Preliminary Report of the Ceren Research Project, 1993 Season

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CEREN PROJECT 1993 PRELIMINARY REPORT

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Chapter 1. INTRODUCTION TO THE 1993 RESEARCH SEASON, CEREN, EL SALVADOR.

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Site Overview

Ceren was a thriving southern Mesoamerican village 1400 years ago. Each household had specialized buildings, including a domicile (for sleeping and various daytime activities), a storehouse, and a kitchen. Beyond the household, structures were built for communal use, including a public building with a plaza, a sweat bath, and what apparently was a ritual complex near the river. The gardens and milpas that surround each household contained corn, agave, flowers, manioc, palm trees, and other plants.

The exceptional preservation is due to the volcanic ash burial of the site from the AD 600 Loma Caldera eruption. That extraordinary preservation requires us to make major efforts in objects and architectural conservation, to give the site and its contents the best future possible. Geophysical exploration (electromagnetic induction) has explored for anomalies to the south and west of the excavated portion of the site. Regional volcanology has clarified the role of Loma Caldera volcano in burying the site (Miller 1992). Excavations concentrated during 1993 on the Structure 10-12 complex, intended to be models of architectural and objects conservation. Most of the two buildings and their environs has been excavated, except for balks of tephra left to help support fragile walls. More of the midden south of Household 2 was excavated, along with areas north and south of Structure 9, to assist in decreasing humidity and microorganisms. Analyses of botanical materials and artifacts were conducted.

Many of the following paragraphs of this introductory chapter which deal with household archaeology theory, method, and prior research, are modified versions of sections of the research proposal submitted to the National Science Foundation. It was awarded, and NSF provided the funds which supported the 1993 field and laboratory research.

Project Description

A. Introduction

Household archaeology focuses on quotidian and ritual aspects of domestic co-residental groups to reconstruct the functions of production, sharing and redistribution, reproduction, and transmission (Wilk and Rathje 1982). It is contributing to a "democratization" in Mesoamerican archaeology, as research shifts from the elite orientation characteristic of many earlier Mesoamerican projects to an investigation of all components of prehistoric societies. A limitation of Mesoamerican household archaeology has been poor preservation of architecture, artifacts, and the utilized landscape. Many natural processes,

particularly strong in tropical climates, deleteriously affect sites. They include erosion, solar radiation, bioturbation by flora and fauna, and other deranging variables which interpose between prehistoric activities and the archaeologist wishing to reconstruct them. Thus, biases are introduced that are difficult to detect and quantify unless cases are known where such factors were dramatically reduced.

Another weakness of Mesoamerican household archaeology has been the paucity of household-oriented excavations and publications for comparison. As Flannery (1976:13) noted, there is "not a single published plan of a complete Early Formative house" in Mesoamerica. Classic and Postclassic houses, and occasionally households, are somewhat better known. Research in Oaxaca (Flannery 1976, Spencer 1981, Whalen 1981) provided a strong stimulus to household archaeology in Mesoamerica.

The exceptional preservation at the Ceren site, from sudden volcanic burial, provides an unusual opportunity to study households in considerable detail. The Loma Caldera explosive eruption occurred about AD 600 with negligible warning, a characteristic of phreatomagmatic eruptions of basaltic magmas. When the magma contacted the Rio Sucio, a series of violent steam explosions began. Structures, artifacts, plants, animals, and people were engulfed by hot (100° C) moist clouds of volcanic ash and gasses that were moving between 50 and 200 km/hour. Each of these was followed by an airfall deposit, many of which had larger particles with temperatures over 575°C. As the hot larger pieces of Unit 2 rained down on the structures, they perforated the thatch roofs and caught them on fire. The eruption rapidly buried the site with 4-6 meters of volcanic ash, sealing it from factors of natural and human disturbance. It also preserved organic materials, often to the cellular level. Organic preservation occurred by four processes: (1) direct preservation, (2) carbonization, (3) indirect preservation by the volcanic ash encasing an organic item which later decomposed, leaving a void, and (4) some form of rapid mineral replacement that is not understood. Preserved organic materials include palm and grass roofing thatch, roofing support posts and beams, mats, baskets, string, twine, cloth, agave plants, corn, manioc, flowers, and other plants, many species of grains in storage as well as the insects and mice consuming them, and organic residues in food serving vessels and on food grinding and cutting implements, birds, and other items. No remains of people killed by the eruption have been found to date. Structures would have conferred sufficient protection from the first phase of the eruption, but the hot lava bombs during the second phase penetrated the thatch roofs and caught them on fire. If people stayed in structures during Unit 1's emplacement, they probably fled during the second phase (Unit 2). Or, it is possible that people heeded early warnings and "headed south" before Unit 1 arrived at the site. Dan Miller found small cracks near Structures 12 and 10 that indicated that some seismic activity preceeded Unit 1's arrival, and that, along with some possible initial explosions, may have provided sufficient warning for people to flee.

Burial of the Ceren village was sufficiently rapid that the site essentially was not abandoned by its inhabitants, in contrast to most prehistoric settlements. The most common mode of village abandonment is gradual, in the present and the past, where people take their most valued posessions with them. After abandonment, subsequent people often remove artifacts and building materials. Dean (1987) notes the strong bias in material remains as

modern households are gradually abandoned in northern Honduras and people remove many important items. Lange and Rydberg (1972) noted the same as a family left their domicile in Costa Rica. Wilshusen (1986) has clearly demonstrated how the mode of abandonment affects preservation of artifacts and activity areas, and the superiority of sudden abandonment for detailed reconstruction of Anasazi behavior. A wide range of abandonment modes were identified in the "Abandonment Processes" symposium at a recent Society for American Archaeology meeting; by comparison the Ceren site anchors an end of the spectrum, because the site was abandoned so abruptly. Although sites such as Ceren with the full inventory of artifacts and architecture preserved *in situ* are exceptionally rare, we are working to improve the applications of geophysical exploration techniques that may be pertinent to other areas to find and explore more suddenly buried sites.

B. The Context: Previous Research

Numerous reviews of previous archeological research in El Salvador are available (Sharer 1978, Sheets 1984, Demarest 1986), including Salvadoran research related to volcanism (Sheets 1978, 1979a, 1979b, 1983a, 1983c, 1992), requiring only a brief summary here. Prior to the 1970's, Salvadoran prehistory was poorly known and even more poorly published, with only a scattering of brief preliminary articles, and Longyear's monograph (1944). Fortunately, that has changed during the past 15 years (Sharer 1978, Andrews V 1976, Fowler et al. 1976, Demarest 1986, and others), allowing for regional culture history and processual reconstructions. The last two decades have witnessed the publication of site reports, syntheses, and critiques (e.g. Demarest 1988). The sequence of major explosive volcanic eruptions in central El Salvador is well known (Hart 1983, Hart and Steen-McIntyre 1983).

The Zapotitan Valley, where Ceren is located, has been surveyed intensively using a probability-based stratified random sampling design that covered fifteen percent of the 546 km^2 valley (Black 1983). Settlement patterns during the Classic and Postclassic periods are well known, and artifact sequences are published. Thus, research at the Ceren site is conducted within a regional framework of known archaeology and volcanology.

Archaeological research began at the Ceren site in 1978, two years after its inadvertent discovery by a bulldozer leveling a hill for grain storage silo construction. That was followed by geophysical exploration in 1979 and 1980. However, for most of the 1980's the research was suspended due to the intensity of civil war in the area. Research at the site resumed in 1989 and has continued to the present.

Geophysical explorations at Ceren have utilized ground-penetrating radar, resistivity, electromagnetic induction, and seismic refraction to discover anomalies at depths of 4 to 7 meters. Seismic refraction has proven cumbersome and barely effective. Fortunately, radar and resistivity have detected many anomalies, of which 8 have been judged appropriate for further investigation. Three of those have been confirmed as prehistoric structures by core drilling, 3 have not been confirmed as prehistoric structures and evidently are natural, one large one remains enigmatic, and one has yet to be drilled. The latter is located on top of a small hill 400 m west of the known site, and may turn out to be a sizeable prehistoric

structure. Resistivity instruments have detected larger structures as anomalies, yet some medium to small sized structures were not detected. Geophysical exploration conducted in 1992 indicated the most effective instrument would be the electromagnetic induction EM31 for conditions at Ceren (Doolittle and Miller 1992), and that research is slated for March of 1994.

The 1989 season successfully confirmed the geophysical anomalies detected in 1979 and 1980 as prehistoric structures, and Structures 1, 2, and 3 were excavated (Figure 1). The first two clearly functioned as the domicile, or principal structure, of their respective households. Structure 3, with its solid earthen walls, large benches in the front room, massive cornice, paucity of artifacts, and huge roof, clearly functioned in a different realm than the household buildings. It is interpreted as a civic building. Later research has found that it opens onto a hardpacked plaza, and another structure to the south of the plaza (Str. 13) probably functioned with it to define a civic zone at the center of the known site.

The 1990-91 and 1992 field seasons saw the excavation of other structures associated with Structures 1 and 2, to get a more complete understanding of the buildings, artifacts, and activities of Households 1 and 2 (Figure 1). Two more *bodegas* (storehouses) were excavated, and their similarities and differences are informative. *Bodegas* have 25 to 30 ceramic vessels each (Figure 2), many of which were suspended by ropes or on high shelves, probably to make the grains stored in them less accessible to insects and rodents. Food was stored in vessels (corn, beans, cacao), hung dry (especially chiles), or in special baskets (beans) or granaries (maize). The front porches of *bodegas* were actively used for multiple purposes, and the thatch roofs above their doorways were used for temporary storage of obsidian knives that were in everyday use. Obsidian knives that had yet to be put into everyday use were cached in less accessible high-peaked thatch, toward the center of buildings. *Bodegas* share a common set of basic artifacts, yet they also varied in their contents, probably reflecting household occupational specializations. One held large amounts of cacao, another had possible tobacco and five miniature paint pots with varying hues of pure cinnabar pigment (HgS), possibly for painting gourds. The other had numerous implements for making groundstone artifacts. Although some food was stored in the kitchen, and occasionally some in the domicile, most was stored in the *bodega*. The range of storage facilities and techniques is similar to those among the contemporary Puuc Maya (Smyth 1991), including a corn crib for husked corn on the cob, corn ears doubled over in the field, beans in ceramic vessels, baskets, and storage on fired floors on top of leaves functioning as moisture barriers, dried chiles hanging in bunches from beams, and various seeds in pots suspended with ropes or on large sherds salvaged from broken vessels. However, based on the data Smyth (1991:39) presents, I calculate that an average household would need to store about 1100 kilos (or 7 m^3) of maize for a year, and we have yet to find that size of storage facility at the site.

The kitchen of Household 1 was excavated in 1990 (Str. 11). It is circular, almost 5 meters in diameter, with a thin thatch roof and thatch walls, probably to allow smoke to escape. Cooking was done on a three-stone hearth, with maize grinding and soaking nearby. The kitchen was organized into four different functional zones: food storage, pantry, food processing, and accessways. Excavations of Household 1 are largely complete.

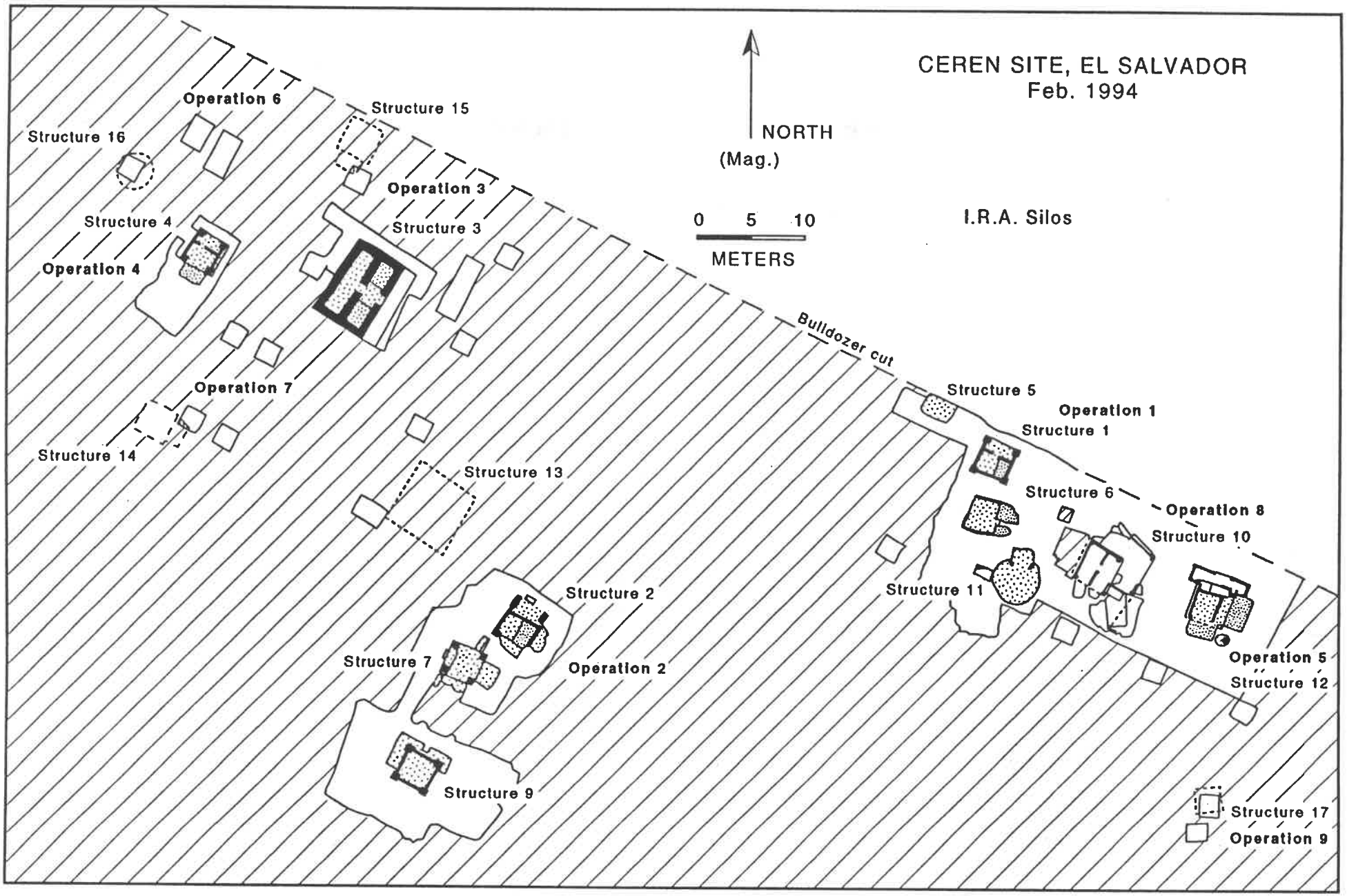

Figure 1 Map of the Archaeological Site of Joya de Ceren

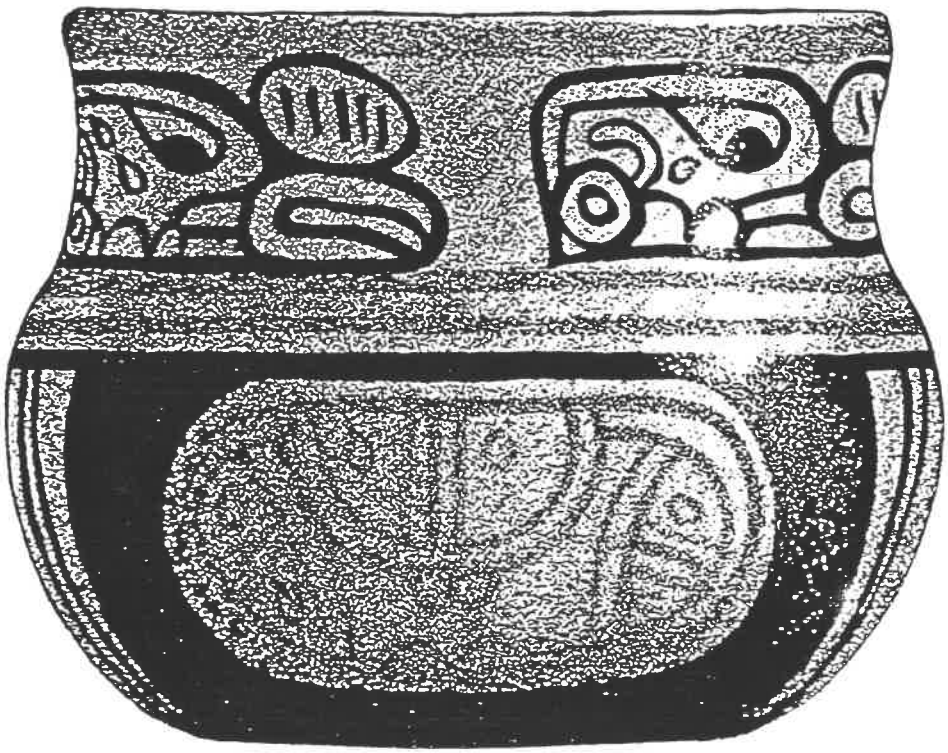

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Fig. 2. Polychrome Ceramic Jar from the bodega of Household 1. Drawing by Ted Fitzkee.

Structure 9 measures 4 by 4 meters, with solid adobe walls supporting an architectural masterpiece: an earthen dome that rose a meter above the cornice-decorated solid wall tops to a height two meters above the floor (McKee 1990). Under the dome is a firebox that saw intensive burning. A thin thatch roof above the dome protected it from rain and sun. It evidently was a sweathouse. It may have been for multi-household or community use, given its elegance and size. It could seat more than a dozen people. The finding of evidence of water erosion in a corner of the entry, in 1993, further substantiates its interpretation as a sweathouse.

Structures 10 and 12 apparently form a part of a ritual complex at the eastern end of the site, near the river. They share characteristics that are otherwise unusual at the site, in that they have more than the standard four columns, they both have enclosure walls with columns in front of them, they were painted white, they have red painted decoration, they are different from the dominant azimuth of orientation, and they have unusual artifact assemblages.

Structure 12 is one of the more unusual buildings excavated to date. It is the only excavated structure to have ten columns, as most others have a maximum of 4, a lattice window, numerous "vertical niches," artifacts cached or placed individually, and difficult access and egress. The only other structure with more than four columns is the associated Str. 10, with seven. It is possible that Str. 12 was the locus for a shaman, or person providing some service for which individual artifacts were exchanged. Architectural and artifactual discoveries are described in a separate chapter below.

Structure 10, partially excavated in 1992, has about the same azimuth as Structure 12. That differs from the usual building orientation, rotated 30° clockwise from our cardinal directions. A comparison of Ceren orientations with solstice, equinox, and lunar standstill azimuths encountered no correlations. They may have been oriented to more localized features, such as local topography. Structures 10 and 12 are the only buildings found at Ceren to date that were painted white on interior and exterior surfaces, to have more than four columns, and have red paint on walls. Structure 10 opens to the east, toward Str. 12, and the two probably are part of a structural complex with shared functions. Structure 10 has the most massive columns found at the site. Its artifacts are not a usual domestic assemblage, and many are unusual or unique to the site. They include a deer skull headdress with remnants of red and white paint, with the string that was used for attachment. It has two antlers and the skull bones including the eye orbits, nasal area, and the upper jaw. It probably is a ritual artifact, a headdress or mask for religious performances. It was stored high, in the rafters of the building, above the internal doorway. It is reminiscent of the deer skulls in the "sacred bundle" still in ritual use by *cofradias* in Santiago Atitlan, associated with human/blood sacrifice, rain, and sustenance (Mendelson 1958). Discovered in 1993 just past the deer skull headdress, stored in the innermost room, were two deer scapulae and other unique items (described in Chapter 4). Also found in the building were numerous unusual ceramic vessels, including a large ovoid vessel in the form of an alligator and a shoe-shaped vessel. A major contribution of the 1993 excavations were the finding of an elaborate wall around the east side of the building, with over a dozen ceramic vessels and numerous other artifacts stored just inside the wall. Most of the wall was of high bajareque

(wattle and daub) construction, to block access, but one section was low, solid, apparently to facilitate people coming up to the wall, but not entering. This probably was to distribute food and drink from the inside.

Numerous gardens and agricultural fields were excavated in 1990, with plants growing in rows following the dominant architectural orientation. The voids of decomposed plants encountered during excavations were explored with a fiber optic endoscope and most were cast with dental plaster. Cornfields were found in various stages of plant growth. One mature field has corn stalks doubled over with the ears of corn attached, an in-field storage technique still used in traditional Middle America. A garden with 17 agave plants provided fiber for string, twine, and ropes. Another garden had a variety of species including possible manioc, flowers, and others that are in process of identification.

The architectural similarities among structures excavated to date are significant, including consistent orientation of most structures 30° east of north (excepting Strs. 10 and 12). Buildings are on top of large fired adobe platforms. Walls generally are bajareque, but sometimes are solid adobe (Strs. 3, 9, and 13; Figure 3), and one was made of thatch. All buildings were covered by extensive thatch roofs. Often the roofs covered more area outside the walls than inside, providing ample areas for activities and storage. Structures were specialized for particular activities; the domiciles of two households have been excavated, and they have large solid adobe benches for sleeping and daytime activities. Storage vessels were found on the floor and hanging from roofing, with grains such as beans and corn inside. The majority of pottery vessels were ***not*** on the floor in one *bodega*, but were elevated on high shelves or hanging by ropes from rafters. In spite of protective measures (ceramic and stone lids, suspension) evidence of difficulties in food storage was found inside some vessels in the form of two species of ants and a mouse. Other fauna included domestic dog, domestic duck, deer, and large freshwater snails, yet no cockroaches. Obsidian prismatic blades that were in use were hidden in rather standardized (i.e. predictable) locations in the roof thatch over doorways and porches.

Explanations for the differences among structures and their contents involve economic, social, political, and demographic factors. Household 1 was agrarian (evidence: digging stick in house, maize milpa adjoining) and craft oriented. They were making groundstone tools and Guazapa scraped slip pottery in the house, and likely trading them with other households (evidence: pottery working area, prepared hematite cylinders, petrographic correspondence of prepared clay and pigment with utilitarian ceramics). They also were making thread, likely of cotton, as evidenced by small spindle whorls and two types of fine cloth found. Household 2 also was involved in domestic and agrarian activities, but the fine polychrome vessels, jade, paint pots, and more substantial architecture may be an indication of status or wealth greater than Household 1. Only the *bodega* of Household 4 has been excavated to date, but Gerstle recently discovered numerous other structures nearby. The large amounts of cacao stored there and the more substantial architecture probably indicate wealth greater than Household 1.

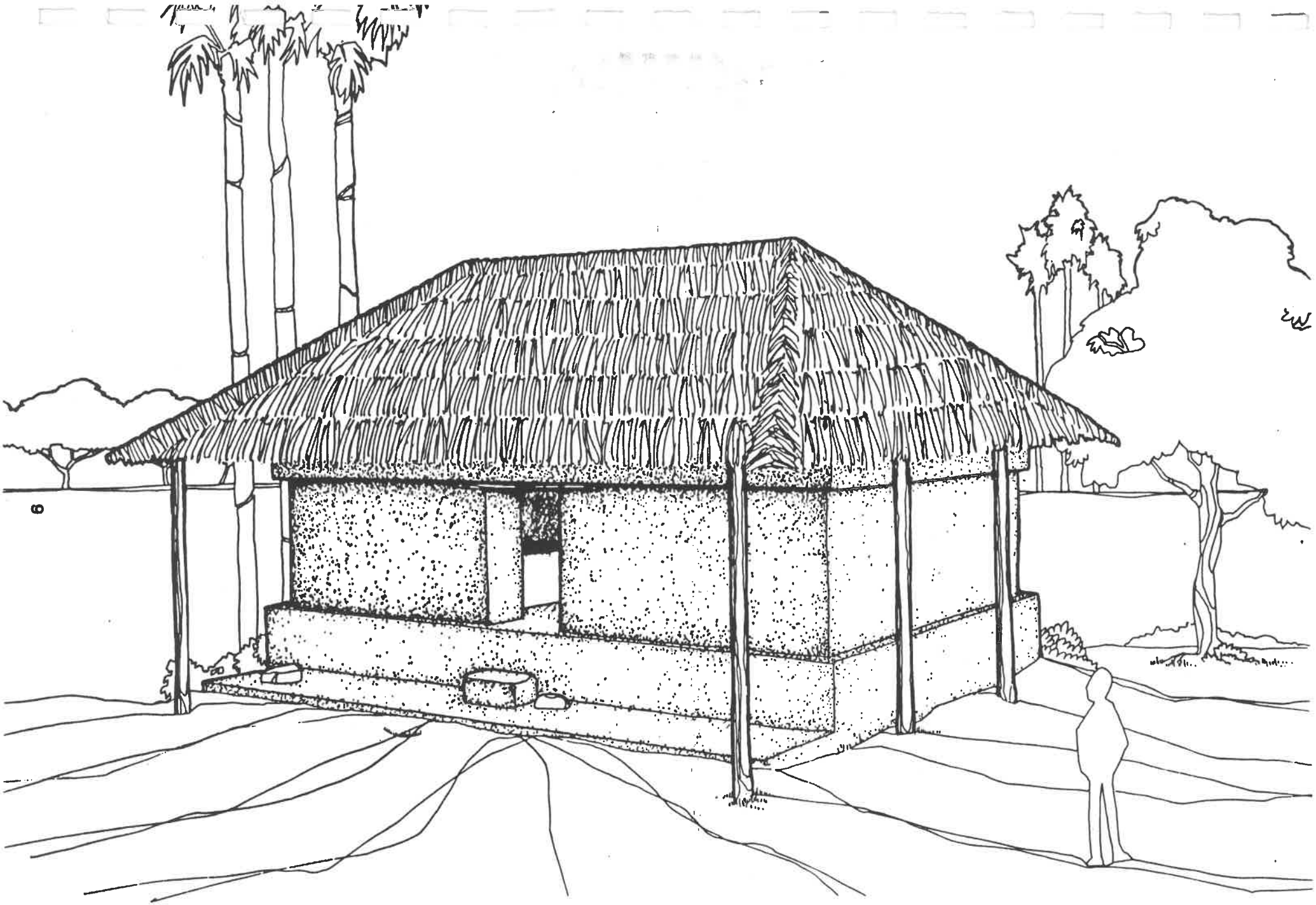

Fig. 3. Reconstruction of Str. 3, a probable civic building. Drawing by Karen Kievit.

C. Households: The Analytical and Theoretical Framework

The theoretical framework for 1993 research is household archaeology, the rapidly expanding subfield focusing on the domestic co-residential social and adaptive unit. Household archaeology has roots in settlement archaeology (Willey et al. 1965, Chang 1968), ethnoarchaeology (Kramer 1982, Wauchope 1938), ethnography (Wilk 1988, Wisdom 1940), and affiliated social sciences (Arnould 1986). It has changed from a field with a few isolated practitioners to one with ethnographic sophistication, improving field techniques (Hayden and Cannon 1984), and an emerging corpus of appropriate method and theory (Netting, Wilk and Arnould 1984, Wilk and Rathje 1982, Ringle and Andrews 1983, and Wilk and Ashmore 1988).

In contrast to migratory hunter-gatherers, households in sedentary societies are immersed in material culture (Wilk and Rathje 1982), facilitating the identification of household activities at Ceren. The household is here defined as the co-residential task-oriented social and adaptive unit intermediate in level between the individual and the neighborhood. Behavior is spatially focused upon the house structure(s) and includes activities inside and outside the house.

Following Adams (1981), households are being studied as "adaptive vehicles," as units which adapt to their natural and social environments. As Laslett (1969) states, "a convincing case can be made out in favour of the household as the fundamental unit in pre-industrial European society for social, economic, even educational and political purposes.... (The components) make up an intricate adaptive mechanism which we are only now beginning to understand." Households are localized and enumerable (Arnould 1986), in contrast to families, which are kin-based and not necessarily localized (Netting et al. 1984). Therefore, households are more suitable units for archaeological study than families. Households share five spheres of activity: (1) production, including food, implements, vessels, and housing; (2) pooling, i.e. storage, distribution, maintenance, and curation of the common goods, including generalized reciprocity, which we extend to include exchanges between households and wider corporate units; (3) transmission of information, knowledge, materials, possessions, including inheritance and access rights to resources; (4) reproduction in biological and social-cultural senses, including the need for recruitment of spouses outside the household; and (5) co-residence/membership, with the activity areas of the domestic group revealing communal living and working (Arnould 1986).

Boundaries suggesting probable activity areas of various types are being found at Ceren. An obvious structural boundary is a building's walls, platform, door, and the dripline of the roof, but functional boundaries include adjacent storage and activity areas and outbuildings. Most individual structures excavated to date have more roofed area outside the walls than within them, providing sheltered activity areas, storage spaces, and walkways. The 1993 research was able to discern, for the first time, the boundary between a household patio and a special-use patio (associated with Str. 10). The edges of roofs and their driplines are discernable, along with 1 meter-wide walkway either inside or outside the dripline. Generally gardens or agricultural fields abut the walkways. A subsistence boundary includes the sustaining area, with contiguous fields and possible outfields. Within-field boundaries are discernable by changes in vegetation or field preparation, and one within-field boundary was

created by a drainage ditch. Economic boundaries encompass the maximal geographic extent of commodities traded; this likely will extend to Guatemala (Ixtepeque obsidian, Sierra de las Minas jade and serpentine) and the Pacific Coast (salt, shells). In this broader domain, household boundaries are expected to overlap considerably, and the nature of the overlap is an index of community and regional economic integration.

Research in Oaxaca provides comparative data and useful methods and concepts (Flannery 1976, Winter 1976). Winter (ibid:25) defined a "household cluster" as the houses, storage pits, graves, and associated ovens and middens. The household includes these features along with the activity areas inside and directly ouside the house. Thus the term household as used here includes the physical data and the interpretations of past human behavior of the functioning social unit. Oaxacan households varied somewhat in their features and were commonly spaced 20 to 40 m apart. Winter estimates the individual Tierras Largas "household cluster" occupied 300 m^2, smaller than Ceren households.

Whalen (1981) excavated one of the best preserved Mexican houses; most of the house floor and contact artifacts were preserved by the adding of fill for a new floor. There are disagreements about which artifacts were *in situ*, which were somewhat misplaced, and which were inadvertent inclusions in construction fill, with Spencer (1981) conservatively analyzing only artifacts partially impressed into the floor. Parry (1987) argued for a more inclusive approach. Fortunately, Ceren conditions obviate the problem.

Although still small, the number of excavated southern Mesoamerican houses has increased in the past decade. Ringle and Andrews V (1983) recorded hundreds of Formative residences at Komchen, and hundreds of other enigmatic smaller features of stone and soil, but excavated few. A range from small features to apparent housemounds to larger structures is representative of many Maya sites, and makes it difficult to distinguish residences from outbuildings. Eaton (1975) has identified farmsteads as one room stone-walled houses with fenced enclosures, and housemounds as raised platforms supporting perishable structures in the Rio Bec area. Blake's excavations (1987) at Paso de la Amada, Chiapas, uncovered surprisingly large houses of an Early Formative chiefdom. Hammond et al. (1979) report on an apsidal structure at Cuello that, in spite of earlier claims, is now dated to the Middle Formative (Andrews V and Hammond 1990).

At Copan significant advances in household archeology are being made (Webster and Gonlin 1988). Maya commoners, as agrarian "producers" living in the peripheries of Copan, had very basic housing, usually consisting of multiple small rectangular structures, sometimes on a platform, with active use of the "peripheral spaces" surrounding each structure. Structures were consistently aligned. Maya households in Copan proper had more substantial construction and more "ideal" Maya architecture consisting of rectangular substructures with steps in front, terraces, and interior benches, some of which had niches (ibid:186). In "built" space, Ceren architecture is more similar to the Copan core than its agrarian periphery.

In part because they share a common culture, Ceren households are similar to each other in many features, architecture, and activity areas. However, households vary

considerably in some characteristics, including the nature and quality of architecture, artifact content and location, and possibly household composition, their relative "maturity" in the household cycle, occupational specialization, and probably status in the community. Explanations of household similarities and differences must be based upon full data of excavations of all structures, artifacts, and activity areas.

D. 1993 Research Objectives and Issues

The social science issues addressed during the 1993 research program include household and community ritual, the definition of Ceren households, settlement size (the extent of the community), gender issues, agricultural productivity, cultural affiliation and trade, and discard behavior. The principal natural science issue addressed regards the nature and extent of the Loma Caldera volcanic ash. Botanical studies focus on the identification and interpretation of exploited species. Biomedical studies are pending the discovery of human remains.

1. Object and Architectural Conservation

The exceptional preservation of the Ceren site requires unusual efforts in conservation and site protection. An international Advisory Committee was formed to aid conservation of architecture, objects, botanical remains, and other aspects of the site. Members include Anthony Crosby and William Wendt (National Park Service), Lambertus van Zelst (Smithsonian Institution), and Elena Charola (World Monuments Fund). The objective of the board is to have the conservation effort approach the highest international standards for earthen architecture. The committee visited the site during 1992 and wrote a 67 page report, in English and in Spanish. The committee made 22 specific recommendations. Five have already been implemented, seven have been partially implemented, and ten are pending.

The site has been named to the World Heritage list of the United Nations so that architectural conservation assistance can be solicited from the World Heritage Fund. The site and the ten hectares to the south and west are now officially a national archaeological monument.

The Conservation Analytical Laboratory of the Smithsonian Institution is assisting in objects conservation, and Holly Lundberg, an objects conservator, was trained as an intern and was in the field for the entire 1993 season. That follows on the success of Mark Fenn, objects conservator intern who rescued and treated fragile artifacts during the entire 1992 season.

Botanical conservation is under relatively good control, utilizing procedures established by the National Museum of Health and Medicine, and with the assistance of the Salvadoran Museo de Historia Natural and the Jardin Botanico. Most plants in gardens decomposed *in situ,* but the volcanic ash packed around them retains a precise mold. We cast the plants with dental plaster, and leave many *in situ*. A program is now largely funded and is currently being implemented to make provisional duplicates for the field, so all originals can be curated under museum conditions.

We construct permanent protective roofs over all fields and structures prior to excavating them. Thus we are able to reverse the usual situation of excavations at Mesoamerican sites having to be conducted in the dry season. Ceren structures, when protected from rain and sun, are best excavated during the rainy season, so the earthen architecture can dry more slowly. President Cristiani, and the first lady Margarita de Cristiani, donated four large roofs to the site, two of which were installed early in 1993. They are a great improvment over the duralite modules.

2. Artifact Analyses

Initial artifact analyses are done by industry, with specialists analyzing chipped stone, bone, ceramics, ground stone, wood, basketry, architecture, and other artifacts. Each will be analyzed by form, by manufacture, by function, by context, and by style (e.g. Beaudry 1983, Sheets 1978). Artifact industries will be cross-cut by activity area and household studies to relate artifacts to their spatial context to reconstruct household activities, exchange, possible household specialization, and adaptation. Regional economics will be reconstructed. Clays used in ceramics have been, and will continue to be, sourced by X-ray fluorescence and neutron activation analysis at the Conservation Analytical Laboratory of the Smithsonian Institution. A small sample of every vessel is analyzed to look for clusters or groupings of manufacture and use. Preservation is sufficient at Ceren that many groundstone, chipped stone, and ceramic artifacts still retain organic residues from their last use(s). Some of the organic residues on prismatic blades, scrapers, and macroblades of obsidian are being analysed for potential hemoglobin content.

3. Cultural Affiliation

Southeastern Mesoamerican scholars have studied cultural affiliation or ethnicity in the area, often focusing on Maya to non-Maya contact and its effects through time. Sharer (1988), Willey (1986) and Schortman (1986) have explored multicultural dynamics at Quirigua, Copan, and in the SE Periphery. Schortman's four behavioral systems for comparing ethnicity, i.e. technology, proxemics, ideology, and society, are pertinent. Gerstle (1988) identified a Lenca elite enclave at Copan. Her criteria for differentiating Maya and Lenca artifacts are being used to explore cultural affiliation of Ceren residents. Previously the Ceren inhabitants were considered Maya (Sheets 1983, 1986), but a critique (Demarest 1988) is well taken, and they may have been Lenca, or possibly Xinca. Given the multiethnic nature of the southeastern Mesoamerican frontier, Ceren residents may not have been a relatively "pure" single ethnic group, but may have acculturated considerably. The architecture and some of the polychrome ceramics indicate close Maya connections, yet some unusual ritual ceramics discovered in Structures 10 and 12 have intriguing lower Central American similarities. Research is continuing on cultural affiliation and social dynamics in this active frontier zone.

4. Household and Community Ritual

Archaeologists have learned much about ritual at the elite level of Mesoamerican society by study of monumental architecture, tomb burials, hieroglyphs, stelae, murals, and polychrome ceramics. Not surprisingly, little is known about ritual at the household and community level in Mesoamerican prehistory, largely due to poor preservation. Fortunately, Ceren presents an opportunity to examine the material evidence for ritual at these two levels.

The ethnographic and ethnoarchaeological literature provide comparative and analogical material.

Rituals in many traditional southern Mesoamerican communities are practiced on three levels: the household, the community or village, and the ceremonial center. Zinacantan is a well-described example (Vogt 1990). The ceremonial center of Zinacantan has an annual round of rituals that are operated by the formal hierarchy of religious cargo holders. They center on the largest structure in the region, the Church of San Lorenzo, and its large plaza. That church is cognitively and physically located in the center of the five sacred mountains that help define the ritual universe. Most of the Zinacantecos live in villages and hamlets scattered across the countryside; they attend the major ceremonies at the church and plaza when appropriate.

At the household and village level, the ceremonial practitioners who carry out rituals outside of the ceremonial center are the "*h'iloletik*" or "shamans", literally translated as "seers" (Vogt 1990). The shamans perform ceremonies for curing illness, for agriculture, to dedicate new houses, for rain making, to assist the new year renewal, and various lineage and waterhole rituals. Over 2% of the economically-active population of Zinacantan are shamans, of whom almost a third are female. Female shamans are active principally in curing ceremonies. Shamans utilize various specific items for rituals, some of which are stored in their houses, including censers and copal incense, candles, food and drink with their containers, sacrificial chickens, staffs, ceremonial clothing, flowers, and musical instruments. Few shamans are full-time specialists, and thus their households also contain the artifacts common in non-shaman households. Shamanistic curing rituals often involve sweatbaths, frequently taken in series over a few days.

Ritual bloodletting by household members is still practiced in many traditional Maya communities using fractured glass slivers instead of obsidian (Deal and Hayden 1987). Many elements of the bloodletting reflect a long tradition. Percussion blows to the bottle "core" detach glass slivers, most of which are hand held. Very few are hafted. Fractured glass pieces are segregated into utilitarian and ritual implements. The bloodletting shards are consistently curated in elevated and protected contexts, often in bags hanging from walls, on high shelves, or with the rafters (ibid:290). Households for which bottle glass is expensive used the same bloodletter many times, and kept it in a cloth bundle hung high in the house between uses. Minor bloodletting is done at home, but major problems involve a shaman and often a special sweatbath or sacred location with the curative bloodletting (ibid:254ff). Manufacture and use of fractured glass tools are strongly male-associated. Special care is often taken to discard manufacturing waste and used bloodletters in isolated locations where people are not likely to injure themselves.

Ethnographically, other artifact categories have utilitarian and ritual versions. For instance, deer antlers can be fashioned into "*tapiscadores*" used for de-husking ears of maize (Hayden and Cannon 1984). They are frequently mis-identified by archaeologists as awls. Alternatively, deer antlers can be used in ritual as symbolic of sacrifice and of deer and the forces with which they are associated (Mendelson 1958).

Using traditional Maya communities for analogs does not indicate that we believe the Ceren residents were Maya. Groups such as the Lenca and Xinca lack sufficient ethnographies for detailed analogs. What is known about Lenca shamanism (Stone 1948:216) is similar to that described here.

Households can participate in ritual activities on three levels: regional, village or multi-household, and within the household. Ceren residents probably participated in regional ritual activities by traveling to the primary regional center of the Zapotitan Valley, San Andres. The recent research at Ceren has found evidence of what may be village or multi-household ritual in Structures 10 and 12. The ladle incensarios found in each Ceren household excavated to date may be evidence of intra-household ritual activity, and it is possible that prismatic blades found in households were used in bloodletting activities. That hypothesis is being tested by analyses for hemoglobin that currently are underway.

The analog proposed here is that the structured, centralized religious organization of the Zinacantan ceremonial center is at least roughly comparable to that of the primary regional center of San Andres, five kilometers southwest of Ceren. Structures 10 and 12 may represent a village level of ritual, in the shamanistic and religious sodality traditions. These buildings are described in detail and interpreted in chapters below. The third level of ritual that could be documented at Ceren is within the household, probably represented by censers, and possibly obsidian blades.

5. Biomedical Research

The biomedical team, consisting of Dr. Marc Micozzi (Director of the National Museum of Health and Medicine) and Dr. Frank and Julie Saul (Medical College of Ohio) will analyze human remains if and when they are encountered. If human remains are encountered, data on gender, age, health status (including pathology and nutrition), body build, and other characteristics will be sought. Research to date suggests that Ceren residents fled immediately prior to the emplacement of Unit 1 or during the deposition of Unit 2. It is probable that they "headed south" both figuratively and literally. How far they got is unknown.

6. Gender Issues: Sexual Division of Work

Evon Vogt (1990) found a clear conceptual and behavioral segregation of work areas by sex within Maya households at Zinacantan. Female activity and storage areas clustered around the hearth, while male work and storage areas were located at the other end of the house. Agricultural fields consistently are male-associated. A few areas combine male and female artifacts and activities. That pattern is widespread in SE Mesoamerica, both ethnographically and ethnohistorically. I have observed the same pattern in traditional households of contemporary El Salvador, Honduras, and Guatemala. Wisdom (1940) documents the practice in considerable detail for the Chorti occupying the southeastern Maya area. The contemporary Chorti not only sexually subdivide individual structures, they often use multiple structures per household which are specialized to activity and gender. Numerous scholars are researching the roles of females in Precolumbian societies (e.g. Miller 1988).

Identification of work areas by sex from the excavations to date at Ceren indicates a segregation similar to the above sources. Most activities performed within the domicile buildings (Structures 2 and 7; Figure 4) probably were female associated, including spinning, pottery making, and food storage-processing-serving. The elevated adobe benches probably were used as family activity areas and food consumption during the daytime, and for sleeping at night. Structure 5, the ramada-like building with its obsidian scatter, and the maize fields near the households, probably were male daytime activity areas. The *bodegas* (Structures 6, 7, and 4) and the kitchen (Structure 11) probably were female-associated. Activity areas can be analyzed utilizing the archeological, ethnographic, and ethnoarcheological techniques developed by Kramer (1982) and Kent (1984). Structures 3, 9, 10, and 12 have unknown gender associations.

7. Discard Behavior

Discard behavior is a crucial component of formation processes of the archaeological record (Schiffer 1987). In most archaeological sites, abandonment and post-abandonment processes affect refuse disposal. Most sites were gradually abandoned, giving people time to remove valuable and useful items. The result is the majority of artifacts that remain at archaeological sites, to be recovered by archaeologists represent trash (Stevenson 1982). This severely limits comparisons between artifacts that were in use and artifacts that were discarded, but it is important for archaeologists to understand the relationships between trash categories and artifacts in their original systemic contexts. Ceren has the full inventory of artifacts that were in use immediately before the eruption, "frozen" in their systemic context, as well as the discarded artifacts that had entered the archaeological record as trash before the eruption. Ceren even allows us to study artifacts that had been obtained by a household but not yet put into systemic context, such as the bundle of pristine obsidian blades kept near the peak of the thatch roof for future use.

Detailed comparisons of the in-use assemblage and discarded artifacts will reveal recycling and secondary use as well as primary and secondary refuse deposits. Reid and Shimada (1982) have tried to use ratios of decorated to plain pottery and vessel sizes as indications of modes of abandonment; Ceren data provide a baseline for similar studies in southern Mesoamerica. Variation in the durability or use-life of artifacts should be represented by differences in ratios within systemic versus archaeological contexts. For instance, a lower percentage of the total number of metates, a long use-life artifact, should be found in the midden than artifacts of shorter duration. An insight from 1992 midden analysis is that most prismatic blades were discarded because they snapped during use, into fragments that were too short, not too dull. That contradicts most archaeologists' expectations that prismatic blades would have been discarded because use resulted in excessive edge dulling.

E. The Objectives of the 1993 Research Program

The research program for the 1993 field season was subdivided into 10 scheduled components. These are the field and laboratory activities to generate data pertinent to the research objectives and issues described above. The following chapters describe the achievements in each of these categories.

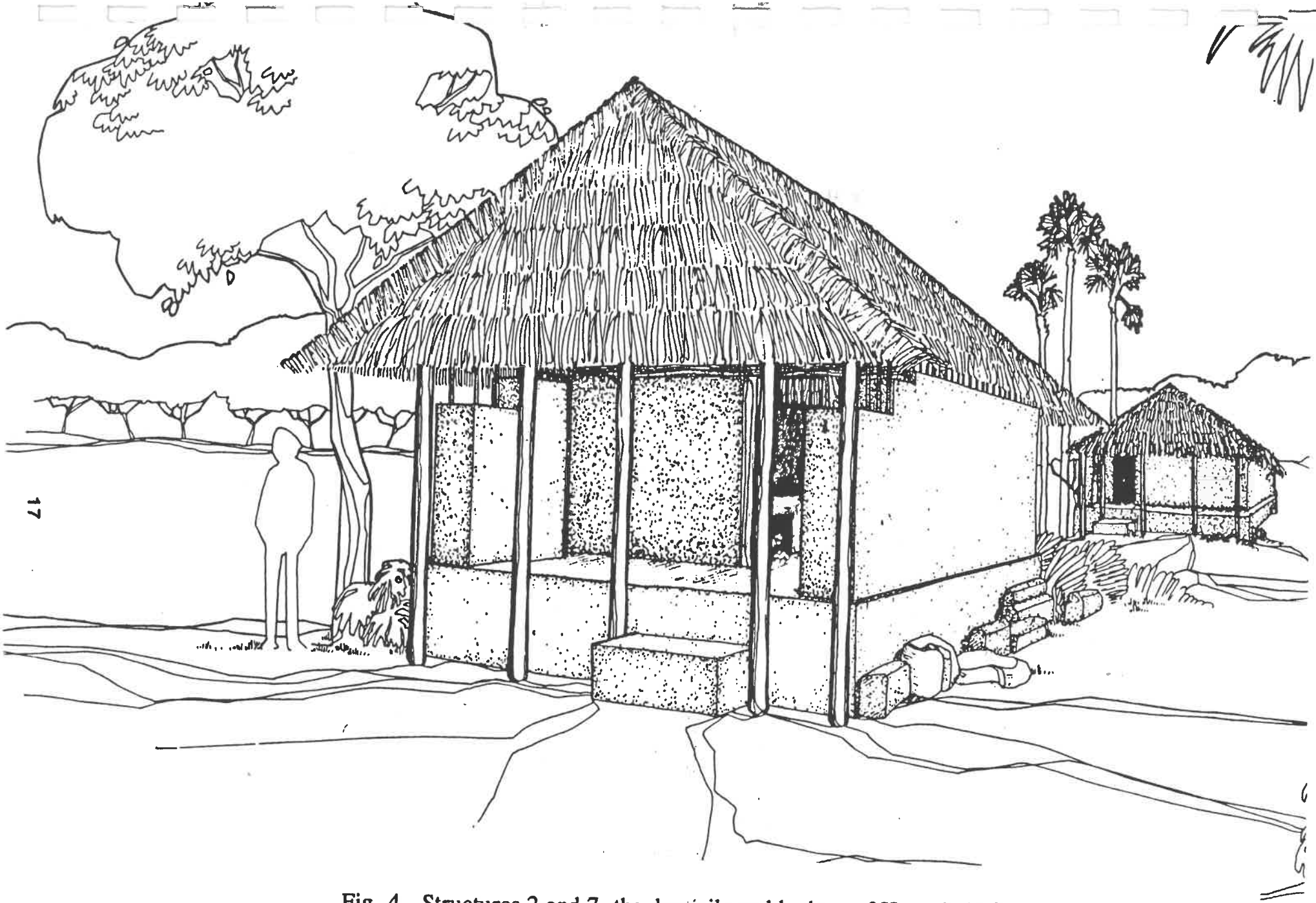

Fig. 4. Structures 2 and 7, the domicile and bodega of Household 2. Drawing by Karen Kievit.

1. **Preliminaries**

The first phase of the research program involved basic logistics including purchasing equipment and supplies, notifying authorities, re-establishing the laboratory and living facilities, establishing the season's artifact processing and documentation systems, and hiring workers.

2. **Geophysical Survey & Testing**

The geophysical survey will be directed by Frank Miller and James Doolittle during February and March of 1994. In previous years the geophysical research program at Ceren has successfully located anomalies under 5-7 m. of tephra using refraction seismography, resistivity, electromagnetic induction, and ground-penetrating radar (Sheets, Loker, Spetzler, and Ware 1985; Loker 1983, and Ceren preliminary reports). Three of the earliest anomalies detected in geophysical exploration at Ceren were confirmed as prehistoric structures by core drilling, and two were excavated in 1989. They are the domicile structures of Households 2 and 3 (Figure 4). The other anomaly, confirmed as the *bodega* of Household 4, is Structure 4 on Figure 1. Curiously, some other structures are large enough to have been detected by the geophysical instruments, such as Structure 9, but were not.

One result of the 1992 geophysical research is the realization that the most appropriate instrument for the survey south of the known site is the electromagnetic induction EM31 instrument, as it profiles between 2.75 and 6 meters in depth. It will be utilized to survey the 4 hectares to the south of the already-surveyed area. Strong geophysical anomalies will be testpitted to determine their nature, and they will be mapped as structures when confirmed. Anomalies detected by EM and confirmed by testing will be considered for excavation during anticipated future field seasons, in the context of a comprehensive conservation and site development plan. It is essential to know if settlement density increases, decreases, or remains constant to the south and west of the known site. An increase in housing density may indicate the direction of the site center. Given the known Salvadoran settlement patterns in the Middle Classic (Sharer 1978, Black 1983), it is conceivable that a small ritual and commercial center, with intact pyramids, temples, residences, and a market, is preserved under the few km^2 buried by the Loma Caldera tephra.

3. **Probable Village Ritual Focus: Structures 10 and 12**

The general comparative context for Ceren households and ritual includes ethnographically known Lenca (Stone 1948) and Chorti Maya households (Wisdom 1940), contemporary settlements in the Maya highlands and lowlands (e.g. Wauchope 1938, Vogt 1990), the rapidly expanding literature on domestic structures in Copan and environs (Webster and Gonlin 1988, Gerstle 1988), traditional housing and activity areas in contemporary rural villages of El Salvador and adjoining countries, and ethnographic and archeological remains of houses from other areas in Mesoamerica and the Intermediate Area. The Ceren structures share certain widespread Mesoamerican characteristics including prepared clay floors, wattle and daub (*bajareque*) walls, and thatch roofs (Flannery 1976:15). These structural characteristics, with four corner posts and floor areas of 24-35m^2, are

common in Mesoamerica even by the Early Formative. The strongest similarities in Ceren architecture and use of space are with Copan, particularly its more central areas.

The interior room of Structure 10 was excavated in 1993. One large ceramic vessel was discovered in 1992, but not lifted, in the southwest corner of the room. Other artifacts were found this season, including shaped deer scapulae and ceramic vessels, but no benches. The architectural surprise of the 1993 season is the elaborate wall enclosing a sizeable area to the east of the Structure 10 platform. It enclosed an area for short term storage of food, along with food preparation and serving areas and items. The area also included two 3-stone hearths and an elevated metate with a vessel at its lower end to catch the ground *masa*. Andrea Gerstle describes and interprets the structure and its artifacts below.

Although Structure 12 was largely excavated during 1990, the northern portion could not be excavated because it extended past a property boundary. That was recently resolved, and the northern portion of the building was excavated in 1993, for conservation and research purposes, and to make it visible to the public.

The analysis of artifacts from the 1993 excavations of Structures 10 and 12 is clarifying the functioning of those structures. The artifacts excavated from Structure 12 are not a functioning household assemblage. Rather, it appears that individual artifacts were brought to the structure and placed in various locations such as niches, wall tops, column tops, on the lintel, or on the floor. Many showed signs of having been used and curated for long periods, some even after having portions broken off. I suspect that most of the objects left in Structure 12 had more personal value than intrinsic worth. Most of them would not, I think, be effective items for exchange purposes in a transaction motivated by economic aims.

Some of the chipped stone, groundstone, and ceramic artifacts from Structure 10 are similar to those in households, yet others are unique, such as certain ceramics, deer scapulae, and a deer skull headdress. The deer skull, complete with two antler tines, had been painted red and white, but much paint had worn off. It also had a string running over the top, probably used for attachment to a religious specialist's head. Unusual ceramics included a large polychrome alligator vessel and a pot with a human effigy face on the handle. This may be a structure belonging to a religious association that stored ritual paraphernalia there. They also stored some food, and prepared it for ritual participants. In addition, they dispensed considerable amounts of heated liquid for the participants. The liquid probably was not water, as it was cooked on the 3-stone hearth. It may have been a maize-based beverage.

If bloodletting was practiced by household members at Ceren, the instrument of choice must have been the obsidian prismatic blade. Organic preservation at Ceren is sufficient to test blades to see if human hemoglobin remains on them. The techniques for removing organic residues from prismatic blades, which are nondestructive to the artifacts, are those developed by Margaret Newman, University of Calgary.

4. Midden Excavations

Until recently, no middens have been found at Ceren, only dispersed discarded sherds and lithics in fields beyond household structures. However, the discovery of a midden in the southwest corner of Operation 2 provides the opportunity for stratigraphic excavation and detailed analysis. The midden is in a depression in the pre-Ilopango eruption clay-laden soil that may have been a borrow pit for earthen architectural building material, common in prehistoric and contemporary societies (Hayden and Cannon 1983). Because artifacts vary considerably in their use, breakage, and discard rates, comparing artifacts in the midden with those in households can indicate those differences. And, establishing ratios of midden to household artifacts can give a sense of what household artifacts were like at sites where only midden artifacts were excavated.

5. Botanical Research

David Lentz is responsible for identifying botanical remains, including plant casts, carbonized remains, and pollen. Maria Luisa Reina de Aguilar, Director of the Jardin Botanico, has provided biological expertise, laboratory space, specimen curation, and access to reference collections. As can be seen from the Paleoethnobotanical chapter below, the list of species confirmed at Ceren is long, and growing.

The cultivated fields were sampled for pollen. The objective is to identify cultigens planted in the growing seasons preceeding the Loma Caldera eruption. Because that eruption occurred at the middle of the growing season, probably in August, it is likely that not all crops had been planted, including beans and/or squash. Soil samples will be taken from the swales and directly beneath the ridges. Although pollen is poorly preserved at most Salvadoran sites, because of post-depositional abrasion and low soil pH, protection during the past 1400 years by 5-7 m. of tephra may mitigate these factors. Samples were also collected from each square meter excavated for flotation. Float samples were separated into the heavy fraction and the light fraction. Sample analysis is proceeding this academic year.

6. Volcanological Research

Volcanological fieldwork is conducted under the direction of Dr. C. D. Miller. The stratigraphic sequence of eruptive components at Ceren is well known from Miller's previous research, but the sourcing and distribution of the Loma Caldera tephra are less clear until recently (cf. Hart 1983, Hoblitt 1983, Miller 1992). It was thought that the tephra which buried Ceren about AD 600 came from Laguna Caldera, but 1992 regional research on the Ceren tephra units indicates that most came from a source immediately south of Laguna Caldera, named Loma Caldera. The 1993 regional data confirmed Loma Caldera as the source of the volcanic materials that entombed Ceren. Field activities included mapping and characterization and differentiation of eruptive units and measurement of critical "type" stratigraphic sections. These data are allowing more detailed assessments to be made of the physical characteristics of the eruptions that buried Ceren.

Specifically, volcanological research included the following three activities. (1) The isopach map of the Ceren sequence was refined by describing more locations where the tephra sequence was equivocal or coverage was sparce. In areas with few or no exposures, small tephra test pits were dug. This clarified how far the NW lobe of the tephra extended.

(2) The stratigraphic details of surge and fall deposits near Structures 10 and 12 were examined, to determine the relationships between eruptive units and the structures being buried. (3) Other sections exposing Loma Caldera units were examined and recorded.

7. Objects and Architectural Conservation

The exceptional preservation qualities of the Loma Caldera tephra, particularly Units 1 and 3, provide unusual opportunities to recover artifacts that are rare or unheard of in the moist tropics of southern Mesoamerica. These include baskets, painted gourds, string, twine, cloth, various seeds, fences, doors, roofing elements, shelves, flowers, small animals, and a wide range of plants and trees. Holly Lundberg, the intern trained for a year by Harriet Beaubien at the Conservation Analytical Laboratory of the Smithsonian Institution, assisted with the recovery of fragile artifacts, their treatment, and help with long term curation of the objects by the Museo Nacional David J. Guzman. She was on-site for the full 1993 field season.

Architectural conservation is conducted under the guidance of the Advisory Committee, and coordinated with officials in the Ministry of Education and CONCULTURA. Architectural conservation is achieved in the field by a well-trained crew of 15 Salvadorans, under the direction of Victor Manuel Murcia, hired by the ministry, and permanently assigned to the site. Their experience has demonstrated that excavated structures need at least two meters of "breathing space" around them to avoid excessive moisture within the building. A building that is excavated with little or no exposed ground surface around it will absorb considerable moisture from below, and as that evaporates from the building, salts are left behind. In contrast, the excavated building with a few meters of original ground surface exposed around it will remain dry, as the moisture evaporates from the surrounding ground surface, greatly facilitating long-term conservation.

8. Biomedical Research

Margaret Newman at the hemoglobin laboratory, Calgary University, has agreed to conduct analyses on samples removed from prismatic blades to determine if any show evidence of human blood. Most of the 29 samples were negative to animal or human hemoglobin testing, but five of the blades sampled did test positive. Two were positive to deer (295-1-43 from the roof thatch above Area 3 of Structure 1, and 1-233 was found in the roofing thatch of Str. 11, the kitchen of Household 1). It is not too surprising to find deer confirmed, given the large numbers of deer bone implements in the site. It appears that Household 1 members at least occasionally ate deer meat, given the blade found with deer hemoglobin in the kitchen. The blade from Structure 1 with deer hemoglobin came from the craft-oriented room added onto the structure's east side, so it is more likely to have been used for cutting skin for leather or perhaps internal elements for various uses. Two blades were positive to dog (295-8-370 from the Household 1 patio just east of Structure 1, and -8-250 a discarded blade fragment from in the same household's patio just east of Structure 6).

It appears that people were eating dog meat, although use of other internal components is possible. The other positive is from a blade found stored with roofing material, but not in the thatch, over the east wall of Structure 10, 295-8-451. It probably was stored on top of a rafter. It tested positive for human blood. It is probable that it was

used in human blood sacrifice, although it is conceivable that it could have inadvertently cut someone who was using it to cut something else, or it could have accidently cut someone during its manufacture. In addition to these analyses, Marc Micozzi at the National Museum of Health and Medicine, with Frank and Julie Saul, have agreed to assist in forensic anthropology, in the event human remains are discovered.

9. **Final Activities**

The final activity of the 1993 field season was writing reports in Spanish for the Museo Nacional, prior to the departure of each research team member from El Salvador. The Museo requires each foreign researcher to write and translate into Spanish a report of their activities and results. In addition to satisfying contract obligations, having each person write a substantial report has a salutary effect on production of the final published manuscript. It solves a common problem of integrated interdisciplinary research, i.e. the intellectual gridlock that can occur when each person's work is waiting for the data and initial interpretations from a number of other project researchers.

F. **Summary**

Explosive volcanism twice affected human settlements in the Zapotitan Valley during the first millenium A.D. The catastrophic eruption of Ilopango Volcano, which probably occurred during the summer of AD 175, largely eliminated human settlement for c. 200 years, at least in lowlying areas. However, recovery of soils and vegetation was followed by human reoccupation by the 5th or 6th Century. The colonists, likely Maya, Lenca, or a combination, established large ritual-habitation centers, large and small villages, and agrarian households. Loma Caldera Volcano erupted explosively at about AD 600, when basaltic magma contacted water and began a series of steam explosions and vertical blasts. The hot and rapidly-moving clouds of gases and volcanic ash quickly buried a few square kilometers, preserving Classic Period households exceptionally well.

During the 1993 season, the Ceren project excavated the remainder of two structures that may have been used for village ritual, and continued research in a midden. The project is investigating possible use of prismatic blades for human blood sacrifice. The research is primarily synchronic, but it will be related to the changes in households over time and to the processual framework of cultural and ecological change in the Zapotitan Valley and in the region. Interdisciplinary research focused on the extraordinary preservation of organic materials, houses, artifacts, activity areas, and agriculture continued to yield unusually detailed information on households and how they adapted to their natural, social, and religious landscapes in the 6th century A.D.

Acknowledgements

I want to express gratitude to Scott Simmons for a very thorough read of an earlier draft of this chapter. His sharp eye and even sharper red pencil have improved it considerably. The US National Science Foundation, with grant # DBS-9305791, supported the field and laboratory research reported in the following chapters. Their benevolence and benificence are greatly appreciated.

Salvadoran workers, officials, and volunteers are too numerous to mention individually here. On behalf of all project staff, we wish to express our sincere appreciation for many long hours, under occasionally uncomfortable conditions, working toward a common end. That end is to give the Ceren site the longest possible future. Its past was magnificent and most unexpected, its present is spectacular, and it deserves a bright future.

Vessel 295-2-388, Inside. By Ted Fitzkee.

Chapter 2.

SUMMARY OF 1993 GEOLOGICAL INVESTIGATIONS AT JOYA DE CEREN

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Introduction

Ongoing geological/volcanological research at the Ceren Site is designed to complement archaeological and other research by providing a stratigraphic framework and context for archaeological and other investigations at the site, to provide information about the character of the eruptions that destroyed and buried structures at the site, and to provide details about the source and distribution of the eruptive sequence that mantles the site. The goals of the 1993 field season were to: 1) reconfirm Loma Caldera volcano as the source of the deposits that buried the Ceren site; 2) to add additional data points and refine the isopach map of Loma Caldera deposits, particularly to the west and northwest of Joya de Ceren; and 3) to describe and evaluate stratigraphic details of the relationships between eruptive units and structures excavated during the 1993 field season. I gratefully acknowledge assistance in the field by Brian R. McKee and Eduardo Gutierrez, Centro de Investigaciones Geotecnicas, El Salvador, during the 1993 field season. I also thank Payson D. Sheets for making additional field observations at Ceren during fall, 1993, to help constrain the timing of ground cracking that was found during the 1993 field season.

Revisions to the Loma Caldera Isopach Map

During the 1993 field season 16 new data points were added to the 1992 isopach map of fragmental deposits from the Loma Caldera eruption (Figure 1). All of the new data points are located west of the highway from Sitio del Nino to San Juan Opico and their sites were picked to help better define the distribution of the Loma Caldera eruptive sequence to the south, west, and northwest of the Loma Caldera vent. In addition to establishing new stratigraphic sites, numerous stratigraphic sections from the 1992 field season were revisited to re-check identification, thickness, and characteristics of deposits, and to compare described sections with new stratigraphic sections described during 1993.

In the course of determining the distribution of distal parts of the Loma Caldera sequence to the west of Ceren, six new stratigraphic sections containing the San Andres Talpetate tuff (Hart 1983:48-50) were located and described. According to Hart (1983), the San Andres Talpetate tuff originated during explosions from the crater of El Boqueron. The fine-grained character of the deposit combined with the presence, closer to source, of accretionary lapilli suggested to Hart that the eruption occurred through a crater lake. Stratigraphic sections observed during this study that expose the San Andres Talpetate tuff are all located south and southwest of the village of Joya de Ceren. Two stratigraphic

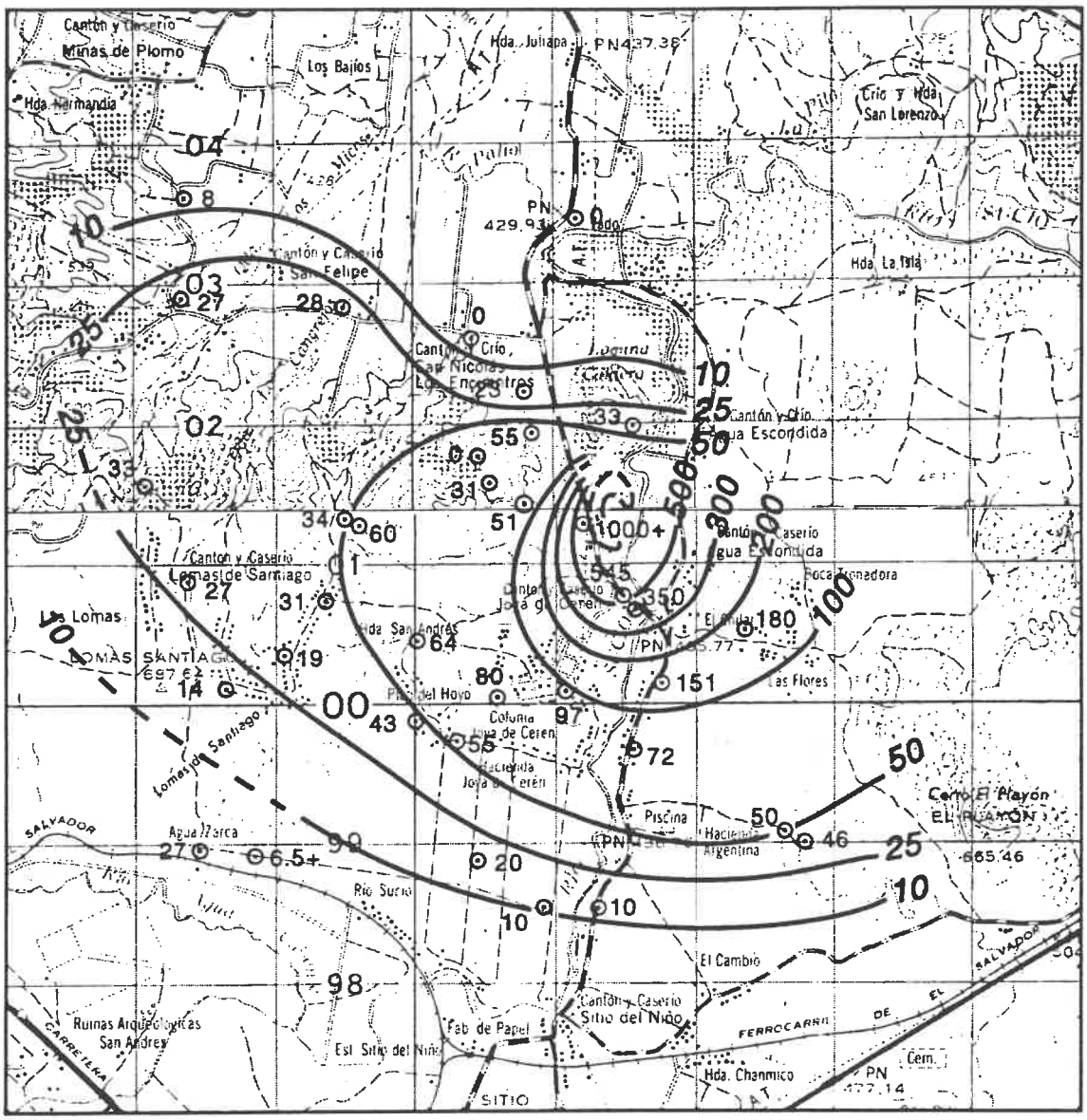

Figure 1 Isopach map showing distribution and thickness of the Loma Caldera eruptive sequence. Thickness contours in centimeters. Circled points mark locations of stratigraphic sections used to construct the isopach map. Numbers adjacent to circled points represent thickness in centimeters of the Loma Caldera deposits.

sections, (D-37, D-38), contain both the San Andres Talpetate tuff and the Loma Caldera eruptive sequence. Distinguishing physical characteristics, summarized below, normally allow distinction of thin distal sections of the Loma Caldera sequence from the San Andres Talpetate tuff.

Characteristics of Distal Sections of Loma Caldera Sequence

The Loma Caldera sequence is located directly on top of the weathering profile developed on the *tierra blanca joven* (TBJ). The Loma Caldera sequence normally consists of brownish, massive to laminated, accretionary lapilli-bearing surge beds interbedded with dark gray scoria bearing ash- or lapilli-fall beds. Surge beds are typically not well sorted and are strongly indurated and very hard, suggesting that they were emplaced wet. The top surge units of the Loma Caldera sequence typically are oxidized to a reddish brown color. The oxidation, a consequence of soil-profile development that occurred prior to deposition of younger tephras, may extend up into a colluvial soil horizon that lies above the Loma Caldera deposits.

Characteristics of Distal Sections of the San Andres Talpetate tuff.

The San Andres Talpetate tuff sits stratigraphically above the Loma Caldera sequence and its soil, and beneath the younger El Playon tephra deposits. The San Andres Talpetate tuff is separated from the Loma Caldera sequence by a colluvial organic-rich soil horizon that typically is oxidized to a reddish-brown color near its base. The San Andres Talpetate tuff consists of several massive to laminated, light olive gray- to tan-colored silt beds. The silt beds are well-sorted, may be graded, and are usually indurated. As was noted by Hart (1983), individual beds are outlined by iron oxide stains. Lowermost units in the San Andres Talpetate tuff contain abundant casts of organic remains of plants. No accretionary lapilli or scoria- rich beds were identified in the distal San Andres Talpetate deposits examined during this study, although they apparently occur closer to source (Hart 1983).

Loma Caldera Isopach Map

Addition of new data points to the isopach map of the Loma Caldera sequence has provided more information about the distal part of the northwest-trending "tail" of the sequence, but has made only minor alterations to the general shape of contours on the isopach map produced during the 1992 field season (Figure 1). The 10, 25, and 50 cm. contours have moved slightly, but contours of thicker parts of the sequence remain the same as they were when the isopach map was first completed during the 1992 field season. Although, in general, the thickness data points of the Loma Caldera sequence can be easily contoured, there are two areas on the isopach map where anomalous thickness measurements do not fit the map contours. The high area around, and to the north, of Cerro El Chichipate, west northwest of Loma Caldera, has anomalously thin accumulations of the eruptive sequence (Figure 1). The deposits at these locations are anomalously thin, probably because

surges did not have the energy to reach the top of the hill, or because surge clouds were fluid and flowed off steep slopes without leaving deposits. An anomalously thick section of the Loma Caldera sequence near Agua Zarca, south of Lomas de Santiago, may reflect flowage of the wet Loma Caldera surges into a topographically low area, resulting in an anomalously thick deposit. Alternatively, the section near Agua Zarca may include both the Loma Caldera and San Andres Talpetate deposits without the intervening colluvial soil, which does not allow them to be differentiated.

Significance of Loma Caldera and TBJ deposits at the Brigada de Artilleria Tte. Cnel. Oscar Osorio.

About 55 cm. of the Loma Caldera sequence is exposed in stratigraphic sections on the military base west of Laguna Caldera. The sequence consists of several interbedded phreatomagmatic surge beds and scoriaceous lapilli-fall deposits. Under the Loma Caldera sequence is 52 cm. of TBJ with a thick, partly colluvial soil at its top. Under the TBJ is a deeply weathered old volcanic sequence from an unknown source. This older sequence of pyroclastic-surge and -fall deposits may be the same as the section of old volcanics exposed at the summit of Cerro El Chichipate. The presence of a very thin (55 cm.) Loma Caldera sequence only 500 m. from the Laguna Caldera vent confirms the fact that Laguna Caldera did not produce the sequence of volcanic deposits that buried the Ceren site. If Laguna Caldera was the source of the deposits that buried the Ceren site, the deposits would be much thicker than 55 cm. at this location. Furthermore, the presence of the underlying TBJ in stratigraphic sections at the military base indicates that the Laguna Caldera vent has not erupted significant deposits (no deposits that reached these locations) since about AD 260, the date of the Ilopango eruption.

Stratigraphic Relations at Structure 10, Operation 8

Relationships between eruptive units and structural elements of Structure 10 were determined by detailed examination of excavations north, south, and within the eastern half of Structure 10. Stratigraphic relations reveal the following sequence of events, beginning with Unit 1:

1) One to five cm. of Unit 1 surge deposits accumulated on the floor of the east platform of Structure 10. Part of the east wall between the north and central exterior columns appears to have been destroyed during Unit 1 surges, an unusual occurrence at Ceren, where most evidence suggests that Unit 1 surges were not particularly destructive. The force of Unit 1 surges may have been concentrated at this location as surges were "funnelled" between the Feature A (the wall N of Structure 10) and the north wall of Structure 10.

2) As the roof of Structure 10 collapsed, roofing thatch was deposited on top of thin Unit 1 surge deposits, which covered the floor over much of the east porch of Structure 10.

3) Unit 2 scoria lapilli and bombs were deposited on top of roofing thatch in the eastern half of Structure 10. Unit 2 varies in grainsize and thickness on the east porch of Structure 10, and commonly is associated with burned and charred roofing thatch and roof-support beams, especially where scoria bombs were large and hot.

4) Additional roofing thatch is deposited on top or near the top of Unit 2, particularly, west of and close to the central exterior column, and to the south and southeast of the central exterior column.

5) Early during deposition of Unit 3 the Feature B wall, between the southeast column of Structure 10 and the south exterior column, was knocked down toward the northeast.

6) Following deposition of about 18 cm. of Unit 3 surges, the East Facade wall and the west half of the south wall of Structure 10 were knocked down. The East Facade wall was "lifted" right off the platform when it fell toward the east.

7) The remaining 25 cm. of Unit 3, and later eruptive units through Unit 7, were deposited upon the Eastern Facade wall and upon the west half of the south wall before the east half of the south wall of Structure 10 was "tilted" toward the south by the force of the eruption.

Structure 10 is somewhat unique with respect to deposition of Unit 1 inside the structure, removal/destruction of roofing thatch during Units 1 and 2, and damage to different walls during deposition of Units 1, 3, and possibly Unit 8. The roof of Structure 10 was removed early in the eruptive sequence, compared to events at most other structures, and surges caused damage to walls of the structure at several times during the eruption.

Exposures of Unit 3 on the west side of Structure 10 reveal evidence for a brief period of surface-runoff erosion that occurred near the end of the Unit 3 eruptive episode. Twelve centimeters below the top of Unit 3, the top of a muddy surge deposit displays a series of small post-depositional erosional rills. The surface and bedding of Unit 3 slope to the west due to differential accumulation of unit 3 against the west wall of Structure 10. The slightly eroded surface near the top of Unit 3 displays a fan-shaped series of rills about 0.5 to 1 cm. deep and 1 to 2 cm. wide. The existence of erosional rills near the top of Unit 3 indicates that a brief rain-shower-induced erosional episode occurred near the end of deposition of Unit 3. A similar rain-induced erosional episode occurred at the top of Unit 3, as was documented during the 1992 field season (Miller 1992).

Anomalous Accumulation of Unit 8 in Operation 2

In the southwest corner of Operation 2, Unit 8, the "*capa dura*," is anomalously thick, which may indicate post-depositional thickening due to flowage and thickening of saturated phreatomagmatic surge deposits which constitute the layer. In the north and east walls of Operation 2, Unit 8 typically is 10 to 18 cm. thick, where it consists of massive to faintly bedded matrix-rich ash and lapilli beds that are strongly indurated. At most locations at the Ceren site, Unit 8 averages 18 to 20 cm. thick. In the southwest corner of Operation

2, where the upper surfaces of the TBJ and Units 1 through 7 slope toward the southwest, Unit 8 thickens to about 85 centimeters. There, the basal part of Unit 8 consists of a 3 cm-thick accretionary lapilli-rich fine ash surge bed overlain by 11 cm. of well-sorted gray ash. The upper part of Unit 8 consists of about 70 cm. of very indurated, poorly sorted blocks and lapilli in an ash matrix. The texture and induration of the upper part of Unit 8 at this location resemble characteristics of a debris flow or lahar. The upper part of Unit 8 appears to be reversely graded with respect to large scoria clasts, which appear to have preferentially "floated" to the top of the unit. At this location the top of Unit 8 is nearly horizontal, or slopes slightly toward the northeast. Thus, Unit 8 was apparently fluid enough to allow flotation of low-density clasts and it has partially filled a topographically low area southwest of Operation 2.

The debris flow-like character of Unit 8, combined with the fact that scoria bombs "floated" toward the surface suggest that, at least the upper 70 cm. of Unit 8 accumulated by flowage at this location. Unit 8 water-saturated debris may have flowed under the influence of gravity from sloping, topographically high areas within Operation 2, to its present location, filling a topographic low. Thus, exposures of Unit 8 in Operation 2 suggest that Unit 8 was deposited wet, or was saturated soon after deposition, accounting for its extremely indurated character at Ceren.

Faulting of the TBJ in Operation 8: Evidence for Seismicity associated with the Loma Caldera eruption?

A series of linear to arcuate fissures and small normal faults exposed at the top of the TBJ (occupation surface) north and northeast of Structure 10 and north of Structure 12 suggest that faulting/slumping of the west bank of the Rio Sucio occurred immediately prior to, or during the eruption of Loma Caldera volcano. It is possible that the faulting occurred as a consequence of ground motion(s) associated with seismic activity that are likely to have preceded and accompanied the eruptive activity.

Fissures and faults north of Structure 10 form a series of en echelon features trending from 330° at the westernmost feature to 356° at the easternmost feature. Individually, the features range from slightly longer than 1 m. to about 3.5 meters in length. Fissures range in width from 1 cm. to about 20 cm. where eroded, and in depth, from a few centimeters to more than 20 cm. Fissures are always deeper than they are wide. Most fissures/faults individually display vertical displacements, down to the east, of 1 to as much as 5 cm. No examples of faults with displacements down to the west were identified. In the area where the fissures are exposed, the TBJ ground surface is nearly level and the fissures could not have been formed by erosion by water, although two of the features were temporary channels for runoff of water, as indicated by the presence, in erosion-widened "pockets," of water-laid well-sorted sand.

On the north side of Structure 12, another fissure/fault system extends northerly from the west column at the north entry of Structure 12, for a distance of about 2 meters. The fissure/fault is slightly convex toward the west in plan view, has a maximum width of about

1.5 cm, and has a maximum vertical displacement of about 2 cm, down to the east. The southern part of this fissure extends to the foundation of Structure 12 and may have actually penetrated the Structure.

When excavated, the fissures near Structures 10 and 12 were filled with Unit 1 surge debris. Very fresh, sharp morphology of the upper edges of the fissures and faults, and the fact that they were not infilled with TBJ colluvium, suggest that the fissures were not subject to degradation by human and animal foot traffic for long before being filled with Unit 1 ejecta. There is no evidence that fissures or faults in the TBJ extended upward into Unit 1 deposits, and no fissures were seen which were not infilled with Unit 1 debris, which suggests that the fissures did not form at some time after deposition of the Ceren sequence. Furthermore, the fact that two of the fissures display evidence of slight erosion and the accumulation of pockets of water-washed sediment suggests that at least one rainstorm occurred after formation of the fissures and before burial by Unit 1 deposits. Thus, available evidence suggests that the fissures formed either shortly before the eruption began or during the earliest stages of the eruption.

The system of fissures/faults north of Structures 10 and 12 is located within about 20 meters of the top of the west bank of the Rio Sucio. The location and orientation of the features, which roughly parallel the bank of the Rio Sucio, their extensional character, and their consistent down-to-the-east displacements, suggest that the fissures resulted from slumping of the west bank of the Rio Sucio. Failure of the west bank of the river channel would have resulted in surface extension combined with downward rotation of the slump block(s), both of which would produce the kinds of features seen north of Structures 10 and 12.

It is likely that faulting and slumping of the west bank of the Rio Sucio near Structures 10 and 12, resulted from ground shaking associated with seismic activity that preceded and/or accompanied eruption of Loma Caldera volcano, located only 600 m. to the north. Movement of magma up into the vent of a volcano before and during eruptions normally produces earthquakes that are felt by inhabitants in the vicinity. Similar normal faulting, but with much greater displacement, was identified west of the Loma Caldera vent during the 1992 field season (Miller 1992). Although the timing of the fault west of Loma Caldera vent is less well constrained, it probably occurred during the eruption as a consequence of excavation of a cone-shaped crater and ground shaking.

Movements and adjustments of the ground surface, possible structural damage to their houses, and possibly, other precursory activities in the vicinity of the awakening volcanic vent, may have provided ample warning to the residents of Ceren of the cataclysm that was soon to occur, and may have given many residents of Ceren the opportunity to escape before the arrival of lethal Unit 1 phreatomagmatic surges. The frantic departure of Ceren residents during precursory earthquakes or during the earliest stages of the eruption would explain both the absence of the remains of human occupants in the structures to date, and the fact that, in their hurry to leave, residents abandoned most of their possessions.

Chapter 3. LANDSCAPE ARCHAEOLOGY IN OPERATION 8 BETWEEN HOUSEHOLD 1 AND THE STRUCTURE 10 PATIO

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Introduction

Operation 8 is a large excavation area located in the easternmost portion of the Ceren site (Figure 1). For recording convenience, the decision was made to designate all of the excavated area east of the Household 1 group, except Structure 12, as part of Operation 8. Structure 12 is part of Operation 5 (Sheets & Sheets 1990; Sheets & Simmons, this volume). The easternmost edge of Operation 8 continues to the eastern extent of the excavated area in this part of the Ceren site. This chapter will focus on the work in a portion of Operation 8. Separate reports present the results of the work conducted in the other parts of Operation 8. Gerstle discusses the results of investigations in Structure 10, and she refers to the areas immediately surrounding that building (Gerstle 1992; this volume). Sheets and Simmons report on the work in Structure 12 and the areas immediately north and west of Structure 12. These two areas outside of Structure 12 are also designated Operation 8 (Figure 1).

This chapter deals with the work that was conducted in the area that is bounded on the west by Structures 1 and 6, on the south by Structures 10 and 11, on the north by the former IRA property now bounded by the visitor walkway, and on the east by the 5E grid line (Figure 1). The 5E grid line is an arbitrary dividing line that is used soley for the descriptive purposes of this report, although this grid lines appears to us to represent a close approximation of the boundary between the Household 1 and Structure 10 patios. That portion of Operation 8 located immediately east of the 5E grid line will be discussed by Gertsle in her summary of the results of investigations in and around Structure 10 (Chapter 4 of this volume). The easternmost area of Operation 8, located directly north of Structure 12, will be discussed by Sheets and Simmons in Chapter 5 of this report. The investigations in Operation 8 began under the supervision of Andrea Gerstle on June 11, 1993, and continued to the end of July, with a crew of 15 to 20 Salvadoran workers. Archaeological investigations were begun in this area in order to accomplish several objectives.

The primary goal of the work in this area of Operation 8 was to understand how this area was used by the prehistoric inhabitants of Ceren. This was accomplished by examining the area north and east of the Household 1 group and north of Structure 10. It was hoped that excavations in this particular area would clarify the relationship or differences between Household 1 activities and the activities occurring within and around Structure 10. Structure 10 apparently was a focus of village level religious activities (Gerstle 1992; this volume).

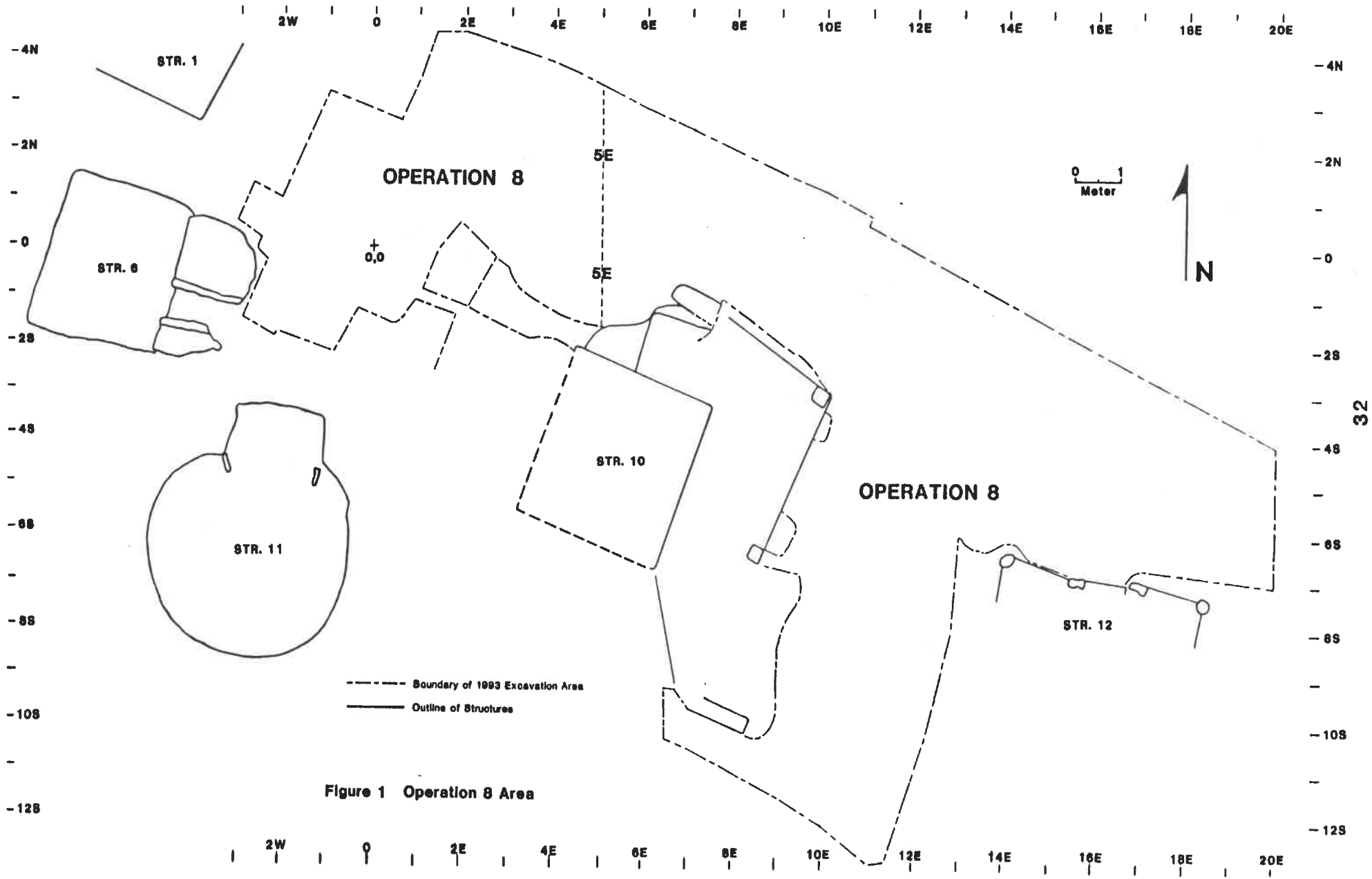


Figure 1 Operation 8 Area

Another objective was to complete the work of exposing the original ground surface of *tierra blanca joven* (TBJ) in this particular area for site visitation purposes. Exposure of the original ground surface in Operation 8 was considered important because for the first time since excavations began at Ceren, a large metal roof covered a substantial area around and between structures, allowing for greater lateral exposure of contiguous areas of the site. Therefore, excavations in this part of Operation 8 were a part of one of the principal goals of the work, to enhance visitor appreciation of and knowledge about the Ceren archaeological park.

Field Methods

This section provides a detailed description of the methods used in the 1993 archaeological investigations conducted in that portion of Operation 8 east of Household 1 (Figure 2). The procedures used in excavation, data collection and control, obtaining soil samples, and the treatment of artifacts are discussed in this part of the report. As is the case in every excavation area at the Ceren site, conservation work was integrated with archaeological excavations in Operation 8. The specific methods and results of this conservation work are described in detail in Chapter 9 of this volume.

Horizontal and Vertical Control

A transit was set up over the permanent concrete datum at 2N/5W, and a grid was laid out using the 1989 grid system (Tucker 1989). Nails with flagging tape were set every meter along the E/W baseline beginning with the 1N line. Grid lines were then established along every meter point in this area of the site.

A series of elevation markers were established in order to maintain vertical control in Operation 8. Previous elevation markers on old roof support posts were lost when the posts themselves were removed as part of the replacement of the duralite roof with the new large roof. As a result, new elevation markers needed to be re-sighted on the modern roof support posts, located along the edges of Operation 8. Permanent notches were made in several posts denoting an elevation of 444.50 meters above sea level. This elevation was determined by sighting on the 1992 season's 443.20 marker, located inside Structure 10. An elevation point of 442.57 was also established in the tephra block located near the NW corner of Structure 10. Artifacts encountered in Operation 8 were located in vertical space from these elevation points using a string and line level.

Excavation and Recording Procedures

After the project received governmental approval for continued excavation at the Ceren site this year, Salvadoran workers began removing the upper layer of Unit 3 tephra on June 11, 1993. They started east of Structure 1 and northeast of Structure 6, generally working in a W to E direction. Removal of the tephra blocks still surrounding the old steel roof posts between Structures 6 and 10 also began. One of these was located north of Structure 10 and another northwest of that same structure.

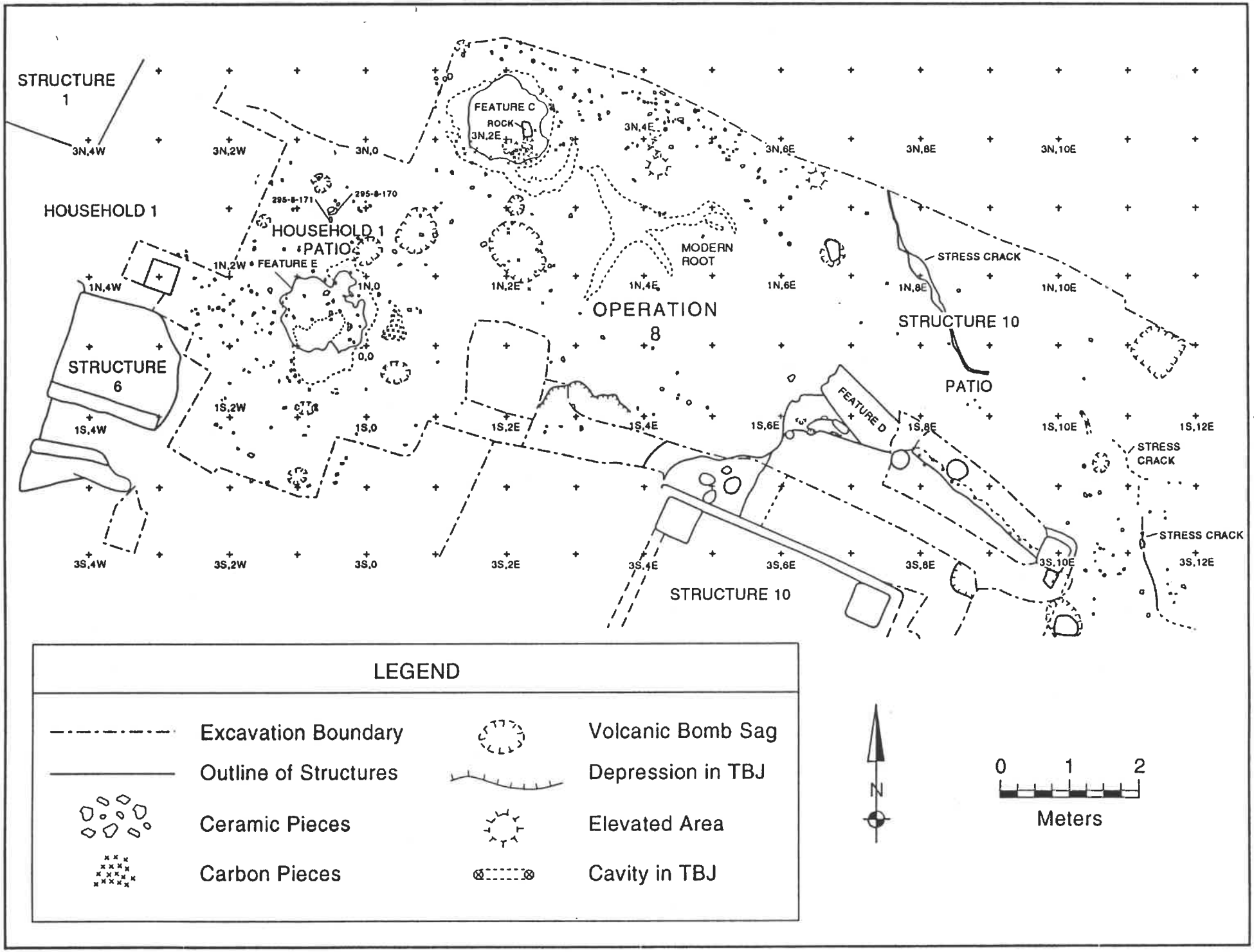


Figure 2 Surface of T.B.J. in western portion of Operation 8

Workers carefully excavated by hand the tephra of Units 1-3 sublayer by sublayer using hoes, shovels and trowels. Since the layering characteristics of volcanic ash units can indicate potentially important subsurface archaeological features, all cavities and changes in tephra contours were carefully inspected during the course of excavations. Other tools were used for excavating small, delicate materials such as the remains of roofing thatch and small animal bones. These tools included fine paint brushes, dental picks, and wooden clay-molding tools that were all used in the removal of ash.

Several recording procedures were used during the investigations in Operation 8. Field Specimen (FS) numbers were assigned to artifacts that were found during the course of excavations in Operation 8. Field specimen numbers were composed of the site number (295) first, followed by the Operation number (8) and finally the individual specimen(s) number last. Field specimen lists were kept, and information on each artifact or group of artifacts was entered on these lists on a daily basis.

There were two ways in which FS numbers were assigned to artifacts found in Operation 8 during the 1993 field season: on a group (lot collections) or on an individual basis. Artifacts resting on the surface of the TBJ were given FS numbers according to the meter square in which they were located. For instance, all of the artifacts found within 1-2N and 0-1E were given a lot FS# 295-8-219.

Field specimen numbers were also assigned to unusual individual artifacts and plaster casts of impressions or cavities. For example, an individual FS number was given to a large ceramic jar handle (295-8-170) as well as a plaster cast of an impression left in the TBJ by a corn cob (295-8-171). These can be seen in Figure 3.

All artifacts that were found on the surface of the TBJ were drawn in plan view, collected and taken to the field lab for later processing. Any that were embedded in the surface of the TBJ were left in place. All elevations were recorded on plan view drawings of Operation 8. Elevations were taken on features, artifacts given individual FS numbers, and a number of points on the surface of the TBJ. Elevations on artifacts given individual FS numbers were also recorded on the Op. 8 Field Specimen list. Where features and unusual areas of soil color were encountered on the surface of the TBJ, a Munsell soil color chart was used for color description.

Photography was an important method of field recording. Both black and white and color photographs were taken of archaeological and volcanological features. A series of photographs was also taken of the surface of the TBJ itself in Operation 8. Videotaping was also an important part of field recording. This method was used to record excavation work in progress, and served as a useful account of archaeological interpretations as they were being made in the field.

Flotation and Pollen Sample Collection

Flotation and pollen samples were taken in order to recover small particles and pollen. The Unit 1 tephra directly overlying the original ground surface was collected from the NE corner of each 1 X 1 meter unit for both samples. Paper bags were used for the

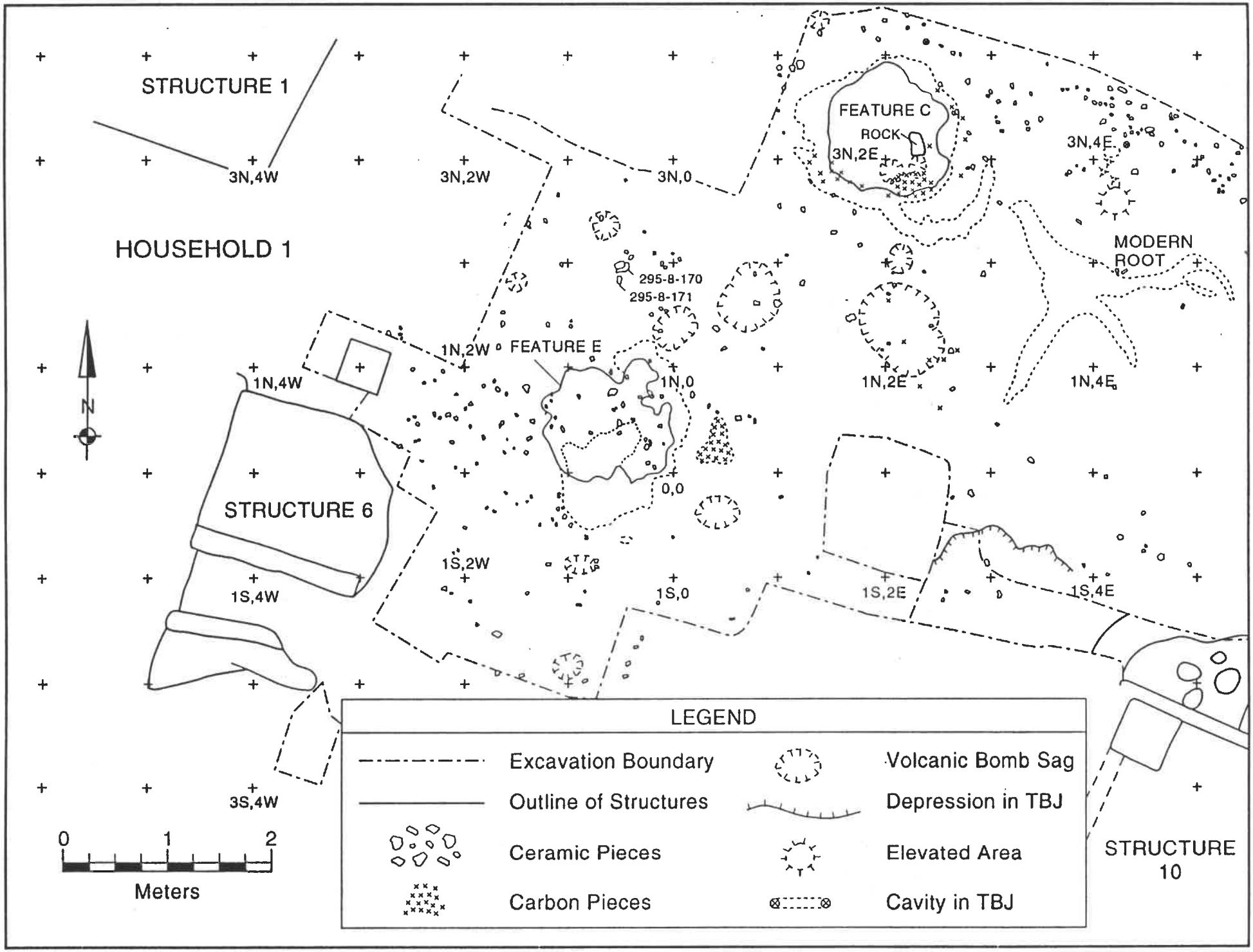


Figure 3 Detail of Household 1 Patio. Note high sherd densities and features in patio area

collection of pollen samples. These bags were useful in facilitating the drying of moist soil samples. The bags were labelled with the field specimen number, N-S/E-W provenience, current date, and intials of recorder. A cloth bag and plastic tag containing the same information were prepared for the flotation sample.

The letters "A", "B", and "C" were added to the end of FS numbers in order to designate the nature of these samples. The letter "A" was used as the identifier for the light fraction of the flotation sample, and the letter "B" was used to identify the heavy fraction of the flotation sample. The letter "C" was used at the end of the FS number as an identifier of pollen samples.

A trowel was used to collect these samples. It was wiped with a clean cloth after each sample was taken. Only a handful of tephra was collected for the pollen sample. A larger cloth bag was used to collect a liter of the remaining ash for the flotation sample. A plastic identification tag was placed in this bag and was stored until its processing was undertaken (see McKee 1992 for flotation process).

Objects Treatment

Volcanic Bombs

Several large juvenile and accidental bombs were encountered in the Unit 2 air fall of the Loma Caldera explosion. The juvenile material consists of basalt bombs that were part of the Loma Caldera magma chamber that were blown out during the course of the eruption. The lava bombs were blasted up and out of the vent at temperatures greater than 575 degrees (Hoblitt 1983), causing the most damage of all of the volcanic ejecta. Their impacts left large depressions in the TBJ (Figures 2 & 3). Each bomb and its corresponding depression were plotted on the site plan and elevations were recorded.

When workers began to excavate the lower Unit 1 ash to the level of approximately 1-2 cm. above the surface of the TBJ, flotation and pollen samples were taken from the NE corner of each 1 X 1 meter unit in the Operation 8 area (see Flotation Collection Procedure below). In order to ensure complete artifact recovery, the decision was made to pass the 5 cm. of the ash lying directly above the TBJ through 1/8" hardware cloth.

Roofing Thatch

When roofing thatch was encountered, as it was east of Structure 6 beyond the structure's dripline, fine brushes were used to remove the ash covering this fragile material. Upon exposure to air, the moisture that had been retained by the thatch evaporated rapidly, which left the thatch dry and powdery. Therefore, it was necessary to photograph, draw, and take elevations on the thatch immediately following its exposure. While the thatch remained in good condition, information regarding the location of the thatch within the tephra units was recorded in order to determine at what point during the course of the eruption the roofs of structures collapsed. Its location was then plotted on the site map.

Animal Bones

Because of the extremely small size of some of the rodent bones that were discovered buried within the tephra, dental picks and other fine utensils were used to remove the pumice and chunks of ash covering the bones. A plastic straw was used to gently blow away the finer ash from hard to get to places, a technique devised by the Salvadoran workers. Small paint brushes were sometimes moistened to form a point on the paint brush tip, serving as an efficient method used to lift tiny bones and teeth. The moisture served as a gentle adhesive substance to which small bones would stick at the end of the brush in order to move them and place them carefully into a foam-lined tray for conservation (see Chapter 9, this volume). Flotation samples were taken from beneath animal bones in order to recover other small bones or associated particles.

Cavities in the Tephra

During the course of the removal of the volcanic ash in Operation 8 a number of cavities in the tephra was encountered. Past work at the Ceren site has found that these cavities generally are voids left by decayed organic matter that was completely encased in volcanic ash during the eruption of Loma Caldera and eventually decomposed. In order to prevent these cavities from being filled with volcanic ash during the excavations, cloth plugs were immediately placed in openings in the ash until the cavity could be filled with dental plaster. Once the dental plaster had been prepared, the plug was removed from the opening of the cavity and the plaster was poured in until the cavity was filled. After allowing the plaster to harden, a period of roughly 24 hours, the tephra surrounding what was now a solid mold of the object that had left its impression in the tephra was slowly removed using small tools such as dental picks and paint brushes.

Excavation Results

The results of the work in Operation 8 in 1993 were important in providing a clearer understanding of the use of exterior space at the Ceren site. As expected, no new structures were encountered during the 1993 season in Operation 8. However, it was possible to distinguish areas that were kept clean of discarded objects, and others where numerous artifacts were found lying directly on the surface of the TBJ, indicating that trash was allowed to accumulate in other areas (Figures 2 & 3). The results of the excavation also identified at least two areas where special activities occurred within the area defined as Operation 8.

As was described in the Methods section, the 1993 work began in Unit 3, the powerful base surge volcanic deposit (Miller 1989). Very little was found in the Unit 3 tephra in this area of the site, with several exceptions. A cavity was located in Unit 3 in the old roof support tephra block east of Structure 6 and was cast with plaster.

Two more small holes were found in the old roof support tephra block in the lower Unit 3 ash levels below the first cavity that was cast. The cavities were filled with plaster to be excavated the next day. The cast, 295-8-161, revealed a branch with two smaller branches. A piece of twine had been used to attach a small pole perpendicular to the main

branch. This tree branch, with its remnant of a pole tied to it, had apparently been blown into this position from a lateral blast of the Unit 3 volcanic surges. In this far western end of Operation 8 the east wall of Structure 6 fell first during the deposition of Unit 1 tephra, followed by the collapse of the roof of the building in Unit 2 and finally the branch was blown in during the Unit 3 base surge.

Other cavities oriented in a horizontal direction were encountered in the tephra block west of Structure 10. These were determined to be animal burrows, which are created when tephra blocks are left exposed for some time.

In upper levels of Unit 3 ash, several channels forming cavities appeared that were approximately 3 centimeters deep and varying in shape. Upon discussion with project volcanologist C. Dan Miller, it was suggested that water may have permeated this less dense layer of ash at some point after its deposition. These channels were located in upper levels of Unit 3 ash, east of Structure 1 and northwest of Structure 10, south of the large modern root cavities left in the TBJ (Figure 3).

No artifacts were recovered from Unit 2. However, a small section of roofing thatch was found along the western edge of the Operation 8 excavation area, at the Unit 3/Unit 2 interface around the 3N 1W grid point. This thatch is a remnant of roofing from Stucture 1, which was first investigated in the 1978 season (Zier 1983). The thatch measured roughly 25 X 25 cm. in diameter. No roofing support poles, carbonized or otherwise, were found in association with the thatch, and no artifacts were recovered during the course of its excavation.

A number of volcanic bombs were encountered at the Unit 2/Unit 1 interface. Some of these lava bombs were quite large; one was over 70 cm. in diameter. However, most were substantially smaller, averaging 24 cm. in diameter. Many of the volcanic bombs were large enough to continue through Unit 2 and into Unit 1 and leave a bomb sag in the surface of the TBJ. Several of the larger volcanic bombs created substantial depressions in the surface of the TBJ (Figure 3).

During the course of excavating the Unit 2 ash, several distinct elevated areas were observed. These are discussed in detail below. Overall, however, the top surface of Unit 1 was fairly level across the entire area of the Operation 8, suggesting that the surface of the TBJ was relatively level as well. Roofing thatch appeared at the Unit 2/Unit 1 interface on the eastern edge of the northeast wall-fall of Stucture 6 (Figure 3). The thatch extended east from the eastern edge of the 1990 Operation 1 excavations to approximately the 2W grid line. The material excavated was passed through 1/8 inch mesh hardware cloth. No artifacts were recovered in the thatch associated with Structure 6. The thatch was found lying on Unit 1 tephra. Since very little Unit 1 ash was found below the thatch, it seems that the roof of Structure 6 fell early during the Loma Caldera eruption.

In upper Unit 1, located between sublayers of tephra, a cluster of small animal bones (295-8-167), from a small rodent, were found. These bones were drawn, photographed, and conservation work on the bones began immediately (see Chapter 9). It appears that the east

wall of Structure 6 was still standing when the rodent was relocated, perhaps by a lateral blast toward the end of the deposition of Unit 1. The presence of Unit 1 tephra below the rodent bones indicates that the animal was not running on the original floor surface at the time of its burial. The rodent was probably living in the roofing thatch of this building.

During the course of excavations it became clear that sherd densities on the surface of the TBJ varied over the area of Operation 8. In general, greater numbers of sherds were found on the ground surface just east of Structure 6, as well as along the northern edge of the excavation area, than were found in the area immediately north of Structure 10 (Figure 2). The latter area appears to have been one that was carefully maintained, probably by sweeping and the removal of ceramic sherds and other pieces of trash. As a result, very few ceramic sherds and only one lithic artifact were recovered from the area immediately north of Structure 10. Along with being almost completely free of trash, the surface of the TBJ in this area immediately north of Structure 10 was also very flat and highly compacted. The interpretations of why this particular area had those charactersitics will be presented in the following section of this chapter.

The area located north of the 2N grid line (Figure 2) had the highest density of ceramic sherds per square meter at 10.6. The origin(s) of these sherds is unknown. They may have been swept up from the area adjacent to Structure 10, or they may represent refuse that was swept away to the outer edges of primary activity areas that were at one time located north of the bulldozer cut. The IRA silo construction destroyed this area so its use is unknown.

The second highest density of sherds encountered on the surface of the TBJ was located just east of the Household 1 group, specifically, east of Structure 6, which is believed to have functioned as a *bodega* or storehouse. An average of 9.1 ceramic sherds per square meter was found in this area, west of the 0 E grid line (Figure 3). It is not suprising that sherd densities per square meter would be high around a household group, where many ceramic pots would have been used on a day-to-day basis.

In contrast, sherd densities on the surface of the TBJ were lowest immediately north of Structure 10, which is believed to have had a non-domestic function (Gerstle 1992, this volume). Only 3.9 ceramic sherds per square meter were found in the area of Operation 8 located south of the 3 N line, east of the 0 E grid line, and north and west of the 1992 excavation boundaries for Structure 10 (Figure 3). This data has important implications that will be discussed in further detail in the next section of this report.

One of the raised areas that was identified in Operation 8 was composed of a concentration of ash and small pieces of carbon, designated Feature E. It was found at the extreme western end of the area investigated in the area of high sherd density on the east edge of the household 1 area (Figure 3). The ash/carbon concentration is approximately 1.4 X 1.7 meters at its widest points, but the heaviest accumulations of ash and carbon are found within an area approximately 1.0 X 1.2 meters. At its greatest height, Feature E is roughly 5 cm. above the surrounding TBJ. The carbon flecks are not concentrated or densely clustered in any one area. Instead, they were found grouped in a number of smaller clumps

located within the inner part of the larger area that is distinct from the surrounding TBJ. Feature E lies mainly within the 0-1 W and 0-1 N grid lines (Figure 3). Scattered charcoal fragments, most of which were smaller than 1 cm. in size, were found throughout this area, and a number of ceramic sherds were also seen in the center, most elevated portion, of this area.

The sherds found in this ash/carbon concentration varied in size and decoration. Most of the sherds were smaller than 4 cm. in size, and all but a few were plain, undecorated pieces. These sherds appeared to be from vessels that were used in food preparation activities due to the presence of carbonized organic remains adhering to their interior surfaces. Nearly all of the sherds were found lying flat. A total of five fragments of unfired clay were found in this raised ash and carbon concentration. None of these pieces had smoothed surfaces, and most were recovered from the area near the 0,0 site primary datum point.

One of the most interesting features seen in Operation 8 was located in the northwestern section of the excavation area (Figure 3). This area was defined as Feature C, and is a raised platform-like feature that is between 10-15 cm. higher than the surrounding TBJ. The feature is a circular, compacted clay platform that is distinctly different in character from the surrounding TBJ. The surface of this circular platform is uniformly very flat, and gently sloping. The surface is also characterized by linear perpendicular impressions that extend over much of the surface of the feature. The impressions are fairly shallow, but well defined. A brownish-yellow or mustard coloring was found throughout much of the surface of the platform that is more than likely the remains of some organic material, possibly grasses or leaves that carpeted the feature. Samples of this material were taken and will be subjected to analysis. Two fairly shallow depressions are present along the southern edge of this feature (Figure 3). A distinct area of carbon fragments is located just south and partially within these two small depressions. None of the carbon flecks are larger than approximately 1 cm. in size.

Several other interesting components of this Feature C are noteworthy. First, a stone was found resting directly on the surface of the feature that is not a volcanic bomb or "country stone" that was blown in by the eruption of Loma Caldera (C. Dan Miller, personal communication 1993). There is no volcanic ash between the surface of the platform feature and this stone, therefore the stone was resting on the surface of the feature at the time that Loma Caldera erupted. It is 11 cm. X 21 cm. at its widest points, and is a tabular block of metamorphosed sandstone, with some plagioclase and quartz components (C. Dan Miller, personal communication 1993). The function of this stone is uncertain, although it may have been used as a weight for the fiber carpet on the platform.

Second, a roughly cylindrical vertical hole, probably a post hole, was located along the western edge of the platform. The hole is roughly 8.5-9 cm. in diameter from top to bottom, and extends from the surface of the platform down 22 cm. into the TBJ. The hole was cleared of loose Unit 1 ash and no artifacts were recovered during this process of excavation. Several small pieces of carbon, possibly charcoal, were scattered around the area of the probable post hole.

Finally, there is an appendage of Feature C which is an elevated, built-up area of clay that is irregular in shape, and appears as a tail curling southeast of the feature. This "tail" is approximately 5-10 cm. lower in elevation than the surface of the platform itself, and forms part of the outer edge of this irregularly shaped area surrounding the raised platform.

Two other features were present on the surface of the TBJ in Operation 8. The larger is located just southeast of the 3N,4E point, while the other was located slightly northwest of the 2N,7E point (Figure 2). These were small mounds, approximately 12-15 cm. in height, that were made of TBJ. Conical and very uniform in shape, these two mounds measured approximately 22 and 27 cm. in diameter at their bases. It is unknown what function these small mounds served, but their alignment with the probable post hole in Feature C, the raised platform, is noteworthy. The centers of both of these small mounds and the center of the post hole in Feature C form a straight line with an azimuth of 100 degrees.

A scatter of decomposing seeds and reddish soil found just slightly northwest of 2N 5E is also noteworthy. What appeared to be squash seeds (295-8-172) were found with a scatter of small, unidentified white particles, which were also collected with the seeds. A soil sample was taken for immediate seed identification by David Lentz, project archaeobotanist, who had confirmed the identification of the squash seeds. However, identification of the small white particles is still pending. They probably are modern insect eggs, and the squash seeds are also probably modern. This feature is located near the bulldozed cut, and the area has been subjected to modern root disturbance as well.

Interpretations

This section of the report presents the authors' interpretations of the archaeological information obtained from the 1993 investigations in the western portion of Operation 8. As previously noted, Structure 10 is part of Operation 8. However, the interpretations of the archaeological data from Structure 10 will not be discussed here in this chapter unless they are considered relevant to the interpretations of the use of exterior space in this area of the site (see Chapter 4 for a discussion of Structure 10).

Features

Feature C was initially interpreted as an earthen platform that was associated with Household 1. No other feature of this kind has been found at Ceren to date. As a result, it is difficult to determine its function(s). However, some tentative interpretations of its use or uses can be offered here. First, its pattern of perpendicular impressions suggests that some organic material, probably a sedge or grass, was laid upon the surface of this earthen platform. The analysis of the soil sample taken from this feature may provide some insight into this interpretation.

Given its location relatively close to Structures 1 & 6, it is possible that this feature could have been used as a drying platform for foods or other household materials. It is unknown why a small pocket of charcoal flecks was found along the southern edge of this feature, although these may be related to the platform's function in some way. Both the

stone and the post hole also remain mysteries as well. The stone was clearly in place on the surface of the platform when the Loma Caldera eruption occurred, and may have been used as a weight to prevent drying plants from blowing away. No wood remains were found during the excavation of the post hole, which was filled with fine Unit 1 tephra. However, it is possible that by the time the Loma Caldera eruption took place, the post had been removed from its hole.

Ethnographic research may shed some light on the functions of earthen platforms. It is also possible that other features such as this may be found at Ceren. However, until further archaeological excavations or ethnographic research yields results, the precise function of this platform will remain unclear.

Feature E is more than likely a temporary dump site for hearth ash and charcoal associated with Household 1, and specifically with Structure 11, the kitchen. The presence of numerous ceramic sherds, many of which appeared to have carbonized residues on their interior surfaces, suggests that cooking vessels that had broken in the hearth during heating were discarded along with ash and charcoal that had accumulated in the kitchen hearth. Several small pieces of unfired clay were also found in this feature. It is possible that these were pieces of construction clay that were used or intended for use in one of the structures at the site. Since these pieces were unfired, it is likely that they were simply discarded on the ash pile after the pile was created, and were not part of the kitchen hearth.

Boundaries and the Use of Exterior Space

The ethnoarchaeological work of Hayden and Cannon (1983) in the highland Maya area has allowed archaeologists to better understand the relationship between the artifact densities found in different kinds of activity areas in Maya villages and how these activity areas were used. Our interpretations of the use of exterior space and boundaries of activity areas are based in large part on the results of this work, and their application at Ceren can help indentify activity areas, their uses, and their boundaries. The following assumptions were made in an attempt to better understand these behavioral phenomena at Ceren: 1) high traffic areas located outside structures were probably kept fairly clean. These were well-maintained, clean-swept areas and, as a result, had very few artifacts on the ground surface, and 2) ground surface areas subjected to high amounts of foot-traffic would be compacted and would likely also be relatively flat.

The identification of "boundaries" between Household 1, a residential complex (Beaudry and Tucker 1989; Mobley-Tanaka 1990; Tucker 1990), and Structure 10, a focus of village-level ceremonies (Gerstle 1992; this volume), is based on several lines of evidence. First, the distribution of artifacts scattered on the surface of the TBJ provides some information on the use of outside spaces in this particular area of the site. As previously discussed, the relatively high number of ceramic sherds and other items found on the surface of the TBJ immediately east of Structure 6 sharply contrasts with the low number of sherds found north of Structure 10. Also, the surface characteristics of the TBJ itself are very different in these two areas. Immediately north of Structure 10, the TBJ surface is very flat, smooth, and highly compacted, suggesting that this area was a high-traffic and therefore high maintenance area. In contrast, the surface of the TBJ immediately east of Structure 6 was

uneven, not highly compacted, and, in general, did not appear to have been subjected to alot of foot-traffic.

These differences provide strong evidence that the two areas were used in distinctly different ways by the inhabitants of the village. A boundary, whether formal or informal, did exist between the Household 1 area and the religious/ceremonial group, represented by Structure 10 in this particular area of Operation 8. In terms of the distribution of artifacts and the characteristics of the TBJ surface, this boundary probably lies somewhere in the vicinity of the 4E and 5E grid lines (Figure 2). Specifically, the area of west of the 4-5E grid line is believed to be associated with Household 1 activities. The archaeological information indicates that the patio area immediately east of Structures 1 and 6 was used for some of the activities associated with a functioning household unit, including the disposal or cooling before collection and storage of hearth ash and charcoal (Feature E), and the possible drying of organic materials (Feature C). The ground surface of this patio area did not need to be kept clean and well-swept, probably because it was regarded as more or less a household work or sporadic use area.

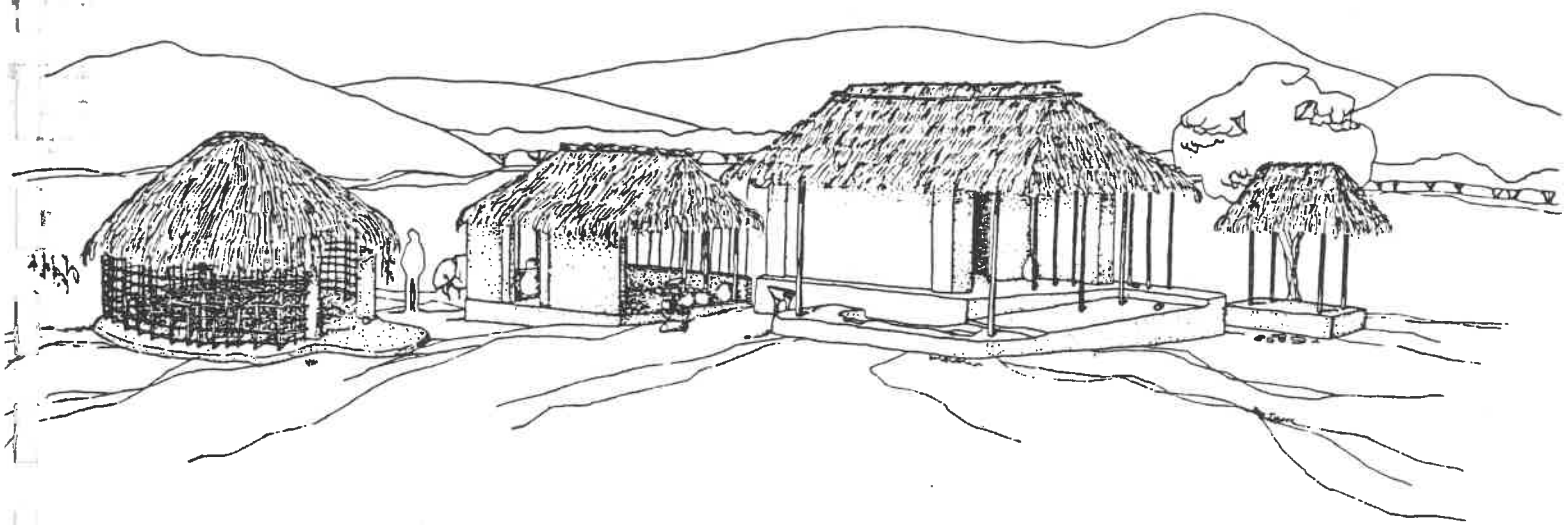
In contrast, the evidence indicates that the area immediately north of Structure 10 was clean swept, well maintained, and saw periods of intense foot-traffic. Specifically, the area east of approximately the 4E grid line, where sherd densities decline dramatically and the surface of the TBJ becomes smooth and compacted, is probably associated with Structure 10 activities. This information supports the interpretation that the north side of Structure 10 was a locus of visitation during village ceremonies; it is the only entrance into the structure.

Additional support for this belief is found within the enclosure (north) wall outside of Structure 10. The presence of two stone hearths, a metate for food grinding, and several ceramic vessels with food remains all suggest that the north side of Structure 10 was part of the large-scale food preparation and distribution activities that are believed to have been associated with Structure 10 (Gerstle, this volume). It is reasonable to assume that if villagers were being served foods and/or drinks from around this enclosure wall during village ceremonies, then the ground surface would have been well maintained and relatively free of trash. Also, the high degree of TBJ compaction in this area makes sense given the volume of foot-traffic that occurred in this area during those ceremonies.

Summary

The work that was conducted in the western portion of Operation 8 in 1993 was productive in several ways. The two research objectives of the work were met. First, it was important to obtain an understanding of the distribution of artifacts on the surface of the TBJ in the area between the Household 1 group and Structure 10. The characteristics of the surface of the TBJ itself were also carefully examined. The results of this work were successful in providing important information on the nature of activities outside of the structures themselves, along with ideas on relationships or differences between Household 1 activities and the activities occurring within and immediately around Structure 10.

In terms of the second goal of the work, the removal of the large block of volcanic ash in Operation 8 has undoubtedly facilitated the visitor's ability to perceive the site layout and scale. Operation 8 is part of the first area that the visitor sees when they approach the Ceren archaeological site. Excavation of the last block of volcanic ash in this area allowed the visitor to see several things, including a large, contiguous area of the Ceren site open for the first time, the spatial relationships between structures, and the contours and features on the original ground surface.



Artists Conception of Household 1. From L to R: Str. 11, the Kitchen; Str. 6, the Bodega; Str. 1, the Domicile; and Str. 5, an Obsidian Workshop Platform. By David Tucker.

Chapter 4. 1993 EXCAVATIONS AT STRUCTURE 10, JOYA DE CEREN (OPERATION 8)

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Introduction

Structure 10 (Operation 8) excavations were initiated in 1992 (Gerstle 1992). In June and July of 1993, thanks to the recent installation of a large new roof by the Direccion de Patrimonio Cultural and Patronato pro-Patrimonio Cultural, we were able to completely excavate the structure and its surrounding architecture as well as expose large areas of surrounding original ground surface on the north side of Structures 10 and 12, the area between these two structures, and the area between Household 1 (Strs. 1,6,11) and Str. 10 in 1993 (Figure 1). These excavations served several purposes: to recover additional data pertaining to the use of the structure and adjacent areas as well as the nature of boundaries between use areas; to make the structures visible to the visiting public; and to promote structure conservation by improving ambient conditions such as humidity and ventilation.

This chapter reports on the 1993 discoveries in and around Structure 10. A preliminary interpretation of the structure's function that integrates the 1992 and 1993 data is presented.

Structure 10 excavations were delayed until July while the previously-exposed walls and other architectural features were consolidated by the conservation crew under the direction of Victor Manuel Murcia. Excavation techniques established during previous field seasons were continued (see Gerstle 1992), including systematic soil flotation and pollen sample collection procedures that were initiated in 1992 following the recommendations of the project paleoethnobotanist David Lentz. Horizontal provenience was maintained by extending the site-wide metric grid (Tucker 1989) from the Household 1 area (this is oriented approximately 1 degree east from the grid used for 1992 Operation 8). Elevation data were taken from preserved 1992 elevation markers. The original arbitrary site elevation datum of 100 m. corresponds to a real elevation of 444.17 m. above mean sea level. The 1993 catalog of collected specimens starts with the next sequential number following the final 1992 catalog number.

All 1993 Operation 8 investigations were carried out under my direction. Excavations were carried out by an experienced and highly skilled crew of 6 to 12 Salvadorans. Numerous people assisted with documentation and other tasks, including Marilyn Beaudry-Corbett, Valerie Connor, Hector Armando Guevara, Moises Arturo Guevara, Holly Lundberg, Brian McKee, Carleen Sanchez, Evelin Guadalupe Sanchez, Payson Sheets, Scott Simmons, and Susan Villalobos. Special thanks to Payson Sheets (project director) and to the Ministry of Education (CONCULTURA and the Direccion de Patrimonio Cultural) for the opportunity to collaborate in the project.

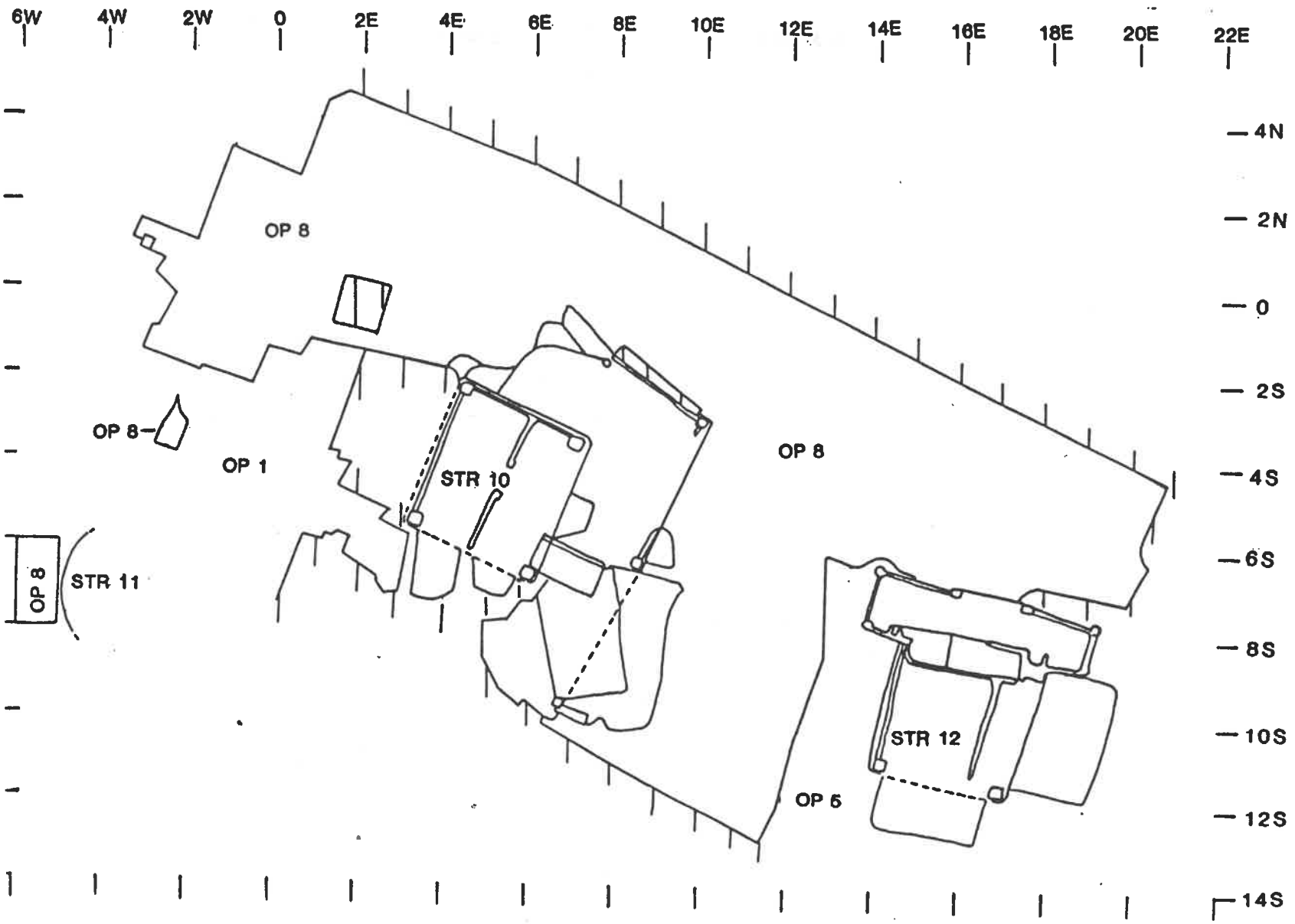


FIGURE 1. OPERATION 8 AREA

Previous Excavations

The 1992 excavations of Structure 10 exposed the tops of all superstructure walls, the interior of the east room, parts of the substructure platform, and limited paved floor areas surrounding the structure (Gerstle 1992). It is a two-room superstructure with the entrance on the east side. The preliminary interpretation, based on structure orientation, unusual architecture, and structure contents, suggested that Structure 10 was non-residential, that Structures 10 and 12 functioned together as a special-use complex, and that Structure 10 may have served as a location for storing special equipment and preparing for special events, including large-scale food preparation. The 1993 excavation results provide support for this preliminary interpretation.

The results of the 1993 excavations in Structure 10 are presented in the remainder of this report. The architecture and permanent features are described first, followed by artifacts and other portable materials. Brief comparative and interpretive comments on the form, function, and history of the structure are included. Because the analysis of the artifacts and other materials is not yet complete, these comments remain preliminary in nature.

Architecture

The 1992 report presented descriptions of the substructure platform, the superstructure walls and columns, the east room, the roof, paved floors adjacent to the north, east, and south sides of the platform, and two free-standing exterior walls, Features A and B. Additional information on these features is presented here, along with newly discovered areas and features. Figure 2 is the structure plan and Figures 3a, b and c are the section drawings.

Substructure

No new information was recovered. However, the platform surface that forms the floor of the east room apparently does not form the floor of the west room (see below).

Superstructure

Relatively little new information was recovered on the superstructurearchitecture. Excavation of the west room provides new data on room configuration and construction.

Columns

No new information recovered.

Walls

Some information on the pole framework within superstructure walls was recorded, as well as a few additional details.

North Wall

In the west half of the wall, vertical pole spacing ranged from 8 to 13 cm., with most about 10 cm. apart.

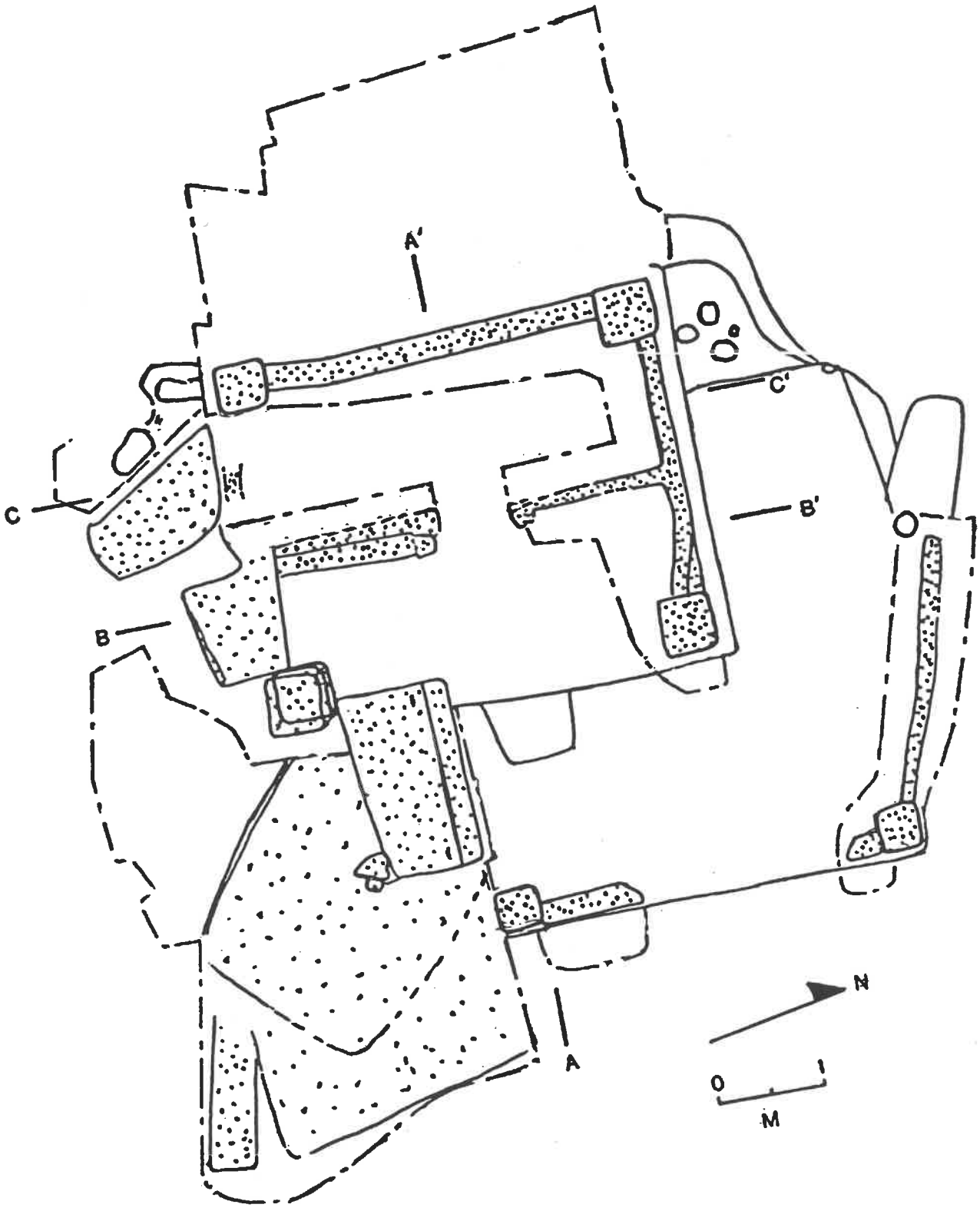


FIGURE 2. STR 10 PLAN AND SECTION LOCATIONS

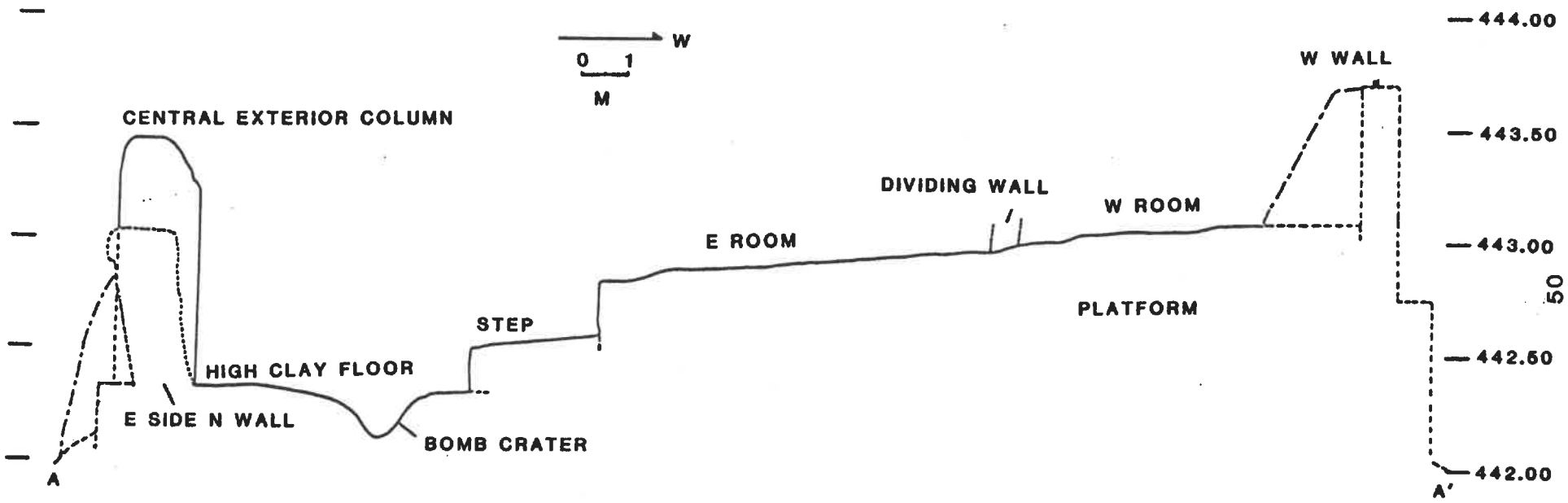


FIGURE 3a. STR 10 SECTION A-A'

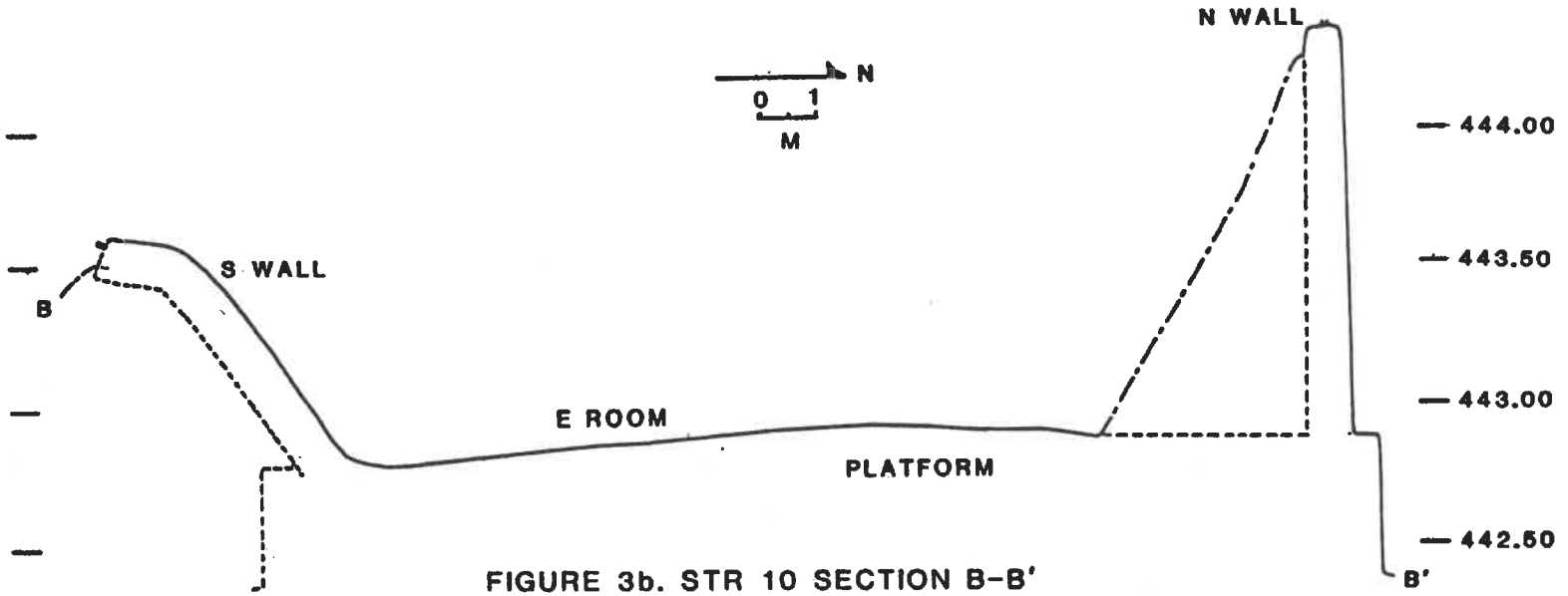


FIGURE 3b. STR 10 SECTION B-B'

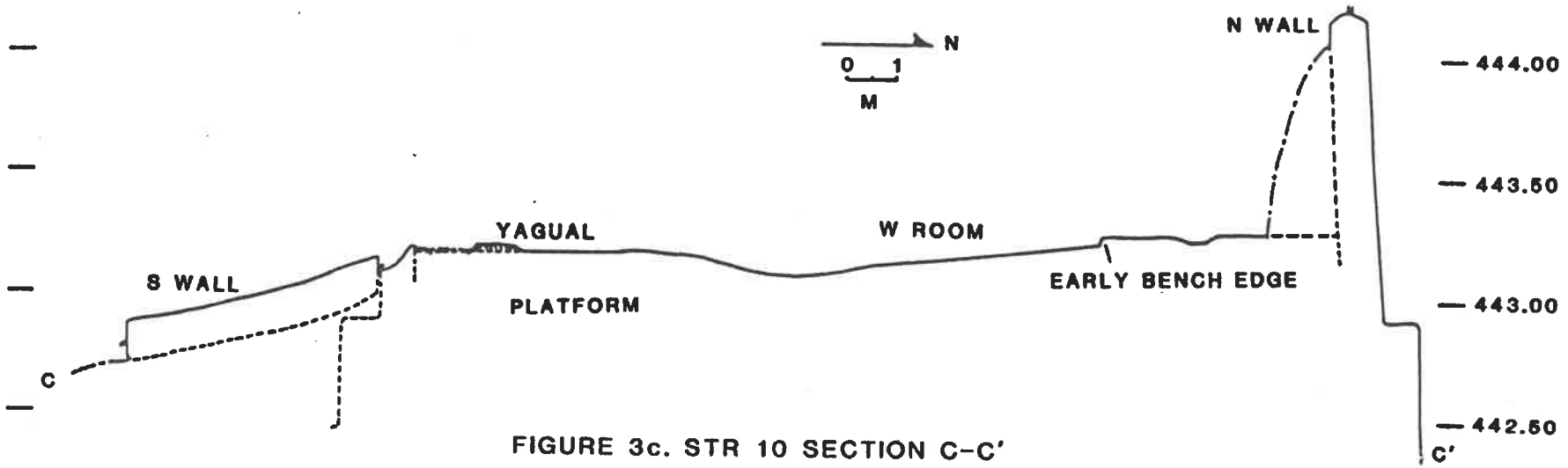


FIGURE 3c. STR 10 SECTION C-C'

West Wall

The west wall was built with at least 24 vertical poles. These were spaced from 9 to 19 cm. apart, with most either 10-13 cm. or 15-16 cm. apart. When replacement poles were inserted during wall consolidation, it became clear that, at its southern end, the base was probably displaced outward during the eruption by one or more of the large volcanic bombs that fell in the south half of the room. Toward the top, the wall is closer to its original position, suggesting that horizontal beams tied at the corners provided strength to the superstructure walls.

South Wall

Excavation of the west room showed that the fallen west segment of the south wall broke off just a few cm. above the west room floor. In this segment, 4 vertical pole cavities were preserved, spaced between 10 and 18 cm. apart. In the east segment of the wall by the east room, up to 9 vertical pole cavities were apparent, mostly spaced about 16 cm. apart, but two were within 7 cm. of each other.

East Wall

The upper interior face of the east wall, fallen outward, was exposed. The vertical molded pilaster by the entrance extends to the top of the wall. The upper edge of the wall was somewhat crumbled, but four vertical pole cavities were evident, including a double-pole cavity just inside the inner edge of the molded pilaster. All exposed cavities are about 4 cm. in diameter, and are just inside the exterior wall surface.

A ceramic jar handle is embedded near the wall top on the interior wall face. It is 13-17 cm. from the inner edge of the pilaster, 1.35 m. above the lower handle exposed in 1992, and 20-30 cm. below the wall top. The handle is fairly large (ca. 9 cm. long and 4 cm. wide) and projects 3.0-3.5 cm. from the wall surface. It complements the handle embedded near the wall base, exposed in 1992.

Interior Dividing Wall

During consolidation work, it became clear that the vertical pilasters by the doorway were molded around multiple adjacent small poles or single larger poles. The pilasters appear to have been an integral part of the original wall design. In the north half of the wall, ten vertical pole cavities were preserved, including a larger post in the pilaster. Most were 13-15 cm. apart, but some were separated by up to 23 cm. In the south half, ten cavities including 4 paired poles within the pilaster were preserved. Spacing was between 9 and 23 cm., with most spaced by 13-15 cm.

Rooms and Room Features

East Room

No new information was recovered.

West Room

The 1992 excavation exposed the upper Unit 3 volcanic ash in the west room, sherds from one vessel (8-V.17) and another apparently whole vessel (8-V.39) just inside the fallen south wall.

In 1993, the excavation exposed the room floor, except for balks left against the standing north, west, and interior dividing walls for conservation purposes. Total room area is approximately 4.9 m2. The area exposed at floor level was 3.30 m. N-S x 0.85 m. E-W (2.80 m2). Hector Armando Guevara conducted and documented the west room excavation. The description of the architecture and room contents (see below) are based primarily on his documentation.

Room Floor. The floor exposed in the west room rises dramatically and unevenly from the level of the east room floor and platform surface. It is up to 30 cm. higher than the east room floor level.

The north end of the floor is the highest. It presents a relatively flat and even surface. About 1.00-1.10 m. south of the north wall, a discontinuity in the floor surface crosses the room from W to E. The floor level drops about 4-6 cm. south of the discontinuity, which is slightly irregular in plan.

South of the discontinuity, the floor is irregular. At the southern end of the room, the floor averages about 3-5 cm. lower than at the discontinuity. It appears to have had a highly irregular surface, although this may be partly due to disturbance by volcanic bombs. The center area is extremely distorted by a large bomb depression.

Near the doorway to the east room, the floor level slopes down to the east, forming an irregular ramp. The steepest drop is just west of the doorway (9 cm. drop over 15 cm. distance), but there is no squared step. In the doorway itself, the level of the east room floor is maintained.

The entire west room floor was probably raised by the addition of fill. It is possible that the higher flatter surface in the north end of the room was added first, forming a solid bench about 30 cm. high. Some support for this may be seen in its smooth flat surface and southern edge, which runs roughly parallel to the north room wall.

The central and southern parts of the room may have been filled at a later date, and less carefully. Differential settling would account for the irregularities in the floor surface and foot traffic may have caused erosion at the edge of the suggested early bench and in the doorway between the two rooms.

Elevated Shelf (Tabanco). No direct evidence of an elevated shelf in the form of pole impressions in volcanic ash or in clay was found inside the west room. However, numerous volcanic bombs caused extensive damage to the fallen artifacts in the west room, and these could easily have obliterated any evidence of a high pole shelf if it was not daubed with clay (the elevated shelf in the east room was not clay-daubed).

Surrounding Architecture

Apart from the west superstructure room, the 1993 excavations concentrated on the north and east sides of Str. 10. In these areas, clearing of the high clay floors surrounding the north and east sides of the platform was expanded and the partly exposed clay walls

(Features A and B) were further explored. Newly discovered features include three exterior columns and two connecting walls on the east side of the structure, and a mounted metate, a second hearth, a possible fallen wall (Feature D), and a pole wall or door on the north side of the structure. The entire east and most of the north sides of Str. 10 were surrounded and enclosed by linked columns and walls, all built on the outer edge of the high clay floor. The only access to the Str. 10 platform was on the north side of the structure. These architectural features are described here.

North Side

The narrow trench excavated in 1992 on the north side of the Str. 10 platform was extended north. West of the Feature A standing wall, the north edge and NW corner of the high clay floor was exposed, and a northern step, a pole wall or door, and a possible fallen *bajareque* (wattle and daub) wall (Feature D) was uncovered. North of this, the excavations uncovered the original TBJ ground surface.

Between the platform and the Feature A wall, the 1992 trench was expanded an additional 45 cm., leaving a balk 25-60 cm. thick against the south face of the Feature A wall for conservation purposes. In this area, a hearth (Hearth 2) was discovered, along with a metate mounted on *horquetas*.

High Clay Floor. The total length of the high clay floor north of the structure (NE to NW corner of floor) is about 4.55 m. It is about 9 cm. higher at the west end than on the NE corner. Except for the early wall base at the west end, the floor surface is more even toward the west end.

The NW corner of the high clay floor was uncovered about 1.5 m. north of the platform. The west edge of the floor is relatively straight until it curves around a postmold at its NW corner. The postmold, about 10 cm. in diameter, is encased by the clay floor except for a few cm. on its extreme outer (NNW) circumference. The north edge of the high clay floor is approximately 5 cm. N of the postmold, and runs east to the large cavity left by a tree trunk or massive post exposed in 1992 at the west end of the Feature A wall. At this location, the high floor is about 1.75 m. wide. Except for an indentation near the NW corner postmold, the north edge of the high clay floor is straight and smooth.

The top of the Feature A bajaraque wall leans outward as a consquence of the eruption, but its base is still resting on the northern edge of the high clay floor. The clay floor between the platform and the Feature A wall is relatively smooth, although there are some depressions possibly due to differential settling of the fill. The clay floor is probably about 1.65 m. wide between the NE platform corner and the Feature A wall.

Early Wall Base. A possible early wall base at the west end of the high clay floor was exposed in 1992. This was a 36-cm. wide ridge with a N-S orientation, abutting the platform. Near the NW corner of the floor exposed in 1993, the ridge was less pronounced. However, up to five possible early post or pole holes centered in the ridge lend support to its existence. They are recognizable as circular areas of relatively loose clay. They are all about 4-5 cm. in diameter. They are neatly aligned, and three of them were separated by 12-15 cm. Others are 23 and 40 cm. apart; intermediate early postholes probably are no longer distinguishable. The northernmost posthole is about 4 cm. from the NW corner post

and they extend to within 43 cm. of the platform. The may represent an early pole wall anchored in a clay wall base (Gerstle 1992). If so, it may predate the high clay floor.

Northern Step. The floor surface at the NW edge of the high clay floor is approximately 50 cm. above the flat TBJ ground surface 60 cm. to the north. The transition between these two levels is partly obscured by a possible fallen wall (Feature D; see below), but appears to involve an intermediate step along the north edge of the high clay floor. The west end of the step is about 30 cm. east of the NW corner of the high clay floor. It is exposed for a distance of only about 65 cm.

The step is made of smooth river cobbles embedded in clay. The largest exposed cobble is oval, 19 cm. long, and 13 cm. wide. Except for the largest, two other irregular and probably smaller cobbles are visible in the vertical face of the step; these have a thick layer of clay on top. Where there are no cobbles, the edge of the clay step is highly eroded and irregular, especially near its W end. The riser is 12-15 cm. high and the tread is about 23-25 cm. wide. The high floor surface is about 32-35 cm. above the step surface. The step appears to abut the north face of the high clay floor and presumably was built after the floor was completed.

The large tree trunk or post cavity exposed in 1992 at the west end of the Feature A wall extends from the top of the Feature A wall down into the high clay floor. The cavity has very smooth straight sides and its base is encased by the high floor paving. The post was functionally analogous to the column found at the east end of the same wall. The Feature A wall was erected on top of the high clay floor (see below for discussion of Feature A wall and East Side Columns).

Feature D: Possible Fallen Bajareque Wall. This feature is a sloping sub-rectangular layer or slab of clay located at the west end of the Feature A wall against the north side of the high clay floor. The slab is 50-60 cm. wide with approximately parallel edges and is about 1.6 m. long. The east end is wider and higher, slopes up against the north side of the high floor, and covers the step. Its east end was not entirely excavated, but appears to abut the west end of the Feature A wall. To the west, it slopes down as it angles away from the high clay floor, and its slightly narrower lower west end rests on the TBJ ground surface, leaving an uncovered area up to 65 cm. wide between it and the edge of the high floor. The high east end of the slab surface is about 17 cm. above the low west end. Its upper surface is slightly convex in cross-section, very smooth, and compacted.

This slab may be a fallen *bajareque* wall. Possible pole impressions were preserved along the long edges of the feature but there is no evidence of internal perpendicular poles crossing through the slab. Depending on the time lapse between its collapse and the eruption, it may have been subject to foot traffic and other compacting; it is convenient for a ramp or step up to the high clay floor. However, the long edges of the slab were quite sharp and showed little signs of erosion.

If the Feature D slab is a fallen wall and its E end matched the W end of the Feature A wall, it would have extended to the post at the NW corner of the raised floor, thus closing off the north side of the high floor entirely. Assuming that it is essentially intact, the wall would have been 60 cm. high on the inside and about 1.50 m. high above the TBJ ground surface on the outside.

If the slab is a fallen wall, then it was probably a late addition to the area. The step along the north side of the high clay floor would have been in use before the wall was erected. When the wall fell, it partially obscured the step. In any case, it fell before the eruption of Loma Caldera, as the Unit 1 ash is absent below the slab but present on top of it.

The Feature D slab was covered by an intact layer of grass thatch that matched its dimensions almost exactly. The thatching was oriented longitudinally to match the slab's orientation. The thatch layer is up to 10 cm. thick, including a reddish layer of decomposed thatch underneath the preserved grasses (295-8-270). There was no sign of poles associated with the thatch layer. Unit 1 and some fine Unit 2 ash pushed up under the edges of the grass thatch layer during the early phases of the Loma Caldera eruption.

It seems likely that the thatch was laid onto the slab intentionally before the eruption, perhaps to dry or in readiness for use. It is practically impossible that thatch loosened by the eruption should fall onto the slab with virtually identical shape and alignment. Additionally, the north eave of the Str. 10 roof in this area can be accounted for in multiple layers of thatch found in and above the Unit 2 volcanic ash above the north side of the high floor (see discussion of Roof below). Whether the Feature D slab was a fallen wall or built to specification, it may have been used for temporary thatch preparation or storage.

Pole Wall or Door. The base of a pole construction, possibly a wall or door, was preserved in the form of aligned pole cavities on the high clay floor near its NW corner. The cavities were preserved only in the Unit 1 ash, approximately 2 cm. thick in this area, and did not extend into the clay floor. There were a total of 13 pole cavities, including 4 pairs of adjacent poles. The cavities were about 1.5-2.0 cm. in diameter, similar to other pole constructions. The base of some of the cavities reached the surface of the high clay floor; others were partially filled with ash fallen in from above. These cavities were cast in plaster (295-8-359-369). Additional pole casts (295-8-356-358) may also belong to the feature.

The preserved line of poles was about 47 cm. long. Its northern end was about 22 cm. SE of the postmold at the NW corner of the high floor; from there, it extended to the SE at an angle to both the W and N edges of the high floor. Very likely, the pole construction extended farther toward the platform but was not detected in the narrow 1992 trench.

If the pole construction was a wall, it could originally have closed off either the west end of the high floor next to Hearth 1 or the north edge of the high floor above the long north step. In the former case, it would have been a late replacement of the early perishable wall represented by the early clay wall base. If the latter is true, then it may have replaced the fallen Feature D wall, in which case it would have contained a door, as it seems unlikely that people entering Str. 10 would have been forced to walk through the hearth to enter and exit the building.

Hearth 2. A second hearth was partially uncovered against the interior (S) face of the Feature A standing north wall, opposite the substructure platform. It was constructed of whole river cobbles, three of which were completely or partially exposed. Unlike Hearth 1, no cooking pot was on the stones, but traces of wood ash were visible between them.

The visible stones are 19-26 cm. in length and 15-23 cm. high. They are arranged to form a triangle, with 12-28 cm. between the stones. Additional stones may still be buried in

the unexcavated balk against the Feature A wall face, but probably it was a three-stone hearth similar to Hearth 1 and the hearth in the Str. 11 kitchen (Mobley-Tanaka 1990).

Mounted Metate. A metate mounted on forked wood support posts was located in the NE corner of the corridor, next to the interior (S) side of the Feature A wall. Although the grinding stone and its posts remain partly buried in the balk against the wall, the southern half of the stone, the tops of both forks of the east post, and the south fork of the west post were exposed. The east post is preserved as a hollow cavity; the west post was partly carbonized.

The metate, made of vesicular rhyolite or andesite, is 58 cm. long and probably about 30 cm. wide. It is shaped along its sides, ends, and base, and the grinding surface is rimmed along its long edges. The east end of the stone is 16 cm. higher than its west end, suggesting that the user stood in the 30 cm-wide space between it and the east wall of the corridor. Vessels on the floor at its lower end provide corroboration.

The floor in the area where the user would have stood is not exposed, but the high end of the stone is about 40-45 cm. above the nearby irregular floor surface. It is possible that the stone is no longer in its original position. Although the stone itself is not tilted from side to side, the support posts at one or both ends may have been broken or displaced; the south forks of both posts project horizontally from the stone but the north fork of one post rises vertically. The metate and upper ends of the support posts are in lower Unit 3 ash and were covered by fallen roof thatch.

Features A and B: North and South Exterior Walls

These two walls were partly exposed in 1992. They are *bajareque* walls, built using a crossed-pole framework daubed with clay. On both walls, the horizontal poles of the framework remained visible on the exterior faces. With the exception of a third wall on the east side of the Str. 10, this "exposed-pole *bajareque*" construction technique has not been identified elsewhere in the site.

Feature A: North Side Exterior Wall. The Feature A standing *bajareque* wall is resting on the north edge of the north high clay floor. Only the top edge of the wall and its west end were exposed. The upper part of the wall, especially its west end, was tilted outward (north) by the eruption of Loma Caldera. Total wall length is about 2.35 m.

At its west end, the wall is approximately 14-15 cm. thick near its base. Horizontal pole cavities are apparent at the west end of the wall, as are vertical pole cavities along the top of the wall.

The horizontal pole cavities indicate that larger diameter poles (ca 4-6 cm.) alternated with two or three smaller diameter poles (ca 2-3 cm). The horizontal poles probably were visible on the exterior (north) face of the wall; they are adjacent to that surface and the clay does not cover their north sides.

By contrast, the vertical pole cavities are approximately centered in the wall; they would have been on the south side of the horizontal poles. Within the wall, they were completely embedded in the wall clay but also extended above it. One vertical pole cavity near the east end of the wall was preserved 15 cm. above the clay wall top. The vertical poles were separated by 12-23 cm., with 15-17 cm. spacing the most common. The interior (south) face of the wall was probably well-finished with smoothed clay.

At its west end, the wall base abuts the NE edge of the large vertical tree trunk or post cavity uncovered in 1992. The cavity measured about 24 cm. in diameter in upper Unit 3 tephra and expands slightly toward its base, with very smooth straight sides. It is at least as high as the wall. In 1992, no structural link to the Feature A wall was apparent. In 1993, it became apparent that the west end of the Feature A wall abutted the cavity and that it was most likely a massive support post.

As noted in the 1992 report, a beam preserved as a 4-cm. diameter cavity ran along the top edge of the wall. This was on the interior (S) side of the vertical pole cavities and was probably tied to the large support post at the west end of the wall. There is no evidence that a molded clay cornice was formed around it.

The interior (S) wall face is inset approximately 30 cm. from the north edge of the high floor. If this is its original position, a narrow ledge about 15 cm. wide would have run along the exterior base of the wall. The large post would have projected beyond the interior (S) wall face.

However, the wall may have been inset farther from the edge of the floor. At the east end of the wall where it abuts a clay column, the interior (S) wall face is about 45-50 cm. in from the floor edge. This would leave an exterior ledge about 30-35 cm. wide at its base (still covered by the balk against the north side of the wall and floor). If this is the original position, the west end of the wall would have abutted the SE part of the large post and the post would have projected slightly beyond the exterior (N) wall face. The wall base at the west end of the wall may also be shifted outward as a consequence of the eruption.

Feature B: South Side Exterior Wall. The collapsed Feature B *bajareque* wall near the SE corner of the Str. 10 platform resembles the Feature A *bajareque* wall. Most of Feature B was exposed in 1992; it had collapsed to the NE and the exterior (SW) face of the wall was visible. In 1993, the SE end and upper edge of the wall were identified; both are fragmented and crumbled. Maximum preserved wall height is about 1.45 m; this is probably close to the original complete wall height.

The horizontal pole cavities preserved in Unit 3 ash near the wall top extend SE beyond the crumbled clay end of the wall, yielding a maximum preserved wall length of about 2.50 m. This is probably close to the original wall length if the NW end of the wall abutted the SE corner of the platform and the SE end of the wall abutted the south exterior column, fallen nearby.

The exposed exterior (SW) face of the wall and the Unit 3 ash above it retain the cavities of the horizontal and vertical poles forming its structural framework. As in the Feature A wall, the horizontal poles are on the outside of the vertical poles, alternate one thicker pole with two or three thinner poles, and remained visible. The vertical poles were completely embedded in the wall clay, and the interior (NE) face of the wall, now facing down, was probably smoothly finished with clay.

East Side

The east side of Str. 10 is enclosed by three columns and two walls that were erected on the high clay floor near its outer edge. The fallen south column was probably abutted by the Feature B collapsed "exposed-pole *bajareque*" wall, which in turn probably abutted the SE corner of the Str. 10 platform. The north column is abutted by the Feature A standing "exposed-pole *bajareque*" wall that extends west along the north side of the Str. 10 platform.

On the east side of Str. 10, the three columns are connected by two intervening walls, one between the south and central columns, and one between the central and north columns. These columns and walls completely closed off southern and eastern access to Str. 10. All of them were erected on the high clay floor.

High Clay Floor. Total N-S length of the high clay floor is approximately 7.8 m. At the SE corner, the floor is 18 cm. lower than in front of the platform, suggesting a slight slope down to the south. However, most of the decline occurs under the fallen walls near the south end of the floor; at the north end, the floor maintains a consistent elevation although its surface is somewhat irregular. The floor extends about 2.3 m. out (E) from the front of the structure platform.

The NE corner of the high clay floor is about 2.7 m. NE of the NE corner of the platform. In plan, the corner is well-rounded. In section, a sloping accumulation of clay on the floor against the column is apparent. The edge of the floor is 25 cm. above the adjacent TBJ.

The SE corner of the high clay floor is located approximately 3.0 m. from the (unexposed) SE platform corner and in plan is only slightly rounded. On the south side, the floor is 22 cm. above the adjacent TBJ ground surface, but on the east side where the TBJ slopes up, the floor is only 11 cm. above the adjacent TBJ.

East Side Exterior Columns. Three aligned clay columns were placed along the east side of Str. 10, evenly spaced and separated by about 3.0 m. They are about 1.85 m. east of the Str. 10 platform. The central and north columns are still standing; the south column broke and fell out to the east. All three columns were standing on the high clay floor; the north and central columns are inset 11-15 cm. from the edge of the high floor.

The three columns are very similar in dimensions: all are square in section, with slightly rounded corners and smooth finished surfaces. They are 42-46 cm. across near their tops and about 1.15-1.25 m. high. The north and south columns are about 5 cm. wider near the tops than at their bases, giving them the top-heavy almost triangular appearance. The central column maintains the same dimensions from top to bottom. The tops of the north and south columns were capped with large *lajas* (tabular andesite slabs). There was no evidence that beams rested on the tops of any of these columns.

Southern East Side Exterior Wall. The *bajareque* wall connecting the exterior south and central columns collapsed outward to the east. Its north end and the wall base near the north end of the wall are well preserved, but the upper and south edges are fragmented and crumbled. Most of its base and lower portion remain hidden where the Feature B wall and the east superstructure wall collapsed onto it.

Maximum preserved length of the wall is about 2.95 m. This approximates the distance between the south and central column and the preserved wall is probably almost complete. The wall height is difficult to determine; at the N end of the wall where the wall base is exposed, maximum preserved height is approximately 1.1 m. This may approach the original height, as the adjacent central column is only a few cm higher. At its N end, the wall is about 15 cm. thick, and examination of poorly preserved pole cavities in the north end and broken south end of the wall suggests that it was "exposed-pole *bajareque*" like the

Features A and B walls. The interior (W) wall face was smoothly finished with clay, but the horizontal poles were probably visible on the exterior (E) wall face.

The wall was resting on the high clay floor, probably with its interior (W) face flush with the interior (W) faces of the columns it abutted at either end. On the outside, a ledge up to 30 cm. wide would have remained along the edge of the high clay floor.

Northern East Side Exterior Wall. The wall connecting the central and north exterior columns collapsed in the middle but segments remain standing at either end. It is different in appearance and construction from the other exterior walls.

The wall was of standard thickness but quite low. At its south end where it abuts the central column and is best preserved, the wall is 69-70 m. high and 15-16 cm. thick. The upper parts of the standing wall segments are pushed outward (W), however, at the base at the south end of the wall, the interior (W) wall face is aligned with the interior (W) face of the central column it abuts. This was probably also true for the north end of the wall and the column it abuts. An exterior ledge up to 30 cm. wide was formed between the exterior wall base and the outer edge of the high clay floor.

A horizontal cornice runs along the top of the wall on its exterior (E) face. The cornice is squared with slightly rounded edges, projects 4-5 cm. from the face of the wall, and is 20 cm. high. It is well formed and smoothed, and appears to have been an integral part of the original wall construction rather than added on.

There is little evidence that the wall was anchored to the floor on which it rests. Although there are traces of an interior pole framework (parallel and perpendicular linear depressions in lumps of fallen wall clay), there is almost no trace of vertical poles in the wall base or floor in the area where the wall collapsed. The base of the wall and floor in the latter area were carefully examined for evidence of pole or post holes, but only a few very irregular and shallow linear depressions were observed.

The top edge of the wall in the standing portions shows no evidence of poles extending above the wall.

Characteristics of the fallen wall debris support the notion that the wall was poorly reinforced. The collapsed central portion of the wall includes abundant small and medium size lumps of soft clay, very few of which have pole impressions in them. The wall apparently disintegrated as it fell, suggesting that the clay was poorly consolidated to begin with. Most of the lumps fell outward, but many fell onto the wall base and the artifacts located just inside (W of) the wall. This clay is relatively soft, and the weight of overburden compressed the lumps into an almost continuous layer. Few of the lumps retain their shape and very few are longer than 10 cm. This is very much in contrast to the clay from any other wall and suggests poor quality puddled-adobe construction.

Roof

The thatched roof of Str. 10 apparently extended to the surrounding walls on the east and north sides and a little beyond. It is unclear whether the extended roof was contiguous with the roof over the superstructure or built as a separate unit. All thatch was apparently grass thatch.

Next to, under, and between thatch layers, beams, poles, rafters and other wooden elements were preserved either as hollows or carbon. Occassional bits of carbonized twisted

2-ply string with or without knots were found among the carbonized thatch and wood. The wood elements found in the 1993 excavation were particularly fragmentary; their original position is impossible to reconstruct in detail.

In the west room of the superstructure, a single layer of thatch was found. In the areas surrounding the N and E sides of Str. 10, two distinct layers of fallen roof thatch were usual. As in the 1992 excavations, thatch was preserved in both carbonized and uncarbonized forms.

West Room Roof Elements

A single layer of thatch was present in the west superstructure room. It was relatively intact in the northern part of the room, where it measured 3-10 cm. thick, and was draped over lower irregular Unit 2 deposits and artifacts. It was oriented primarily E-W across the width of the room. In the south half of the room, the thatch layer was very irregular and disturbed, partly because of numerous volcanic bombs that fell in the area and partly because it was draped over numerous irregular and large items below. Throughout the room, the grass thatch was partially burned, particularly on its underside (carbon sample: 295-8-377).

North Side Roof Elements

On the north side of the structure, each of the two thatch layers were continuous with the layers exposed in 1992 and fairly intact. The upper layer was in lower Unit 3 ash, about 25-35 cm. higher than the lower layer. The lower layer was directly on Unit 2 ash. The grass in both layers was oriented primarily N-S or NW-SE, although it was sometime distorted by underlying deposits.

Along the Feature A wall, thatch in two layers was abundant in the area between the wall and the structure. No thatch was uncovered outside the wall, although it is possible that some is still hidden in the 35 cm-wide balk along the wall exterior.

West of the Feature A wall, the lower thatch layer covered several long thin pole cavities. These are often parallel to the thatch orientation or perpendicular to it, and presumably were rafters or stringers that came down with the thatch. The poles are 1.5-3.5 cm. in diameter; several are preserved up to 80 cm. long and the longest preserved example is about 1.3 m. long. The best-preserved perpendicularly oriented poles are concentrated in the area just west and north of the Feature A wall and are aligned with it. A pair of sticks and the string used to tie them together were preserved in carbonized form (295-8-271).

East Side Roof Elements

Two thatch layers were present on the east side of the building in the area between the platform and the exterior north wall. The upper thatch layer is on Unit 2 ash and in lower Unit 3 ash. The lower thatch layer is below Unit 2 ash.

The upper thatch was exposed in three areas on the east side of the structure: over the high clay floor east of the platform and over the north exterior wall, the area of the fallen south exterior wall, and at the southeast corner of the high clay floor.

In the area of the high clay floor and north exterior wall, the general thatch orientation was E-W although it was discontinuous, irregularly burned, and displaced where it was draped over projecting underlying material and where it had piled up against the interior (W) face of the standing portion of the north exterior wall. Various burned pole

fragments and short pole cavities were preserved under the thatch layer and often the underside of the thatch layer was burned. It extended east up to 30 cm. beyond the edge of the high clay floor over the area of the fallen north exterior wall. An isolated small patch and several pole fragments were found up to 50 cm. E of the north exterior column.

The same upper layer of thatch was draped directly over the fallen south exterior wall. There is no volcanic ash between the wall and the thatch layer, indicating that they collapsed simultaneously. In this area, the thatch was very well-preserved, burned on its underside, continuous, and with a NW-SE orientation. It did not extend beyond the upper edge of the wall, which was poorly preserved.

The stratigraphic sequence in the south exterior wall area is as follows (from bottom to top): TBJ ground surface, Unit 1 ash, Unit 2 ash, fallen south exterior wall, thatch layer, lower Unit 3 ash, fallen Feature B wall, lower Unit 3 ash, fallen east superstructure facade wall, upper Unit 3 and subsequent ash units.

Above the southeast corner of the high clay floor, a small unburned patch of the upper thatch layer was preserved at the Unit 2/3 contact; its orientation was NW-SE. Numerous pole cavities 2-3 cm. in diameter and up to 1.4 m. long were also preserved in the area.

The lower thatch layer was found draping the east step in 1992. It is carbonized in places where volcanic bombs landed on it, and on its underside everywhere. The layer is continuous and covers artifacts, wall debris, and the thin layer of Unit 1 ash on the high clay floor. It was not apparent in the area of the fallen south exterior wall, but may be present under the collapsed wall.

Total Roofed Area

All of the walled areas surrounding the SE, E, and N sides of the structure appear to have been roofed. However eave drip-lines are not easily identifiable because the surrounding TBJ ground surface in the general area slopes to the S and W. Shallow drainage channels allowing for surface drainage around Str. 10 were apparent on the north and east sides of the structure. In some areas, these may correspond to roof drip-lines. Assuming that surface drainage channels are at or outside the drip-lines of eaves, minimum roof extensions may be calculated in a tentative fashion.

On the east, a linear depression in the TBJ ground surface suggesting a possible drip-line was located 35-60 cm. from the high clay floor. Near the center of the collapsed north exterior wall, it was about 30-35 cm. from the edge of the floor, matching the approximate limits of the fallen roof thatch. Farther south, it moved farther out: by the central exterior column it was about 60 cm. from the floor edge. The possible drip-line was not apparent around the NE corner of the high clay floor.

On the north side, W of the Feature A wall, the outer edge of the sloping TBJ surface against the high clay floor indicates the location of the drainage channels. These are located about 45 cm. north of the high clay floor, and about 65-70 cm. N and about 75-80 cm. W of the NW platform corner. North of the Feature A wall, the drainage channel is probably about 30-35 cm. N of the floor, under the edge of the ash balk left standing against the wall.

Only 45 cm. of TBJ floor area was exposed south of the SE corner of the high clay floor, too little to expose a drip-line. However, about 60 cm. farther east, a drainage channel was identified running approximately parallel to the south edge of the floor and about 60-65 cm. south of the floor edge line. This channel originates about 2.4 m. east of the floor

corner, far beyond any possible roof eave, but may merge with the drip-line as it approaches the structure.

Roofed area is calculated assuming that the roof drip-line corresponds to the drainage channels where they are closest to the structure. On the east and north sides, this would be 35 cm. beyond the edge of the high clay floor. Sixty cm. is used for the south side, and 75 cm. for the west side. The NE corner of the high clay floor is included with the east side. Along the south side, the boundary between the east and south high clay floors is assumed to be aligned with the east side of the platform. The SE and NE eave corners are included with the E side eaves. The SW and NW eave corners are included with the west side eave. Distances are rounded to the nearest 5 cm. Table 1 presents total and sub-divided roofed areas.

The E and N walled corridors comprise about 41% of the total roofed area. The unwalled clay floors comprise an additional 14%. All told, over half (55%) of the roofed area covers exterior raised clay floors on the north, east, and south sides of the structure. The platform itself comprises only about 26% of the roofed area. About 19% of the roofed area consists of eaves extending beyond walls over the surrounding TBJ ground surface.

Summary and Discussion of Architecture

The 1993 excavations exposed the limits of the Str. 10 architecture on the north and east sides and the interior of the west superstructure room. These allow for a fuller understanding of the construction techniques, physical layout and access characteristics of the building and its construction history, and facilitates comparison with other excavated structures. The most unusual of these features is discussed briefly.

Construction Techniques

At least two and probably three of the exterior walls surrounding the platform exhibit an unusual construction technique called here "exposed-pole *bajaraque*" in which the horizontal poles of the wood framework remained visible on the outer wall surface. A fourth exterior wall may also be atypical in construction, without any interior vertical poles anchored to the floor on which the wall rests, and with poorly consolidated puddled clay construction. These wall construction techniques have not been discovered on any other excavated structure.

The width of the exterior columns contrasts greatly with the massive columns on the Str. 10 superstructure, and are comparable to those of other excavated structures. However, they are unusual because they are significantly shorter than most columns and two of them taper toward their bases; both had *lajas* on top.

Another unusual "column" is the large wood post at the west end of the Feature A wall. In other structures, smaller diameter wooden posts are used to support roofs and are incorporated into *bajareque* walls, but do not mark the ends of clay walls.

The thatched roof over the exterior high floor on the north and east side of the platform may not have been integrated with the thatched roof over the superstructure rooms. Overlapping roofs are suggested by the two layers of thatching found in the exterior high floor areas, unlike the single layer found on the superstructure. Very likely, the exterior roofing was an addition to Str. 10 (see Construction History below).

Physical Layout and Access

Newly exposed architectural features tend to emphasize the non-residential character of Str. 10.

Open access indicated by the unusual wide entrance on the east side of the platform was completely negated by the walled corridors surrounding the platform and extremely restricted access to these corridors. The only entrance to the corridors was on the north side, requiring a long detour to get to the platform entrance and superstructure rooms. However, the low exterior wall on the east side near the N exterior column suggests that visual access from inside out was important.

There was no bench in the west room at the time of the eruption. There is some indication of an early low bench or raised floor in the north end of the west room that was later obliterated by raising the floor in the center and south parts of the room. This "bench" would have been much lower than benches found in other residential and non-residential structures.

Construction History

Structure 10 appears to have had a construction history involving various modifications. As mentioned above, a possible low bench or raised floor in the west room was apparently covered by raising the floor level throughout the rest of the room. Outside the structure, low wall bases extending from the north and south platform sides may have supported pole walls that separated the back from the front and sides of the platform. The high clay floor surrounding the front and sides of the platform was a subsequent addition, and the exterior columns and walls were raised after the floor was paved. Their symmetrical placement with the central column directly in front of the step up to the platform suggests that the columns and walls were erected in one construction episode.

Artifacts, Portable Features, and Organic Materials

The 1993 excavations yielded numerous artifacts and other materials that, in combination with the 1992 materials, indicate that the structure and surrounding areas were used for a variety of activities. In general, the new excavations provide ample corroboration that the structure probably was not residential and that two of its most important uses were for storage and for large-scale food preparation.

In situ and fallen items and materials are described separately by area. These areas do not necessarily correspond to activity areas. The ceramics, chipped stone, and ground stone are described by M. Beaudry-Corbett (Chapter 7) and Payson D. Sheets (Chapter 8).

The only newly-excavated area inside the superstructure is the west room. Off the platform, the high clay floor area is divided into the following areas: the southeast corner and fallen southern walls, east side in front of the platform including the northeast corner, and the area north of the platform. Materials that originated from these areas but fell beyond these limits are included. Items that were on the original TBJ ground surface outside of the clay-paved floors and west of Str. 10 are discussed in Simmons and Villalobos (Chapter 3).

Superstructure West Room

Numerous artifacts were found in the superstructure west room, including various vessels and smaller items. Many fell from a high location in the north part of the room, perhaps from the *tabanco*. The larger *in situ* items were concentrated in the south half of the room, but more may still be present in unexcavated balks against walls in the north part of the room. Figure 4 shows the location of *in situ* items. Figure 5 shows the location of fallen items.

In Situ Items

In situ artifacts in the west room include a large Guazapa Scraped-slip jar (8-V.39) at the south end of the room and a second Scraped-slip jar in the SE room corner (8-V.38). Only the rim, neck and shoulders of the latter vessel were exposed; it is located against the interior dividing wall about halfway between the S doorjamb and the SE corner of the room. In the center and north parts of the room, sherds and a *laja* were exposed.

Vessel 8-V.39 was partly exposed in 1992 and completely excavated in 1993. Soil samples were taken from above the collapsed upper body sherds (295-8-538,539) and from the vessel interior below the upper body sherds (295-8-562). The lower contents contained impressions of bean-like seeds.

Vessel 8-V.39, an unusually large jar, was fixed in place with a fairly complex external support system. A layer of white TBJ ash, probably 5-6 cm. thick, was laid on the room floor. The impression of an organic ring support (*yagual*) placed on top of the TBJ was well preserved. The ring support was made of flexible branches or vines about 2 cm. thick, bent at least three and possibly four times around to form a circle, and only slightly twisted to hold together. The vessel was then placed on top of the *yagual*. Layers of sherds (295-8-620) were wedged against the sides of the TBJ, the *yagual*, and the vessel. Covered by Unit 1 ash, the sherds in the upper layer were loosely packed, varied from about 5 to 18 cm. in length, and abutted the vessel itself. Below this, at least two other layers of sherds were tightly packed up against the *yagual* and partially embedded in the TBJ layer. These sherds vary from about 4 to 30 cm. in length; most have been left in place.

Various small sherds were embedded in the floor throughout the central and north parts of the room. Most are less than 5 cm. in length, although a few are up to 10 cm. long. The edge of a *laja* (tabular andesite) was exposed in the NE corner of the room, with several sherds on top of it. This may be the edge of a feature still hidden in the balk against the north and west walls of the room. Several chunks of fallen construction adobe were also found in contact with the floor in the NW part of the room.

Fallen Items

Several artifacts were found directly on the fallen thatch layer in lower Unit 3 volcanic ash. Three sherds (295-8-515) were scattered in the north half of the room directly on the thatch.

Various artifacts were found in and just below the roof thatch layer. These had clearly fallen from a location just below the roof. Large chunks of fallen construction clay,

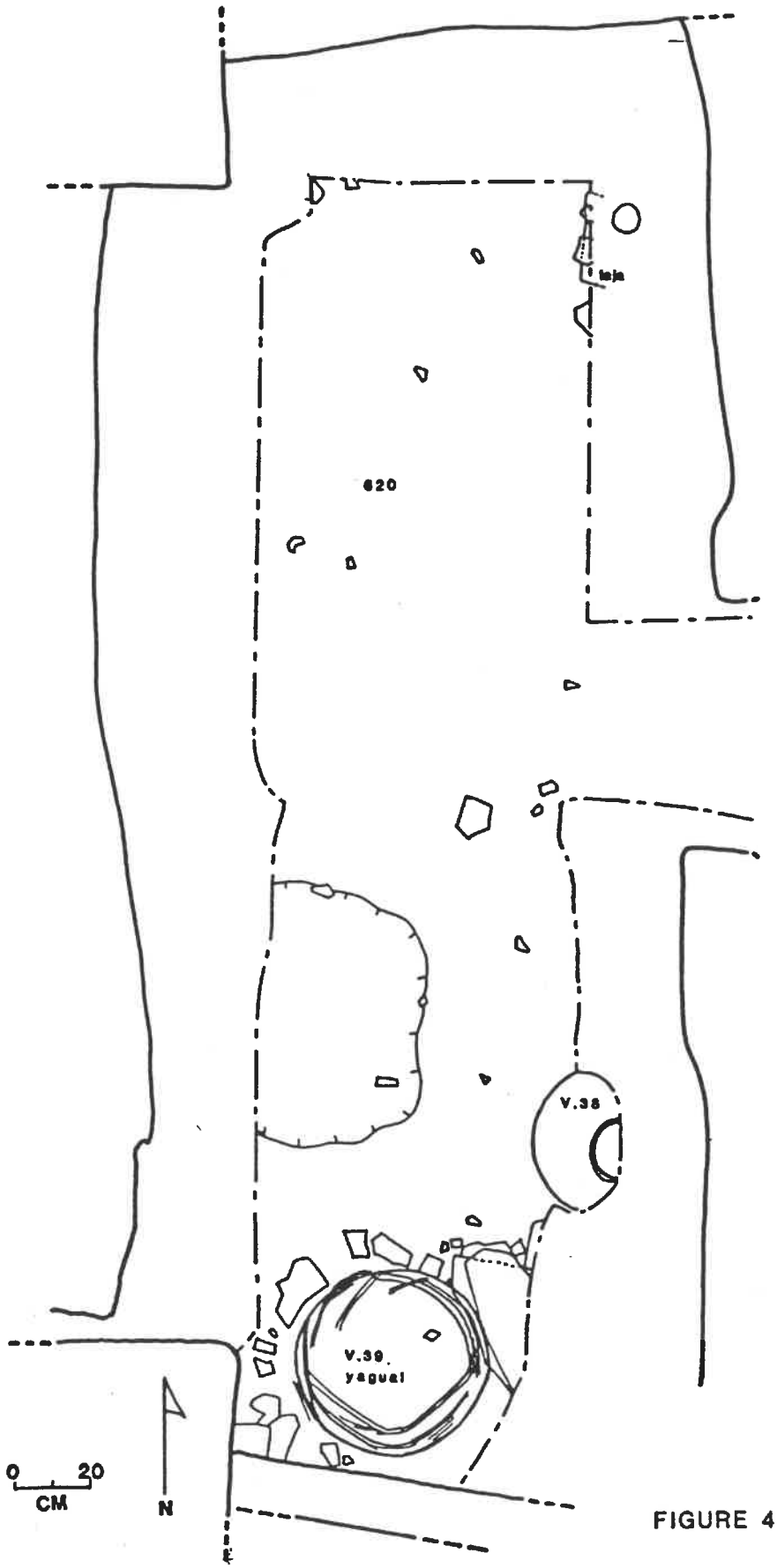


FIGURE 4.

STR 10 WEST ROOM IN SITU OBJECTS

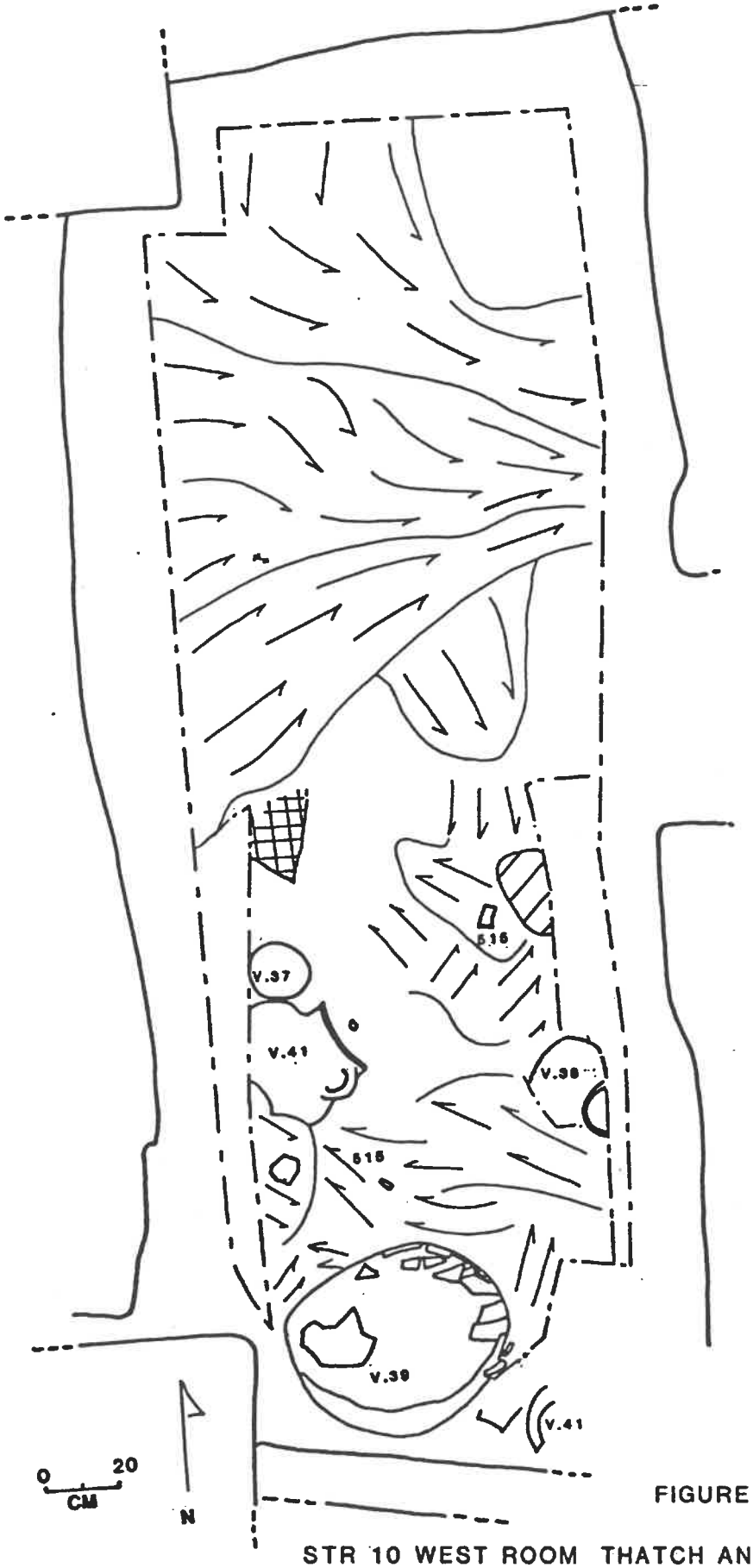


FIGURE 5a.

STR 10 WEST ROOM THATCH AND FALLEN OBJECTS

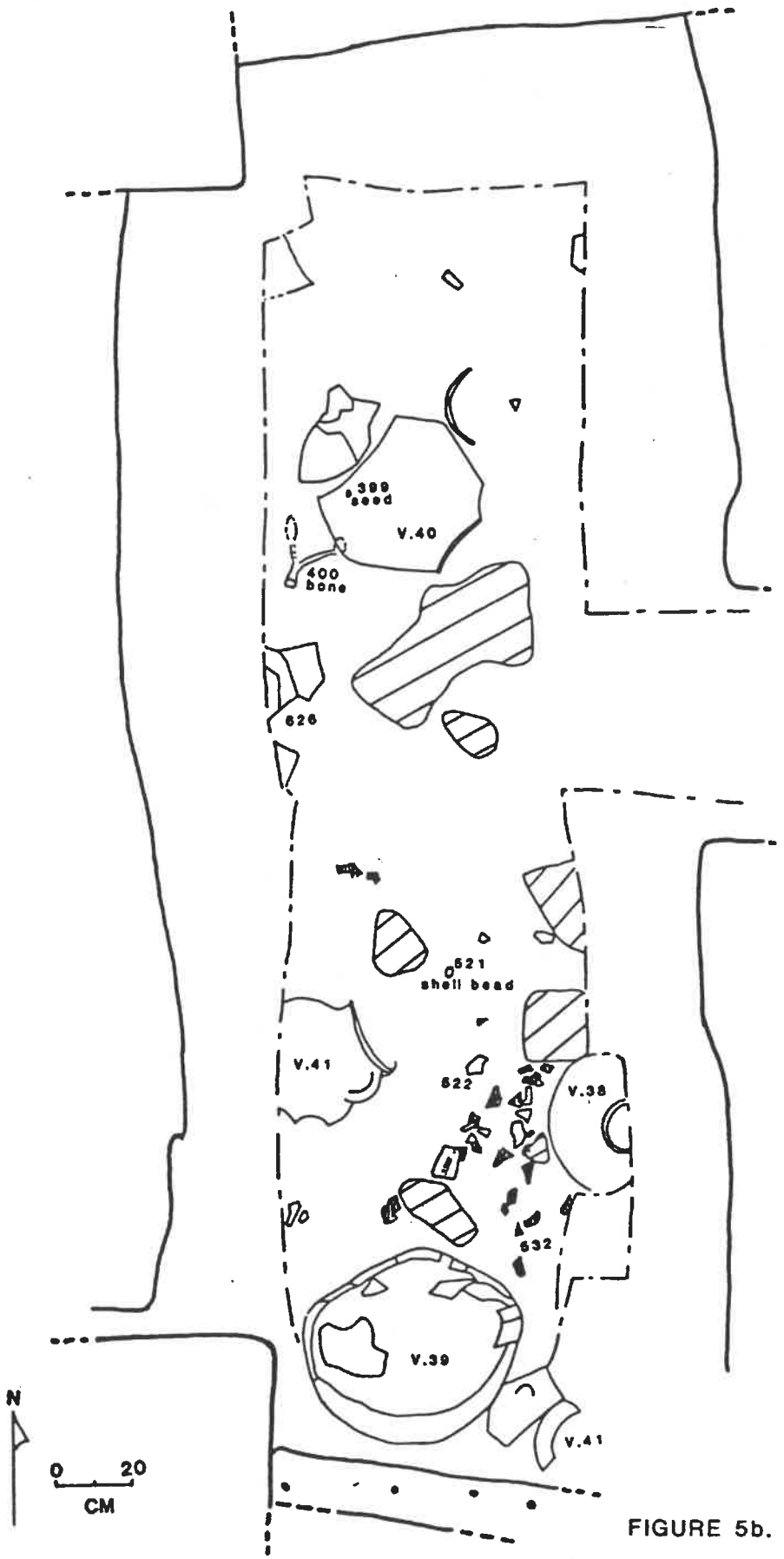


FIGURE 5b.

STR 10 WEST ROOM FALLEN OBJECTS

probably from the north room wall and/or northwest column, had also fallen with the roof; these were concentrated in the northern and central parts of the room. Almost all of these materials were associated with volcanic bombs of various sizes. One bomb measuring over 55 cm. in length landed just west of the doorway into the room and almost certainly dragged part of the walls and/or column and the artifacts down from an elevated position (shelf?) just inside or outside the north room wall. Another large bomb landing in the SW part of the room probably dragged down the fallen vessels that were located directly above it.

The handle and some rim sherds of a fallen and broken jar (8-V.41) were in upper Unit 3 ash, fallen against the upper part of vessel 8-V.39 in the south end of the room, and a body sherd was in the central part of the room. This jar was clearly dislodged and dragged down by a large volcanic bomb; it was partly covered by fallen roof thatch. Visible contents (295-8-614) included impressions of bean-like seeds.

In the north half of the room, a partial jar broken into several pieces (8-V.40) was flattened just below the roof thatch layer (contents:295-8-397 and seed:295-8-399). Parts of another fallen large vessel with a handle (295-8-626) remain embedded in the balk against the west room wall. These materials were surrounded by and on top of volcanic bombs and broken chunks of construction adobe.

Several fallen vessels were recovered in the south half of the room. One (8-V.37) is a complete bichrome red and cream recurved 2-handled bowl of unusual Sacazil type (Beaudry-Corbett, Chapter 7). No seeds were immediately apparent in the contents sample (295-8-475).

The Unit 2 ash in the west room varies from 5 to 12 cm. thick and is extremly coarse. Numerous small to large volcanic bombs were found among fallen roof beams (e.g., 295-8-536 from SW room corner), especially in the south half of the room. Sherds were found scattered throughout the south half of the room in Unit 2 ash (295-8-522).

Numerous items were located at the Unit 2/Unit 1 contact in the central and southern area of the room, including sherds (295-8-532), a highly eroded sub-spherical shell bead (295-8-521), and a bone tool made from a scapula (deer?; 295-8-400).

The Unit 1 ash layer is relatively thin, varying from 0.5 to 3 cm. in thickness. The large Unit 2 bomb that landed in the SW part of the room caused a enormous depression 70 cm. wide and over 30 cm. deep in the floor. A small bomb (295-8-615) within this depression was in floor contact. A few scattered sherds (295-8-621) were found in the Unit 1 ash and possibly in contact with the room floor in the central and northern part of the room.

Southeast High Clay Floor and Fallen Southern Walls

Except for the extreme southeast corner of the exterior high clay floor, almost none of the southern portion of that floor was exposed. Most of the area between the corner and the front platform step was covered by various fallen walls. However, some fallen materials were recovered. The area north of the fallen walls is included in the discussion of the high

clay floor area east and northeast of the platform. Figure 6a shows the location of *in situ* items. Figure 7a shows the location of fallen items.

In Situ Items

No *in situ* items were recovered from the 1/2 sq m. area exposed at the SE corner of the high clay floor.

Fallen Items

Very few fallen items were found south of the front platform step. Near the collapsed south exterior column, the *laja* that was presumably resting on it was found within 30 cm. of the column top. Another piece of *laja*, perhaps broken from the same slab, had fallen near the center-north side of the column, into the space between the column and the end of the abutting east exterior fallen wall.

Several items fell onto that same wall farther to the north. These include a cobble and two obsidian prismatic blade fragments.

The cobble was irregular, river-worn, and rounded, with a diameter of about 20 cm. It fell on top of the thatch layer on the wall about 70 cm. from the south end of the wall. Its original location is difficult to determine; it may have been on top of the Feature B wall that collapsed nearby onto east exterior wall.

Two obsidian blade fragments (295-8-624,625) were found resting on the upper (interior) surface of the wall, immediately below the roof thatch that collapsed onto it. They were not within the thatch, but were trapped between the thatch and the wall. They were located within 1.0 m. of its north end of the wall. In order to be trapped between the wall and the roof, the obsidian blades probably were stored originally on top of the east exterior wall. At its north end, this wall was close to the superstructure entrance, an area that was heavily used for storage.

East High Clay Floor

The exterior high clay floor east and northeast of the platform contained abundant *in situ* and fallen artifacts and other materials. Numerous vessels, some with visible contents, were on the floor along the interior face of the exterior wall. A mounted metate, described above, occupied the northeast corner of the high clay floor. A great variety of smaller items fell into the area and were probably stored in high locations nearby. Figure 6b shows the location of *in situ* items. Figure 7b shows the location of fallen items.

In Situ Items

At least 14 ceramic vessels, two ceramic lids, and one painted gourd (*morro*) were located against or near the interior base of the exterior east wall. They are concentrated in the area in front of the platform itself. They are less dense toward the northeast corner of the floor and the mounted metate. An unknown number of vessels are located under the fallen walls in the south part of the high clay floor. Most of the vessels were cracked and

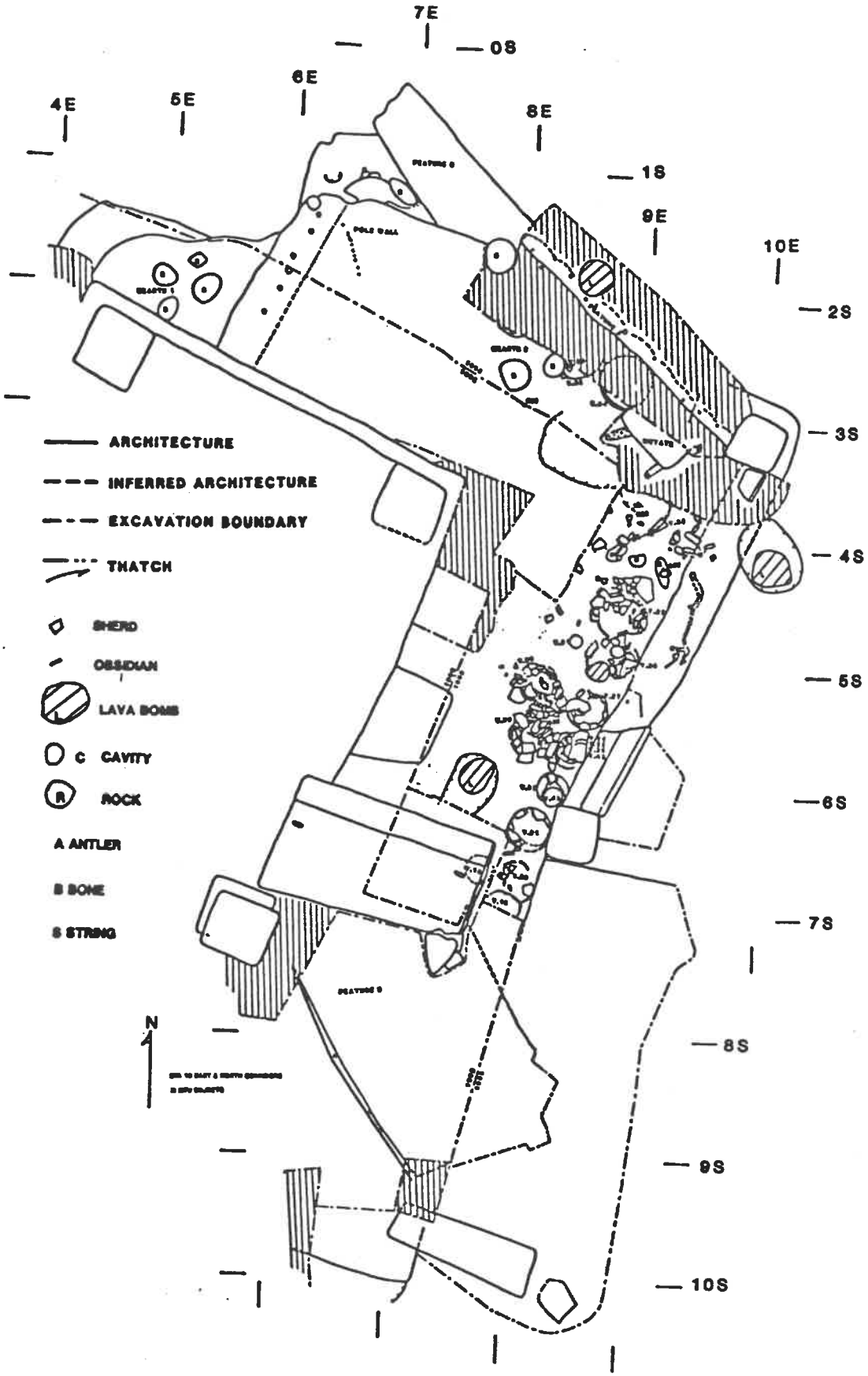


FIGURE 6. STR 10 IN SITU OBJECTS

(See Fig. 6a and 6b for detail)

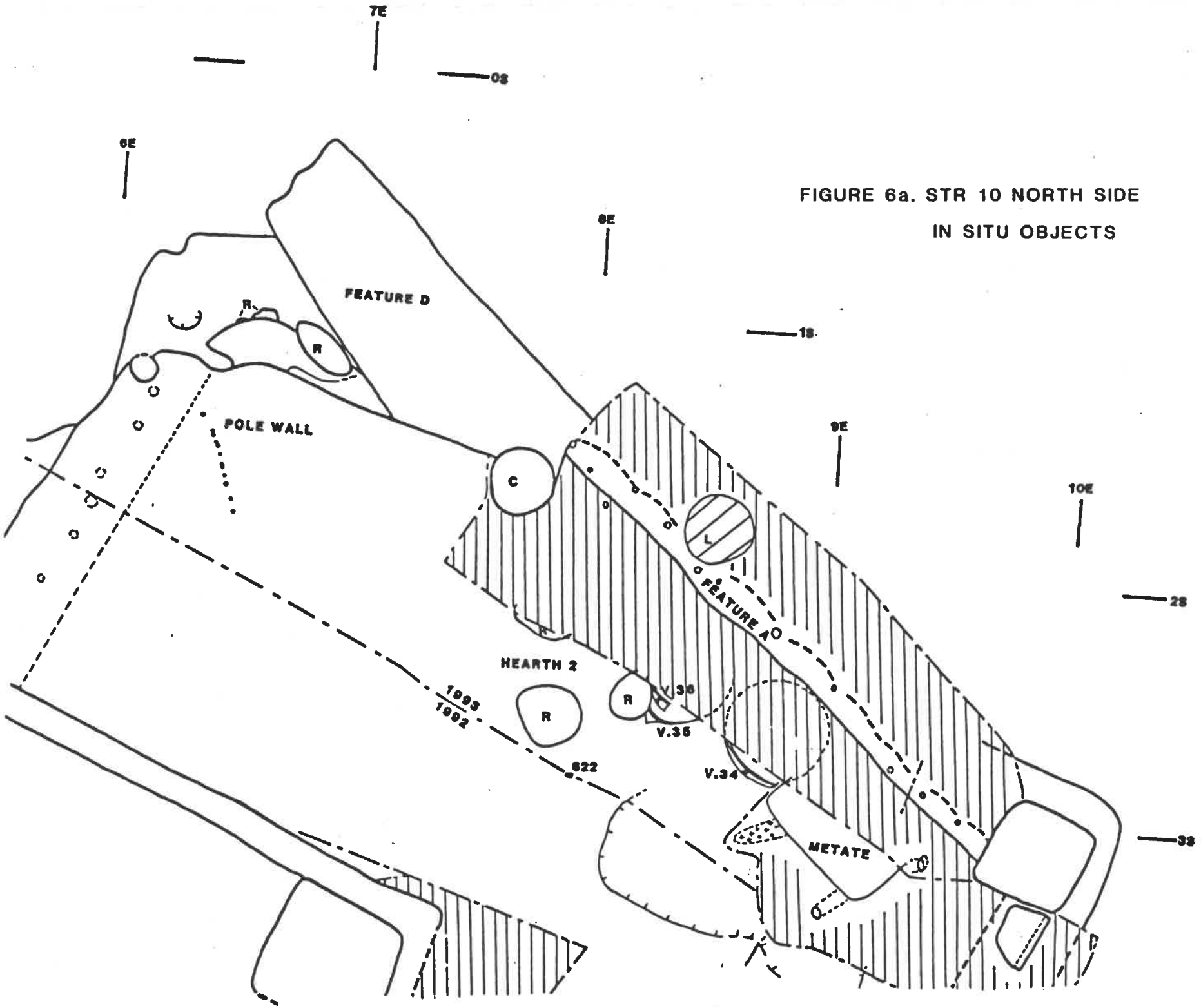


FIGURE 6a. STR 10 NORTH SIDE
IN SITU OBJECTS

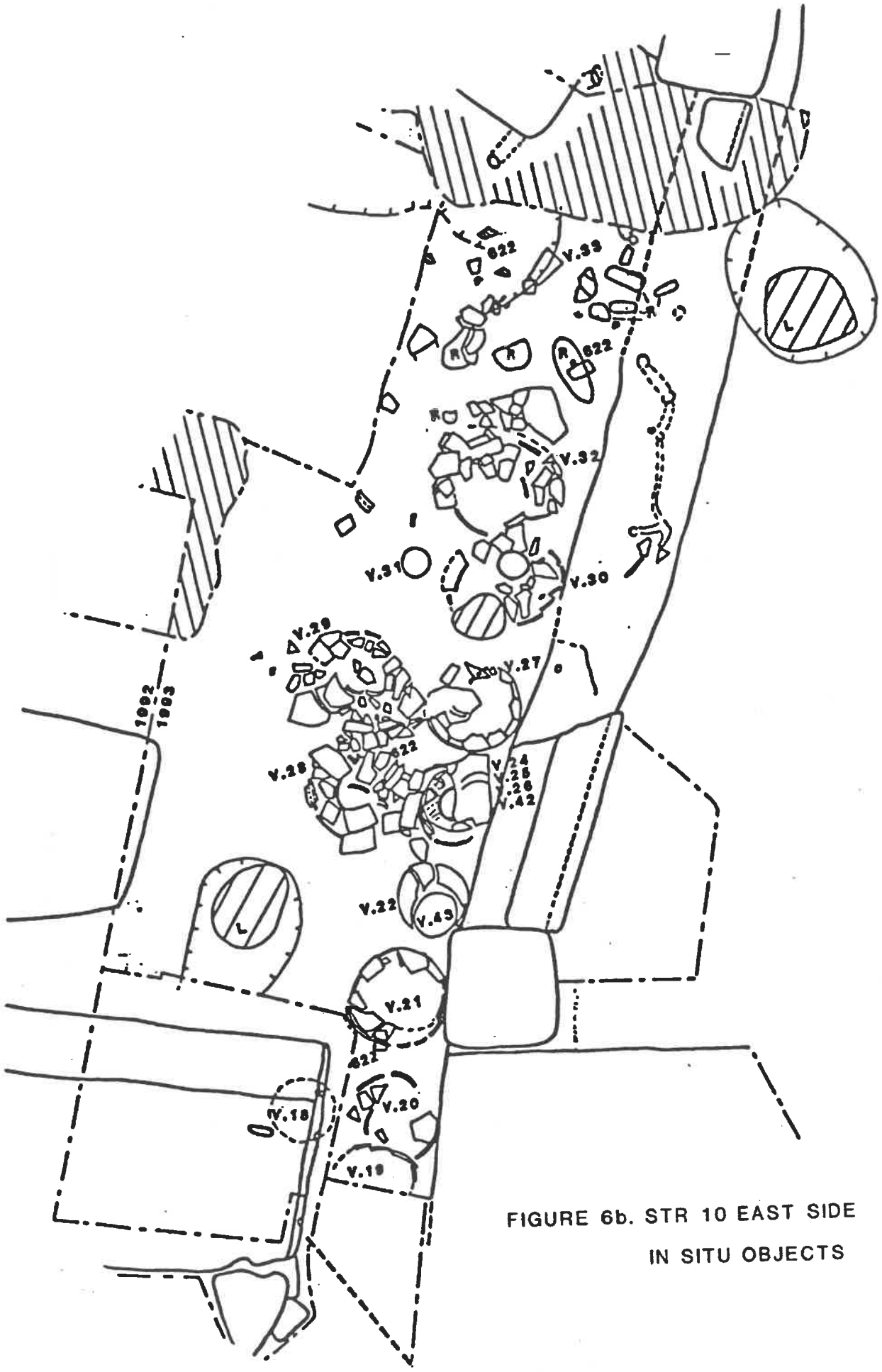


FIGURE 6b. STR 10 EAST SIDE
IN SITU OBJECTS

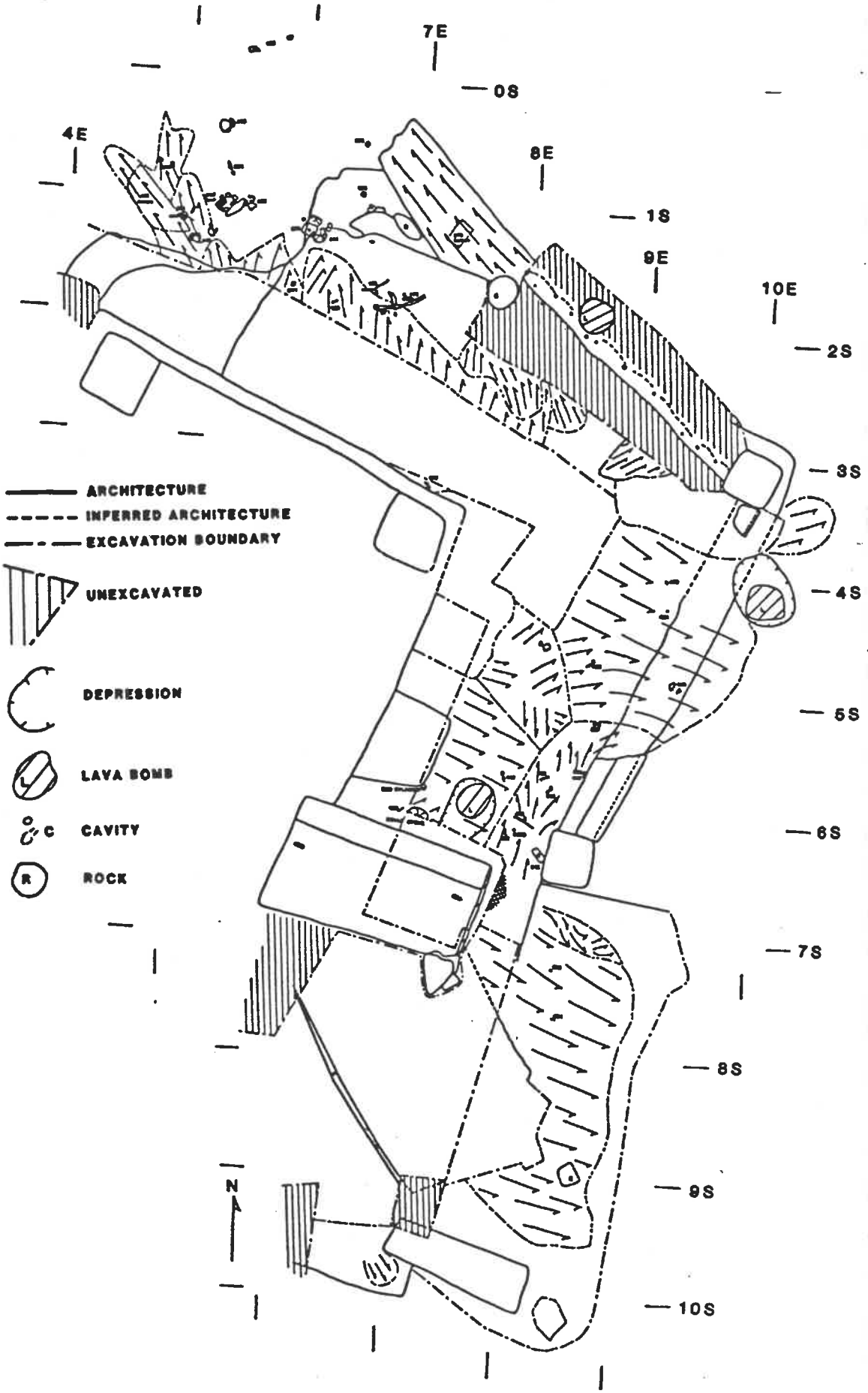
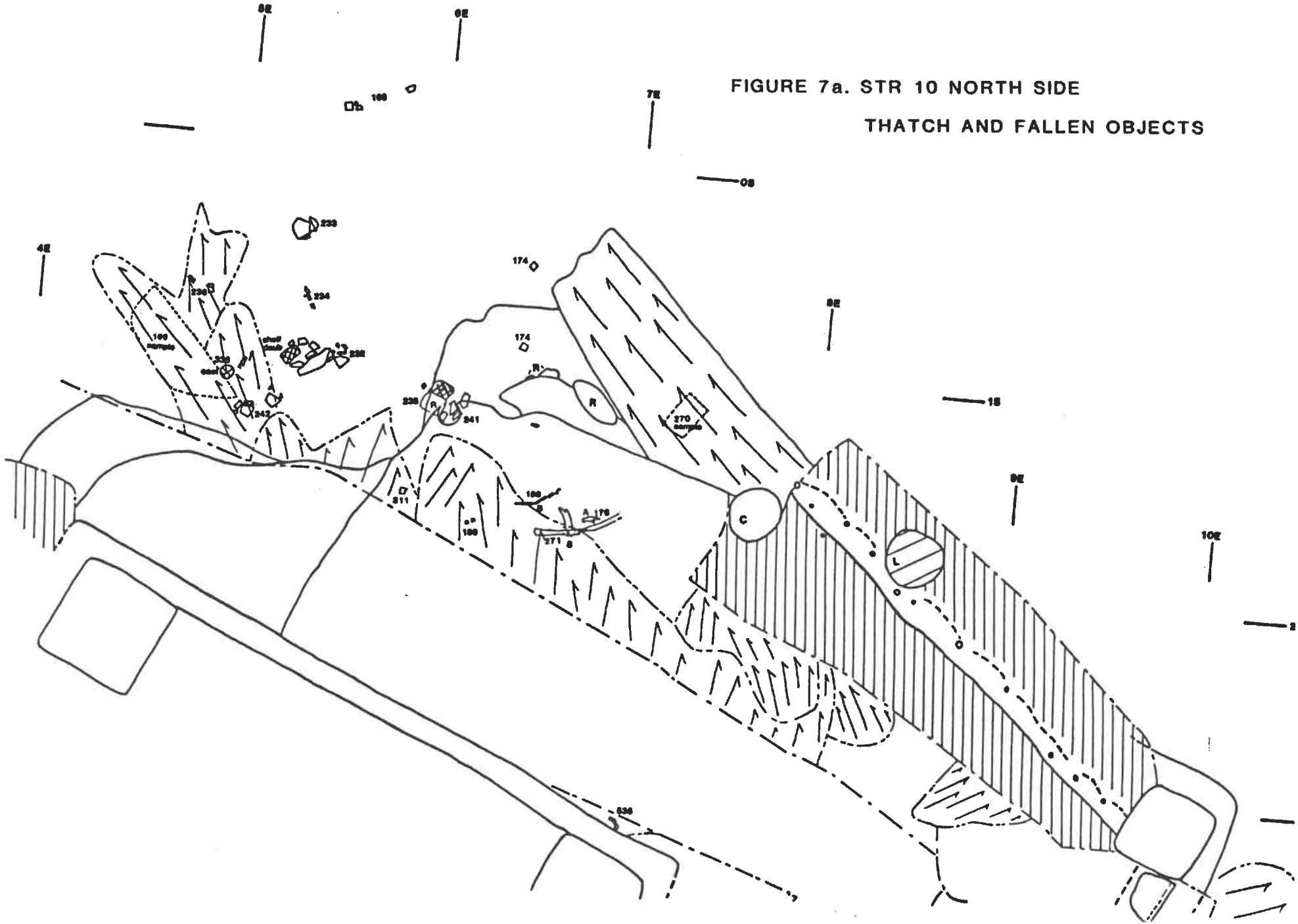


FIGURE 7. STR 10 THATCH AND FALLEN OBJECTS

(See Fig. 7a and 7b for detail)

FIGURE 7a. STR 10 NORTH SIDE

THATCH AND FALLEN OBJECTS



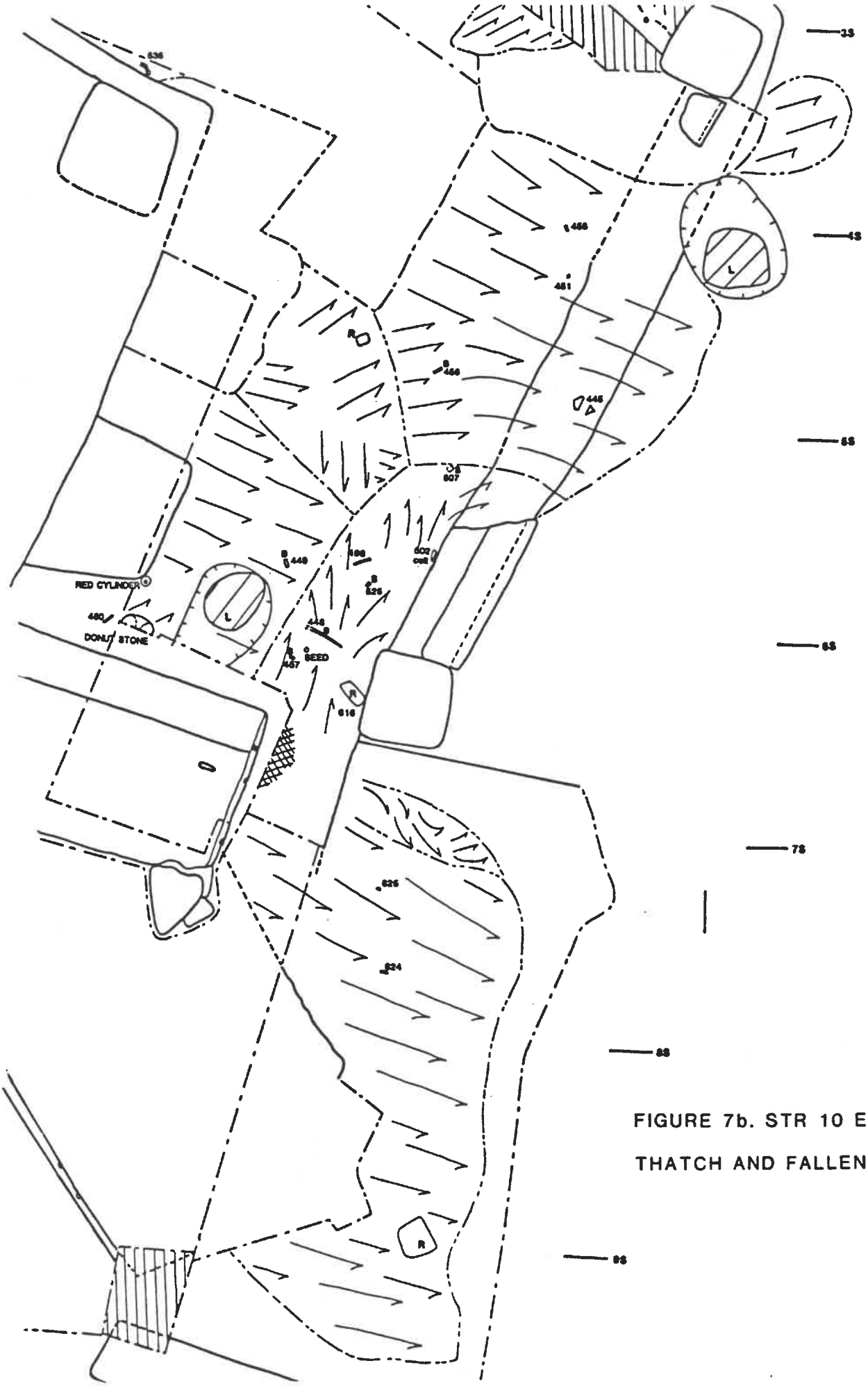


FIGURE 7b. STR 10 EAST SIDE

THATCH AND FALLEN OBJECTS

broken by the ash, roof, and wall debris that fell on them but a few are still complete. The northern-most vessels are the most damaged and displaced.

Eleven of the vessels, all ceramic, were lined up against the wall, including three nested vessels. Lids made from large sherds covered the top vessel in the nested stack and one other vessel. An additional three ceramic vessels and one painted *morro* were placed in a second row just W of these; all were in the vicinity of the platform front step. Table 2 lists the vessels by number, along with their repective FS numbers, form, type, and contents.

Vessel characteristics. Utilitarian basins or bowls and jars are the most common form among the vessels (2 bowls, 9 jars, 3 unknown). Most are Guazapa Scraped-slip vessels and relatively uniform in size and shape. The Guazapa jars measure about 35 cm across at mid-vessel near the shoulder and most are handled. Several unusual vessel types are present including a Martir Incised/Punctate jar (8-V.26) and a Huatales Bichrome jar (8-V.29). The painted *morro* (8-V.31) probably was an open bowl, at least 11 cm. in diameter and probably more at its widest. The forms of three vessels are unknown at this time; all appear to be utilitarian types. The ceramic vessels are described more fully by Beaudry-Corbett (Chapter 7).

Although no obvious contents were observed in most of the vessels, several probably contained grains or seeds. All of these are located in the cluster in front of the front platform step. The Martir Incised/Punctate jar (8-V.26), which was the top vessel in the stack of three and covered with a sherd lid, was half full of squash seeds. A lidded Guazapa open basin (8-V.22) contained an unidentifable organic material in its interior base and the volcanic ash above retained impressions of unidentified seeds. The ash in a jar (8-V.28) also retained impressions of unidentified seeds. Another jar (8-V.30) had a reddish deposit on the interior base, possibly a residue from some liquid contents.

The majority of the vessels are utilitarian large or medium sized jars. The Martir Incised/Punctate jar with squash seeds and the painted *morro* are the only vessels that do not fit this general description.

Fallen Items

Numerous smaller fallen items were recovered from the east side of the platform, especially bone and stone tools (Table 3). They are found in two clusters.

Cluster 1. The first cluster, containing most of the items, is between the front platform step and the east exterior wall. The 1993 items include carbonized corn, a painted cylindrical organic object, two obsidian blade fragments, six bone tools and ornaments, a donut stone, a celt, and two unworked cobbles. In 1992, three donut stones, two worked stones, one unworked cobble, a spindle whorl, and two sherds were found in the same area. Except for a long bone tool and the perforated and unperforated worked cobbles, all of these items were located either in Unit 1 ash or between Unit 1 ash and fallen roof and/or east wall debris. The perforated and unperforated cobbles recovered in 1992, all found near the front platform step, had apparently fallen with or through multiple roof thatch layers. They were between layers of fallen roof thatch or at the Unit 2/3 ash contact zone. The 1993 perforated stone

was found at the U.1/2 contact below fallen roof thatch. The long bone tool fell with lower Unit 3 ash.

The lower items must have come down prior to the earliest roof collapse. As suggested in 1992, the items closer to the platform may have been stored on the *tabanco* over the east superstructure room. Of the material recovered in 1993, this might include the painted organic cylindrical object and an obsidian blade fragment. However, most of the 1993 items were found nearer the exterior central column and walls than the platform. Some of the lighter objects, especially the carbonized corn, two bone tube beads, two bone spatulate tools or ornaments, and a second obsidian blade, could have come from the superstructure shelf. A volcanic bomb that landed just in front of the step may have sent them flying. At least two heavier items (the greenstone celt and the smooth stone) had landed between the wall and adjacent *in situ* vessels; they probably fell from the wall itself.

The 1993 donut stone undoubtedly fell together with the stones recovered in 1992 in the same area. As suggested in 1992, they may have been stored in that area or fell from the roof above. The long bone tool found in lower Unit 3 ash must have been stored on or in the roof; it was below the upper layer fallen roof thatch but above the Unit 2 ash that brought down the lower roof thatch layer.

Cluster 2. The second cluster is located near the north end of the east exterior wall. It contains two obsidian prismatic blade fragments, many unworked cobbles, and two sherds. Except for the sherds, all of these items are found on or in the debris of the collapsed exterior east wall, either on or inside the wall line. The obsidian and cobbles probably were resting on the wall originally. The two sherds found on collapse debris outside the wall line may have been displaced by one of the numerous small volcanic bombs that landed in and around the structure.

Artifact characteristics. Several classes of materials fell into the east high floor area. Bone tools are especially numerous and include two pairs of matched items as well as two singular tools. Many needed restoration (Beaubien and Lundberg, Chapter 9). Obsidian prismatic blade fragments were also fairly common. A brief description of the artifacts follows.

The carbonized unshelled corn was found scattered in and around the vessels located in Cluster 1 (Vessels 8-V.20,24,26,28). No sign of corn husks were observed; the ears had apparently been shucked.

A matched pair of bone tube beads were made on large mammal (deer?) longbones. They have a burned appearance and are highly polished. One was fragmented; the other was whole. They were found within 43 cm. of each other, fallen among the vessels inside the exterior east wall. They are presumably ornaments rather than tools.

A matched pair of small bone tear-drop or spatulate-shaped pieces were found in the same area, within 40 cm. of each other. They were highly fragmented. There was no apparent use wear; they may be ornaments rather than tools.

A long narrow bone tool was cut from a large mammal longbone. It is at least 22 cm. long (the tip was not recovered) and less than 1 cm. wide. Another bone ornament or tool was cut from a scapula; it was badly broken and not completely restorable.

The donut stone was similar to those found in 1992; it had a biconical perforation and no ornamental design on its circumference. It was left *in situ* under the edge of the fallen east superstructure facade wall.

The painted organic object was in the shape of a cylinder with one flaring end. It was well preserved although incomplete at both ends. The paint was red, without designs. The preserved portion of the object was 2.5 cm. long, with diameters of about 2.0 cm. at the narrow end and about 5.0 cm. at the wide end. It was left *in situ*.

The obsidian prismatic blade fragments, greenstone celt, and smooth stone are described in separate chapters (Sheets, Chapter 8).

North High Clay Floor

Materials recovered from the north side of the platform include *in situ* items and fallen materials. The fallen items were associated with fallen roof thatch layers, mostly off the west end of the Feature A wall. The *in situ* artifacts are on the high clay floor just inside the Feature A wall and include several vessels located between the mounted metate and Hearth 2 (described above). Figure 6a shows the location of *in situ* items. Figure 7a shows the location of fallen items.

In Situ Items

Three vessels were partially exposed in the balk against the interior (S) face of the Feature A wall. All are located in the 60 cm. between Hearth 2 and the mounted metate. Two of these vessels (8-V.34,35) are clearly resting on the floor. The third (8-V.36) was broken and partially overlapping 8-V.35. So little of it was exposed that its original location is unclear; it may have fallen from an original high location. All three were left in place.

All three of the vessels are large open Guazapa Scraped-slip bowls with handles. Vessel 8-V.34 was placed below the low end of the mounted metate; it may have the recipient vessel for the *masa* or corn dough that is pushed off the stone during the grinding process. Vessel 8-V.35 was placed next to it and adjacent to Hearth 2. These two vessels probably were lined up against the interior face of the Feature A wall.

A small sherd (295-8-622) was on the high clay floor about 12 cm from Hearth 2. No artifacts were found on the floor west of the Feature A wall in 1993.

Fallen Items

Fallen items were recovered in the area over the NW corner of the high clay floor. These were mostly small items associated with fallen roof thatch layers (Table 4).

A burned antler tool was found in the fallen upper thatch layer near the west end of the Feature A wall. It probably had been stored in the thatch of the overhanging roof eave.

A long narrow bone tool and a nutshell along with several shelf daub fragments retaining the impressions of the poles were found in the ash between fallen roof thatch layers. These items may well have been on the exterior extension of the shelf originally adjacent to the west superstructure room. A ceramic support fragment (295-8-174) was found in a stratigraphically similar position outside the limits of the fallen thatch.

Two obsidian prismatic blade fragments and numerous sherds (295-8-233-236,311,241,242, many probably from the same vessel) were found under the lower fallen thatch layer. These items must have fallen before or with the lower thatch layer and been in locations underneath the lower thatch. Other sherds (295-8-168,237) were found outside the limits of the fallen thatch layers in upper Unit 1 and in lower Unit 2 ash. These are below the lower thatch layer stratigraphically and may be from the same original location.

A ceramic jar rim (295-8-535), exposed in 1992, was lifted from its location in U.1/2 ash adjacent to the north side of the platform near its NE corner. This probably is part of one of the numerous fallen vessels recovered from that area in 1992.

Summary and Discussion of Artifacts, Portable Features, and Organic Materials

The 1993 excavations revealed an abundance and variety of materials from the west superstructure room and from the front and north sides of the enclosed and roofed corridor around the structure. These materials provide the basis for a more complete interpretation of the function of the structure.

Artifact Distribution and Context

The number of artifacts found in 1993 more than doubled the assemblage from Str. 10. Most of them were from areas surrounding the platform, especially the east side corridor. Numerous vessels as well as tools, ornaments, and food remains were recovered.

Vessels. Twenty-five whole and partial vessels (24 ceramic and one *morro*) were recorded in 1993 (some were not excavated). Some partial vessels or large sherds may not yet be distinguished from or matched with the broken vessels. The complete assemblage from Str. 10 comprises about 43 vessels, including 38 whole and partial ceramic vessels, 2 painted *morros*, and 3 pieces of recycled pottery (one cup made from a pedestal ring base and two lids made of large sherds). Beaudry-Corbett (1992, this volume) has analyzed the assemblage in detail. The vessel total of 41 used below does not include the two lids.

Almost half of the vessel assemblage (18, including one painted *morro*; 44%) was located on the corridor floor east of the platform. Most of these vessels were fairly large jars and open basins of common utilitarian ceramic types, but one was a Martir Incised/Punctate jar, one was a Huatales Bichrome jar, three were small polychrome vessels, and the painted *morro* was probably a small open bowl.

Three other areas contain similar numbers of vessels. The east superstructure room contained seven vessels including a painted *morro* (17%). As described in the 1992 report (Gerstle 1992), these vessels included storage jars of common types as well as some vessels with very unusual decorations and forms.

The west superstructure room contained six vessels (15%). Except for one unusual Sacazil polychrome recurved bowl with handles, most of the vessels and partial vessels were jars and open bowls of common utilitarian types.

The 1992 investigation recovered at least six vessels that had fallen from their high storage location on the north side of the platform (15%). They include serving dishes and jars, one of which is an assymmetrical "shoe-shape" jar.

A total of 4 vessels (10%) were on the north side of the structure. These include three large utilitarian open basins in the corridor and one large cooking pot, excavated in 1992, on Hearth 1.

The vessel inventory from Str. 10 is quite large. Vessel numbers are highest where storage was the most important apparent function, in the east side corridor. Other storage areas, including the east and west superstructure rooms and the north high exterior shelf, had somewhat lower numbers of vessels. The area with the lowest number of vessels is where actual activities are most apparent; the north corridor area where food preparation and cooking took place.

In her ceramic analysis, Beaudry-Corbett (Chapter 7) confirms the importance of storage in noting the relative abundance of jars, the relatively high number of handle-less jars, and the relatively large vessel volume potential, by contrast with other structures (see Beaudry-Corbett, Chapter 7).

Tools and Ornaments. The 1993 excavations recovered a great number and variety of non-vessel items including tools and ornaments. Most of these were probably in storage contexts at the time of the eruption and probably were used in a variety of activities (Table 5).

Probable bone ornaments were concentrated in the east side corridor, fallen from the east superstructure room *tabanco* or walltops or from the roof thatch above the corridor. A shell bead had fallen into the west superstructure room. These may be part of the ritual outfit that includes the deer antler headdress. The small greenstone celt and cylindrical painted organic object may also be elements of this ritual assemblage.

For other items, it is more difficult to determine if they were used in ritual or utilitarian contexts. A variety of other bone tools, obsidian prismatic blades, perforated donut stones and unworked cobbles were found in the storage and nearby food preparation areas. These may have had more prosaic functions (Table 5). An obsidian blade with human blood on it (Newman, Chpater 12) may have used in rituals, but it was associated with the food preparation area and it is equally likely that a distracted cook cut herself by accident.

Food Remains. In contrast to the 1992 evidence, the 1993 excavations revealed that some of the most common foods were stored and prepared in Str. 10. Beans were stored in the west superstructure room and in the east corridor. Shucked but unshelled corn was stored in or above the east corridor and had fallen onto and into several storage vessels below. The 1992 excavations revealed some stripped corn cobs near Hearth 1; this corn was probably boiled and then ground on the metate. One special jar was used to store squash seeds. Chiles, which have been found in virtually every domestic structure, have NOT been found in Str. 10.

Large quantities of possible achiote were stored in the superstructure east room (Gerstle 1992). These may have been used for pigment or other purposes, not as food. Other unidentified seeds were also stored in and around Str. 10.

Activities and Activity Areas

Materials found in the two superstructure rooms and in the enclosed areas surrounding the platform suggest that these spaces were used for different purposes. The most obvious of these are storage and food preparation.

Storage. Most of the fallen items and many of the *in situ* items were undoubtedly in storage at the time of the eruption, and certainly storage was an important function of Str. 10. However, the volume and types of stored items and the storage locations vary in different parts of the structure.

In the west superstructure room, most items are vessels, and these were stored in both high and low locations. The vessels stored high were in the north end of the room, possibly on a high shelf, together with a few small items including a shell bead and a bone scapula tool. The vessels stored low were on the floor in the south end of the room.

This distribution is similar to that of the materials found in the east superstructure room. In the east room, a vessel, deer-antler headdress, and possibly the fallen spindle whorl and small bone ornaments and tools found east and north of the platform were stored on the high shelf in the north end of the room. Several vessels were on the floor in the south part of the room. In both rooms, other vessels and artifacts may be present on the floor in the north end of the room where balks were left unexcavated.

There are some qualitative differences between the materials stored in the east and west rooms. Most of the vessels in the west room were common utilitarian ceramic types. In the east room, many were rare or unique in form or decoration. This pattern may be paralleled by differences in vessel contents. Foods appear to have been stored in the west room but achiote seeds, used for pigment, and another unidentified seed were stored in the east room. Also, a much higher number of small ornaments and tools, especially bone items, were stored in the east room than in the west room. Apparently, the west room was used primarily for storing utilitarian items but the rare and special-use items were stored primarily in the east room.

The surrounding enclosed and roofed corridor areas were also used for storage. Abundant but generally utilitarian items were stored on the floor directly in front of the platform entrance, especially vessels and foodstuffs but also donut stones and other stone tools. A few vessels were also stored north of the platform, but the main corridor storage area was on the east side. Most of the vessels are storage and/or cooking jars and other utilitarian forms. The exterior extension of the high shelf or *tabanco* over the north corridor was also an important storage area for vessels.

Food Preparation. Food preparation activities took place on the north side of the platform. These activities ranged from shelling corn to grinding on the metate to cooking on two nearby hearths. The relatively high volume of foods, large numbers and sizes of storage and cooking vessels, and the two hearths indicate large-scale food preparation. The large serving vessels stored above the food preparation area provide additional evidence of the large scale on which food preparation took place. Many of the obsidian prismatic blades and bone tools may also have been used in food preparation activities.

Interestingly, the area in which the various food preparation activities took place is quite small and circumscribed. It is within the enclosed corridor area on the high clay floor, except for one hearth adjacent to the high floor. Apparently, these large scale food preparation activities were not open to public access.

Ritual Activities. As discussed above, certain items that were stored high in the superstructure or above the east corridor may be ritual equipment. These include the deer-antler headdress and bone and shell ornaments as well as possible other items. Their storage context makes it clear that Str. 10 was part of ceremonial complex, but it is impossible to name the specific venue of the rituals involving this costume.

Other Activities. Other activities that clearly took place west of Str. 10 are maintenance/cleaning and trash disposal (see Simmons and Villalobos, Chapter 3). The extramural area north of the structure, on the same side as its only entrance, is a relatively clean, flat, hard-packed TBJ surface. It appears to be a well-trodden and well-swept area.

By contrast, the extramural area east of the structure is littered with artifact fragments, especially ceramic sherds. To the SE of the structure, the ground surface becomes irregular and artifact density is high; there were also some small shrubs or plants. This zone appears to have been a disposal area, possibly for the sweepings from the north side of the structure and other rubbish originating from the structure itself (Feature G).

Activities other than storage, food preparation, sweeping, and trash disposal are not as easily identified. Ritual activities can be inferred from the stored artifacts but the locations where the activities occurred are impossible to identify. Items found in 1993 indicate that a variety of activities probably took place in or near the structure.

Summary and Conclusions

The 1993 excavations revealed an unsuspected architectural configuration to Str. 10. The substructure platform and two superstructure rooms revealed in 1992 comprise just part of the structure, which is surrounded by roofed and walled corridors on its east and north sides. These corridors are formed by a series of contiguous columns and walls built onto a raised clay floor surrounding the platform. The only entrance was on the north side of the platform, and access to the superstructure rooms was by a circuitous route through the corridors to the east side of the platform.

The enclosed spaces around and on the structure were used for a variety of purposes, most notably storage and food preparation but also general cleaning and maintenance. However, it appears that these took place in a ritual or public context, not in a domestic or residential context.

The north corridor was an area of intensive and large-scale food preparation, as indicated by two hearths, a grinding stone, and several large utilitarian vessels. Many and large storage and cooking vessels and foods were stored in the east corridor. Similar items were also stored in the west superstructure room. It seems likely that this equipment and food was used to feed large numbers of people, but the surrounding enclosing walls suggest that access to and preparation of the food itself was strictly controlled. Outside the building entrance, the ground was kept clean and well-swept.

The east superstructure room, including the room floor and the high shelf and overhanging east roof, was used to store ritual or ceremonial equipment. This probably included a costume made of a deer-antler headdress and bone and shell ornments and possibly other ritual accessories such as red achiote pigment, special vessels, and other smaller tools.

The association between large-scale food preparation and stored ritual equipment suggests a special-use structure similar to a post-conquest "*casa de cofradia*" (Vogt 1990). These are communally-owned structures used as headquarters for preparing public feasts and rituals. Between events, they may be unoccupied storage structures containing the ritual costumes and equipment, or the *cargo*-holder and his family may reside in the structure for the duration of his office.

If this ethnographic analogy may be applied to Structure 10, then the building served as a storage structure between events and was used during preparations for ritual/public events. The large cooking pot on one of the hearths suggests that food preparations were underway. However, the ritual costume was still in storage. Perhaps the Loma Caldera eruption interrupted the preparations for a ritual that, had it been completed, would have saved Ceren from destruction.

Table 1. Structure 10 Roofed Areas.

	N-S m	E-W m	Subtotal sq m	sq m
E walled clay floor	7.80	2.30	17.94	
N walled clay floor	1.75	2.25	3.94	
Subtotal walled clay floors				21.88
Clay floor S of plat.	1.80	3.70	6.66	
N low clay floor	0.80	1.20	0.96	
Subtotal unwalled clay floors				7.62
N exterior eave outside Feature A wall	0.35	3.05	1.07	
S exterior eave by high floor	0.60	2.30	1.38	
E exterior eave	8.45	0.35	2.96	
W exterior eave	6.20	0.75	4.65	
Subtotal area under eaves				10.06
Platform area				13.70
				===
Total minimum roofed area				53.26

Table 2. *In situ* Vessels on East Side High Clay Floor.

Vessel No.	Field Name	FS No. 295-8-	Form	Type	Contents
1993 vessels:					
8-V.18*+-		none	unknown	unknown	unknown
8-V.19*+-		none	unknown	unknown	unknown
8-V.20	-	518	jar (h)	G:M	no sign (FS 519)
8-V.21	H	470	jar (h)	G:M	no sign (FS 501)
8-V.22	G	468	jar (h)	G:M	beans (FS 492),seed impr. (FS 491), org. mat.
8-V.24	J	497,465	util.bowl	G:M	fallen corn (FS 477)
8-V.25	K	495	util.bowl	G:M	no sign (FS 494)
8-V.26	I	479	jar (h)	G:Martir Inc/Pnct.	squash seed (FS 480) fallen corn (FS 477)
8-V.27	D	466	jar (h)	G:M	no sign (FS 506)
8-V.28	F	463	jar (h)	G:M	no sign (FS 487), seed impr. interior upper body, fallen corn (FS 477), paint frag (FS 489)
8-V.29	E	462	jar	Huatales Bichrome	roof fall (FS 485)
8-V.30	C	460	jar	G:M	red deposit or U.1 in base (FS 483), roof fall (FS 482)
8-V.31+	-	520	bowl	painted *morro*	no sign
8-V.32	B	461	jar	G:M	no sign (FS 481)
8-V.33+	A	473	unknown	unknown	unknown
8-V.-	(I)	464	lid, unshaped	unknown	none
8-V.-	(G)	467	lid, disc	unknown	none
1992 vessels against E side of platform:					
8-V.7	-	138	recurved bowl	Gualpopa	no sign
8-V.8	-	135	small jar	Cashal Cream	no sign
8-V.9	-	145	recurved bowl	Copador	no sign

	1992 vessel, possibly fallen			
8-V.10 -	105,106	assymet.	G:M	no sign
	114,137	jar (h)		
	472 (=shoe-pot)			

Key:
Form: jar (h) = jar with handles
Type: G:M = Guazapa group, Miltatlan variety
Contents: no sign = no contents visible during excavation
FS # = field number of contents sample collected
* recorded but not excavated
+ not analyzed by Beaudry-Corbett (this volume)

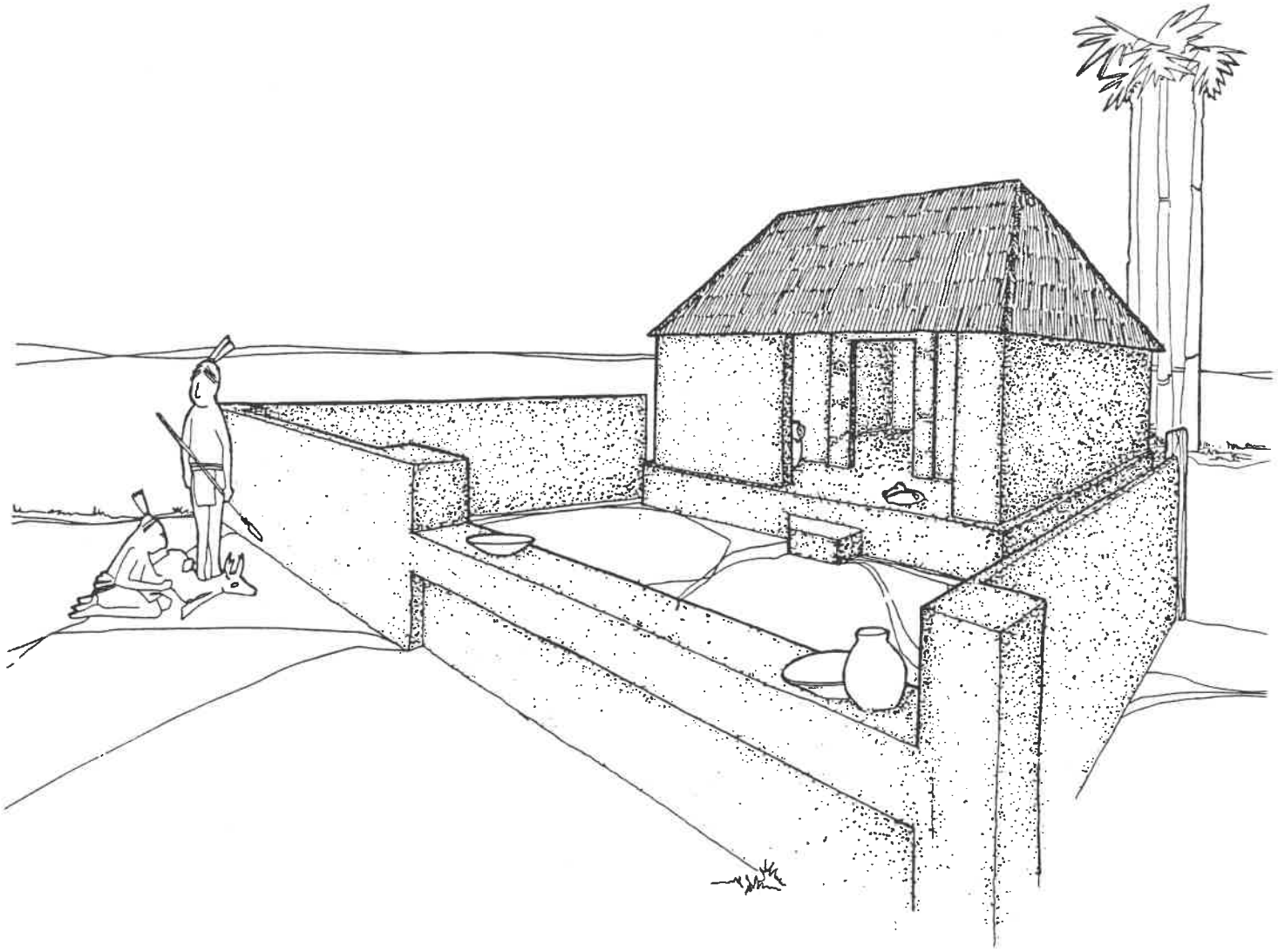
Vessel 295-4-137. By Ted Fitzkee.

Table 3. Fallen items in East Side High Clay Floor area.

FS No. 295-8-	Item	Location	Context
	CLUSTER 1:		
none	Red cylindrical organic object	Near SE corner of front step	U.1
none	Donut stone	S side of front step	U.1/2
450	Obsidian prismatic blade fragment	S side of front step	U.1 low
616	Smooth stone	By central exterior column	U.1.roof fall
449	Bone tube bead	Near central exterior column	U.1/roof fall
457	Bone tube bead	Between step/E wall	U.1/roof fall
525	Bone teardrop	Near central exterior column	U.1/roof fall
524	Bone teardrop	Near central exterior column	U.1/roof fall
448	Bone long tool	Near central exterior column	U.3 low
498	Obsidian prismatic blade fragment	Near central exterior column	U.1/wall fall
502	Greenstone celt	By central exterior column and wall	U.1/wall fall
456	Bone scapula tool	Between platform and east wall	On wall fall
none	Unworked rock	Between platform and east wall	U.1/wall fall
	Found in 1992:		
70	Unworked sherd	Between platform and east wall	U.1
71	Spindle whorl	Between platform and east wall	U.1
69	Unworked sherd	Between platform and east wall	U.1
47	Donut stone	S side of front step	In roof fall
49	Donut stone	S side of front step	U.2/3
51	Donut stone	S side of front step	U.2/3
52	Worked cobble	S side of front step	U.2/3
53	Unworked cobble	S side of front step	U.2/3

CLUSTER 2:

451	Obsidian prismatic blade fragment	Exterior wall fall, north part	On wall fall
458	Obsidian prismatic blade fragment	Exterior wall fall, north part	On wall fall
none	Unworked rocks (8+)	Exterior wall fall, north part	In wall fall
445	Unworked sherds (2)	Exterior wall fall, north part	On wall fall



Artists Conception of Structure 10. By Karen Kievit.

Table 4. Fallen Items in North High Clay Floor area.

FS No. 295-8-	Item	Context
176	Burned antler	In upper thatch layer
188	Long bone tool	U.2/3 betw thatch layers
189	Carb. nutshell frags	U.2/3 betw thatch layers
238	Shelf daub frags w/	U.2/3 between thatch layers
239,240	pole impressions	
174	Sherd, support	U.2/3 outside thatch limits
177	Obsidian prismatic blade frag	U.1/2, below lower thatch
178	Obsidian prismatic blade frag	U.1/2, below lower thatch
233	Sherds	U.1/2, below lower thatch
234	Sherds	U.1/2, below lower thatch
235	Sherds	U.1/2, below lower thatch
236	Sherds	U.1/2, below lower thatch
241	Sherds	U.1/2, below lower thatch
242	Sherds	U.1/2, below lower thatch
311	Sherd	U.1/2, below lower thatch
168	Sherds	U.2, 1 cm above U.1, outside thatch limits
237	Sherds	Lower U.1, outside thatch limits
535	Ceramic jar rim	U.1, N side platform nr NE corner

Table 5. Artifacts in or near Structure 10 and possible uses.

1993 Artifacts:

Ornaments (matched bone beads and tear-drops, shell bead).....public/ritual activities?
Painted organic cylinder (1).....?
Small greenstone celt (1).....cutting? chopping?
Obsidian prismatic blade w/ human blood (1).....ritual? accidental?
Obsidian prismatic blades (5).....cutting (foods?)
Long bone tools (2).....shucking/shelling corn?
Antler tool (1).....shucking/shelling corn?
Metate (1).....grinding corn, foods
Bone scapula tools (2).....scraping?
Donut stone (1).....digging stick?
specialized grinding?
roof weight?
Unworked cobbles (numerous).....clay smoothers? roof weights?

Chapter 5. EXCAVATIONS AT STRUCTURE 12, OPERATION 5.

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Introduction

The first indication of Structure 12's existence occurred when earthmoving equipment was working along the eastern edge of the site late in 1990 (see Figure 1, Chapter 1). The earthmoving equipment was removing the top two meters of sterile volcanic overburden in order to create a gentle, consistent slope toward the river, to direct surface runoff away from the architectural portion of the site. The equipment encountered a considerable bulge in some of the upper units of the Loma Caldera tephra (Units 10 through 8). Tephra bulges often indicate structures buried under the tephra, and a bulge of this shape and magnitude generally buries a structure whose walls did not collapse during the eruption. Geophysical instruments were not employed in this area due to the complicating factor of "free-face interference" that scrambles the signals of anomalies. Two free faces exist in this area of the site, one to the north, i.e. the 1976 bulldozer cut, and the other to the east, in the form of the steep slope into the Rio Sucio.

Excavations of Str. 12 began in December 1990, after a Duralite roofing module was constructed over the structure, and drainage established. The details of those excavations are presented in Sheets and Sheets (1990). The southern and central portions of the structure were excavated during that season, but a property boundary prevented the excavation of the northern portion of the structure, as well as its environs consisting of the patio outside its entrance. The property problem was resolved in 1992, permitting the excavation of the remainder of the structure and surrounding area during 1993. The emphasis of this chapter is on the 1993 research and its results, but, for purposes of completeness, frequent reference is made to the previous research at the structure.

The suspicion that Structures 12 and 10 were not domestic (Sheets and Sheets 1990), based on observation of column and wall tops upon first discovery, has been confirmed by subsequent research. The suspicion that the two structures shared a common religious function has not been confirmed, at least not in that simple fashion. Physical characteristics that the two structures share, and that are different from domestic buildings at the site, include their orientation (azimuth), the unusually large number of columns, frontal enclosures, white-painted walls and columns, and red decoration on the walls. However, the two structures differ in many aspects of architecture and considerably in terms of artifacts. Although they both probably were religious structures, they apparently functioned very differently.

The 1993 excavations discovered the remainder of the enclosure architecture that defines the north room of the structure (Figure 1). Areas inside of the north room and to the north of it that were unavailable for study during 1990 were excavated in 1993. Numerous

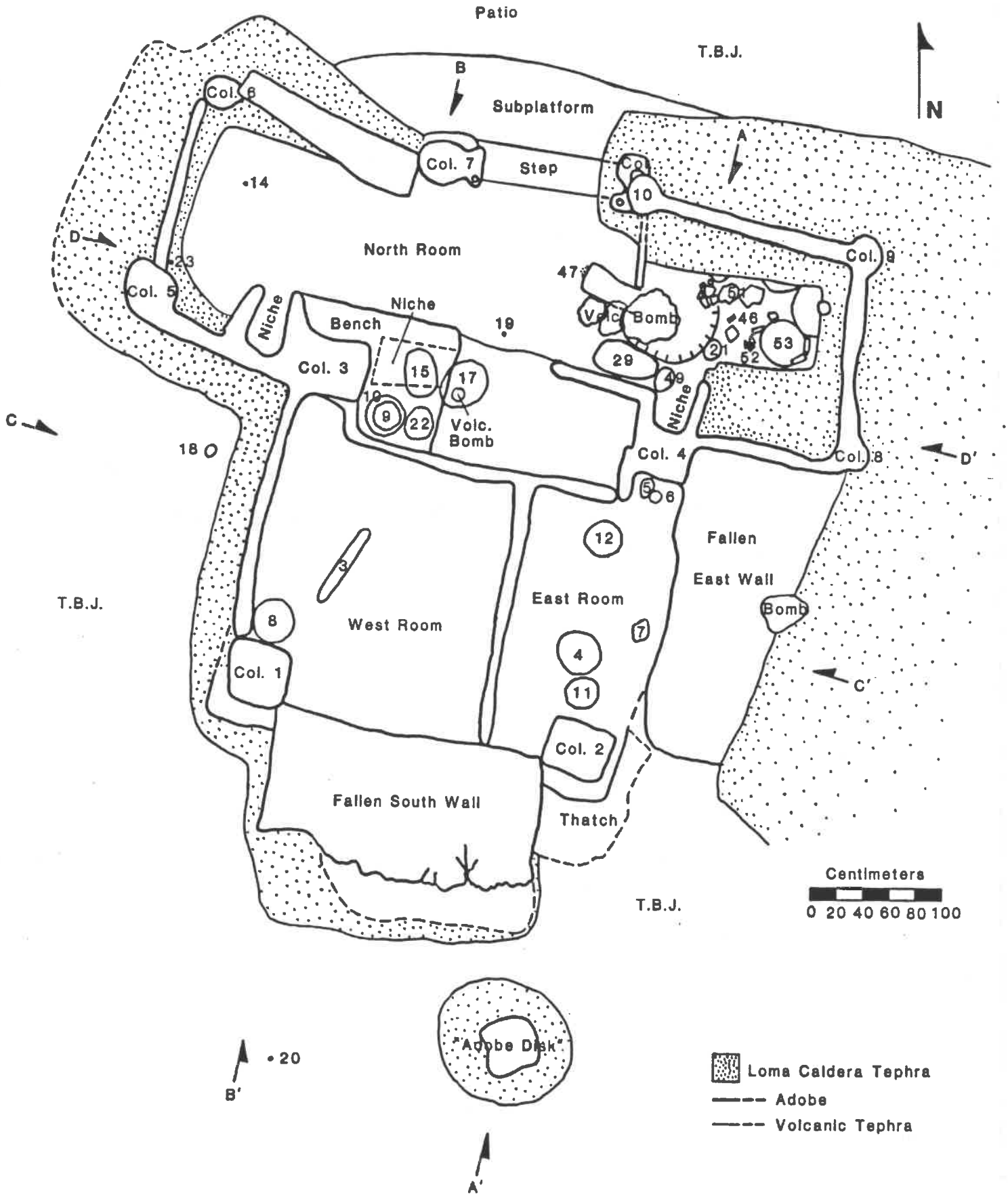


Figure 1 Plan View of Structure 12

large artifacts were encountered in the east end of the north room, on the floor. Numerous small artifacts had been placed in elevated contexts in the entryway to the building, most of which fell during the early part of the eruption. A sizeable area to the north and west of the structure was excavated down to the ground surface that existed immediately prior to the Loma Caldera eruption. Those areas were studied for compaction, for the degree to which they were maintained as a flat surface, and for the artifact density. The assumption, based on ethnographic and ethnoarchaeological observation, is that more high-use areas were kept more clean of artifacts, were flatter, and had soil surfaces that were more compacted. It was discovered that the area between Structures 10 and 12, leading to the south, received relatively little foot traffic. The evidence is the irregular surface, a relatively high sherd density, and minimal compaction.

An examination of the patio in front of Structure 12 indicated that the most heavily traveled route in and out of the building (or to and away from its entrance) ran almost due north, based on the degree of compaction, smoothness of surface, and the paucity of artifacts on that surface. Unfortunately, the 1976 bulldozing that led to the original site discovery completely destroyed whatever feature(s) or structure(s) were in primary relation to this building. The secondary traffic routes led westward to Str. 10, and eastward toward the river, providing some direct evidence that the uses of these two buildings were related, but probably not tightly related.

This chapter focuses on the 1993 excavations of the northernmost part of Structure 12, and the areas to the north and to the west of the structure. The architecture and artifacts found during 1993 are related to the earlier discoveries (Sheets and Sheets 1990) in a moderate amount of detail in this chapter, to present as integrated an overview of material culture as possible.

Research Objectives

As part of the integrated research and conservation objectives that were agreed upon by researchers and the Ministry of Education for the 1993 field season, it was decided to remove all of the tephra in the areas between Structures 10 and 12, and north of Structure 12 to the 1976 bulldozer cut (see Figure 1, Chapter 1). In terms of our research objectives, we wanted to obtain an understanding of surface use patterns in the area between and north of these two important structures. It was also felt that exposing the original ground surface immediately north of Structure 12 would provide information on how that particular area of the site may have been used by the prehistoric inhabitants of the village.

In terms of conservation, it has been found that removing the volcanic tephra around structures at Ceren promotes their conservation by allowing ground moisture to evaporate from the soil surrounding the buildings, which facilitates drying and consolidation of the adobe architecture. As a result, removal of the ash helps to strengthen the walls and platform of the buildings. Therefore, the excavation of the ash around Structure 12 was considered important for the long-term conservation of the building. Also, because Structure 12 is the first ancient building the visitor to the Ceren Archaeological Park sees on their tour

of the site, the excavation and conservation of the structure was and still is a priority for the enhancement of visitor appreciation of the site.

Another important goal of the 1993 field season was to excavate more of the ash that remained inside Structure 12 itself. Specifically, our objective was to expose the north side of the building as completely as possible, keeping in mind the need to leave sloping ash *taluds* in some places for the conservation of the building's fragile architecture. The information obtained from the work that had been completed during the 1990 field season suggested that the entrance to the building would be found on the north side, and that the walls and entrance columns might be bilaterally symmetrical. Therefore, we anticipated that the excavation of the north side of Structure 12 during the 1993 season would enable us to identify the location of the entrance, and would also provide detailed information on its architectural elements and associated artifacts.

Excavations

Excavation of the areas immediately north and west of Structure 12 began on June 24, 1993 with the removal of the Unit 10 tephra. The Operation 8 grid was extended east from the area that had been the focus of the first half of the 1993 field season's efforts. Several vertical datum points were also established in this area in order to facilitate the recording of elevation information. Two vertical datum points were established on one of the new steel roof beams north of Structure 12. One of these was set at 442.75 meters above sea level, and the other was at 444.00 meters above sea level.

Field notes were recorded on a daily basis by each of the authors. These notes included observations on such things as architectural details, artifacts and their contextual information, initial interpretations of findings, and basic data recording. All artifacts and samples of archaeological materials collected were given individual numbers that were recorded on a Field Specimen List (Appendix A). These FS numbers began with # 295-5-30, the number that followed the last FS number given to an object during the 1990 field season.

The excavation strategy that was followed involved the removal of individual tephra units in the reverse order of their deposition. Each unit of ash was excavated using picks, hoes and shovels until the entire ash unit had been removed. The tephra was taken away from the excavation area using wheelbarrows to a locale south of Operation 8 designated for the deposition of excavation backdirt.

Any changes detected in the surface contours of the ash units were noted during the course of excavations in the areas immediately north and west of Structure 12. As previously discussed in the Introduction, the presence of a noticable bulge in the upper tephra units (10 through 8) continuing north of Structure 12 provided a general indication of the approximate extent of the walls of the north room of the building. As a result, the decision was made to leave a tephra balk approximately 1 meter thick to the north of what we believed was the northern extent of the building. It was decided that the workers would then

continue excavating the tephra north of that balk. This procedure was followed in order to protect the north wall of the structure from damage that might occur from any vibrations traveling through the tephra layers caused by the use of picks and hoes.

Once the Unit 3 tephra had been exposed north of the structure, Column 9, the northeastern-most building column, became visible. Also, removal of the Unit 3 volcanic ash in this area resulted in exposing that section of the north wall of the building between Columns 9 & 10. A large horizontal cavity was found roughly 30 cm northeast of Column 7. This column, which we found forms the western entrance boundary of the building (Figure 2), had been partially exposed in 1990. Based on the observation of wood grain impressions on its inner surfaces, the cavity was believed to represent a hollow that was left by the decay of an oval-shaped (in cross-section) wooden beam that was roughly 17 cm. in diameter. The beam's orientation indicated that it had been a lintel beam that had spanned the two entrance columns of the building, Columns 7 and 10. At that stage of the excavation, Column 10 had not yet been exposed. However, a noticable bulge in the Unit 3 tephra suggested the probable location of this other entrance column, assuming the bilateral symmetry of the north end of the building.

Further excavation in the entrance of Structure 12 confirmed the location of Column 10, the eastern entrance column, beneath the teprha bulge. As a result, it was possible to see that the two north walls of the structure were indeed bilaterally symmetrical. Further excavations in the entrance also confirmed that the wooden beam had spanned Columns 7 and 10, and that the lintel had been coated in adobe (Figure 2). Excavations of the Unit 3 tephra revealed numerous small fragments and some larger chunks of adobe still preserving the form of the beam. Several still had wood-grain impressions from the time when the wet clay had been applied as a coating around the wooden beam. This will be discussed in further detail below. A sample of the burned remains of the wooden beam was taken (295-5-30) for possible radiocarbon dating.

Excavation of the volcanic tephra surrounding Columns 7 & 10 provided some interesting information on changes in both the architecture and possibly the functional significance of the building over time as well. Both Columns 7 & 10 were originally round in shape, as are the other columns in the north room walls of the structure (Sheets & Sheets 1990). At some point in time, the columns were modified by the addition of *bajareque* poles covered with considerable amounts of wet clay. This remodeling work resulted in the creation of a squared corners on the insides of each of the two columns. Evidence for the modification of the entrance columns became clear during the process of removing the layers of volcanic ash that had settled in the doorway. A noticable seam in the adobe on the north face of Column 7 was exposed during the excavation of the upper portion of tephra Unit 3. This seam indicates the juncture of the original round column with the clay addition. The modification of these columns resulted in the generally 'squared-off' appearance of their interior faces.

The round shape of the entrance columns is particularly evident on Column 10, the eastern entrance column of Structure 12. During the course of the Loma Caldera eruption, the adobe that was added on to the original round column was dislodged, probably the result

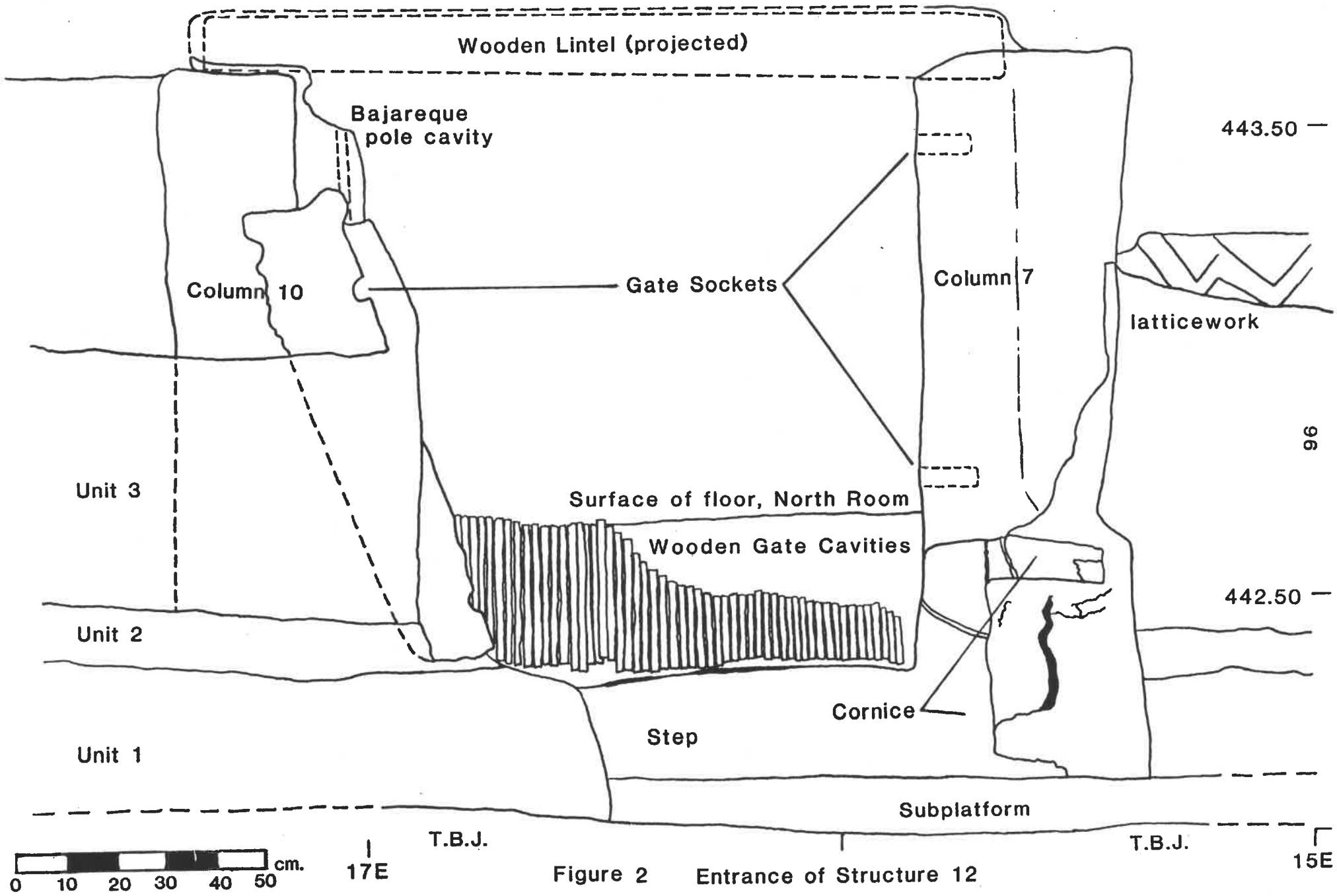


Figure 2 Entrance of Structure 12

Note stress cracks, slumpage of Column 10, lower Col. 10 socket. Darker line below gate cavities is exposed laja.

of weakening related to buffeting by volcanic ash hurricanes or to earthquakes or strong tremors associated with the eruption. The add-on portion of the column broke away from the original round column and slumped early during the deposition of Unit 2, the coarse, hot, airfall tephra unit. Both the original round column and the later *bajareque* and adobe addition can be seen in Figure 2. While the base of this add-on portion of Column 7 came to rest at the base of the Unit 2 ash, the upper part was found lying against the original round column. Figure 2 also illustrates how far the add-on portion of the column had slipped down below the original column top, roughly 28 cm.

The evidence for possible changes in the functional significance of these two entrance columns comes from horizontal holes that were found in each of the columns. These horizontal holes are believed to be part of an entrance gate that was in place between Columns 7 & 10. Figure 2 shows that these two holes in Column 7 are 70 cm. apart (center to center), and are each 4 cm. in diameter. Corresponding holes are also present in the addition part of Column 10, and are also spaced 70 cm. apart. The upper holes were found 20 cm. from the column tops.

Careful inspection of Column 10 revealed that the holes were found in the adobe addition only, and **not** in the original round column, suggesting that either a different type of entrance gate was present earlier in the life of the building, or that no gate at all was present prior to the modification of the entrance columns. If the latter is true, then it is possible that the function of the building changed from one in which access was originally easy, (since no gate existed) to one in which access later became much more restricted after a semi-permanent gate was erected. It is more than likely that the latter is true, that no gate existed prior to the modification of the entrance columns. Aside from the other evidence for an entrance gate, which will be discussed shortly, no evidence for earlier gate remains was seen during the excavation of the doorway. Nor was any evidence found of vessel handles mounted inside the walls to tie a door, although most of the area where a handle would have been mounted remains in the tephra balks. The relationships between architectural details and the possible function(s) of the building within the community will be discussed in greater detail in the following sections of this chapter.

No artifacts or architectural material was found in upper and middle Unit 3. It was not until we had excavated most of this base surge ash unit that these remains began to be found. A number of objects were found during the excavation of lower Unit 3 tephra in the doorway of Structure 12. Architectural materials, including roofing thatch and construction adobe, were found in the lower Unit 3 ash. Both the objects that had apparently been placed in elevated storage contexts near the entrance of the building and the architectural materials were found in lower Unit 3, indicating that this material had fallen fairly early during the Unit 3 depositional episode.

Burned roofing thatch was found in lower Unit 3, indicating that the northern section of the roof of the building survived the deposition of Units 1 and 2, but had finally collapsed early during the period in which the Unit 3 base surges were being deposited. Collapsed thatch was also found in lower Unit 3 ash just outside of the west half of the north wall. A number of what appeared to be white-painted adobe pieces were recovered from the doorway

area during the excavation of lower Unit 3 tephra. Most of these were small chunks, no larger than 2 cm. in diameter, that probably broke off of the faces of the entrance columns early during the deposition of Unit 3. These small pieces were a pale tan-white color, which matches the color of the painted surfaces of the interior of the surfaces of Columns 7 & 10. This apparently is the same TBJ and binder mixture confirmed as the white "paint" used elsewhere in Structures 12 and 10.

During the excavation of Unit 3 tephra on the outside of the western half of the north wall it became obvious that the outer surface of the wall itself was not smooth. The lateral force of the powerful Unit 3 base surge had partially collapsed the upper portion of this wall. We found that at the base of this collapsed upper wall section there were small, rounded sections of adobe that were in the form of crossed diagonals (Figure 2). Further excavation revealed that what had been exposed was an architectural feature very similar to the adobe latticework window discovered in the west wall of the building in 1990 (Sheets and Sheets 1990). However, because of the extremely fragile condition of the north wall of this building, the decision was made not to attempt to excavate the ash that was found between each of the elements of the adobe lattice on the north wall. As a result, it is uncertain whether this adobe lattice is indeed another window, similar to that found on the west wall of the building, or it is a decorative lattice-work on the exterior surface of the north wall of Structure 12. This latticework, as it resembles a mat design, may be a key element in the interpretation of the function of the building, discussed below.

There are several interesting architectural elements of this lattice feature. First, it is similar to the window on the west wall of the building in that the lattice portion is made of *bajareque* poles covered in clay. However, unlike that window, the feature on the western half of the north wall is not completely surrounded by this kind of frame. Although only a small portion of it was exposed due to conservation concerns, the western edge of this architectural feature was found not to have been framed. Instead, the lattice appears to have directly abutted the western face of Column 7. The southern and western edges of this window/applique were not exposed during this field season, due to conservation concerns. The lateral force of the Unit 3 base surge worked to partially collapse the upper section of the wall above the lattice work at its weakest point - the juncture of the wall with the lattice feature. The west wall window and the feature found on the western section of the north wall are similar in that the individual abobe covered *bajareque* elements of the latticework are approximately 5-8 cm. in diameter. The angles at which the *bajareque* poles were originally set are also very similar for both.

Another interesting architectural feature appeared during the excavation of lower Unit 3 ash. An elaborate rounded cornice was discovered near the base of Column 7 (Figures 2 & 3). Since the bottom half of the western portion of the north wall was not exposed for conservation reasons, it is not known if this adobe cornice continues around the north side of the building away from this entrance column. This cornice has rounded edges and extends horizontally across the north face of Column 7 between 41-50 cm. above the base of the step into the building (Figure 2). The cornice turns down vertically, toward the ground surface, along the eastern edge of Column 7. Horizontally, it extends 10-14 cm. out from the surface of the column (Figure 3).

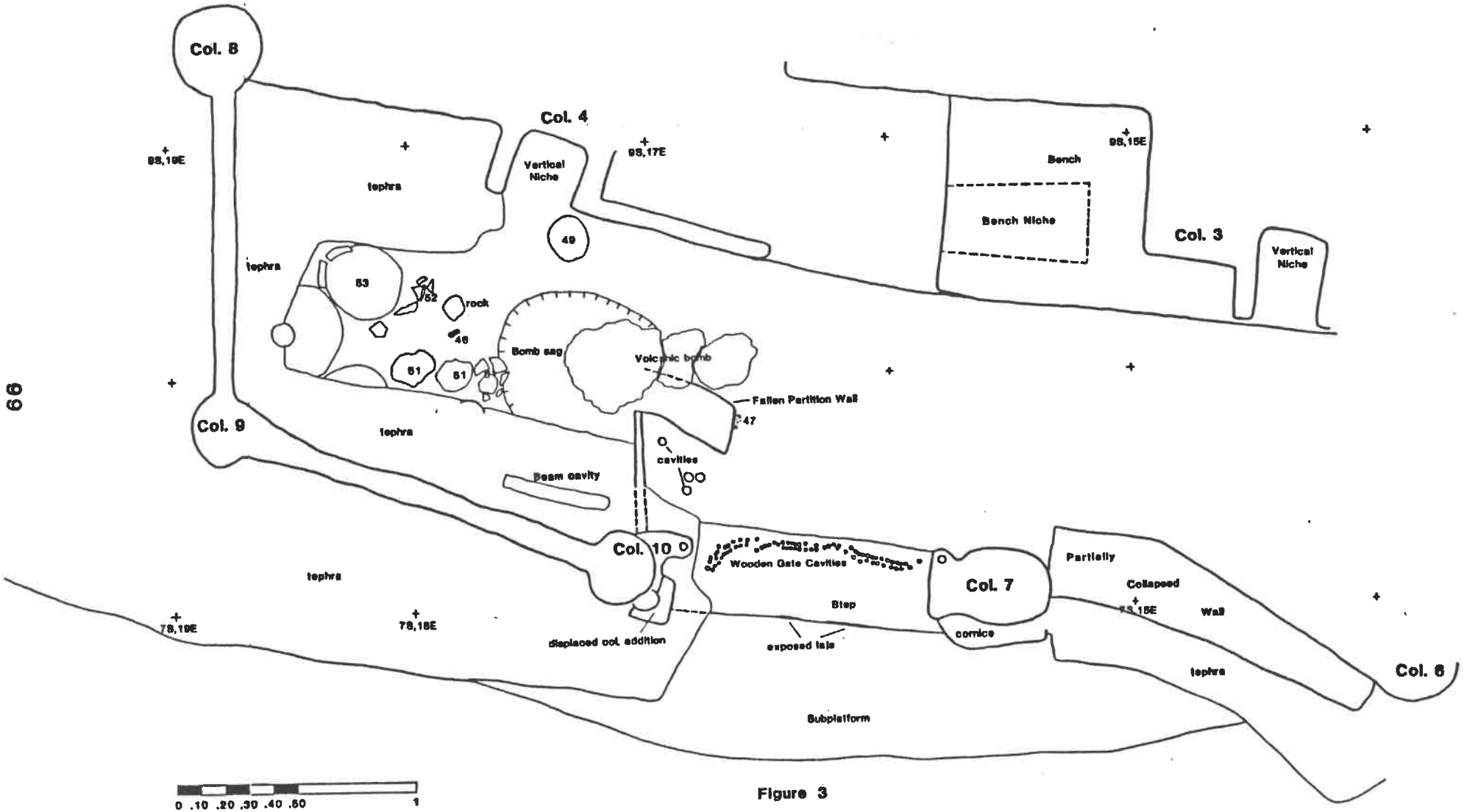


Figure 3

Plan View of Structure 12's Entrance and North Room

Continued excavation of the lower Unit 3 tephra in the doorway area of the north side of this building revealed a variety of objects, many, if not all of which, probably were dislodged from elevated storage above the doorway. A large obsidian macroblade (295-5-41) was found in lower Unit 3, roughly 10 cm. above the top of the Unit 2 tephra. Its quantitative and morphological attributes are described in detail in Chapter 8 of this report. Remnants of what was clearly burned roofing thatch were found adhering to the bottom surface of the distal end of the macroblade. The tool was also found to be resting directly on top of a small amount of roofing thatch. The presence of this thatch, both on and immediately underneath the obsidian macroblade, suggests that this tool had been stored in the roof of the building at the time of the eruption, and had fallen early during the deposition of Unit 3 when most of the roof of the building collapsed.

A ceramic spindle whorl (295-5-33) was found lying flat side up at the base of the Unit 3 deposit, less than 1 cm. above the coarse Unit 2 tephra. It had a fairly plain decoration, consisting of short incised lines located just below the flat edge and above a circle of small punctation marks. The spindle whorl was found approximately 70 cm. north of the entrance of the building, and therefore must have been displaced from where it was presumably stored at the time of the eruption, just inside the doorway in an elevated context. A second ceramic spindle whorl (295-5-39) was found lying at the bottom of the Unit 3 tephra, also less than 1 cm. above the Unit 2 airfall deposit. There were also numerous small pieces of construction clay found lying just above the Unit 2 ash. A small, apparently well-used obsidian blade segment (295-5-38) was also recovered from this lower Unit 3 tephra.

Along with the fragments of construction clay that are believed to have fallen from the lintel spanning the two entrance columns, the carbonized remains of what appeared to be burned sticks were found at the base of the Unit 3 ash. Since burned thatch remains were found directly overlying the burned sticks, it is likely that these sticks represent a portion of the northern edge of the wooden superstructure that supported the roofing thatch.

What would turn out to be one of the most interesting archaeological finds we encountered during our excavation of the doorway of Structure 12 was a double row of very narrow cavities in the lower Unit 3 tephra (Figures 2 & 3). Several cavities began to appear during the excavation of the lower Unit 3 tephra near the west face of Column 10. These cavities were found roughly at the same level as the surface of the floor of the north room. As more tephra was removed, more cavities were found, until a total of 74 were counted. These cavities spanned the entire area between Columns 7 & 10. Spaced very close together, the cavities would not be fully exposed until the Unit 2 ash was removed from the doorway. Assuming they spanned the entire distance of the doorway originally (not all apparently were preserved as hollow spaces, as there were some gaps), the door would have been built of well over 80 vertical poles.

The coarse Unit 2 airfall tephra was excavated from the doorway and the area immediately north of the doorway fairly quickly, since this deposit was only 10 cm. thick. As is almost always the case at Ceren, no artifacts were recovered during the excavation of this ash layer. However, a small, hard greenstone disk (295-5-40) was found below the Unit

2 ash lying on the surface of Unit 1, just above the double row of cavities. This greenstone disk, like many of the other objects found in the doorway, had probably been left on top of the wooden lintel spanning the two entrance columns of Structure 12.

After the Unit 2 ash was removed from the entrance of the building it was possible to see the full horizontal and vertical extent of each of the cavities in the remaining Unit 3 ash (Figure 2). Each cavity was slightly larger than 1 cm. in diameter, and the cavities were found spaced roughly 2 cm. apart from one another. Careful inspection of the cavities revealed that what appeared to be wood remains were present within these long, vertical hollows in the tephra. The configuration of the double row of cavities was such that those nearest to Column 10 formed an arc that curved around toward Column 7. The cavities then continued on in a straight line to Column 7 (Figure 3). An explanation for what might cause this particular configuration will be discussed in the next sections of this chapter. Our working hypothesis during the course of uncovering and recording these cavities was that they probably represented the remains of the front door or gate between the two columns. This point will also be discussed in great detail in the Results and Interpretations sections of this chapter.

The cavities were recorded in several ways. Both profile and plan view drawings were made (Figures 2 & 3). Also, a series of black and white and color photographs was taken. Once the cavities were fully exposed, dental plaster was introduced into each. Unfortunately, the very narrow diameter of each of the cavities meant that even the smallest pieces of ash that had fallen into the cavities effectively blocked the plaster from filling the holes. This being the case for almost all of the cavities, it was not possible to obtain complete plaster casts. The failure to successfully create plaster casts of the cavities is unfortunate. However, the ash surrounding the cavities has been stabilized so that it is possible for visitors to observe and researchers to further study, if need be, this interesting wooden feature of Structure 12 architecture. As has been the case so many times during the course of the Ceren project, the uncovering of remains such as these suggests that new, innovative excavation techniques and possibly replication procedures as well may need to be developed and tested so that these kinds of fragile remains can be better preserved.

During the course of excavating the tephra in the doorway of Structure 12, excavations were also continuing outside the building. Groups of Salvadoran workers removed the Units 3 and 2 tephra in the areas immediately north and west of the building using picks, shovels and hoes. Changes in the contours of these ash deposits were being monitored and recorded concurrently. It became obvious that there were some subtle differences in the contours of the surface of the Unit 1 ash. Two areas in particular showed rises in the Unit 1 ash. One of these, Feature F, was located immediately north of Column 6, and the other, Feature G, was located southwest of the building (Figures 4 & 5). These interesting features were mounds of clay that rose between 25 - 35 cm. above the surface of the TBJ and were mixed with numerous ceramic sherds.

Prior to the excavation of the final centimeter of Unit 1 ash overlying the TBJ outside the structure, flotation and pollen samples were taken in each 1 X 1 meter unit located in this easternmost area of Operation 8. After soil samples were taken, the excavation of the

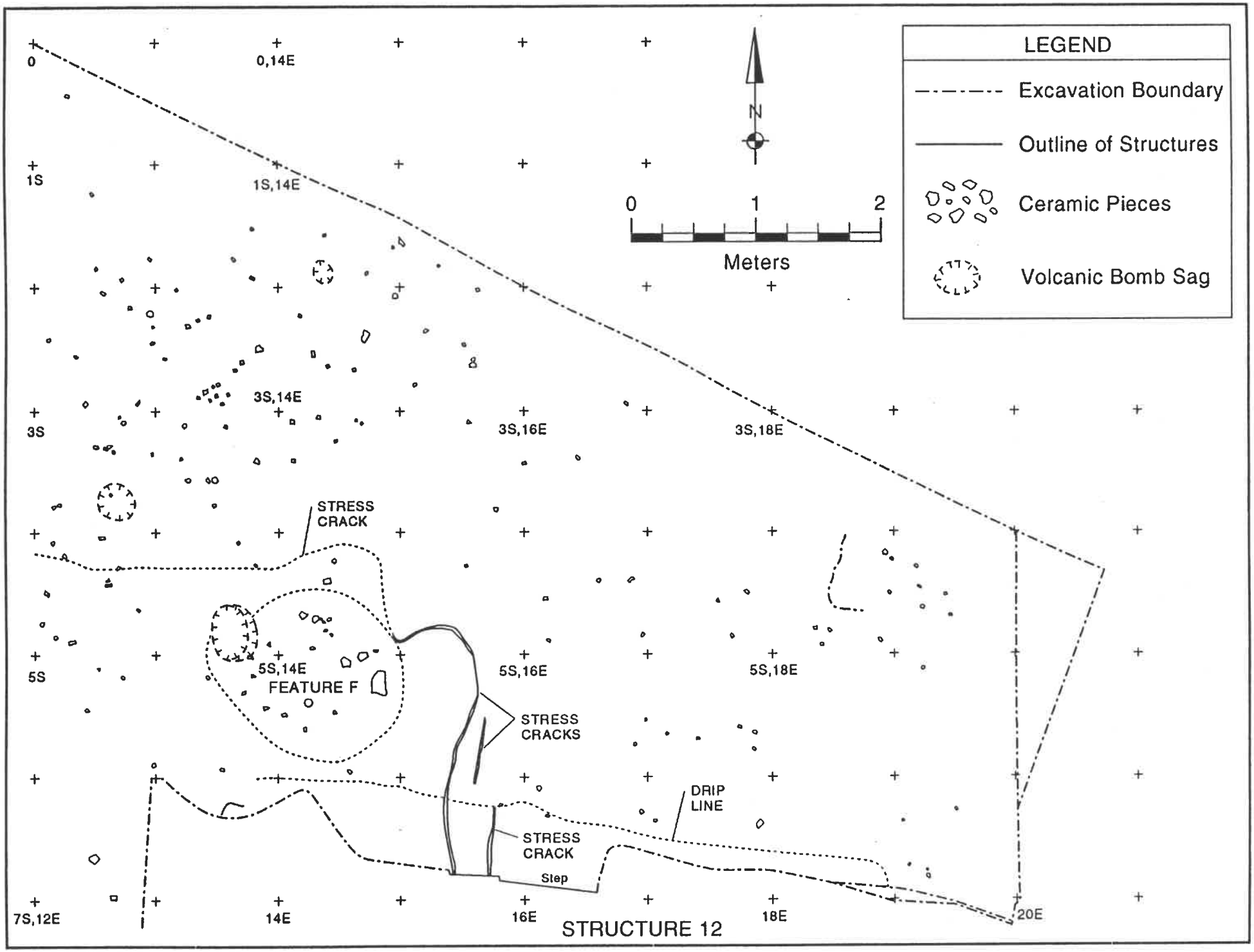


Figure 4 Structure 12 patio area, Operation 8

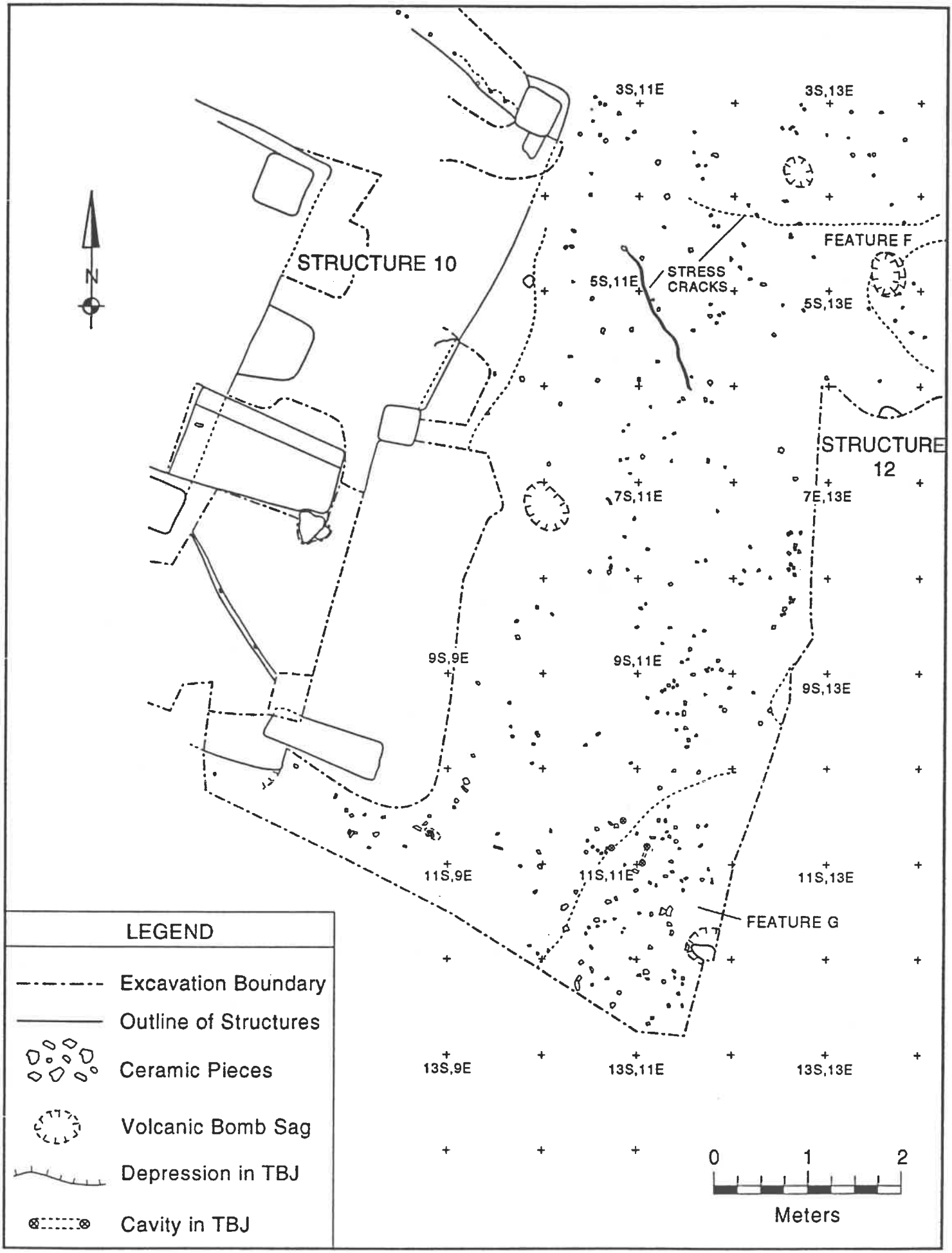


Figure 5 T.B.J. surface between Structures 10 and 12, Operation 8

remaining Unit 1 ash in the open patio areas north of Structure 12 and between Structures 10 and 12 resulted in exposing the original ground surface (TBJ). All artifacts found resting on the surface of the TBJ were left in place and plotted on plan view drawings made for each of those areas (Figures 4 & 5). The results of this work, along with interpretations of the significance of the distributions and densities of artifacts on the TBJ, will be presented in the Interpretations section of this report.

Returning to the area inside the doorway of Structure 12, removal of the Unit 2 tephra resting on top of the step into the building revealed a number of what initially appeared to be small paint flecks resting on the surface of the Unit 1 ash. Further excavation in the immediate area and careful inspection of these pieces revealed that they were part of a painted gourd that had fallen from an elevated context, probably from on top of either the lintel or Column 7. Conservation efforts were immediately undertaken by Holly Lundberg in order to preserve the remains of the gourd prior to its removal from the entrance of the structure. After consolidants were applied (see Chapter 9 of this report), the gourd was block-lifted from the Unit 1 ash and taken to the field laboratory for further consolidation work.

Removal of the Unit 1 ash covering the step revealed that it was 26 cm. in height at its highest point above the gently sloping clay building platform. The riser into the North Room of the building is 27 cm. in height at its highest point. The step was found to be 35 cm. deep and is more than likely 1.15 m. in width. Although it was not possible to determine the precise width of the step because the collapsed portion of Column 10 partially covers it, in all probability the step runs from column to column.

As we were exposing the step by removing the last remnants of Unit 1 ash we were able to see and understand how the step had been made. The badly worn edge of the step showed the sharp edges of a block of *laja* that had originally been completely covered by adobe. Apparently, the *laja* was laid down first, as a solid base or support for the step, then was covered by wet clay. Heavy wear, which is believed to be related to how the building was used, eventually worked to erode the edge of the step, revealing the *laja* construction underneath (Figures 2 & 3).

Moving inside the building, workers began to excavate the sloping ash talud left in place on the south side of the north wall between Columns 9 and 10. Again, because of the fragile nature of the walls of this building, it was not possible to remove all of this supporting ash (Figure 3). However, much of Units 3 and 2 along the inside surface of the wall was removed in this eastern portion of the north room. Following the removal of Unit 3 tephra in this area, roofing thatch was discovered in Unit 2 ash. This portion of the building was a particularly difficult place to work, largely because of the presence of a huge volcanic bomb that had fallen between the north and south walls of the North Room of the building (Figure 3). Partially exposed in 1990, this bomb measured approximately 80 X 60 cm. and, in addition to badly smashing some ceramic vessels, left a deep bomb sag in the floor of the North Room (Figures 3 & 6).

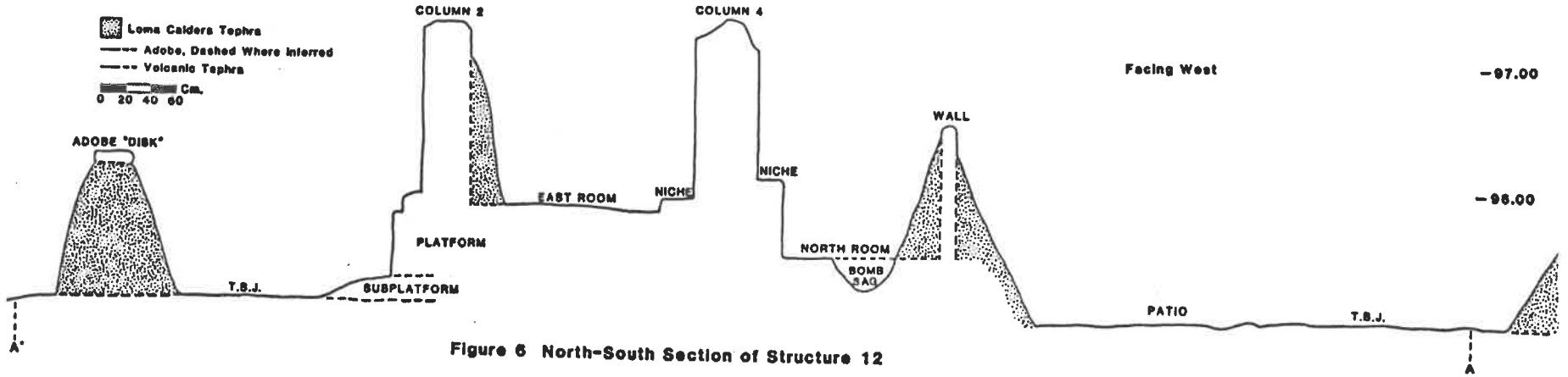


Figure 6 North-South Section of Structure 12

Another horizontal, round-shaped cavity in the Unit 3 tephra, very similar to the one found between Columns 7 and 10, was identified on the south side of Column 10 (Figure 3). Probably the impression left by a round wooden beam now decayed, this cavity measured 8.5 cm. in diameter. Its location very close to Column 10 and its orientation toward Column 9 suggests that this cavity represents the remains of a wooden beam that connected those two columns. Careful inspection of Column 9 indicated that a round shaped cavity was present at the top of the column, and that cavity measured 8.5 centimeters in diameter. A similar round cavity was present on top of the opposite column, Column 6. The excavations indicate that round wooden beams were used as connecting structural supports above or at the top of the mudded portions of the walls between the columns of the north walls of this building.

Moving east from the entrance, into the eastern portion of the North Room, structural remains were found abutting the south face of Column 10. What appeared during the course of excavating the Unit 3 tephra was a thin (8-9 cm.) *bajareque* wall, oriented N-S, that had partially collapsed during the Loma Caldera eruption. The southern half of this small partition wall was broken away from the rest of the wall by the large volcanic bomb that landed in this part of the north room (Figure 3). The wall had cavities for *bajareque* poles, and extended out (south) from Column 10 80 cm. into the North Room, leaving a narrow space of around 55-60 cm. between the southern edge of this small wall and the south wall of the North Room (Figure 3).

Immediately west of the section of this small partition wall that had fallen, a small cluster of minerals was found (295-5-47). These minerals, which are found locally in the Zapotitan Valley (C. Dan Miller, personal communication 1993), were determined to be augite, biotite, and plagioclase. Further excavation in the lower Unit 1 tephra lying just above the floor of the North Room revealed that the minerals continued under the small section of the partition wall that had fallen during the eruption. This indicates that the minerals were deposited onto the floor of the North Room of the building sometime early during the deposition of Unit 1 ash. It is likely that they were stored in some elevated context, possibly on the top of the small partition wall itself, or on top of Column 10.

Continued excavations east, further into the eastern half of the North Room, revealed a number of ceramic pots lying on the floor of the room against the inner surfaces of the north and east walls (Figure 3). These pots were covered in roofing thatch that had fallen inside the North Room during the deposition of Unit 2. Several of these pots, including 295-5-53, were fairly large in size. Two of the largest of these ceramic vessels were left in place because their presence within the sloping ash *taluds* provided stability and strength for the fragile north and east walls of the building.

A number of ceramic sherds were found around and underneath a part of the large volcanic bomb located in this section of the north room. These sherds are shown in Figure 3 as 295-5-51. Charred corn was found in association with these sherds. Given the information available, it is likely that vessel 295-5-51 was placed on the floor of the North Room of the building against the south side of the north wall. It is likely that corn was stored in the vessel at the time of the eruption. During the deposition of Unit 2 tephra on the

site, a very large, intensely hot volcanic bomb crashed down on the pot, charring the corn stored inside. The carbonized corn (295-5-48) was collected for analysis.

Immediately in front of the vertical niche on the north side of Column 4 (Figure 3) a painted gourd (295-5-49) was found covered by Unit 1 ash on the floor of the North Room. Face down on the surface of the floor, this gourd had been decorated with a pattern of red and blue lines. The gourd had more than likely been resting inside the vertical niche, and may have been dislodged from its place inside the niche by the earthquake(s) that occurred just prior to the deposition of Unit 1 ash.

Consultations with Marilyn Beaudry-Corbett and Holly Lundberg preceeded all removals of fragile artifacts during the last weeks of research at Str. 12 (see chapters 7 and 9). Special conservation efforts were necessary in the case of unusually well-preserved organic materials. These include the painted gourds described above and the pottery vessel (295-5-53) that had a mat-like feature that formed a band around its constricted neck. The latter was conserved directly onto the ceramic vessel. Its function is unknown, as it could have been for suspension, for strengthing, or for some other purpose. It is even possible that it had a symbolic function; if the latticework in the front of the building was depicting the mat symbol as indicative of authority, it is possible that the mat around the neck of the vessel also had the same significance. If this is correct, it likely was used to dispense a liquid to members of the council of elders of the community, or some similar function. The vessel had no handles. Consultation in the case of two large vessels resulted in the unanimous conclusion that they both must remain in situ. They are in the volcanic ash balk-talud in the extreme northeast corner of the north room. If they were removed, they would undermine the volcanic ash deposit that has been left to help support the fragile bajareque wall. Only one, the northeastern vessel, was slightly open at the neck, allowing us to visually check for vessel contents. None could be seen, but sufficient volcanic ash had fallen into the vessel to partially fill the vessel. Either could have organic contents still preserved.

During the last two weeks of field work at the site, six workers removed Units 8 through 2 in a strip to the east of Structure 12, with the objective of providing sufficient area for capillary ground moisture to evaporate outside of the building. The objective was conservation, as the excavations were not continued down to the pre-eruption ground surface. The strip is 2.35 meters wide (east-west) and 12.40 meters long (north-south). No features were exposed during the tephra removal, but all of Unit 1 was left in place. Figure 7 shows an East-West section of the architecture of the building and the area excavated to the east of the structure.

It is possible that very small-scale features are present in this zone, and it is likely that discarded sherds and other small artifacts will be found below Unit 1, when it is excavated. When Unit 1 is removed in this area, some time in the future, it will be important to study the microtopography to explore how this area was used and how it related to the structure. The only artifact found in the area was a mano (295-5-50) that was found in basal Unit 4, to the east of the structure and south of Column 8. It originally was in a somewhat exposed location, upside-down, judging from the accumulation of the moist Units 1 and 3 along its griding surface and one side. The most likely location was storage on top of that column. At first this presented an interpretive problem, as Unit 4 is an airfall unit, and thus there is no known source of energy to move the mano from its original location to where it was found. However, a sizeable lava bomb was found adjacent to the mano, that impacted at the same stratigraphic unit (and therefore at the same time) as the movement of the mano. It appears that the reverberations from the bomb's impact tumbled the mano off the column top into the beginning accumulation of Unit 4 airfall tephra.

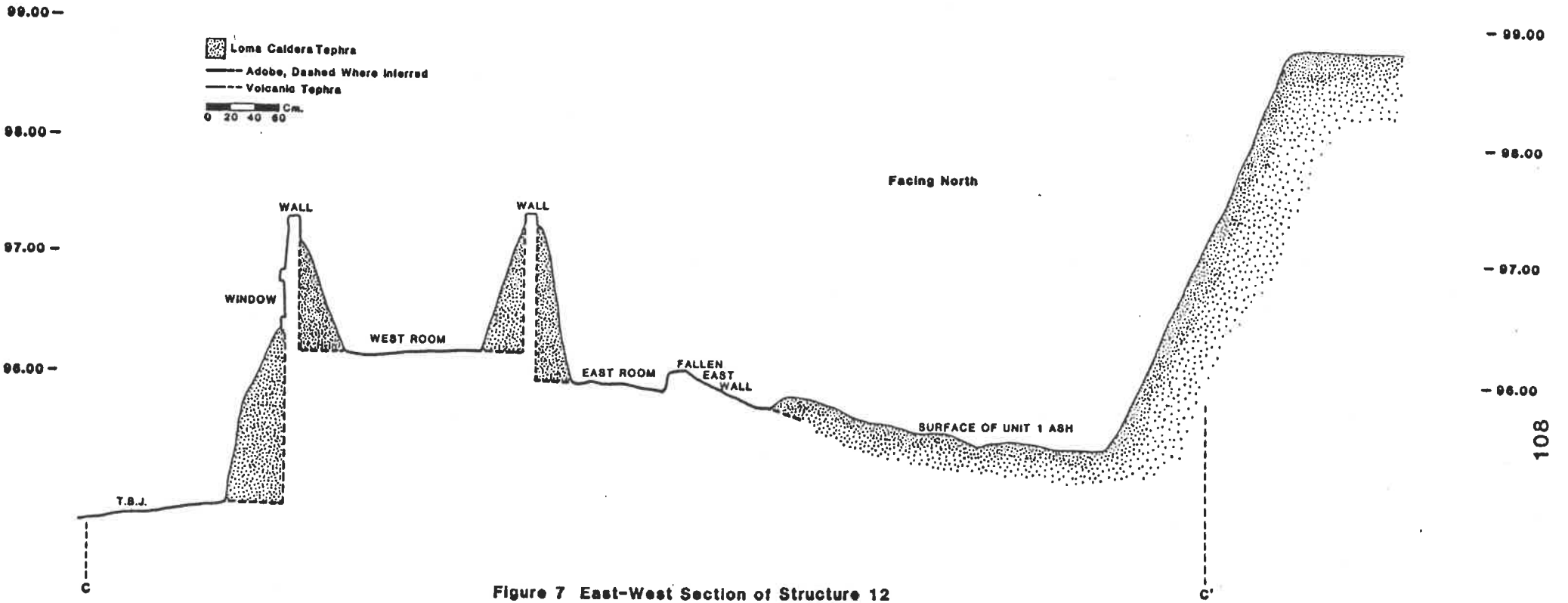


Figure 7 East-West Section of Structure 12

As the tephra deposits were being cleared from the area north of Structures 10 and 12, a small pit was discovered that had been excavated down into the tierra blanca joven. The objective probably was to dig some of the volcanic ash out, for use elsewhere. Of interest is that the digging stick marks were visible in the pit. Most of the marks were hazy or overlapping, and therefore were difficult to measure. Fortunately, one of the marks, from one of the last scoops to be made, was well preserved. It measured 14 cm. in length, and was 4.5 cm wide. The width of the mark can be taken as a reasonably accurate reflection of the length of the sharpened edge at the end of the wooden digging stick.

During the final week of research the architectural elements were cleaned, as well as the surrounding ground surface to the north and west of the structure, for final recording by black-and-white and color photography as well as on videotape. The architectural conservation, including treatment with the escobilla mixture as well as re-introduction of the vertical poles into the bajareque cavities, continued throughout the research period. Architectural conservation of Str. 12, as with all excavated structures at the site, continues into the indefinite future as a standard activity of the permanent conservation crew employed by the Ministry of Education.

During the cleaning of the previously excavated interior partition walls, the very tops of the lintels of the interior doorways were revealed. They are unlike all other door lintels found at the site to date, as they taper toward a very small lintel at the top, only 30 cm wide. They are low, as each is about 1.43 m above the floor. That is an estimate, as the tephra balk remaining in each doorway does not permit an accurate vertical measurement. And, until that balk is excavated, we have no information about the size or shape of the doorway below the lintel.

Results

The results of the 1993 research at Structure 12 are presented in terms of the architecture and artifacts. Because the excavations are a continuation of research conducted in 1990 (Sheets and Sheets 1990), frequent mention is made to the previously discovered remains, to present the most complete picture possible. That will set the stage for the interpretations that follow this descriptive section.

Architecture

The architecture that was discovered in 1993 is presented here not in order of discovery, but in order beginning with the entryway and moving into the north room, to connect with the architecture discovered in 1990.

The northernmost architectural feature of the building is the beginning of the entryway. Specifically, the gently sloping clay ramp immediately north of the steps is the feather edge of the substructural mound (Figure 8). That is the architectural element of the building that extends farthest into the patio. Rounded substructural platforms were commonly built at Ceren prior to constructing the formal rectilinear platforms. They serve to elevate the buildings as well as create drainage away from the platforms. The edge of the substructural mound coincides with the dripline at the edges of the thatch roof (Figures 6 & 8), as with many other structures at Ceren.

The gentle rise of the substructural mound, of 13 cm, continues up to the riser of the step into the entryway, over a distance of 60 cm. The step itself is sizeable, 1.15 x 35 cm, and is stabilized by a large laja located under a thin veneer of surfacing clay. The riser below the step is 26 cm high, and the riser above the step, to the floor of the building's north room, is almost identical at 27 cm in height.

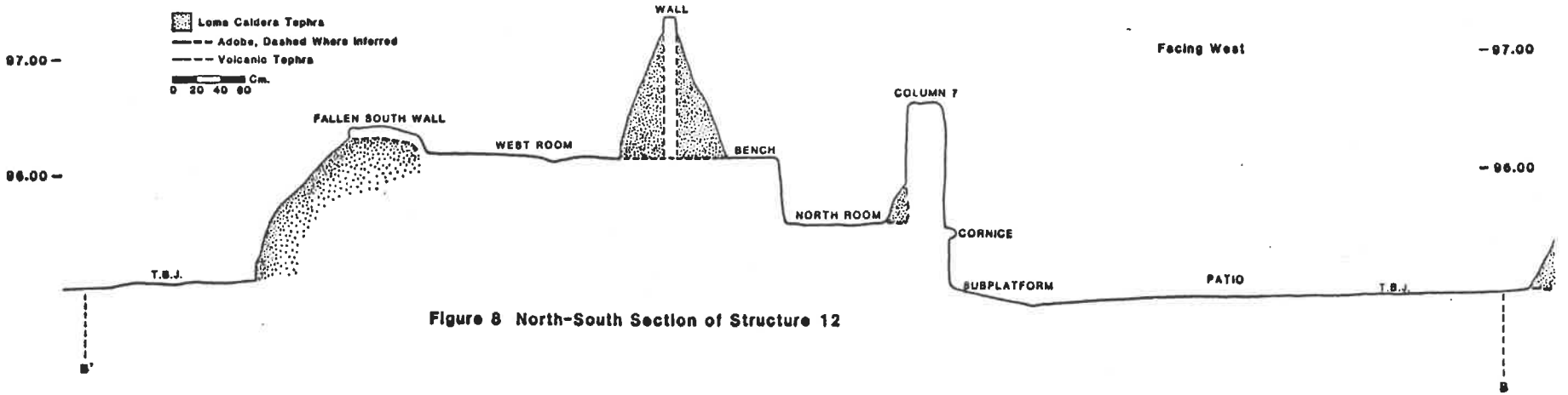


Figure 8 North-South Section of Structure 12

Resting upon the step was the substantial double-pole front door of the building that was in place at the time of the eruption. The door was constructed of more than 70 vertical poles, probably of Tithonia rotundafolia, the cane used frequently for fences and doors at Ceren (D. Lentz personal communication, 1993). Not all poles were preserved as cavities, and there probably were 80 to 100 poles originally. The poles were preserved only at the bottom, but its construction can be inferred from other evidence. They were about 1/2 cm in diameter, in two rows (Figures 2 & 3). The door had been bowed inward, from the force of the southward-moving lateral blasts of Units 1 and 3, but it was not detached from its moorings. It is probable that the vertical poles were connected to two horizontal poles that made a solid door framework. The horizontal poles presumably would have been inserted into the pairs of sockets in the columns forming the door jam (Figure 2). The lintel above the doorway was only 1.24 cm above the step, so the door had to have been somewhat shorter. Assuming the door was anchored into the two socket holes in each side column of the doorway, the lower horizontal pole was 37 cm above the step, and the upper one was 70 cm above it. To place the door in the doorway, it would have had to have been bent or bowed so the horizontal poles can be inserted into the sockets. Although wider than most doorways at Ceren, this doorway is notable for being very low. With only 1.24 cm between the top of the step and the bottom of the lintel, and with the door open, one would have to bend over considerably to enter or exit the building. It is possible that some of the small artifacts that apparently were placed on the lintel were put there by people that had not entered the building, but had only approached to the step, and then left.

Although the north room's floor is not as high as the floor of the rest of the building (created by the formal platform), it is 70 cm above the patio area to the north of the building. That floor and the walls that encircle it probably were designed and built together, and that could have been as a later addition to the building. The material of the walls differs from most earthen construction material at the site, and when it dries, it is very friable. Fortunately, the daily treatment with the diluted resin of the *escobilla* plant (Sida rhombifolia) does strengthen it. However, more volcanic ash had to be left in sloping taluds inside and outside of Str. 12 walls than in most buildings at Ceren, to protect the fragile architecture. It is reasonable to assume that some artifacts and architectural details of the building still await discovery. One important question is if the latticework decoration that is found to the right of the entryway has a symmetrical latticework on the left of the doorway.

The six columns that mark the corners or ends of the encircling walls that define the North room are unique at the site in that they were circular, 30 to 35 cm in diameter, and stood almost a meter above the north room floor. It is possible that they were designed to be stylistically similar to the rounded cornices that decorate vertical and horizontal elements of the platform and the base of the north room extension. The column tops and wall tops of the north room were about 1.75 meters above the exterior ground surface, a height that would have provided visual privacy from the outside. Privacy would have been greater in the innermost three rooms, as column and wall heights are even higher above the surrounding ground surface. The columns at the ends of the northern encircling wall create the door jams for the entrance. The wall to the west of the entryway is decorated with latticework reminiscent of the window in the building's west room (Figure 2). It is not known if the holes penetrate through the wall, and thus it should be called a window, because ash was not removed from its interior or from the south side of the wall. If it does not penetrate the wall, it would be a latticework decoration, perhaps symbolic of the mat, the Maya symbol of authority. We do not know if the latticework continues westward to the corner (Column 6) because only a small area could be cleared. The wall is too fragile to have more than the very top excavated and exposed, so these encircling walls were left with volcanic ash taluds inside and outside.

The horizontal and vertical edges of the Str. 12 platform were decorated with rounded cornices (Sheets and Sheets 1990). Similar rounded cornices were found this season decorating the northern extension near the entryway. Below Column 7, at the entry, a rounded cornice ran horizontally and vertically, decorating the entrance and the base of the column (Figure 2). The distance the rounded cornice runs to the west is unknown. Also, it is not known if these features exist on the east side of the entryway, making the building bilaterally symmetrical. Wall fragility did not allow exploration to determine presence or absence of latticework or cornices between Columns 9 and 10. The walls encircling the North room are of bajareque; the vertical reinforcing poles were used for roof support. The thatch roof extended about 60 cm to the north of the building's walls, but only 20 to 45 cm beyond eastern and southern walls respectively. Those distances of thatch extension probably were designed to coincide with the edges of the subplatform to facilitate drainage of moisture away from the building.

A small thin partition wall extended into the North room, more than 1/2 way across the room, from the south side of Column 10. It extended 70 cm into the room, and was only about 5 cm. thick. Its original height is unknown, but it was at least 44 cm, but probably not more than 60 cm. It partially walled off the eastern end of the North room. It probably is not coincidental that all of the floor-contact artifacts of the North room were found behind the partition wall, and none on the floor in the more open west end or central portion of the room. No evidence of storage of artifacts outside the walls and under the eaves has been found at the structure. This contrasts with the extensive use of ample eaves for artifact storage, and activity areas such as maize griding and cooking, in the domestic buildings.

The other architectural details are presented in the chapter covering earlier research (Sheets and Sheets 1990). This includes the step up, past the bench with the niche, and through the door into the east room. Another door led into the west room. Neither doorway had been found in 1990, but their presences were presumed. Only the top portions of their lintels have been discovered, but at least that allows for accurate placement on the plan, and an estimation of the height of the lintels above the floors.

Artifacts

It is easier to interpret the artifacts of Str. 12 in terms of what they are not, instead of what they are. Neither their placement nor their nature closely resemble any assemblage of artifacts yet excavated at the site, or found in any ethnographic, ethnarchaeological, or archaeological reports, to the best of our knowledge. They are not a domestic functioning assemblage that even remotely resemble the assemblages found in households at the site. Nor do they resemble the assemblage at Structures 10 or 3, other special-purpose structures at the site. Of course they do not resemble artifacts at Structure 9, the temescal, as there were none. The artifacts and their locations within Str. 12 are described in this section, with attempts at interpretation being made in the following section. Artifacts are presented with their FS numbers in parentheses, in abbreviated format. A number such as (-21) is abbreviated from (295-5-21), the full designation.

Although the artifacts of Str. 12 do not seem to be a functioning assemblage, there are some patterns in their distribution. Certain kinds of artifacts are found in clusters, and these are described here, with emphasis on the artifacts that were excavated in 1993. There are two clusters of small artifacts, one placed in an elevated context on the lintel at the entrance, and the other placed inside the niche that was built into the bench between the North and West rooms (Figure 9). There are two relatively dense clusters of ceramics, one at the east end of the North room, and the other on top of the abovementioned bench. A somewhat smaller cluster of ceramics was found on the floor of the East room. The other artifacts were found scattered in various locations. Overall, when compared to domestic buildings or Str. 10, it is notable that Str. 12 had relatively few artifacts.

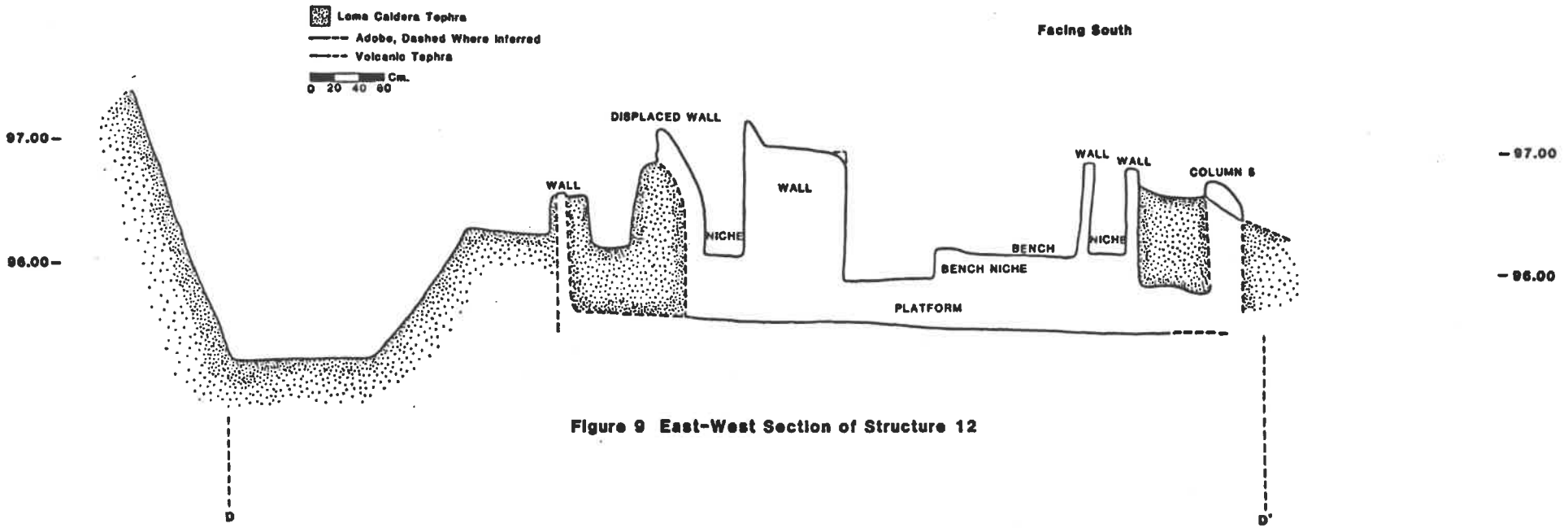


Figure 9 East-West Section of Structure 12

A very interesting concentration of eight small artifacts were found associated with the doorway. Six of them were found where they had fallen in the doorway of the structure, with two more located nearby. Most apparently had been placed in elevated storage on top of the lintel spanning Columns 7 and 10, with a few on top of these columns. They include two spindle whorls (-33 and -39), a small, used obsidian prismatic blade (-38), a large and unbroken tanged macroblade of obsidian (-41), a painted gourd (-35), and a hard greenstone disk (-40). The only characteristics they share is their placement on or near the lintel, and their small sizes. Most were used. These artifacts probably were individually placed on or near the lintel; they do not seem to be components of any kind of known functional assemblage.

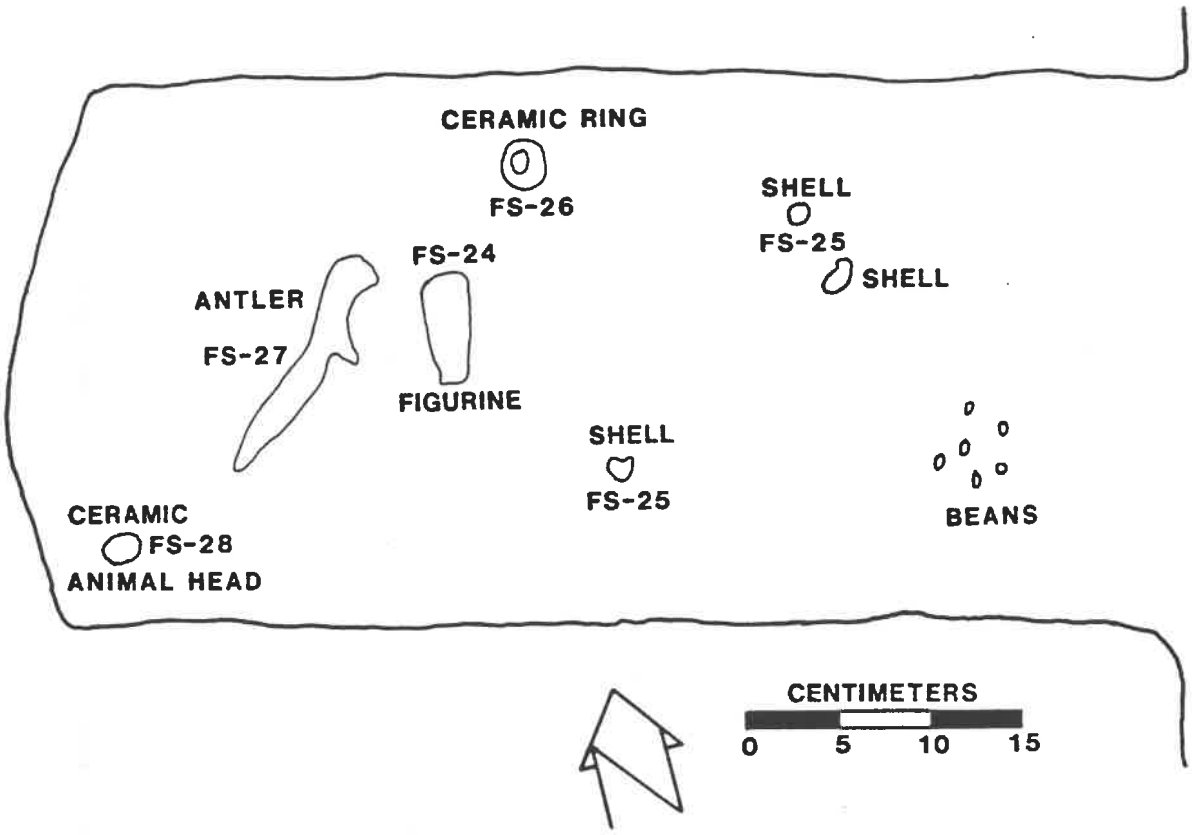
The two other artifacts that could be considered a part of the eight doorway-associated small artifact cluster were located at a slightly greater distance from the lintel. Just south of Column 10 a cluster of tiny crystals (-47) was found, and it probably fell from the top of that column. It evidently represents a collection of crystals that someone made and brought to the building. Most of the crystals are augite and biotite, minerals that are common in this volcanic area (C. Dan Miller personal communication, 1993). Also found fallen into the north room was a piece of marine shell (-19), that may have been placed on top of Column 7. Because it was broader and lighter than the other artifacts, it may have been carried farther into the north room by the lateral motion of Unit 1.

Another cluster of small artifacts was found in the niche that was built into the bench immediately south of the North room, adjacent to the step up and passageway toward the East room (Figure 10). In the east end, the near side of the niche, were found some fragments of shell (-19) and a few scattered beans. The beans may have been the remains of a pile of beans, such as that found in the East room, but the pile of beans in the niche had been largely picked up, leaving only a few scattered ones behind. Three artifacts were found farther into the niche, a ceramic ring (-26), a human figurine (-24), and a deer antler (-27). The ring was half of what originally was a ceramic double ring, but it had broken. Adjacent to the ring was a human female figurine of fired clay, with black and red paint. Beyond the figurine, in the southwest corner of the niche, was an animal head ceramic figurine with remnants of white paint. All three of these ceramic artifacts had broken well before they were placed in the niche, judging from the rounded condition of the breaks. They appear to have been curated for quite some time. Finally, a deer antler was found between the two figurines. It showed use wear in the form of smoothing and polishing. It may have been used as a *tapiscador* or corn husker. Unfortunately, the tip had broken and then a rodent had gnawed on the broken tip before the eruption, presumably removing most evidence of its use.

The only artifact found in the west end of the North room was an obsidian prismatic blade fragment (-14), quite used, that was in elevated storage, probably on top of Column 6, or on an adjacent wall top. The use of the building evidently required keeping the floor of the central and western end of the North room clear, in contrast to the east end.

The east end, partially walled-off by the partition wall south of Column 10, had a number of artifacts placed directly on the floor or on the bottom of the niche. Leaning against the south wall of the north room, almost below the niche, was a large trough metate (-29). It had been used considerably, judging from the extensive wear of its grinding surface as well as the remnants of organic-stained soil adhering to its bottom side. The soil evidently came from a dirt floor where it had been employed as a grinding stone. If the metates that have been found at the site so far are a guide, it probably came from a kitchen. The only metate found in use on a floor came from Str. 11, the kitchen of Household 1. Its base was encrusted with the same kind of organic-stained soil.

Figure 10 Detail of Niche in Bench



An upside down painted gourd (-49) was found immediately east of the metate, in tephra from Unit 1. It had been in elevated storage, almost certainly in the niche above it. It apparently tumbled from the bottom of the niche and landed upside-down. The pigments appear similar to the painted gourd recovered from the niche of Str. 2, the domicile of Household 2. A large volcanic bomb landed immediately north of the metate and the fallen gourd, smashing a pot (-51) that contained maize kernels. The bomb created a deep impact crater, but damaged no walls because it fell between them. A very old used obsidian prismatic blade fragment (-46) had been placed in an elevated location above that vessel, probably on the top of the wall or on a rafter. The edge damage, the size of the blade, and particularly the heavy patination of all surfaces, indicate that this probably was discarded into a garden or milpa area, and had been picked up and brought to the building. It is difficult for us to understand why a mundane piece of patinated obsidian trash would have been brought to the building and placed high in the North room.

Three ceramic vessels had been placed on the floor at the northeast corner of the room, near Column 9. Two large jars have been left *in situ* in order not to undermine the volcanic ash talud left in place to aid wall conservation. They do not have FS numbers. No vessel contents could be seen, but it will not be known definitively if there is any vessel contents remaining inside them until they are excavated and studied. The third vessel (-53) was excavated, and it contained beans, preserved as impressions in fine moist Unit 1 tephra that was deposited in the vessel bottom. Also preserved by the fine tephra was the unusual organic item mentioned above. Around the neck of the jar was a band, about 3 cm high, of matting. Woven like the mats from the site and like the mats still made in the area today, the mat encircled the neck of the vessel. But what is unusual is that it is a narrow band of matting, and that it was placed around the neck of the vessel. It is not known if its purpose was to strengthen the vessel, to facilitate suspension, for symbolic purposes, or something else. It was not tightly attached to the vessel neck. It was preserved because some fine moist Unit 1 tephra worked its way between the mat and the vessel as well as coating the mat around the outside. It was consolidated onto the vessel.

In addition to the east end of the North room, the other dense accumulation of ceramic vessels was the five vessels placed on the bench above the horizontal niche between the North and West rooms. Two (-15 and -17) were immediately above the niche, but were damaged by a direct hit from a small lava bomb. The other three were unaffected by the bomb, as they were along the south edge of the bench. One is an inverted bowl (-9) capping a large jar (-10), and the other is a vessel that was placed near the east edge of the bench (-22). The step up and the left turn toward Column 4 was kept clear, presumably for foot traffic between the North and East rooms. Turning right, and ducking under the low lintel, allows one to enter the East room. Immediately east of the doorway is a vertical niche associated with Column 4. The bottom of that niche was coated with a layer of wood ash, and a small mano (-5) was placed on top of that layer. A polychrome sherd (-6) was nearby, perhaps fallen from the top of the column. Three vessels were placed in a line on the floor of the East room, one (-12) near the door and the other two at the south end of the room, near Column 2. The latter two vessels (-4 and -11) were small jars of the form still called "chicha pots" in the area today. The latter was carefully placed on top of 4 olivella shells. All the shells had been perforated for suspension, and all showed wear from string use. The only other cultural item in the East room was a small pile of beans (-7). Other piles of beans at the site, that were not inside ceramic vessels, were stored on top of organic separators such as layers of leaves, probably to keep them isolated from ground moisture. These had no separator, which may indicate that they were to be sitting on the East room floor for a very short time.

After entering the East room, if one wished to continue into the principal inner room, the West room, they would need to turn right and duck under the low lintel. In spite of its

large size, the West room was notably lacking in artifacts. The only artifact found in the room was a large open bowl (-8) found in the southwest corner, adjacent to Column 1. The presence of the window on the west wall of the West room makes us wonder if it could have been used for communication between someone inside the building and someone approaching the building from the outside. The patio area immediately to the west of the window, excavated in 1990, evidently was not the high traffic area compared to the area outside the doorway, but it does show evidence of compaction, smoothing, and virtually no surface artifacts. The patio area farther to the south certainly was a low traffic area, judging from the surface irregularity, amount of lumpy clay accumulation, high numbers of artifacts, and lack of surface smoothness and compaction.

An occasional artifact was found outside the building, that had tumbled outside during the eruption, but no artifacts have been found that were deliberately placed outside it. They probably were originally placed inside but were dislodged during the eruption. A miniature ceramic "paint pot" (-18) was found outside the West room, in tephra, and probably fell from the top of Column 5 or the adjacent walltop. It contained remnants of cinnabar pigment, and it presumably would have been one of the more intrinsically valuable artifacts left at Structure 12, along with the complete vessels and the macroblade. And, its "used-up" condition, that virtually all of the pigment had been taken out of the pot, is a characteristic shared with many of the other artifacts in the building. Two used manos were found to the east of the East room, and they probably were dislodged from elevated storage atop Columns 4 or 8, or the wall connecting the two. A piece of marine shell (-20) was found to the south of the structure. It probably had been placed atop Column 1 or nearby. It is almost identical to a piece of marine shell (-19) found in the North room.

In the composite, the artifacts of Structure 12 are notable not only for their nature and unusual distribution, but also for their having been used. All the chipped stone and most of the small fired clay artifacts exhibit extensive use wear. Many of the artifacts could have been family or personal heirlooms with personal or sentimental value. Three clusters of beans (one in a vessel) and a pot full of corn kernels could represent food offerings or gifts. Many of the artifacts either are directly associated with storing or serving food or drink, or they are artifacts to process food. Most of the artifacts may have been things of personal or practical value that were brought to the structure in exchange for some kind of service performed there.

Interpretations

The artifacts and architecture of Structure 12 are sufficiently difficult to interpret that we shall use a process of elimination, and then explore some alternative interpretations. It is easier to discuss what Structure 12 was not, and at least that does give us a comparative context within which we can begin to consider what it may have been.

Architecturally, Str. 12 does not resemble any known civic or household structures yet discovered at the site, with its low lintels, barrier or partition walls, tiny interior doorways, vertical niches, multiple floor levels, fragile construction materials, white and red paint, double pole front door, rounded moldings, and latticework. Also, its azimuth of orientation is different from the domestic and civic buildings at the site. There is no architectural or artifactual evidence of any particular physical craft, storage, or material processing conducted in the building. Likewise, it is clear that it was not a building for household activities. Nor does it match or approximate any of the specialized buildings found at the site, other than exhibiting some similarities with the architecture of Str. 10.

We do have some evidence that the building may have been in either a long or short-term process of architectural remodeling. The two lumps of clay in which numerous ceramic sherds were present, Features F and G, are believed to represent the remnants of mounds of construction clay that was purposely dug up from nearby and intended for use in stuctural refurbishings.

Some of the artifacts found in the structure are unique to the site, as known to date. They include the mineral collection, the vessel with the mat around the rim, the mano placed on top of wood ash in a vertical niche, the greenstone disk, and the "chicha jar" on top of olivella shells. However, individually, most of the Str. 12 artifacts do have similarities or analogs with other artifacts found at the site, including grinding stones, ceramic vessels, obsidian prismatic and macroblades, gourds, and spindle whorls. However, in domestic contexts these are identifiable as functioning assemblages, with matched sets of manos and metates in food preparation areas, smoke-blackened cooking vessels in a kitchen, storage vessels in bodegas, sharp cutting implements kept handy in predictable locations in thatch roofing, and food serving ceramic and gourd vessels in bodegas and domiciles.

The architecture is designed to restrict public access, from the front door, partition walls, steps, to the low lintels and sharp right-angle turns (Figure 11). The West room window would have provided a little light into the room and some air circulation, but compared to the light and air circulation provided by the open areas of all walls above the mudded bajareque and below the thatch roofs throughout the structure, these would have been negligible. The window may have been designed to function in a very different way. It could have provided voice communication between a person inside the building and people who approached the building from the west. If the lattice work along the northernmost wall penetrates the wall, then similar activities could have taken place in that area.

Previously, a possible interpretation was offered for the building and its contents, that it may be a building where a shaman or curer practiced (Sheets and Sheets 1990). If that were an accurate interpretation, it could explain the nature and distribution of artifacts, as they could have been brought to the structure individually, and left there in exchange for services rendered. Most small objects were placed on the lintel or column tops at the entrance, and the person placing them there did not need to enter the structure. Some other small items were placed in the niche under the bench, just inside the North room. And, the few scattered beans probably represent a "pile of beans" that had largely been picked up. Other larger items, particularly ceramic vessels, were concentrated in the northeast corner, or on the bench, or some in the East room. A shamanistic interpretation might help explain why so many of the artifacts were quite used, many of them with rounded-off broken parts, and some of them quite useless from a utilitarian functional point of view. It is conceivable that a shaman would be willing to assist a person in exchange for something of high personal value rather than intrinsic, at least more than someone interested principally in an economic transaction of one material for another. It would explain why the architecture and building location share much with Structure 10, apparently a building with a religious association.

One of us (S.S.) noted how much more abraded was the middle step than the top step into the north room. It is likely that people were approaching the building, standing on that step, reaching up, and placing small artifactual offerings on the lintel or the column tops with the front door closed. The relatively high traffic on the step correlates with the high traffic in the patio to the north of the entryway, and contrasts with the minimal abrasion within the north room or elsewhere inside the building. ("Even when the shaman's away, the people still pay.")

If shamanism, curing, or the like is what was going on at St. 12, then this may be evidence that shamanism was more architecturally elaborated in the Middle Classic period in

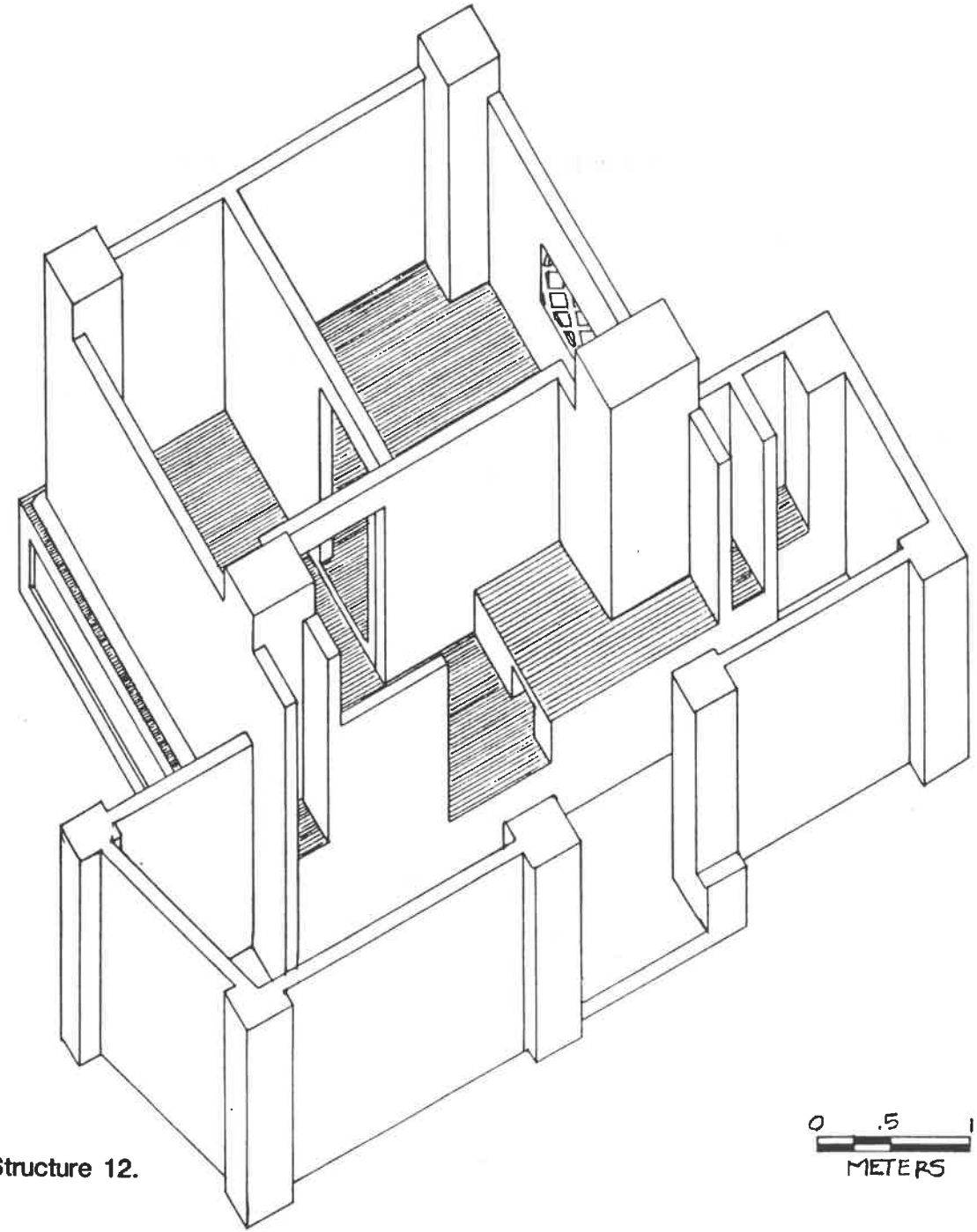


Figure 11

Isometric reconstruction of Structure 12.
By Karen Kievit

this area of southern Mesoamerica than it has been recently. The shamans who are actively practicing at Zinacantan (Vogt 1990) do so out of their own homes. Their activities outside their homes involve shrines and other holy places, outside of buildings. They do not practice from a specialized building that was constructed for that purpose alone.

The shamanistic interpretation is offered here simply as a viable suggestion, given the information available from the building as well as the alternatives that we explored in the ethnographic, ethnoarchaeological, and archaeological literature. The other viable interpretation is that Str. 12 may have functioned as the council house, discussed below. Other possible interpretations appeared to us to be less likely than these two, but that certainly does not mean that some alternative that we did not consider could be the actual function or functions.

The council house interpretation is based principally upon the latticework on its front wall, and to a lesser degree on the mat decorating the vessel and other architectural and artifactual elements. If that latticework was constructed to depict the mat, the symbol of authority in southern Mesoamerica, then Str. 12 probably functioned as the council house. Barbara Fash was the first to convincingly identify a Classic period southern Mesoamerican structure as a council house (W. Fash 1991:130), and most archaeologists accept her interpretation. Called the *"popol na"* in Maya, it is a small structure with prominent mat symbols on the front. It is located in the East Court of the acropolis, and is one of the smaller buildings in the central area of Copan. The *popol na* is also referred to as the mat house or community house in the Motul dictionary (Fash 1991:130), and Fash notes that project epigrapher Nicolai Grube observed that similar structures with similar functions continue in traditional Maya villages in southern Quintana Roo. Fash (1991) does not present the specific measurements of the building, Str. 10L-22A, but measuring from his drawing, the building is about 15 meters long, considerably larger than the Str. 12 at Ceren. The Copan structure is constructed of cut stone masonry, with plastered and painted decoration, while the Ceren structure was of earthen materials, painted white with the Ilopango tephra with some red painted decoration. The Copan building is also replete with sculpted depictions of the rulers of segments of the valley serving under Smoke Monkey, the supreme ruler in the mid-eighth century, only eight years after 18 Rabbit had been beheaded by Cauac Sky of Quirigua. It also has an elaborate altar-bench in its small innermost room. Fash interprets a midden deposit at the southwest corner of the building as possible evidence of feasting at the structure, an activity to be expected from the Motul dictionary. The same source also states that teaching people ceremonial activities including public dances was also done at the popol na, and Fash suspects that was done at Copan on the large masonry platform constructed a short distance in front of Str. 22A.

Schele and Freidel (1990) argue that the building buried under the Temple of the Warriors at Chichen Itza functioned as a council house. It is elaborately decorated with murals of seated lords with their symbols of office. It may have continued to serve that function in its latest construction phase (Freidel, Schele and Parker 1993). Freidel et al. (1993) also identify a council house or popol na at Uaxactun in Group H, at the eastern end of the architectural complex. Its mat symbols on the walls identify it as the council house. It also has sculpted portraits of lords. As at Copan, the primary working area is in front of the building, not inside, as the interior area is quite small.

An ethnographic analog is presented by Freidel et al. (1993: 166-9). In Tixkakal Guardia, a shrine village of the Cruzob Maya in Quintana Roo, the Maya still maintain and actively use two adjacent structures in the center of town. The "Iglesia" is the principal shrine building, and it has an inner room with stored sacred items and of restricted access. The more public room is larger and accessible by three doorways. Adjacent is the popol na, the community house or council house. It also stores items used in ceremonies, but it

primarily is the meeting structure for the leaders of the community. In front of both buildings is an ample flat area for rituals, peformances, and dances. Freidel et al. (1993) speculate that the *popol na* may have survived the Spanish Conquest, as Thomas Gage may have seen the Maya enact ceremonies involving *Popol Vuh* characters in Maya highland communities during the early 1600s that may have involved *popol na* structures.

If Ceren's Str. 12 functioned as a council building, the only room sufficient to seat a few people is the innermost room (Figure 11). It is big enough to seat only about 8 people comfortably. That it is located at the easternmost edge of the site is consonant with the eastern locations of council houses identified at archaeological sites. Certainly the open patio area to its north could have served for training in ritual performances as well as the enactment of various ceremonies. A weakness in the archaeological record that makes it difficult to adequately test this interpretation is that the artifacts associated with council houses at archaeological sites are largely devoid of the artifacts involved in their functioning. Thus, we have few expectations of what artifacts to expect in Str. 12, if it so functioned. It is conceivable that the various ceramic, lithic, and organic artifacts found in the structure could have been brought there by the council members, and left there. However, it is difficult to understand why such used blades and broken but curated figurines would be brought by council members, to say nothing of the heavy metate and the three manos brought there. The gender associations of the various artifacts found in Str. 12 run the full range from clearly female-associated (metate, manos, spindle whorls), to clearly male-associated (macroblade, prismatic blades of obsidian), with many items of variable association. One would expect, we think, a greater bias toward male-associated artifacts in a council house of the Classic period in southern Mesoamerica.

Apart from the abovementioned council houses, a search of the ethnographic, ethnoarchaeological, and ethnohistoric literature has not found analogs for Structure 12. For instance, Wauchope (1938) describes the principal domicilary structures of the Maya as well as outbuildings that serve as granaries, sweatbaths, ovens, structures for beehives or animals, kitchens, and other functions. Smyth (1991) discusses storehouses and other structures, but none are similar to Str. 12. Wisdom (1940) describes and interprets numerous household and religious buildings among the Chorti Maya of southeastern Guatemala, but none bear architectural or artifactual resemblances with Str. 12. McBryde's (1947) extensive material culture survey of SW Guatemala does not mention a similar structure. Stone (1948) describes Lenca architecture, artifacts, religion, curing, and shamanism, but none of these descriptions assist in the interpretation of Str. 12. Weeks et al. (1987) surveyed the Care Lenca area in Honduras, some 150 km NNE of San Salvador, and found nothing comparable to Str. 12 in the archaeological or early historic records. However, they do note how little is known about the Lenca, making comparison and analogical reasoning difficult. They do describe how much of the prehispanic settlement system was extinguished when the Spanish forced the Lenca to resettle in the 16th century.

A slight degree of similarity seems to exist between Structure 12 at Ceren and Structure 81 at Santa Rita Corozal in Belize (D. Chase 1985: 111-112, Chase and Chase 1988: 17-25), even though they are separated by 500 kilometers, some seven centuries, and numerous cultural events and processes. Structure 81 is multi-roomed, with at least 4 interior doorways, and a progression from more open to smaller interior spaces. Artifacts apparently were brought into the structure to be left there; many ceramic vessels were smashed within the building. The structure is interpreted as a "talking shrine" by A. Chase (personal communication, 1993). It may have functioned somewhat like the large fired-clay talking idol at Cozumel that received offerings from visitors who came from considerable distances (Tozzer 1941: 109-110).

Structure 12 differs in a number of ways with Structure 81 at Santa Rita (D. Chase 1985). Str. 81 is much larger, and it apparently focused on a central altar or bench. Str. 81 probably encompassed residential and ritual functions, but Str. 12 evidently was used for ritual but not residential purposes. The ceramic vessels that were brought to Str. 81 were deliberately smashed. The non-ceramic artifacts brought to Str. 81 bore few resemblances to the Str. 12 non-ceramic artifacts.

It appears possible that Str. 12 at Ceren might have been analogous to the Str. 81 "talking shrine" at Santa Rita, but on a much smaller architectural and functional scale. Str. 12 probably involved people from the community or immediate environs, while the shrine at Santa Rita could have attracted people from a wide area.

It appears possible that the activities represented by the artifacts and architecture of Structure 12 may not have survived from the Classic into the historic or recent periods in southern Mesoamerica. We are not able to find any compelling ethnographic analogs, and the archaeological, ethnoarchaeological, and ethnohistoric literature are of limited assistance. It is probable that the activities that took place at Structure 12 involved a number of households, a neighborhood, or the Precolumbian village of Joya de Ceren. It is conceivable that, as a supra-household phenomenon, it was more vulnerable to the depradations and deculturation that occurred with the Spanish conquest and depopulation than were the intra-household components of native culture. Perhaps one reason why the *cofradia* has survived so well is because the Spanish imposed it on what already had been a successful native institution of a religious association. In contrast, we fear that the institution represented by Str. 12 had no Spanish analog, and simply did not survive.

Acknowledgements

We appreciate the suggestion from Arlen Chase that Structure 81 at Santa Rita in Belize does bear some similarities to Structure 12 at Ceren. His suggestion that Str. 12 bears some resemblance to "talking shrines" does present interesting interpretive possibilities.

APPENDIX A: 1993 CATALOG OF ARTIFACTS AND SAMPLES TAKEN, STRUCTURE 12, OPERATION 5

FS #	Date	Strat. Unit	Item
30	7-11-93	U 3	Sample of carbonized beam between Cols. 7 & 12
31	7-11-93	U 3	Sample of lower portion of carbonized beam bet. Cols 7 & 12
32	7-14-93	U 3	Sample of roofing thatch
33	7-14-93	U 3	Ceramic spindle whorl
34	7-14-93	U 1	Rodent bones
35	7-14-93	U2/U1	Painted gourd
36	7-15-93	U 1	Painted pieces of construction clay
37	7-15-93	U 3	Painted piece of construction clay with stick impressions
38	7-15-93	U 3	Obsidian blade, medial section
39	7-16-93	U 3	Ceramic spindle whorl
40	7-16-93	U 1	Piece of Greenstone
41	7-16-93	U 1	Obsidian Macroblade
42	7-16-93	U 1	Flotation & Pollen sample from step
43	7-20-93	U 3	Paint chips from face of Col. 3
44	7-20-93	U 1	Flotation and Pollen sample from floor of North Room
45	7-22-93	U 1	Sample of seeds found in cavities of entrance gate
46	7-22-93	U 1	Obsidian blade, proximal section
47	7-23-93	U 1	Sample of minerals (Augite, Biotite & plagiclase) recovered next to small partition wall in North Room
48	7-23-93	U 1	Sample of corn associated with Vessel, FS # 295-5-51.

APPENDIX A: (cont'd) **CATALOG OF ARTIFACTS AND SAMPLES TAKEN, STR. 12, OPERATION 5**

FS #	Date	Strat. Unit	Item
49	7-27-93	U1-Floor contact	Painted Gourd with red and blue lines, found next to vertical niche north of Col. 4
50	7-27-93	U 4	Large mano found in lowermost Unit 4
51	7-29-93	Floor Contact	Ceramic vessel broken by lava bomb, possibly capped by FS # 52
52	7-29-93	U 1	Ceramic vessel, possibly capping FS # 51
53	7-29-93	Floor Contact	Large Ceramic vessel with mat around neck
54	7-29-93	Inside Vessel	Flotation and Pollen sample taken from FS # 53

Chapter 6. ARCHAEOLOGICAL INVESTIGATIONS AT OPERATION 2

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Introduction

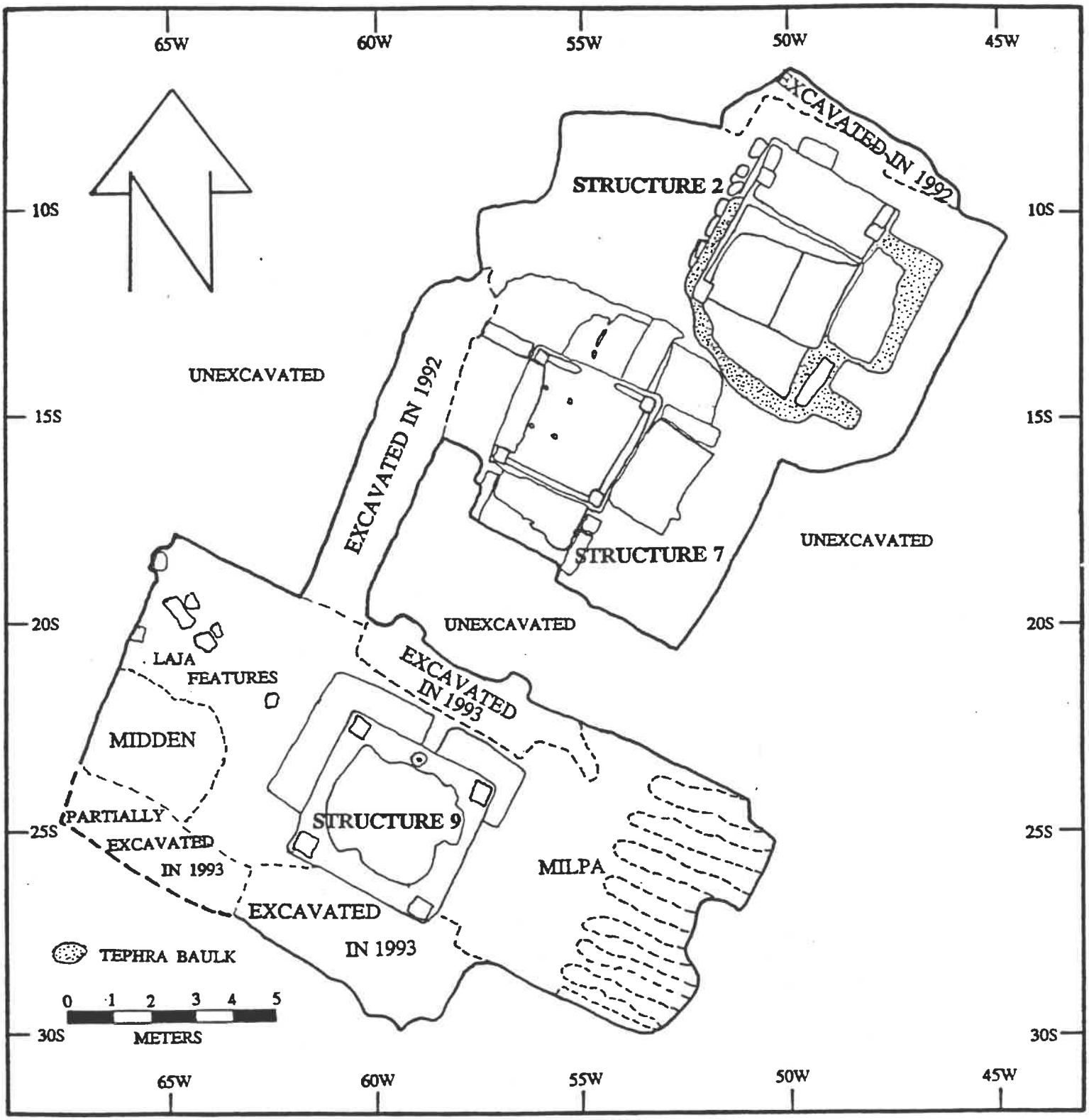
The 1993 excavations in Operation 2 at Cerén exposed new areas north and south of Structure 9 as well as continuing the study of the midden area. Archaeological investigations have been conducted in Operation 2 at Cerén since 1989 (Figure 1). Structure 2, interpreted as a domicile structure, and surrounding areas were excavated in 1989. The 1990 and 1991 excavations exposed Structure 7, a probable *bodega* (McKee 1990a), Structure 9, a probable sweat bath or *temazcal* (McKee 1990b), and surrounding areas. Excavations in 1992 were mainly to address conservation concerns, although some research goals were completed as well (McKee 1992).

The 1993 excavations in Operation 2 at Cerén were also primarily conducted to address conservation issues. The excavations were concentrated in the southern portion of Operation 2, near Structure 9. The majority of the effort was put into rearrangement of roofing and the removal of volcanic deposits near Structure 9 in order to limit the infiltration of ground water into the structure, and thereby reduce problems with salts and biological growth. These excavations did help to improve our understanding of the function of Structure 9 and surrounding areas, as well as accomplishing their primary goal. Limited excavations were continued in the midden area this season as well, in order to better understand discard processes at the site.

Methods

The field methodology of the 1993 season was similar to that utilized during previous excavations (McKee 1989, 1990a,b, 1992). All excavations were by hand, using picks, shovels, and *azadones* in upper levels, and smaller tools when near to structures or other potentially fragile cultural deposits. Excavators utilized the natural stratigraphy, as described by Miller (1989, 1990) to control their digging. All sediments below roofing thatch, where encountered, and all sediments below the top of Unit 1 elsewhere, were passed through 1/8 inch hardware cloth to ensure more complete artifact recovery. All materials excavated from the midden were also screened. Even with careful excavation using trowels, many materials can be missed, and screening ensures a more complete and representative sample of the materials present, without regard to the skill of the excavator. All cultural materials found *in situ* were mapped in three dimensions using the grid established by Tucker (1989), and the stratigraphic positions and associations of all materials were recorded. The locations of materials recovered in the screens were recorded to the nearest square meter.

FIGURE 1. PLAN OF OPERATION 2 INDICATING STRUCTURE LOCATIONS AND AREAS EXCAVATED SINCE 1991.



Flotation and pollen samples were collected from the northeast corner of each square meter excavated (Table 1). The collection methods were devised in consultation with David Lentz. Sediments were scraped to within less than 0.5 cm. of the pre-Loma Caldera ground surface, and then the final few millimeters above and including the surface were scraped with a clean trowel for collection as samples. A 100-200 ml. sample was collected for pollen analysis, and a 1 liter sample was collected for flotation from each square meter. The pollen samples were stored in sealed paper bags and allowed to dry, and the flotation samples were stored in cloth bags until processed. In the midden, a 100-200 ml. pollen sample and a 2 liter flotation sample was collected from the northeast corner of the grid unit at the beginning of the excavation of each level.

Flotation was conducted with the help of Carleen Sanchez, Pedro Ismael Giron, Evelin Sanchez and Salvador Rojas. The samples were poured into plastic tubs filled with clean water, and floating materials were skimmed off using a USDA #40 mesh screen. The sediments were gently agitated and the procedure was repeated until no further floating materials were encountered. The water was then poured through the screen until the sediments that had sunk to the bottom were encountered. Clean water was then added to the tub and the procedure was repeated. The heavy fraction was then poured into a 1/16" mesh screen and washed with clear water. Analysis of the floated fraction will be conducted by David Lentz, and the author will analyze the heavy fraction. Preliminary examinations have encountered small fragments of ceramics, bone, obsidian, and paint within the heavy fraction. The designations and locations of pollen samples are shown in Table 1.

Excavations in the midden utilized methods described by McKee (1992). The excavations were in 1 x 1 m. pits, in arbitrary 5 cm. levels, parallel to the pre-eruption ground surface. In cases where sediment distribution could be clearly defined, the different types of sediments were screened separately, and the origin of materials was recorded. Maps of sediment distribution and artifact locations were drawn at the base of each level. Field notes were recorded by the excavator at the base of each level, and my notes were supplemental. At the termination of each unit, a profile was drawn of each of the four walls. The excavators in the midden included Moises Arturo Guevara, Pedro Ismael Giron, and Evelin Guadelupe Sanchez. The quality of data recovery was excellent, and the continued training of locals in field methods should aid El Salvador in developing its own archaeology program.

Excavations Around Structure 9

Structure 9 was initially excavated in 1990 and 1991 (McKee 1990). The excavations ended approximately 20-30 cm. north of the structure due to the presence of roofing support posts in this area, and did not uncover the south wall, although the extent of the roof and cornice were known. The excavations did not show the extent of the roofing thatch or of the drip line in either of these areas and left the structure in contact with high baulks of volcanic deposits.

This situation has created conservation problems; water has infiltrated into the structure from the buried south side and underneath the structure, and has evaporated on the

TABLE 1. FLOTATION AND POLLEN SAMPLES COLLECTED IN OPERATION 2 IN 1993.

295-2	Location	295-2	Location
700	23S, 55W	760	23S, 67W, L.9
701	22S, 55W	764	26S, 62W
702	22S, 56W	765	26S, 62W
703	22S, 57W	768	21S, 59W
706	23S, 64W, L14	769	21S, 58W
707	21S, 56W, TBJ	770	22S, 58W
712	23S, 64W, L15	771	23S, 67W, L10
720	23S, 64W, L16	773	23S, 67W, L11
725	23S, 64W, L17	778	23S, 76W, L12
726	23S, 64W, L18	783	23S, 67W, L13
731	23S, 64W, L18	785	23S, 67W, L14
734	23S, 64W, L19	789	23S, 67W, L15
739	23S, 64W, L20	792	23S, 67W, L16
742	23S, 64W, L21	807	23S, 67W, L17
749	23S, 64W, L22	813	27S, 58W
752	23S, 64W, L23	814	28S, 58W
754	20S, 60W	819	27S, 60W
755	20S, 59W		
756	23S, 64W, L24		
759	23S, 64W, L25		

exposed sides, creating problems with salts and biological growth. The proximity of the baulk on the north side has led to similar problems. The 1993 excavations around Structure 9 had both conservation and research goals. We hoped to reduce the infiltration of water and allow evaporation to occur from the ground surface north and south of the structure by isolating it from surrounding sediments. This should reduce the growth of salts and fungi. The wide areas exposed in Operation 1 have led to decreased problems with salts and biological growth. The research goals relevant to the excavations will be outlined in the discussion of excavations in each of the areas.

Excavations North of Structure 9

The research goals in this area were to determine the extent of the roofing thatch and the drip line, to examine the nature of the drainage from the structure, to record the entrance

in more detail, and to explore the area north of the structure to determine the nature of the ground surface and materials lying on that surface.

Investigations north of Structure 9 were conducted between 23 June and 27 July, 1993. The first procedures involved the removal of concrete-based posts northeast and northwest of the structure and the substitution of longer posts, originally used as roofing beams. Provisional posts were put in place, and a ca. 1 x 1 m. pit was excavated at the location of the new post to the level of the TBJ ground surface. All cultural materials were mapped in three dimensions in these areas, and materials were screened as described above. A 40 x 40 cm. hole was then excavated into the TBJ to a depth of 60 cm. below the pre-Loma Caldera ground surface. The new post was then set in place and plumbed, and concrete was poured to form a base. After the posts were set and the concrete dried, the remaining sediments were removed to leave a final baulk approximately 1.5 meters north of Structure 9 (Figure 2).

The excavations indicated that the thatch roofing of Structure 9 barely extended past the limit of the 1990/91 excavations. The thatch had been pushed southward by the force of the eruption against the north wall of the structure. The drip-line was well-defined across most of the north side of the structure, although it was less clear at the corners. The drip line was 25 to 40 cm. away from the edge of the platform across the north side, but some minor irregularities were present.

The 1993 excavations also provided some indications regarding the drainage from the structure. The entrance was carefully mapped, and elevations were recorded in this area to the nearest millimeter. There was a gentle slope from the interior of the structure towards the entrance. There was, however, a small area where water would have puddled about 20-30 cm. south of the entrance. The water would have been only 1-2 cm. deep in this area. The clearest evidence for drainage was that the bench at the northwest corner of the entrance has been undercut. An erosional channel 5-8 cm. wide is present in this area, and it appears to have been caused by water flowing out of the structure. After leaving the structure, water would have flowed at a low angle to the west. No well-defined channel is present outside the structure.

The ground surface north of the structure is interesting in several respects. Compaction is fairly low to the north of the drip-line, and the artifact density is very low in this area. Only 3 seeds (cast in plaster) and seven small sherds were recovered from the approximately 8 square meters of excavation (Table 2). The area was kept clear of debris, possibly for use as a walkway, but compaction is much less than in areas identified as walkways in other parts of the site.

Excavations north of Structure 9 helped us to better understand the use of this structure and of the surrounding areas. They should also improve the situation regarding conservation, particularly relating to problems with the infiltration of water, the growth of fungi, and the growth of salts.

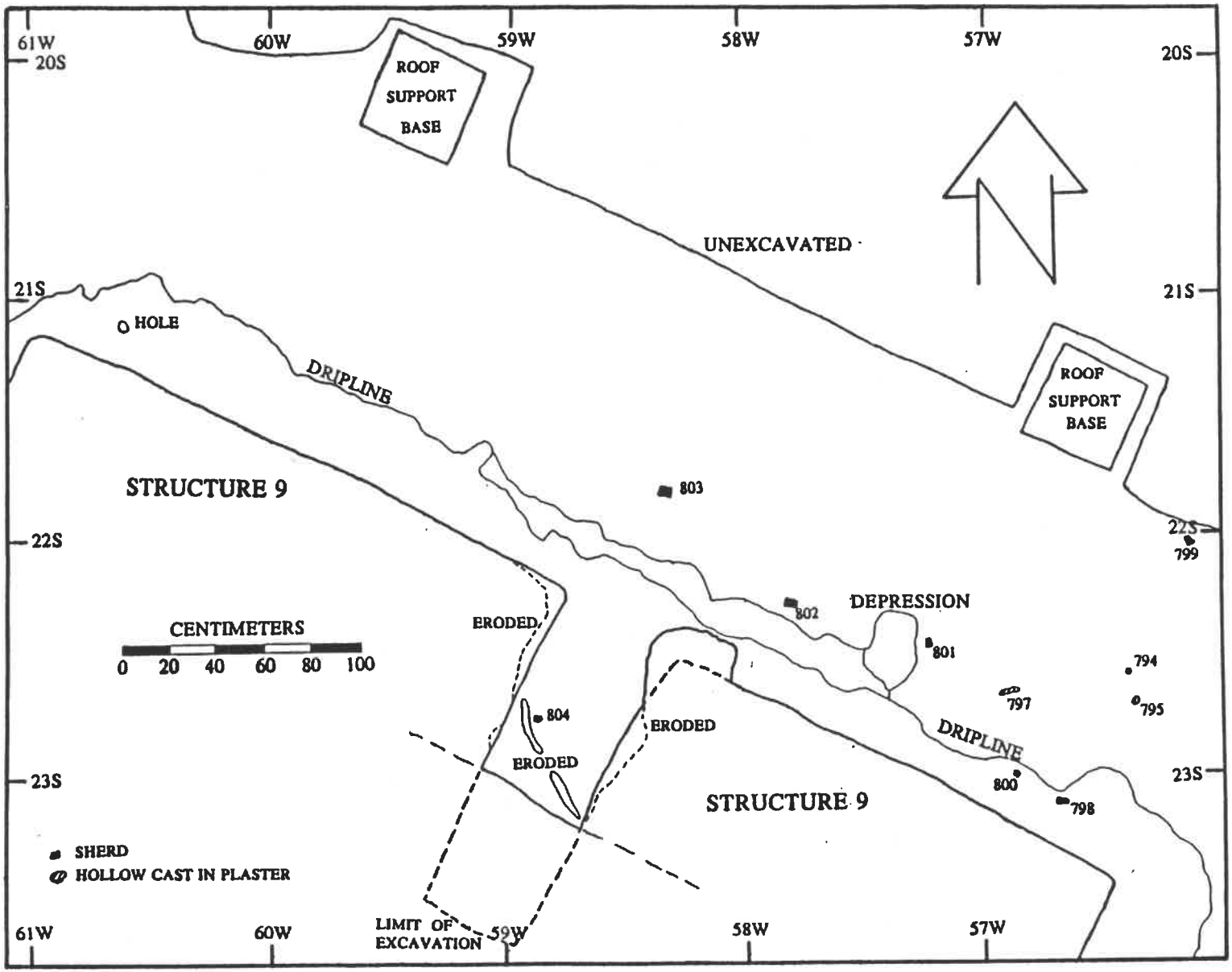


FIGURE 2. 1993 EXCAVATIONS NORTH OF STRUCTURE 9.

TABLE 2. ARTIFACTS NORTH OF STRUCTURE 9

295-2-	Description	Location
704	Sherd	21.48S, 56.50W
705	Sherd Lot (2)	21.65S, 57.33W
709	Carbonized Plant Remain	21.51S, 56.53W
710	Sherds (from TBJ)	21.51S, 56.53W
748	Sherds (from pre-TBJ clay)	21.51S, 56.53W
761	Sherds (from TBJ)	20.12S, 59.25W
794	Plant part (Plaster Cast)	22.57S, 56.39W
795	Plant part (Plaster Cast)	22.70S, 56.36W
796	Plant part (Plaster Cast)	23.13S, 56.37W
797	Plant part (Plaster Cast)	22.65S, 56.88W
798	Sherd	23.12S, 56.67W
799	Sherd	22.04S, 56.13W
800	Sherd	23.00S, 56.86W
801	Sherd	22.45S, 57.23W
802	Sherd	22.27S, 57.83W
803	Sherd	21.80S, 58.32W
804	Sherd	22.75S, 58.87W
805	Obsidian Blade Fragment	20.73S, 58.50W

Excavations South of Structure 9

The research goals for excavations in this area included determining the nature of the south wall. It was not known whether or not there was an entrance along this wall (although ethnographic data indicated that if the structure is a sweat bath (*temazcal*), there should not be). We also wanted to determine the extent of the roofing thatch and the location of the drip line. Another research goal was to explore the nature of the surface south of the structure, and if possible, determine the use of this area.

The 1993 excavations south of Structure 9 began on 7 July, and continued until 31 July (Figure 3). The initial work occurred in two simultaneous stages. The roofing supports had to be removed and replaced with longer supports set in concrete. This procedure occurred in the same manner as north of Structure 9. At the same time, we began to remove the 6-7 meters of volcanic deposits in the area south of the structure. These excavations were by hand, and because of difficulty of access for the removal of sediments, it was a very labor intensive process.

The excavations were successful in isolating the structure from surrounding sediments. We have removed the majority of the sediments for a distance of approximately 2.5 meters south of the structure, and the 1.5 meters directly south of the structure have less than 50 cm. of sediments covering the pre-eruption ground surface. We were only partly successful in meeting our research goals, however. Due to time constraints, we were unable

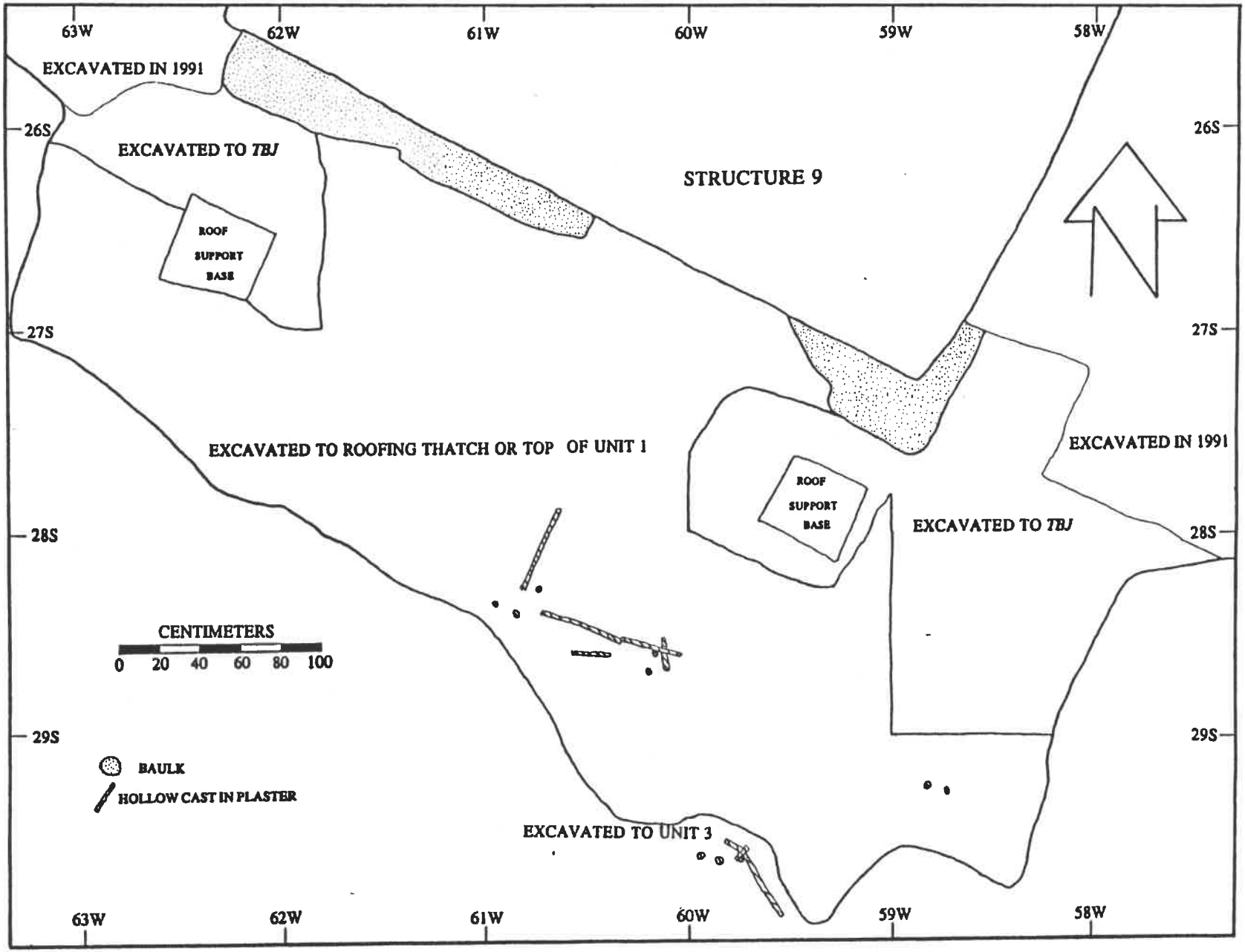


FIGURE 3. 1993 EXCAVATIONS SOUTH OF STRUCTURE 9.

to reach the pre-eruption ground surface in most of the area behind the structure, but we did uncover the majority of the southern wall. There is no entrance on the southern wall, which is inset 5-8 cm. from the edge of the platform, and a cornice extends out above the wall for a similar distance. The wall extends approximately 1.0-1.05 meters above the platform, and is about 38 cm. thick (McKee 1990), and about 3.70 meters long. Because of limitations in the excavation, we were unable to determine the full extent of the roofing thatch, but exposed areas of thatch extend 70 cm to 150 cm. south of the edge of the platform. The drip line was not defined or mapped, as we did not reach the pre-eruption ground surface in relevant areas. The less than two square meters that were excavated to the original surface were very clear of artifacts; only one sherd was encountered. The surface also exhibited very minimal compaction. Table 3 lists artifacts recovered from the area south of Structure 9.

An unusual feature was encountered just above the roofing thatch south of Structure 9. An approximately 75 x 60 x 20 cm. deposit of TBJ mixed with seeds, leaves, and clay was in contact with the roofing thatch in some areas, but separated from the thatch by about 1-2 cm. of base surge deposits in others. The function of this feature remains unknown.

Several holes were encountered about 1.5-2.5 meters south of the eastern portion of Structure 9. These holes were filled with dental plaster, and the resulting molds were partially excavated. Preliminary examination indicated that all plants were corn.

TABLE 3. ARTIFACTS SOUTH OF STRUCTURE 9

295-2-	Description	Location
733	Thatch (for dating)	27.60S, 59.45W
738	Sherds (2)	27.81S, 59.40W
745	Sherds	27.85S, 59.35W
762	Sherds (post-LC)	28.50S, 62.00W
766	Sherds	25.85S, 62.20W
767	Sherds (TBJ)	26.58S, 62.37W
810	Obsidian flake	27.85S, 59.35W
811	Carb. plant remains	27.85S, 59.35W
812	Sherds (Post-LC)	28.50S, 62.00W
815	Sherds	27.50S, 60.30W
816	Obsidian blade	27.50S, 60.30W
817	Sherd	27.50S, 60.30W
818	Carbonized *vara*	26.50S, 60.50W

Excavations in The Midden

The midden southwest of Structure 9 was first discovered in 1990 (McKee 1990). While removing volcanic deposits in this area, some unusual aspects of the topography were noted. The ground slopes steeply away from the structure to the south and west. In 4 meters of horizontal distance, there is a 1.5 meter vertical drop. The depression appears to be either the edge of a drainage or a borrow pit used to extract clay for construction. The 1993 excavations indicate that the depression continues past the edge of the present excavations. On the surface there is a dense scatter of trash. Surface materials include sherds, obsidian blade fragments, organic debris, and wood ash. Midden excavations were initiated in two 1 x 1 m test pits in 1992 (McKee 1992). These pits were located at 23-24 S, 63-65 W, and 23-24 S, 66-67 W. The 1992 excavations reached to 65 and 40 cm. below the present ground surface.

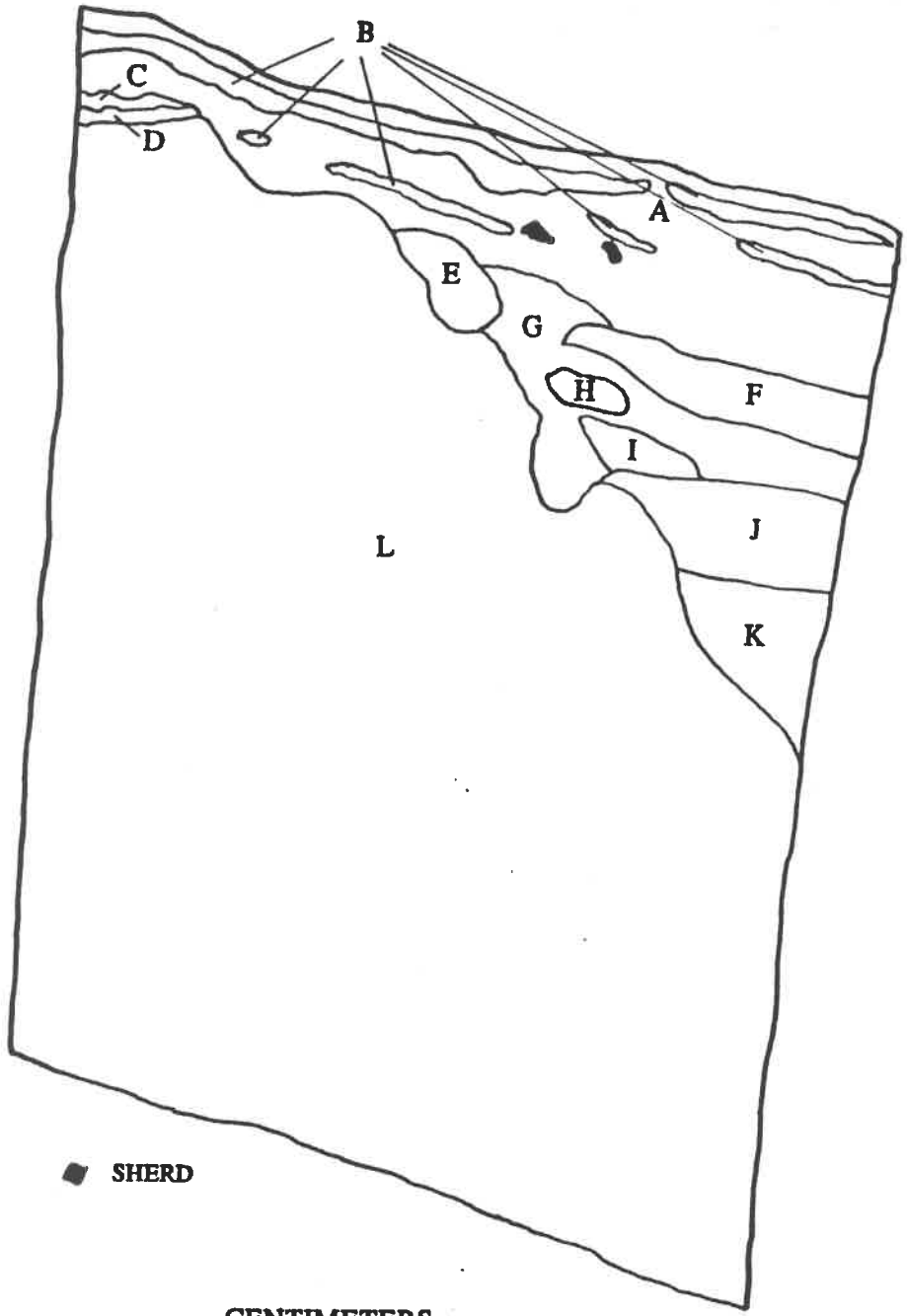
The 1993 excavations in the midden were limited to continuing in these same holes for two reasons. First, modifications to the existing roofing were necessary before excavations could be expanded to the south or west. We did not reach the pre-Loma Caldera ground surface in these areas. Second, excavations occurring to the south and west, approximately 5 meters above the heads of the excavators in the midden, rendered excavations in this area unsafe for the majority of the field season.

Nevertheless, we were able to conduct some excavations in this area. The pit at 23-24 S, 63-64 W was excavated to sterile levels. The pit was terminated at a depth of 135 cm. below the present ground surface. The final 15 to 20 cm. was sterile. The pit at 23-24S, 66-67 W was continued to a depth of 85 cm. below the pre-eruption ground surface. The artifact density was still quite high at that depth, and the termination of that unit must await future excavation seasons. Tables 4 and 5 indicate the field specimen designations of materials recovered from the midden in 1993.

After the termination of the first test pit, detailed profiles of all walls were drawn (Figure 4). The stratigraphy revealed some interesting trends. At the base of the pit, all sediments were of solid red clay. Above this clay, we encountered fill of various sorts, including TBJ, organic-rich layers, including wood ash, sandy clay, and mixtures of all of the above. The clay-rich reddish soil was sterile throughout the pit, and all cultural materials were recovered from fill above the surface of the clay. The clay surface below the fill sloped to the northwest, rather than to the southwest as the surface did at the time of the eruption. This test pit is near the edge of the depression, but may indicate some topographic irregularities predating the use of the midden.

The stratigraphy of the other test pit appears to be complicated as well. We had not yet encountered solid clay anywhere in this unit by the end of the season, but the fill seems to be a mixture of the same elements mentioned above. The artifact density was relatively low between 40 and 70 cm. below the pre-eruption ground surface, but increased in the lower levels of this year's excavations.

FIGURE 4. PROFILE OF SOUTH WALL OF EXCAVATION PIT AT 23S, 64-65W.



Stratigraphic Descriptions for Figure 4.

A. Very dark brown loam. Sand content is relatively high. Mixture of TBJ, clay, and organics
B. Black organic-rich layer. Little clay or sand is present. Primarily wood ash.
C. Light brownish-gray TBJ. Fine-grained sand sized airfall deposit.
D. Very pale brown pumice from TBJ. Lapilli up to 2 cm in diameter.
E. Rodent burrows.
F. Very dark brown sandy loam. Some charcoal is present.
G. Dark Brown Sandy Loam. Some mottling of TBJ and darker sandy material. Mixed fill.
H. Rodent Burrow.
I. Dark grayish-brown sandy loam. Similar to J, but with wood ash.
J. Dark grayish-brown sandy loam. Orangish oxidized mottles. Similar to K.
K. Dark Brown Sandy Loam. Some mottling of TBJ and darker sandy material. Mixed fill.
L. Dark reddish brown sandy clay with minimal structure. Abrupt upper contact.

The 1993 excavations in the midden at Cerén, although limited in extent, gave us our first complete profile of the cultural deposits in this area. The resulting stratigraphic profiles should improve our understanding of cultural deposition in this area. These excavations will also allow us to make preliminary quantitative comparisons of the density of materials with depth.

TABLE 4. FS DESIGNATIONS OF MATERIALS RECOVERED FROM 24S, 64W

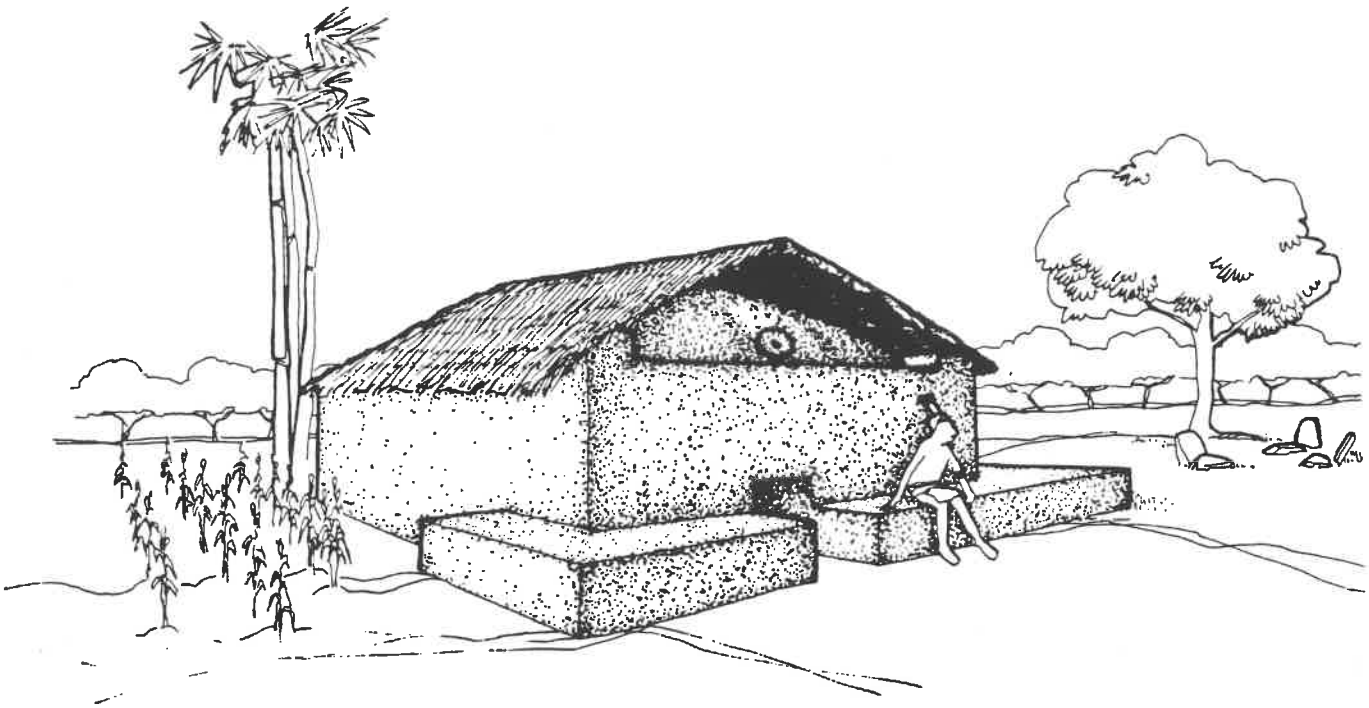
Level	Ceramics	Obsidian	Plants	Faunal
14	708	711	715	714
15	713	722	716-719,721	-
16	723	-	724	-
17	-	729	730	-
18	727,	732	-	728
19	735	736	737	-
20	740	741	-	-
21	743	-	744,746,747	-
22	750	-	751	-
23	753	756	-	-
24	758	-	-	-
25	-	-	-	-

TABLE 5. FS DESIGNATIONS OF MATERIALS RECOVERED FROM 24S, 67W

Level	Ceramics	Obsidian	Plants	Faunal
9	763	-	-	-
10	772	-	-	-
11	774	-	775-777	-
12	779	-	780-782	-
13	784	-	806	-
14	786	-	787,788	-
15	790	-	791	-
16	793	-	-	-
17	808	809	-	-

Summary and Conclusions

The 1993 excavations in Operation 2 were primarily oriented toward conservation goals. We were, however, able to answer some research questions related to Structure 9. We now know that there is no entrance along the south wall, and that the construction of this wall is similar to that used for the other walls. We were also able to excavate and record more clearly the entrance to the structure and to better understand the area north of the structure. Excavations in the midden allowed for a better understanding of the stratigraphy of the deposits, and should allow us to quantify artifact density relative to depth for a relatively limited sample. The excavations did serve to isolate Structure 9 from the surrounding sediments, and should improve problems related to conservation in the future.



Artists Conception of Structure 9. By Karen Kievit.

Chapter 7. CERAMIC ANALYSIS, JOYA DE CEREN: 1993 SEASON

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Background and Objectives

The overall objectives of the ceramic analysis program for the Cerén project continue to relate to reconstructing aspects of community organization as reflected in the ceramic material record. This is accomplished by a series of steps: 1) processing and evaluating each vessel or group of sherds as the material is excavated, assigning the objects to classification type-variety units, taking measurements and describing various attributes of each object; 2) developing structure-specific inventories of the whole and partial vessels by shape and size; 3) studying the chemical composition of the fired paste used to make each pot recovered from an in use context; 4) tabulating attributes of sherd lots to investigate patterns of discard and household maintenance.

In addition to this on-going work, during the 1993 season Postclassic ceramics that had been excavated in prior seasons in Operation 4 and Operation 7 were classified and descriptions were prepared. Although not related to the eruption-period occupation, this part of the Cerén pottery assemblage is an important resource for Salvadoran archaeology since only limited information about Postclassic sequences is available. Thus, the classification work will be useful to investigators dealing with the Postclassic period in various parts of the country.

Methods

Processing and Classification; Household Inventories

More than 20 vessels removed from Operation 5 and Operation 8 were processed and described using a standardized form developed in prior seasons. Following this, they were grouped by size and shape. Potential volume capacity was calculated for jars that could have been used for storage or transport. Information from the 1993 season was combined with data from prior work to compare inventory patterns by structure.

Ceramic Paste Composition

Preliminary groupings from the instrumental neutron activation analysis were checked against the actual vessels to search for cultural attributes that may correlate with the compositional variability. Pottery from this field season was sampled for inclusion in the INAA data base.

Discard Patterns

It was not possible to do any work on the sherds removed from the original ground surface between structures because of time limitations. It is hoped that these materials can be assessed during a future study season at the site.

Postclassic Ceramic Classification

Each lot from this time period from Operations 4 and 7 was pulled from its storage location in the Cerén storeroom at the Museo Nacional David J. Guzman. They were examined and diagnostic pieces were removed. Diagnostic sherds include all rims, handles, supports, bases, and fragments with evidence of surface decoration. Since all the sherds had been numbered they could be taken from the lot bags and sorted by attribute without fear of losing provenience information. Preliminary descriptions were prepared for the classified units. Materials were replaced in the Cerén storeroom bagged by classification units.

Results of Analyses

Processing and Classification

More than 20 vessels were processed from Operations 5 and 8. One new type/variety unit was identified.

Operation 5 Processing

A series of vessels located in the northwest part of the north room of Structure 12 were totally or partially removed; two others were examined *in situ*.

Vessels removed were FS 295-5-51: jar, Guazapa: Miltitlan, partially removed, more than half remains *in situ* in the north wall; FS 295-5-52: jar, Guazapa: Miltitlan, partially removed, may have been on top of 5-51 before the eruption, less than half remains *in situ* in the north wall; FS 295-5-53: jar, Guazapa: Miltitlan, totally removed, the neck had been covered with a woven organic object similar to a *petate* (mat) in texture, material is preserved and has been consolidated by the project conservator.

Vessels entirely *in situ* were Vessels Z and Y (FS number not assigned since the pots have not been removed). Vessel Z, a very large jar on the floor in the northwest corner, may have had an effigy on the neck since an appliqued knob can be felt on a part of the vessel that is not visible. Vessel Y is another large jar, on the floor immediately west of Vessel Z.

Operation 8 Processing

Vessels were encountered in two different areas: the west room of Structure 10 and the corridors to the north and the east of Structure 10. (See the chapter by Dr. Gerstle for details of the areas.) For the two areas combined, the total removed included 15 whole vessels, one partial horizontal section, and a base used as a lid. Some vessels from this Operation were left *in situ*; measurements and descriptions were prepared from examination in the excavation area. In the northern corridor there are two left *in situ* along with another possible one. In the western room there are two *in situ* along with possibly two others.

A few observations about the vessels from Operation 8 should be made:

-- A new type within the Guazapa Group can be established based on the complete vessel, FS 295-8-479 and another piece, FS 295-7-123, reconstructed in 1992 (see below).
-- An example of Sacazil Bichrome at Cerén was excavated from Op 8. This type had been established in 1978 based on artifacts encountered during stratigraphic excavations at the Cambio

site (Beaudry 1983:173) but is quite rare at Cerén. Sacazil is similar to the Delirio red-on-orange type of Quelepa.
-- The second example of Huatales Bichrome was found in Op 8. This ceramic unit had been established in 1989 at Ceren (Beaudry-Corbett 1989:84) based on a whole vessel excavated from Structure 6.

Classification

The new type/variety unit has been placed in the Guazapa Ceramic Group. The description follows.

GUAZAPA GROUP
Type/variety: Martir Incised-Punctate: Martir variety.
Basis for description: two whole vessels (295-7-123, 295-8-479)
Identifying attributes: 1) pattern of alternating linear incision and zoned punctation placed on neck and upper body above the maximum diameter; 2) jar form with handles; 3) probable red paint on lip and below incised and punctated area; 4) possible cream slip in incised area.
Form: jar with outflared neck, rounded or flattened lip, fairly globular walls, slightly flattened base. Two oval section handles placed below lip onto the shoulder of jar (Figure 1). Rim dia: 13, 13.5 cm; maximum dia: 21.5,22.6 cm; height: 17, 23.5 cm.
Decoration: incision alternating with punctation; paint and slip uncertain because both vessels are badly fire-altered.

Structure Inventories

In previous reports and in other presentations (Beaudry-Corbett 1990, 1992 a,b, 1993) pottery inventories have been evaluated according to households or by type of structure among households. The functions of the two structures from which the 1993 pottery assemblage has been retrieved are unclear. Consequently, this section will review the number and type of ceramic vessels among structures without classification by function. Table 1 shows the ceramic inventories for all structures. The inventory for Structure 10 is not complete since there may be additional ceramic containers under the fallen southeastern wall and in the northern extramural area where some *in situ* pots have been noted. (The in situ pots in both operations have been included in Table 1.)

Structure 10 has a higher total count of vessels than any other structure yet excavated. That is true not only in terms of the overall total number but it is true for the subgroups of jars, total utilitarian vessels, and total whole vessels. It had fewer painted serving vessels than some of the other structures and few partial vessels when the recycled partial vessels are counted separately. When the utilitarian vessels are examined by size, Structure 10 has one or more examples of each size category (Table 2). Also, Structure 10 has five jars without handles. It is hypothesized that jars without handles fulfilled a non-portable storage function since they are somewhat more difficult to transport than are containers with handles.

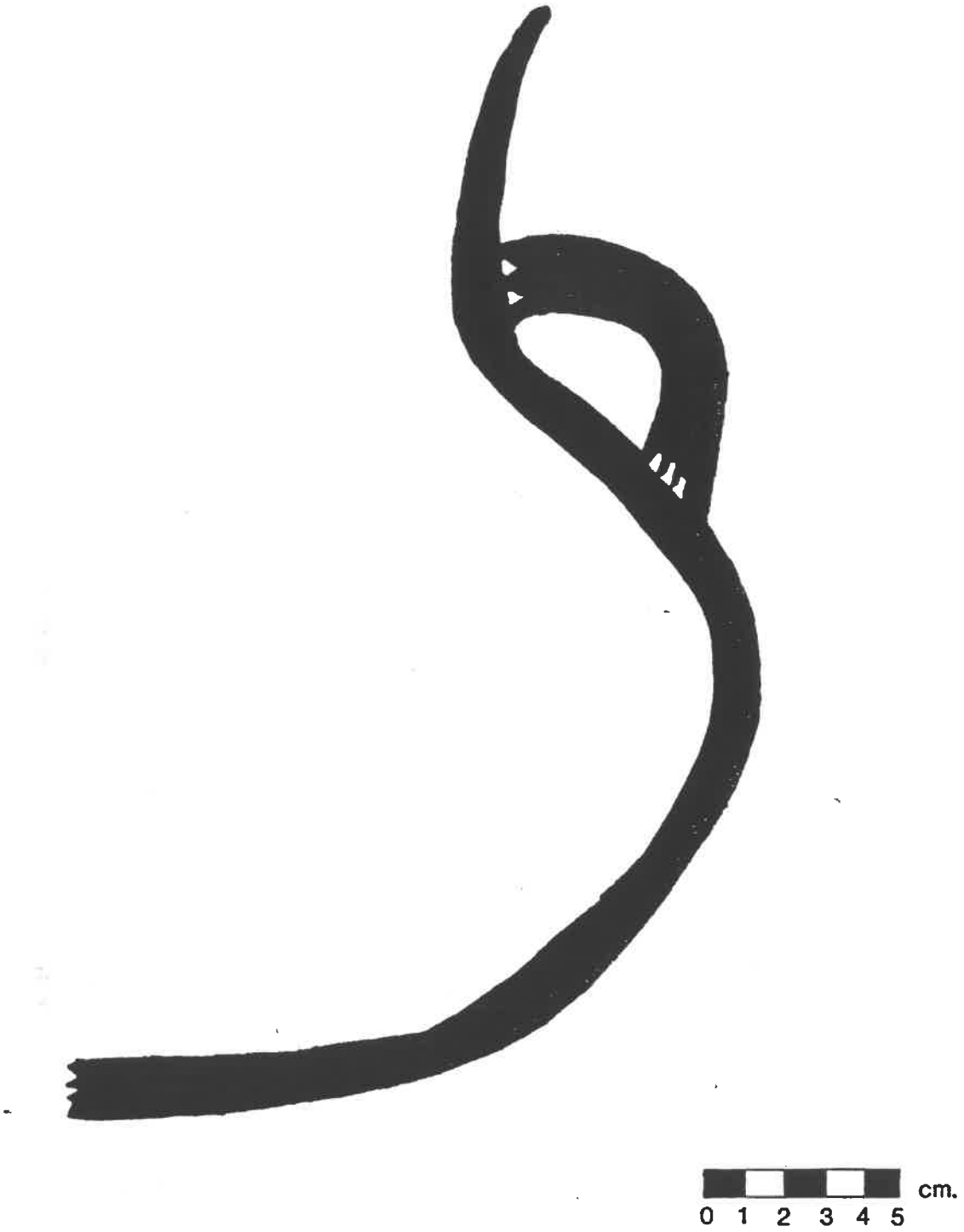


Figure 1 Martir Incised-Punctate: Martir Variety FS 295-8-479

Table 1
Ceramic Inventory by Structure

	Str. 10	Str. 12	Str 1	Str 2	Str 3	Str 4	Str 6	Str 7	Str. 11
Utilitarian Vessels	**25**	**11**	**8**	**0**	**4**	**14**	**16**	**8**	**18**
Jars	20	8	6	0	3	14	12	7	12
Bowls	5	3	0	0	1	0	4	1	6
Small bichrome painted jars	0	0	2	0	0	0	0	0	0
Painted Serving vessels	**5**	**0**	**4**	**3**	**1**	**7**	**0**	**6**	**6**
Other vessels	**0**	**1**	**1**	**1**	**0**	**1**	**2**	**7**	**2**
Incensarios	0	0	1	1	0	1	1	1	1
Miniatures	0	1	0	0	0	0	1	5	1
Slipped, incurved bowl	0	0	0	0	0	0	0	1	0
TOTAL WHOLE VESSELS	**30**	**12**	**13**	**4**	**5**	**22**	**18**	**21**	**26**
TOTAL PARTIAL VESSELS	**3**	**4**	**4**	**3**	**0**	**6**	**9**	**4**	**4**
RECYCLED POTTERY	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GRAND TOTAL	**36**	**16**	**17**	**7**	**5**	**28**	**27**	**25**	**30**

Table 2
Utilitarian Vessels By Size

	Str. 10	Str. 12	Str 1**	Str 2	Str 3	Str 4	Str 6	Str 7	Str. 11
Jars									
Necked with handles				none					
Small (< 12 cm dia)	1	0	0		0	0	1	1	0
Small-medium (12-15 cm)	*3	2	0		0	2	2	0	0
Medium (16-19 cm)	4	1	2		1	6	3	3	2
Medium-large (20-27 cm)	3	0	0		1	5	2	2	8
Large (>27 cm)	2	0	2		1	0	0	0	0
Necked without handles				none					
Small (max. dia 20 cm)	2	0	1		0	0	1	0	0
Large (max. dia 31 cm)	3	2	1		0	1	3	1	2
Bowls				none					
Small (rim dia 20 cm and less)	1	0	0		0	0	2	0	2
Large (rim dia 21 cm and more)	4	3	0		1	0	2	1	4
Jars in situ, not classified by size	2	3	0		0	0	0	0	0

* Includes the vessel with over-the-rim handle

** Two small bichrome painted jugs not included

Structure 12 has only a moderate number of vessels, no painted serving vessels, nothing distinctive in terms of the sizes of the utilitarian vessels. The pottery does not provide insights into the building's functions from the perspective of an inventory-type analysis.

A calculation was made of the potential volume capacity of jars with handles and jars without handles in the structures where these categories of vessels were recovered. Structure 3 was not included because of the uniqueness of its assemblage. The volume calculations were done using the formula given in Ericson and Stickel (1973). Where possible, volume was calculated using the actual measurements from each jar. Where the maximum diameter measurement had not been taken due to the fragmentary nature of the unreconstructed objects, an estimated volume was used for that vessel. Vessels were grouped into size categories using rim diameter measurements. For each size category, an estimated volume calculation was done using medians for rim diameters, maximum diameters, and heights.

Even though the potential volume capacity for Structure 10 containers is somewhat understated because the vessel inventory is incomplete, it still has a greater storage potential than any of the other structures evaluated. (See Table 3.) The capacity of jars with handles is equivalent to that in the kitchen,Structure 11, but Structure 10 has a much higher measured capacity from jars without handles. As with the numerical inventory data, this finding suggests that one of Structure 10's functions related to longer term or larger quantity commodity storage than that of other structures. That observation leads, in turn, to the hypothesis that Structure 10 was fulfilling a non-domestic, non-household level function, probably involving both storage and food preparation. (See Gerstle's chapter, this volume.)

The volume capacity available from jars in Structure 12 is quite low but almost half is from jars without handles. Other lines of evidence have suggested a possible shamanistic function for Structure 12. Non-portable storage containers could relate to food offerings or to commodities stored for non-provisioning use.

Ceramic Paste Analysis

A total of 177 analyses of whole or partial vessels are included in the dataset that was available before the 1993 season samples were taken. The dataset includes pottery from red paste ceramics (both utilitarian and finer textured vessels), cream paste serving vessels, and some special purpose pottery such as incensarios and a figurine fragment. At one level of analysis it is useful to work with the entire corpus within one dataset. For other analyses, however, it is better to divide the specimens according to logical groupings -- coarse versus fine paste, red versus cream paste.

During the 1993 field season only certain sections of the dendrogram containing all the analyzed cases were evaluated. The entire corpus will be the subject of a symposium paper to be presented at the American Anthropological Association meeting in November 1993 and will be covered in the next season's report.

Within the area of the dendrogram where the red paste vessels were concentrated, one chemically well-defined group emerged. It includes utilitarian vessels from the Guazapa Group

Table 3
Vessel Volume Potential (in cc)
By Structure

	Necked jars with handles	Necked jars without handles	Total, Utilitarian jars
1993 Focus			
Structure 10	360,929	66,163	427,094
Structure 12	39,469	54,936	122,513*
Other Structures			
Structure 1	151,011	26,466	177,477
Structure 4	311,095	13,233	324,428
Structure 6	148,022	43,199	191,221
Structure 7	127,936	13,233	141,169
Structure 11	357,204	26,466	383,670

* Includes capacity of 28,108 cc estimated for *in situ* vessels that cannot be classified by presence or absence of handles.

plus examples of several other types: 2 Tazula Black, 1 Sacazil Bichrome, the "caiman" jar from Structure 10, and the Op 2 figurine. The chemically similar pottery was not concentrated in one structure nor a specific area of the site. Also, this compositional group includes vessels of all forms. As noted last year, it does not appear that there were specialized producers using distinctive paste "recipes" to produce specific forms or to make pottery exclusively for certain domestic groups. There may be some correlation between shape and chemical composition but this is only very tentatively suggested at this stage of the analysis.

Cream-paste serving vessels group together but with some slight variability indicating the possibility of two clay resources. These specimens will be evaluated against an El Salvador data base and a more revealing pattern may be found. There does not appear to be a correlation between the slight chemical separation and either the design program or the level of craftsmanship. As mentioned in the 1992 report (Beaudry-Corbett 1992b:91), there are definite differences within the Cerén cream paste serving vessel corpus in use of design elements, design layout, and other stylistic attributes. This topic will be evaluated further as the compositional work continues.

A number of vessels remained clearly ungrouped, indicating the use of distinct or unique resources. These pieces include Campana polychrome, Zuluniche Painted (FS 295-1-93 with a repair plug), a Chichontepec incensario from Structure 2, various painted serving vessels, and two jars with modelled faces on the necks from Structure 12.

Postclassic Ceramic Classification

Lots were divided according to the surface treatment since with one exception the suite of inclusions is basically the same. Inclusion differences relate to grain size; clay with finer particles was used for thinner walled pots. The group of minerals (identified by C. Dan Miller) includes quartz, feldspar, ferruginous particles and mafic minerals like augite and pyroxenes. Some are the size of silt; others sand size. The exception was a group of thick body sherds with large fragments of siltstone ground before having been added to the clay. These pieces appear to be from the colonial period since they are somewhat vitrified, reflecting post-contact production technology.

The dating within the Postclassic period is tentatively determined to be Late Postclassic-Protohistoric on the basis of several lines of evidence:

1. Stronger association with Chalchuapa types from the later rather than the earlier Postclassic period.
2. The presence in a number of Cerén lots of small fragments of glazed ware, indicating a post-contact period.

The Postclassic taxa have not been classified into named groups, types, and varieties according to the standard practice in Mesoamerican systematics. A preliminary summary of descriptive units has been prepared pending additional comparison with published data and discussion with colleagues. (A copy of the Spanish-language report was left at the Guzman National Museum; a copy of this report will be circulated in the United States.)

Group I: Unslipped

There are four taxonomic units in this group. Identifying attributes for the group as a whole are:
1) orange-beige-brown-grey surface color; 2) clear fired wall; 3) unslipped; 4) wall thickness from 0.4 to 0.9 cm; 5) direct rims; 6) strap handles applied horizontally.

Type A: Polished Variety
Identifying Attributes:
1) visible polishing marks; 2) open forms.
Forms: 1) tall, recurved, open bowl with medium to thin wall, both surfaces polished; unknown if base is rounded or flattened; horizontally oriented handle, 2.5 cm below rim (Fig. 2a-c);
2) same general shape as (1) but with straight cylinder walls; one example with a horizontal handle @2 cm below lip (Fig. 2d-f);
3) same general shape as 1 and 2 but lower wall becomes thicker; this could relate to a different overall size (Fig. 2g);
4) Incurved (Fig. 2h) or shallow open bowl (Fig. 2i,j), both with direct rim;
5) Outflared rim with rounded lip, overall shape unknown (Fig. 2k).

Type A: Smoothed Variety
Identifying Attributes: As for Polished Variety but not as well finished. With a larger sample it is possible that this variety will prove to be only the extreme of variability of the Polished Variety.
Forms: Shapes 1 and 2 of Type A: Polished Variety, 3) recurved open bowl (Fig. 2l); 4) very shallow bowl; 5) small direct rims not attributable to specific shapes.
Note: Type A may be what has been classified as Muyuapa Unslipped: Muyuapa Variety from the 1978 work in the Zapotitan Valley (Beaudry 1983:175).

Type B:Rag Wiped and Roughened Variety
Identifying Attributes: 1) upper part is rag wiped with lines parallel to the rim while lower part is intentionally roughened (there can be a smoothed area between the two zones; a potential variety); 2) shallow open bowl (Fig. 2m) is the only form represented in this sample.
Note: Type B may be what has been classified in the Granadillas Group from the 1978 Zapotitan Valley work (Beaudry 1983:175).

Type C: Comal Variety (Tentative) (Fig. 2n)
Identifying Attributes: 1) thickened rim; 2) well-polished interior; 3) exterior either smoothed or roughened; 4) thin walls (0.3 - 0.7 cm); 5) vestigual handles that are not really usable.
Note: there is no talc-like finish on the cooking surface as mentioned at Chalchuapa; the pieces seem quite fragile to have been cooking griddles although the shape is clearly that of a comal.

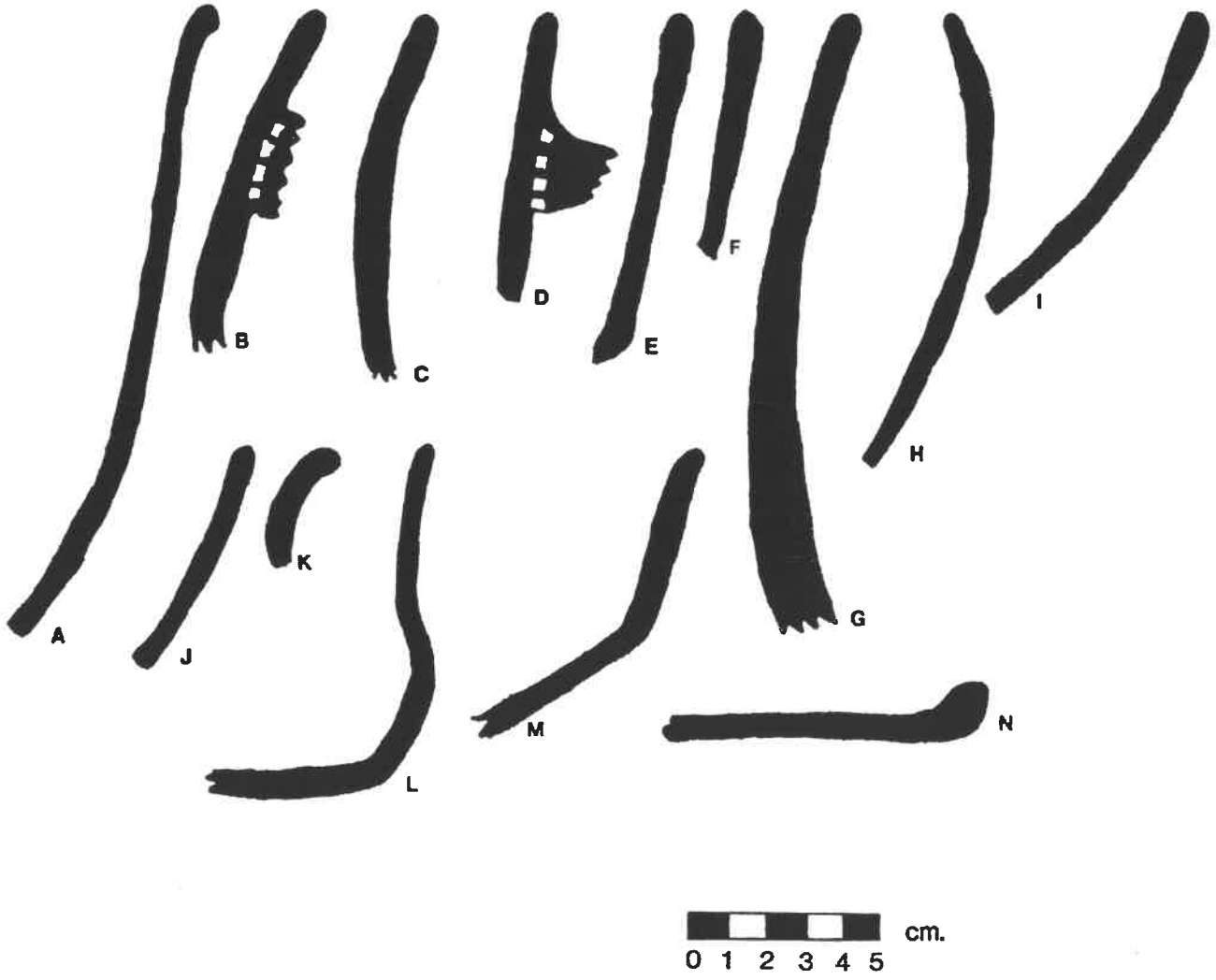


Figure 2 Postclassic ceramics of Group I.

Type A: Polished Variety: a–c Form 1, b–f Form 2, g Form 3, h–j Form 4, k Form 5.

Type A: Smoothed Variety: l Form 3.

Type B: Rag Wiped and Roughened Variety: m.

Group II: Red Painted

See individual types for identifying attributes. There are solid and hollow supports in conical and birdhead shapes for the group that are not attributable to the individual types

Type D: Rim Band Painted Variety
Identifying Attributes: 1) narrow (0.5 cm) red-painted band is the only decoration; 2) outflared wall vessels predominate.
Forms: 1) outflared wall with direct rim (Fig. 3a); 2) outflared wall with slightly everted rim (Fig. 3b,c); 3) direct rim on round sided bowl (Fig. 3d).

Type E Design Painted: Both Surfaces Decorated Variety
Identifying Attributes: 1) exterior has linear designs from lip (no rim band); 2) interior has dots in the lip area followed by bands, then linear or geometric designs.
Form: small bowl with outflared walls (Fig. 3e).
Type E Design Painted: Interior Decorated Variety
Identifying Attributes: 1) exterior carries a narrow painted band; 2) interior has a band near the rim with a linear pattern in the register; 3) surfaces are polished not slipped.
Forms: rounded or outflared wall vessels with direct or slightly everted rim (Fig. 3f-h).
Note: three body sherds from bowls have designs only on the exterior surfaces. They have not been classified into a variety because of the very low frequency.

Group III: Red monochrome

Identifying attributes: 1) one or both surfaces covered with red slip; 2) shapes are open vessels with outcurving walls; 3) walls are thin to medium thickness; 4) pigment is not specular hematite.

Group IV: Design-painted jars

Only body sherds were recovered so description is tentative. There appear to be both complex and simple linear designs on jar forms. Probably several types, certainly several varieties, are present. A larger sample is needed for meaningful classification.

Final observations about the Postclassic materials can be made:
1. The vessel shapes are very simple with unelaborated rims.
2. Handles are placed horizontally on the vessel walls rather than vertically as during the Classic period occupation.
3. Comales are present in this time period whereas they are absent in the Classic period occupation.

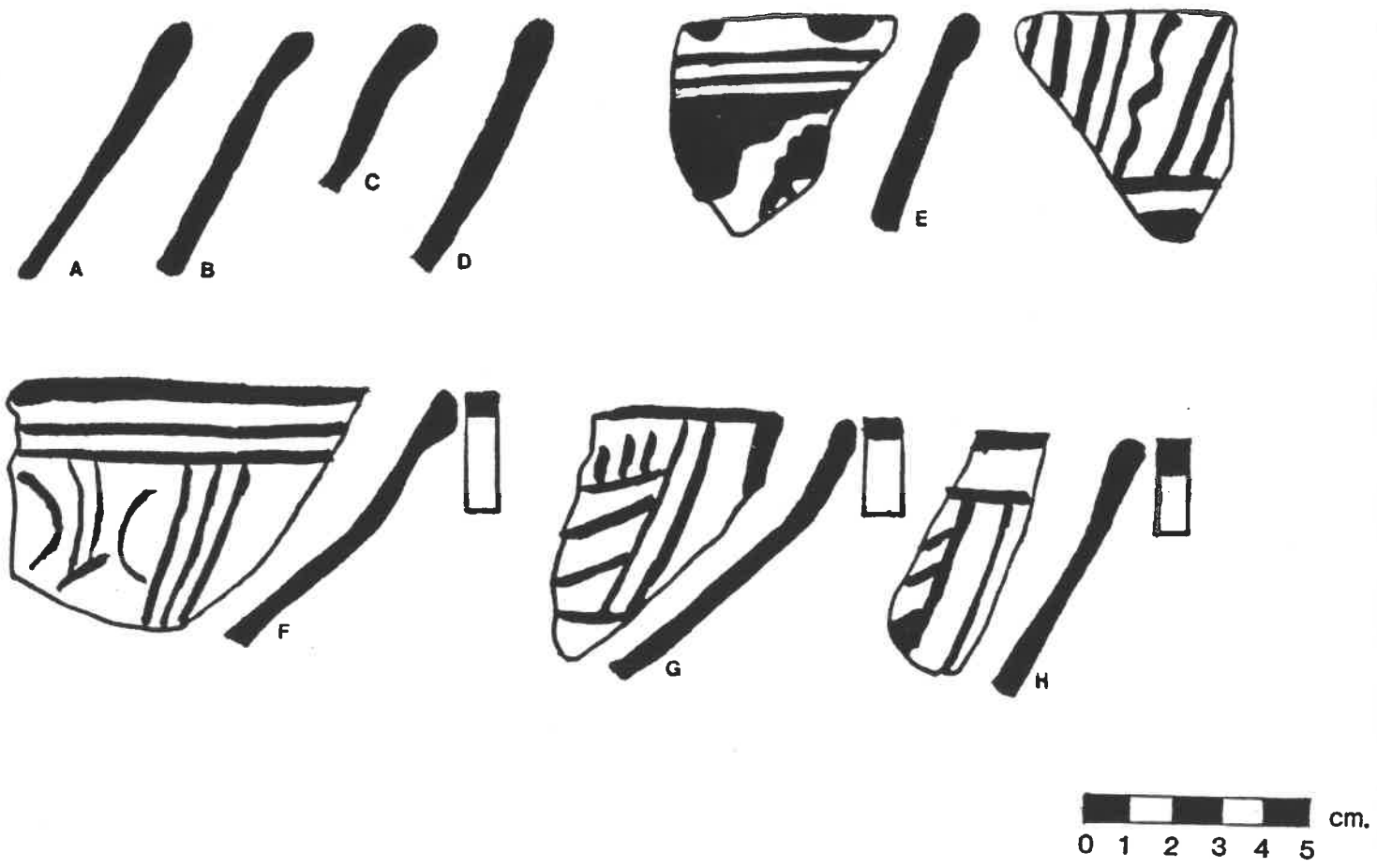


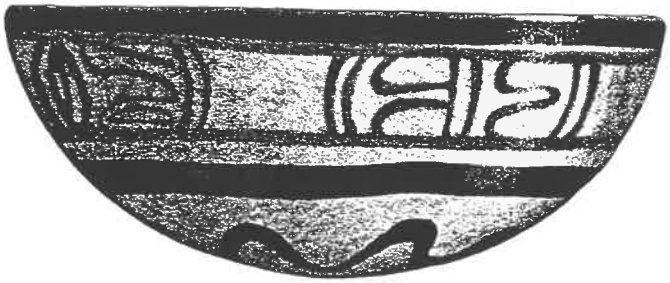
Figure 3 Postclassic ceramics of Group II.

Type D: Rim Band Painted Variety: a Form 1, b,c Form 2, d Form 3.

Type E Design Painted: Both Surfaces Decorated Variety: e.

Type E Design Painted: Interior Decorated Variety f–h.

4. The glazed pieces from contact period occupation were recovered from Operation 7 lots and not from Operation 4 lots. The particular lots containing glazed pottery within Operation 7 did not cluster in one well-defined area of the site so it is not possible to determine from these materials where contact-period settlement was located.



Ceramic Vessels.

Clockwise: 295-1-280, 295-2-388 Exterior, 295-2-280.

By Ted Fitzkee.

Chapter 8. LITHIC ARTIFACTS EXCAVATED DURING THE 1993 SEASON, CEREN, EL SALVADOR

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Introduction

The 1993 season focused on excavations in and around Structures 10 and 12, believed to be village religious buildings (see chapters by Gerstle and by Sheets and Simmons above). Frequent reference is made to the earlier partial excavations of these two structures in 1992 and 1990-91 respectively (Gerstle 1992, Sheets and Sheets 1990) in order to give the reader a more complete description of the structure's contents. In addition, a sizeable area of the patio of Household 1 was excavated, and further excavations were completed in the midden in Operation 2, and the south and north sides of Str. 9. The text of this chapter discusses the lithic artifacts, their contexts, and interpretations regarding context and function. Appendix A is a description of each artifact. I believe that the unusual circumstances of sudden burial and preservation at the Ceren site warrant individual descriptions.

Twenty nine samples of possible organic residues were taken from prismatic blades and a few macroblades in an attempt to determine the species that were being exploited by prehistoric residents of Ceren. All prismatic blades and macroblades recovered at the Ceren site are of obsidian. The blades were immersed in pure water in an ultrasonic cleaner for 5 minutes, and the 2 ml. samples of water with possible organic residues were frozen in vials prior to analysis by Margaret Newman at the University of Calgary. Results are presented elsewhere in this preliminary report.

The discussion and interpretation of artifacts in this chapter are arranged topically. The order of topics is: trash and the discarded lithics from the Operation 2 midden, lithic manufacture at the site, prismatic blade storage at Structures 10 and 12 and how that contrasts with household blade storage, other aspects of Str. 10 and 12 lithics, and the discarded lithics from the patios included in Operation 8. That is followed by a discussion of the groundstone artifacts.

Chipped Stone Artifacts

A total of eight obsidian chipped stone artifacts were excavated from the environs of Structure 9 (sweatbath) in Operation 2. Most were recovered from fine screening, and are so small that interpretations are difficult (Appendix A). Most are tiny fragments of flakes or blades. One is a flake from what appears to be a cobble percussion industry (not core-blade) which has been recorded before in the Zapotitan Valley, although rare (Sheets 1983). Another small percussion flake may be the discarded wastage from removing the platform overhang during macroblade manufacture. If correctly interpreted, this indicates some of the early stages

of core-blade technology were practiced at the Ceren site, or close nearby. There is some other evidence of core-blade technology at the site, albeit weak.

In addition, there is at least a slight indication of some core-flake manufacture at the site. One small obsidian artifact from Operation 2 (FS -741) is a flake from what appears to be a cobble percussion industry, not core-blade. A cobble industry has been recorded before in the Zapotitan Valley, although it was found to be quite rare (Sheets 1983b:208-9). A difference is that this "rural obsidian percussion flake industry" recorded before had relatively few flakes with cortex, but the Ceren flake carries cortex over most of its dorsal surface. This could merely mean the flake represents the early stage of cobble core-flake reduction, and therefore what was recorded before in the valley is similar to what may have occasionally been done with core-flake technology at Ceren. Or, the Ceren flake may be an indication of a different kind of core-flake procurement and production system that has not been recorded from the valley. A larger sample than this single flake is necessary to resolve this problem.

All of the prismatic blades found in Structures 10 and 12 were not stored in roofing thatch, in contrast to the blades in daily use stored in domestic settings. This is a striking difference between these two structures and the household contexts. In households, virtually all obsidian prismatic blades in systemic contexts, in daily use, were stored in thatch roofing. Curiously, not a single blade in either of these structures has been found to have been stored in thatch. Rather, they were all in open elevated contexts such as wall tops, column tops, rafters, or high shelves. It should be noted that it is possible that other obsidian blades may remain unexcavated, as some volcanic ash deposits were not excavated in both structures, particularly in Str. 12, to assist in supporting fragile earthen architecture.

The reason or reasons why short term storage of obsidian prismatic blades that were in daily use was so different in households versus these two structures is unknown. It is possible that the difference has considerable significance, but what that is remains unclear. It seems ingenious and logical to store obsidian blades in predictable locations in the soft roofing thatch above doorways or above porches inside households. The avoidance of this practice outside the household, in these two buildings, is puzzling. Particularly puzzling are the prismatic blades of Str. 10, as there were many and evidently they were in systemic context, in frequent use. The use wear on them ranged from virtually none to two that were quite worn. The blades evidently were a functioning assemblage of cutting implements.

Perhaps the difference in household versus Str. 10 storage has to do with the number of people using prismatic blades, and their relationships. In the household, there would have been only a few people that would have been using blades on a frequent basis, and they would have been in face-to-face contact and extended communication. Thus, they could have maintained current knowledge about where the blades were stored. Thus, they could avoid the problems that people who were less familiar with obsidian blade locus of storage would have in "fishing around" in the thatch for a knife, potentially damaging the blade or their hands. It appears probable that Str. 10 was utilized by a religious association, or at least by a number of families. Such a use would be quite different from the daily use of structures and implements within the household. The use of Str. 10 probably was very intensive during a religious observance, followed by a long period of little or no use. The people from various families using prismatic

blades probably would not maintain the detailed knowledge of just where the blades were stored in the thatch. Thus, with the more episodic use of obsidian in Str. 10, by a wider variety of people from various families, may have led to short term storage in elevated places that were visible.

Seven prismatic blades were found in Structure 10 (Operation 8) excavations in 1993. They are similar to Structure 12's obsidian in that all were placed in elevated contexts, but none was placed in roofing thatch. The blades of the two structures differ in edge condition: the blades of Structure 12 are heavily used, yet most of the blades in systemic context in Structure 10 retain very good edges. Only two of the seven had moderate to heavy use wear. The blades were stored on wall tops, column tops, or rafters along the building's east side or near the north entrance. Both these areas are concentrated activity areas where much food was stored, processed, and dispensed (see Gerstle chapter, this volume). These blades certainly seem to be a set of cutting implements used on a variety of materials.

The blades of Structure 10 suffered unusual amounts of edge damage as they fell, for two reasons. First, they were not protected by thatch as they fell, and second, they often fell immediately below, onto, or into the coarse clasts of Unit 2 instead of the fine volcanic ash of Unit 3.

A few chipped stone artifacts were excavated from Structure 10 during 1992, including a prismatic blade and macroblade of obsidian and a core-hammerstone of jasper (Gerstle 1992, Sheets 1992). The macroblade was incorporated into the floor at the north entrance, and the core-hammerstone was nearby. The prismatic blade was stored high above the doorway connecting the inner with the outer room, likely on top of the tabanco that also held the deer antler headdress. It had very visible little use wear, and might have been used in ritual situations.

The two relatively complete obsidian artifacts found in Structure 12 in 1993 were both placed atop a column at the entrance, or on a rafter, and their stratigraphic context indicates they fell early in the eruption. One is a well-worn prismatic blade and the other is an intact but very worn macroblade. In addition to these two, a worn and apparently previously-discarded blade fragment was brought into the building and placed in an elevated context. It was heavily patinated, and evidently had sustained considerable edge damage after it was discarded. The reason why someone would bring such an artifact into Str. 12 is unknown. The only other obsidian artifact from the structure was excavated previously (Sheets and Sheets 1990). It is a very worn prismatic blade that was placed atop the north wall of the building and fell during the eruption. The used condition of these three artifacts is consonant with the used condition of most other artifacts found in the building. The obsidian prismatic blades of Str. 12 have more worn edges than the blades from any other structure at the site yet excavated. The important and largely unanswered question is why most of the obsidian in Str. 12 is so edge damaged that it is unusable. Only the large macroblade appears usable, but barely, or only for harsh uses, given the extensive wear on both edges.

Nine prismatic blade segments were found in the Operation 8 patios that extend from the east edges of Structures 1 and 6 (Household 1) eastward to the north of Structures 10 and 12.

These three patios were associated with the household and these two ritual structures, respectively. These prismatic blades quite clearly were discarded; they generally measure between 1.5 and 3 cm in length, which is too short to be effectively used for cutting if the blade was hand-held. The edges are used, with use wear ranging from fairly light to quite heavy. However, the most pronounced edge damage of most of these blade segments apparently occurred after they were discarded, and probably occurred by trampling, patio compaction, or other activities. Some of these blades are quite patinated, perhaps from prolonged surface exposure, salt deposition by groundwater, and sun-baking. Given the large size of the three patios, it is notable that relatively few discarded obsidian prismatic blade fragments were found on that surface. It appears probable that efforts were made not to discard obsidian artifacts in the patio areas. Care in disposal of sharp chipped stone materials is well known ethnoarchaeologically (Torrence 1986).

Groundstone Artifacts

Two groundstone artifacts were found in Structure 12 in 1993. In the north room was a greenstone disk that was slightly shaped. It may have been a blank that could have been shaped into a pendant or other artifact, but was not. A large mano was found east of the building, at the base of the Unit 4 tephra, probably dislodged from an elevated position by the fall of lava bombs. It probably was on top of Column 8. It is the largest of the three manos recovered from the building. The two manos found in 1990 (Sheets and Sheets 1990) were smaller, and both also came from the east side of the structure. None of these manos match the metate found inverted in the building in 1990, indicating that the reason the manos and metate were in the building was not for maize griding, but more likely as a payment. The only other groundstone artifact from the building, found in 1990, came from the north room. It is a trough metate that was largely upside down, and leaning against a wall.

A well-shaped greenstone celt was found in Structure 10, immediately inside the eastern wall and adjacent to the central column. It was stored in an elevated context, likely on a rafter. It had been sharpened shortly before the eruption on a whetstone. As with the other celts discovered at the site to date, it showed no definitive evidence of having been hafted. It appears that small celts were held in the hand and used more than archaeologists had thought.

A Postclassic metate fragment was found during the removal of the tephra block between Structures 10 and 12. It was found above the uppermost unit of the Loma Caldera tephra, and below the tephra from El Playon (AD 1658).

Appendix A: Artifact Descriptions

Note: All measurements are given in the sequence of length, width, and thickness, followed by weight. Provenience information is provided for the artifacts clearly placed in structures or with important associations. Specific provenience information for discarded pieces of obsidian is available from the FS lists. The chipped stone artifacts below are followed by a section on groundstone artifacts.

Chipped Stone

Operation 2

295-2-711

This is such a small obsidian flake that it is difficult to interpret. It measures only 1.1 x .7 x .1 cm, and weighs almost .1 g. One edge has a regular series of flakes removed, but for what purpose is unknown. It is not known if it is a part of core-blade technology, part of a resharpening flake, or other technology.

295-2-722

This miniscule flake, .6 x .4 x .1 cm, and less than .05 g, could be the result of about any kind of lithic activity.

295-2-727

In level 7 of the trash excavations near Structure 9 was a tiny fragment of what was a very small prismatic blade. The fragment, from near the distal end, measures only 1.2 x .6 x .2 cm, and weighs almost 0.1 g. No use wear was detected on either edge. A large (2mm.) nick is missing from one side, probably the result of post-abandonment treatment.

295-2-736

This very tiny fragment of obsidian, measuring .7 x .4 x .3 cm, and weighing only .05 gram, is so small that it is difficult to determine how it relates to obsidian manufacture, use, and discard at the site. It may be percussion shatter, but from what activity remains unknown.

295-2-741

This tiny percussion flake from the trash in Operation 2 (23-24S, 64-65 W), measures only 1.8 x .9 x .4 cm, and weighs .5 g. It is a small percussion flake from a small cobble of obsidian. Virtually the entire dorsal surface is perlitic cortex. This is not a flake having anything to do with core-blade technology. Rather, it was collected as a small cobble, and percussion severed. This has occasionally been recorded in the Zapotitan Valley (Sheets 1983: 208-9) but not previously at the Ceren site. The location of the source, access, processing, and distribution of this obsidian is completely unknown.

295-2-756

Level 23 in the basurero excavations divulged a very tiny flake measuring .9 x .3 x .1 cm, and weighing almost .05 g. It is not known how it relates to obsidian processing and use at the site, as it could have derived from a wide range of activities.

295-2-805

On the original ground surface, just under Unit 1, was a small medial segment of an obsidian prismatic blade measuring 1.5 x 1.4 x .3 cm, and weighing .8 g. Both edges exhibit light use wear and moderate post-discard edge damage.

295-2-809

In level 9 of the trash deposit near Structure 9 was a tiny fragment of shatter from some kind of percussion flaking. It is not a bifacial thinning flake. It probably is a result of core-blade technology. It measures 1.6 x .9 x .5 cm, and weighs .3 g.

295-2-810

This tiny percussion flake was found on the TBJ surface southeast of Structure 9. It measures 1.8 x 1.2 x .2 cm, and weighs .2 g. It probably was removed during the percussion blows that remove the platform overhang during macroblade manufacture. Its presence, if correctly identified, indicates at least some percussion blade manufacture at the Ceren site.

295-2-816

A medial section of a prismatic blade measuring 2.4 x 1 x .2 cm was found on the TBJ near Structure 9. The edges show slight use-wear and some large nicking, probably caused by post-abandonment stresses.

Operation 5

295-5-38

In the excavations of tephra from within the doorway of Structure 12 a prismatic blade medial segment was found. It was stored elevated, perhaps on a column top or a rafter, but not in thatch. It measures 3.2 x 2.0 x .3 cm, and weighs 2.4 g. One edge was damaged post-abandonment with laterally-snapped portions of the edge missing. The other edge has use wear in the form of microflakes and edge abrasion. The abrasion is pronounced, with up to 1 mm of contiguous abraded surface. This blade was heavily used before being placed high by the entrance.

295-5-41

Near the abovementioned prismatic blade was a large macroblade measuring 20.2 x 6.0 x 2.5 cm., with a 3.0 x .9 cm. platform (unstriated, percussion flakes removed overhang), and weighing 190.1 g. The blade was manufactured with a harsh percussion blow, as evidenced by the pronounced Hertzian cone that covers 1 cm. of the bulb. The hard hammer contact was only 2mm in diameter. This was stored in elevated context, but not in thatch, on top of the column or perhaps on a rafter at the entrance. There is a large (10.2 x 2.4 cm.) patch of cortex at the distal end of the dorsal surface; the flat and micro-bubbly kind of cortex matches the common

cortex type at Ixtepeque. The cortex indicates that this blade was one of the first removed from a sizeable core. The cortex intersection with the ventral fracture left an edge that was not particularly sharp, but it was used almost as much as other edges. The blade was used quite a lot, and apparently has some organic staining at the distal end; some flakes have been removed after the incrustation was emplaced, but it is not clear if they are resharpening or use-wear flakes. The blade has resharpening flakes removed along both edges, with strong use wear along other parts of the edges. Some of the use was harsh enough to leave step and hinge fractures.

295-5-46

Although this proximal fragment of a prismatic blade looks more like discarded blades at the site, it was placed in elevated storage in the north room of Structure 12, and was found in the upper portion of Unit 1 tephra. It could have been on a walltop or on a rafter. It measures 3.9 x 1.6 x .4 cm., with a moderately striated platform of .9 x .3 cm with scraping overhang removal, weighing 2.8 g. Both edges have quite large flakes removed that look like post-abandonment damage. Other than these large flakes, both edges retain evidence of moderate use-wear. The piece appears patinated all over, like many found abandoned in the agricultural zones of the site. This certainly looks like a piece of discarded obsidian that was picked up from a milpa or garden, brought to the building, and left in an elevated context in the north room.

Operation 8

Note: Operation 8 encompassed excavations of the patio of Household 1 (east of Strs. 1 and 6), the patios north of Strs. 10 and 12, and the area between those two structures.

As an assist to readers, an interpretation of the context of each Op 8 artifact is presented in parentheses. This is to distinguish the discarded archaeological contexts of prismatic blades from the areas around buildings from the blades in stored systemic contexts from within Str. 10.

295-8-177 (in Str. 10)

This obsidian blade probably was stored together with the one described below (#178). They were stored in an elevated context on the north side of Structure 10, likely on a rafter, walltop, or edge of the tabanco. This was not stored in roofing thatch. It measures 6.3 x 1.9 x .3cm., and weighs 5.2 g. Both edges suffered in the fall and subsequent burial in the coarse clasts of Unit 2. One edge sufered more, and much of it is damaged beyond recognizing previous use wear. What does survive is a delicate microflaking, with 6 to 9 microflakes per millimeter, probably caused by fine use. The microflakes are more pronounced onto the dorsal surface. Some organic residues were found, in dull matte patches, primarily on the dorsal surface. Two small zones in the middle of the ventral surface of the blade have a series of faint parallel scratches running perpendicular to the blade axis.

295-8-178 (in Str. 10)

This obsidian blade was stored high on the north side of Structure 10, perhaps on a rafter or wall top, and fell at the end of Unit 1's arrival at the structure. It measures 5.9 x 1.2 x .2 cm., weighs 2.5 g., and has a platform size of .6 x .3 cm. The platform is moderately striated, and the overhang removed by the rapid scraping technique. The blade is long enough to be conveniently held by hand and used, but one edge is badly damaged by deep nicks and gouges. That damage almost certainly occurred with the fall of the coarse Unit 2 tephra; blades that were stored in thatch roofs, and fell with the thatch, suffered little or no damage to their edges. The other edge is generally well preserved, with the exception of an occasional deep gouge, probably caused by the fall of Unit 2. Along much of the better-preserved edge are a uniform series of fine flakes, largely from the dorsal surface, that measure 1/2 to a mm. in size. No organic incrustations were found.

295-8-191 (discarded)

This is a tiny fragment of an obsidian prismatic blade, .6 x .5 x .3 cm. It is a tiny wedge from an edge, the dorsal and ventral surfaces intersect in a section of edge that only extends for 3mm. It appears to have been trampled, as edge damage is pronounced on that edge as well as along other edges and surfaces.

295-8-227 (discarded)

A tiny prismatic blade segment broken from a larger blade. It measures only 1.6 x .7. x .2 cm., and weighs .2 g. All edges have been damaged by trampling.

295-8-245 (discarded)

This is an important artifact, as it probably indicates a local attempt to manufacture prismatic blades. It came from the tbj surface at 2-3N, 2-3E, and measures 2.9 x 1.8 x .4 cm., with a 3 x 1 mm. platform, and weighs 1.5 g. The platform was scraped to remove the overhang, and was very lightly striated. This is a proximal segment, and was hinge fractured less than 3 cm. from the platform. Part of the error may have been selecting a platform that was much too small. Finding the wastage from an attempt at core-blade manufacture probably is a reliable indicator of local manufacture.

295-8-250 (discarded)

As a short and abraded small medial segment of a prismatic blade, this was discarded. It measures 3.0 x 1.0 x .2 cm., and weighs .6 g. It was found at 0-1S, 3-4E. There is much edge damage along both edges, most of which seems to have occurred after it was discarded. There is some use wear in the form of microflakes from 1/2 to 2 mm. in size.

295-8-302 (discarded)

This small fragment of a chert flake measures 1.9 x 1.0 x .5 cm. weighing 1.3 g., from 0-1N, 3-4 E. It is of moderate quality chert. One edge was probably utilized, as there are a series of fairly regular feather-edge flakes removed, measuring between 1 and 2 mm. Some fine abrasion was detected along the intersections of those microflake scars.

295-8-370 (discarded)

This is a discarded prismatic blade segment, from the baulk between the 1978 and 1993 excavations. It measures 2.8 x 1.3 x .2 cm., weighs 1.0 g., and is from the medial portion of a blade. Both edges are abraded and nicked, some of which probably is use wear and some is from post-abandonment trampling. One edge has partially-completed fractures in the edge that run parallel to the edge, and perpendicular to the ventral and dorsal surfaces, and the other edge has one such fracture. These probably represent trampling. The entire piece was patinated to a matte gray-white color.

295-8-450 (in Str. 10)

This prismatic blade segment was found at Structure 10, just outside the front step, with a little Unit 1 tephra below it. It probably was stored on a rafter or on top of the bajareque wall just above and west of the step. It is the proximal and medial portion of a small prismatic blade measuring 5.1 x 1.2 x .3 cm., with a lightly striated platform measuring .8 x .2 cm., and weighing 2.0 g. The complete blade would have weighed less than 3 g. The edges are pristine, with no detected evidence of use or of damage when it fell and became encased in volcanic ash. It was surrounded by the fine-grained Unit 1 ash, facilitating good preservation. No organic residues were detected.

295-8-451 (in Str. 10)

Just north of the above-described blade was a distal segment with a different history. It measures 7.3 x 1.5 x .4 cm., and weighs 4.5 g. It was stored high, perhaps on the walltop between the central and northeast column of Structure 10 or perhaps on a rafter. It measures 7.3 x 1.5 x .4 cm., and weighs 4.5 g. It has an organic incrustation at the distal end, for 2 cm on one side and about 1.5 cm. on the other. Each edge has some damage from fall and compression, as it became incorporated in the wall as it fell during the surges of Unit 1. Both edges are virtually identical, with moderate to heavy use wear, especially at the distal end. The use wear is composed of a series of small flakes, with 1-3 flakes per mm. The use wear is lighter at the medial portion (proximal), with 3-6 microflakes per mm., probably because the blade was held from this end.

295-8-458 (discarded)

This medial segment was found in Structure 10, and measures 2.3 x 1.1 x .2 cm., and weighs .8 g. It has pristine edges, with only the faintest of microflakes removed, with 12 up to 16 flakes per mm.

295-8-499 (in Str. 10)

This proximal segment of a prismatic blade was found in Unit 1 tephra, not stored in the thatch (unlike most blades at the site but like the others at Structure 10). It measures 9.4 x 1.5 x .4 cm., with a lightly striated platform of .6 x .3 cm., scraping overhang removal, and weighs 5.8 g. It is almost in pristine condition, except for three nicks in the edges that probably came from the fall or compression afterward. It came from the east side of Structure 10. There is use wear on both edges, but it is negligible, and along some portions of both edges it was not detected.

295-8-531 (discarded or lost, perhaps from blade breaking)

Screening recovered this tiny prismatic blade fragment from the eastern edge of the raised floor on the east side of Structure 10. It measures 1.2 x .6 x .3 cm., and weighs .2 g. The single edge of the original prismatic blade that is preserved is in excellent condition; it appears almost unused. What happened to the rest of the blade is unknown. Some time prior to the eruption, a relatively new blade was broken, and this tiny portion remains as evidence.

295-8-587 (discarded)

A proximal fragment of a prismatic blade was found on the TBJ surface. It measures 1.7 x 1.4 x .5 cm., and weighs 1.0 g. The platform is moderately striated, with the common scraping removal of the overhang. It measures .7 x .3 cm. The intact edges, of which there are only a few short segments, show moderate use wear in the form of microflakes removed. Most of both edges have been severely damaged after discard.

295-8-600 (discarded)

Resting on the TBJ surface was a medial segment of an obsidian prismatic blade, 2.7 x 1.4 x .3 cm., 1.6 g. It is "waisted" in the sense that two opposing notches have been pressure flaked into the sides, one on the ventral surface and one on the dorsal. The rest of both edges were moderately flaked with a series of small flake removals, some of which may have been detached by use, but the majority of which appear to have been removed by deliberate retouching.

295-8-624 and -625 (in Str. 10)

Two prismatic blade segments were found 50 cm. apart, resting on the fallen bajareque wall connecting the central with the southern column on the east side of Structure 10. The blade segments fit, and apparently broke during their fall. They fell immediately after the wall collapsed, and just before the Unit 2 tephra was emplaced. They were not in thatch, but probably were stored on top of that wall or on a rafter above the wall. The proximal segment, designated -624, measures 6 cm. in length, and the medial segment measures 3.1 cm in length. Hereafter, the two are described as a single artifact, measuring 9.1 x 1.5 x .4 cm., weighing 5.5 g. The platform is rather heavily striated, with only slight platform overhang removal. The platform measures .9 x .4 cm. Both edges were heavily used, with large flakes along side step and hinge fractures, and some abrasion. Dorsal and ventral surfaces have an intermittent incrustation that may be an organic residue.

Groundstone Artifacts

295-5-39

A greenstone rock was found in the entrance of the north room of Structure 12, measuring 3.3 x 3.0 x 1.0 cm., and weighing 13.5 g. It is discoidal shape, and shows some rounding of the edges. Probably most of that rounding was deliberate, but some stream wear is possible. It is not jade, as a knife blade will scratch it, so it is a moderately hard greenstone. It may have come from the zone of metamorphic rocks in the middle Motagua River drainage in central Guatemala.

195-5-50

A mano was found in the basal portion of Unit 4 tephra, to the east of Structure 12. It was only 1 cm. from the top of Unit 3. Because Unit 4 is an airfall tephra, with no lateral energy, a source for what had moved the mano led to two lava bombs that had fallen nearby. They probably dislodged the mano from an elevated position, likely atop Column 8. That it was in an elevated and exposed location was evidenced by the Unit 1 and 3 fine tephra that coated all but one surface of the mano, but particularly the opposite surface and one side (upwind). It was very well shaped, and used only on one surface. It measures 23.1 x 9.9 x 8.0 cm., and weighs 2910 grams. It is made out of a moderately vesicular andesite. The vesicles are key to the manufacture, at least the final shaping, as the pecking collapses small (1-5 mm. usually) amounts of andesite into the vesicle, and it falls away. The moderate amount of use wear extends along the bottom and up the two sides quite high, indicating that it was used in a deep trough metate.

295-8-166

Two small pieces of andesite, only slightly vesicular, were found together near Structure 11. Both were collected as rounded river cobbles, and show no further evidence of shaping. One is about 3.2 cm. in diameter, and the other is an elongated tubular form that broke (3.8 x 4.8 x 1.5 cm.). It is possible that they were kept together as a pair.

295-8-502

A greenstone axe was found in Unit 1 tephra just inside the eastern wall of Structure 10, near the central column. It measures 6.2 x 2.1 x 1.5 cm., and weighs 41.4 g. It was in elevated storage, perhaps on top of the column or wall, or more likely on a rafter. It is made of a very hard greenstone; a steel knife blade will not scratch it, so it probably is jade. It likely came from the metamorphic zone of the Middle Motagua river in Guatemala. The highest polish is at the poll end, on both sides. That could come from haft wear, but no definitive evidence of axes being hafted has come from the Ceren site to date, and this find is no exception. It probably was hand-held. The final shaping by pecking is visible on both lateral surfaces. It was by pecking with a hard point-contact hammerstone that left tiny overlapping fractures. That would allow tiny pieces, usually smaller than .5 mm., to fall away. The cutting edge is quite sharp; it appears to have been sharpened shortly before the eruption, and only used a little. The resharpening was by grinding on a whetstone, forming two convex facets. The edge radius is about .4 mm. or less, along the entire length of some 1.5 cm. Use had begun to polish the resharpening striations.

295-8-616

Inside the east wall of Structure 10, near the center column, was found an elongated, extruded volcanic stone with long vesicles. It measures 20.1 x 8.8 x 4.9 cm., and weighs 940 g. It was used as a hammerstone, as evidenced by the pounding abrasion that is moderately developed on both ends. It probably was also used as a potrest, to help support one or more of the round-bottomed vessels in a line that were found inside the wall.

295-8-623

During the removal of the uppermost disturbed tephra levels at the site, between structures 10 and 12, a fragment of a Postclassic metate was found. It is dated to the Postclassic

exclusively by context, as it came from above Unit 14, the uppermost of the Loma Caldera components. The San Andres tuff was not preserved in this area, but it was clear that the metate was below the volcanic ash from the Playon eruption (AD 1658). It measures 46.1 x 21.8 x 13 cm. It is a fragment of a trough metate, made out of a pinkish gray andesite that is only slightly vesicular. It had to be deliberately roughened to maintain an efficient grinding surface. It was moderately well-shaped, and the final shaping was done by pecking. It was used a lot, probably for many decades, and it wore down to only 2.5 cm. of thickness in the middle. That probably contributed to its breaking and discard.

Laja Fragments

Fragments of *Laja*, the flat-fracturing andesite or related materials, were found in various locations at the site. They are minimally artifactual; the *laja* was transported to the site, probably from a few kilometers at least. *Laja* experiences further exfoliation at the site from at least three processes, natural weathering, from exposure to heat, and to percussion flaking of thinner margins to change the shape. Tiny fragments like the ones found in 1993 are difficult to interpret as to how they formed.

Lot 295-8-304 had 3 tiny laja pieces, averaging 2 cm. in diameter, and 2 cm. in thickness. Lot 295-8-314 had one measuring 8 x 5 x 3 cm. A *laja* fragment measuring 3.6 x 2.1 x .5 cm. was found on the TBJ near Structure 10, in lot 295-8-545. Lot 295-8-274 had one measuring 5 x 2.3 x .7 cm, and lot 295-8-346 had one measuring 4 x 3 x .4 cm. Finally, Lot 295-8-297 contained one measuring 2 x .7 x .3 cm. When they are covered with dirt or tephra, they often look like ceramic sherds.

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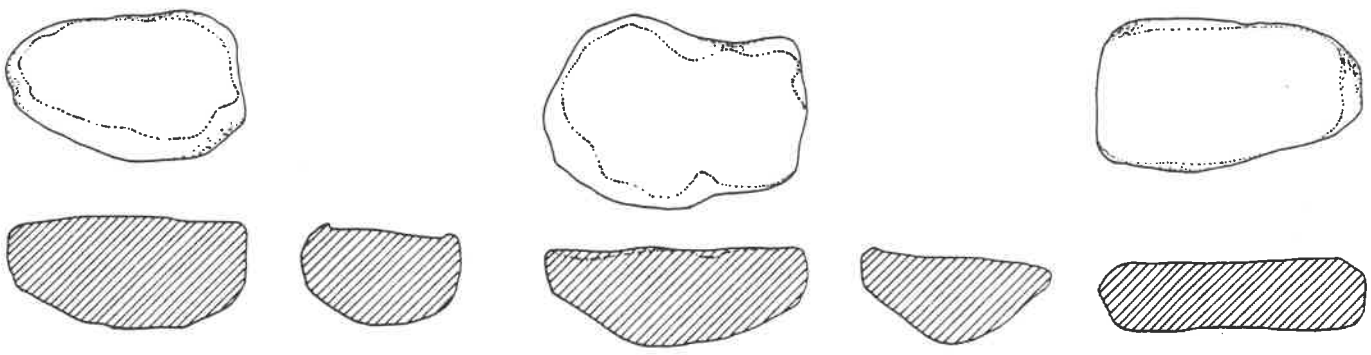

Metates from Ceren. L to R: 295-1-132, 295-1-214, 295-1-84. Drawn by Karen Kievit.

Chapter 9. ARTIFACT CONSERVATION DURING THE 1993 FIELD SEASON

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Introduction

The Cerén Project is a participating project in the archaeological conservation internship program, administered by the Smithsonian Institution's Conservation Analytical Laboratory (CAL) and supported in part by the Samuel H. Kress Foundation. The internships combine a variety of conservation experiences on-site with analytical opportunities at CAL. Through the program, the 1993 field season at Cerén was the second one in which a conservator specializing in archaeological materials was present for the entire field operation.

The laboratory was staffed principally by Holly S. Lundberg, recipient of CAL's 1993 postgraduate fellowship, with Harriet F. Beaubien serving as supervisory conservator at the outset of the season. Conservation activities during the field season took place both in the Museo Nacional David J. Guzmán and on-site. Work in the Museo Nacional was carried out primarily during the first half of the season after which demands on site took precedence.

Conservation Activities in the Museo Nacional

During the 1992 field, a newly partitioned section of the museum's main storeroom was designated as Cerén storage, and considerable time was given to addressing the storage issues of the accumulated collection of Cerén material. This continued to be an important focus in the 1993 season.

Organization of the collection in storage

In general, the collection has been organized in order to facilitate retrieval of individual items for study or display, to minimize damage caused by excessive handling, and to permit accurate inventories to be taken. (The organization system for the collection is described more fully in the 1992 Preliminary Report.)

Much of the material from 1992 excavations in Operations 2, 7 and 8 had been placed in the Cerén storeroom at the end of the season without being integrated into the storage system. These objects were reviewed as to condition, repacked if needed, and stored appropriately. The storage arrangement of the entire collection was reevaluated, and all materials were rearranged as needed to maximize available space and to make any adjustments in their grouping by material and operation.

Packing the collection for safe storage

In general the goals for the safe housing of artifacts are: to provide physical support for fragile or awkward artifacts; to improve the longevity of both the artifact and its housing by using stable or inert materials where possible; to minimize misplacement of artifacts (particularly small ones); to allow the artifact to be viewed easily while minimizing direct handling; and to utilize the storeroom's limited space efficiently. Guidelines for rehousing have been described in detail in the 1992 Preliminary Report.

During the 1993 season, all Operation 7 obsidian was individually repacked into labeled ziplock bags with a padding of 3mm thick polyethylene foam (Ethafoam). Also similarly packed, in ziplock bags or in clear film canisters, were many small finds, bone, paint and pigment samples from Operations 1, 2, 4, 7 and 8. These small objects were housed, either individually or in groups, in light-weight, colorless rectangular polystyrene boxes (brought from the U.S.) and food storage boxes (assumed to be polyethylene or polypropylene, acquired locally). These modular containers were sufficiently sturdy to provide physical protection and could be stacked easily. Where necessary, custom-made cardboard boxes were fabricated for large, heavy or awkward objects.

With regard to ceramics, unreconstructed sherds were stored as before in plastic bags within readymade cardboard boxes. Low-grade plastic bags which showed signs of deterioration were replaced, and bags and boxes were checked for proper labeling. Due to severe space limitations, all boxed sherds from Operation 7 (except a few reconstructible ceramic vessels) were housed on the floor at the rear of the storeroom.

As in 1992, the plaster of paris plant casts, carbonized wood and other unworked botanical materials were transferred to temporary storage at the Jardin Botanico.

Treatments

Reorganization and rehousing of the collection gave the conservation lab personnel an opportunity to review the condition of materials excavated in previous seasons. Those in need of conservation attention were treated in the Cerén storeroom.

Ceramics. Eight ceramic vessels and one figurine from the 1992 excavations were reconstructed,* in order for them to be recorded by ceramic specialist Marilyn Beaudry-Corbett. All ceramics were assembled using Acryloid B-72 adhesive in acetone.
*[FS 2-448/451/589 figurine; FS 7-365; FS 8-86 (v.14); FS 8-106/105/114/137/107/562/etc (v.10); FS 8-128 (v.16); FS 8-130 (v.13); FS 8-135 (v.08); FS 8-138 (v.07); FS 8-145 (v.09)]

Deer skull [FS 8-34]. Quite a few hours were spent in reconstructing the fragmented deer skull excavated during the 1992 season. Pieces were joined with dilute Acryloid B-72 in acetone (applied by brush), and air-dried. In some instances, strips of Cerex spunbonded nylon tissue were used as a backing material behind very vulnerable joins. A large portion of the upper half the skull was reconstructed, and is currently in six large sections. Two sections on which the antlers are attached can be joined at the suture line dividing the two halves of the skull. The four other major sections can be joined to make up the nose and one maxilla. These joins were not adhered because many small fragments of bone remain to be fitted together and joined, and

a custom-made mounting system will be necessary before this object is stabilized and displayable.

Inventory

As the storage organization was adjusted to accommodate recently excavated material, updated inventory labels were attached to each of the shelves. Because reconstructed ceramic vessels were likely to be removed frequently, a new system for tracking them was introduced which would minimize handling. A piece of yellow flagging tape was loosely tied to (or placed inside of) each vessel on which was written the vessel's FS number. A length of tape was also made for vessels which had been removed from the storeroom for display. These ribbons were loosely tied around the vertical shelf support adjacent to the storage area for a particular "missing" vessel. Thus, when an object is returned, the tape may be reattached before it is put back onto the shelf; likewise when a vessel is removed its ribbon would be tied to the adjacent shelf strut.

Conservation Activities On-site

The majority of time was spent at the site working on newly excavated materials both in the field and in the laboratory: providing assistance in the field with excavation of problematic artifacts, carrying out individualized treatments for stabilization or research purposes, and contributing to the technical interpretation of artifacts. Activities at the outset included cleaning and reorganization of the laboratory, inventory of supplies (both newly brought and remaining from last season), and local aquisition of supplies. Early in the season, the laboratory space was expanded with the addition of a new module. Design plans were submitted by the laboratory staff for new shelving and table space which would accommodate all laboratory functions. The resulting laboratory facility proved to be adequate for temporary storage, conservation activities, flotation sample processing, and material analysis among other activities. At the close of the season, an inventory of remaining supplies was taken, and all excavated finds and lab contents were packed for storage.

Treatments in the field

The following items were too fragile to be lifted without damage and required special conservation attention in the field before they could be brought to the laboratory for further cleaning, stabilization and packing.

Expanse of fallen roof thatch [FS 8-169]. A section of well-defined roof thatching was chosen by Payson Sheets for eventual display purposes. The area was brushed clean, and consolidated *in situ* with Acrysol WS-24 in demineralized water at a 1:4 ratio. The expanse was thoroughly wetted with consolidant (one time daily over a three day time period) and allowed to air-dry. A plaster support cap was cast on the object (using Cling film and aluminum foil as a separation layer during the process) prior to block-lifting. Once in the lab, the section was inverted, further consolidated from the reverse, and backed with cotton muslin and Acryloid B-72 for stability. A conforming plaster of paris support was cast on the reverse side (with a separating layer) to serve as a mount. Unfortunately, this plaster, purchased in the previous year, did not set properly (remaining soft and crumbly). This was most likely due to the ingress of

water/moisture during its storage on-site. A replacement mount will need to be fabricated using new plaster.

Articulated rodent skeleton [FS 8-167]. The bones were lifted using a water dampened brush and a micro spatula, and brought to the lab to be packed for storage and future analysis. The bones were laid on a circular padding of 3mm thick polyethylene foam (Volara); this was enfolded in acid-free tissue and then placed into a small polystyrene weighing boat to provide rigid support; the whole was placed into a labelled polyethylene bag.

Plaster cast of tree branches lashed with rope [FS 8-161]. The cast was surface cleaned in situ with demineralized water and soft brushes to remove adherent ash, then consolidated with 1:4 Acrysol WS-24 in distilled water, air-dried and lifted. A final cleaning was given to the object in the lab using "tap" water, followed by air-drying, and joining of small detached fragments with Acryloid B-72 adhesive. The cast was laid within a precut recess in 2.5cm thick polyethylene foam (Ethafoam) and placed within a custom-built cardboard box.

Carbonized tree branch with attached rope [FS 8-271]. The object was consolidated in situ using dilute Acryloid B-72 in acetone (applied by pipette), air-dried, and lifted. The find was further consolidated in the lab and airdried. Results of consolidation were considered unsatisfactory as the object remained very brittle to the touch and tended to break up. Following careful examination in conjunction with archaeologist Andrea Gerstle, the object was packed for storage. The pieces were placed into precut recesses in 2.5cm thick polyethylene foam (Ethafoam), reproducing their in situ arrangement, and packed within a custom-built cardboard box. (Note that results of consolidation tests on carbonized wood by Mark Fenn in 1992 showed that neither Acryloid B-72 nor Acrysol WS-24, the two materials available at the site, were successful for complete consolidation.)

Carbonized twine [FS 8-507]. A bundle of discontinuous twine strands (possibly knotted together) was first consolidated in situ using two applications of 1:4 Acrysol WS-24 in distilled water and air-dried over an eight hour time period. Still slightly fragile, the object was further consolidated using 3-5% Acryloid B-72 in acetone and air-dried (one hour) before being lifted on a spatula, placed in a container, and brought to the lab. Superficial moisture-whitening of Acryloid B-72 was cleared by misting with acetone. The twine was supported by resting it in a recess cut into a piece of 2.5cm thick polyethylene foam (Ethafoam) packed within a polypropylene box.

Paint layer [FS 5-35]. A fragmented layer of red paint applied to a pinkish-white ground was found lying on the top of ash units 1 and 2 with its ground side up; it measured approximately 3 to 4cm in length. The exposed surface was brushed of adhering ash, and initially faced using small cut pieces of Cerex nylon tissue and methylcellulose (Dow Methocel A4C) in distilled water, and air-dried overnight. This facing method proved inadequate (due to damp conditions, overly dilute consolidant, or stiffness of the tissue) and was replaced using dilute (3-5% w/v) Acryloid B-72 in acetone and torn strips of *tengujo* Japanese tissue. Once dry, the layer of paint was lifted (into a weighing boat) and brought to the lab where it was packed awaiting further treatment.

Paint deposit [FS 5-49]. A fragile deposit of paint fragments in a bowl shape (possibly once a painted gourd or *morro*) was found inverted and crushed in close contact with the earthen flooring directly below the east niche of Structure 12. The paint decoration appeared to be of a red background with a blue-gray stripe pattern. Excess ash and debris were removed from around and atop the object using soft brushes and a microspatula. The exposed layer of paint was faced using small torn strips of *tengujo* Japanese tissue and dilute methylcellulose in distilled water. After air-drying, a plaster support cap was made for the exposed top of the object to serve as a rigid support for lifting and future conservation work. Using a sheet of cling film and then aluminum foil as separation layers, plaster impregnated strips of gauze were laid in a criss-cross fashion over the top of the object and allowed to set. Ash and debris were then slowly excavated out from below the object working from one side. A aluminum pie tin with 2/3 of the rim cut out was slowly introduced under the object until it rested completely in the pie tin. In the lab, the plaster capped object was inverted and gradually the obscuring ash was removed from the inside. This revealed a second paint layer, back to back with the first layer; the second layer proved to be pink in color near an edge. This was faced with the torn strips of Japanese tissue using dilute Acryloid B-72 in acetone as an adhesive, and air-dried. The object on its mount was packed for storage in a large polyethylene bag, laid in a pre-cut recess within a piece of 2.5cm thick polyethylene foam (Ethafoam), and placed into a custom-made cardboard box.

Paint deposit [FS 8-520]. A tapered cylindrical shaped deposit of paint layers was found lying slightly on one side, possibly the remains of a painted "morro" although no evidence of a base was found. Areas of both the interior and exterior painted surfaces were exposed during excavation. The interior exhibited blue and red pigments, and these colors plus pink were also observed on the exposed exterior face. This partial excavation left the object extremely vulnerable to handling; therefore the exposed areas were faced (as described above for FS 5-49) and a plaster support was utilized. Using cling film and aluminum foil as separation layers, two narrow strips of plaster impregnated gauze were wrapped around the circumference of the object at its maximum body diameter. Similarly, plaster was applied in the hollowed out center of the object to serve as a support mount. The object was pedestaled on a layer of ash/flooring, and lifted using the pie tin. In the lab the object was inverted onto the plaster mount, and the ash/flooring removed in order to reveal the shape and form of the object. The object was packed for storage as described above.

Laboratory treatments

Conservation treatments were carried out on all materials which were excavated and brought to the laboratory by the archaeologists. These treatments are described below, by material.

Ceramics. All ceramic sherds and vessels were cleaned in water using soft brushes and wooden picks to remove adherent ash, and air-dried. Cleaning was usually done under the supervision of the conservation staff (and in some instances by the conservator). Ceramic small finds were cleaned by the conservator using solvent dampened cotton swabs. Sherds and vessels were numbered with India Ink (white or black) on an area which had first been sealed with a strip of dilute Acryloid B-72 (in acetone); the number was protected with another application of dilute

B-72. The cleaning and numbering of sherds was primarily done by Valerie Connor.

Excavation of the area in and around Structure 10 in Operation 8 yielded a large number of ceramic vessels. Five were selected for reconstruction by M. Beaudry-Corbett,* and this was accomplished using dilute B-72 in acetone to seal breakfaces and a more concentrated solution to join the sherds together. Excess adhesive was removed using acetone dampened swabs. Note that all vessels were sampled by M. Beaudry-Corbett for neutron activation analysis of the paste; drilled samples were taken (usually from base sherds) prior to reconstruction.
*[FS 8-466; FS 8-468; FS 8-474; FS 8-495; FS 8-497/465]

Bone. Eight worked bone objects,* including two worked objects made from animal scapulae, two large bead- or tube-like objects, and two long narrow bone tools, were excavated during the season. All bone finds were first dry-brushed and then swabbed with a 1:2 solution of ethanol and distilled water to remove adherent ash. Fragments were joined using Acryloid B-72 in acetone (in varying concentrations) as an adhesive, and air-dried. In some instances fragile fragments of bone were consolidated with a 2-4% solution of Acryloid B-72 in acetone (applied by brush), and slow dried within polyethylene bags to ensure deep penetration of the consolidant. Worked bone objects were packed for storage in polyethylene ziplock bags or clear polystyrene boxes, with foam padding as needed.

Rodent skeletons excavated during the season were packed as described for FS 8-167 in the "Treatments in the field" section above.
*[FS 8-188; FS 8-400; FS 8-448; FS 8-449; FS 8-456/488; FS 8-524/496; FS 8-526/525; FS 8-533]

Shell bead [FS 8-521]. One shell object, a bead, was excavated this season and was found in a highly degraded, powdery condition. It was lightly brushed to remove adherent soil, consolidated with dilute Acryloid B-72 in acetone (applied by syringe), and slow dried in a closed polyethylene bag to insure deep penetration of the consolidant. The find was placed in a perforated polyethylene ziplock bag with a padding of 3mm thick polyethylene foam (Ethafoam).

Fibrous material. A fragmented ceramic vessel [FS 5-53] was excavated from Operation 5, Structure 12, on which some organic woven matting was preserved on two rim sherds and one body sherd. These three sherds were cleaned of ash in the lab, and the matting consolidated in place using dilute Acryloid B-72 (2-5%) in acetone applied by syringe and air-dried. They were packed carefully and stored with the remainder of the vessel sherds awaiting completion of cleaning and future reconstruction.

Plaster casts. A number of plaster (dental grade) casts were made by field team members of branches, fencing, garden plants, etc. These were brought to the lab and cleaned in water using soft brushes when necessary to remove adherent ash. Care was taken not to alter the surface detail and texture of the casts. They were all numbered using the same method as described for ceramics. The casts were packed for storage in individual perforated ziplock bags, with foam padding as needed.

Stone. Most of the stone and lithic finds were processed by P. Sheets. However, in some instances small obsidian flakes and blades were cleaned with a dry brush by the conservation staff. Care was taken not to remove any adherent remains that may have accumulated through use. Recommendations were made on proper packing of small lithic finds using ziplock polyethylene bags with polyethylene foam padding to minimize handling, facilitate visibility, and maximize safety in storage.

Consolidation tests

Consolidation tests were carried out on some red pigment adhering to the earthen wall of Structure 12. Two different consolidants (5% Acryloid B-72 in acetone and 1:4 Acrysol WS-24 in distilled water) were applied by pipette to two test patches on the north face of column three (immediately to the left of the west niche). These areas can be identified by elevation (B-72 at 443.45 and WS-24 at 443.44) and are marked with straight pins; the results should be assessed next season.

Packing of objects for storage

All objects which came through the laboratory were packed for storage with the aim of providing packaging which would assure long-term preservation of the material. Generally, small artifacts, as well as carbonized material, paint and/or pigment samples, were packed in individual transparent ziplock bags, padded and/or supported with polyethylene foam (Volara or Ethafoam) if needed. The bags were perforated for objects made of organic materials to ensure that any entrapped moisture would evaporate. Large, irregularly shaped, and/or fragile objects were given extra support by being laid into pre-cut recesses within thick (2.5cm.) polyethylene foam (Ethafoam). All objects were then placed into rigid polypropylene or polyethylene storage containers or custom-made cardboard boxes, packed individually or in groupings by material. Bags and containers were clearly labeled with the FS information of their contents, using a permanent black marking pen.

Introduced this year were synthetic cloth (polyester/cotton mix) drawstring bags for sherd storage. All sherds from a given lot and/or operation were placed into labeled drawstring bags which in turn were stored in cardboard boxes. These should provide a more durable means of storage than low-grade plastic bags which deteriorate rapidly, given the local climate and storage conditions.

Conservation Priorities for Future Seasons

Collections Care

The artifacts conservation laboratory will continue to place a strong emphasis on collections care, specifically addressing the housing and storage issues of the artifact inventory so that these materials will be available over the long term for research and display. These activities require adequate supplies of packing materials such as modular containers, fitted boxes,

stable plastic bags and padding, ample shelving to avoid overcrowding, and attention to security measures, including careful registry and control of the artifact inventory. This responsibility is one which should be shared by the project and Museo Nacional personnel.

Particular tasks include checking that the small finds from 1993 (e.g. bone, shell, and ceramics) have been stored in the appropriate storage boxes for each particular operation, and that all 1993 finds have been stored on the correct shelves. The FS numbers of these materials will need to be added to the appropriate container, shelf, drawer, or cabinet labels. The reconstructed 1993 ceramics should be placed onto the Operation 8 vessel shelf, with a yellow flagging label attached to each vessel.

Treatment

The laboratory will continue to respond to the conservation needs of newly excavated material, beginning with *in situ* stabilization and lifting interventions as needed and continuing in the laboratory. Individualized treatments will be carried out to stabilize the artifacts, to support the research interests of project specialists, and/or to prepare materials for museum display.

Materials from 1993 which were stabilized but whose treatment could not be completed during the field season are listed below:
- The two painted *morros* [FS 5-49 and FS 8-520] and the paint layer [FS 5-35] excavated at the end of the 1993 field season. These need further cleaning and stabilization, with appropriate mounting supports fabricated for storage.
- Sherds with remnants of woven matting from FS 5-53. Excess adherent ash should be removed and the vessel reconstructed, if M. Beaudry-Corbett considers it a priority.
- Expanse of roof thatch [FS 8-169]. This requires a replacement plaster mount for safe storage.
- Ceramic vessel [FS 8-106/etc., v.10]. Stains from masking tape, used as a temporary joining method for documentation, should be removed using organic solvents. (Note: this method, while useful in the short term, can result in disfiguring stains which are very difficult to remove.)

Materials from previous seasons which should receive additional attention are listed below:
- The deer skull [FS 8-34]. Further reconstruction would be aided by a comparison skull of either *Odocoileus Virginianus* or *Mazama Americana*; a mounting system will be necessary both for storage and museum display.
- A fragmented tortoise shell (FS# not known, from a previous season). Its pieces are friable and powdering, and will require consolidation and careful rehousing.
- Basket [FS 1-234]. Lifted in 1991, this object currently is stored in an inverted position on a plaster mount. David Lentz has requested information about its contents (if any). This investigation will require removing a portion of the base. Eventually, a conforming plaster mount should be made for the base, and the basket returned to its original orientation.
- The paint deposit [FS 8-160] from 1992. The decoration of this object would be clarified by removal of ash on its surface.

Research

Artifacts which show evidence of painting or contain colorant materials have been excavated since 1989 and provide a unique opportunity to study pigments available at Cerén. The technical analysis of these materials is being carried out at the Conservation Analytical Laboratory; samples from painted objects excavated in 1993 are needed for this study.

The paint consolidation tests on Structure 12 should be evaluated. Lab participation is recommended in any efforts to develop appropriate replication techniques for the plaster of paris plant casts. Note that inexpert use of untested materials and techniques for any consolidation or replication process could lead to loss of information and to damage of specimens.

Training

With the ongoing development of the laboratory's capabilities, it is expected to continue as a training resource both for conservators from CAL's archaeological conservation internship program, for participating archaeologists and Salvadoran colleagues.

Principal conservation materials utilized in treatments

Acryloid B-72 (Rohm & Haas):
copolymer of ethylmethacrylate and methylacrylate, dissolved in acetone for consolidation and adhesion; reversible in acetone

Acryloid B-48N (Rohm & Haas):
copolymer of methylmethacrylate and butyl acrylate, dissolved in toluene and acetone for adhesion; reversible in acetone Acrysol WS-24 (Rohm & Haas): an acrylic colloidal dispersion in water, used for consolidation

Methocel A4C methylcellulose (Dow):
a cellulose ether, gelled in water, used for temporary adhesion; reversible in water

Cerex tissue:
spunbonded nylon tissue, used for backing Japanese tissue: *tengujo* mulberry paper, used for backing

References

Conservation Logbooks have been maintained for the 1989, 1990-1, 1992, and 1993 field seasons at Cerén. Detailed conservation laboratory reports, as well as CAL treatment documentation and analytical data connected with the painted *morro* [FS 2-51], are on file at the Conservation Analytical Laboratory, Smithsonian Institution. Duplicates are kept at the Department of Anthropology, University of Colorado and at CONCULTURA, Department of Education, El Salvador. Conservation reports have also been included as chapters in the annual site reports issued by the University of Colorado.

Chapter 10. PALEOETHNOBOTANICAL REMAINS: FIELDWORK AND ANALYSIS DURING THE 1993 SEASON

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This past season dramatically expanded the data base relating to plant use activities of the pre-Colombian Cerén inhabitants. The growth in information resulted largely from a systematic plant remain retrieval strategy which generated a large number of flotation samples bearing plant microfossils, collection of modern plant specimens that served as voucher samples to aid in ancient plant part identification and preliminary analysis of macroremain samples from previous Cerén excavations.

The procedures designed to extract plant remains from soil deposits using water flotation were streamlined from the previous season and a large volume of archaeological soil was processed. Samples prepared in this manner were slowly dried in newspaper then placed in paper bags with the appropriate provenances written in indelible ink on the outside. These samples will be weighed in the laboratory then sorted into three particle sizes to aid in the identification process, since seeds of the same species are likely to be of the same dimension. The research design for the collection of flotation samples focuses on plant use activities across the site as a functional unit and within structures, as well. Accordingly, flotation sample collection from activity surfaces, i.e., house floors, patios, etc., have been given a high priority for study. Also, middens were sampled extensively to help provide more chronological perspective since most of the data generated from Cerén excavations pertain to a narrow window of time. Not only do flotation samples from middens expand our chronological horizons, but they also generate comparative data vis-à-vis other archaeological sites in the region. These interesting bits of prehistoric plant data will remain in El Salvador until next season when they can be exchanged for the current batch of macroremains undergoing analysis.

Several dozen modern plant specimens were collected from the environs of the Cerén area. These were pressed and dried at the Jardin Botánica de La Laguna in preparation for subsequent herbarium storage. These modern plant samples serve multiple purposes for the Cerén Archaeological Project. Some of the herbarium specimens collected will serve as voucher specimens for Susan Villalobos' study on local plant use practices in the modern village of Joya de Cerén. Also, the herbarium sheets will help to form the basis of a modern floristic study of the surrounding area by providing a preliminary inventory of current vegetation. Finally, the modern plants, collected and identified to species, will serve as reference material for identification of the ancient plant remains retrieved from Cerén archaeological deposits.

Paleoethnobotanical analysis in recent months has resulted in the preliminary identification of numerous plant taxa from Cerén excavations. Among the plant remains thus far identified are: Brysonima crassifolia (nance) fruit casts, Nectandra sp. charcoal, Zea mays (corn) cobs, kernels, cupules and leaf casts, Capsicum annuum (pepper) seeds and peduncles, Cupania dentata charcoal, Cucurbita sp. (squash) seeds, Theobroma cacao (cocoa) seed and peduncle impressions, Tithonia rotundifolia stem impressions, Persea americana (avocado)

cotyledon and leaf impressions, Trachypogon sp. leaves and stems, Crescentia sp. (calabash) rind, Lagenaria siseraria (gourd) rind, Psidium guava (guava) fruit casts, Cyperus sp. (sedge) tubers, Agave cf. americana (maguey) leaf casts, Manihot esculenta (manioc) stem and tuber casts, cf. Ficus sp. charcoal, Acrocomia mexicana (coyol) endocarps, Aspidosperma sp. charcoal and an assortment of dicot wood, monocot stems and several seed unknowns. The process of preparing light and electron micrographs of these paleoethnobotanical remains has been initiated and will continue with the intent of documenting the collection in publishable format.

Numerous Phaseolus sp. (bean) seeds were recovered from the site, as well, and excavations at Cerén may have produced one of the largest collections of archaeological beans found in Mesoamerica. Although most of the beans appear to be Phaseolus vulgaris, the size variation within the collection is tremendous, suggesting that several land races and/or other species from the same genus may be represented. Accordingly, a representative sample of the Cerén beans has been sent to Dr. Lawrence Kaplan of the Biology Department, University of Massachusetts-Boston, for detailed analysis.

From evidence gathered thus far, it appears that Classic period Cerén inhabitants had orchards of avocado, nance and guava growing directly adjacent to and even within their house compound boundaries. Also directly adjacent to the house compounds were cultivated fields of corn, manioc and maguey, sometimes referred to as "in-fields." This pattern is similar to the small house-lot gardens called calmilli, known from ethnographic sources. These in-fields or calmilli could be tended easily and fertilized with night soil or kitchen waste, thus enhancing their productivity. Presumably, these in-fields were coupled with larger but less efficient out-fields or milpas located some distance from the house compounds. Due to logistic and other problems, little is known about possible out-fields at Cerén, but pending excavations may provide insights.

Future Cerén paleoethnobotanical studies will focus on the plant remains retrieved from Structure 11, previously described as the "kitchen" in Operation 1. During the most recent field season, all paleoethnobotanical samples relating to the structure were set aside, packaged and shipped to the laboratory for analysis. This study will ensue this winter and should provide an unusual picture of intra-structural food preparation activities dating to Classic times.

Brysonima crassifolia (nance)

Psidium guava (guava)

Plants Identified at Ceren.

Chapter 11. PALEOGEOGRAPHY OF THE CEREN SITE, EL SALVADOR

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The following report is an interpretation of the paleogeography of the Ceren archaeological site in El Salvador. The area of study encompasses the immediate area of the archaeologic site, an area of approximately 5,500 square meters. Measured sections of the volcanic units which buried the village were obtained from 32 locations in the site. The data were gathered by the author in June, 1992.

One purpose of the study was to determine the elevation of the ground surface in and around the village prior its burial by volcanic ash, lapilli flows and surge beds. Another objective of the study was to determine how that existing topography influenced the deposition of the eruptive sequence, especially during the early phases of the eruption, while humans may have still been in the area and were most likely fleeing the effects of the eruption. Paleographic reconstructions prior to and during the initial phases of the eruption may be able to help delineate routes the populace may have taken if they were successful in escaping the volcanic flows and air-falls which destroyed their community. As yet no human remains have been found in the excavated area and it can be assumed that the inhabitants were either successful in escaping the eruption or were trapped and killed by pyroclastic flows or air-falls at some location away from their village.

The Ceren volcanic sequence which buried the prehistoric village has been studied in detail by C. Dan Miller (1990; 1992). It consists of 15 units of alternating lapilli and hot-block air fall deposits and pyroclastic flow and surge units. The lowest unit lies on a juvenile soil horizon formed on a light colored ash bed referred to as Tierra Blanca Joven (TBJ). The TBJ was both the building surface and the soil cultivated by the pre-historic inhabitants. The Ceren volcanic sequence, as described by Miller (1990), consists of beds numbered from 1 through 15. The vent which was the source of the Ceren sequence, called the Loma Caldera, has been located approximately one kilometer north of the site (Miller 1992). The lowest bed in the volcanic sequence, Unit 1, was deposited by a pyroclastic surge (Miller 1990). It was deposited directly on the TBJ surface in most locations and its thickness was influenced by the existing land surface and by buildings. Unit 2 consists of a sequence of lapilli and hot-block deposits which were air-fall in origin and range from 3 to 15 centimeters in thickness. The deposition of Unit 2 collapsed roofs and started many thatched structures on fire. It is unlikely that inhabitants who had not fled the area would have survived the event which deposited this unit. Unit 3 is a series of pyroclastic surge deposits which range from 60 to 80 centimeters thick. This sequence knocked over walls of many of the structures in the village and would have killed anyone who may have survived the air fall event of Unit 2. The remaining units consist of alternating units of pyroclastic surge and air-fall deposits. Excavations to date indicate that any walls which may have been left standing by previous eruptions were in most cases completely buried by the deposition of Unit 5 (Miller 1990).

Dan Miller in his regional reconnaissance work in the area noticed that the Ceren sequence air-fall deposits are regionally extensive while the pyroclastic surge-beds are more aerially restricted. It is well known that pyroclastic surge beds tend to follow topographic lows while air-fall units are deposited more as a "blanket" and thickness differences are the result of distance from the source as well as meteorologic conditions present during the time of the eruption.

Field Methods

Thirty-two measured sections of the Ceren tephra sequence, all with a common horizontal datum, were measured and described within the site. An arbitrary horizontal datum of 100 meters was used in the measurement of all sections. The tops of all volcanic beds were measured, either above or below this datum. Unit designations were followed as defined by Miller (1990). Units were numbered 1 at the base through 8 at the top of the sequence studied for this report. Dan Miller personally field checked many of the measured sections for accuracy.

Only the Ceren sequence units 1 through 8 (out of a total of 15) were included as part of this study. Although higher stratigraphic units are important for regional correlations, most structures in the village were completely buried after the emplacement of Unit 5. Beds higher than Unit 8 are also typically removed during the excavation process and are not available for study.

Measured sections were located around all excavated structures as well as in test pits which had not yet been back-filled. Sections were placed in locations which would yield the widest geographic coverage as well as produce a complete sequence from the TBJ through Unit 8.

The arbitrary 100 meter horizontal datum was extended through the area by means of level lines. In all cases when transferring the datum from one excavation to another with a level line the datum was always "tied back" to its source to insure accuracy. In no cases was the error greater than 12 centimeters in the transfer of the horizontal datum from excavation to excavation. Vertical measurements of unit tops were taken directly from tape measure readings below the horizontal datum. The measured sections obtained in the field and the calculated vertical elevations are included in Appendix I.

It was discovered early in the study that thicknesses of many of the pyroclastic surge beds varied considerably over very short distances along excavated faces. Miller (1990) noted that some of the lowest units, especially the pyroclastic flows, are considerably influenced the buildings which re-directed and in some cases blocked the movement of surge flows. Because most of the excavations in which the measured sections were made are in areas where structures are located there is an inherent bias in the data. In order to keep the data as un-biased as possible sections were located as far from structures as possible and in areas where the sections were best exposed.

Paleogeographic Maps

Two maps were constructed which are most meaningful in the interpretation of paleogeography. An elevation map of the TBJ surface (Figure 1) represents the paleo-topography of the surface of the ground immediately prior to the eruption and burial of the village. This contour map shows that the highest topographic area is located in the easternmost portion of the study area, near Structure 12. The pre-eruptive TBJ surface dips to the south and west from this high area. This paleo-high area is at present located directly adjacent to the lowest area topographically today, which is the Rio Sucio. Dan Miller's (1992) analysis of the regional stratigraphy of the Ceren volcanic sequence also demonstrates that the Loma Caldera which was the source of the Ceren sequence volcanic flows is at present bisected by the Rio Sucio. In both cases it is apparent that these two areas which were elevated in the past are at present the lowest areas topographically. It is evident that there must have been considerable lateral migration of the Rio Sucio channel since the eruption. This channel migration has not only eroded through the center of volcanic crater but also has migrated laterally to its present location near the Ceren Site, just to the east of what used to be the highest topographic area in the site. The exact location of the Rio Sucio prior to the eruption of the Ceren sequence is not known but it was likely to the south of the buried village.

The most dramatic topographic feature observed in the paleo-topographic map of the TBJ horizon (Figure 1) is a long, narrow "ditch" trending north-south in the western portion of the mapped area. On the edge of this feature, just west of Structure 9, a trash midden was discovered. It is likely that this ditch was a natural drainage which was used for refuse disposal by the prehistoric inhabitants of the village. There is also evidence for another ditch just to the south of Structure 11. A topographic change of more than one meter in this area may delineate the headward portion of another ditch which also flows to the south or west. Its location to the southeast of Structure 11, which is interpreted as a kitchen structure, may make this ditch an excellent area for the preservation of food remains if it was also used for refuse disposal.

The paleotopographic map structured on the surface of the TBJ (Figure 1) also demonstrates how human-made structures were located in areas which were on topographic benches or small knolls. The most striking example of this is at Structure 4 which is located on a knoll with a meter and a half of local topographic expression. Structures 14 and 16, as yet un-excavated, are also located on prominent topographic highs. A garden, located between Structures 4 and 14 was located in a swale with drainage probably towards the ditch to the east. Other garden areas have also been excavated to the west of Structures 11 and 6 and to the west of Structure 9. Garden areas may have been located in areas which were relatively flat where structures were located on the topographic highs.

An isopach map was constructed of Units 1,2 and 3 (Figure 2). Units within this mapped interval include two pyroclastic surge beds (Units 1 and 3) and one 5-15 cm. lapilli fall deposit (Unit 2). This composite sequence was mapped because it was easily identified, represents the earliest deposits which covered the village, and is composed of primarily pyroclastic flow units. The isopach contours of these units show regional thickening to the north. The thickness of this composite sequence was also highly influenced by the north-south ditch in the eastern portion of the site. In the ditch area as much as 170 centimeters was deposited compared to 84 to 113 centimeters on its bank. Thick pyroclastic units were also deposited to the north of Structures

CEREN ARCHAEOLOGICAL SITE
EL SALVADOR

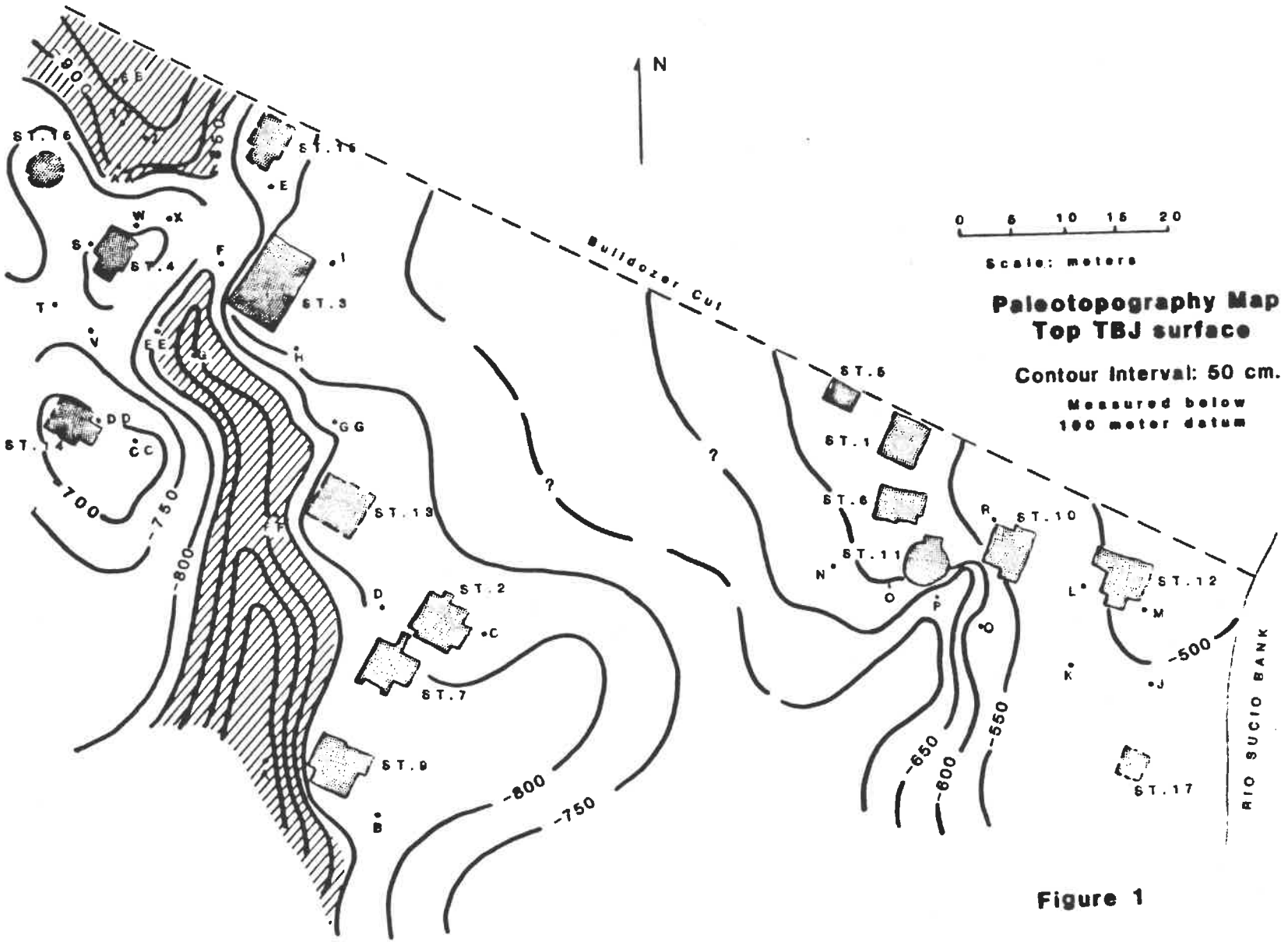

Figure 1

CEREN ARCHAEOLOGICAL SITE
EL SALVADOR

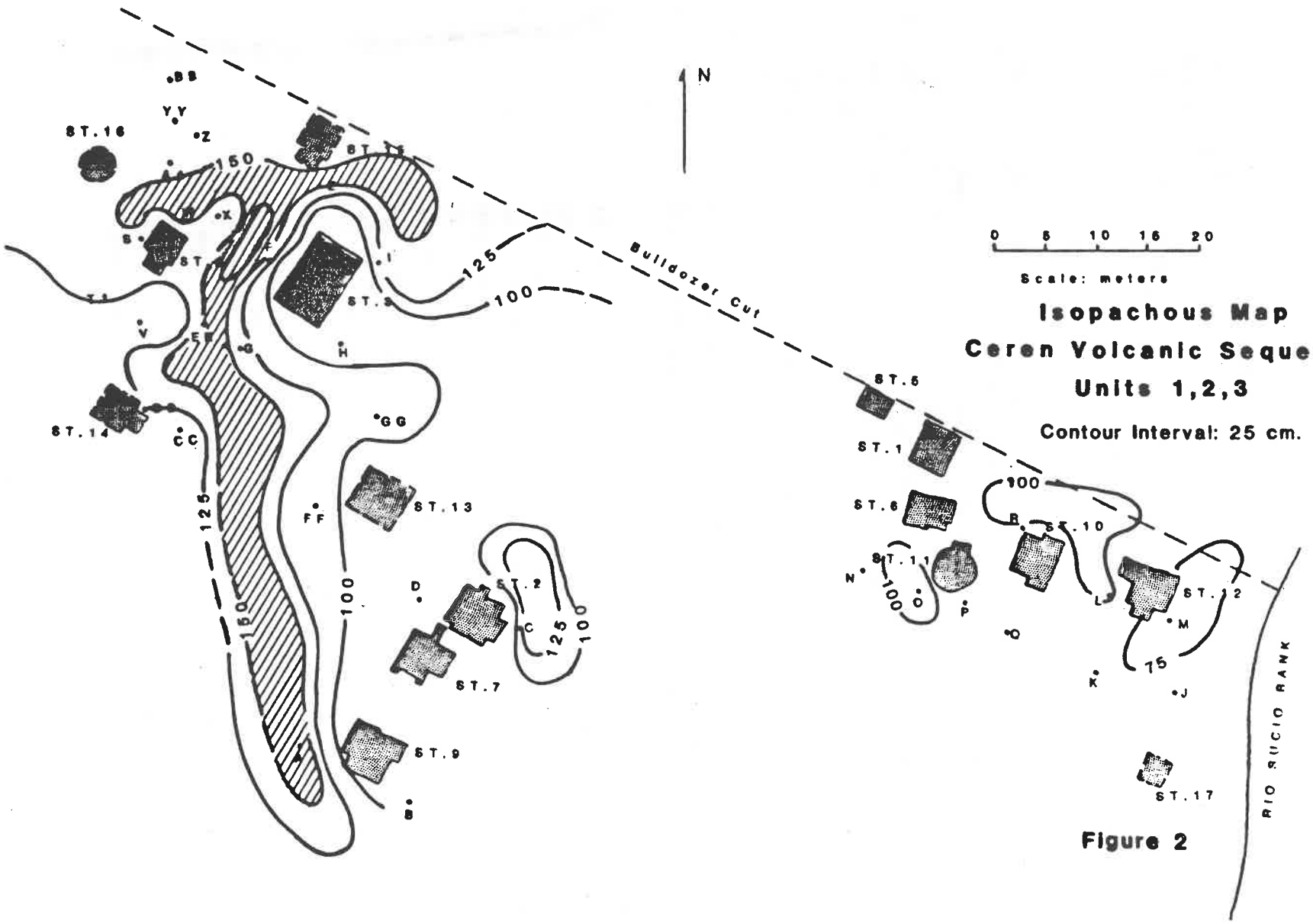

Figure 2

3, 4 and 10, where the buildings obstructed the southern flow. Areas on the leeward side of structures received considerably less deposition of these flow units. The thinnest section of the early volcanic units was measured just to the east of Structure 12 (75 centimeters). This area corresponds to the highest elevation of the TBJ surface and because of its high elevation received the thinnest sequence of pyroclastic flows.

Archaeological Implications

Previous work in the Ceren Site by Dan Miller (1990) concluded that many of the buildings may have offered some protection from the pyroclastic flows of Unit 1. If people took refuge in buildings during the first phase of the eruption and then fled prior to the emplacement of lapilli and volcanic bombs of Unit 2 then their most likely direction of escape was probably first to either the east or west, and then to the south, away from the eruption. The highest areas would have received the thinnest amounts of ash deposition immediately following the eruption of Unit 1 and a thin ash in these areas may have cooled enough over a period of time to permit a surface of retreat. Dan Miller has noted (personal communication, 1993) that the tephra and base surge units at Ceren were probably wet or damp, and only about 100 degrees centigrade. Base surges especially are muddy in texture when deposited and could have been walked upon soon after their deposition. It is unlikely that the direction of escape would have been toward the active crater to the north and the lowest elevations along the ditch trending to the south received the thickest sections of ash and may have been less passible immediately following emplacement of Unit 1.

Paleotopographic reconstructions document the location of one major ditch, which would have been a location for refuse disposal. It is likely that there were numerous other ditches in the area, as yet un-discovered, which may have acted as a similar locations for refuse disposal. The location of structures on the topographic knobs and bench areas is what would be expected in an area which receives heavy amounts of rainfall and where drainage is of prime importance. The density of human habitation was probably high during this period of time and all land suitable for cultivation was probably in use. The un-excavated areas between the two clusters of structures (east and west portions of the site) may have been used for a variety of agricultural activities. This area is mapped as a broad terrace area, based on the elevation change between the two habitation clusters, but subsurface control is sparse.

There is a striking dissimilarity between the modern and ancient topography across the site. The present land surface rises to the south of the site but prior to the deposition of the Ceren sequence that area was topographically low. The lowest present-day elevation is the valley of the Rio Sucio, just to the east of the site, but prior to the eruption this area was topographically the highest. It is likely that the local topography was significantly altered following deposition of the Ceren sequence due to infilling of topographic lows and the build-up of the thick sequence of volcanic units. Subsequent lateral migration of the Rio Sucio channel has also extensively modified the terrain.

APPENDIX I MEASURED SECTION DATA, CEREN SITE, EL SALVADOR

SECTION:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DATUM(meters)	95	95	95	95	95	95	95	95	95	98	98	98	98	96	96	96
DEPTH TO TOP OF UNITS IN CENTIMETERS FROM DATUM																
STRATIGRAPHIC UNIT																
8	-223	-134	-44	-58	-23	-84	-98	-2	40	-147	NP	-85	-114	-29	REMOVED	-78
7	-247	-148	-71	-79	-48	-100	-120	-31	22	-169	NP	-106	-133	-57	REMOVED	-97
6	-284	-172	-98	-119	-91	-123	-160	-64	-26	-193	-180	-137	-162	-86	REMOVED	-129
5	-305	-185	-123	-126	-110	-133	-174	-75	?	-206	-200	-155	-185	-112	REMOVED	-146
4	-322	-217	-143	-171	-149	-150	-235	-122	-92	-222	-211	-183	-200	-126	REMOVED	-160
3	-345	-235	-163	-92	-175	-175	-260	-146	-117	-244	-240	-218	-220	-149	-92	-184
2	-485	-304	-240	-268	-254	-320	-350	-210	-225	-303	-309	-283	-250	-219	-170	-260
1	-492	-310	-250	-276	-260	-326	-353	-216	-233	-309	-319	-295	-217	-226	-178	-271
TBJ	-500	-330	-290	-284	-281	-345	-385	-230	?	-325	-335	>-315	-280	-234	-201	-280

SECTION:	R	S	T	U	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG
DATUM (meters	96	94.28	94.28	94.28	94.28	94.28	93.4	93.4	93.4	97.4	93.01	92.94	94	96	97
DEPTH TO TOP OF UNITS IN CENTIMETERS FROM DATUM															
STRATIGRAPHIC UNIT															
8	69	101	48	50	109	119	3	18	-19	-319	270	264	-26	-228	-265
7	50	83	10	22	93	109	0	-5	-34	-359	256	253	-44	-258	-283
6	15	58	-11	-3	60	60	-49	-42	-68	-385	232	224	-86	-270	-319
5	-5	38	-32	-26	36	2	-64	-74	-93	-440	212	207	-106	?	-333
4	-13	-31	-74	-66	-4	-10	-125	-116	-129	-520	154	171	-149	-333	-357
3	-41	-51	-91	-88	-27	-32	-144	-136	-151	NP	120	143	-271	-352	-377
2	-116	-140	-181	-172	-109	-159	-243	-252	-249	NP	34	65	-253	-443	-459
1	-127	-146	-189	-179	-172	-163	-249	-254	-254	NP	27	56	-268	-438	-465
TBJ	-144	-200	-217	-207	-190	-181	-271	-270	-284	NP	0	0	-284	-456	-490

DEPTH TO TOPS OF UNITS BELOW STANDARD 100 METER DATUM

SECTION:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
STRATIGRAPHIC UNIT																
8	-723	-634	-544	-558	-523	-584	-598	-502	-460	-347		-285	-314	-429		-478
7	-747	-648	-571	-579	-548	-600	-620	-531	-478	-369		-306	-333	-457		-497
6	-784	-672	-598	-619	-591	-623	-660	-564	-526	-393	-380	-337	-362	-486		-529
5	-805	-685	-623	-626	-610	-633	-674	-575		-406	-400	-355	-385	-512		-546
4	-822	-717	-643	-671	-649	-650	-735	-622	-592	-422	-411	-383	-400	-526		-560
3	-845	-735	-663	-592	-675	-675	-760	-646	-617	-444	-440	-418	-420	-549	-492	-584
2	-985	-804	-740	-768	-754	-820	-850	-710	-725	-503	-509	-483	-450	-619	-570	-660
1	-992	-810	-750	-776	-760	-826	-853	-716	-733	-509	-519	-495	-417	-626	-578	-671
TBJ	-1000	-830	-790	-784	-781	-845	-885	-730		-525	-535		-480	-634	-601	-680

SECTION:	R	S	T	U	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG
STRATIGRAPHIC UNIT															
8	-331	-471	-524	-522	-463	-453	-657	-642	-679	-579	-429	-442	-626	-628	-565
7	-350	-489	-562	-550	-479	-463	-660	-665	-694	-619	-443	-453	-644	-658	-583
6	-385	-514	-583	-575	-512	-512	-709	-702	-728	-645	-467	-482	-686	-670	-619
5	-405	-534	-604	-598	-536	-570	-724	-734	-753	-700	-487	-499	-706		-633
4	-413	-603	-646	-638	-576	-582	-785	-776	-789	-780	-545	-535	-749	-733	-657
3	-441	-623	-663	-660	-599	-604	-804	-796	-811	-260	-579	-563	-871	-752	-677
2	-516	-712	-753	-744	-681	-731	-903	-912	-909		-665	-641	-853	-843	-759
1	-527	-718	-761	-751	-744	-735	-909	-914	-914		-672	-650	-868	-838	-765
TBJ	-544	-772	-789	-779	-762	-753	-931	-930	-944		-699	-706	-884	-856	-790

Chapter 12. ORGANIC RESIDUES ON OBSIDIAN BLADES

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The application of molecular biological techniques to the analysis of archaeological materials offers a new and exciting means by which we can extend our knowledge of past cultures. In recent years it has been recognized that lithic and ceramic artifacts often retain traces of protein residues from the time of their original use. Studies have demonstrated that by the use of biochemical and immunological methods, the species of origin can be identified to at least the family level of identity (Briuer 1976; Broderick 1979; Downs 1985; Hyland *et al.* 1989; Kooyman *et al* 1991; Newman 1990; Newman and Julig 1989; Newman *et al.* 1993; Shafer and Holloway 1979; Yohe *et al.* 1991). The identification of animal residues in soil samples has been demonstrated recently from a site in the Lower Mackenzie River Valley, Northwest Territories, Canada and from a site in southern California (Newman *et al.* 1993; Nolin *et al.* n.d.). Data acquired by these means can be used in the reconstruction of prehistoric subsistence patterns, to recreate past environments and possibly in identifying task specific artifacts.

Although various immunological methods have been used, the basis of all is the antigen-antibody reaction first observed in the classic precipitin test in the late 1800s. Following its discovery, the test quickly achieved integrity in the fields of clinical and forensic medicine and has been used extensively in medico-legal work since the beginning of this century (Gaensslen 1983). Although the successful identification of protein residues is dependent on their condition, forensic studies have demonstrated that proteins are extremely robust molecules and can withstand harsh treatment while still retaining their antigenicity and biological activity (Arquembourg 1975; Haber 1965; Gaensslen 1983; Lee and DeForest 1976; Macey 1979; Sensabaugh *et al.* 1971, among others). The fact that valid results from the analysis of old and severely denatured proteins are obtained in forensic medicine is of special relevance to archaeology where 'old and denatured' proteins are the norm. The sensitivity and specificity of precipitin reactions makes them an extremely effective method for the detection of trace amounts of protein (Kabat and Meyer 1967:22).

Materials and Methods

Cross-over immunoelectrophoresis (CIEP) is used for the identification of bloodstains, body tissues and fluids in medico-legal work (Culliford 1964; Gaensslen 1983) and is the method of analysis used in this laboratory. Minor adaptations to the original method were made following procedures used by the Royal Canadian Mounted Police Serology Laboratory (Ottawa) and the Centre of Forensic Sciences (Toronto). The test is based on the principles of the precipitin test but affords a higher degree of sensitivity and can identify 10^{-8}g of protein (Culliford 1964; Gaensslen 1983). The procedure is discussed fully in Newman and Julig (1989).

Twenty-nine sample vials of ammoniacal extracts from key obsidian blades were submitted for immunological analysis. All extracts were first tested against pre-immune serum (i.e., serum from a non-immunized animal). A positive result against pre-immune serum could arise from non-specific protein interaction not based on the immunological specificity of the antibody (i.e., nonspecific precipitation). No positive results were obtained and the artifact extracts were tested against the antisera shown in Table 1.

Table 1: Antisera used in analysis.

ANTISERA	SOURCE
anti-cat	Organon Teknika
anti-chicken	forensic medicine
anti-deer	"
anti-dog	"
anti-guinea-pig	"
anti-human	"
anti-mouse	"
anti-rabbit	"
anti-yucca	University of Calgary

Antisera obtained from commercial sources are developed specifically for use in Forensic Medicine and, when necessary, these sera are solid phase absorbed to eliminate species cross-reactivity. However, these antisera are polyclonal, that is they recognize epitopes shared by closely related species. For example, anti-deer will give positive results with other members of the Cervidae family such as deer, moose, elk and caribou as well as with pronghorn (Antilocapridae family). The antiserum to yucca (University of Calgary) is polyclonal and will recognize other members of the Agave family. Immunological relationships do not necessarily bear any relationship to the Linnaean classification scheme although they usually do (Gaensslen 1983).

Results

The results of CIEP analysis are shown in Table 2 and discussed below.

Positive results to deer antiserum were obtained on two artifacts, #'s 23 and 24. As previously discussed, a positive result to this antiserum could represent any member of the Cervidae family but cross-reactions with other families do not occur with this antiserum.

Two artifacts, #'s 2 and 5, reacted positively to dog antiserum. Any member of the Canidae family (coyote, wolf, fox and dog) could be represented by these results but cross-reactions with other families do not occur.

A positive result to human antiserum was obtained on artifact # 29. Positive results to this antiserum are obtained only with humans and monkeys. The identification of human proteins may be due to the deposition of blood from accidental cuts during: 1) tool use, 2) tool manufacture, or 3) tool re-sharpening. They may also result from recent handling, however, more positive results would be expected if this was true.

No other positive results were obtained in this analysis. The absence of identifiable proteins on artifacts may be due to poor preservation of protein or that they were used on species other than those encompassed by the antisera. It is also possible that the artifacts were not utilized.

Table 2: Results of CIEP analysis.

Catalogue #	Result
1	Negative
2	Dog
3	Negative
4	Negative
5	Dog
6	Negative
7	Negative
8	Negative
9	Negative
10	Negative
11	Negative
12	Negative
13	Negative
14	Negative
15	Negative
16	Negative
17	Negative
18	Negative
19	Negative
20	Negative
21	Negative
22	Negative
23	Deer
24	Deer
25	Negative
26	Negative
27	Negative
28	Negative
29	Human

Chapter 13. MEDICINAL PLANTS OF CEREN

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During June and July of 1993, my principal responsibility at the archaeological site of Ceren was to begin an ethnoarchaeological research program in traditional households in El Salvador. The shamanic tradition continues in some villages in El Salvador, and most of these traditional households continue to use local plants and other substances for folk medicinal and perhaps ritual purposes. My interest is in seeking information about the use of plants in healing and ritual in order to aid in interpreting what may have been the uses of plant remains being excavated at Ceren.

I established contacts in the colonia of Joya de Ceren through the Salvadoran workers at the site and their families. In this way, I developed a network of informants for future visits to El Salvador. I also established a working relationship with Gloria Mejia de Gutierrez of the Patrimonio Cultural's Department of Anthropology, who has an interest in pre-contact medicinal plant use in El Salvador and has done ethnographic work in traditional districts such as Panchimalco. Julio Cesar Gonzalez Ayala and Raul Francisco Villacorta Monzon of the Jardin Botanico, along with project ethnobotonist David Lentz, instructed me in the collection, drying and identification of the plants. Samples we collected are now part of the collections at the Asociacion Jardin Botanico La Laguna in Antiguo Cuscatlan, El Salvador.

It was necessary for me to become familiar with the medicinal plants, learn their local names and their uses in order to establish a "common ground" between myself and the curers I will meet during the next field season. Near the archaeological site of Ceren, I collected samples and recorded the uses of the following medicinal plants presented in Tables 1 and 2. Table 3 is a list of plant remains that have been found at the archaeological site of Ceren, and their uses today. Please note that these include using different parts of the plant and various processing techniques.

Acknowledgements

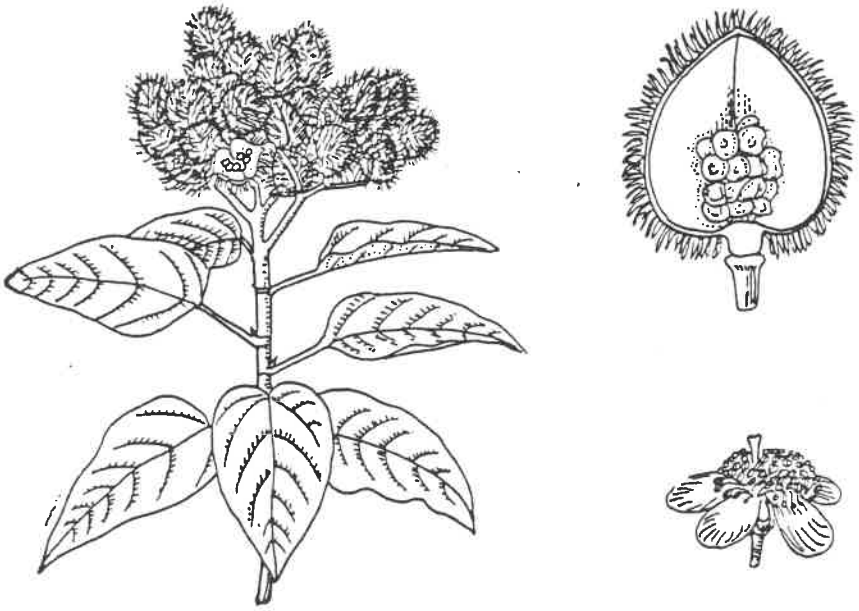
Uses of these plants have been recorded from several sources, including various books, published and unpublished and interviews with informants in El Salvador. I would like to extend my appreciation to the National Science Foundation (NSF Grant #1533070), Chamba, Don Pedro, Encarnacion, Gloria, Julio, Raul, Edi, Haydee, Lita, Vitelio, the Coca Family, Yuca, and David Lentz. They have given me much support, inspiration and a greater understanding of life in El Salvador. A special thanks to Payson Sheets for introducing me to Ceren.

Table 1. Medicinal Plants Growing Near Joya de Ceren, 1993.

	GENUS/SPECIES	FAMILY	LOCAL NAME
1.	Hamelia patens	Rubiaceae	Chichipince
2.	Latana camara	Verbenaceae	Cinco Negritos
3.	Paspalum notatum	Procerae	Gama Pacha
4.	Xanthosoma robustum	Araceae	Quequeshque
5.	Heliatropium indicum	Boraginaceae	Cola de alacran or Borraja
6.	Asclepias curassavica	Asclepiadaceae	Senorita
7.	Triunfetta lappula	Tiliaceae	Mosote de caballo
8.	Justicia carthagineusis	Acanthaceae	Yerba de susto
9.	Solanum diphyllum	Solanaceae	Yerba de golpe
10.	Calea urticilfolia	Compositae	Juanilama
11.	Hyptis verticillata	Labiaceae	Verbena
12.	Catharauthus roeus	Apocynaceae	Chula
13.	Chenopodium ambrosioides	Chenopodiaceae	Epazote
14.	Pluchea odorata	Compositae	Siguapate
15.	Ruta chalepensis	Rutaceae	Ruda
16.	Tecoma stans	Bignoniaceae	Arbol de San Andres
17.	Kalanchoe pinnata	Crassulaceae	Hoja del aire
18.	Urera caracasana	Urticaceae	Chichicaste
19.	Piper arboneum var. tuberculatum	Piperaceae	Cordoncillo
20.	Bixa orellana	Bixaceae	Achote or Achiote
21.	Stemmadenia donnell-smithii	Apocynaceae	Cojon
22.	Annona reticulata	Annonaceae	Anono Colorado
23.	Pereskia aculeata	Cataceae	Matial
24.	Aristolochia angicida	Aristolochiaceae	Yerba de guaco or chumpipito
25.	Scoparia dulcis	Scrophullariaceae	Culantro
26.	Vernonia patens	Compositae	Sucuanyo
27.	Tridax procumbens	Compositae	Yerba del Toro

Table 1. (cont'd)

	GENUS/SPECIES	FAMILY	LOCAL NAME
28.	Cercropia peltata	Moraceae	Guarumo
29.	Ceiba pentandra	Bombacaceae	Ceiba
30.	Muntigia calabura	Elaeocarpaceae	Capulin
31.	Argemone mexicana	Papaveraceae	Carlos Santo
32.	Solanum nigrum	Solanceae	Mora
33.	Ocimum micranthum	Labiaceae	Albahaca de gallina
34.	Sansevieria hyacinthoides	Agavaceae	Curarina
35.	Solanum hernandessi	Solanaceae	Huishtomate
36.	Erythrim beteroana	Fabaceae	Arbol de pito
37.	Commalina erecta	Commelimaceae	Santa Lucia
38.	Enterolobium cyclocarpum	Mimosaceae	Conacaste
39.	Jatropha curcas	Euphorbiaceae	Arbol de tempate
40.	Cassia uniflora	Caesalpinoideae	Frijolillo



Bixa orellana (achiote)

Table 2. Local Uses of Plants from Table 1.

1.	Rheumatism, vomiting, fungicide, kidney stones, diabetes, diarreah, scurvy, rashes and cuts
2.	Fever, pain
3.	Internal injuries
4.	Roots used as food (like taro)
5.	Fever, infammations, abscess, scabies
6.	Tooth pain, cuts
7.	Kidney illnesses, coughing, and dysentery
8.	Nerves, fear, anxiety, spasms
9.	Internal injuries
10.	Cancer, diabetes, vaginal hemorrhaging
11.	Tumors, cancer, fever, stomach pain, irritated eyes, headaches, calm the nerves and the cough, rheumatism, colds
12.	Hoarseness, sore throat, eye infections, leukemia
13.	Ulcers, dysentery, asthma, rheumatism, nerves, athlete's foot, tapeworms, wounds, stomach ache
14.	Stomach pain
15.	Stomach pain, tapeworms, nerves, earaches
16.	Diuretic, diabetes, pain from rheumatism, hypoglycemia
17.	Migrane headache, diuretic, expectorant, boils, ulcers, swelling, earaches, gas
18.	Pain in the kidneys, diuretic
19.	Tooth aches, hemmorhaging, diarrhea, gonorrea, inhibits tumors
20.	Diarrhea, improve appetite, measles, earaches
21.	Rheumatism, inflammations, tooth aches
22.	Inflammations
23.	Inflammations, diarrhea with blood
24.	Stomach pain, diarrhea
25.	Heavy menstrual flow, diuretic, vomiting, fever, malaria
26.	Stomach ache, diarrhea
27.	Fever, kidneys, lower back pain, cystitis, fungus, urinary infections
28.	Calm nerves, stomach ache, rheumatism, arthritis, expectorant, diuretic, asthma

29.	For strength, to gain weight, rash, dermatitis, expel placenta
30.	Sores in the mouth, pimples
31.	Malaria, vomiting, sweating, warts, sedative, anemia
32.	Calm nerves, headache, heal wounds, expel phlegm, epilepsy, Parkinson's disease, analgesic
33.	Calm nerves, headache, ear aches, dysentery
34.	Swelling, insect and snake bites
35.	Blackheads, acne, coughing
36.	Insomnia, headache
37.	Sore eyes
38.	Inflammation
39.	Hemorrhoids, wounds, inflammations, stops bleeding from wounds, laxative, stomach cramps, toothache, herpes
40.	Stop bleeding from wounds, nerves, paralysis, sore eyes

Table 3. Local Uses of Plants Found at Archaeologocial Site of Ceren

GENUS/SPECIES	LOCAL NAME	LOCAL USE
Bixa orellana	Achote or Achiote	Diarrhea, burns, gonorrhea, astringent, diuretic, fever, measles, ear ache
Crescentia alata	Morro	Expectorant
Cucurbita maxima	Ayote	Parasites, worms, tension
Byrsonima crassifolia	Nance	Heals wounds, kills fungus and bacteria
Persea americana	Aguacate	Tooth ache, parasites, arthritis, stops bleeding
Gliricidia sepium	Madrecacao	Inflammations
Capsicum annuun	Chili	Skin infections
Zea Mays	Maiz	High blood pressure, stomach ache, diarrhea, diuretic, antibiotic
Psidium guava	Guayaba	Diarrhea, stomach cramps

Jum Kaax The Maya God of Corn

Chapter 14. SUMMARY AND CONCLUSIONS

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Introduction

As can be seen from the above chapters, the two month 1993 field season, followed by various analyses, has been quite successful. The huge new roof over Operation 1 and continuing over Structures 10 and 12 allowed for lateral excavations to a degree unprecedented at the site. The roof covers almost 20 by 40 meters, and much of the area under the roof has now been excavated. We were able to excavate the patio of Household 1, to the east of Structures 1 and 6, and to the north of Structure 11. It also allowed us to continue those excavations eastward and determine, at least approximately, where the patio of that household ended and the patio of Structure 10 began. That patio extended around that structure, and it continued near to Structure 12. Both Structures 10 and 12 had high-use patios on their north sides, which appear to be the direction from which most of the people came who were using the buildings.

Structures 10 and 12 could not be excavated completely during previous field seasons for a variety of reasons. Those unexcavated areas in and around both buildings were excavated during 1993, with the exception of tephra balks left to help preserve architecture. Both structures provided architectural and artifactual surprises, and the various authors who have contributed to this preliminary report do their best to interpret them in the chapters above. In addition, excavations continued in Operation 2, and they not only provide important data for interpretation of human activities there, but they also help in the conservation of structures already excavated.

Artifactual analyses are continuing. The ceramic analysis of vessels found during 1993 and earlier seasons is progressing well, and lithic analysis is providing suggestions regarding obsidian curation and use. The attempt to identify protein residues on obsidian blades was successful, with considerable import in our attempts to understand how the blades were used. The results are discussed below in overview fashion, and in more detail in the individual chapters.

Volcanology

Dan Miller continued his research on the nature of the Loma Caldera eruption and its effects on architecture within the Ceren site. He was able to refine the isopach map that records the thickness of the volcanic ash deposits from the Loma Caldera eruption in the few square kilometers surrounding the volcano and the site. The volcanic ash is not equally and uniformly deposited in all directions around the

Loma Caldera vent, in part perhaps because of prevailing winds and in part because some layers were sufficiently wet to flow downhill and fill in depressions, leaving areas anomalously thin and thick. One case was found, to the southwest of Structure 9, where Unit 8 was unusually thick, apparently because it flowed into the depression created by the gully behind the building. That gully contains the midden being excavated by Brian McKee. The unit was sufficiently fluid to permit some of the more porous clasts to float upward.

Small cracks were discovered in the TBJ surface that formed the patios to the north of Structures 10 and 12. They apparently formed as a result of seismic activity that occurred just before Unit 1 was deposited. Because they approximately parallel the Rio Sucio, and the east side of each crack is slightly lower than the west side, the earthquake evidently caused a small slumpage of the riverbank downward and toward the river. After the cracks formed, but before Unit 1 was deposited, a rainstorm occurred that eroded two of the cracks. The cracks potentially are of great importance, as they evidently indicate that Ceren residents had seismic warning, contributing to their decision to abandon the zone of the site excavated to date, and "head south." An abandonment under such conditions would certainly discourage people from removing substantial amounts of their posessions.

Miller also noted the complexity of structural-volcanological relationships at Structure 10. Of the various walls that collapsed at Ceren due to the lateral blasts of the surges, most of the failures occurred during emplacement of Unit 1. It is unusual for architecture to fail during Unit 1's emplacement, but part of the wall at the northeast corner of Structure 10 failed at that time. Apparently the force of the blast was concentrated by a funneling effect of two walls along the north side of the building. Other complexities of Structure 10's wall and roof fall are detailed in his chapter.

Another important conclusion is that Laguna Caldera erupted at some time prior to the Ilopango eruption, and thus preceded the Loma Caldera eruption by more than four centuries. The evidence was found in stratigraphic sections studied by Miller within the artillery military base located to the west of Laguna Caldera volcano.

Paleoethnobotanical Investigations

Flotation and pollen samples were collected from the northeast corner of each square meter of all excavations. At least 100 ml. were collected for pollen, and 1 liter was collected for flotation. During processing, the flotation samples were separated into heavy and light fractions. The materials recovered from the samples are in the process of being studied by David Lentz at the New York Botanical Garden. The total sample has been divided into thirds, and he has completed the first third, is well into the second, and should complete the analysis of the final third during 1994. Not surprisingly, Lentz has identified maize, beans, squash, and chiles

at Ceren, and many of them occur in various forms and varieties. He also has found cacao, avocado, calabash, gourd, guava, sedge, maguey (agave), fig, and manioc growing at the site. The variation within the beans was far greater than expected, and the assistance of Lawrence Kaplan in Boston has been engaged to explore the nature of that variation.

Landscape Archaeology between Structures

Scott Simmons and Susan Villalobos describe their work done in the Household 1 patio, in Operation 8. Their excavations also included the patios north of Structures 10 and 12, which are discussed in separate chapters. The Household 1 patio is located to the east of Structures 1 and 6, and to the north of Structure 11. An important research objective was to explore the internal variation within each patio, and to see if a boundary could be discovered between them. It was found that patio boundaries were gradational rather than abrupt. The Household 1 patio gradually shifted from a high use area adjacent to structures to a more irregular surface at greater distance, and then into the flatter and more compact patio of Structure 10, the building that probably belonged to a religious association. Higher use areas of the Household 1 patio were characterized by having quite compact TBJ surfaces, with few artifacts, evidently because of high foot traffic and frequent cleaning. The area farther from the buildings was a less regular, flat surface, with more artifacts, and was less compact.

This area immediately east of Structures 1 and 6 also had some small features that are of interest. One patch of wood ash and small carbon pieces, called Feature E, may have been a location to allow fireplace cleanings to cool. Because much wood ash was stored inside of buildings, probably in gourd containers, the advantage of having it completely cooled is obvious. Feature C is an elevated clay platform, about a meter in diameter and 10 to 15 cm. high, covered by organic materials. The organic covering, consisting of long stems of what appears to have been grass, was laid flat in bunches or layers that were perpendicular to each other. The feature is similar to drying platforms found in traditional communities in El Salvador which were used to dry food grains (Victor Manuel Murcia, personal communication 1993). Why a large rock was placed on top of the feature, and why a hole, apparently a posthole, was dug into its side, are unknown. The function(s) of two tiny mounds, that line up with the posthole to the east, are also not understood.

Structure 10 - A Religious Association

Andrea Gerstle describes the research at Structure 10, also included within Operation 8. Structure 10 was partially excavated in 1992 (see Gerstle 1992), and the remainder was excavated this season. The data gathered in 1993 substantiate the earlier interpretations of Structures 10 and 12 being a part of a special use complex involving religious activities. The building's two innermost rooms, on top of the

formal platform, housed religious artifacts including a painted deer skull headdress, deer scapulae, and special ceramics. For instance, one large and elegantly decorated (plastic and painted decoration in form of a caiman) vessel held achiote seeds. The seeds make a brilliant red color for painting people or items, or when diluted make an orange to yellow color. The outer room, i.e. the eastern enclosure, housed a wide variety of food storage, processing, and serving artifacts along with various food remains themselves. Both Strs. 10 and 12 diverged from the dominant architectural orientation of domestic buildings at the site, both were painted white with Ilopango tephra and had some red-painted walls, and both had sizeable enclosures outside their main entrances. However, they were not in a direct, primary relationship to each other, as it appears that most traffic from both structures came from the north, instead of passing directly between the buildings. Unfortunately, all buildings to the north of these two structures were destroyed during the 1976 bulldozing.

The eastern enclosure contains pottery vessels with a greater storage capacity than any other building excavated at the site to date. Also, there were two hearths under the roof of the building, one of which had a large vessel resting on the stones at the time of the eruption. A metate was mounted on its *horquetas* in the northeast corner of the eastern enclosure. The combination of storage of sacred artifacts in the innermost rooms and the food storage-processing-serving complex on the east appears much like the *cofradia* houses in traditional Maya communities that are known ethnographically and ethnohistorically. In particular, it resembles the earlier historic *cofradia* houses, before they began moving year by year to new cargo holder's houses. That change occurred a couple centuries ago in many communities (Robert Carlsen personal communication 1993). In the first few centuries after the conquest, religious associations would construct a permanent structure to house their sacred artifacts and their food storage-processing-dispensing artifacts. If we are correct in this interpretation, it may provide an explanation for why the supposed Spanish introduction of the institution of *cofradias* was successful: it closely matched a native institution of considerable antiquity.

One of the obsidian blades stored in an elevated context toward the northeastern corner of Structure 10, probably on or near a roofing beam, tested positive for human protein. It is possible that the blade retained human hemoglobin because someone inadvertently cut themselves while making or using the blade, but it appears more likely that it was used for human bloodletting in a ritual context. Many other items were stored in elevated contexts in this area, along the front or east side of the building, including a painted gourd, obsidian blades, bone tubular beads, other shaped bone items, a greenstone celt, and numerous donut stones. There were, in total, at least 43 vessels in the structure. The total roofed area was some 53 m^2, as Gerstle calculates, larger than domestic structures at the site. One intriguing feature of the structure is the half-height *bajareque* wall along the northern end of the eastern wall. It probably was designed to allow religious participants to approach the building to receive food and drink, without having to enter the building.

Structure 12 - A Religious Building

Structure 12 is more difficult to understand in terms of what people did in and around it than is Structure 10. As pointed out in the Sheets and Simmons chapter, it clearly was not a household structure, and it was not a public building such as Structure 3, or a semi-public special use building such as Structure 9, the *temescal.* Access to the building was discouraged by a very low wooden lintel coated with clay and a doubly-thick wooden pole door securely anchored into sockets dug deep into the clay columns outlining the doorway. Even inside the building, easy access to different rooms was discouraged by partial partition walls and two small interior doorways. When the pole door was in place, people evidently would approach the building and leave offerings on top of the lintel or the column tops. We found small offerings that had been left there, including a small collection of minerals, two spindle whorls, an obsidian blade and macroblade, a greenstone disk, and other items. Also, there was much more foot traffic outside the building and up to the first step than there was continuing inside, judging from the compaction of the ground surface and the abrasion to the surface of the first step.

Most of the artifacts found in the structure seem to be more personal or family heirlooms than items of intrinsic value. Many are partially broken and worn, apparently from years of curation. They may have been brought to the building in exchange for some kind of service rendered. A possible service could have been shamanism. Alternatively, the building function might be divulged by the latticework decoration found along the front wall adjacent to the entrance. It has the appearance of the mat symbol, thus suggesting that the building could have been a council house, a *popol na* in Maya. As such, it would have been the locus for meeting of the council of elders, presumably to discuss a range of political-religious-social issues. The nature and distribution of artifacts in the structure are difficult to reconcile with it functioning as a *popol na*, however.

Operation 2

In Chapter 6 Brian McKee reviews the work done this season in Operation 2. For conservation purposes, the tephra removal to the north and south of Structure 9 was a major accomplishment. The fact that direct evidence of some erosion by water having flowed out of the building was found along the bench at the entrance lends considerable additional credence to the interpretation that it was used as a sweatbath or *temescal.* The excavations on the building's north side, that encountered the water erosion, also encountered various artifacts, and the drip line that was 25 to 40 cm. beyond the north wall of the structure. The north side tephra removal will aid conservation by providing extramural ground surface for the evaporation of capillary moisture. A considerable amount of tephra was removed from the building's south side to decrease intrastructural humidity. Unfortunately, the tephra removal intersected a small perched water table or subsurface flow, and water is still dripping into the operation at the southwest corner of the excavation cut.

The south wall of the structure is now exposed, and there was no entrance from this side. A very curious large "lump" of TBJ tephra, mixed with some seeds, leaves, and clay, had been placed on top of the thatch roof, along the south side of the building. Why it was placed there is unknown. The southernmost extent of the excavations encountered numerous maize plants, so the maize field that was found to be so extensive to the east of the building is now known to extend to the south of it as well. The midden excavations were continued, and a dense accumulation of sherds, lithics, organic material, and wood ash was discovered. Most of the obsidian prismatic blades found in the midden are surprisingly sharp, but short. We are beginning to suspect that the principal reason that blades were discarded was not because they became dull during use, but because they broke and the small pieces that snapped off were too short to hold and use effectively.

Ceramic Analysis

Marilyn Beaudry-Corbett continues her thorough analysis of ceramics, relating them to community organization. She includes an analysis of Postclassic ceramics from the area. She found the Postclassic forms to be simple, with plain rims, and horizontal handles (Classic period ceramic vessel handles were vertical). *Comales* were common. Occasional glazed ceramics probably were from the period of contact with the Spanish. In the Classic period Ceren site she recovered and analyzed over 20 vessels from Structures 10 and 12. Three jars were lifted from the north room of Structure 12, but two very large jars had to be left in place in the tephra that is assisting in supporting two fragile *bajareque* walls. She was able to recover and study 15 complete vessels, and parts of other vessels from Structure 10. Other vessels had to be left *in situ* within volcanic ash balks, for the same reason the vessels were left in Structure 12. Beaudry-Corbett was able to define one new type/variety unit within the Guazapa ceramic group. She notes that Structure 10 has more vessels than any other yet excavated at Ceren. And, within the subgroups by form, it has more jars, more utilitarian vessels, and more total whole vessels than any other structure. I believe that these relate directly to its probable function as a religious association, for short-term storage of food, its processing, and dispensing. The building is notable for having the greatest food storage capability in ceramic vessels than any building excavated to date. Some of that food storage may have been long-term, if the assumption that jars without handles are used for long-term food storage is correct. She is continuing her work on elemental analyses of ceramic paste.

Lithic Analysis

The lithic analysis is presented in Chapter 8. A moderately wide range of chipped stone and groundstone artifacts were excavated during the 1993 season, from intra-structural contexts as well as from areas between structures and from the midden. The midden yielded a small percussion flake from the cobble percussion industry, an informal alternative means of obtaining cutting edges to the more

specialized core-blade technology. Although they are rare, at least a few small artifacts of obsidian from the midden seem to have derived from core-blade manufacture, indicating that at least some manufacture took place nearby. The vast majority of chipped stone artifacts from the midden were small, short, but generally quite sharp segments of obsidian prismatic blades.

The consistent pattern of storage of obsidian prismatic blades is in roofing thatch at predictable locations within all **household** buildings excavated to date at the site. It appears significant that none of the stored but useable prismatic blades in Structures 10 and 12 were stored in the thatch. The blades of Structure 10, the religious association, were stored in elevated contexts on elevated roof beams or on the elevated shelf. Perhaps because Structure 10 would have been used by many people, and presumably various people would be using the same blade at different times, it would have been best not to store it in roofing thatch, but in a more visible but still elevated and protected location. Within a household, very few people would have used a given blade, so storing in a very safe yet less visible location would be feasible. The blades found in Structure 12 were on the lintel at the entrance or on wall or column tops. These blades, including the macroblade, apparently were individually placed as offerings rather than stored by the user for later use as parts of a functioning assemblage. In fact, the macroblades and prismatic blades found in Structure 12 have edges with the greatest amount of use wear of blades found in any structure yet excavated at Ceren. Most of them would be difficult to employ in cutting tasks.

The blades found in Structure 10 are notable in a few respects. In addition to all being in elevated but not thatch storage, they all were in fair to good condition just prior to the eruption. Only two of the eight prismatic blades in use had moderate to heavy use wear, and the others had little or no detectable use wear. No other structure excavated to date had so many prismatic blades in storage that were easily accessible. As previously mentioned, one of these blades tested positive for human hemoglobin.

Only a few groundstone artifacts were found during the 1993 season. A greenstone disk was found in the entryway of Structure 12, and it probably was placed on the lintel. A large mano was found immediately east of that building, evidently dislodged from its original locus on top of a wall or column by the impact of a sizeable lava bomb at the beginning of the Unit 4 tephra emplacement.

Structure 10 sheltered a nicely-made greenstone celt just inside the low eastern wall, adjacent to the central column. As with the other celts found at the site to date, it too showed no definitive evidence of having been hafted.

Only 8 prismatic blade fragments were found in the excavations of some 118m^2 of patio extending east from Household 1 to the north sides of Structures 10 and 12. That is a very low density for such a common artifact, and probably is a direct result of efforts to discard sharp and potentially dangerous items in safer or

more distant locations. The more high-use areas within this extent of patios had fewer prismatic blades than the more informally or presumably less frequently used areas. The blades found in the patio areas consistently are short (less than 3 cm. in length), quite used, heavily patinated, and have sustained edge damage from trampling or compaction. Two of the blade segments found in this area tested positive for dog protein.

Electrophoresis of Organic Residues on Obsidian Blades

As a part of the lithic analysis, 29 samples of organic residues were removed from obsidian artifacts, largely prismatic blades, and sent to Margaret Newman at the University of Calgary for analysis. Of the 29, 24 tested negative for protein, meaning that either there was insufficient protein remaining on the blade to be detected, or it had no protein and had been used to cut other substances. Five of the 29 tested positive for protein, and all five could be identified as to species. Two had deer blood on them, one of which (295-1-233) came from a long blade kept in the roofing thatch of the Household 1 kitchen (Str. 11). It is not difficult to conclude that, at least occasionally, females in Household 1 were cutting deer meat to include in meals. It is likely that the deer bones, hide, antlers, brain, and some internal components were utilized in other activities as well. The other blade with deer protein (295-1-43) was stored in the roof of the craft room added onto the east side of Structure 1, the Household 1 domicile. Given the craft orientation of the room, it is likely that further processing of deer bodies was done in this area.

Two of the blades analyzed for protein tested positive for dog. One was a blade (295-8-370) that had been discarded into the Household 1 patio area just to the east of Structure 1, and the other (295-8-250) was a blade that had been used and discarded by members of the same household into the area east of Structure 6. The most probable reason that Ceren residents were cutting dogs is for food. It is possible that the skin and some other parts were also utilized.

One of the prismatic blades (295-8-451) tested positive for human protein. It was placed in elevated storage, probably on a roofing beam, over the eastern wall of Structure 10. Because Structure 10 apparently belonged to a religious association, it appears likely that this blade was used in human bloodletting. However, it must be pointed out that it is at least conceivable that the protein on the blade could have resulted from an error during manufacture, or from someone inadvertently cutting themself while attempting to cut something else. The latter possibility is lessened by the fact that the sample was taken from the distal end of the blade, away from where one would be holding it.

Objects Conservation

Holly Lundberg and Harriet Beaubien report on their object conservation activities in Chapter 9. It would be difficult to overstate the importance of having objects conservators on-site during the entire field season. Although we, as archaeologists, are adequately trained to handle the usual ceramic or lithic artifact, we are certainly not adequately trained in polar and non-polar solvents for various consolidants that can conserve the fragile organic artifacts that must be preserved into the indefinite future. Thus we greatly appreciate the efforts of the Conservation Analytical Laboratory of the Smithsonian Institution in training and providing objects conservators to handle the extraordinary artifacts of Ceren. The conservators reorganized storage at the Ceren bodega in the Museo Nacional David J. Guzman, and improved the condition of many artifacts stored there from previous years of research. The deer skull headdress received much attention, but it needs many more hours of work and the design of a special mount before it can go on display.

Eight pottery vessels and a figurine from last season's research were reconstructed, using Acryloid B-72 adhesive dissolved in acetone. The conservators used specialized lifting and treatment procedures for numerous artifacts that were too fragile to be lifted directly. Those included a particularly well-preserved section of roofing thatch, an articulated rodent skeleton, a tree with a pole lashed to it by rope, carbonized organic materials and artifacts, various painted objects including gourds, and other artifacts. The painted gourds generally require special treatment including chemical treatments, plaster support caps, block lifting, inverting, and further treatment and excavation done in the laboratory with the assistance of a binocular microscope.

Paleotopography

Larry Conyers collected topographic and tephrastratigraphic information to assist him in a partial reconstruction of the paleogeography of the site prior to the Loma Caldera eruption. As he notes, the Ceren volcanic sequence is a series of 15 units of alternating airfall and surge (pyroclastic flow) units, made up of 14 Loma Caldera units and the last of the later eruptions. The airfall units follow the pre-existing topography. However, the laterally moving surge units occasionally scour the pre-existing landscape or previously-deposited volcanic unit, and they often fill in low areas. They occasionally knocked over obstructions such as standing walls, trees or limbs of trees, crops, and other previously vertical items. Conyers measured the Ceren volcanic sequence at thirty- two locations within the site to study variation in unit thicknesses, focusing on the lowermost eight units. The results of his study include the realization that the highest part of the site yet excavated lies around Structures 12 and 10. The most clear topographically low feature is a ditch or drainage that runs from north to south along the western edge of the known site. Part of the drainage was used for trash disposal, and has been partially excavated in Operation 2, to the southwest of Structure 9. A smaller ditch separates the north and

south gardens of Operation 1, and also heads north. They may meet and head toward the east, to drain into the Rio Sucio. Conyers found that Ceren residents tended to construct buildings on topographically high locations.

Conyers was able to digitize the analog data from the original radar survey conducted on the one hectare at the site in 1979. After digitizing the immense set of data, he has begun analyzing it, and has found numerous anomalies that may well prove to be ancient structures. Also, as the data are presently being analyzed, he is discovering topographic variation within the hectare of which we had no knowledge before. The digitized radar data are so robust that we have decided to arrange for more radar work between the site and the town of Joya de Ceren to be conducted in March of 1994, using a SIR-10 digital ground penetrating radar unit.

Medicinal Plants at Joya de Ceren

Susan Villalobos began research on local plants growing in the Ceren area, around the site and the village of Joya de Ceren. It is possible that some of the plants that were used for medicinal and related uses in the area 1400 years ago are still similarly employed by residents of traditional villages in the area. She was able to find and document a number of plants in the area that are currently being used, for a wide variety of purposes. They are summarized in her chapter. She was also able to interview community residents, and she found that some people are exceptionally knowledgeable about the plants growing in their area, and their uses for medicinal purposes.

Summary

The 1993 season added important data and understanding to a number of aspects of village life in ancient Ceren, not the least of which came from Structures 10 and 12. Both are involved in religious activities, but in very different ways. The large protective roof allowed for lateral "landscape" excavations of the patio of Household 1, which graded into the patios of Structures 10 and 12. The small cracks in the latter two patios provided the first direct clues to what initial phenomena preceding the eruption may have provided the impetus for people to figuratively and probably literally "head south" and flee their village. How far they got is unknown, as they may have been overcome by the 50 to 200 km/hr lateral blasts of Unit 1 not far from their structures. On the other hand, some people probably were able to flee to places far enough from the searing clouds of ash to escape with their lives. They certainly did not escape with much in the way of posessions.

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