excavated field locations.

Lacking a reliable means of dating the fields, the only option is to assume they date to the same period as the Merchant village. This conclusion is reasonable, given that maize pollen and charred plant fragments were identified in multiple contexts at the Merchant village. The age range of the Merchant site, and by association the inferred age of the fields, falls within the generally accepted dates for gridded fields in north-central New Mexico. Based on the range of well-dated ceramic types collected from gridded fields, the construction and use of fields throughout the Chama and Rio Grande valleys occurred primarily between A.D. 1300 and 1550 (Anschuetz 1998; Anschuetz et al. 1985), although use continued into the historic era in some localities (Maxwell 2000). Based on ceramic cross-dating, Moore (2010) assigned an age of A.D. 1450 to 1550 to a series of gridded fields in the Ojo Caliente Valley. In his comprehensive review of agricultural features across the U.S. southwest and Mexican northwest, Doolittle (2000:243) notes “all of them date between A.D. 1200 … and the arrival of Europeans … with most being used in the 1400s.” In the present case, the possibility that the fields were used during earlier Maljamar phase occupations of the area, or perhaps even after abandonment of the Merchant village, cannot be ruled out, but it is reasonably certain that the primary period of construction and use took place between A.D. 1300 and 1450.

Classification and Description

A multitude of terms and variants of terms are used to describe the range and variability of agricultural features of north-central New Mexico and the greater U.S. Southwest (Anschuetz 1998; Moore 2009; Woosley 1980). Choosing a single, specific term from among that multitude to accurately characterize the features at the Merchant site is a challenging proposition because *it requires that we define and apply an analytically and descriptively precise term to features that are archaeologically imprecise*. Many of the terms used in the U.S. Southwest and northern Mexico describe formally constructed and well-defined features, and the use of those terms conveys certain connotations and tacit assumptions. Applying such terms to describe the features of the present study may serve to impose those connotations and assumptions, thus creating false impressions regarding the formality and function of the Merchant examples.

Several terms are used to describe categories of agricultural features that are essentially constructed of linear patterns of cobbles: cobble-bordered fields, cobble-bordered mulch fields, gridded fields, grid gardens, waffle gardens, terraces, and check dams. The terms "mulch garden" or "mulched field" were used interchangeably with grid gardens, fields, and other terms throughout the 2016 report – a fact that, at the time, illustrates our individual and collective uncertainties regarding the morphology and function of the features. The broader exposures of features achieved during the 2019 fieldwork and subsequent analysis have narrowed the range of options, and it is evident that the Merchant fields were probably not gravel-mulched. In contrast, the areas between the rock alignments appear to have been cleared of rocks. Moreover, pits and depressions are commonly associated with cobble-bordered mulch fields (Anschuetz 1998; Bugé 1984; Dominguez 2002; Lightfoot 1990, 1993a, 1993b; Lightfoot and Eddy 1994; Maxwell 2000; Moore 2009; Tjaden 1979; Wiseman and Ware 1996). There is some debate over the function of the pits, but the consensus is that they served as borrow pits to obtain cobbles and gravels for the fields. These and other common components of gravel-mulched fields in north-central New Mexico are conspicuous by their absence among the fields of the Merchant site.

We note, however, that our understanding of the Merchant fields is still rudimentary. An interesting and as yet unresolved issue is whether the indurated caliche bedrock and exfoliated caliche cobbles did, in fact, serve as an alternative form of water and temperature-regulating material similar to mulch. A much more concerted and focused research program will be required to resolve these issues.

Anschuetz (1998) avoids using the term "garden" because of its connotations of specialized function, as does Maxwell (2000), who observes the differences between gardens and fields in terms of proximity to settlements, the types of plant food grown within, and the labor investment to care for the plants. The term "terrace" (Doolittle 2000) is not appropriate because, as noted in the geomorphological analyses, the Merchant field alignments are not solely oriented perpendicular to the flow of water.

The remaining options are cobble-bordered fields and gridded fields. "Cobble-bordered fields" is an apt description of the morphology of the Merchant examples, but the term describes a rather formal mode of construction and morphology in north-central New Mexico. We are not quite certain how and why Merchant cobble alignments were constructed, nor is it clear if the Merchant examples were designed to clear spaces for planting, to trap water or accumulate soil, or to conserve water and soil. Accordingly, the generic term "gridded field" is thought to best characterize both the morphology of the features and reflect our continuously evolving understanding of their form and function.

The second type of feature at LA 43414 is described as a check dam (Doolittle 1985; Doolittle et al. 1993). Several linear alignments of cobbles were placed across and perpendicular to the drainage channel leading from the swale. The term "check dam" accurately describes the morphology and assumed function of these features to trap and conserve runoff water.

Dimensions, Morphology, and Preservation

Gridded agricultural fields and terraces have been mapped throughout the U.S. Southwest, particularly in north-central New Mexico and southern Arizona (Doolittle 2000). In the majority of cases, the fields are located on relatively stable surfaces with minimal alluviation or erosion (at least when compared with the eolian environment of southeastern New Mexico), and thus broad areas of fields and long segments of cobble alignments can be traced and mapped based on their surface manifestations. In the present case, the mapping of cobble alignments and field arrangements through surface survey and aerial photography is complicated by the combination of eolian deposition and widespread disturbances, both natural and human-induced.

The 2019 excavations were able to expose much broader sections of the fields than was possible during the 2015 fieldwork, and the results provided critical information on the general dimensions of cobble alignments and the intervening spaces. Yet, the 650 square meters of vegetation clearance and 64 square meters of excavations provided only a limited window into the estimated 4,500- to 6,000-square-meter area of the fields, and the overall extent of the fields remains unknown. The excavations did yield basic information on the layout of the grids and the dimensions of individual grids. The excavations of Features 82 and 91 established that gridded areas range from 4 to 6 m wide, and sections of approximately 2 m width were also observed in both the excavated and trenched sections of fields. The longest alignment measures 8 m in length. These measurements are from the limited excavation exposures of Features 82 and 91 and the profiles of Trenches 2015-2 and 2015-3. The full lengths of alignments and dimensions of interior gridded areas are uncertain because large areas of the fields have been buried and cobbles in alignments displaced through natural processes and cattle trampling.

Despite these incomplete data, it is noteworthy that the dimensions of the Merchant grids are roughly equivalent to those recorded among the gridded fields of north-central New Mexico and southern Arizona. Cobble-bordered and mulched fields in the Chama, Ojo Caliente, and Rio Grande valleys average approximately 2.5 to 4 m (Anschuetz 1998; Camilli and Banet 2012; Dominguez 2002; Lightfoot 1993b; Moore 2009; Wiseman and Ware 1996). Gridded fields in the Safford Valley of southeastern Arizona average 4 to 5 m in width (Doolittle and Neely 2004), and fields in the Queen Valley to the north range from 2 to 5 m (Homburg et al. 2011).

Figure 10.22 compares the gridded fields of Feature 82 of LA 43414 with a selection of mapped fields in the Ojo Caliente Valley of north-central New Mexico illustrated in Moore (2009). These comparisons are intended as a heuristic exercise to demonstrate the general similarities in size and layout. For example, the orientation of the gridded fields of Feature 82 have been modified to better match those of the Ojo Caliente examples. We wish to be explicit that the comparisons are not intended to link the LA 43414 examples to technologies in other regions of New Mexico, nor do we imply that there was a specific functional similarity between the fields of the two regions.

Excavations provided additional details on morphology and artifact associations. Feature 82 provides the most detailed exposure of the overall layout of a section of gridded field at LA 43414, but the exposures of Features 91 and 95 provide more concise impressions of the morphology of the alignments. Excavations revealed linear arrangements of stacked and mounded caliche cobbles extending across the surface of the unit and, in the case of Feature 95, the adjacent trench profile. Areas on both sides of the mound were mostly devoid of cobbles, and no charcoal-stained cultural sediments were associated with the features.

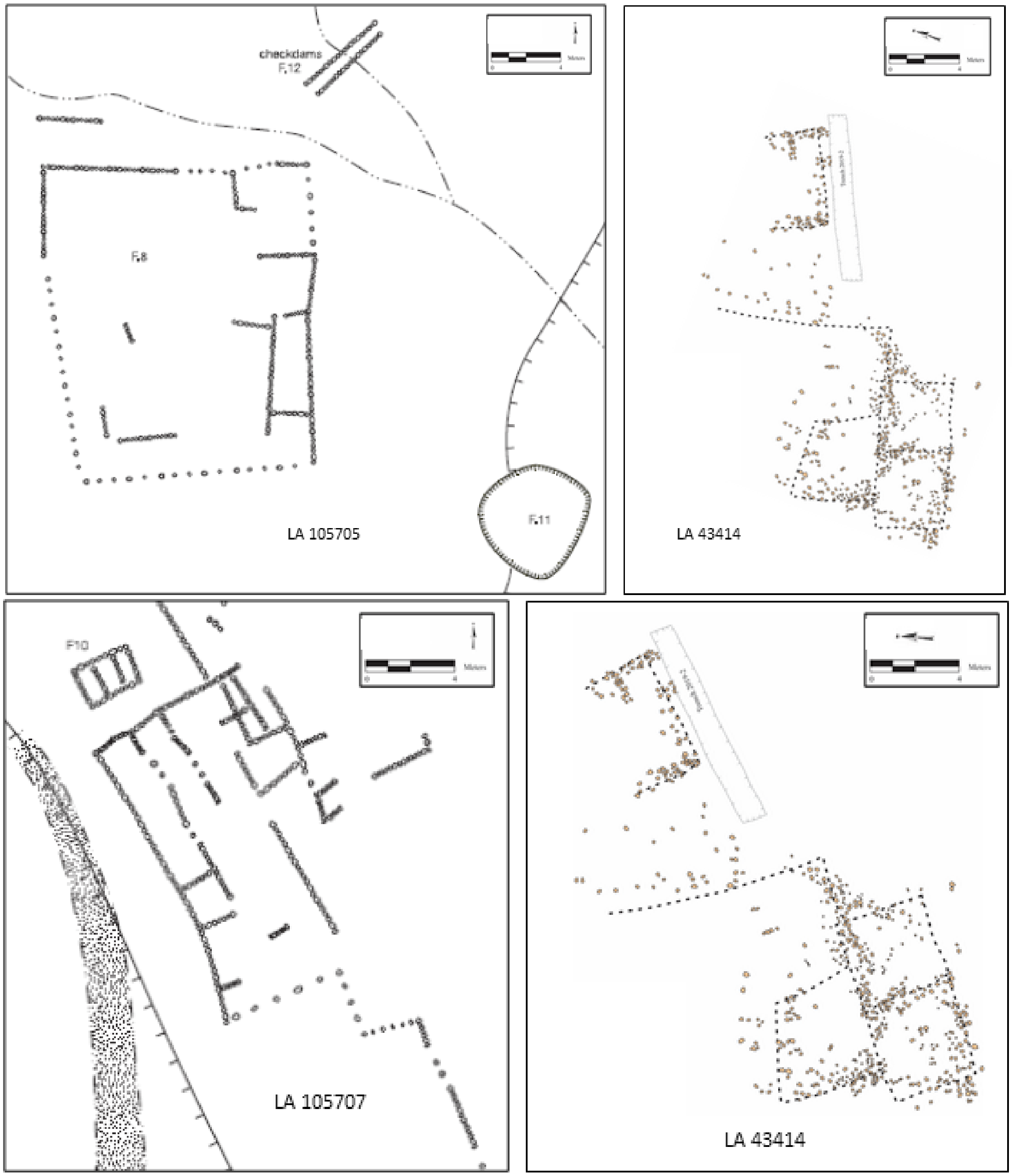

Figure 10.22. Comparison of the excavated section of Feature 82 to groups of gridded fields at LA 105705 and LA 105707 in the Ojo Caliente Valley of north-central New Mexico (adapted from Moore 2009:Figures 9.5 and 11.4).

Moderate quantities of artifacts were recovered from each of the four excavations in fields conducted in 2015 and 2019, including the primary artifact classes of chipped stone debitage and tools, projectile points, groundstone, and ceramics. The major artifact category notable for its absence was faunal bone, which is an important indicator that the features did not have a residential function similar to the Merchant village pueblo, where bone was abundant throughout rooms, middens, and extramural spaces. Although seldom present in substantial numbers, lithic and ceramic artifacts are commonly recovered during excavations of gridded and mulched fields in northern New Mexico (Camilli and Banet 2012; Moore 2009, 2010; Wiseman and Ware 1996).

Most prehistoric groups performed various activities in and around fields, including field maintenance and auxiliary production tasks like projectile point manufacture conducted while guarding fields, garden hunting, and even the use of field houses (Gauthier et al. 2007; Kohler 2004; Powers and Orcutt 1999).

The situation in LA 43414 is complicated by the presence of past and present occupations across the Grama Ridge escarpment. As revealed through the Merchant Vicinity survey, the landscape surrounding the San Simon sink was occupied from Middle Archaic through Historic times (see Chapter 5). This continuous record of occupation is manifested in hundreds of features and thousands of artifacts distributed across the surrounding terraces of Grama Ridge and Antelope Ridge, as well as within the 1.3 m of intermixed cultural and eolian deposits preserved in Trench 2019-1. Many or most of the artifacts recovered during field excavations may have been deposited during any number of earlier and later occupations.

Another cause of debate regarding the anthropogenic origin of the fields at LA 43414 is the irregular structure and appearance of the alignments. The alignments forming the gridded field boundaries are somewhat indistinct. Cobbles are scattered along the margins of the alignments as well as across the intervening open spaces. These features do not resemble the cobble borders typical of fields in north-central New Mexico. Again, this presupposes a level of formality for the Merchant fields that is probably unwarranted. Examples of gridded fields in southern Arizona (Figure 10.23) are composed of similar patterns of informal stacks and arrangements of cobbles forming indistinct alignments.

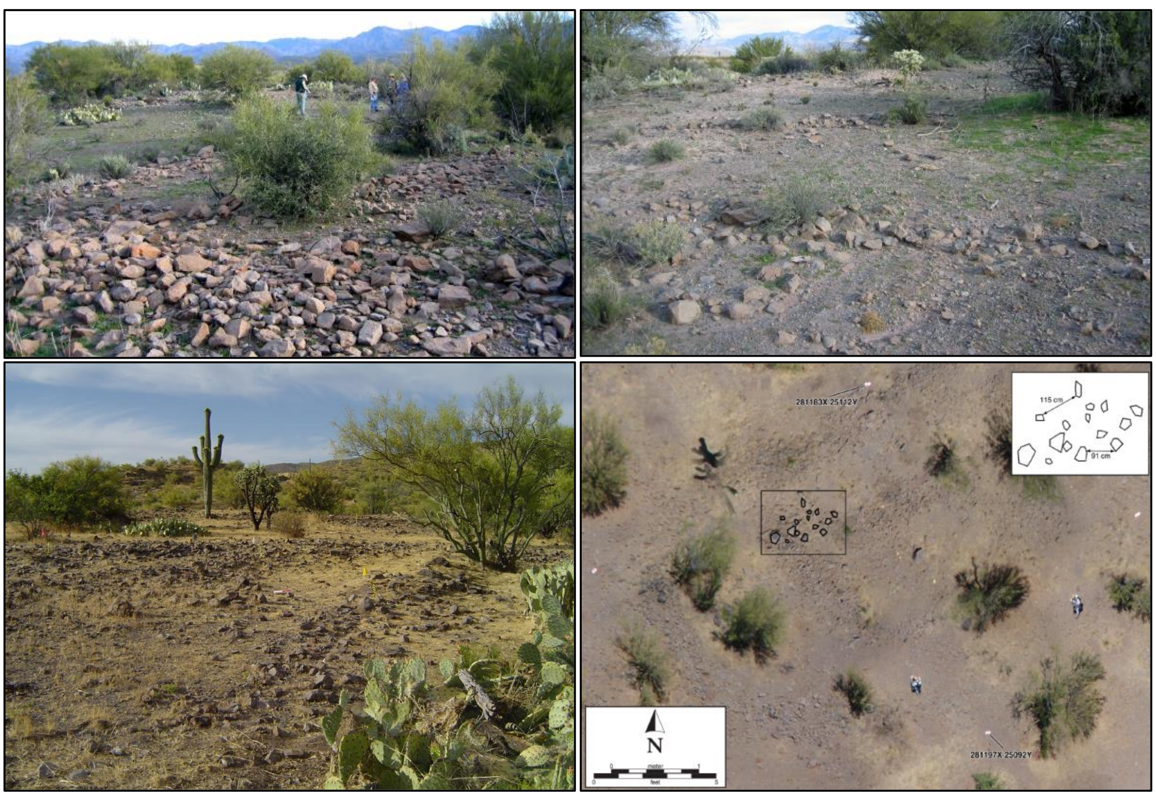

Figure 10.23. Examples of gridded fields from sites along the Queen Valley of southern Arizona: upper panels from Homberg et al. 2011: Figure 135, 136; lower panels from Wegener et al. 2014:Figure 9.12.

The contemporary appearance of the gridded fields of LA 43414 is also a product of geomorphological and historical processes. A century of ranching and cattle grazing[3] across the site contributed to the indistinct nature of the cobble alignments and scatters of cobbles within the interiors of the gridded fields. The modern landscape of LA 43414 is crisscrossed by a web of cattle trails (Figure 10.24), and cobble alignments forming gridded fields (as well as the wall foundations of rooms exposed on the surface of the pueblo to the south) were displaced by the movement of cattle plodding across the site. Bioturbation by badgers and other burrowing animals also moved cobbles out of their original position. The OSL dating of strata in Trench 1 at the eastern margin of the field area (see Chapter 5) revealed that sediments throughout the area had been vertically and horizontally mixed by extensive bioturbation. In the case of burrowing, it should also be noted that exhumed clasts consist of unsorted material ranging from small nodules to small cobbles and exhibit no structure or patterning (Figure 10.25), thus verifying that the cobble alignments were not formed by burrowing animals.

Figure 10.24. Aerial view of cattle trails across the Merchant site (image is dated to 11/2017).

[3] The lands surrounding the Merchant site and fields of LA 43414 are within BLM grazing allotment #76027 that has been permitted to the Merchant Livestock Company of Eunice, New Mexico, since 1941. The permit notes that the rancher has been grazing the property since 1897. The company and its owner, Mr. J.D. Merchant, were the origin of the name assigned to the site in 1959 by Bus Leslie and the LCAS.

Figure 10.25. Photograph of an animal burrow observed near the west edge of the mesa where a burrowing animal has excavated through the eolian cover and into the caliche. The scatter of caliche clasts exhumed by this burrow is about 2 m wide but exhibits no patterning and consists of a variety of size classes.

The excavated examples of grid borders were partially exposed on the present surface and may have been subject to greater degrees of cattle trampling and eolian erosion of surrounding sediments. The buried examples of cobble alignments, such as the examples in Trench 2015-3 (see Figure 10.9), were less subject to processes of erosion and displacement and therefore exhibit a greater degree of preservation. These features resemble the stacked lines of cobbles in the examples from southern Arizona as well as some cobble borders from north-central New Mexico (see for example Camilli and Banet 2012).

Without imposing pre-conceived notions of morphology and formality derived from gridded fields in other regions, we suggest that the excavated examples reviewed in this discussion represent what gridded agricultural fields look like on the plains of southeastern New Mexico. They are not as formal or extensive as examples from other regions of the U.S. Southwest and northwest Mexico, but nevertheless represent a form of agricultural dry farming technology adapted to the specific environmental conditions and cultural context of Ochoa phase villages in southeastern New Mexico.

Geoarchaeological Observations: Natural or Anthropogenic Origin?

Geomorphological and geoarchaeological investigations were completed during the 2015 fieldwork and are reported in Frederick et al. (2016). A summary statement is provided here. To assess the origin of these linear stone features, it is best to reduce them to their most fundamental attributes as documented through the geomorphological investigations:

(1) The features consist of what appear to be linear clast-supported piles of gravel and cobbles;
(2) They rest on the Mescalero calcrete;
(3) They are composed of rounded caliche cobbles and gravel;
(4) The features exhibit a wide range of orientations (parallel and perpendicular to topographic contours);

(5) The areas between stone alignments often (but not always) have many fewer stones, and the stones in these areas are often matrix supported;
(6) The coppice dunes hinder a clear view of their plan arrangement.

At the start of this discussion, it is necessary to consider what, if any, natural processes could create such features. The only natural features that come to mind are sorted stone circles and stripes that are created by periglacial conditions, which in this case would have to be relicts of the Pleistocene. Such features are created in regions subject to permafrost and are formed by the repeated freezing and thawing of the soil in the active layer that differentially moves rocks, resulting in a bewildering array of repetitive stone alignments and patterns. Examination of regional summaries (such as Hawley 2005) that might record such features in this landscape reveals no reference to such features in this region (although he does note them in higher altitude settings). Discussion with geomorphologists with extensive experience within the southern Plains of Texas and New Mexico concurred that none have ever been recorded (Vance Holliday [University of Arizona] and Dustin Sweet [Texas Tech University], personal communication, 2016), and therefore it seems unlikely that these are periglacial relicts from the Pleistocene.

The low gradient surface that characterizes part of the mesa surface where these features are found is most likely too flat for rocks of this size to be moved substantially by overland flow. Even if they could be moved by overland flow, that process would be unlikely to stack them multiple clasts high.

The rocks that comprise the stone alignments are most likely clasts derived from the Mescalero Caliche, which in many places comprises subrounded to subangular cobbles and gravel of caliche. That these rocks are loose on the top of the laminar calcrete and not cemented to it suggests that they are a byproduct of erosion or disturbance of the caliche. This loose veneer of gravel and cobbles could be formed by at least two processes: bioturbation and channelized erosion. Walking across the site, it was noted that burrowing animals are capable of penetrating the caliche and casting the resulting rocks onto the ground surface (see Figure 10.25). One would expect that such clasts would be mixed with the eolian sand and possibly form a matrix-supported deposit, but one would also expect such rocks to be fairly angular. Solution etching of the caliche fragments once they had been enveloped by the eolian sand could explain some of the rounding.

The second possible origin is channelized erosion of the calcrete. Although these clasts appear to be too large to be moved about by overland flow, their origin may be a product of more channelized erosion of the caliche before the eolian sand that mantles this surface today was deposited. But no evidence of such erosion of the caliche was noted during the fieldwork, and it is unlikely that channelized movement of gravels across this surface would result in this wide range of orientations visible today. Hence, it is probable that the clasts that comprise these alignments are derived from disturbance of the caliche, and that the linear piles and alignments are most likely the product of human activity that moved loose gravel clasts that were scattered across the top of the Mescalero caliche and within the Upper Eolian Sand into linear piles.

Hydrology

No formal hydrological mapping and analysis efforts were undertaken during the 2015 or 2019 fieldwork, but the entire landscape was mapped using an aerial drone that provided high resolution imagery for terrain analysis. Wienhold (2012) proposed that the hydrological functions of prehistoric agricultural features can be determined through analysis of high-resolution topographic maps generated by LiDAR. In the case of LA 43414, as an alternative to LiDAR we utilized high-resolution topographic maps generated through drone aerial photography and photogrammetric methods. Mark Willis completed aerial photographic surveys LA 43414 during both field seasons and processed the imagery. Topographic contour maps and digital elevation models (DEM) were created, allowing for terrain analysis of the contours and water flow patterns surrounding the pueblo and gridded fields (Figures 10.26 and 10.27).

The gridded fields are positioned along the upper slopes leading from the highest elevation point of Grama Ridge (Figure 10.26). They were strategically positioned on the southeastern-trending slopes with two to four percent slope gradients leading to a drainage channel below (Figure 10.27). These locations would have structured and conserved surface water flow leading from the highest point, and the shallow gradients made it easier to manage runoff from intense summer monsoonal storms and to prevent erosion of fields and soils. The southeastern placement is also of interest. Homburg et al. (2011) note that fields in southern Arizona are often positioned along eastern and southeastern facing slopes to reduce exposure to intense afternoon sunlight and thus reduce moisture loss through evaporation.

The check dams of Feature 65 and other examples are clearly positioned across the drainage leading toward the southeast from the high elevation point and series of gridded fields. It is uncertain whether the dams were intended to trap soils and nutrients or to capture and conserve water. Woosley (1980) cautions against making assumptions regarding the function of check dams, noting that the common interpretation of their use for silt retention for planting crops is not always warranted, and in many situations check dams were designed as water collection facilities for nearby habitations. In the case of the fields and dams of LA 43414, it could also be suggested that the dams captured and stored water for pot-irrigation of nearby gridded fields.

Several studies explore the possibility or likelihood that pot-watering was utilized to augment rainfall and runoff in the gridded fields of north-central New Mexico (Lang 1980; Lightfoot 1993b, 1994; Lightfoot and Eddy 1994; Maxwell and Anschuetz 1992). Lightfoot (1993b) suggests that crops were pot-watered or pot-irrigated using ceramic *ollas* and dippers even during wet years. The growing stalks of maize plants were watered during critical growth stages, such as the early dry season when seeds and sprouts were vulnerable and the hot late summer months when the critical tasseling stage took place. Lightfoot (1993b) cites an unpublished study by Maxwell and Anschuetz (1987) describing the experimental results of planting three mulched garden plots and leaving two unattended while watering one plot each week. The plants in the two unwatered plots were stunted and offered reduced nutritional potential, while the hand-irrigated plot produced more mature and nutritious plants. Given the patchy and unreliable precipitation of southeastern New Mexico, the use of pot-watering to supplement rainfall capture in the gridded fields would be an efficient and often a necessary requirement for a successful harvest. As reviewed in the following section, the pollen and phytolith records provide ample evidence that ponded and standing water was present in the fields and behind the dams.

Pollen and Phytoliths

At this point, several lines of evidence involving morphology, size, and hydrology have been presented in support of the identification of gridded fields at LA 43414. The analysis of pollen and phytolith samples provides the conclusive, direct evidence that the locations were indeed gridded agricultural fields and that maize was one of the crops grown in the fields.

2015 Pollen Sampling and Analysis: Two soil samples were collected from Trench 2015-2 for pollen analysis to determine if cultigens were present (see Figure 10.7). The first sample was collected from near the top of the paleosol about 2 m north from the south end of the trench; the second was collected about 6.5 m north of the south end of the trench. Smith (see Chapter 13; Appendix B.2) reports that these samples exhibited relatively low pollen concentrations (2150 to 2580 grains/gram), a significant number of degraded grains (15.4 percent and 22.7 percent) and were dominated by Asteraceae (sunflower family) and Cheno-am pollen, with minor amounts of mustard family, yucca type, juniper, and *Tidestromia* (possibly wooly honeysweet) pollen. No pollen of domesticated plants was observed.

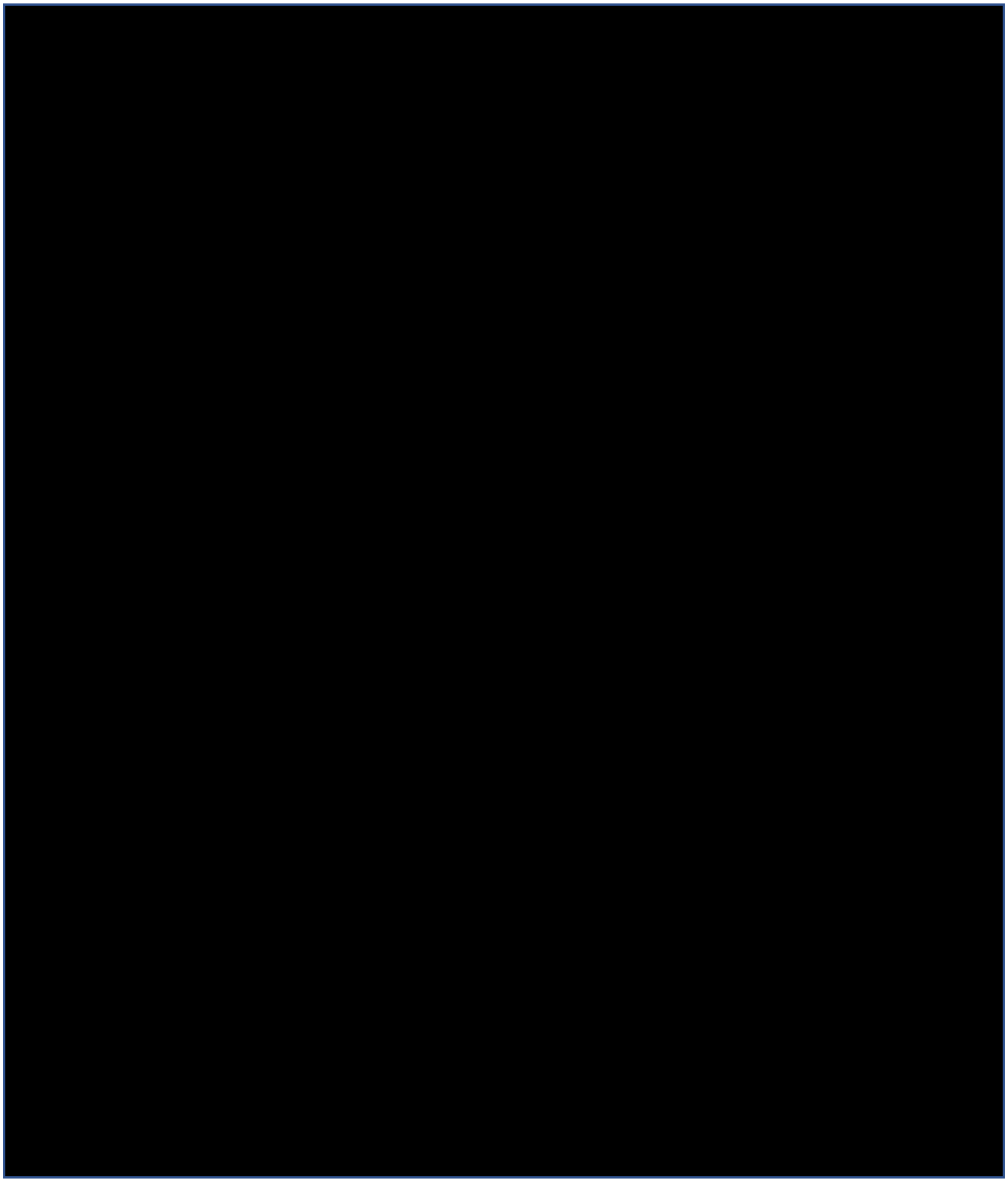

Figure 10.26. Color ramp DEM illustrating the topography of LA 43414 based on 2015 aerial survey data. The open LCAS excavations Pit Structures 1 and 2 from the 1960s are visible in the center of the image. Note also the high elevation point of Grama Ridge and the drainage leading toward the southeast.

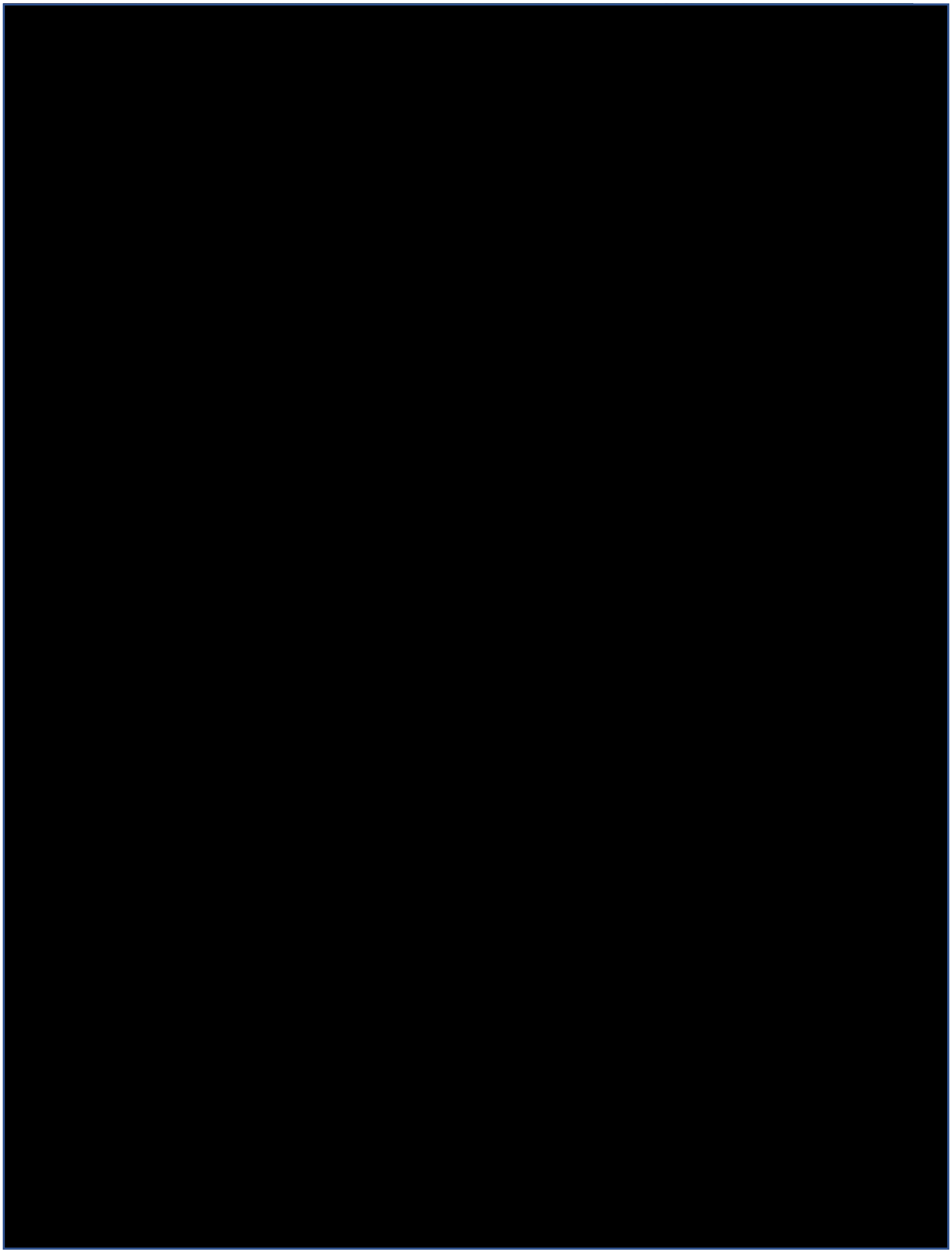

Figure 10.27. 50 cm-interval contour map illustrating the topographic setting of the gridded fields and check dams of LA 43414.

Two soil samples were collected from the relatively stone-free soil formed at the top of the Upper Eolian Sand in Trench 2015-3 and were submitted for pollen analysis (see Figure 10.8). The first was located approximately 0.75 m from the west end of the trench and the second was located about 2.35 m from the west end of the trench. Both samples were collected from 5 to 10 cm below the top of the paleosol. These samples had lower pollen concentration than the samples from Trench 2015-2 (961 and 1285 grains/gram) but surprisingly exhibited the greatest taxon richness. The first sample contained 15 different taxa and was dominated by Asteraceae and Cheno-am pollen. It also included fir, pine, and alder, that presumably are vestiges of Pleistocene vegetation. Neither sample revealed any pollen from domesticated plants.

A single pollen sample was collected from the paleosol in the control profile of Trench 2015-4. As observed for the samples from the trenches in features, it did not yield any evidence of domesticated plants. Like the other samples, this sample also had a low pollen concentration (1214 grains/gram), numerous degraded grains, and was dominated by Asteraceae, Cheno-am, and grass pollen.

Five pollen samples were collected during the excavation of Feature 108. Four of the five samples contained one or more of three introduced taxa (elm, pecan, and crane's bill), indicating samples were collected in modern horizons or from churned contexts with mixed levels. No cultigen pollen was recovered.

The 2015 pollen analysis effort was disappointing in that no evidence of maize pollen or other cultigens was identified in samples collected from trench profiles and a single excavation exposure. It was uncertain if the absence of cultigen pollen was the result of insufficient sampling intensity, poor preservation, or reflected a reality that the fields were natural features and that maize or other crops were never grown in the area. Sampling intensity is one possible factor. Camilli and others (2019:Tables 3.1 and 3.2) provide a review of maize pollen identification rates in 293 samples collected from mulched and non-mulched agricultural fields in the northern Rio Grande region. Pollen ubiquity values for mulched fields range from 0 to 50 percent, with an average of 18 percent; values for non-mulched fields range from 0 to 70 percent with an average of 14 percent. In other words, there is a general 1 in 5 chance of finding maize pollen in samples from mulched fields and a 1 in 7 chance of identifying maize in samples from non-mulched fields. At the Merchant site, the count of eight samples from suspected cultural contexts would be on the margin of the 1 in 7 probability for finding maize pollen. Moreover, compared with the suspected fields at LA 43414, the mulch and cobble-bordered fields of the northern Rio Grande Valley were much less subject to eolian erosion, cattle trampling, and other disturbances.

Moreover, based on her experience in the northern Rio Grande region, Susan Smith noted that cultigen pollen was usually recovered from the upper 10 cm of deposits in mulch fields and cobble-bordered fields. Therefore, it was possible that the pollen sampling locations in the Merchant site trenches that averaged 20 cm depth below the surface may have been too deep. It was concluded that a more intensive program of pollen sampling and analysis would be required to detect signatures of maize cultivation in the suspected fields at the Merchant site. The 2019 investigations took these factors into account in the design of the pollen sampling strategy.

2019 Pollen Sampling of Features 82 and 65: In July 2019, Susan Smith conducted a systematic pollen sampling of the rock alignments and cleared spaces of Feature 82. Ten pollen samples and paired phytolith samples (labeled CN 401-410) were collected from the western cleared area Samples were collected near each corner and one was collected from the center. Each location was sampled at two depths, the first at 6 to 16 cm below the surface and a second at depths ranging from 11 to 21 cm. Four samples (2019-5, 6, 8, and 9) were collected from the cobble alignments north of Trench 2019-3 where certain alignments formed corners around cleared areas. Additional samples were collected from Feature 65, the series of check dams along the drainage and exposed in Trench 2019-3. Intensive scanning procedures identified maize pollen in Sample 2019-6, collected from the edge of a cobble alignment (see Figures 10.14 and 10.15), and from Sample CN 454, collected from the margins of a check dam (Figure 10.28).

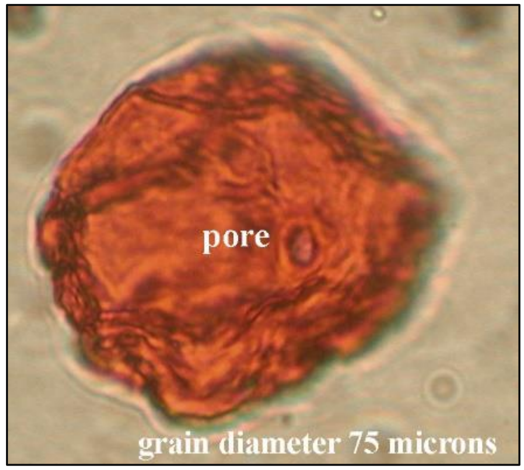

Figure 10.28. Maize pollen in sample CN 454 adjacent the Feature 65 check dam.

No other cultigens were identified in the pollen record, including cotton that is a common component of pollen assemblages in samples from the mulched fields of north-central New Mexico (Camilli et al. 2019; Smith 2012). In the summary of results from the Yunge project, Camilli et al. (2012: Figure 8.3) note that non-mulched gridded fields had significantly more maize pollen than mulched fields that were predominantly cotton pollen.

Cattail (*Typha* sp.) pollen was observed in three samples from Feature 82. Cattail pollen is somewhat common in samples from gridded fields in north-central New Mexico (Smith 2012), and Schaafsma and Briggs (2007) report cattail pollen from gridded silt fields in the northern Phoenix basin of Arizona. Cattail pollen was widely used in rituals among Pueblo and Athabaskan societies of the Southwest (Castetter et al. 1938; Cushing 1998; Dunmire and Tierney 1995; Moerman 1998; Rea 1998). Of specific relevance to the gridded fields at LA 43414 is the observation that the Hopi planted cattail with other cultivated herbs and plants in their fields (Whiting 1939). Cattail pollen is behind only maize and pine pollen in terms of the frequency these pollens are mentioned in the ethnographic and ethnobotanical accounts. It often carries abstract metaphorical allusions to watery underworlds (Cushing 1896, 1988; Stevenson 1904).

Cattail pollen has been recovered from several baking pits in the Sacramento Mountains (Miller et al. 2011). Of interest for the present study, cattail pollen was recovered from a subfloor feature of Pit Structure 1 at the Merchant village (Dering and Smith 2016). It is unclear whether cattail was utilized in the maintenance or consecration of fields at LA 43414 or if cattail pollen was introduced by pot-irrigating the fields using water from a source where cattail was growing. In the vicinity of LA 43414, sources would include the ponding area and San Simon swale west of the fields and the check dams to the east. Accessible water was a necessity for the fields and inhabitants of the village and cattail, as a specialized desert aquatic plant, would have been part of that landscape.

2019 Phytolith Analysis: Compared with the results of the pollen studies, the analysis of phytolith samples was inconclusive in regard to the presence of cultigens (Chapter 14). Nevertheless, the phytolith analysis does provide intriguing corroborative evidence for the presence of agricultural fields. The 10 phytolith samples were paired with the 10 pollen samples collected from the hand-excavated area of Feature 82 at depths of 5 to 10 and 10 to 15 cm. Additional paired samples were submitted from the check dams of Feature 65.

No maize phytoliths were observed in the samples, although it is noted that the 10 pollen samples collected from these locations in Feature 82 also lacked evidence of maize. Maize phytoliths are often rare or present in low numbers, even in canal-irrigated fields of southern Arizona. For example, maize phytoliths were found in only nine of 26 samples from gridded fields at the Las Capas site (Yost 2015), and a total count of only 16 specimens was identified in the samples using 300 count scans (similar to the scan count of the present study).

Although no maize phytoliths were present in the samples from LA 43414, three plant identifications are of interest. A single hooked hair phytolith was noted in sample CN 406 from the northeast corner of the exposed field. Hooked hair phytoliths have been observed in several types of domesticated bean pods of the *Phaseolus* genus (Bozarth 1990) but are also produced by other uncultivated and poorly known members of the Fabaceae family common to New Mexico such as mesquite (*Prosopis* sp.), milkvetch (*Astragalus* sp.), acacia (*Vachellia* sp. and *Acacia* sp.), and locust (*Robinia* sp.). A positive identification as domesticated bean cannot be made.

A single small squash-type phytolith was noted sample CN 408 from the southwest corner. This phytolith is produced in both wild and domesticated squash pericarp and stems, and in lesser numbers in gourd pericarp; thus, an identification below the family level is not possible. The absence of distinctive large squash phytoliths in any samples from the gridded fields suggests that the phytolith represents a wild *Cucurbita foetidissima* (Buffalo gourd) rather than a cultivated variety of squash.

Cucurbit pollen has been identified in four samples from mulched fields in the Ojo Caliente valley (Moore 2009, 2010), the Chama Valley (Clary 1987), and the Rio Grande valley (Smith 2012). The ubiquity and grain counts were low compared with those of maize and cotton and, as with the present samples, it was not possible to determine if the pollen was from domesticated or wild cucurbit species. Despite the infrequent counts, it does appear that Buffalo gourd grew in the disturbed surfaces of gridded fields. Whether that growth was encouraged or was a natural process remains unknown.

Another potentially significant identification is that samples CN 404 and 406 had phytoliths classified as Unknown S that resemble dayflower (*Commelina* sp.). Yost (2015) provides a detailed discussion of dayflower phytoliths and concludes that there was a likely association of the plant with agricultural fields. Dayflower phytoliths are common in samples from agricultural fields and settlements in Arizona and New Mexico and co-occur in 68 percent of sites that have evidence of cultigens. As noted for Buffalo gourd, it is uncertain if dayflower tended to naturally grow in anthropogenically altered locations such as agricultural fields or was a weed that was tolerated or perhaps even encouraged to grow in the fields for its edible leaves and stems and medicinal properties.

Some connection exists between dayflower and ceramic-era sites in southeastern New Mexico. Of particular relevance to the present study is the identification of thousands of *Commelina* sp. phytoliths in samples collected from vessel fill, from sherd surfaces, and from soils below a Jornada Brown bowl left in a hearth feature at LA 149260, located 60 km southwest of the Merchant site (Cummings et al. 2009; Yost 2015[4]).

Another significant observation is that almost all of the 10 samples from gridded field Feature 82 and three samples from check dam Feature 65 have elevated counts of unidentified diatoms and *Nitzschia* sp. diatoms compared with other contexts at the Merchant site and across southeastern New Mexico (Figure 10.29). The results of the analysis of 504 phytolith samples collected during

[4] Yost (2015:279) identifies the phytoliths as *Commelina* sp., correcting an earlier misidentification in Cummings et al. (2009).

the CFO chronometric and subsistence sampling project are included in the chart (Cummings and Kováčik 2013; data on file at the CFO). The average count of diatoms among the 504 samples collected from hundreds of features throughout Lea and Eddy counties is less than one.

The *Nitzschia* diatoms are pennate forms, indicating a freshwater origin. A large number of *Nitzschia* diatoms were noted in the 13 samples from agricultural features at LA 43414. This genus thrives in moist soils, and their presence in the samples collected from Feature 82 indicates past presence of semi-permanent water. Unidentified diatoms and *Nitzschia* pennate forms were very abundant in sample CN 453 from Feature 65, signaling the retention of perennial or semi-perennial water around the check dam. The check dam samples are all consistent with the environment portrayed in the adjacent gridded field samples, reflecting the presence of water in this otherwise xeric landscape. In a similar study, Winsborough and Railey (2002) report diatoms in samples from pits and water catchment features in the Tularosa Basin.

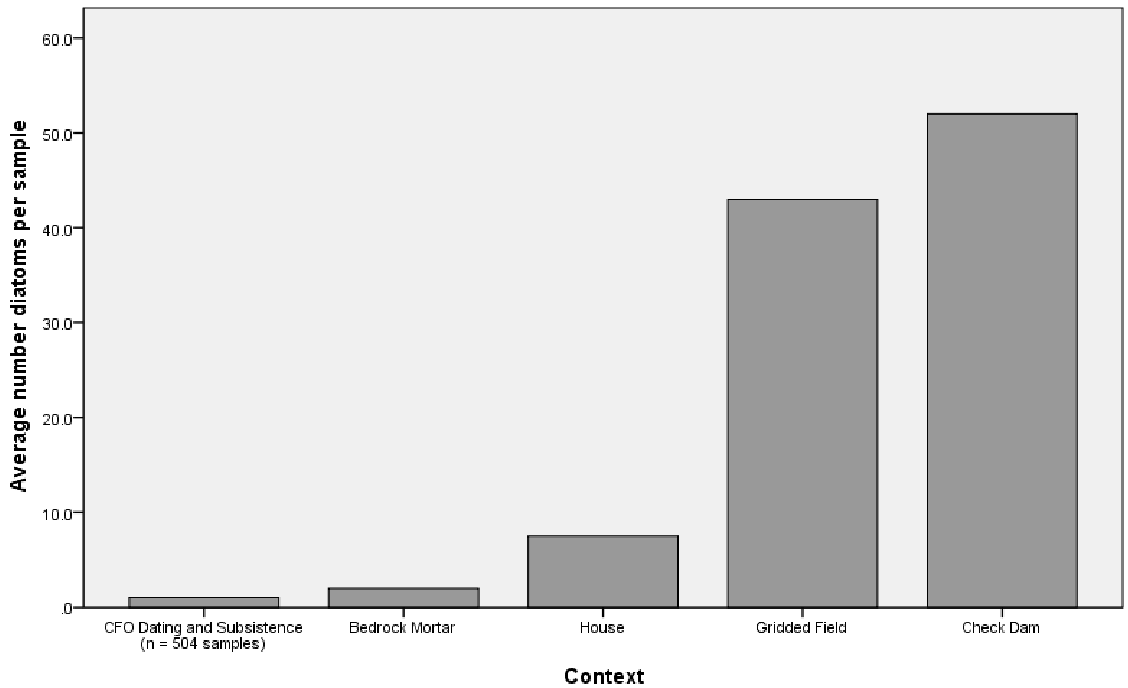

Figure 10.29. Bar chart comparing the average number of diatoms per sample grouped by context.

Soil Analysis

Preliminary soil analyses were conducted in 2016 (Frederick et al. 2016) and comparisons of the physical attributes of the soils in gridded fields against a control profile provided a means of assessing the possible lasting effects of ancient agricultural uses of the soils. Several studies, including ones focused on terraces in the Mimbres region of south-central New Mexico, have examined changes in soils associated with prehistoric agriculture (Homburg and Sandor 2011; Homburg et al. 2004, 2005, 2011; Sandor 1992, 1995; Sandor et al. 1990, 2008; Sullivan 2000). As a group, these studies have identified both positive and negative results. Among the more common signs of soil degradation observed in formerly cultivated soils are decreases in organic matter (and resulting lighter color) and nutrients (such as total nitrogen) and increases in bulk density.

Comparison of the soils in gridded fields with the control profile revealed several differences. In specific, the agricultural soils are generally more organic-rich, darker colored, slightly finer textured, and exhibit higher magnetic susceptibility values than the control profile. Many of these differences are opposite of the qualities observed by Homburg, Sandor, and colleagues. It is possible that they reflect variations in the properties of the deposits across the site, especially as a function of deposit thickness.

In another study, Sullivan (2000) examined cobble terraces in two locations in northwestern Arizona with different soil and environmental settings. Different soil chemistry and texture attributes were observed in the two settings, leading Sullivan (2000:309) to conclude that "Such seemingly chaotic results make it difficult to construct unifying explanations about the effects of small-scale runoff agriculture on terrace soil fertility." Sullivan further cautions that the sample of soil analysis in prehistoric agricultural features is so small and limited in variability that the results of the few extant studies should not be applied as universals to other settings.

Chapter Summary

Prehistoric agricultural features of the U.S. Southwest and Mexican Northwest are often manifested archaeologically as small and spatially isolated phenomena (Anschuetz 2010; Duwe and Anschuetz 2013). They are seldom highly visible or robust structures and are buried, eroded, or disturbed through a variety of natural processes, and they are often overlooked because of their spatial separation from living areas. An interesting historical parallel is that during the early period of investigations of gridded fields in both north-central New Mexico and LA 43414, the features in both areas were identified as the disturbed remains of pueblo rooms.

The situation at LA 43414 adds another dimension to the identification of agricultural features. Based on thousands of archaeological surveys and dozens of excavations conducted over the past five decades, the conventional knowledge is that agricultural fields did not, and should not, exist in the far southeastern corner of New Mexico. As noted earlier, however, it was also once considered conventional knowledge that agriculture was seldom, if ever, practiced anywhere in the region outside of the Roswell Oasis. So, in addition to the difficulties of dealing with informally constructed, spatially isolated, partially buried, and naturally disturbed archaeological features, the investigation of gridded fields at LA 43414 also has to navigate the issues arising from a contentious interpretation that goes against the currents of conventional thought. As plainly demonstrated in Figure 10.30, the proposed agricultural features at LA 43414 do indeed represent a distant outlier from the conventionally understood distribution of such features.

Of interest in the figure is the triangle symbol marking the presence of a "speculative" example in far northeastern Colorado. Perhaps the symbol for the fields of LA 43414 should be assigned a similar triangle symbol as another "speculative" case of dryland agricultural feature. Or perhaps it is equally probable that both symbols indeed mark the locations of agricultural fields outside of the "accepted" boundary of such technologies.

In this perspective, the boxed area added to Doolittle's map adds further insight. Agricultural features associated with pueblo settlements and earlier pithouse villages have recently been identified in the Tularosa Basin of the Jornada region, 250 km west of the Merchant site (Kurota and Sternberg 2018; Kurota et al. 2016; Sandor 2018), and maize pollen was identified in several samples collected from the features (Smith 2018). Equally significant is the recent discovery of a complex of irrigation canals and ditches associated with agricultural fields at Creekside Village, located along a primary stream leading from the Sacramento Mountains (Greenwald 2018). While these features are significant in their own regard, their association with a pithouse village and Great Kiva dating to A.D. 650 to 850 has established that complex agricultural technologies have a substantial time depth in southern New Mexico. While the existence of agricultural features have long been suspected in the Jornada region (Hubbard 1987), only recently has the existence of such features been confirmed.

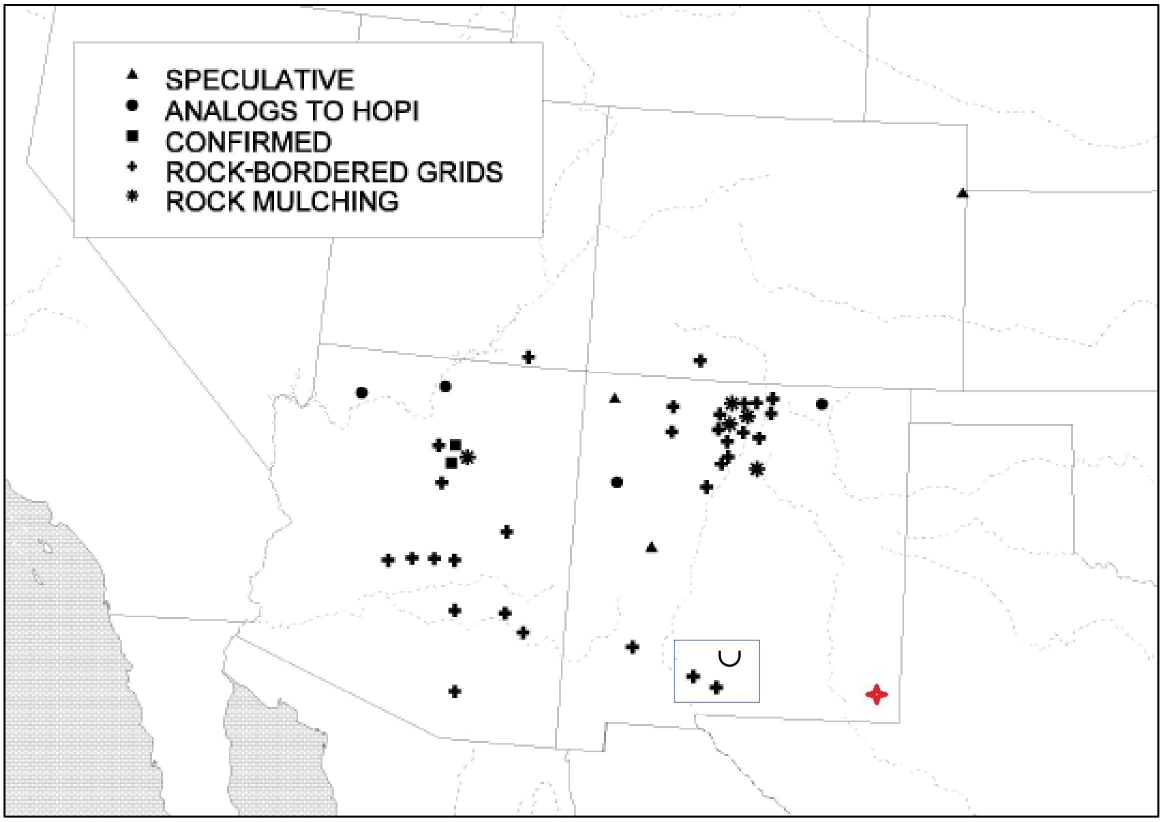

Figure 10.30. Dryland agricultural features in the U.S. Southwest (modified from Doolittle 2000:236; Figure 7.11). Box denotes recent findings in the Tularosa Basin of the Jornada region, and the U-symbol marks the recent identification of irrigation canals. The red cross marks the location of LA 43414 and the Merchant site.

Returning to the present study, when the surficial masses of caliche cobbles to the north of the Merchant village site were first encountered in 2015, the appearance of the features led us to initially think they were agricultural terraces as described by Doolittle (2000). Closer inspection made it clear that the concentrations of cobbles occurred in a wide range of orientations beyond those typically observed with terraces, which raised questions about their origin and function. After excavation of the trench profiles across these features and the discovery of the relatively stone-free areas of soil between them, they began to seem more like clearance features associated with gridded fields rather than terraces. This change in perspective is not to discount the possibility that water retention was one of their functions, but rather that the interpretation of the linear alignments as terraces did not fully account for their apparent morphology. Examination of trench exposures across two sets of the features suggested that the relatively rock-free soil between the linear stone piles is an artifact of rocks having been taken from these areas and moved to the piles, and therefore, at least to some degree, these features may represent clearance cairns. The broad-scale clearance excavations completed during the 2019 fieldwork confirmed these impressions. It remains uncertain whether the caliche cobble alignments also functioned to trap and conserve water, although it is noted that the features were positioned along the most hydrologically favorable setting of the Grama Ridge escarpment.

The ubiquity of maize evidence among pollen and flotation samples from multiple contexts at the Merchant village confirms that the inhabitants were at least part-time agriculturalists and were cultivating maize plants somewhere in the vicinity. The 2015 geomorphological investigations examined the landscape around the Merchant site for locations where agriculture may have been practiced. A single trench was dug into the floor of the basin, and this trench revealed evidence of two alluvial deposits, one recent and one that has probably accumulated throughout the Holocene.

The suite of alluvial deposits that occupy the basin slope and floor is far more complex than time permitted to document, but several points were clear. Examination of numerous cutbanks adjacent to the modern stream channels, as well as the profile of Trench 2015-1, failed to reveal any evidence of long-term ponded or lacustrine sediment. Shallow water ponding probably occurred intermittently, but the soils and location were probably unsuitable for cultivation. Accordingly, since abundant evidence of maize agricultural was present in subsistence samples, and the depression west of the site proved to be an unlikely location for intensive maize farming, the obvious candidate for fields and gardens was the feature surrounding the swale and drainage north of the village.

Through the combination of the 2019 excavations, the additional geomorphological, palynological, and phytolith analyses, and a broader knowledge of the archaeological landscape of Grama Ridge, we now understand much more about the features and their surroundings. A careful consideration of the results of two seasons of fieldwork leads us to conclude that these features are probably the result of human agency and were constructed for agricultural purposes. Their morphology and topographic setting are consistent with the general category of gridded agricultural runoff fields documented in north-central New Mexico, the Galisteo basin, and other regions of New Mexico (Anschuetz 1998; Bandelier 1892; Bugé 1984; Camilli et al. 2012; Cordell et al. 1984; Dominguez 2002; Doolittle 2000; Gauthier et al. 2007; Herhahn 1995; Hill 1998; Lang 1980, 1995; Lightfoot 1990; 1993a, 1994; Lightfoot and Eddy 1994, 1995; Maxwell 2000; Maxwell and Anschuetz 1992; Moore 2009, 2010; Tjaden 1979) and across central and southern Arizona (Doolittle 2000; Doolittle and Neely 2004; Wegener et al. 2014).

By far, the majority of the investigations into such features have focused on the use of stone mulches, whereas the "rock-bordered grids that do not contain a gravel layer are far more numerous and widespread than mulched fields, but absolutely nothing is known about them" (Doolittle 2000:252). Although Doolittle does not comment specifically about where such features have been found, it is noted that low-gradient shallow drainages on the top of mesas are one of the most common settings for prehistoric terraces (Doolittle 2000:294), a pattern that seems to match the topography of the fields at LA 43414.

Given the paucity of data on the morphology and function of non-mulched gridded fields, we have fewer examples to compare and contrast against the features at LA 43414. Based on a comprehensive review of pollen studies in north-central New Mexico, Camilli and others (2012:Figure 8.3; see also Smith 2012) make an important observation that maize may have been more commonly grown in non-mulched fields as opposed to mulched fields. In this light, it is again worth emphasizing that it is probably imprudent to impose a certain set of morphological, topographic, and environmental assumptions derived from the research on gridded, mulched fields in north-central New Mexico on gridded fields found elsewhere across the broader Southwest.

The results of the 2016 pollen studies were disappointing, and it was thought that the sampling intensity was insufficient to capture the elusive evidence of cultivation in the form of maize pollen. A more comprehensive sampling design was therefore implemented during the 2019 fieldwork and combined with more intensive extraction and analysis methods, the pollen study provided the critical evidence for maize cultivation. Phytolith sampling was inconclusive, yielding no evidence of maize phytoliths and ambiguous evidence for other cultivated crops, but the identification of high numbers of diatoms confirmed that the features created a moist environment as would be expected for agricultural fields.

This low expressions of cultigens in the pollen and phytolith records of the fields and check dams do not accurately reflect the productivity or the extent of farming efforts at the Merchant site. Archaeological sites in eolian environments across southern New Mexico are notorious for poor pollen preservation and low recovery rates. The local geomorphology of LA 43414 is characterized by a mantle of Recent Eolian Sand, some component of which is Historic in age (see Chapter 2). The mobile sands combined with historic churning of sediment by livestock has probably disturbed farming surfaces and mixed the stratigraphy. Under these conditions, the recovery of just a few grains of maize pollen is considered significant.

In the summary of the chapter describing the 2015 investigations of the agricultural features (Frederick et al. 2016), we noted that there was much about the features that remained unclear, and as of 2021 there are still several unresolved issues and contentious points that could be directed at our interpretations. The fields are largely obscured by coppice dunes, and even after 656 square meters of vegetation removal, the overall spatial patterning of the features and variation in their size and orientation remain unknown. The conclusive and unambiguous identification of the caliche cobble features and scatters at LA 43414 remains unsettled. The two seasons of investigations have provided a substantial amount of corroborative data indicating that they are probably the result of human agency. The setting and arrangement of the cobble alignments do seem to be beyond any natural process operative at this location in the late Holocene, so they are most likely anthropogenic in origin, and an agricultural purpose would seem to be the most likely use.

It is possible that the perceived alignments and masses of caliche and the linear mounds of caliche crossing the drainage are all natural phenomena. The features could be the result of some as-yet unidentified natural formation process that concentrated caliche cobbles exfoliated from the underlying caliche conglomerate caprock into seemingly linear patterns, and those patterns were intermixed with the landscape distributions of artifacts present across the Grama Ridge terrace.

If so, then the area of massed caliche north of the Merchant village represents a truly unique and perhaps unprecedented situation, and that situation requires an explicit explanation of how mounds of caliche in linear alignments positioned in a hydrologically favorable setting, maize and cattail pollen, and phytolith evidence of moisture all ended up together in one place. A more parsimonious explanation is that these converging lines of evidence confirm that the gridded features of LA 43414 north of the Merchant pueblo settlement were agricultural in nature and were part of the Ochoa phase settlement of Grama Ridge.

Chapter 11

Chronometrics and Chronology of the Merchant Site

Chronometric analysis is the foundation to understanding the structure, age, and history of occupation of the Merchant site and to situate it within the broader temporal contexts of the Southwest and southern Plains. The analysis of dates obtained during the 2015 fieldwork determined that the Merchant village was occupied between A.D. 1300 and 1450 (Miller et al. 2016). The Merchant village has long been considered the "type" site for the Ochoa phase (Leslie 1965a) and thus the manifestation of that phase is also dated to A.D. 1300–1450. This placed the Merchant village and its cultural phase securely within the Late Formative period of the southeastern Southwest and the Late Prehistoric period of the southern Plains and west-central Texas. More specifically, the Ochoa phase occupation of the Merchant site was contemporaneous with the El Paso phase of the southern Jornada region, the Late Glencoe phase of northern Jornada, the Cliff phase of southwestern New Mexico, the Medio period of northwestern Chihuahua, the Pueblo IV period of north-central New Mexico, the Toyah phase of west-central Texas, and the Antelope Creek of the Texas Panhandle.

Setting aside the interpretive and theoretical issues involved with phase taxonomies and linear change models (Cordell and Plog 1979; Upham 1984), it is apparent from the variety of phases listed above that a mosaic of adaptations, social groups, economic arrangements, and cultural expressions were present across the Southwest and southern Plains during the 1300s and 1400s. However, instead of mosaic, perhaps the term "moving kaleidoscope" is a more appropriate metaphor to describe the ebb and flow of people, goods, technologies, ideologies, social arrangements, and social conflicts across the region. These patterns, occurring over a span of at least 150 years, are of interest for the present study, as each of the regional phases and cultural expressions has different intrinsic chronological, scalar, and social implications in regard to how we interpret the Merchant site – and, in turn, the temporal placement of the Merchant site is a critical influence on how we interpret developments in neighboring regions.

Many events and changes transpired between A.D. 1300 and 1450, and the fundamental issue of whether the Merchant village dates to the early or mid-1300s, the late 1300s, the early to mid-1400s, or across two or more of these intervals remained unresolved. Based on the informal nature of the architecture, the absence of burials, and the ceramic discard rates in midden deposits, it is unlikely the village was occupied for more than 30 to 50 years. Did that relatively brief stay take place in the early and mid-1300s when pueblo settlements, maize agriculture, and iconographic expressions appeared across the southeastern Southwest and Plains? The appearance of such settlements in the southern Plains may somehow be related to, or a similar phenomenon to, the widespread patterns of migration that occurred across the northern Southwest during the 1300s (Clark 2001; Clark and Laumbach 2011; Ortman 2012). Or the site may have been occupied during the late 1300s, a time that appears to have been a period of relative stability, although perhaps with increasing demographic pressures. Perhaps Merchant was settled during the early 1400s as a result of those demographic pressures, or perhaps even during the mid-1400s near the time that widespread demographic collapse and social disruption is evident in the radiocarbon record across the entire southern Southwest (Miller 2021a). Does the evidence of violence Collins (1968) observed among human burials at the Ochoa phase Salt Cedar site relate to this period of collapse and disruption?

In light of these temporal issues, the critical objective of the chronometric analysis is to refine and narrow the 150-year-long occupation span of the Merchant village as determined through radiocarbon dating. This objective is much easier said than done, primarily because of the reduced precision of calibrated age ranges that result from the shape of the calibration curve during the 1300s. Several statistical models and simulations are used to analyze the radiocarbon data and attempt to circumvent the problems arising from calibration and to evaluate whether it is possible to separate contexts dating to different intervals along the calendar time scale.

The results of radiocarbon dating and the statistical analysis of the dates are reviewed in the following chapter. The chronology of the Merchant village is primarily based on the analysis of radiocarbon dates, but the utility of other dating methods was explored. The results of statistical analysis and simulation modeling suggest the best fit of the Merchant radiocarbon chronology falls within the A.D. 1300–1350 interval. Luminescence dating of a sample of Ochoa ware sherds tended to complicate rather than clarify the chronology, but statistical analysis of the dispersed set of dates ultimately serves to corroborate the radiocarbon chronology. Relative dating based on ceramic ware and projectile point types is also reviewed, but the results offer few new insights beyond the conclusions provided in the 2016 study.

The Radiocarbon Chronology of LA 43414 and the Merchant Site

Forty-one radiocarbon dates were obtained from the Merchant village and several features in the surrounding archaeological landscape of LA 43414. Another 18 dates were obtained from the aggregate site area of LA 43414 defined during the Merchant Vicinity survey (see Chapter 5). Those dates are reviewed in the survey report (Graves et al. 2021a) and are summarized later in this chapter but are not included here as part of the village chronology study. Fifteen of the dates from the Merchant village were obtained during previous investigations, including 11 dates on samples collected during the 2015 excavations and four dates that were part of the regional chronology project sponsored by the CFO under the PBPA program (Cummings and Kováčik 2013). To the previous assortment of 15 dates, another 25 dates from domestic rooms and one date from an agricultural field have been added as part of the 2019 investigations.

The 41 dates are described in Table 11.1. Information on context, sample type, radiocarbon age, and calibrated age ranges are included in the table. The laboratory report forms are provided in Appendix A.2.

Four dates are from peripheral features that are not associated with the village settlement. Feature 109 is a hearth located north of the village that was sampled by the CFO for the regional dating study. Samples of maize and mesquite wood charcoal were submitted and both provided age estimates that match the major occupation span of the Merchant village. Feature 64 is a small, isolated hearth at the far southern edge of LA 43414 that was excavated in 2015 (Miller et al. 2016). A sample of four-wing saltbush (*Atriplex* sp.) charcoal from the fill yielded a 2-sigma calibrated age range of A.D. 1530 to 1950. Similar dates were obtained from four features that were tested during the Merchant Vicinity survey, and together with Feature 64, reflect several brief and low-intensity Protohistoric or early Historic occupations of the terraces and ridges surrounding Grama Ridge. Feature 482 is a baking pit exposed at a depth of 70 cm below the surface in Trench 2019-1, 350 m northeast of the village. The calibrated age range of 1120–930 B.C. for this feature is representative of the Archaic period occupation of Grama Ridge. These features and their dates are part of the broader archaeological landscape of LA 43414 but are not associated with village occupation.

Thirty-seven dates are associated with the village settlement and agricultural fields. The provenience distribution of the dates includes 20 from domestic rooms, nine dates from the two pit structures, five dates from midden deposits, one date from extramural hearth, and two from agricultural fields. One date is the result of a poor sampling decision. In an attempt to date one of the agricultural fields, an uncharred seed recovered from Feature 82 was submitted for dating. The sample had a ^{14}C measurement in excess of the modern standard, indicating a modern (bomb carbon or bomb pulse radiocarbon) date (de Vries 1958). The seed is clearly a modern intrusion and, in retrospect, the sample should not have been submitted for dating. It is not included in the following discussions.

The two-sigma calibrated age ranges of the remaining 36 dates from village and field are graphically illustrated in Figure 11.1. The age estimates have been calibrated with the most recent consensus dendrochronological calibration curve (Reimer et al. 2020). Calibrated age ranges are rounded to the nearest 5-year interval according to the convention set forth in Stuiver and Polach (1977:362).

The series of age estimates from the Merchant village display a remarkable degree of consistency and concordance, especially considering the complexities of the settlement and surrounding archaeological landscape. The dates were obtained from a variety of short- and long-lived sample materials such as corn cupules and cob fragments, mesquite seeds and mesquite wood charcoal, grass culms, and a charred acorn fragment. Short-lived sample material and wood charcoal are color-coded in the figure, and it is evident that there is little evidence of pervasive old wood biases (explored in greater detail below). There is no systematic evidence of site multicomponency, sampling bias, or dating errors among the series of dates.

This consistency presents a rather unusual situation because radiocarbon sequences from complex village settlements usually exhibit a much wider range of variation. To provide a comparative example, the 37 dates from Area 1 of Hot Well pueblo in the Hueco Bolson of El Paso County, Texas, are graphed in Figure 11.2. Area 1 is the primary room block, consisting of 25 rooms and plaza spaces (Lowry 2005). Hot Well pueblo is of similar age and complexity as the Merchant site, and the two pueblos have similar numbers of radiocarbon dates (37 dates for Area 1 of Hot Well; 35 dates for the Merchant village). The temporal interval for El Paso phase pueblo settlements of A.D. 1300–1450 is highlighted.

Comparing the two series, Hot Well pueblo has a much greater degree of variation and dispersion outside the A.D. 1300–1450 interval, particularly toward older dates and older occupations. The older dates cannot be attributed solely to old wood biases because, as evident among the color-coded calibrated age ranges, roughly equal numbers of dates from short-lived and wood charcoal sample material pre-date the primary occupation period. Some of the dispersion is attributed to the intrinsic sampling and measurement variation of radiocarbon measurement and dating (Buck et al. 1994; Bayliss et al. 2011) and can be resolved through Bayesian analysis (see Miller 2005, 2021b), while some of the dates are probably from earlier Late Dona Ana phase occupations that were overlooked or buried by the pueblo settlement. Regardless of the sources of variation and bias in the Hot Well sequence, the fundamental point emphasized here is that the Merchant site has an exceptionally consistent array of radiocarbon dates.

Table 11.1. Radiocarbon dates from the Merchant village, agricultural fields, and peripheral features of LA 43414

Area	Feature	Type	Sample Material	Lab Number	δ ^{13}C	Conventional ^{14}C Age	Calibrated Age Range
East block	Room 6 F. 6.2	Hearth	*Prosopis* wood charcoal	Beta 567946	-25.2	101.25 ± .38 PMC	A.D. 1955 – 1955
East block	Room 6 F. 6.2	Hearth	*Prosopis* twig	Beta 567947	-24.2	121.13 ± .45 PMC	A.D. 1805 – 1985
East block	Room 6 F. 6.3A	Hearth	*Prosopis* wood charcoal	Beta 567948	-26.4	240 ± 30	A.D. 1520 – 1805
East block	Room 13 F. 13.2	Hearth	*Prosopis* wood charcoal	Beta 567949	-25.8	550 ± 30	A.D. 1320 – 1425
East block	Room 25 F. 404	Floor hearth	Monocot grass culm	Beta 567951	-12.7	650 ± 30	A.D. 1280 – 1395
East block	Room 25 F. 404.1	Pit	*Prosopis* wood charcoal	Beta 567950	-24.6	600 ± 30	A.D. 1300 – 1410
East block	Room 25 F. 404.5	Hearth	Monocot grass culm	Beta 567953	-10.1	650 ± 30	A.D. 1280 – 1395
East block	Room 25 F. 404.5	Hearth	*Prosopis* wood charcoal	Beta 567954	-25.3	660 ± 30	A.D. 1280 – 1395
East block	Room 26 F. 402.1	Floor hearth	*Prosopis* wood charcoal	Beta 567956	-24.4	890 ± 30	A.D. 1095 – 1245
East block	Room 26 F. 402.1	Floor hearth	*Prosopis* seed	Beta 567957	-24.1	630 ± 30	A.D. 1295 – 1400
East block	Room 26 F. 402.2	Pit	*Prosopis* wood charcoal	Beta 567955	-25.2	660 ± 30	A.D. 1280 – 1395
East block	Room 27 F. 406.1	Hearth	*Prosopis* wood charcoal	Beta 567960	-27.0	560 ± 30	A.D. 1310 – 1430
East block	Room 27 F. 406.1	Hearth	*Prosopis* seed	Beta 567961	-25.1	540 ± 30	A.D. 1320 – 1435
East block	Room 28 F. 407.1	Floor hearth	*Prosopis* wood charcoal	Beta 567958	-25.8	570 ± 30	A.D. 1304 – 1425
East block	Room 28 F. 407.3	Posthole	*Prosopis* seed	Beta 567959	-25.8	670 ± 30	A.D. 1275 – 1390
East block	Room 28 F. 407.2	Floor hearth	*Prosopis* wood charcoal	Beta 567962	-24.6	670 ± 30	A.D. 1275 – 1390
East block	Room 29 F. 410.1	Floor hearth	*Prosopis* wood charcoal	Beta 567963	-24.2	560 ± 30	A.D. 1310 – 1430
East block	Midden B F. 110	Level 2	*Prosopis* wood charcoal	Beta 570074	-25.3	700 ± 30	A.D. 1265 – 1390
East block	Midden B F. 110	Level 4	*Prosopis* wood charcoal	Beta 570075	-23.8	620 ± 30	A.D. 1295 – 1400
East block	Midden B F. 110	Level 6 base	*Prosopis* wood charcoal	Beta 570076	-25.2	610 ± 30	A.D. 1300 – 1405
East block	Midden B F. B.1	Level 2 base	*Prosopis* wood charcoal	Beta 434520	-23.3	610 ± 30	A.D. 1300 – 1405
East block	Extramural F. 409	Pit	*Prosopis* seed	Beta 567952	-24.2	610 ± 30	A.D. 1310 – 1405
Kiva Str. 1	F. 1.3	Pit	*Zea mays*	Beta 434662	-10.3	590 ± 30	A.D. 1300 – 1410
Kiva Str. 1	F. 1.3	Pit	*Prosopis* wood charcoal	Beta 434663	-25.4	600 ± 30	A.D. 1300 – 1410
Kiva Str. 1	F. 1.3	Pit	*Prosopis* seed	Beta 434664	-23.2	510 ± 30	A.D. 1395 – 1450
Kiva Str. 1	F. 1.4	Floor hearth	*Prosopis* seed	Beta 434521	-23.7	540 ± 30	A.D. 1320 – 1435
Kiva Str. 1	F. 1.4	Floor hearth	*Zea mays*	Beta 434522	-11.3	540 ± 30	A.D. 1320 – 1425
Kiva Str. 1	F. 1.8	Posthole	*Prosopis* seed	Beta 434660	-21.6	620 ± 30	A.D. 1295 – 1400
Kiva Str. 1	F. 1.10	Posthole	*Zea mays*	Beta 434659	-10.6	560 ± 30	A.D. 1300 – 1430
Kiva Str. 1	n/a	LCAS backdirt	*Prosopis* seed	PRI-13-050-407	-22.2	569 ± 21	A.D. 1320 – 1420
Kiva Str. 2	F. 2.1	Floor feature	*Prosopis* wood charcoal	Beta 434658	-27.9	160 ± 30	A.D. 1665 – 1950

Area	Feature	Type	Sample Material	Lab Number	δ ^{13}C	Conventional ^{14}C Age	Calibrated Age Range
South block	Room 24 F. 400.1	Floor hearth	*Prosopis* wood charcoal	Beta 567964	-25.5	600 ± 30	A.D. 1300 – 1410
South block	Room 7 F. 7.2	Floor hearth	*Prosopis* wood charcoal	Beta 567965	-24.8	660 ± 30	A.D. 1280 – 1395
South block	F. 39	Pithouse fill	*Quercus sp.* acorn	PRI-13-050-406	-25.3	571 ± 21	A.D. 1315 – 1420
West block	Midden C F. 412	Level 1	*Prosopis* wood charcoal	Beta 567968	-24.6	620 ± 30	A.D. 1295 – 1400
Ag Field	F. 108	Midden deposit	Wood charcoal (Unid)	Beta 434661	-24.7	1110 ± 30	A.D. 880 – 995
Ag Field	F. 82	Field	Uncharred seed (Unid)	Beta 555817	-13.5	106.69 ± .40 PMC	A.D. 1956 – 2008
East peri	F.482 (Tr. 2019-1)	Baking pit	*Prosopis* wood charcoal	Beta 555833	-24.7	2860 ± 30	1120 – 930 B.C.
North peri	F. 109	Hearth	Zea mays	PRI-13-050-405Z	-10.9	546 ± 22	A.D. 1325 – 1430
North peri	F. 109	Hearth	Prosopis wood charcoal(vt)	PRI-13-050-405P	-25.2	695 ± 21	A.D. 1275 – 1385
Far south peri	F. 64	Hearth	*Atriplex* wood charcoal	Beta 434523	-11.8	250 ± 30	A.D. 1520 – 1800

Two-sigma age ranges calibrated using INTCAL 20 (Reimer et al. 2020)
Calibrated age ranges have been rounded to nearest 5-year interval (Stuiver and Polach 1977)
(vt) vitrified charcoal
(Unid) = unidentified genus or species
peri = periphery

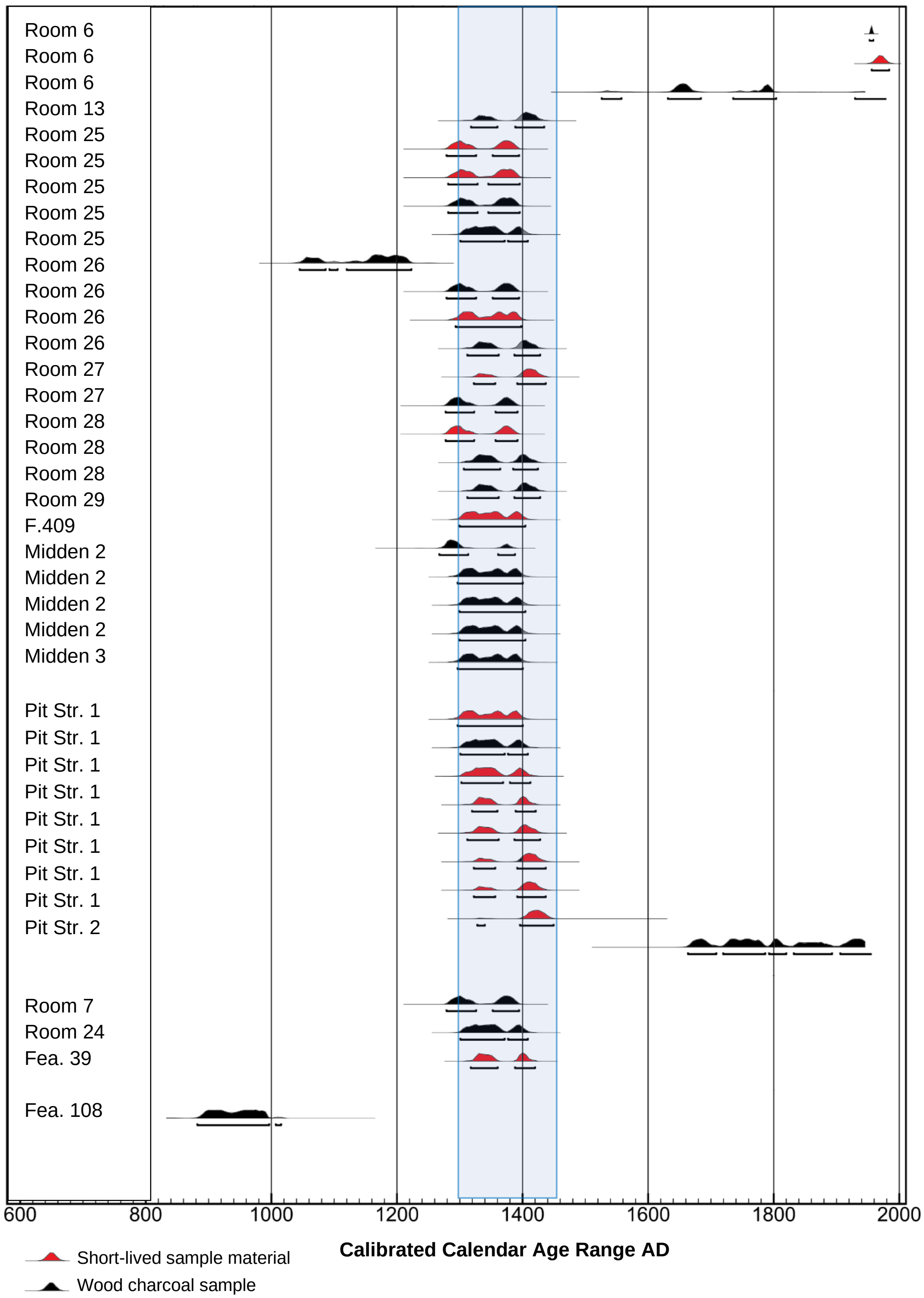

Figure 11.1. Calibrated age ranges (2 sigma) of the 36 radiocarbon dates from the Merchant village and agricultural fields. The span of A.D. 1300 to 1450 is highlighted.

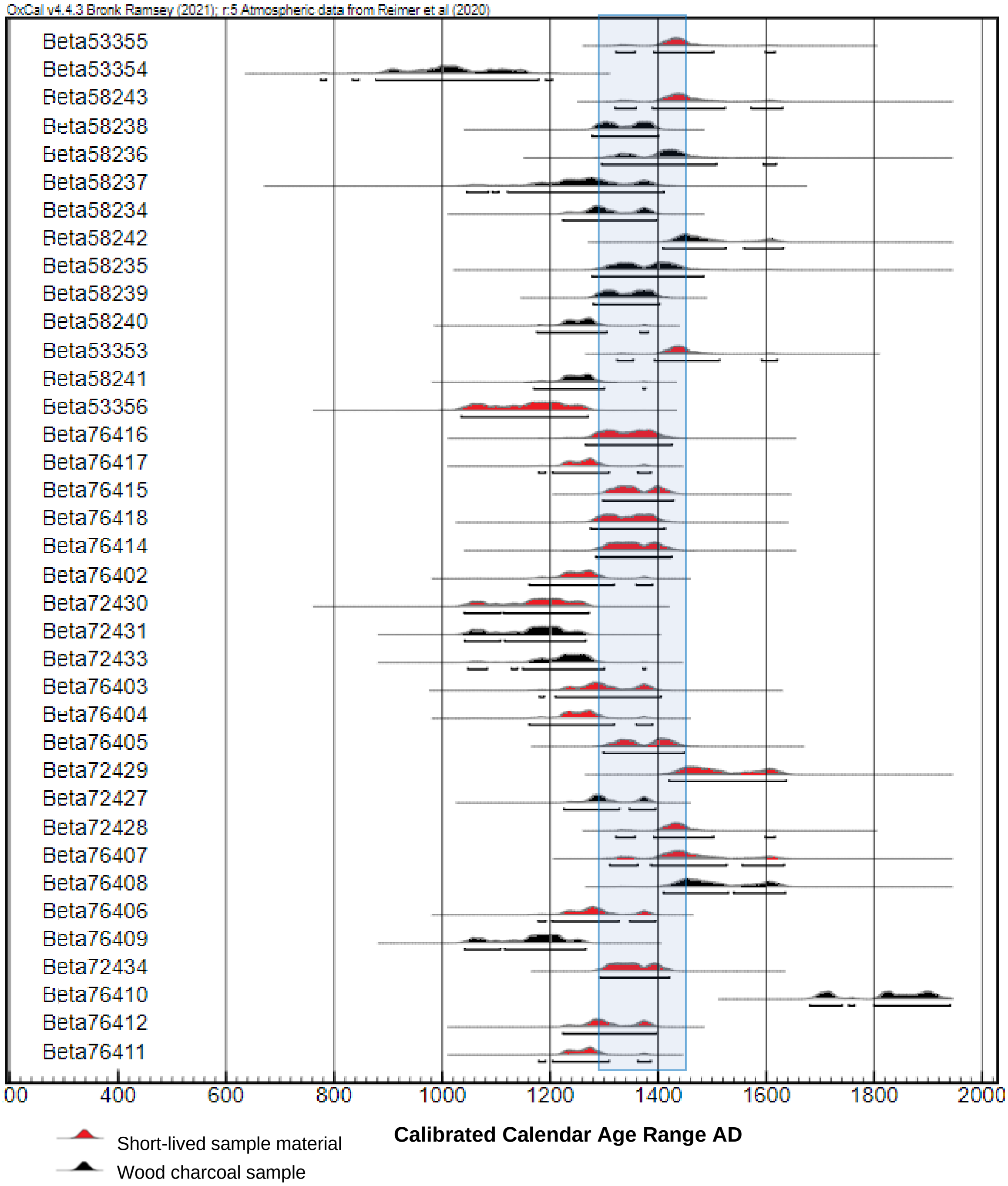

Figure 11.2. Calibrated age ranges (two sigma) of 37 radiocarbon dates from Area 1 of Hot Well Pueblo (data from Miller 1996). The span of A.D. 1300 to 1450 is highlighted.

The Outlier Dates

A strong case can be made that the Merchant site radiocarbon chronology is exceptionally consistent, but several outliers exist among the series of dates. Calibrated age ranges for slightly over 15 percent of the dates (6 of 36) are significantly earlier or later than the primary occupation period of A.D. 1300 to 1450. It is important to note that the six outlier dates are *significantly* offset from the primary period by 300 to 500 calendar years. Most situations of old wood bias and village multicomponency in southern New Mexico and western Texas result in much smaller age offsets, on the order of 50 to 150 years. Therefore, the significant offsets of the Merchant site outliers are probably associated with different periods of occupation, including modern times. Indeed, two of the outliers are modern (bomb carbon) dates, two post-date A.D. 1650, and the one significantly older date is from outside the village

Only one date is slightly older (in radiocarbon years) than the primary occupation period. The calibrated date of A.D. 1095–1245 obtained from Room 26 is one the only date from the village that exhibits a probable old wood offset. This date is reviewed in the discussion of old wood effects below.

A much older date, with a minimal age offset of 450 radiocarbon years, was obtained from Feature 108, one of the agricultural fields located north of the village. As discussed in Chapter 10, the dating of the agricultural fields has proven a difficult endeavor. The calibrated age range of A.D. 880–1010 from Feature 108 is much earlier than anticipated given the presumed association of the agricultural fields with the Merchant village. The calibrated age range is three to five centuries earlier than the earliest possible occupation of the Merchant village at circa A.D. 1300. In all likelihood, the date from Feature 108 was associated with an earlier occupation that was part of the archaeological landscape across the Grama Ridge terrace as discussed in Chapter 5. Notably, the diagnostic artifacts recovered from Feature 108 include a mixed collection of Late Archaic and Late Formative period projectile points and Early and Late Formative ceramic types, establishing that the shallow deposits in this area of Grama Ridge were formed during several periods of occupation. As it stands, the chronometric dating of the agricultural field of Feature 108 and other gridded field features remains unresolved.

On the opposite side of the temporal scale, the four late dates from Room 6 and Pit Structure 2 are more problematic. Three dates were obtained from two floor hearths of the lower floor of Room 6. Paired samples from Feature 6.2 yielded modern (bomb carbon) dates and the sample from Feature 6.3A provided an age estimate with an 85 percent probability of falling within the intervals of A.D. 1630–1685 and 1735–1805. The upper floor of Room 6 was cleared by the LCAS in 1963. There is no record that the LCAS conducted deeper excavations in the room, although no remnant of the floor was identified during the 2019 excavations and it is possible that the room was potholed like most of the surrounding rooms. However, no historic artifacts were found in Level 2 (lower fill) of Room 6, in contrast to the constant recovery of modern metal and glass items from the disturbed upper and lower fills of the other six rooms.

Another late age estimate of 160 ± 30 B.P. was obtained from a wood charcoal sample recovered in a remnant floor feature of Pit Structure 2. The 2-sigma calibrated age range is A.D. 1665 to 1950. The dendrochronological calibration curve of this period has several inversions (wiggles), and thus calibration of the date results in multiple calibrated age ranges of approximate equal probabilities, including a 19.5 percent probability the true age of the sample falls between A.D. 1906 and 1950, as well as three age ranges that overlap with the two calibrated ranges of the date from Room 6. There are little to no statistical grounds to argue that any specific time interval has a greater probability than another, and the true calendar ages of samples lie anywhere between A.D. 1630 and 1950.

The calibrated dates from Room 6 and Pit Structure 2 postdate, by a minimum of two centuries, the series of dates from the surrounding rooms and midden deposits. They also postdate the relative date spans provided by ceramics and projectile points recovered from the surrounding features. It should be emphasized that, with the possible exception of Chupadero Black-on-white, no ceramic types with production spans that postdate A.D. 1450 were recovered from Room 6, Pit Structure 2, or the surrounding rooms and middens.

Several scenarios ranging from laboratory errors, later occupations, and intermixing of modern charcoal can be offered to explain this discrepancy, none of which is entirely satisfactory. Ruling out laboratory contamination (at Versar) or laboratory measurement error (at Beta Analytic), two possible processes or events could have led to the age disjunction. Both explanations involve redeposition of modern or historic charcoal, most likely resulting from the extensive looting and redeposition of deposits within the structure and the surrounding midden deposits. Noting that tin food cans were found throughout the backfilled deposits of pit structures, rooms, and middens, it is possible that the looters or LCAS members made cooking fires during their visits and that charcoal from one of the fires was tossed into or washed into the exposed excavation. Range fires are another possibility that could have resulted in the deposition of charcoal of historic or modern age. The laminated deposits in the deep pit of Pit Structure 2 included lenses of fine charcoal sediments with occasional flecks and fragments, proving that charcoal matter was redeposited throughout the structure.

The LCAS excavations took place from 1959 to 1960, although the site had been the subject of looting and artifact collecting for many years before the LCAS arrived. Fuel wood obtained from living or recently deceased trees and shrubs would have a pronounced "bomb carbon" signature from the atmospheric testing of nuclear weapons beginning in the 1950s (Sarachine Falso and Buchholz 2013; de Vries 1958). In other words, any radiocarbon measurement from a sample of wood or wood charcoal from the early 1960s would be in excess of the modern 1950 standard, demonstrating the presence of bomb carbon. The two samples from Feature 6.2 in Room 6 are clearly intrusive modern contaminants. It is also possible that mesquite deadwood collected around the site was used in the campfires, thus yielding the historic age ranges. The fundamental question is, how did modern, burned mesquite wood end up in a floor hearth of an unexcavated room and how did slightly older mesquite wood come to be deposited in the floor hearth of an unexcavated room and that of a deep communal structure?

A second scenario is that charcoal from a later Protohistoric or Historic occupation of the village was incorporated into the base of Pit Structure 2, either through occupation within the open pit of the structure or backwashed sediments from an adjacent occupation on the surface. A prominent number of post- A.D. 1450 dates were obtained from features tested across Grama Ridge and Antelope Ridge during the Merchant Vicinity survey (Graves et al. 2021a), establishing that the landscape around the San Simon swale was a relatively common settlement location during Protohistoric and Historic times.

As reviewed in Chapter Nine, the midden and occupation deposits of Midden 2 around and above Pit Structure 2 were severely disturbed by looting. Photographs show most of the refuse area dug to depths of 50 cm or more and backdirt and screen spoil piles throughout. Perhaps there was a small post- A.D. 1450 occupation in the midden area and charcoal from that deposit was mixed into the base of Pit Structure 2 when it was looted. An alternative explanation is that Room 6 and Pit Structure 2 were cleaned of roof and wall fall and natural sediments and were briefly occupied 200 to 400 years after the village had been abandoned in the late 1300s or early 1400s. The open pit of Pit Structure 2 would have provided a ready-made sheltered area. There is no artifactual evidence to support or refute this explanation.

In the larger picture, these later dates are a peripheral matter that relate to the entire history of the site, including the modern era of avocational excavations and looting. As conclusively established by 30 tightly clustered age estimates, the primary occupation of the village took place between A.D. 1300 and 1450. The next issue to be examined is whether that 150 year-long calibrated age range can be narrowed and refined.

Sampling Bias, Old Wood Offsets, and Calibration Effects

Removing the six outlier dates results in an analytical sample of 30 dates, referred to as the "analytical subset" for further review and statistical analysis. Before proceeding with statistical modeling, potential sources of bias and the effects of calibration are examined.

Sampling Bias

There is an obvious sampling bias in the spatial distribution of dated organic and ceramic samples across the pueblo (Figure 11.3). The 2016 chronometric analysis was heavily biased toward samples from Pit Structure 1, as eight of the 10 dates from the village area were from floor features in the structure. Moreover, seven of the eight dates from Pit Structure 1 were from Floor 1 and thus associated with the first of two use episodes. The present bias is in favor of domestic rooms in the eastern room block, as 54 percent of radiocarbon and 93 percent of the TL dates are from the seven rooms. All 51 radiocarbon and TL dates are from the eastern and southern areas of the village, leaving rooms and midden areas across the northern and western segments of the pueblo conspicuously undated.

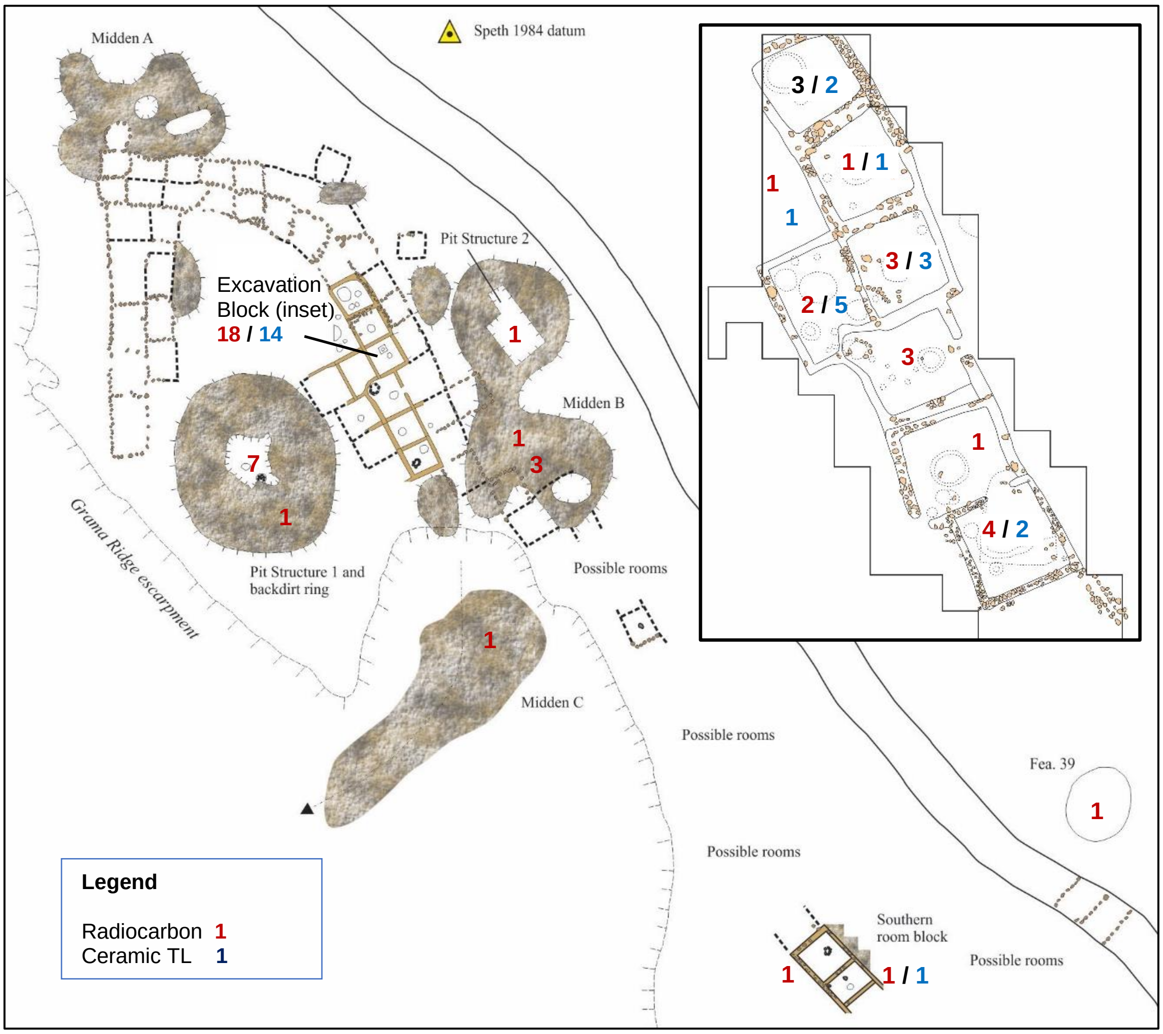

Figure 11.3. Distribution of chronometric dates in the Merchant village.

Considering that groups of dates from four major areas – the southern room block, eastern room block, Pit Structure 1, and two midden areas – all consistently fall within the A.D. 1300–1450 interval, it is reasonable to assume that the northern and western room blocks and refuse deposits of Midden A are also contemporaneous, at least in terms of radiocarbon years via the precision afforded by radiocarbon dating. There are no differences in the variety or proportions of ceramic types or projectile point types between the northern and western arms of the room block and rooms to the east or southern that would indicate otherwise. This similarity does not imply that the entire room block was constructed and occupied at the same time; this is clearly not the case, as demonstrated by the agglomerative growth of the room blocks described in Chapter 6. It is possible, in one of several hypothetical scenarios, that the northern arm of rooms was built a few years or even a decade or two before the eastern arm, but such fine-scaled chronological differences are difficult to pry apart through the current resolution of radiocarbon dating.

Of further relevance is that dates from midden deposits show a remarkable degree of consistency, particularly dates from the lowermost or basal layers of such deposits. Refuse deposits are composite formations reflecting behaviors and material culture discard patterns from one or more habitation areas of a site. Keeping in mind that the formation and internal stratigraphy of such deposits was modified through bioturbation and translocation of artifacts and organic matter[5], it can be assumed within a reasonable degree that the deposits, and dated samples from the deposits, represent a cross-section of the occupational history of most habitation areas of the village.

Two dates were obtained from the basal levels of Midden B (Unit 1, Fea. B.1 610 ± 30 B.P.; Unit 2, Level 6 610 ± 30 B.P.), and one date was obtained from the base of Midden C (Level 1 620 ± 30 B.P.). The three age estimates are statistically contemporaneous ($t = 0.1$, $df = 2$, 95 CI *critical* $x^2 = 6.0$) and indicate that refuse disposal began at the same time in at least two of the three primary midden areas of the village. No dates are available from Midden A at the northern edge of the room block, but it should be recalled that it is not even certain that the deposits of Midden A were prehistoric refuse or backdirt mounds from the LCAS excavations (see Chapter 9).

Old Wood Offsets

Old wood effects are another potential source of bias and error. Residual old wood effects arise from the use of deadwood collected from the surrounding environment (after Smiley 1985) and are the effects described by Schiffer (1986) in his classic study of the "old wood problem." Cross-section effects (Smiley 1985) arise from the dating of interior ring segments of medium to large-diameter wood logs. The interior rings of large trees may be 100 to 200 years older than the outer rings and bark, and the past use of such logs for construction or fuel can create significant age offsets in radiocarbon dates. Both cross-section and residual effects contribute "inbuilt age" (IA, after Dee and Bronk-Ramsey 2014) to a radiocarbon wood charcoal sample and the age measurement derived from it.

As noted earlier, there is little evidence of a pervasive old wood bias among the suite of dates from the Merchant site. All wood charcoal dates in the study were obtained from samples identified as mesquite (*Prosopis* spp.; likely *Prosopis glandulosa*). Mesquite is one of three deadwood species preferred by the Desert dampwood termite (*Paraneotermes simplicicornis*) common through the deserts of New Mexico and west Texas (Haverty and Nutting 1975). The rarity of large trees and the rapid decomposition of surface deadwood and consumption by desert termites, combined with

[5] Midden deposits were also modified by the extensive looting during the 1960s. The radiocarbon date from the disturbed upper deposits of Level 2 is significantly older than the basal dates and probably reflects the effects of the strip looting across the eastern half of the site that redeposited materials from other contexts throughout the upper layers of Midden B.

the probable depletion of local wood sources being exploited by the resident population of a 60+ room pueblo, would suggest that there was little chance for long-lasting deadwood or large trees to have been incorporated into the charcoal record of the Merchant site. On the other hand, construction wood would have been a premium resource on the dry, mostly treeless environment of Grama Ridge, and is it easy to envision how the residents of the Merchant site may have conserved and curated wood for house construction.

Paired short-lived and mesquite wood charcoal samples were submitted for four contexts: Floor hearth Feature 1.3 in Pit Structure 1, Room 25, Room 26, and Room 28. Two dates on grass culms and two on mesquite wood charcoal were submitted from floor features in Room 25, including paired wood and grass culm samples from floor hearth Feature 404.5. The four dates are contemporaneous *(t = 2.4, df = 3, critical x^2 = 7.8)*. A mesquite seed and wood charcoal sample submitted from floor hearth Feature 406.1 in Room 27 are contemporaneous, differing in age by only 20 radiocarbon years *(t = 0.2, df = 1, critical x^2 = 3.8)*. In a similar pairing, a mesquite seed and mesquite charcoal sample from the posthole and floor hearth of Room 28 yielded the exact same radiocarbon age. A diverse set of samples consisting of maize, a mesquite seed, and mesquite wood charcoal was submitted from floor hearth Feature 1.3 of Pit Structure 1. The three dates are also contemporaneous *(t = 5.4, df = 2, critical x^2 = 6.0)*.

The calibrated date of A.D. 1095–1245 obtained from above or within Feature 402.1 of Room 26 is the only dated context of the village that exhibits a probable old wood offset. The date is from a sample of a burned mesquite branch measuring 4 cm in diameter found resting on the top of the floor hearth and may be a fragment of wood used in the superstructure (see Figure 6.10). A charred mesquite seed recovered from the flotation sample of the floor hearth yielded a calibrated age range of A.D. 1295–1400, and another sample of mesquite wood charcoal from adjacent floor pit 402.2 provided a date of A.D. 1280–1395. Accordingly, we can make a reasonable argument that the sample was probably obtained from a mesquite tree of some age for use in the superstructure and the date reflects a cross-section bias. The date can be eliminated from further consideration.

The sample from Room 26 reflects one of the few charcoal pieces from the fill or floor of a structure. The sampling strategy for the Merchant chronometric study used two criteria to select samples: sample context and sample composition. In terms of context, subfloor features in rooms and the two pit structures were specifically targeted with the understanding that charred material from subfloor features had the highest probability of reflecting the target event (after Dean 1978) of the use of the hearth (and by extension, the occupation of the structure). Among the groups of samples available from subfloor features, short-lived samples such as corn or mesquite seeds were accorded the highest priority. If short-lived samples were not available for a context, mesquite wood charcoal was selected as opposed to oak, juniper, creosote, four-wing saltbush, ocotillo, Javelina bush, althorn, and other wood and shrub species. Mesquite wood was chosen because it has a short survival span as deadwood on the desert landscape and thus has little chance for residual old wood effects when used as firewood in hearths. Mesquite also has a rapid growth rate (Patch and Felker 1997), and trees offering trunks and branches of sufficient diameter for jacal construction may only be a decade or two in age. Therefore, there is little likelihood that the samples were biased by significant residual old wood effects from burning interior rings of trees with built-in age effects.

A consideration of the sampling strategy, the review of paired samples, and the overall concordance of the majority of dates reviewed in the preceding discussions leads to the conclusion that there are no large-scale old wood offsets on the order of 30, 40, or 50 or more years that would significantly bias the Merchant chronology. However, there is a possibility that a combination of minor cross-section age effects and perhaps the possible burning of construction wood replaced during remodeling could have contributed to an individual or systematic short-term age offset on the order of 10 to 20 years.

Any wood or wood charcoal sample inherently contains some built-in error, or "inbuilt age" (Bronk-Ramsey 2009a; Dee and Bronk-Ramsey 2014), and that error is unidirectionally distributed toward older ages. The issue is how to determine the degree of inbuilt age that is present, individually or collectively, among the analytical subset of 30 dates from the village area. It is anticipated that any offsets will be of limited magnitude, perhaps 5 or 10 years and certainly less than 20 years (in the case of 5 or 10 years, the offset is generally captured by the measurement error).

To determine whether offsets are present, the dates are examined using outlier identification models described by Christen (1994) and developed for the OxCal program by Bronk-Ramsey (2009a). Both the general (t) outlier model and its derivative, the charcoal outlier model, are used here. The models involve identification and treatment of outliers where the dated event of the sample does not relate to the target event in some manner but does not involve any known or assumed laboratory measurement errors or effects resulting from different radiocarbon isotope reservoir (such as marine or southern hemisphere offsets). Old wood effects are an example of when the dated event, such as the death of the tree from which the charcoal was derived, does not match the target event, such as the use of the wood for fuel in a floor hearth (see Dean 1978 for further definition of these terms). The charcoal model differs in that the age offsets in the model are unidirectional.

The 30 dates of the analytical subset are first analyzed using the general outlier model. In addition to the 30 dates, the 890 ± 30 B.P. (Beta567956) sample from Room 26 with a known offset (caused by old wood or another factor) was included as a control sample to check the results of the model. The models and parameters specified for the analysis in OxCal are:

Outlier_Model ("General", T(5), U(0,4), "t")

The results of the outlier model (Figure 11.4) are revealing. As expected, the 890 ± 30 B.P. date from Room 26 was clearly identified as an outlier at a 100 percent posterior probability, and within the phase model the date has an agreement index of *A*=5.8% (*A*=60.0% being the threshold value), indicating a poor fit with the series of dates. Two other samples were also identified as slight outliers. The mesquite charcoal date 510 ± 30 B.P from Midden B has a posterior probability of 6 percent and an agreement index of *A*=53.7%.

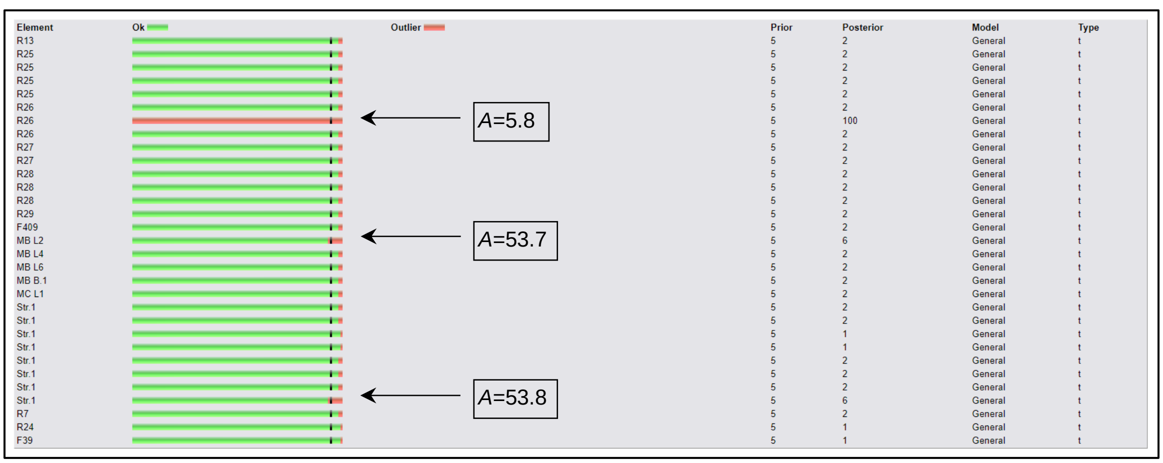

Figure 11.4. Outlier analysis using the general outlier model of OxCal ver 4.4.2. Arrows mark three samples identified as statistical outliers (Room 26 F402.1; Midden B Level 2; and Pit Structure 1 F1.3).

At the opposite end of the time scale, the date of 510 ± 30 B.P obtained on a mesquite seed from Feature 1.3 in Pit Structure 1 has a posterior probability of 6 percent and model fit of *A*=53.8%. This date was identified as an outlier in a previous Bayesian phase analysis of the eight dates from the lower floor of Pit Structure 1 (Miller et al. 2016:239). The outlier identification of this date in the present analysis verifies that it is a consistent identification. The date from Room 26 had previously been removed from the analytical subset of 30 dates. Removing the two outliers identified in the outlier model provides a "modeling subset" of 28 dates for the Bayesian analysis and simulations to follow.

Calibration Curve Effects

The most intractable problem of the radiocarbon analysis of the Merchant site, and for that matter any settlement across the globe dating to the fourteenth and fifteenth centuries, is the presence of a large inversion, or "wiggle," in the dendrochronological calibration curve between 540 and 670 ^{14}C B.P. The presence of this inversion means that any conventional radiocarbon age falling within that interval will yield multiple intercepts and form pronounced bimodal or trimodal calibrated probability distributions (Figure 11.5). Even the calibration of very precise dates, such as the example from the Structure 1 backdirt ring with a standard error of ± 21 years (PRI-13-050-407), will result in a bimodal probability distribution (Figure 11.5, inset).

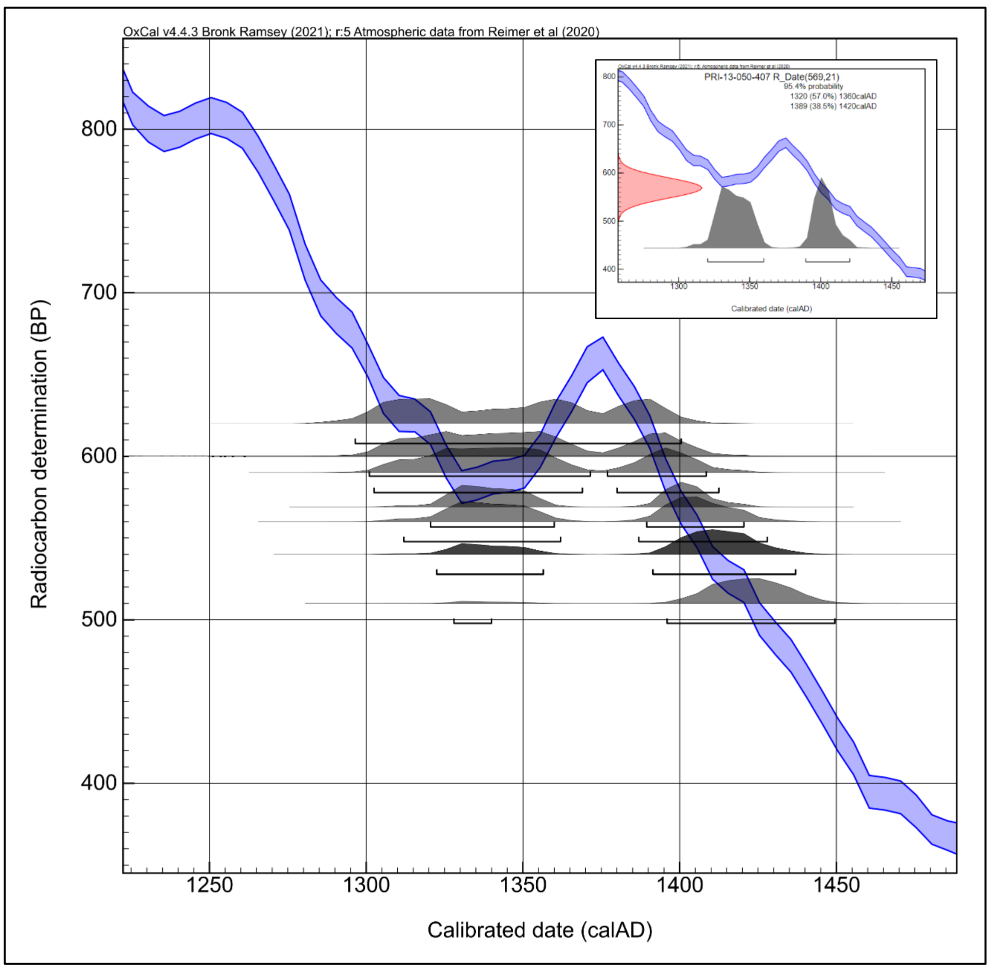

Figure 11.5. Plot of the eight age estimates from Pit Structure 1 on the IntCal20 calibration curve (Reimer et al. 2020) showing the effects of curve inversion on calibrated age ranges. Inset: individual calibration of date PRI-13-050-407 with an error measurement of ± 21 years.

As established in Figure 11.1, we can securely date the occupation of the Merchant village to a time interval falling between A.D. 1300 and 1450. Returning to the issues posed in the introduction to this chapter, a much more precise chronology is necessary to understand the history of the Merchant site within the broader temporal, economic, and social contexts of the southern Southwest and southern Plains during the Late Formative and Late Prehistoric periods. Unfortunately, past attempts to narrow the 150-year-long occupation span, including Bayesian phase modeling, were hindered by the calibration curve effects (Miller et al. 2016), as well as a sampling bias in that most of the dates were from the lower floor of Pit Structure 1.

Yet, even with an enhanced sample size and greater diversity of dated contexts at our disposal after the 2019 field and laboratory work, the spread of calibrated age ranges across multiple intercepts and periods still creates several obstacles for advanced statistical procedures. The overall calibrated probability distributions are not normally distributed, they are often bimodal or even trimodal, and it is difficult or impossible to parse which probability curve reflects the true age of the sample. The final section of the radiocarbon analysis presents alternative modeling and simulation procedures that might overcome, or at least estimate, a more precise time range of occupation.

Statistical Analysis of Radiocarbon Dates

Removing the two additional outlier dates results in a sample of 28 dates, referred to as the "modeling subset" for further statistical analysis. Several methods are brought to bear on the fundamental problem of whether the span 150-year-long span of calibrated dates can be refined and narrowed to identify a more precise period of settlement. Bayesian phase models, charcoal outlier models, kernel density estimation, and calendar age simulations are applied to the series of 28 dates.

Bayesian Modeling

The past and present attempts to narrow the individual and combined calibrated age ranges and to refine the inferred period of occupation of the Merchant site utilized Bayesian statistical methods (Bayliss et al. 2011; Bronk-Ramsey 1995, 2001; Buck et al. 1991, 1992). In general, the Bayesian approach differs from classical or formal inferential statistics by the inclusion of some prior knowledge or beliefs that are used to modify probabilities. The Bayesian approach offers a means of evaluating a series of age estimates within a robust and consistent statistical framework and can be thought of, in essence, as what Buck et al. (1991:819) term a "disciplined uncertainty accounting" that combines archaeological, chronological, and statistical information into a coherent model. Bayesian models have been used for several chronometric analyses in southern New Mexico to establish phase boundaries and refine the occupation interval of El Paso phase pueblos in the Jornada region (Miller 2005; Miller and Graves 2012; Miller et al. 2009), to partition and define occupational intervals at a multicomponent terminal Late Archaic and early Mesilla village in the Jornada (Graves et al. 2016), and to revise and refine the chronology of the Mimbres region of south-central New Mexico (Anyon et al. 2016).

Owing to the nature of radiocarbon sampling populations, measurement errors and probabilities, calibration curves, and other factors, any single or combination of calibrated age ranges will overestimate the true calendar age of the target archaeological event being dated (Bayliss et al. 2011; Buck et al. 1994). The use of Bayesian methods and mathematical procedures takes the underlying sampling phenomena and measurement uncertainties into account to arrive at a more refined probabilistic estimate of the true age span of the group of dates. The original calibrated age distributions are the prior probabilities incorporated into the analysis. The Bayesian model establishes the mathematical constraints (the prior knowledge of the ordering or relationship of events), allowing for the temporal boundaries of the phase period to be estimated. By applying the prior knowledge of the ordering of events or relationship between events, the posterior probabilities can be derived and the beginning and ending boundaries of the phase can be estimated.

Note that the use of "phase" in Bayesian models does not specifically refer to the conventional definition of an archaeological or chronological time period, but rather defines a group of dated events that are related to each other but for which there is no assumption of chronological ordering. In the present case, for example, the dates from the floors and subfloors of room and pit structures are considered a group of dated events that are related to each other, but there is no assumption that any feature predates or postdates another feature.

Bayesian stratigraphic models use the relative stratigraphic positions of dated samples or contexts. These samples and contexts are referred to as "informative priors" (Bayliss et al. 2011) because they provide a firm basis for determining likelihood ratios, boundaries, and temporal relationships. Regrettably, very little stratigraphy remains intact at the Merchant site and there are very few vertically positioned contexts that might be dated and analyzed using stratigraphic models. The stratified deposits in Pit Structures 1 and 2 were long ago removed and either displaced or hopelessly mixed. Some stratigraphy remains intact within the lower levels of midden deposits, but the layers are thin and were subject to indeterminate degrees of bioturbation and mixing.

The features in the upper and lower floors of Room 28 are the only context encountered during the 2016 and 2019 excavations that offered the chance to model at least two dates obtained from sealed, stratigraphically positioned contexts. A mesquite seed from Feature 407.3 and sample of mesquite wood charcoal from Feature 407.2 in the lower floor gave identical dates of 670 ± 30 B.P. A sample of wood charcoal from Feature 407.1 in the upper floor provided a date of 570 ± 30 B.P. While these dates differ by 100 radiocarbon years, calibration yields age ranges that differ by only 30 years, again a factor of the shape of the calibration curve. The dates were modeled using a sequential model that assumes that there was no break in time or overlap in time between the two dated occupations (see Buck et al. 1994 and Bronk-Ramsey 2009b for definitions). The results are presented in Figure 11.6.

The influence of the curve is also apparent in the modeled dates. The estimated begin and end boundaries of the construction sequence, and the estimated transition between the two floors, all essentially display the same wide age distribution from A.D. 1300 to 1450 as observed in other analyses. However, the analysis does confirm that there was little probability of a long interval of time between construction of two floors as would have occurred if the eastern room block or entire site had been abandoned and reoccupied.

In contrast to sequence (stratigraphic) models, phase models incorporate "uninformative priors" consisting of sets of dates that are assumed to have some relationship. They are considered of less power than stratigraphic models but can still be extremely useful. The first analysis of radiocarbon dates from the Merchant site was a phase model incorporating the eight radiocarbon dates from Pit Structure 1. The model has been revised to incorporate the newest consensus calibration curves published in 2020 and is included in the comparison of models presented in Figure 11.7.

The second model of Figure 11.7 is a phase model incorporating the 28 dates of the "modeling subset" defined through the contextual reviews and outlier analysis presented earlier. It is a straightforward single phase model based on the assumption that the 28 age estimates are a representative sample drawn from a uniform probability distribution and do not have significant inbuilt ages.

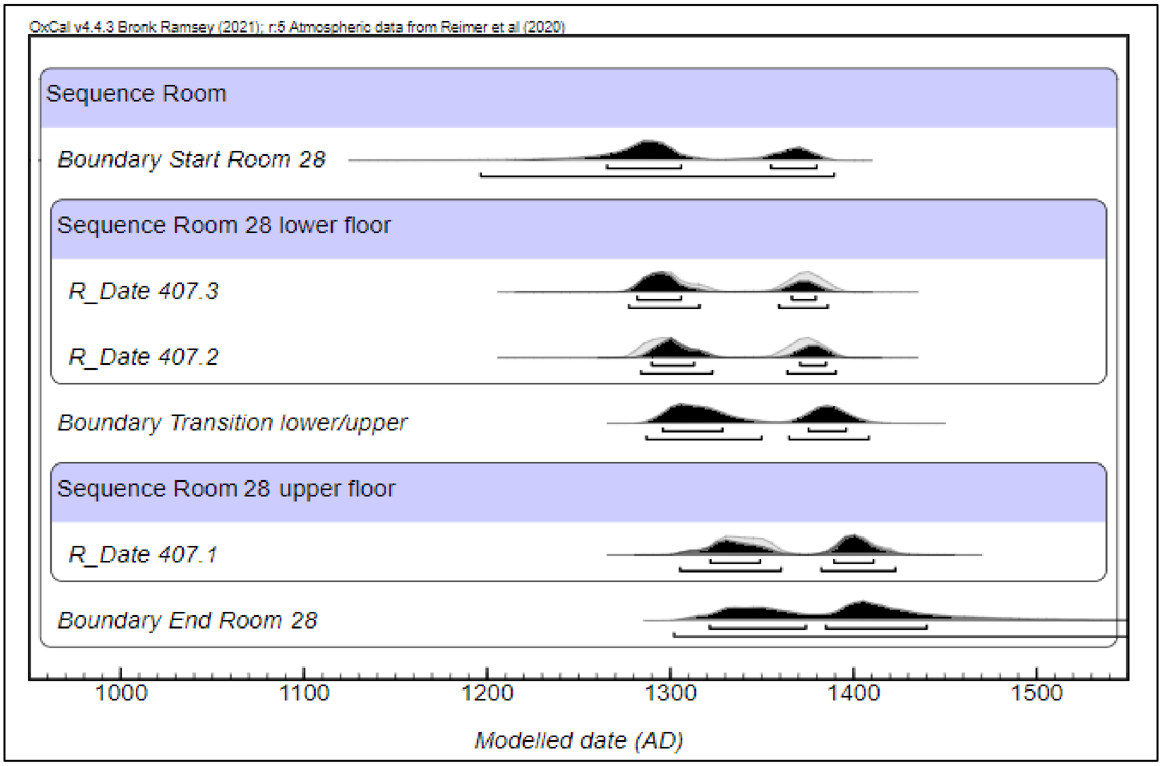

Figure 11.6. Contiguous stratigraphic model for upper and lower floors of Room 28.

A third model is presented in Figure 11.7. This model is a version of the second model except that a potential for inbuilt ages is assumed. It was determined that the likelihood of *significant* old wood offsets was minimal, and the one date with an excessive age was removed from the analysis. However, there is still potential for some degree of *minor* inbuilt age resulting from old wood effects. The effects would be minor – estimated to be on the order of 5 to 10 years and seldom exceeding 20 years, and they would be unidirectional toward older ages. To examine whether such slight effects might alter the phase boundary estimates, the analysis of the 28 modeling subset dates was modified to include a charcoal outlier model (see Bronk-Ramsey 2009a). The models and parameters specified for the analysis in OxCal are:

Outlier_Model ("Charcoal", Exp(1,-10,0), U(0,2), "t")

Note that the scaling parameter "U" was reduced to (0,2) from the default (0,3) to better reflect the estimated age of mesquite cross-section and deadwood lifespans. The lowermost panel of Figure 11.7 displays the modeled posterior probabilities of age offsets. It is important to note that nearly 70 percent of the modeled mesquite wood charcoal samples have inbuilt ages of 11 or fewer years, a very close estimate to the expectations based on mesquite lifespan and deadwood survival described earlier.

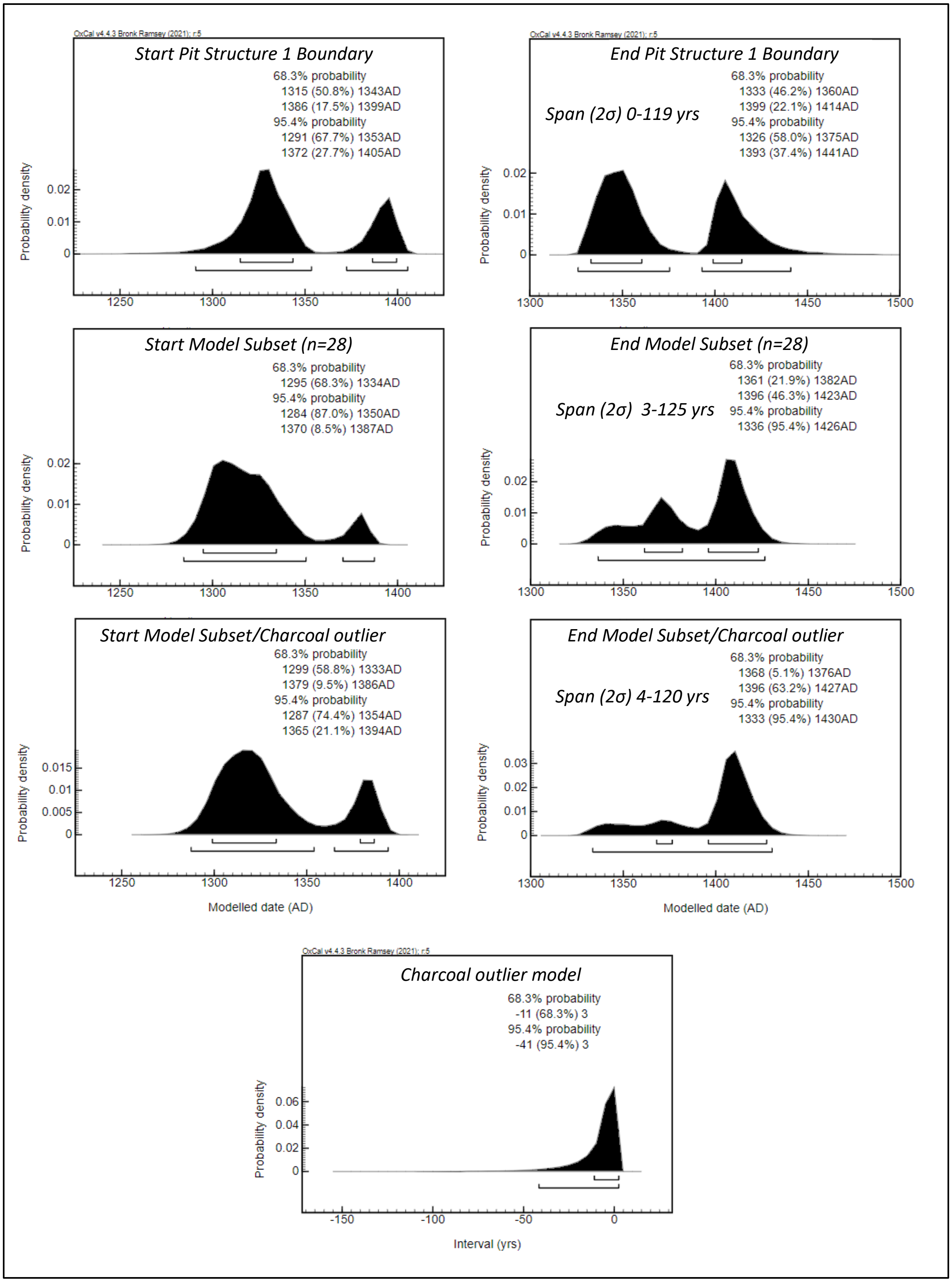

Figure 11.7. Comparison of estimated phase boundaries for three Bayesian models: (upper panel) model of dates from Pit Structure 1 (revised from the 2016 analysis); (middle panel) analysis of the modeling subset of 28 dates; (lower panel) analysis of the modeling subset combined with charcoal outlier model. The lowermost panel shows the distribution of age offsets calculated by the charcoal outlier model.

Comparing the three phase models, it would not be unrealistic to conclude that we are essentially at the same state of affairs accomplished through the analysis of eight dates from Pit Structure 1 reported in 2016. While it was hoped that the Bayesian analysis of a larger set of dates and a more thorough vetting process would refine and narrow the estimated phase boundaries, that does not seem to be the case. The modeled phase spans, representing the estimated time in years between the start and end phase boundaries, are included in each graph. The estimate spans of 120 and 125 years for the two current analyses offer no improvement over the span of 119 years defined for the model based on Pit Structure 1. The only minor difference among the three models is that the unidirectional effects of modeling wood charcoal outliers reduce the probability densities of the end phase boundary of the Model Subset/Charcoal outlier model between A.D. 1350 and 1400.

We are again confronted by the fact that the effects of the calibration curve inversion create a major obstacle to refining chronologies of this period. The modeled phase boundary probability distributions show the same bimodal distributions as the calibrated probability distributions of the individual dates. The Bayesian analysis does result in slight improvements in the probabilistic estimates for phase boundaries as well as several individual dates, but the overall modeled chronology shows little change from the general time frame of A.D. 1300 to 1450 established in previous analyses.

Simulating Probability Distributions for Calendrical Time Intervals

The final analysis explores a proxy method of evaluating the best fit of the Merchant dates by comparing the distributions of summed probabilities (SPD) and kernel density estimations (KDE) against a series of simulated probability distributions. The approach involves simulating multiple series of radiocarbon dates sampled from the calendar time scale and comparing the probability distributions against the Merchant site chronology. The underlying theory is that if, for example, a hypothetical site was occupied from A.D. 1310 to 1345 and a random selection of samples was submitted from that occupation, assuming a uniform probability sampling population, then the SPD or KDE model would reflect that occupation. In turn, it is assumed within reasonable parameters (see Bayliss et al. 2007) that the 28 radiocarbon samples of the modeling subset submitted from the Merchant village reflect a uniform probability distribution and thus are a representative statistical sample of the period of occupation of the village and can be compared with other statistical distributions.

Three intervals on the calendar time scale were selected: A.D. 1300–1349, 1350–1399, and 1400–1450. Each calendrical interval is considered an independent uniform probability distribution (Buck et al. 1992; Nicholls and Jones 2001) from which random samples are drawn with replacement (*with replacement* meaning any calendar date can be selected more than once). The analysis of the multiple Merchant dates using Bayesian analyses described in the preceding discussion also operates under the assumption of a uniform probability distribution.

It is important to understand that, owing to the intrinsic uncertainty and measurement errors of radiocarbon dating, any specific annual date on the calendar scale will fall within the calibrated probability distributions of multiple measured ^{14}C ages. For example, a calendar date of A.D. 1321 will fall within the calibrated age ranges of both a measured ^{14}C age of 670 ± 30 B.P. (cal to 1277–1323/1257–1392) and 610 ± 30 B.P. (1299–1404), as well as several other radiocarbon ages. The simulation process takes this into account and based on the error measurement parameter and other input variables, will select a randomized radiocarbon age for each calendar year. For the present simulation, a single error of ± 30 years was chosen because that is the reported measurement error for 28 of the 30 dates from the Merchant village.

Using the *R_Simulate* routine of OxCal, 50 random simulated ^{14}C ages were derived from each calendrical interval. The simulation was run 10 times for each calendrical time interval, providing 10 series of 50 simulated dates. The calibrated probability distributions of each run were summed and normalized, and then each set of simulations was compared with the SPD of the 28 final model dates of the Merchant site. The results of the individual comparisons and a combined comparison are presented in Figure 11.8. The red line denotes the SPD of the Merchant modeling subset of 28 dates.

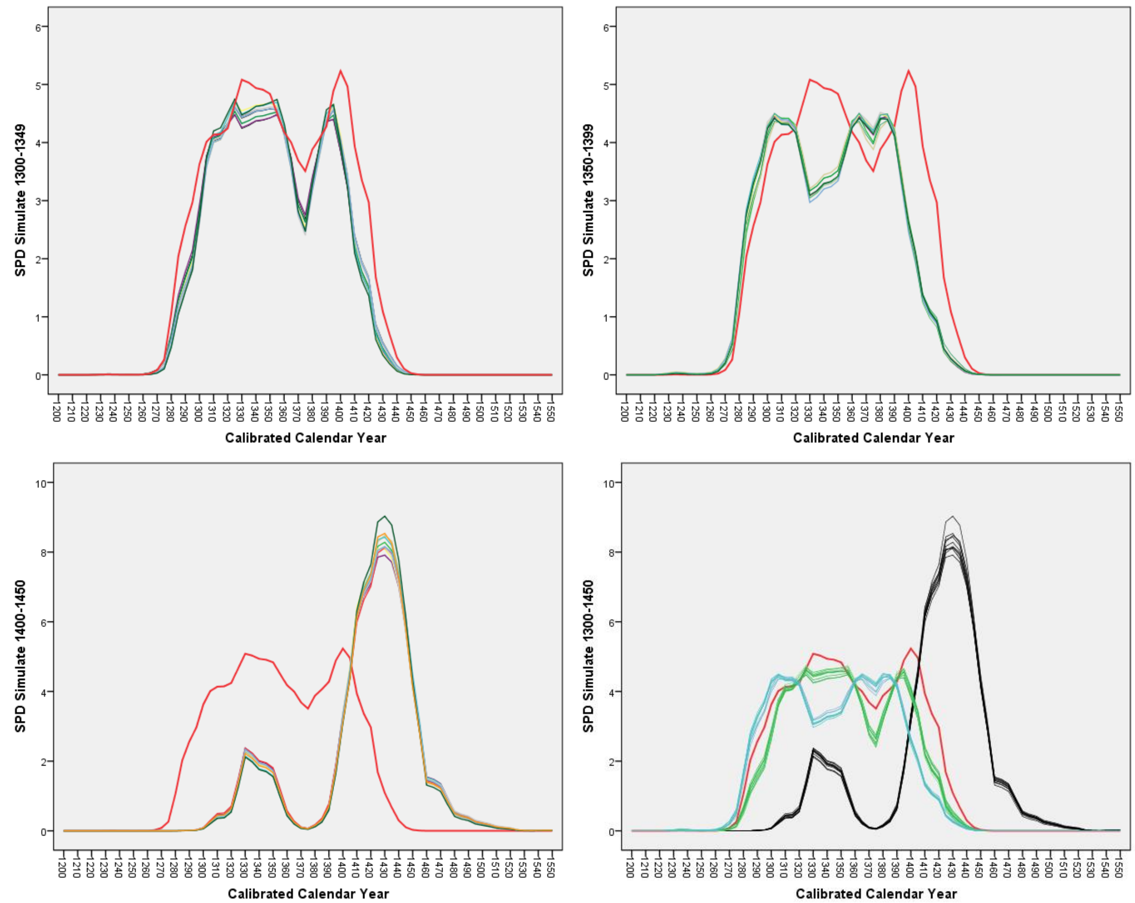

Figure 11.8. Comparison of Merchant SPD (red line) and simulated SPDs for intervals of A.D. 1300–1349, 1350–1399, and 1400–1450. The lower right graph is a combination of the three individual graphs.

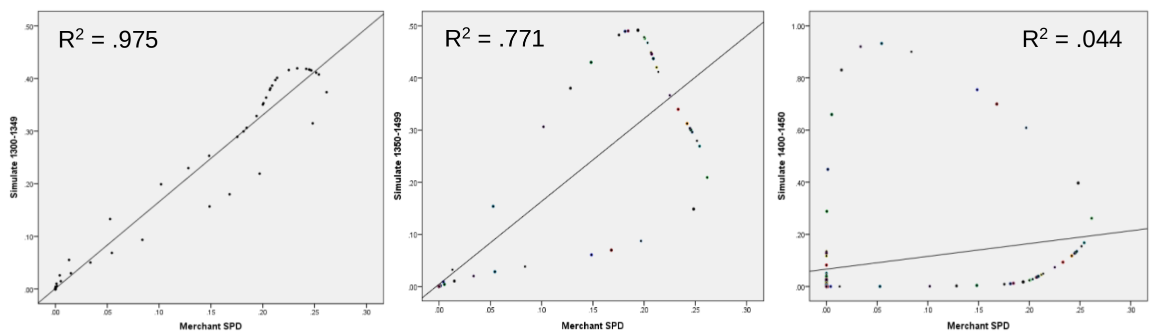

Figure 11.9. Regression models for the three simulated data comparisons.

A visual inspection of the individual and composite displays finds that the Merchant SPD appears to best match the simulated SPD for the A.D. 1300–1349 calendar interval. A more robust means of comparing the distributions is through a linear regression analysis comparing the Merchant distribution against the three simulated calendrical distributions. Brown (2017) uses regression models to compare simulated distributions, although in a much more sophisticated manner than the simplified analysis presented here. A perfect one-to-one match between two probability distributions would result in a regression equation r = 1.0 and $r^2 = 1.0$. As revealed in Figure 11.9, the regression analysis of the Merchant SPD and the SPD of the simulated calendar interval of A.D. 1300–1349 is very close, with a r^2 of .975 indicating more than 97 percent of the dataset is explained by the regression line. The plot of the simulated calendar interval of A.D. 1350–1399 is also rather close with an r^2 of .771, but there is a greater degree of dispersion from the regression line. In contrast, the plot of the A.D. 1400–1450 SPD shows little correspondence with the Merchant SPD. Note that the plots are recursive instead of linear because the probability distributions begin and end at 0.0 at both tails of the distribution along the calendar time scale.

The analysis is further refined by using KDE modeling instead of raw summed probability distributions. KDE is a non-parametric method used to estimate the underlying distributions of discrete data points in probability density functions and smooth the distributions. It has received widespread application in GIS spatial analysis (Conolly and Lake 2006), including the spatial density analysis of TRU data from the Merchant site (see Chapter 5, Figures 5.13, 5.15, and 5.17). Bronk-Ramsey (2017) developed a routine for use in the OxCal program to analyze summed radiocarbon probability distributions using a KDE model. The effectiveness of KDE is illustrated in Figure 11.10 that compares the SPD, KDE, and Bayesian phase models calculated for the sample of 100 radiocarbon dates from El Paso phase pueblos in the Jornada region. The boundaries of the KDE distribution more closely approximate the robust Bayesian-derived phase models, thus demonstrating that KDE provides a refinement over the use of simple SPDs for visual identification of temporal boundaries.

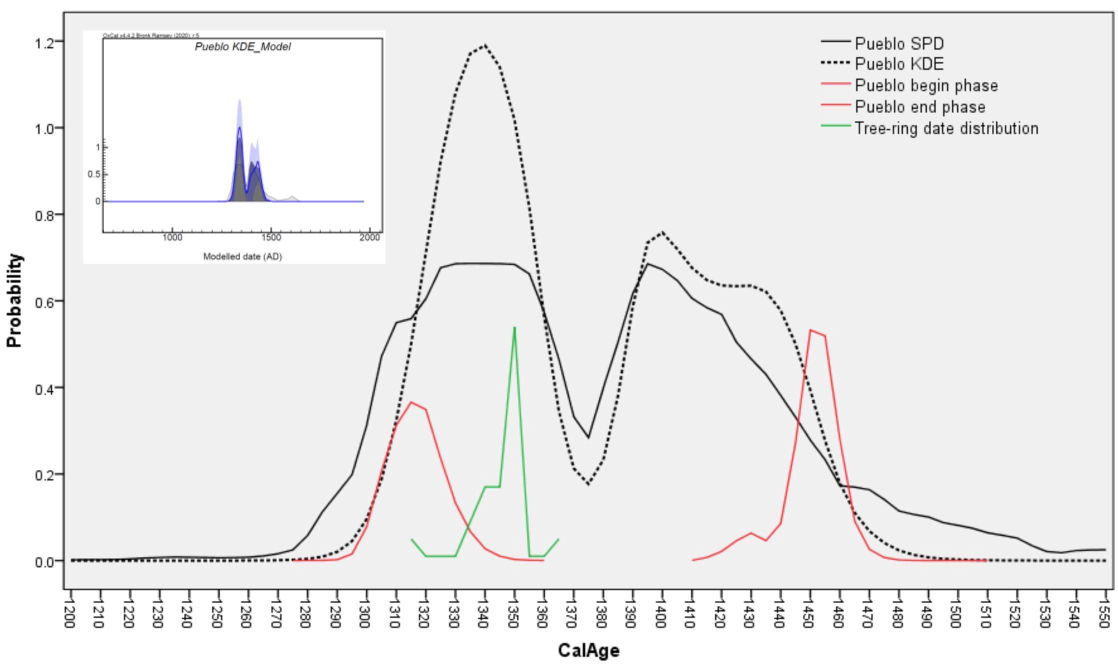

Figure 11.10. Comparison of SPD, KDE, and Bayesian phase boundaries for El Paso phase Jornada pueblos (from Miller 2021b).

The three simulated calendrical datasets were analyzed using the KDE_model function of OxCal ver 4.4.2. The 28 dates comprising the modeling subset of the Merchant village were also run through the KDE_model procedure. Figure 11.11 displays the comparison of the distributions. In contrast to the SPDs, the smoothing effects of the KDE procedure on the peaks and valleys of the distributions are evident. A visual review of the KDE distributions finds that the Merchant site KDE again favors the simulated A.D. 1300–1349 interval, although the correspondence is not as strong or clear as seen previously in the comparison of SPDs. These relationships are also seen in the regression analysis (Figure 11.12), in which the A.D. 1300–1349 and 1350–1399 simulations are more alike than they were in the SPD comparisons. Nevertheless, the A.D. 1300–1349 interval remains the strongest fit with the Merchant KDE and the A.D. 1400–1450 KDE is again the least likely fit.

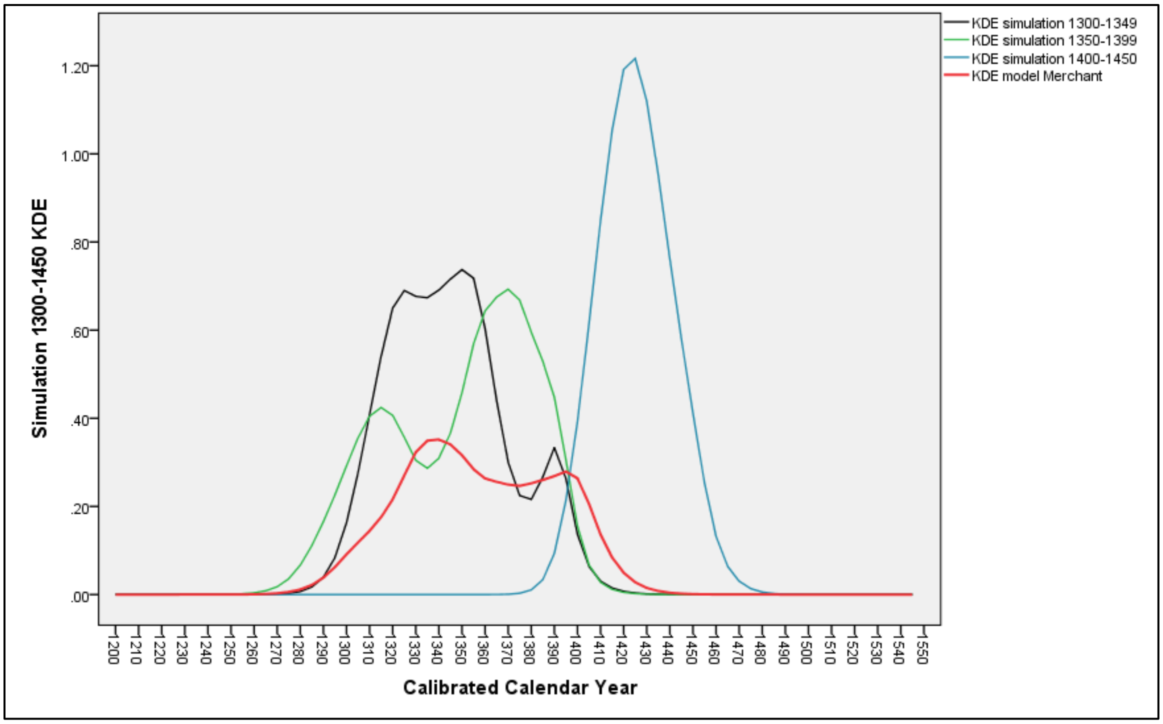

Figure 11.11. Comparison the KDE distribution of the Merchant village model subset dates against the KDE distributions of the three simulated calendrical intervals. Note the smoothed curves compared to the SPDs of Figure 11.8.

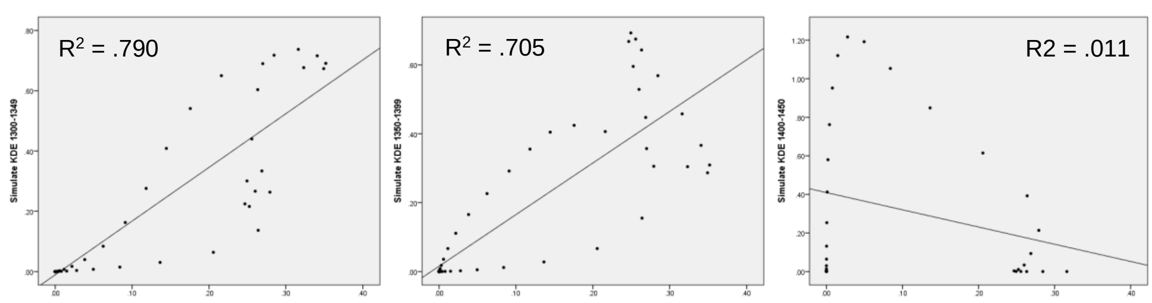

Figure 11.12. Regression models for the three simulated KDE data comparisons.

Whether using SPDs or KDE models, the comparison of the Merchant aggregate probability distribution against simulated distributions seems to indicate that the calendar interval of A.D. 1300 to 1349 best matches the Merchant dates. The interval of A.D. 1350 to 1399 is also a relatively good match, but the period of A.D. 1400–1450 is a poor fit. The following section reviews the results of another dating method to see if the radiocarbon results can be independently corroborated.

Ceramic Thermoluminescence Dates

The chronometric analysis of the Merchant village includes a pilot study to examine the utility of ceramic luminescence dating. Fifteen Ochoa ware sherds were submitted to the Luminescence Dating Laboratory of the University of Washington. The approach of the laboratory is to measure the thermoluminescence (TL), optically stimulated luminescence (OSL), and infrared-simulated luminescence (IRSL) signals and determine a best fit age estimate based on the radiation dose rate and moisture content of the surrounding environment and other factors.

Luminescence dates on Ochoa ware ceramics would theoretically provide an independent series of chronometric dates that tracked the production and perhaps the use of locally produced ceramic vessels. The luminescence signal is reset during firing of the vessel and can also be reset if the vessel is exposed to sufficient heat from cooking fires or within a burning pithouse or pueblo room. Ochoa ware sherds encountered on the floors or lower fills of rooms were collected along with a sample of the surrounding fill or soil to provide the background radiation measure required to calculate the dose rate.

The determination of luminescence ages and error estimates is a complex procedure. The rationale for assigning ages to each sample is described in the laboratory report included as Appendix A.3. Descriptions of the sherd samples and their luminescence age estimates are provided in Table 11.2. Note that luminescence ages are reported as calendar dates. Two soil moisture content estimates were used to determine the dates and, with one exception, the differences between the ages of two estimates did not vary by more than 10 or 20 years. The exception is Sample UW4042 that yielded dates of 4050 ± 740 B.P or 3880 ± 720 B.C. and probably represents an Ochoa vessel that was fired at such a low temperature that the luminescence signal of the paste was not reset. The sample is excluded from further analysis. The 14 dates are displayed in Figure 11.13.

Two observations are immediately apparent from the date plot: first, there is a much greater range of dispersion among the luminescence dates than is observed for the radiocarbon dates. If only the mean age is considered, the dates range from A.D. 1040 to 1580; if the two-sigma (95 percent) age ranges are considered, the time spanned by the 14 dates ranges from A.D. 810 to 1900, a period of nearly 1100 years. However, if the two dates contributing to this overlong span of time (UW4043 and UW4046) are considered outliers, the remaining dates more consistently represent a series of dates between 1200 and 1400.

Second, there is not systematic age differences between burned and unburned sherds, indicating that exposure of vessels to cooking fires did not reset the luminescence clock. No evidence of intensive structural fires was found during excavation of the rooms where the sherds were collected. Therefore, it is concluded that the luminescence signals of the dated ceramics, and thus the dated events of the Ochoa analysis, is the firing of the vessel that is the source of the sherds.

We might therefore consider the 14 dates to be a random sample of variability among luminescence signals formed through different firing conditions, paste compositions, and other factors underlying the dates. Certainly, the broad distribution of dates does not indicate that the Ochoa sherds at the Merchant site were produced for decades or even hundreds of years before and after the occupation of the pueblo. Assuming that the samples represent a common population, the *C_combine* procedure of OxCal can be used to combine the dates and calculate a pooled mean and error. The two outliers (UW4043 and UW4046) were not included in the model. The results of this analysis are shown in the inset at the lower left corner of Figure 11.13. The critical result of this analysis is that the calculated 2-sigma age range of A.D. 1295–1350 matches the results of the radiocarbon simulation studies presented in the preceding section.

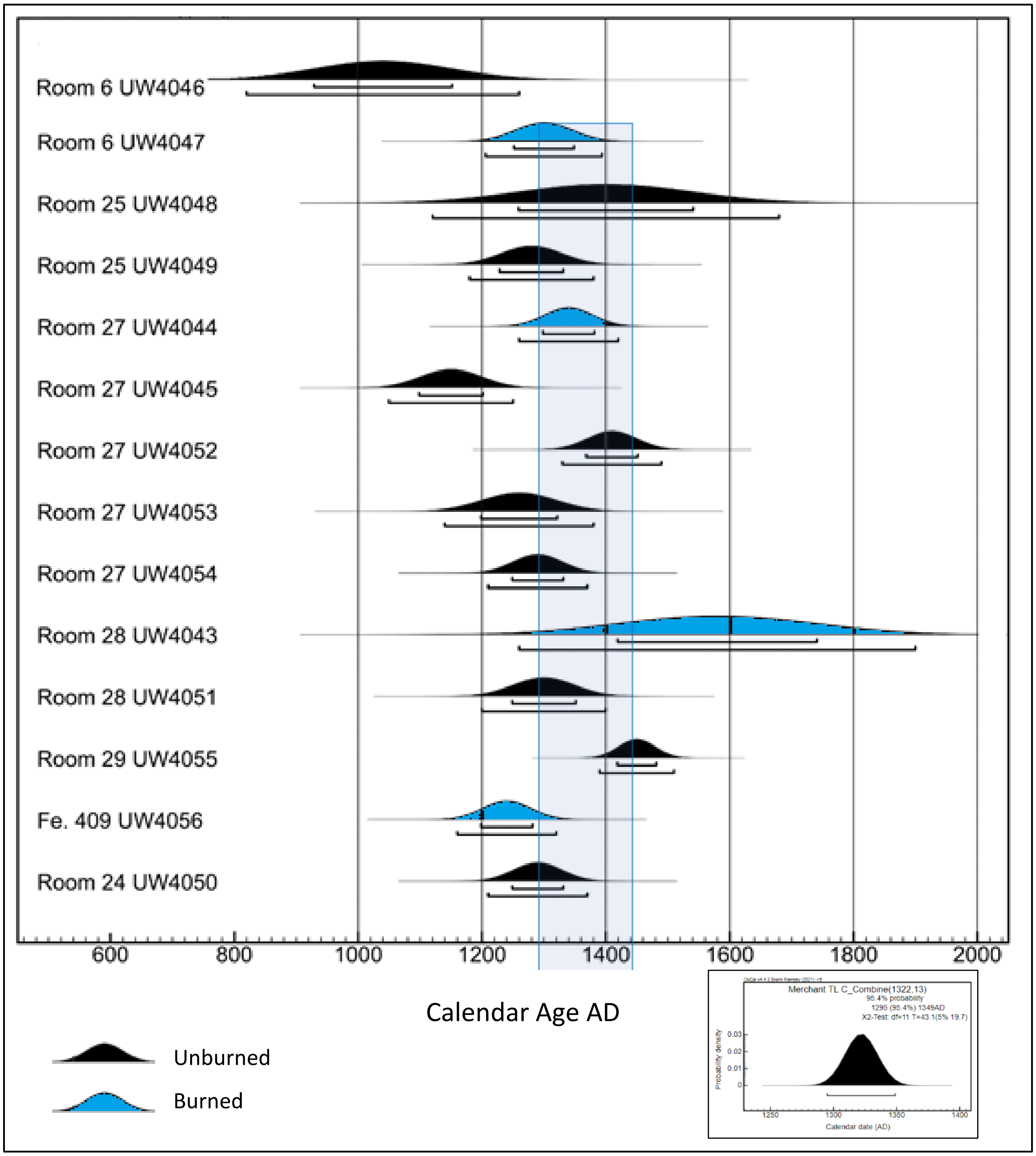

Figure 11.13. Plot of 2-sigma age ranges of 14 ceramic luminescence samples on the calendar time scale. Sample UW4042 is not displayed. The period of A.D. 1300–1450 is shaded. Inset shows average of 12 dates using *C_combine* routine of OxCal (UW4046 and UW4043 removed as outliers).

Table 11.2. Ceramic luminescence dates from Ochoa ware sherds at the Merchant village

Area	CN #	Feature		Context	Sample Material	Corrugation style	Lab Number	Calendar Age (50% mc)	Calendar Age (30% mc)
East block	262	Room 6	F. 6.0	Room fill, lower	Body sherd	Obliterated	UW 4046	A.D. 1020 ± 110	A.D. 1040 ± 110
East block	270	Room 6	F. 6.0	Room fill, lower	Body sherd, burned	Flattened	UW 4047	A.D. 1290 ± 48	A.D. 1300 ± 47
East block	310	Room 25	F. 404.5	Floor hearth, lower	Body base sherd	None	UW 4048	A.D. 1380 ± 140	A.D. 1400 ± 140
East block	311	Room 25	F. 404.6	Ash pit	Body sherd	Ridged	UW 4049	A.D. 1260 ± 50	A.D. 1280 ± 50
East block	221	Room 27	F. 406	Room fill, lower	Body sherd, burned	Flattened	UW 4044	A.D. 1330 ± 40	A.D. 1340 ± 40
East block	244	Room 27	F. 406	Room fill, lower	Body sherd	Flattened	UW 4045	A.D. 1130 ± 50	A.D. 1150 ± 54
East block	347	Room 27	F. 406.1	Floor hearth	Jar rim sherd	Flattened	UW 4052	A.D. 1400 ± 40	A.D. 1410 ± 40
East block	350	Room 27	F. 406.6	Floor pit	Body sherd	Flattened	UW 4053	A.D. 1250 ± 60	A.D. 1260 ± 60
East block	356	Room 27	F. 406.6	Floor pit	Body base sherd	Obliterated	UW 4054	A.D. 1270 ± 40	A.D. 1290 ± 40
East block	211	Room 28	F. 407	Room fill, lower	Body sherd, burned	Flattened	UW 4043	A.D. 1570 ± 160	A.D. 1580 ± 160
East block	203	Room 28	F. 407	Room fill, lower	Body sherd, burned	Flattened	UW 4042	B.C. 4050 ± 740	B.C. 3880 ± 720
East block	337	Room 28	F. 407	Room floor	Body sherd	Flattened, polished	UW 4051	A.D. 1290 ± 50	A.D. 1300 ± 50
East block	362	Room 29	F. 410	Room floor	Body sherd	Flattened, polished	UW 4055	A.D. 1440 ± 30	A.D. 1450 ± 30
East block	394	F. 409		Pit fill	Body sherd, burned	None	UW 4056	A.D. 1220 ± 40	A.D. 1240 ± 40
South block	382	Room 24	F. 400	Room fill, lower	Body sherd	Obliterated	UW 4050	A.D. 1270 ± 40	A.D. 1290 ± 40

Jim Feathers of the Luminescence Dating Laboratory provides a more robust analysis of the dates and their variability (Figure 11.14). Using the using 30 percent content moisture estimate that best reflects other dates from the site, the 14 dates (UW4042 was omitted) are plotted as a radial graph in Figure 11.14. Radial graphs plot precision, measured as the coefficient of variance or its reciprocal, on the x-axis. The points with greater precision are plotted to the right and points with lower precision are to the left. Age is plotted on the y-axis but the values have been normalized by the number of standard errors the value lies from the mean reference age. The two references used in the graph are 0.685 (blue shading) and 0.620 (yellow shading), which represent the average of two expected age ranges for the collection (A.D. 1320–1350 and A.D. 1380–1425). The green area represents overlap between the two ranges. Lines passing from the origin through any point intersect the right axis at the calculated age.

Six of the 14 ages (42 percent) plot within the blue band representing the 1320–1350 range. Only one age (7 percent) is clearly restricted to the 1380–1425 age range. Four dates overlap both periods and three dates are earlier. While there is some degree of uncertainty and dispersion in the analysis, the majority of the ceramic luminescence dates fall with in the 1320–1350 time interval.

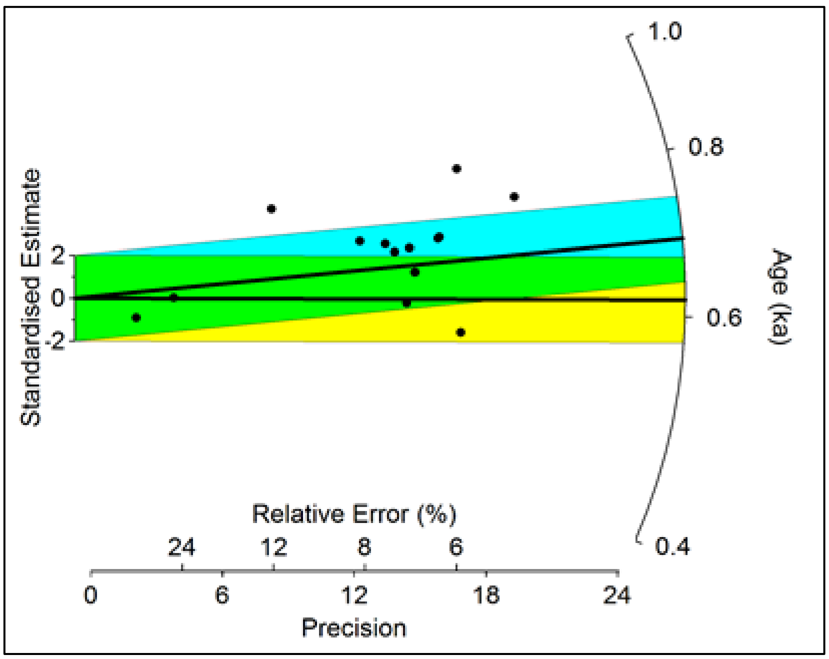

Figure 11.14. Radial graph of ceramic luminescence ages and error estimates. Blue shading represents the expected age ranges of A.D. 1320–1350 and yellow shading represents the expected age range of A.D. 1380–1425.

Ceramic and Projectile Point Relative Dating

The ceramic and projectile point types and chronological information they provide were reviewed in the 2016 report of investigations. No previously unrecognized ceramic or projectile point types were recovered during the 2019 fieldwork and the status of the relative chronology of the site remains unchanged. The variety of ceramic types recovered during the LCAS excavations of the early 1960s included Chupadero Black-on-white, Three Rivers Redware, and El Paso Polychrome from the northern and southern Jornada regions and Chupadera Mesa, Medio Period types from north-central Chihuahua, Roosevelt Redware (formerly Salado Redware) from southwestern New Mexico and southeastern Arizona, and Rio Grande Glazeware from northcentral New Mexico.

Most of the ceramic wares and types described by Leslie (2016a) were also recovered during the excavations conducted in 2015 and 2019 (Table 11.3), although somewhat surprisingly the only imported types recovered from the eastern and southern rooms of the 2019 fieldwork were Chupadero Black-on-white and Lincoln Black-on-red. The current estimates of production ages for the various wares and types are included in the table. Considered in its entirety, the imported assemblage is typical of fourteenth and early fifteenth century settlements throughout southern New Mexico, west Texas, and northern Chihuahua. With the possible exceptions of early varieties of Chupadero Black-on-white and Three Rivers Red-on-terracotta dating as early as A.D. 1150, the general absence of ceramic sherds pre-dating A.D. 1300 is noteworthy.

On the other end of the occupation interval for the Merchant site, ceramic types postdating A.D. 1450 are also rare, and in each case the production period for the type spans both the 1300–1450 and post-1450 time periods. In other words, none of the ceramic wares from the site have production periods that occurred exclusively after A.D. 1450. The manufacture of Glaze A, Chupadero Black-on-white, and Lincoln Black-on-red may have continued for a few decades after A.D. 1450, but the primary period of production for each type occurred between A.D. 1300 and 1450. Moreover, the post- A.D. 1450 terminal production dates for these types have never been conclusively established. In summary, there is little to no ceramic evidence for occupation of the Merchant village before A.D. 1300 or after A.D. 1450.

Leslie (2016a) describes an extraordinary count of 1,567 projectile points from the LCAS excavations. The points recovered during the 2015 and 2019 investigations include several of the variants of Fresno/Cottonwood and Washita along with lesser numbers of basal-notched Harrell types (Bell 1958; Justice 2002; Suhm and Jelks 1962; Suhm and Krieger 1954; Turner and Hester 1993). As noted for the ceramic assemblage, the three major point types recovered from the Merchant site are ubiquitous among pithouse and pueblo settlements dating from A.D. 1300 to 1450 across southern and southeastern New Mexico. These types comprise the majority of projectiles at Henderson pueblo, Bloom Mound, and the Fox Place site near Roswell (Adler and Speth 2004; Speth and Newlander 2012; Wiseman 2002) and the Block Lookout and Phillips sites in the Capitan Mountains (Kelley 19845), as well as Sacramento Pueblo in the southern Sacramento Mountains (Miller and Graves 2012).

Chapter Summary: Dating the Merchant Site

The world of chronometric dating is seldom a clear-cut and tidy place. Multiple issues underlie the physical and chemical processes being dated, laboratory measurements have various degrees of inherent uncertainty, a variety of taxonomic and site formation issues create disjunctions between the target event to be dated and the actual dated event, and sampling biases can introduce further distortions. Each dating method has its individual quirks, correlations, and calibrations that introduce additional levels of error and statistical noise. Add to this mix the fact that past (and present) human behavior is inconsistent and sometimes incomprehensible, and it becomes rather astonishing that we can date anything at all.

The ability to model and define robust statistical parameters to compare and interpret series of dates has improved dramatically over the past two decades, and the accuracy and precision of dating laboratories continues to improve. Yet, there is still much uncertainty in the process of radiometric dating and it is unlikely that the resolution of radiocarbon and luminescence dating will ever approach that of tree-ring dating. It is also noted that that the use and interpretation of SPDs, KDEs, and other forms of aggregate probability distribution models have been the subject of considerable debate. Much of the debate revolves around whether demographic signals are reflected in probability distributions based on combining large numbers of calibrated age estimates, or whether such probability distributions are intrinsically biased by various mixtures of sampling, measurement, statistical, and taphonomic distortions combined with the effects of calibration curve inversions (Attenbrow and Hiscock 2015; Brown 2015; Contreras and Meadows 2014; Crema et al. 2016; Downey et al. 2014; Freeman et al. 2018; Peros et al. 2010; Shennan 2013; Shennan et al.

2013; Surovell et al. 2009; Timpson et al. 2014; Wang et al. 2014; Williams 2012, 2013; Williams and Ulm 2016; Zahid et al. 2016). In the most recent salvo, Carleton and Groucutt (2020) even go so far as to call into question the entire statistical rationale and veracity of any and all aggregate radiocarbon distribution studies.

Table 11.3. Imported ceramic types and production dates.(Blue text indicates wares or types recovered during the 1959–1965 LCAS and 2015 excavations; red text indicates types recovered during the 1959-1965, 2015, and 2019 excavations)

Ware / Type	Production Period (all A.D.)	Comments
Jornada Wares, southern New Mexico and west Texas		
Chupadero Black-on-white[1]	1100/1150 – 1500+	Most common import, most contexts
Three Rivers Red-on-terracotta[2]	1150 – 1300/1350+	Recovered from most contexts
Lincoln Black-on-red[3]	1300 – 1400/1500	Some Lincoln B/R may be Glaze A
El Paso Polychrome[4]	1100 – 1450	Recovered from most contexts
Jornada Brownware[5]	500 – 1400s	Probably includes Roswell Brown
Medio Period Wares, Chihuahua		
Ramos Polychrome[6]	1300 – late 1400s	Several contexts
Ramos Black[6]	1300 – late 1400s	Rare
Playas Redware[7]	1200/1250 – late 1400s	Rare
Roosevelt Redware, SW New Mexico and Arizona		
Gila Polychrome[8]	1300 – 1450	Pit structures and Rooms 3 and 4
Rio Grande Glazeware, central New Mexico		
Rio Grande Glaze A[9]	1315 – 1425/1500	Some Glaze A may be Lincoln B/R

References for age estimates:

1 Chupadero B/W:	Clark 2006; Wiseman 1986; Smiley 1977; Smiley et al. 1953
2 Three Rivers Red-on-Terracotta:	Breternitz 1966; Smiley 1977; Smiley et al. 1953
3 Lincoln Black-on-red	Wiseman 2014
4 El Paso Polychrome	Perttula et al. 1995
5 Jornada Brownware	Wiseman 2014
6 Medio Period Wares	Dean and Ravesloot 1993; Rakita and Raymond 2003
7 Playas Redware:	Dean and Ravesloot 1993; Rakita and Raymond 2003
8 Gila Polychrome	Nuezil and Lyons 2005
9 Glaze A	Wilson 2005; Franklin 2007

The present study does not attempt to draw inferences regarding demographic trends from the data, nor does it attempt to correlate the aggregate probability distributions with exterior phenomena such as past environments. The analysis is site-specific, but it does have larger implications. Moreover, several sources of potential and actual bias were examined and were either eliminated or were incorporated into one or more of the statistical models. Multiple models and variants of models were presented and the results were critically evaluated. The limitations of the analyses, as well as the data underlying the analyses, have been taken into account and the results are presented as general probabilistic estimates of time and place.

The combination of modeling and simulation analyses of radiocarbon dates from the Merchant site indicate that the primary interval of occupation began sometime during the early to mid-1300s. The proposed radiocarbon time frame is corroborated by the ceramic luminescence dates, although the latter is a particularly "noisy" series of dates when considering their dispersion and error measurements. It is also important to understand that the analytical results reflect a statistical model (the "modeled subset" of dates) developed through an iterative process, and that model is used to estimate the most likely occupation span of the site. The combined target dating events of cooking and heating fires, food production, the firing of Ochoa ware pots, and refuse disposal are subsumed within the modeled time period. However, it is still a model construct, and it must be emphasized that the modeled phase does not necessarily subsume the entirety of occupations at the site.

It is also important to consider that the age estimates from Pit Structure 1 are associated with the first occupation associated with Floor 1 and prior to the remodeling and addition of Floor 2. The models would also support an interpretation that the settlement was also occupied through the late 1300s and perhaps even the first decade or two of the 1400s. However, what is clear is that the initial settlement of the Merchant village began during the first decades of the 1300s and occupation of the location ceased during the late 1300s or very early 1400s.

This is an important conclusion for two reasons. First, the settlement of the Merchant site, and by extension the inception of the Ochoa phase on the plains of southeastern New Mexico and western Texas, occurred during the early 1300s, a period of widespread population movements and migrations that took place across the U.S. Southwest and Plains during and after the Great Drought of A.D. 1280. The appearance of Ochoa settlements in the southern Plains may be related to, or a similar phenomenon to, the widespread patterns of migrations, movements, or coalescent populations that occurred during that time. The second conclusion relates to the latter years of the Late Formative/Late Prehistoric period of A.D. 1300 to 1450. It does not appear that the Merchant village was occupied around the time of widespread demographic collapse and social disruption at circa A.D. 1450 apparent in the archaeological and radiocarbon records across much of the southern Southwest. However, this is a Southwest-centric viewpoint on the matter. It is possible that the end of the Ochoa phase was related to large-scale social, demographic, and economic changes across the southern Plains and central Texas. These and other implications of the Merchant chronology are reviewed in the summary chapter.

Chapter 12

Macrobotanical Remains from the Merchant Site: Implications for the Subsistence System of a Late Formative Village on the Mescalero Plain

J. Phil Dering

Seventy-five light fraction flotation samples were collected from two seasons of excavations conducted at the Merchant site. Sixteen flotation samples were collected in 2015, analyzed, and reported by Miller et al. (2016). Fifty-nine samples were submitted for analysis from the 2019 field season. The results of these two projects, along with notes or observations from the LCAS investigations that were conducted more than 55 years ago, will be used to assess the botanical assemblages from the Merchant site. The data will be used to assess the nature and condition of the plant remains from this site and to discuss the role of mesquite and acorns in the foraging and farming economy of the Merchant site.

Laboratory Methods

Flotation is a method of recovering organic remains from archaeological sediments by using water to separate both heavy and soluble inorganic particles from plant parts and small animal bone. The material floating to the surface, called the light fraction, is caught on a fine mesh screen or strainer. In most cases, carbonized plant material, the subject of this analysis, is separated into the light fraction. The material that sinks to the bottom is the heavy fraction. The heavy fraction is usually composed of rocks, heavier bones, and other large clasts in the archaeological sediments. The clay and silt portions of the sediments remain suspended in water and pass through the screens. In this study, the light fractions were submitted for analysis.

The analysis follows standard archaeobotanical laboratory procedures. The volume of the light fraction is measured first. Although most samples are smaller, up to 100 milliliters (ml) of light fraction from each sample is set aside for analysis. The portion to be analyzed is passed through a nested set of screens of 4-millimeter (mm), 2-mm, 1-mm, and 0.450-mm mesh and examined for charred plant fragments, which are separated for identification.

Each light fraction is size-sorted through a nested set of graduated geologic sieves of 4-mm, 2-mm, 1-mm, and 0.450-mm mesh and examined for charred material. Each size grade is manually sorted using a stereo–zoom microscope at magnifications of 5–10x. The plant parts are sorted into wood and seed/edible plant part categories according to standard laboratory procedures (Pearsall 2015). Screen- or point-collected macrobotanical samples (such as radiocarbon samples) are also sorted, identified, and weighed to the nearest 0.1 gram (g). Charred material caught on all the sieve levels, including the bottom pan, is scanned for floral parts, fruits, seeds, and other potentially edible plant parts such as agave/yucca or maize fragments, and these plant parts are counted and examined for identification. Carbonized wood from the 4 mm and 2 mm screens (smaller pieces are difficult to manipulate and identify) is separated in a 25-piece grab sample and identified. Care is taken to select representative materials from both levels (cf. Diehl 2003:213; Huckell 2002:645; Miksicek 1994:243).

Sample content may be affected by various biological disturbance factors, including insect or small mammal activity and plant root growth. In an effort to assess this impact, the amounts of insect parts, termite pellets (frass), gastropods, mammal remains (including fecal pellets), and modern uncharred seeds are estimated for each flotation sample. These amounts are reported on a scale of 1-25 (+), 25-50 (++), and over 50 (+++). Termite pellets occur in higher numbers when samples are taken from an area containing wood that has been exposed to the elements for a long time before burning. In arid to semi-arid conditions, they may also appear in higher numbers in stems or roots of shrubs and trees, in which case the termite pellets can appear in any locus where this wood is burned, such as in a hearth or roasting pit. However, evidence of termite infestations seems to be more frequent and intense in samples drawn from the remains of burned prehistoric habitations with vertical elements constructed of wood.

Plant names are assigned according to current taxa contained in the PLANTS Database (USDA NRCS 2021). Seed identifications are secured using reference material and seed manuals. Carbonized wood is identified by using the snap technique, examining the transverse, radial, and tangential surfaces at 5 to 75 power with a binocular stereo-zoom microscope, and comparing the material with reference specimens in the Treehouse Archaeobotanical Services collection and standard reference manuals (Core et al. 1979; Hoadley 1980, 1990; InsideWood 2004; Panshin and de Zeeuw 1980).

The anatomy of some woods is so similar that identification to species or even genus is not possible. These taxa are assigned into wood types. For example, I include willow (*Salix* sp.) and cottonwood (*Populus* sp.), both members of the Salicaceae or willow family, into artificial category, cottonwood/willow-type (Salicaceae). All identifications in the "type" category represent identifications to the taxon level indicated by the name of the type. Another commonly encountered wood type is the saltbush-type, a combination of saltbush and winter fat (*Atriplex* sp. and *Krascheninnikovia* sp.). Wood fragments of mesquite, acacia, screwbean, and paloverde, all members of the legume family (Fabaceae), are also difficult to distinguish. Mesquite usually can be separated from other woody members of that family, but in cases where separation is a problem, the material is assigned to the Fabaceae-type (woody legume). Ephedra, cholla, and ocotillo produce woody tissue that in transverse section has wide rays radiating from the center with vessel-like vascular tissue sandwiched in between the rays. With respect to the wide rays, the wood resembles the arid-adapted live or shinnery oaks, but the pores are much smaller. Although it is possible to find and describe differences in minimally altered reference material, the small charcoal fragments are sufficiently similar to assign them in a single category, the ephedra/cholla-type. Small fragments of juniper or pine wood can be difficult to separate, so I sometimes assign those in a pinyon/juniper-type.

Results

The overview in Table 12.1 summarizes seed taxa abundance, and disturbance indicators. Table 12.2 presents the identifications and counts of material recovered from the flotation and macrobotanical samples.

During the course of the two investigations, about 3,000 wood charcoal fragments weighing a total of 187 g were examined. Modern contaminants were noted in moderate to abundant quantities in the flotation samples. Roots/rootlets were most common, occurring in all samples; insect parts and uncharred seeds, including cheno-ams, bladderpod, and Torrey croton, were present in many of the samples. Leporid scat, much larger than mice or termite frass, was present in 16 samples. Its presence indicates a fairly high level of disturbance in the archaeological deposits.

Table 12.1. Sample summary, 2015–6 and 2019 field seasons

Feature No.	Feature Type	Level	Light Fraction Vol. (mL)	Wt. (g)	Roots (r), insect parts (ip), rodent pellets (rp), termite pellets (tp), leporid scat (lp)	Number of Charred Seed Taxa (incl. *Zea*)	Total Charred Seeds or Maize Parts	Field Season
PS1 1	Pit Structure 1		250	84.0	r+++, lp+, s+	1	4	2015
PS1 1.1	Posthole		27	3.8	r+++	1	2	2015
PS1 1.1	Posthole		40	22.0	r+++	2	14	2015
PS1 1.14	Posthole		47	24.2	r+++, lp++	1	4	2015
PS1 1.2	Floor hearth		52	13.9	r+++, s+++	--	--	2015
PS1 1.3	Storage pit				r+++, rp+	3	12	2015
PS1 1.4	Floor hearth		92	43.2	r+++, ip+	2	2	2015
PS1 1.5	Posthole		66	18.7	r+++, lp+++	1	4	2015
PS1 1.6	Ash pit		72	69.9	r+++	1	3	2015
PS1 1.8	Posthole		68	20.2	r+++, rp++	2	3	2015
PS1 1.9	Ash pit		70	42.1	r++	2	14	2015
R6 6	Pueblo room	2	237	38.0	r ++	--	--	2019
R6 6.1	Floor hearth	3	72	15.7	r ++	--	--	2019
R6 6.2	Floor hearth	3	22	5.0	r +	--	--	2019
R6 6.3A	Floor hearth	3	130	48	r+++; ip++	--	--	2019
R6 6.3B	Ash pit	3	55	18	r+++	--	--	2019
R6 6.4	Large caliche cap	4	28	5.0	r+++, lp+	--	--	2019
R7 7.1	Floor hearth	2	32	6.0	r+++, ip+	--	--	2019
R7 7.2	Floor hearth	2	40	11.0	r+++	--	--	2019
R7 7.3	Posthole	2	45	12.0	r+++	--	--	2019
R13 13.1	Floor hearth	3	12	2.0	r++	--	--	2019
R13 13.2	Floor hearth	3	85	37.0	r+++, ip+, lp+	--	--	2019
R13 13.3	Floor hearth	4	75	61.0	r+++, lp+++, ip +	--	--	2019
39	Pit structure		70	26.6	r+++, ip+	1	1	2015
39.1	Pit structure		37	10.3	r+++, ip+	--	--	2015
64	Hearth		120	77.0	r+++, lp++, ip +	--	--	2015
108	Pit structure		97	43.3	r+++, lp+++, s++	--	--	2015
109	Hearth		210	38.0	r+++, lp++, s++	--	--	2015
MidB 110	Midden	2	120	112	rp++, lp+++	--	--	2019
R24 400.1	Hearth	2	180	119	r+++, ip++	--	--	2019
R31 401.1	Pit	3	60	39.0	r++	--	--	2019
R26 402.2	Floor hearth	4	95	45.0	r++, rp+, ip+	--	--	2019
R26 402.3	Posthole	4	10	2.0	r+++	--	--	2019
R26 402.4	Floor hearth	2	260	190	r++, ip+	1	2	2019

Feature No.	Feature Type	Level	Light Fraction Vol. (mL)	Wt. (g)	Roots (r), insect parts (ip), rodent pellets (rp), termite pellets (tp), leporid scat (lp)	Number of Charred Seed Taxa (incl. *Zea*)	Total Charred Seeds or Maize Parts	Field Season
R25 404	Pueblo room	3	185	113	r+++, ip+	--	--	2019
R25 404.1	Upper floor hearth	2	27	3.0	r+++	--	--	2019
R25 404.3	Pit	3	72	28.0	r+++, rp+, lp+	--	--	2019
R25 404.4	Hearth	4	220	92.0	r++	--	--	2019
R25 404.5	Lower floor hearth	5	190	89.0	r++, ip+	--	--	2019
R25 404.6	Ash pit	5	72	34.0	lp+++	--	--	2019
R25 404.7	Posthole	5	< 10	5.0	r++	--	--	2019
R25 404.8	Pit	4	62	24.0	r++, lp+++	--	--	2019
R27 406	Pueblo room	2	35	20.0	r+++, lp+++	--	--	2019
R27 406.1	Floor hearth	3	170	72.0	r+++	1	21	2019
R27 406.2	Collared hearth	4	150	137.0	r++	--	--	2019
R27 406.3	Posthole	2	15	4.0	r+++	--	--	2019
R27 406.4	Posthole	2	< 10	4.0	r+++	--	--	2019
R27 406.5	Pit	3	80	54.0	r+++, rp+++	--	--	2019
R27 406.6	Large pit feature	4	40	29.0	r+++, rp+++	--	--	2019
R27 406.7	Posthole	3	20	7.0	r+++	--	--	2019
R27 406.8	Posthole	3	47	16.0	r+++, rp++	--	--	2019
R28 407.1	Collared hearth	2	32	14.0	r+++	--	--	2019
R28 407.3	Posthole	4	40	10.0	r+++, ip+	1	6	2019
R28 407.4	Posthole	4	145	64.0	r++	--	--	2019
R28 407.5	Posthole	4	55	24.0	r+++	--	--	2019
409	Pit	3	85	53.0	r++, ip++	1	15	2019
R29 410	Room fill	2	15	2.0	r++	--	--	2019
R29 410.1	Floor hearth	4	110	88.0	r+	--	--	2019
R29 410.2	Posthole	4	40	11.0	r++, ip+	--	--	2019
MidC 412	Midden	1	60	19.0	r+++	--	--	2019
415	Pit	3	47	11.0	r+++	--	--	2019
LA 43414 Vicinity Survey								
226	Floor hearth	2	49	17.0	lp+++	--	--	2019
262	Floor hearth	1	< 10	3.0	r+++	--	--	2019
308	Hearth	1	52	9.0	r+++	--	--	2019
323	Hearth	1	< 10	1.0	r++	--	--	2019
326	Hearth	2	110	35.0	r+++, rp+++	--	--	2019
419	Hearth	1	9	25.0	r+++, ip++, rp++	--	--	2019
451	Midden	1	20	5.0	r++	--	--	2019

Feature No.	Feature Type	Level	Light Fraction Vol. (mL)	Wt. (g)	Roots (r), insect parts (ip), rodent pellets (rp), termite pellets (tp), leporid scat (lp)	Number of Charred Seed Taxa (incl. *Zea*)	Total Charred Seeds or Maize Parts	Field Season
453	Midden	1	15	8.0	r++, ip++	--	--	2019
455	Midden	1	< 10	3.0	r+++	--	--	2019
474	Hearth	1	20	7.0	r+++	--	--	2019
475	Hearth	1	27	3.0	r++	--	--	2019
476	Roasting pit	2	40	22.0	r++, ip+	--	--	2019
480	Roasting Pit	1	29	2.0	r+++	--	--	2019

Wood types identified in the current analysis were mesquite, oak, javelina bush-type, juniper, allthorn, saltbush-type, and creosote bush. This assemblage generally reflects the woody taxa present in the region today; however, it does not indicate the local abundance of each taxon or the nature of the herbaceous ground cover. An interesting deviation is the presence of juniper in Pit Structure 1 and in two hearths, 400.1 and 402.4, from a surface structure. Although juniper grows in protected areas in the region, it is not present in the immediate vicinity of the site. Mesquite charcoal is by far the most widespread and abundant of the wood types in the flotation samples from the Merchant site, a trend reflected in plant assemblages throughout the CFO region (Whitehead and Flynn 2016:190). We can infer that mesquite dominated the sandy dunes and some oak was growing nearby, but we do not know the percentage of ground covered by grasslands or other herbaceous vegetation.

Table 12.2. Flotation sample results (shaded rows indicate subsistence remains)

Feature #	Feature Type	Taxon	Common	Part	Count	Mass (g)	Field Season
PS1 1	Room fill	*Zea mays*	Maize	Cob fragment	3	0.1	2015
PS1 1	Backdirt	*Prosopis* sp.	Mesquite	Seed fragment	4		2015
PS1 1	Backdirt	Indeterminate	NA	Wood	3	0.1	2015
PS1 1	Backdirt	*Prosopis* sp.	Mesquite	Wood	25+	5	2015
PS1 1	Backdirt	*Prosopis* sp.	Mesquite	Wood	25+	4.8	2015
PS1 1.1	Posthole	*Zea mays*	Maize	Cupule fragment	1	--	2015
PS1 1.10	Posthole	Indeterminate	NA	Seed fragment	1	--	2015
PS1 1.1	Posthole	*Prosopis* sp.	Mesquite	Seed fragment	2	--	2015
PS1 1.10	Posthole	*Prosopis* sp.	Mesquite	Seed fragment	13	--	2015
PS1 1.1	Posthole	*Atriplex* sp.	Saltbush-type	Wood	1	<.1	2015
PS1 1.10	Posthole	*Atriplex* sp.	Saltbush-type	Wood	9	<.1	2015
PS1 1.10	Posthole	Indeterminate	NA	Wood	17	0.3	2015
PS1 1.1	Posthole	*Prosopis* sp.	Mesquite	Wood	25+	0.8	2015
PS1 1.10	Posthole	*Prosopis* sp.	Mesquite	Wood	5	0.1	2015
PS1 1.12	Fill in burrow	*Prosopis* sp.	Mesquite	Wood	25+	13.5	2015
PS1 1.13	Cultural Lens	Indeterminate	NA	Wood	2	0.1	2015
PS1 1.13	Cultural Lens	*Prosopis* sp.	Mesquite	Wood	25+	11.8	2015
PS1 1.14	Posthole	*Prosopis* sp.	Mesquite	Seed fragment	4	--	2015
PS1 1.14	Posthole	*Fouquieria* sp.	Ocotillo-type	Wood	8	0.1	2015
PS1 1.14	Posthole	Indeterminate	NA	Wood	25+	0.8	2015
PS1 1.14	Posthole	*Prosopis* sp.	Mesquite	Wood	2	0.2	2015
PS1 1.2	Floor hearth	*Juniperus* sp.	Juniper	Wood	2	<.1	2015
PS1 1.2	Floor hearth	*Prosopis* sp.	Mesquite	Wood	5	0.1	2015
PS1 1.3	Storage pit	*Zea mays*	Maize	Cupule fragment	2	--	2015
PS1 1.3	Storage pit	*Yucca* sp.	Yucca	Seed	1	--	2015
PS1 1.3	Storage pit	*Prosopis* sp.	Mesquite	Seed fragment	9	--	2015

Feature #	Feature Type	Taxon	Common	Part	Count	Mass (g)	Field Season
PS1 1.3	Storage pit	*Atriplex* sp.	Saltbush-type	Wood	4	0.2	2015
PS1 1.3	Storage pit	Indeterminate	NA	Wood	25+	2.3	2015
PS1 1.3	Storage pit	*Prosopis* sp.	Mesquite	Wood	15	1.9	2015
PS1 1.4	Floor hearth	*Zea mays*	Maize	Cupule/cob fragment	16	--	2015
PS1 1.4	Floor hearth	*Prosopis* sp.	Mesquite	Seed fragment	4	--	2015
PS1 1.4	Floor hearth	*Atriplex* sp.	Saltbush-type	Wood	2	<.1	2015
PS1 1.4	Floor hearth	*Fouquieria* sp.	Ocotillo-type	Wood	12	0.5	2015
PS1 1.4	Floor hearth	Indeterminate	NA	Wood	25	0.6	2015
PS1 1.4	Floor hearth	*Prosopis* sp.	Mesquite	Wood	10	0.4	2015
PS1 1.5	Posthole	*Prosopis* sp.	Mesquite	Seed fragment	4	--	2015
PS1 1.5	Posthole	*Atriplex* sp.	Saltbush-type	Wood	2	0.1	2015
PS1 1.5	Posthole	Indeterminate	NA	Wood	12	0.5	2015
PS1 1.5	Posthole	*Prosopis* sp.	Mesquite	Wood	13	1.4	2015
PS1 1.6	Ash pit	*Prosopis* sp.	Mesquite	Seed fragment	3	--	2015
PS1 1.6	Ash pit	*Atriplex* sp.	Saltbush-type	Wood	21	0.6	2015
PS1 1.6	Ash pit	*Fouquieria* sp.	Ocotillo-type	Wood	2	0.1	2015
PS1 1.6	Ash pit	Indeterminate	NA	Wood	17	1.1	2015
PS1 1.6	Ash pit	*Prosopis* sp.	Mesquite	Wood	25+	2.3	2015
PS1 1.8	Posthole	*Zea mays*	Maize	Cupule fragment	1	--	2015
PS1 1.8	Ag terrace?	Not Carbonized	NA	NA	--	--	2015
PS1 1.8	Posthole	*Prosopis* sp.	Mesquite	Seed fragment	2	--	2015
PS1 1.8	Posthole	*Atriplex* sp.	Saltbush-type	Wood	7	0.4	2015
PS1 1.8	Posthole	*Prosopis* sp.	Mesquite	Wood	25+	2.2	2015
PS1 1.9	Ash pit	*Zea mays*	Maize	Cupule fragment	2	--	2015
PS1 1.9	Ash pit	*Prosopis* sp.	Mesquite	Seed fragment	12		2015
PS1 1.9	Ash pit	*Atriplex* sp.	Saltbush-type	Wood	19	0.5	2015

Feature #	Feature Type	Taxon	Common	Part	Count	Mass (g)	Field Season
PS1 1.9	Ash pit	Indeterminate	NA	Wood	22	0.8	2015
PS1 1.9	Hearth	Indeterminate	NA	Wood	7	<.1	2015
PS1 1.9	Ash pit	*Prosopis* sp.	Mesquite	Wood	25+	2.3	2015
R6 6	Pueblo room	*Prosopis* sp.	Mesquite-type	Wood	25+	2.7	2019
R6	Pueblo room	*Quercus* sp.	Oak	Wood	3	.1	2019
R6 6.1	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	6	2019
R6 6.2	Floor hearth	*Prosopis* sp.	Mesquite-type	Twig with pith	2	<.1	2019
R6 6.2	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	2.1	2019
R6 6.3A	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25	0.9	2019
R6 6.3B	Ash pit	*Prosopis* sp.	Mesquite-type	Wood	24	0.1	2019
R6 6.4	Large caliche cap	*Condalia* sp.	Javelina bush-type	Wood	1	<.1	2019
R6 6.4	Large caliche cap	Indeterminate	NA	Wood	10	<.1	2019
R6 6.4	Large caliche cap	*Prosopis* sp.	Mesquite-type	Wood	11	0.1	2019
R7 7.1	Floor hearth	No identifiable plant remains	NA	Charcoal flecks	--	--	2019
R7 7.2	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	0.7	2019
R7 7.3	Posthole	No identifiable plant remains	NA	Charcoal flecks	--	--	2019
R13 13.1	Floor hearth	Indeterminate	NA	Wood	16	.<.1	2019
R13 13.2	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	1.9	2019
R13 13.3	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	1.1	2019
39[1]	Pit structure	*Prosopis* sp.	Mesquite	Seed fragment	1	--	2015
39	Pit structure	Indeterminate	NA	Wood	5	0.2	2015
39	Pit structure	*Prosopis* sp.	Mesquite	Wood	25+	7.8	2015
39.1	Floor hearth	*Prosopis* sp.	Mesquite	Wood	17	0.2	2015
64	Hearth	*Atriplex* sp.	Saltbush-type	Wood	25+	3.9	2015
64	Hearth	Indeterminate	NA	Wood	15	0.4	2015
109[2]	Hearth	Indeterminate	NA	Wood	7	<.1	2015
MidB 110	Midden	*Prosopis* sp.	Mesquite-type	Wood	25+	2.3	2019

Feature #	Feature Type	Taxon	Common	Part	Count	Mass (g)	Field Season
R24 400.1	Hearth	*Juniperus* sp.	Juniper	Wood	16	0.3	2019
R24 400.1	Hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	0.6	2019
R31 401.1	Pit	*Prosopis* sp.	Mesquite-type	Wood	15	0.1	2019
R26 402.2	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	0.6	2019
R26 402.3	Posthole	No identifiable plant remains	No charred material	--	--	--	2019
R26 402.4	Floor hearth	*Prosopis* sp.	Mesquite	Seed	2	--	2019
R26 402.4	Floor hearth	Indeterminate	NA	Wood	3	0.2	2019
R26 402.4	Floor hearth	*Juniperus* sp.	Juniper	Wood	2	0.1	2019
R26 402.4	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	7.2	2019
R25 404	Pueblo room	Monocot	cf. Grass	Stem/culm	6	0.1	2019
R25 404	Pueblo room	Indeterminate	NA	Wood	3	0.5	2019
R25 404	Pueblo room	*Koeberlinia spinosa*	Allthorn	Wood	8	0.8	2019
R25 404	Pueblo room	*Larrea tridentata*	Creosote bush	Wood	5	0.9	2019
R25 404	Pueblo room	*Prosopis* sp.	Mesquite-type	Wood	25+	1.8	2019
R25 404.1	Upper floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	0.3	2019
R25 404.3	Pit	Indeterminate	NA	Wood	3	0.1	2019
R25 404.3	Pit	*Larrea tridentata*	Creosote bush	Wood	2	0.1	2019
R25 404.3	Pit	*Prosopis* sp.	Mesquite-type	Wood	21	0.4	2019
R25 404.4	Hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	9	2019
R25 404.4	Hearth	*Quercus* sp.	Oak	Wood	2	<.1	2019
R25 404.5	Lower floor hearth	Monocot	cf. Grass	Stem/culm	8	0.1	2019
R25 404.5	Lower floor hearth	*Koeberlinia spinosa*	Allthorn	Wood	25+	8.7	2019
R25 404.5	Lower floor hearth	*Prosopis* sp.	Mesquite-type	Wood	7	2.1	2019
R25 404.6	Ash pit	Indeterminate	NA	Wood	25+	0.5	2019
R25 404.6	Ash pit	*Koeberlinia spinosa*	Allthorn	Wood	7	0.1	2019
R25 404.6	Ash pit	*Prosopis* sp.	Mesquite-type	Wood	19	0.3	2019

Feature #	Feature Type	Taxon	Common	Part	Count	Mass (g)	Field Season
R25 404.7	Posthole	Monocot	cf. Grass	Stem/culm	8	<.1	2019
R25 404.7	Posthole	Indeterminate	NA	Wood	25+	0.1	2019
R25 404.7	Posthole	*Prosopis* sp.	Mesquite-type	Wood	4	<.1	2019
R25 404.8	Pit	Indeterminate	NA	Wood	25+	0.9	2019
R25 404.8	Pit	*Koeberlinia spinosa*	Allthorn	Wood	4	0.1	2019
R25 404.8	Pit	*Prosopis* sp.	Mesquite-type	Wood	12	0.4	2019
R27 406	Pueblo room	Indeterminate	NA	Wood	25+	1.2	2019
R27 406	Pueblo room	*Koeberlinia spinosa*	Allthorn	Wood	5	0.1	2019
R27 406	Pueblo room	*Prosopis* sp.	Mesquite-type	Wood	23	0.7	2019
R27 406.1	Floor hearth	*Prosopis* sp.	Mesquite-type	Seed	21	--	2019
R27 406.1	Floor hearth	Indeterminate	NA	Wood	9	1.1	2019
R27 406.1	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	16.3	2019
R27 406.2	Collared hearth	Indeterminate	NA	Wood	6	0.2	2019
R27 406.2	Collared hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	3.8	2019
R27 406.3	Posthole	Indeterminate	NA	Wood	25+	0.2	2019
R27 406.4	Posthole	No identifiable plant remains	No charred material	Wood	--	--	2019
R27 406.5	Pit	Indeterminate	NA	Wood	20	0.1	2019
R27 406.6	Large pit feature	Indeterminate	NA	Wood	25+	0.9	2019
R27 406.6	Large pit feature	*Prosopis* sp.	Mesquite-type	Wood	25+	0.5	2019
R27 406.7	Posthole	Indeterminate	NA	Wood	25+	0.2	2019
R27 406.8	Posthole	*Prosopis* sp.	Mesquite-type	Wood	25+	0.3	2019
R28 407.1	Collared hearth	Indeterminate	NA	Wood	25+	0.2	2019
R28 407.1	Collared hearth	*Prosopis* sp.	Mesquite-type	Wood	8	<.1	2019
R28 407.3	Posthole	*Prosopis* sp.	Mesquite	Seed	6	--	2019
R28 407.3	Posthole	Indeterminate	NA	Twig with pith	5	0.1	2019
R28 407.3	Posthole	Indeterminate	NA	Wood	25+	0.4	2019
R28 407.3	Posthole	*Prosopis* sp.	Mesquite-type	Wood	5	0.1	2019

Feature #	Feature Type	Taxon	Common	Part	Count	Mass (g)	Field Season
R28 407.4	Posthole	*Atriplex* sp.	Saltbush-type	Wood	2	<.1	2019
R28 407.4	Posthole	Indeterminate	NA	Wood	25+	1.8	2019
R28 407.4	Posthole	*Koeberlinia spinosa*	Allthorn	Wood	10	0.2	2019
R28 407.4	Posthole	*Prosopis* sp.	Mesquite-type	Wood	25+	1.6	2019
R28 407.5	Posthole	*Condalia* sp.	Javelina bush-type	Wood	1	0.1	2019
R28 407.5	Posthole	Indeterminate	NA	Wood	25+	2.2	2019
R28 407.5	Posthole	*Prosopis* sp.	Mesquite-type	Wood	25+	1.1	2019
409	Pit	*Prosopis* sp.	Mesquite	Seed	15	--	2019
409	Pit	*Prosopis* sp.	Mesquite-type	Wood	25+	7.8	2019
R29 410	Midden	Indeterminate	NA	Wood	25+	0.1	2019
R29 410.1	Floor hearth	*Condalia* sp.	Javelina bush-type	Wood	11	0.9	2019
R29 410.1	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	2.9	2019
R29 410.2	Posthole	Indeterminate	NA	Twig	2	<.1	2019
R29 410.2	Posthole	Indeterminate	NA	Wood	25+	<.1	2019
R29 410.2	Posthole	*Prosopis* sp.	Mesquite-type	Wood	3	<.1	2019
MidC 412	Midden	*Prosopis* sp.	Mesquite-type	Wood	25+	1.6	2019
415	Pit	Indeterminate	NA	Wood	25+	0.1	2019
416	Large pit feature	No identifiable plant remains	No charred material	NA	--	--	2019
LA 43414 Vicinity Survey							
226	Floor hearth	Indeterminate	NA	Wood	25+	0.5	2019
226	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	8	0.1	2019
262	Floor hearth	Indeterminate	NA	Wood	25+	0.9	2019
262	Floor hearth	*Prosopis* sp.	Mesquite-type	Wood	6	0.2	2019
308	Hearth	Indeterminate	NA	Wood	25+	<.1	2019
323	Hearth	No identifiable plant remains	No charred material	NA	--	--	2019
326	Hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	7.8	2019

Feature #	Feature Type	Taxon	Common	Part	Count	Mass (g)	Field Season
419	Hearth	*Prosopis* sp.	Mesquite-type	Wood	25+	0.4	2019
451	Midden	Indeterminate	NA	Twig	1	<.1	2019
451	Midden	Indeterminate	NA	Wood	18	<.1	2019
453	Midden	Indeterminate	NA	Wood	25+	0.4	2019
453	Midden	*Prosopis* sp.	Mesquite-type	Wood	9	0.1	2019
455	Midden	No identifiable plant remains	NA	Charcoal flecks	--	--	2019
474	Hearth	Monocot	cf. Grass	Stem/culm	8	<.1	2019
474	Hearth	Indeterminate	NA	Wood	25+	0.2	2019
475	Hearth	Indeterminate	NA	Wood	15	0.1	2019
475	Hearth	*Prosopis* sp.	Mesquite-type	Wood	9	<.1	2019
476	Roasting pit	*Prosopis* sp.	Mesquite-type	Root	2	4.2	2019
476	Roasting pit	*Prosopis* sp.	Mesquite-type	Wood	21	0.3	2019
482	Roasting Pit	Indeterminate	NA	Wood	15	<.1	2019

[1]A charred acorn cap was recovered from a test pit in Feature 39 during a previous test excavation (Cummings and Kováčik 2013:23).

Table12.3 displays the ubiquity values of maize and mesquite recovered from all 75 samples and a comparison of the results from the 2014 field season and the 2019 field season. A comparison of ubiquity in Pit Structure 1 to all other samples is included. Edible plant parts, represented by seeds and fruit fragments, were relatively sparse when the samples from both field seasons are included. However, plant ubiquity values differed between the two assemblages from 2014 and 2019, and radically between features associated with Pit Structure 1 and all other features. For example, mesquite seeds provide the only evidence for edible staple plants from the 2019 analysis. In contrast, the 2014 analysis found mesquite seeds and maize cupules/cob fragments in several samples. Eleven of the 2014 project samples came from Pit Structure 1 and two from Pit Structure F39. The other three samples were collected from two hearths (F64 and F109) and a suspected agricultural gridded field (F108). Maize was noted in 37.5 percent of the samples from the 2014 field season, and mesquite seeds/pod fragments in almost 80 percent of the samples. When ubiquity in features from Pit Structure 1 only is considered, the values change very little. Pit Structure 1 samples contained far more mesquite and maize fragments than the other samples.

Table 12.3. Ubiquity of seeds and maize fragments compared between the 2014 and 2019 field seasons, and between Pit Structure 1 and all other features

Taxon	Part	2014 and 2019 Samples Compared		Pit Structure 1 Features Compared to all other Features		All Samples
		Ubiquity 2014 Samples (n=16)	Ubiquity 2019 Samples (n=59)	Ubiquity Feature 1 (n=11)	Ubiquity all other Contexts (n=64)	Ubiquity All Samples (n=75)
Maize	**Cob, cupule fragments**	37.5%	---	36.4%	---	8.0%
Mesquite	**Seed fragments**	68.8%	6.8%	72.7%	6.3%	20.0%

Why is the outcome of the two field seasons so different? Why are acorns not present in the flotation samples? The discrepancy may be the result in part of the unusual use history of Pit Structure 1, which makes up the majority of the flotation samples from the 2015 field season. Another possibility is that plant preservation is better in all of the pit structures than in the surface structures. Most of the 2019 samples were recovered from surface structures, where only mesquite seeds were recovered. A third possibility, although difficult to demonstrate, is that different areas of the site were occupied during the settlement history of the site. These occupations may have emphasized different plant resources resulting from short-term environmental constraints.

Archaeological Context: Maize, Mesquite, Acorns

Maize and mesquite are the two staple plant resources identified in the samples from the 2015 and 2019 field seasons. Maize was recovered in several features, associated with Pit Structure 1, sampled during the 2015 field season. Maize was also recovered from a large stain feature (designated Feature 109 by Versar) by CFO archaeologists during the chronometric and subsistence sampling project (Cummings and Kováčik 2013). Mesquite is present in samples from Pit Structure 1 and other features across the site. A third possible major plant resource, shinnery oak, has been identified in features from Pit Structure 1 by the LCAS excavations and in a test pit in Feature 39, another pit structure, conducted by CFO personnel (Cummings and Kováčik 2013).

Maize

Macrobotanical evidence for maize is rare across the CFO until the Late Formative period. The Merchant site contains the best evidence for maize agriculture in the region. Maize is relatively abundant in Pit Structure 1 at the Merchant site, occurring in 37.5 percent of the samples from that context. A flotation sample (CN 405) collected from a small test unit in a feature 27 m north of the main village area during the CFO sampling project yielded 437 cupules and 4 kernels (Cummings and Kováčik 2013; Stovel et al. 2015:101; data on file at the CFO). This feature, designated Feature 109, was tested during the 2015 fieldwork, but no maize remains were identified in the flotation sample (Dering and Smith 2016). Otherwise, however, maize is missing from the samples recovered from the surface rooms for this project.

Table 12.4 presents the context for each of the occurrences of maize in the flotation samples collected by Versar personnel. Although maize was recovered from the LCAS backdirt mound, which may have been associated with an upper floor, the rest of the contexts are associated with or immediately below the lower floor of the pit structure. The maize remains were recovered with mesquite seeds in Features 1.1, 1.4, which are postholes, and 1.9, an ash pit. Maize pollen was also noted in Features 1.3 and 1.4. The ash pit is associated with the hearth and may be a cleanout feature.

Table 12.4. Maize recovered from flotation samples

Feature Number, Type	Context	Plant Remains
Pit Structure 1	Room fill.	3 cob fragments
Pit Structure 1, Feature 1.1	Posthole in lower floor of pit structure. Found with mesquite seed.	1 cupule fragment
Pit Structure 1, Feature 1.3	Storage pit in lower floor of pit structure.	2 cupule fragments
Pit Structure 1, Feature 1.4	Floor hearth surrounded by Feature 1.9. Recovered with mesquite seeds.	16 cupules, cob fragments
Pit Structure 1, Feature 1.8	Posthole in lower floor of pit structure.	1 cupule fragment
Pit Structure 1, Feature 1.9	Ash pit in lower floor of pit structure, around margins of a hearth, F-1.8; may be an ash dump from hearth. Associated with mesquite seeds.	2 cupule fragments

[1]A maize cupule was collected from a test pit in Feature 109, a baking pit (Cummings and Kováčik 2013:65; Miller et al. 2016:230).
[2]Maize cupules and kernels were recovered from Feature 109 by CFO archeologists (Stovel et al. 2015:101**).**

Maize occurs in only one area of the site beyond Pit Structure 1. More than 350 cupules and kernels were found in a sample from Feature 109 (Stovel et al. 2015:101). However, many areas of the site, including most of the excavated surface rooms, did not yield macrobotanical evidence for maize. Starting with Pit Structure 1, the upper floor is not well represented in the sampling strategy because it had been excavated by looters and by the LCAS efforts. The maize in the sample from room fill sample may be associated with a later construction or reconstruction event within Pit Structure 1 (first entry, Table 12.4).

Although maize is not present in the flotation samples recovered from surface structures in this project, maize pollen was noted in a sample from Feature 404 (Room 25), from Room 6, and from Refuse Area B. The pollen data indicate a more widespread occurrence of maize across the site. Maize pollen has also been reported in three field contexts (Smith, this volume). These data support the construction and use of fields adjacent to the site.

Acorns

Excavation and analysis from previous excavations have found acorns in five features, three pit structures, and one refuse area. The analysis of materials from the 2019 fieldwork yielded only oak wood, which is present in samples from two surface rooms, Feature 6, and Feature 404.2, a looter pit in the fill (Table 12.5).

In a survey of 526 flotation samples recovered from 256 sites in the southeast New Mexico region, about 6 percent contained oak wood charcoal and 0.4 percent contained acorn fragments (Cummings and Kováçik 2013:24). Further analysis of the same data set showed that acorns occurred in 1.3 percent and oak (both wood and acorn fragments) in 13.8 percent of Late Formative samples (Stovel et al. 2015:149, 156). Three Late Formative sites were included in the survey, Burro Tanks (LA 32227), Maroon Cliffs (LA 33085), and Merchant (LA 43414) (Stovel et al. 2015:84).

Table 12.5 shows the context of acorns and oak wood recovered from the Merchant site, as reported in Miller et al. 2016, Stovel et al. 2015, and the current analysis. Although acorns are reported from only four contexts, these contexts are located across a wide area of the site. Refuse Area D is in the northern room block near Rooms 3 and 19, Pit Structure 1 is in the central or main part of the site, and Feature 39 is near the southeast edge of the site. Oak wood is present in a sample from Feature 402, near the center of the central room block, and in nearby Room 6, a feature where two modern dates were recovered. The broad distribution of acorn fragments is not a direct indication of acorn use, but it does suggest the possibility.

Table 12.5. Oak wood (*Quercus* sp.) and acorns recovered from all Merchant excavations, 1959–2019

Feature Number, Type	Context	Plant Remains
Refuse Area D	Refuse pit in surface depression, outside east wall of Room 3, and underneath foundation walls of Rooms 3 and 19. Possibly a cleanout ash deposit from a firepit in Room 3 or extramural firepit of with Room 3 (Miller et al. 2016:145).	"several charred acorns"
Pit structure 1 (Room 1), Zone C, Unit C-2, 45-60 cm level	Zone C is a refuse deposit <90 cm thick resting on the upper floor on the eastern side of Pit Structure 1 White ash deposit within Zone C, removed from firepit contains acorns (Miller et al. 2016:153).	22 charred acorn fragments
Pit Structure 1 (Room 1), Zone C, Unit C-2 75-90 cm level	Zone C is a refuse deposit <90 cm thick resting on the upper floor on the eastern side of pit structure (Fig 6.6). Ash deposit with charred bone and acorn fragments similar to that noted for the 45–60 cm level (Miller et al. 2016:154).	Unspecified quantity of charred acorns
Pit Structure 2	Entryway fill that was similar to Zone C-2 with dense ash deposits. Four ash deposits with plant materials and acorns (Miller et al. 2016:179).	Unspecified number of charred acorns
Feature 39, probable circular pit structure	Ash deposit in structure (Miller et al.:223; Cummings and Kováçik 2013:24, 65). From test pit conducted by CFO.	Acorn cap fragments
Room 6, surface room (Lot 258)	Surface structure, rectangular, with collared hearth in center.	Oak wood charcoal fragments
Room 25 / Fea. 404.2 (Lot 302)	Sample recovered from a 1960s looter pit inside northeast corner of Feature Room 25, a surface structure.	Oak wood charcoal fragments

Mesquite

LCAS excavators and others did not observe mesquite seeds in the Merchant site deposits; however, subsequent analysis of samples collected during the earlier LCAS excavations found mesquite seeds in Pit Structure 1. Carbonized mesquite wood is abundant in most sites in the region. In a survey of 526 flotation samples recovered from 256 sites in the southeast New Mexico region, about 90 percent contained mesquite wood charcoal and 1.8 percent contained mesquite seeds

(Cummings and Kováçik 2013:24). Further analysis of the same data set showed that mesquite seeds occurred in 3.8 percent of samples from Late Formative contexts (Stovel et al. 2015:149, 156). Three Late Formative sites were included in the survey, Burro Tanks (LA 32227), Maroon Cliffs (LA 33085), and Merchant (LA 43414) (Stovel et al. 2015:84). Mesquite seeds occur in 20 percent of 75 flotation samples at the Merchant site, much higher than is reported for the rest of the region. Mesquite wood is present in 77 percent of the Merchant site samples.

Table 12.6 reviews the occurrence of mesquite seeds by feature type and number. As with the occurrence of maize and acorn, most of the material was recovered from Pit Structure 1. Mesquite seeds were also recovered from Feature 39. Mesquite seeds were found in features associated with three surface rooms, Room 26 (F.402), Room 27 (F.406), and Room 28 (F.407), and in an extramural pit, Feature 409. Rooms 26, 27, and 28 are located in the central part of the site, east of Pit Structure 1. The mesquite seeds recovered from floor hearths in F.402, F.406, and from a posthole in F.407 likely come from secondary contexts, introduced into the feature as waste from other activities such as floor cleaning or simply foot traffic. The material from Feature 409, an extramural hearth, may be refuse from a parching activity. The archaeological evidence suggests that mesquite was a major resource at the Merchant site.

Discussion: Maize, Mesquite, and Acorns

In the final chapter of the Merchant site report, Miller (2016:403) states: "The subsistence base was a mix of maize-based agriculture, wild plant foods such as mesquite and acorns, and big game hunting." Taken as a whole, the new data from the Merchant site support this conclusion. From a plant production and procurement perspective, how do the major plant resources, mesquite, maize, and acorns, fit into such a system? Is there sufficient information in the literature to place the archaeological data into a broader context? The final part of this report provides a preliminary description of how such a system might have worked at the Merchant site. In this section, we will briefly review the biological and ethnobotanical literature dealing with mesquite and acorns and consider some implications for fourteenth century lifeways at the Merchant site.

Mesquite, Farming, and Bison

From combined ethnographic and archaeological evidence, we can argue that mesquite was an integral part of the subsistence system. This section presents an overview of the biological and ecological context for mesquite as a major plant resource as part of the subsistence calendar of the Merchant site inhabitants.

The role of mesquite in Native American farming economies is described in ethnographic observations of the Tohono O'odham and the Akmiel O'odham (Gila River Pima) Indians in southern Arizona/northern Sonora. Ethnologists and ethnobiologists have worked with informants to detail mesquite use in the context of annual agricultural or foraging (Castetter and Bell 1942; Rea 1997; Russell 1975 [1908]. Felger (1977) synthesized much of this work in an overview of indigenous mesquite use in southwestern North America. Hodgson (2001) has compiled these works, together with exhaustive field observations, to produce comprehensive descriptions of plant use in the Sonoran Desert including mesquite. Although mesquite use in the Chihuahuan Desert and the southern Plains is less well documented, ethnographies of the Western and Plains Apache and the Comanche attest to the importance of mesquite along the eastern edge of its distribution (Basehart 1960; 1967; Carlson and Jones 1940; Kavanagh 2008; Nabhan et al. 1979; Jordan 2008). The information is sufficiently complete to move beyond simple descriptions of plant use and describe the interrelationships among plants and animals, people, and weather, in the context of an annual cycle.

Table 12.6. Mesquite seeds identified in Merchant site deposits

Feature Number, Type	Description	Plant Remains
Pit Structure 1	Backdirt (looters?) screened by LCAS excavators. Found with maize cob fragment.	4 seed fragments
Pit Structure 1, Feature 1.1	Posthole, floor feature exposed during floor cleaning, Maize cupule found in same sample. Associated with occupation of the lower floor.	2 seed fragments
Pit Structure 1, Feature 1.10	Posthole, a floor feature exposed during floor cleaning.	13 seed fragments
Pit Structure 1, Feature 1.14	Posthole, a floor feature exposed during floor cleaning by LCAS.	4 seed fragments
Pit Structure 1, Feature 1.3	Storage pit, a floor feature exposed during floor cleaning by LCAS. Found with yucca seed and maize cupule.	9 seed fragments
Pit Structure 1, Feature 1.4	Floor hearth, a floor feature exposed during floor cleaning by LCAS. Found with maize cupules.	4 seed fragments
Pit Structure 1, Feature 1.5	Posthole, a floor feature exposed during floor cleaning by LCAS.	4 seed fragments
Pit Structure 1, Feature 1.6	Ash pit, circular, in southeast quarter of structure.	3 seed fragments
Pit Structure 1, Feature 1.8	Posthole, southeast corner. Found with maize cupules.	2 seed fragments
Pit Structure 1, Feature 1.9	Ash pit, around floor hearth (F-1.4.) Found with 2 maize cupules.	12 seed fragments
Pit Structure 39	Pit structure tested by John Speth, identified as a pit structure during 2015 field season.	1 seed fragment
Room 26, Feature 402.4	Floor hearth in surface structure (room)	2 seed fragments
Room 27, Feature 406.1	Floor hearth in surface structure (room)	21 seed fragments
Room 28, Feature 407.3	Posthole in surface structure (room)	6 seed fragments
Feature 409	Pit in an activity area outside and west of Rooms 6 and 29.	15 seed fragments

Observations of mesquite utilization include notes on the dietary importance of mesquite, harvesting and processing the pods for storage and food preparation, medicinal applications, and the use of mesquite wood in structures and as fuel. Relevant to the context of mesquite in the broader landscape, informants and ethnographers have documented mesquite phenology, or seasonality, and its significance in the annual planting/harvest cycle. Two notable attempts have been made to draw on these ethnographic works to reconstruct Hohokam plant use and the agricultural or food production cycle (Bohrer 1970; Hunt and Ingram 2015).

The ethnographic information, combined with biological studies of mesquite, may be applied to answer questions regarding mesquite use at the Merchant site, with a couple of caveats. First, the most detailed ethnographic studies were made on velvet mesquite (*Prosopis velutina*) in the Sonoran Desert, and not honey mesquite (*Prosopis glandulosa* var. *glandulosa*), the mesquite native to Southeastern New Mexico and points east, north, and south. Second, regarding seasonality, some phenological observations were made in the Sonoran Desert, which has two rainfall peaks, one in the summer and one in the winter, and some in the Chihuahuan Desert, which has a single rainfall peak. The Merchant site is located in the eastern Chihuahuan Desert, which experiences a single summer rainfall peak when 50 percent of annual precipitation falls between July and September. Therefore, we will begin by determining to what degree these differences might affect mesquite phenology, from leaf bud break to flowering, fruiting, and ripening.

Phenology: We infer from pollen and macrobotanical data that the people living at the Merchant site relied to a certain extent on agriculture. To many agricultural groups in the Southwest, mesquite was the most important wild plant resource, not only for food and fuel, but for its utility as a seasonal clock. For example, from initial leaf formation to pod ripening, mesquite growth was intertwined with the Gila River Pima agricultural cycle, including planting and harvesting dates. According to Rea, Gila Pima named two months of the calendar after mesquite, "mesquite leafing out moon" around April, and "mesquite flowers moon" around May (1997:184). Castetter and Bell (1942:147–148) noted that maize was planted when cottonwood leafed, and pumpkins, tepary beans, tobacco, and cotton when mesquite leaves emerged. Because mesquite leaf budbreak occurred later than cottonwood budbreak, timing plantings with mesquite leafing resulted in a lower risk of frost damage.

It is reasonable to assume that Merchant farmers, like O'odham farmers, would be concerned about freezing events. However, for mesquite to work as a planting clock guarding against freeze damage, both velvet mesquite and honey mesquite must respond to temperature, and not changes in moisture.

If we are to apply the ethnobotanical observations of the O'odham to the Merchant site, we must also take into account that the observations are on a different species of mesquite, velvet mesquite. We must further consider that the observations were made, for the most part, in a river valley, in a desert with a different rainfall regime. Does the difference in species and location matter? If so, how does it affect seasonality and arguments for the role of honey mesquite in the Merchant site economy?

A review of mesquite literature confirms that leaf bud break in both velvet mesquite and honey mesquite is controlled primarily by winter temperatures, and not rainfall. In a classic early study of mesquite, the authors note that the timing of mesquite leaf break appears to be "*rather independent of rainfall* i*n all of the species of section Algarobia* with which we were concerned" (Mooney et al. 1977:28, emphasis added). Although the species that primarily concerned them was *Prosopis velutina*, velvet mesquite, in southern Arizona, the *Prosopis* section Algarobia includes honey mesquite. Does honey mesquite follow the same pattern? McMillan and Peacock (1964:182) noted that all spring activity varied by 10 days during the 2-year study. They concluded that, within a certain window of time, initial leaf formation is controlled by temperature differences (McMillan and Peacock 1964:186). It appears that leaf formation is also determined by photoperiod in the northern populations (northern Mexico to the southern Plains). Compared with other woody species within Texas plant communities, honey mesquite begins leaf formation later in the spring, apparently because the young foliage is frost sensitive (McMillan and Peacock 1964:187). Solbrig and Cantino (1975:189) note, "blooming in both *Prosopis chilensis* and *P. velutina*, and perhaps leaf production as well, are initially triggered by an environmental stimulus other than water availability, probably photoperiod." Mesquite is affected by a combination of winter temperatures mediated by photoperiod and has the ability to delay budbreak during colder winters (Goen and Dahl 1982:533).

Taken as a whole, these studies confirm leaf emergence in velvet mesquite or honey mesquite is not determined by precipitation, but instead by temperature and photoperiod. After meeting a chilling requirement, warmer temperatures trigger mesquite leaf emergence. In all cases, mesquite is one of the later woody shrubs to initiate leaf growth, making it a good sign for planting cultigens that are less frost tolerant. Merchant farmers could expect the appearance of mesquite leaves to indicate that the chance of frost damage was low. The biology of mesquite supports the practices of Pima and Papago farmers. Castetter and Bell (1942:147) explain, "the leafing of mesquite was regarded as a more conservative and safer indication that danger from frost had passed than was leafing of cottonwood. Hence maize was usually planted when cottonwoods started to leaf; pumpkins, teparies, cotton, and gourds when the mesquite began to turn green."

Productivity: Although the timing of leaf bud break and flowering are not tied to precipitation, pod productivity is, often in an inverse relationship. For velvet mesquite, Nilsen et al. (1987:226) noted that fruit production decreased during years of higher winter precipitation, and conversely fruit production increased during years of lower precipitation. A study of honey mesquite produced similar results. During a dry year in south Texas, honey mesquite trees produced more than three times the fruit compared with a high rainfall year. The authors state that their data "corroborates the observations of south Texans, namely that drought promotes pod production in honey mesquite (Lee and Felker 1992:316)".

Several sources note that mesquite can produce more than one harvest in a single year, a trait recorded by ethnographic observers in Pima and Papago Countries, as well as by biologists working with honey mesquite. Rea's Pima informants recognized a primary crop in mid- to late June and a second crop in September–October (Nabhan et al. 1979:181; Rea 1997:186). In western Texas, honey mesquite can bloom up to four times a year (Mooney et al. 1977:29). Most of the observers note that the first bloom is most productive, although one of Rea's informants said both were equally productive (1997:186).

Underscoring the limits of reliability and sustainability in any subsistence system, pod production can fail as a result of weather extremes (Nabhan et al. 1977:181; Russell 1908:66, 74). Although Felger (1977:154) emphasized the reliability of mesquite as an "unfailing crop," Nabhan et al. (1979:181–182) make a case for extreme spatial and annual variability in mesquite pod production. In the case of the Pima and Papago, they argue that a successful harvest required a "spatially and temporally flexible subsistence pattern." Basehart (1967:278) noted that for the Mescalero Apache, mesquite and piñon crops varied both geographically and over time. Understanding the conditions causing variability in pod production requires careful consideration of the observations and data collected in each study and the environmental conditions producing the variation.

Year-to-year variability in production appears to result from fluctuations in both rainfall and temperature. For example, an average rainfall year followed by a drought year can boost mesquite pod production in the drought year (Lee and Felker 1992; Mooney et al. 1977; Nilsen et al. 1987). However, several drought years in a row can drastically curtail the mesquite harvest or cause it to fail outright (Russell 1908; Nabhan et al. 1979; Solbrig and Cantino 1975). Freezing temperatures can affect mesquite harvest especially at the northern edges of distribution, or higher elevations. Although mesquite flowers bloom later in the growing season than many other trees, the buds emerge with mesquite leaves, and they are susceptible to frost damage from late season freezes. However, mesquite crops could have served as an effective backstop to maize crop failures during drought years because pod production increases in a response to drought, at least for a year or two.

Mesquite Processing and Storage

Bell and Castetter (1937:23–24) provide several accounts of mesquite processing that reflect the conflicting nature of the ethnohistoric literature. One account of mesquite processing states, " . . . the seeds and pods were pounded in a mortar, since they were too sticky for the metate" (1937:23). On the next page, they note that "the raw beans were ground into flour on a metate" (1937:24). They also note that the seeds could be ground as flour, presumably on a mano and metate.

Felger and Moser (1971:57) give an excellent account of mesquite processing by the Seri. The pods are toasted in sand heated by a fire, then carried to bedrock mortars, where they are pounded into meal. Felger (1977:159) speculates that processing helps to kill the bruchid beetle eggs deposited in the seeds, preventing subsequent damage from the larvae. The hard, small seed is ground into flour on a metate. However, Felger (1977:159) observed that the use of pod flour was more widespread than the use of seed flour, despite the higher protein content of the seed. Likewise, Carlson and Jones (1940:530) relate that the seeds were discarded because they were considered indigestible.

I attempted to resolve the conflicting accounts of mesquite processing through a series of experiments in 1999. I tried using a mano and metate, comparing them to the combination of a mortar fashioned from a mesquite stump hollowed out with hot coals and a mesquite pestle. I immediately learned two lessons. First, using a mano and metate is an ineffective means of reducing pods into meal, doing little more than scattering pod fragments. The pestle, however, crushed the pods and contained the fragments within the mortar. Second, when I reduced the brown, brittle mesquite pods into meal, they became a sticky mass. I quickly learned to dry them on hot coals before pounding. The drier they are, the easier it is to work them into meal. Toasting on hot sand or in a parching tray is an effective means of drying the pods. These results suggest that the accounts of Seri mesquite processing seem to be the most accurate (Felger 1977; Felger and Moser 1971).

The meal from the mashed pods is winnowed from the seeds and woody endocarps encasing the seeds. The meal is mixed with water and fashioned into cakes which are dried in the sun (Felger and Moser 1971:57). Refuse from mesquite pod processing is often recovered from sites as small pod fragments, endocarps, and hard seeds.

Bison and Mesquite

Although accounts of mesquite use by mobile groups in the Chihuahuan Desert are not comprehensive, they underscore the importance of this resource. Annual variation in the abundance of plant and animal resources demanded a mobile subsistence pattern and a flexible social system. In response, Mescalero Apache utilized a range of plant and animal resources with a broad geographical distribution (Basehart 1967:278). The preservation properties of mesquite dictated its high value as a resource. Mescalero groups ventured along the western banks of the Pecos River and moving eastward into the Llano Estacado (Basehart 1967:279; Figure 1:280).

The movements of the Mescalero bands along the Pecos River and into the adjacent plains put them into a region with bison and mesquite. Mesquite grew at lower elevations in the southern part of that range, while bison were the target when the Mescalero moved into the plains. Ethnographic evidence suggests that mesquite and bison were utilized together, either during processing mesquite or using mesquite meal to make a sweet meat or pemmican-like food. This hypothesis is supported not only by ethnographic accounts but evidence of both bison and mesquite remains from the Merchant site.

Direct ethnographic evidence from the southern Plains supports the idea that mesquite was mixed with meats. For example, the Mescalero processed mesquite beans by pounding them and straining the mass through a bison stomach strainer to separate the meal from the seeds and endocarps (Basehart 1960, Section 1:38). A Comanche consultant, Frank Chekovi, gave a more detailed description of mesquite processing in the context of bison (Kavanagh 2008:373):

> They gathered mesquite beans when ripe. They took only sweet ones. They put them on a big rawhide, then crushed them with a pestle until it looked like meal. Then they separated the pods and used them; the seeds are no good. They might get a small sackfull. A dry buffalo paunch, stretched over a bent limb, was perforated and used to sift out the finer meal. This was mixed with lean meat and sewed up in the bag, then stored for later use.

According to Plains Apache consultant Rose Chaletsin, mesquite meal could be eaten with dried meat, pounded meat, or any sour food such as sand plum (Jordan 2008:72). Post Oak Jim, a Comanche interviewed in 1933, related that pemmican was made with mesquite in the old days. He also indicated that mesquite was used with peyote, a cactus with a bitter taste (Kavanagh 2008:264). Unfortunately, the references found do not detail the manufacture of pemmican, which is a mixture of either hard fat or fluid oils, meat, and sometimes a type of sweetener (Colpitts 2015). However, these ethnographic references connect mesquite to meat processing.

Archaeological mesquite remains have been found in association with evidence for bison processing on the southern Plains. Quigg (1997:155–156) argued that the association of extremely reduced bison bone and mesquite pod fragments and seeds constituted a pemmican processing activity area at the Rush Site near San Angelo, Texas. He excavated a Toyah phase component on a Holocene terrace associated with an abandoned channel and recovered more than 11,000 bone fragments, including bison and deer, scrapers, contracting stem projectile points, drill fragments, modified edge tools, hammerstones, along with dozens of mesquite seeds and pod fragments.

Mesquite Harvest in the Context of Food Production

When mesquite beans ripen and fall to the ground, they are ready for harvest. Competition for the ripened pods included deer, skunks, packrats, rabbits, coyotes, and kangaroo rats (Solbrig and Cantino 1975:205). Moser and Felger (1997:338) note that the Seri would raid packrat middens for mesquite pods. The time window for harvest varies from year to year. In southern Arizona/northern Mexico, the first mesquite harvest could occur as early as mid- to late June and as late as August through early September (Rea 1997:186). Joseph Giff, a Pima informant, told Rea that a second harvest was available in late October (Rea 1997:185). In the case of the Papago, mesquite was gathered in August (Bell and Castetter 1937:28).

The literature records mesquite harvests that were conducted by both large and small groups from one to several days (Rea 1997:185). For the Mescalero Apache, mesquite gathering involved small groups (Basehart 1960:37). In a conversation recorded by Lloyd (1911:123), Comalk-Hawk-Kih, a Pima, said that large groups participated in the harvest. George Kyyitan reported to Amadeo Rea that he would venture out with his family to collect mesquite pods for a week. Rea suggests that this information implies both men and women were in the parties (Rea 1997:185).

Hunt and Ingram's (2015) food production calendar included both the major crops and wild plant foods in the O'odham diet. Accounting for the labor involved in production of both cultigens and wild plants, they identified a potential labor bottleneck in the late June-early August time window (Hunt and Ingram 2015:270). At this time, the first crop of cultigens would be harvested and prepared at roughly the same time that mesquite and saguaro would be harvested. Contributing to this labor stress would be planting the second crop of cultigens (Hunt and Ingram 2015:271).

The Sonoran Desert dates would differ somewhat from the Chihuahuan Desert dates, but the arc of planting and harvesting cultigens, and the harvesting of mesquite, could be similar, especially if the Merchant site experienced an average or a wet winter, such as during El Niño years. Modern climate data indicate that winter rainfall is significantly higher during El Niño years (Wainwright 2006:36). If we can extrapolate that data to the fourteenth century, then spring (April-May) maize plantings would occur in favorable conditions for an early crop. Otherwise, maize planting would coincide with the initiation of the summer monsoon in late June to early July (Wainwright 2006:17).

Acorns

Sand shinnery oak, *Quercus havardii*, is an unusual oak that has not been the subject of either ethnographic observations or much formal scientific study. Sand shinnery oak is a low-growing clonal shrub, seldom exceeding 1 m in height, with extensive below-ground woody rhizomes. Most of the biomass in a shinnery oak stand is underground. Although estimates vary, it may cover 6 million acres across the southwestern areas of the southern Plains (Dhillion and Mills 1999; Garrison et al. 1977:37). The historic climax plant community is a midgrass prairie with open to dense stands of broad-leaved deciduous shrubs, primarily sand shinnery oak and mesquite, with yucca and sand sagebrush. This community is interspersed throughout the broader shortgrass prairies of the southern Plains (Garrison et al. 1977; Zavaleta et al. 2016:226).

Ethnographic accounts of acorn use for other oak species are widespread among groups living in higher elevations across the greater Southwest. These include Western Apache, Shoshone, Yavapai, and Diegueño (Hodgson 2001). Also, groups such as the Tohono O'odham traveled into higher elevations to secure acorns (Rea 1997; Castetter and Underhill 1935). In southern California, the Cahuilla collected several species of white oaks. The Tipai of Baja California collected and processed acorns in bulk (Weiss 1994). However, the evidence that groups on the eastern side of the region relied on acorns as a staple is weaker. The Mescalero did not emphasize acorns. Basehart (1960, Section I:30) reports that the four most important wild plant resources were mesquite, mescal, datil, and piñon; acorns were of minor importance. Informants mentioned that when acorns were collected, they favored lowland acorns (Basehart 1960, Section I:42). We may infer that the reference to lowland acorns include sand shinnery oak.

The Mescalero ranged across a broad swath of the Llano Estacado, the southern Plains, mountains to the east and west, passing close the Merchant site (Basehart 1967:280). The Mescalero moved into the plains to hunt bison and then south to winter in warmer areas. Although Basehart's territory maps are a product of informants adapted to horseback, the general idea of moving from plant resource-rich mountains to lowlands or plains to hunt bison may be reasonably applied to the Late Prehistoric period.

However, the Mescalero were highly mobile, a limiting factor for any subsistence analogy applicable to the pueblo dwellers of the Merchant site. At best, we have a general guide to plant and animal resource use. We can infer that the location of the Merchant site is anchored in a plant resource-rich environment of mesquite and shinnery oak, adjacent to the plains for hunting southward-drifting bison herds. We should not, however, disregard the fact that this location is marginal, and was probably suitable for a sedentary occupation only a short time or times during a favorable climate period.

Any argument for the intensive use of acorns at the Merchant site must address pros and cons. A plus would be the superior flavor, or lack of bitterness, of most white oaks, including shinnery oak. This factor would reduce or eliminate a need to remove tannins before use. Perhaps the most compelling argument is that acorns have a relatively high fat content, which is valuable in a fat-poor, semi-arid environment.

One problem with relying on shinnery oak stands is that although they are extensive, the shrubs are seldom much more than 1 to 2 m tall. Most of the biomass is underground in the roots, limiting mast production. The mast productivity may be lower than a stand of other oak tree species. As noted in more recent discussions of shinnery oak, it is not a well-studied species; most of the research is limited to controlling the species using herbicides (Zavaleta et al. 2012). We have no data on shinnery oak mast productivity.

Regardless of the pros and cons, acorns are present in archaeological contexts across the site, increasing the possibility that they were at least a seasonal staple. Acorns are underrepresented in archaeological sites because the shell is relatively thin and delicate, and most of the cooking process occurs after acorns are reduced to meal. However, if acorns are to be stored before they are processed, they must be exposed to heat to drive out moisture, kill insect predators, and to prevent the acorns from germinating. This form of processing may have been one means by which the acorns from the Merchant site were charred (Asch 1972; Petruso and Wickens 1984:361; Jackson 1991:304).

Conclusion: Nutrition, Mesquite, Acorns, and Maize-based Farming

Table 12.7 shows the proximate nutrition values of plant resource types that may have been used at the Merchant site, including acorns, grain amaranth, sunflower, dropseed and panic grass, mesquite, and maize. Although sand dropseed and mesquite are the only plants that grow in the immediate area, these examples give a relative impression of the nutritional content provided by each resource type.

Mesquite pod meal, and species of grass such as sand dropseed and maize, are excellent carbohydrate sources. Complementing these resources, acorns have a higher fat content than most plants or animals in a semi-arid region, an advantage in a fat-poor environment. Obvious advantages of shinnery oak and honey mesquite over other resources are that they grow in dense stands, have deeply buried root systems, and hence are easier to harvest and relatively drought resistant.

The four oak species appearing in the table provide two examples of red oak and two of white oak types. Both *Quercus emoryi*, a red oak, and *Quercus gambelii*, a white oak, are native to the greater Southwest and grow in Texas and New Mexico at higher elevations. The proximate nutrition data show that acorns from white oaks, while they contain less tannin and are easier to process, also contain less oil. Emory acorns contain roughly three times more oil than acorns from Gambel oak trees. It is likely that acorns from sand shinnery oak, a white oak type, contain a quantity of oil in the same range as other white oaks. Furthermore, sand shinnery oaks are closely related to Gambel oaks and hybridize with them (Peterson and Boyd 1998:6). With an oil content of 8.2 percent, Gambel acorns contain more oil than the grasses (dropseed, panic, and maize). White oak acorns, which include sand shinnery acorns, would have provided a good source of oil in a marginal environment.

Table 12.7. Proximate composition of some plant resources (protein, oil, carbohydrate, fiber, and ash are percentages based on dry weight)

Plant Resource	Energy Kcal/100g	Moisture	Protein	Oil	Carbohydrate	Fiber	Ash
Quercus emoryi acorn (red oak)*	474	2.6	21.1	24.8	41.6	7.5	2.4
Q. rubra (red oak)**			6.56	20.81		3.10	2.42
Q. alba (white oak)**	--	--	6.25	6.32	--	2.47	2.64
Q. gambelii acorn (white oak) ***	--	--	6.9	8.2	--	--	--
Amaranthus hypochondriacus grain amaranth seed*	366	8.4	14.7	7.8	59.2	7.7	2.2
A. retroflexus redroot pigweed seed***	--	--	17.5	7.2	--	--	3.4
Helianthus annuus sunflower seed*	514	4.3	22.2	33.3	3.1	4.1	4.8
Panicum sonorum Sonoran panic grass seed*	247	7.7	8.9	4.6	42.5	31.2	5.1
Sporobolus cryptandrus seed ***	--	--	14.4	2.8	--	--	--
Prosopis glandulosa mesquite pod only, no seeds**	--	--	6.81	2.79	31.6	26.57	3.44
*Zea mays**	373	7.5	11.6	4.2	72.3	2.7	1.7

*Ariffin 1984; **Waino and Forbes 1941; ***Earle and Jones 1962; ****Becker and Grosjean 1980

The diversity of major plant resources – maize, mesquite, acorns, and wild grasses – would have provided the opportunity to harvest both wild and cultivated crops during good years or bad years. Mesquite is both a seasonal guide and backup for the maize-squash-beans crop system. During periods of reliable rainfall conditions, the mesquite-shinnery oak plant community would have provided a reliable resource base for a small settlement, and perhaps even a bumper crop during drought years when cultigen production was low.