TERMINAL FORMATIVE RELIGION AND POLITICAL ORGANIZATION ON THE COAST OF OAXACA, MEXICO:

THE PERSPECTIVE FROM CERRO DE LA VIRGEN

By

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Terminal Formative Religion and Political Organization on the Pacific Coast of Oaxaca, Mexico: The Perspective from Cerro de la Virgen

Thesis directed by Professor Arthur A. Joyce

This dissertation examines the political organization of the first complex polity in the lower Río Verde Valley on the Pacific coast of Oaxaca, Mexico during the Terminal Formative Period (150 BCE-250 CE). During this time, political complexity in the region culminated in the emergence of a political seat of power at the site of Río Viejo at ca. 100 CE. However, the incipient polity collapsed little more than a century later. While traditional models of political organization in early complex polities might assume that secondary communities represented an administrative hierarchy through which leaders at Rio Viejo governed the region, current evidence does not suggest a strong degree of regional integration during the Terminal Formative. Examining political integration in the Río Viejo polity allows us to explore an instance where regional rulership may have been tenuous and short-lived rather than strong and historically durable. Rather than assuming integration in the hinterland, the project makes the rural community of Cerro de la Virgen the focus through large-scale excavations of the site's public architecture and examines the social and material relations that constituted meaningful collectivities at the so-called "margins" of the polity. Though people were tied together through cultural institutions, rules, and obligations that went beyond economic commitments to elites, this research pushes integration a step further by considering the complex relationships between humans and the material world that enabled and constrained social life. Results of the project indicate that strong affiliations to local communities were facilitated by communal religious practices in public buildings, which likely prevented the development of regional political authority.

for Ruthie

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I. INTRODUCTION TO THE DISSERTATION

Exploring the ways in which institutionalized political authority emerged in the world's earliest complex polities is one of the central concerns of archaeological research today. Archaeology is particularly well suited to study the earliest manifestations of this phenomenon because it can capture social complexity over extended periods through the analysis of material remains. Despite the attention archaeologists have focused on early polities in the past, there has been little consensus on an approach toward understanding how they were established and how they operated. Past research has focused on identifying the categorical markers of political authority (e.g., Fox et al. 1996; Marcus 1998), while some contemporary frameworks have analyzed the material signatures of human practices that facilitated, and sometimes prevented, complex social hierarchies (e.g., Joyce and Barber 2015a). Put simply, this topic is one that attempts to understand how leaders come to lead (or fail to do so) and why followers decide to follow (or refuse to do so). Among other areas of the ancient world in which complex polities (or, "states") first developed like Egypt, Mesopotamia, China, the Indus Valley, and the Andes (Bard 2008; Chang 1989; Loewe and Shaughnessy 1999; Trigger 2003; Yoffee 2005), the region of Mesoamerica provides an ideal laboratory to examine these questions.

This dissertation examines the social institutions that shaped the political organization of the first complex polity in the lower Rio Verde Valley[1] on the Pacific coast of Oaxaca, Mexico (Figure 1.1). As in other areas of Pre-Columbian Mesoamerica, the culture history of the lower Verde is marked by increasing social complexity throughout the Formative Period (1800 BCE - 250 CE[2]). During this time, the regional population in the lower Verde increased dramatically. The total regional settlement area increased from 344 ha in the Late Formative to 1138 ha by the end of the Terminal Formative

[1] Throughout this dissertation, I use the phrase "lower Verde" as an abbreviation for "lower Rio Verde Valley", and use "Rio Verde" to refer to the river that runs through the region's flood plain.
[2] Dates reported in this dissertation with "BCE" and "CE" are uncalibrated.

(Hedgepeth Balkin et al. 2017; Joyce 2010). Sociopolitical complexity culminated in the growth of a nascent polity at the outset of the Terminal Formative Period (150 BCE - 250 CE), with its political seat of power situated at the urban center of Rio Viejo. Several secondary communities were distributed in the hinterland surrounding Rio Viejo, including Cerro de la Virgen, Yugüe, San Francisco de Arriba, Charco Redondo, Loma don Genaro, and Barra Quebrada. The Rio Viejo polity was unstable, collapsing by 250 CE as the region's population dispersed into small settlements. The ceramic chronology of the lower Rio Verde Valley is displayed in Table 1.1.

Archaeological evidence from over thirty years of research in the lower Verde has suggested that, to some extent, polity leaders at Rio Viejo were able to extend their influence across the region, illustrated by the growth of the site into an urban center during the Terminal Formative (Joyce 1991; 2010; Joyce and Barber 2015a; Joyce et al. 2016). The construction and use of the massive Mound 1 acropolis, occupying a volume of about 455,050 m^3 at the end of the Formative, has also indicated that people from around the valley were drawn to Rio Viejo to participate in collective building projects and ritual feasts at the ceremonial center (Joyce 2006; Joyce and Barber 2011; Joyce et al. 2013). While traditional models of political organization in early complex polities might assume that secondary communities during this time represented an administrative hierarchy through which leaders at Rio Viejo governed the region, current evidence has not yet clarified the degree of regional integration in the lower Verde. To address the nature of the tenuous Rio Viejo polity, especially why it collapsed so quickly, this dissertation focuses on the social and material relations that constituted meaningful collectivities at the so-called "margins" of the polity. The rural site of Cerro de la Virgen presents an ideal case for studying the negotiations that occurred between Rio Viejo and the valley's hinterland because the site persisted through the social upheaval at the end of the Formative.

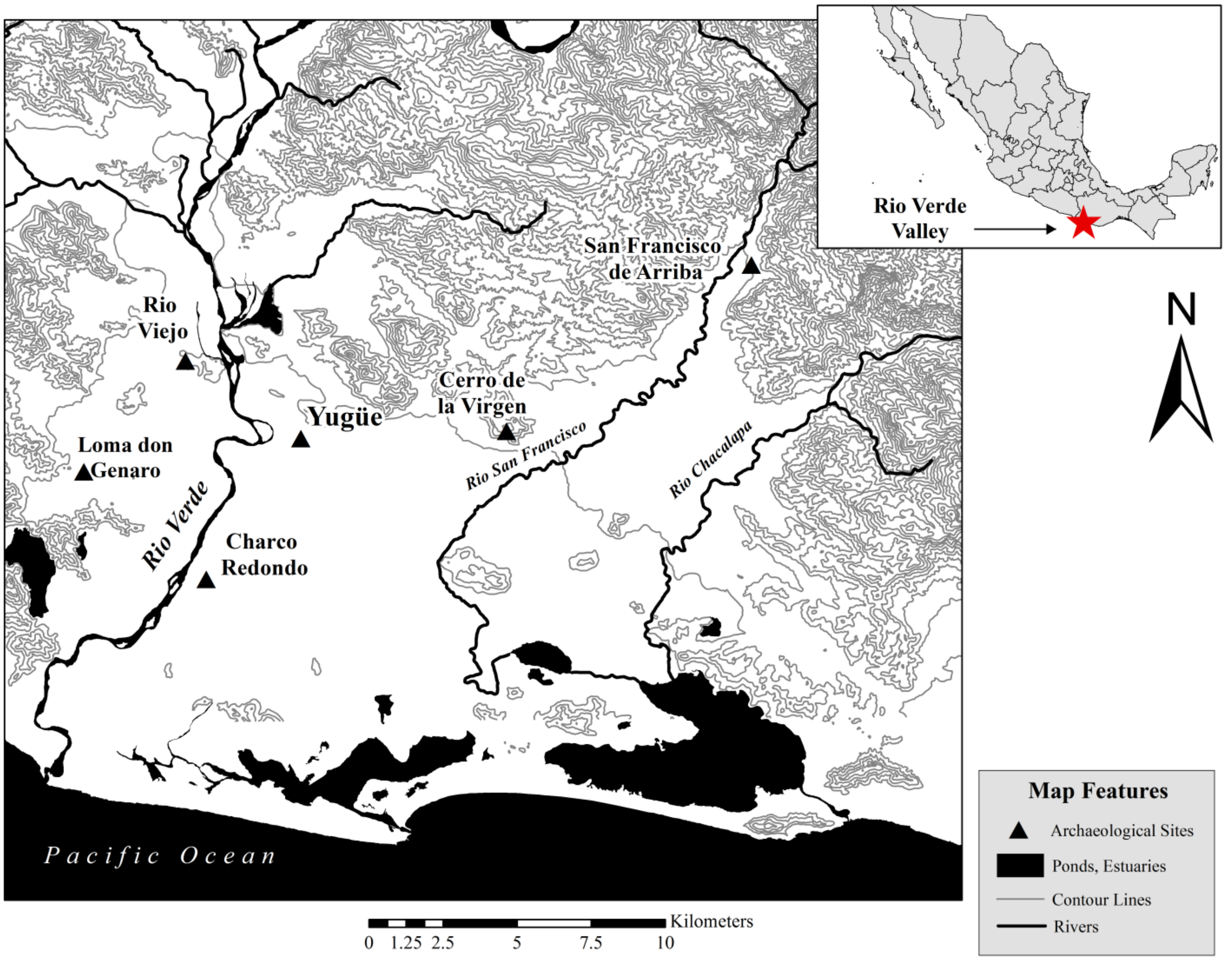


Figure 1.1: Map of the lower Rio Verde Valley with later Formative period sites mentioned in the text (map courtesy of Jessica Hedgepeth Balkin)

CULTURE HISTORY AND ECOLOGY OF THE LOWER RIO VERDE VALLEY

The lower Rio Verde Valley consists of the floodplain of the Rio Verde, coastal estuaries and lagoons, and the surrounding piedmont zones in the foothills of the Sierra Madre del Sur. The large drainage area and volume of discharge of the Rio Verde make it one of the largest rivers on the Pacific coast of Mesoamerica (Tamayo 1964). The valley is home to an array of ecological zones, including riverine, floodplain, lacustrine, estuarine, marine, piedmont, and mountain habitats (Joyce 2013; Joyce et al. 1998). This diverse ecology bestows abundant resources on the region's populations, including fish, shellfish, wild plants and animals, and some of the most productive agricultural areas in the state of Oaxaca (Joyce 2013; Rodrigo Alvarez 1998; Kowalewski et al. 2009).

Table 1.1: Lower Rio Verde regional ceramic sequence with uncalibrated radiocarbon dates (see A. Joyce 1991; Hepp 2015)

Phase	Period	Date
Yucudzaa	Late Postclassic	1100-1522 CE
Yugüe	Early Postclassic	800-1100 CE
Yuta Tiyoo	Late Classic	500-800 CE
Coyuche	Early Classic	250-500 CE
Chacahua	Late Terminal Formative	100-250 CE
Miniyua	Early Terminal Formative	150 BCE-100 CE
Minizundo	Late Formative	400-150 BCE
Charco	Late Middle Formative	700-400 BCE
(unnamed)	Late Early-Middle Formative	1350-700 BCE
Tlacuache	Initial Early Formative	1600-1350 BCE

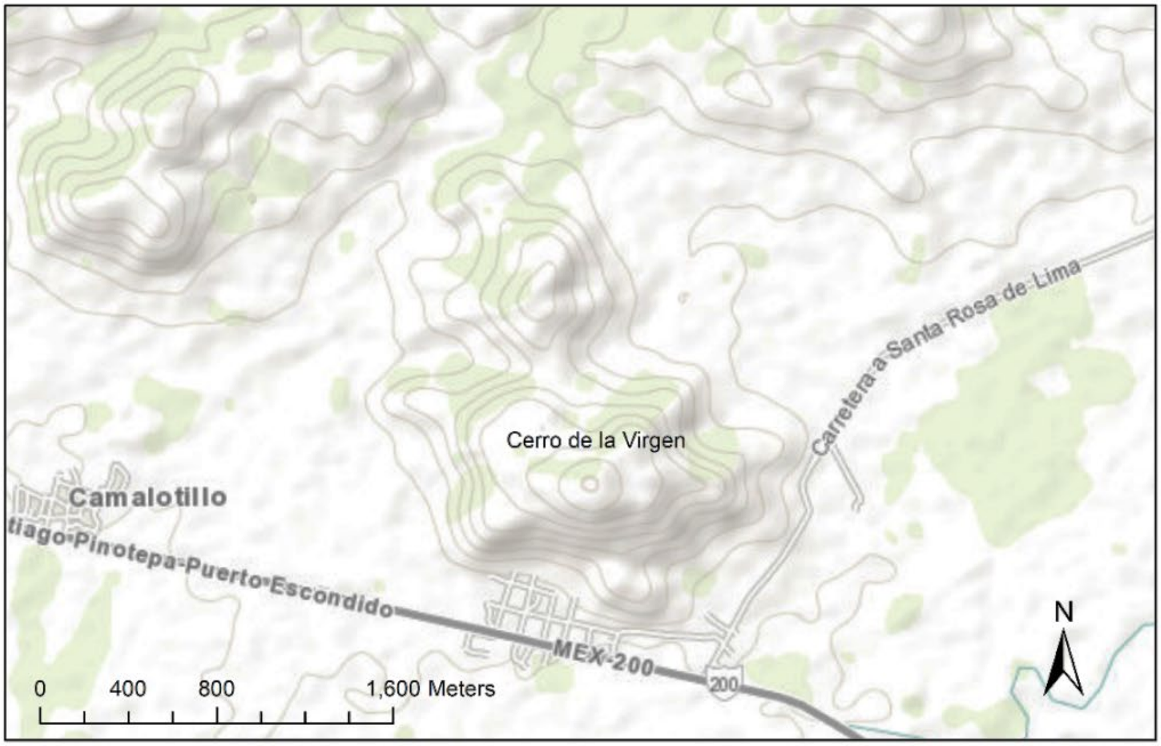
The lower Verde experienced significant population growth throughout the later Formative (400 BCE - 250 CE), the beginnings of which can be traced back to the Middle Formative (Joyce 1991a, 1994, 2010). Paleoenvironmental evidence from sediment cores suggests that the expansion of the lower Verde floodplain and the creation of coastal estuaries during the earlier period contributed to the growth of settlements at the end of the Formative (Goman et al. 2005, 2013; Mueller et al. 2013). By the Late Formative, demographic centers emerged at Charco Redondo (70 ha) and San Francisco de Arriba (95 ha) with monumental construction occurring at both sites (Butler 2018; Joyce et al. 1998; Workinger 2002). Outside of these sites, most people lived in smaller communities where communal practices such as ritual feasting, cemetery burial, and the collective construction of public buildings defined local collectivities of people at the scale of multiple households or even whole communities. For example, Joyce's (Joyce 1991a, 1991b, 1994) field work at the small (1.5 ha) Late Formative site of Cerro de la Cruz revealed indications of ritual feasting and cemetery burial that took place in public buildings. These practices brought together multiple households, but there are few material signatures of social distinctions in the form of elaborate burials or residences. Joyce and colleagues (2016:65) argue that the presence of communal rituals and labor projects, and the lack of pronounced inequality, indicate that political authority during the Late Formative was defined in terms of social relations that were “horizontal” and “communal” rather than “hierarchical” and “exclusionary.” These communal activities constituted a sense of identity among Late Formative communities that was predicated on local affiliations rather than those at the regional level (Joyce 1991b).

Political complexity in the lower Verde reached a pinnacle during the late Terminal Formative period at ca. 100 CE (Joyce 2010). During this time, the lower Verde witnessed a rapid increase in population and the development of the Mound 1 acropolis, a massive monumental structure that served as the late Terminal Formative-period ceremonial center at Rio Viejo (Joyce 2006). Monumental architecture dating to the late Terminal Formative was constructed at no less than nine other sites in the region, including outlying communities like Cerro de la Virgen in the piedmont (Joyce et al. 2016). Evidence from the Rio Viejo acropolis suggests that polity leaders were able to control labor resources at the regional level, and at times, were able to draw people to the ceremonial center for communal rituals such as large-scale feasts (Joyce 2010; Joyce et al. 2016). The expansion of regional political authority by leaders at Rio Viejo was short-lived, as the polity collapsed little more than a century later at 250 CE and the valley’s population dispersed into scattered settlements in the foothills (Joyce 2010).

Coastal Oaxacan scholars have recently argued that the incipient and short-lived regional political authority in the lower Verde was the result of negotiations among the myriad social groups that lived in the region, which involved political and religious practices, ideas, and materials that were focused on public buildings (Barber 2013; Barber et al. 2014; Joyce 2010; Joyce and Barber 2015a; Joyce et al. 2016). This dissertation tests the hypothesis that the persistence and strength of hinterland people’s ties to their local communities likely conflicted with growing demands by leaders at Rio Viejo for communal labor and participation in rituals at the Mound 1 acropolis. Rather than assuming integration in the hinterland, this dissertation project makes the rural community of Cerro de la Virgen the focus of its study through large-scale excavations of the site’s public architecture.

THE SITE OF CERRO DE LA VIRGEN

Cerro de la Virgen is an archaeological site located on a large hill of the same name overlooking the modern town of San Felipe in the local municipality of Tututepec, Oaxaca, Mexico. The site is situated about 10 km to the east of the Río Verde and approximately 14 km north of the Pacific Ocean in the southernmost edge of the piedmont. The hill consists of two peaks linked by a saddle that runs north-south, the southern peak steeply rising over 200 m above the floodplain (Figure 1.2). The archaeological component of the site covers 92.25 hectares, including most of the hill and possibly up to 100 m of the floodplain to the south. Previous research at Cerro de la Virgen included a full coverage survey conducted by Arthur Joyce in 2000 (Joyce et al. 2009) that identified the site's impressive terraces and masonry building foundations. In 2003, Sarah Barber (2005) carried out horizontal excavations of an elite residence (Residence 1) near the top of the hill, which identified at least three construction episodes dating to the late Terminal Formative-period Chacahua phase. Barber also identified ritual practices tied to the elite residence in the form of caches of ceramic vessels as well as possible evidence for feasting. Preliminary reconnaissance of the public, ceremonial center of the site was also carried out on the terraces below and to the west of Residence 1. Over the course of three days in 2009, I conducted additional reconnaissance and completed a preliminary total station map of the ceremonial center, which was augmented by additional mapping in 2013 and 2016.



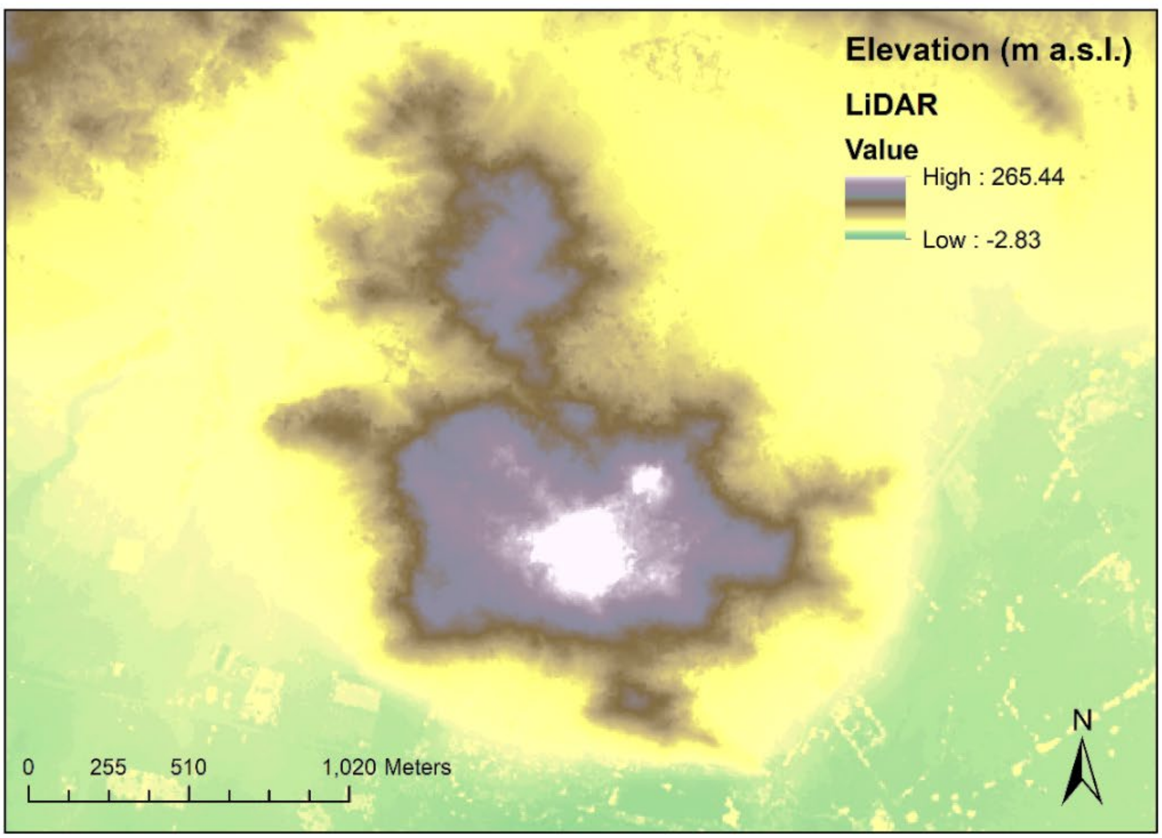


Figure 1.2: (top) Topographic map of Cerro de la Virgen (INEGI); (bottom) LiDAR map of Cerro de la Virgen (INEGI)

The base of the ceremonial center at Cerro de la Virgen is formed by Terrace 2, a large, flat space with an area of approximately 1.1 ha on the side of the hill (Figure 1.3 and 1.4). Terrace 2 supports an architectural complex (Complex C), two smaller terraces to the northwest (Terraces 12 and 13) and Terrace 11 to the northeast. Terraces 11 and 12 contain architectural complexes (Complexes A and B, respectively) with stone building foundations in L-shaped, perpendicular configurations. The space between Terraces 12 and 13 formed the playing alley of an I-shaped ballcourt. We recognized the complexes as distinct based on architectural features that demarcated spaces as separate. For example, Complexes B and C were separated by the open plaza in the center of Terrace 2; Complex A is situated about 7 m above Complexes B and C on Terrace 11. Builders mined stones from local granite outcrops and shaped them into blocks of varying size to construct the terrace retaining walls, which ran parallel to one another. The playing alley of the ballcourt had an orientation of 23˚-203˚ and was approximately 25 m long and 6 m wide, forming an I-shape similar to ballcourts at other Formative-period sites in Oaxaca, including Monte Alban (Gillespie 1991; Kowalewski et al. 1991). Terrace 12 supports architectural Complex B, which consists of an L-shaped building with a stone foundation and two small patios, one open patio located to the west overlooking the ballcourt and one to the northeast that was enclosed by the building's foundations. Terrace 13 may have supported several smaller structures, but looter's pits prevented delineating these structures based on surface observations. While the southern end of the ballcourt remains mostly intact, the northern end has been washed out by erosion.

Across the open plaza to the south of the ballcourt, Complex C consists of an L-shaped building and two adjacent rectangular buildings situated near the southern edge of Terrace 2. Looter's pits have heavily damaged the smaller buildings. The L-shaped building faces a small patio, which opens toward onto the Terrace 2 plaza. To the east is Terrace 11, which rises 5 – 6 m above the plaza. Terrace 11 supports architectural Complex A, an L-shaped building with patios located to the north and south. The buildings in Complexes A and B were similar in size but oriented in opposite directions, with Complex B opening toward the east and Complex A opening to the west. A monumental stairway with steps and balustrades leads from the base of Terrace 11 up to Terrace 10, which overlooks the civic-ceremonial core. On Terrace 10, builders constructed Structure 1, a rectangular building with stone foundations. A small open patio occupied the space between the stairway and Structure 1.

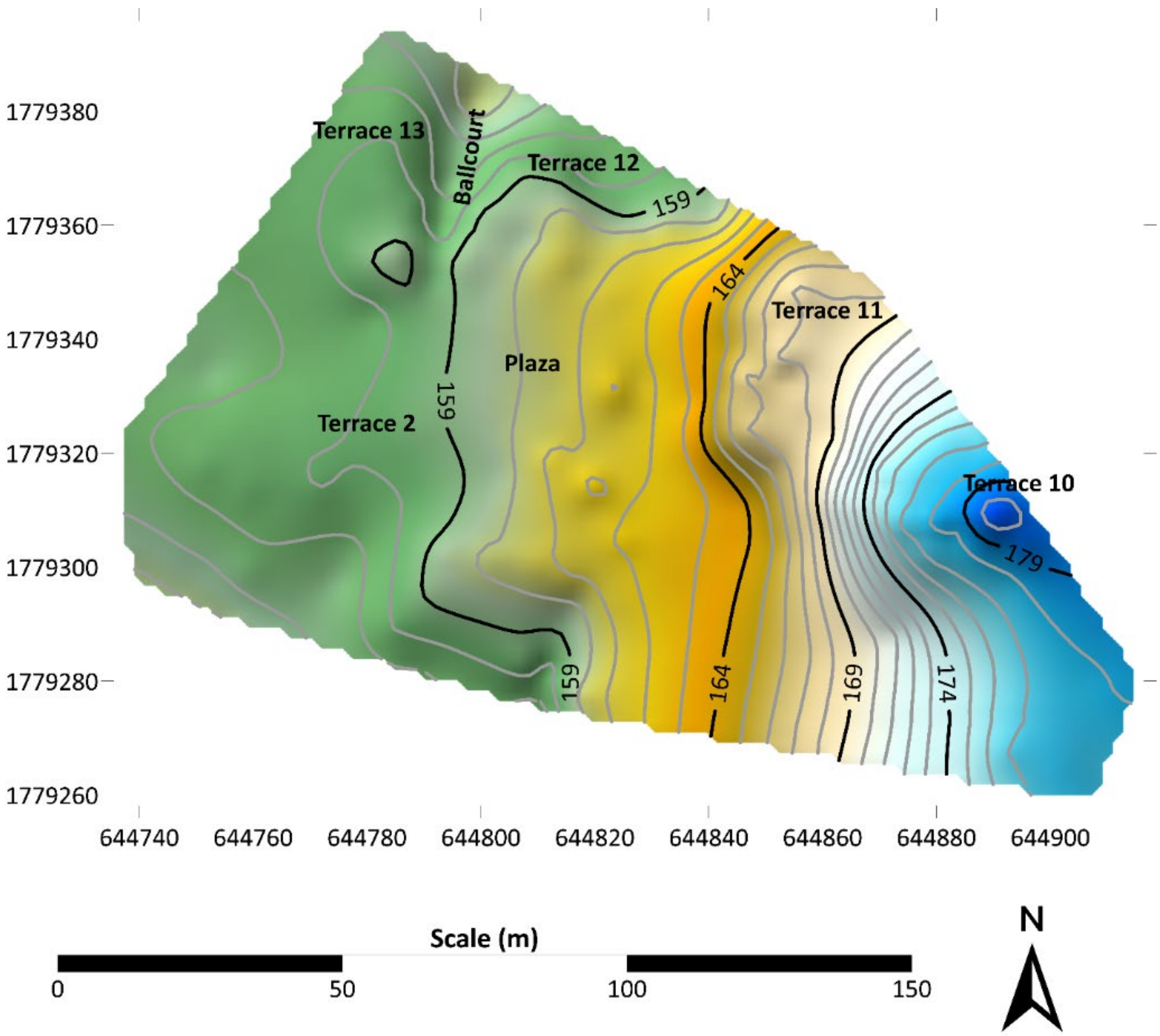


Figure 1.3: Topographic map of the ceremonial center of Cerro de la Virgen, with relevant architectural features labeled.

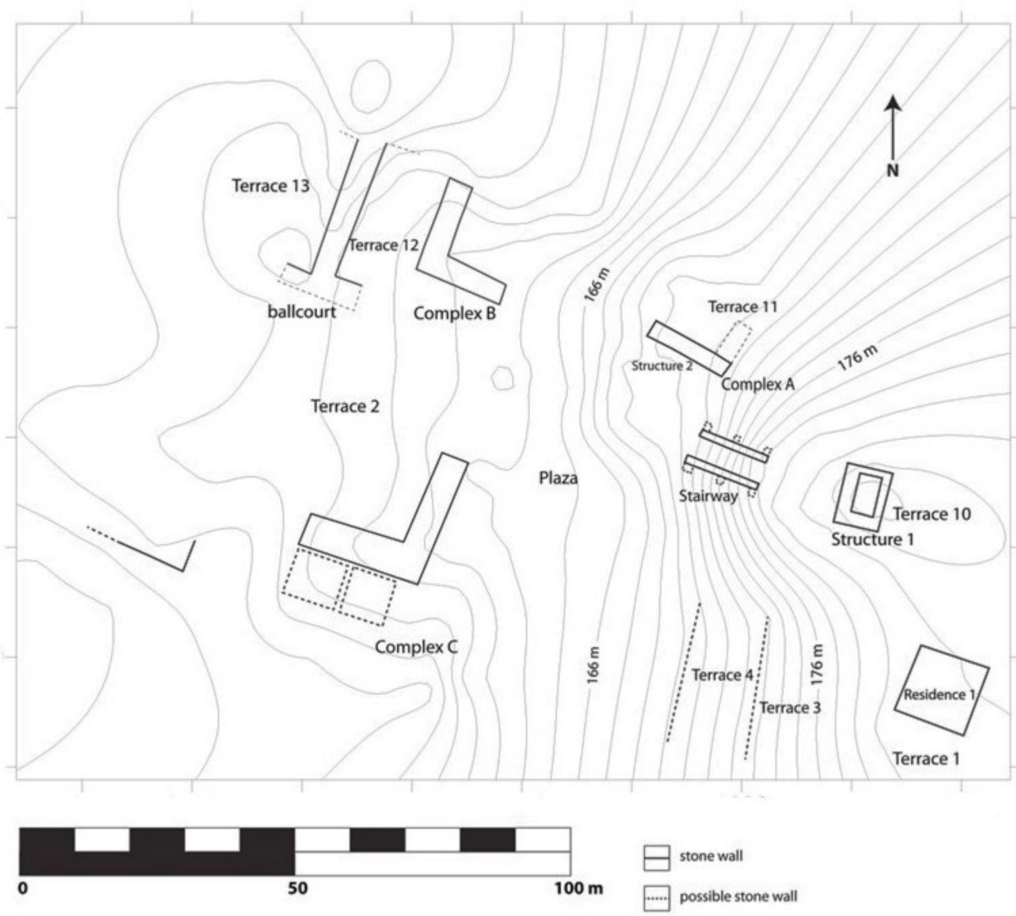


Figure 1.4: Topographic map of the ceremonial center at Cerro de la Virgen with architecture visible on the surface labeled.

Among the dozens of terraces that surround the ceremonial center in each direction was Terrace 15, located approximately 150 m to the north of Complex B, separated from the ceremonial center by an arroyo. The terrace contained three levels, the lowest of which was broken into two sub-terraces (15a and 15b) separated by a gap that may have served as the entrance to the complex (Figure 1.5). Masonry building foundations were observed on the modern surface of Terraces 15a and 15b. Above and to the west of the lower level were Terraces 15c and 15d, both of which were retained by large stone walls visible on the modern surface. Collectively, the built terraces and masonry architecture in Terrace 15 are termed Complex E. Immediately to the north, the terrain drops off steeply into the saddle between the two peaks of the hill. Several smaller, likely residential terraces overlooked Complex E from the east. Several modern erosion channels were also observed on the southern edge of the complex.

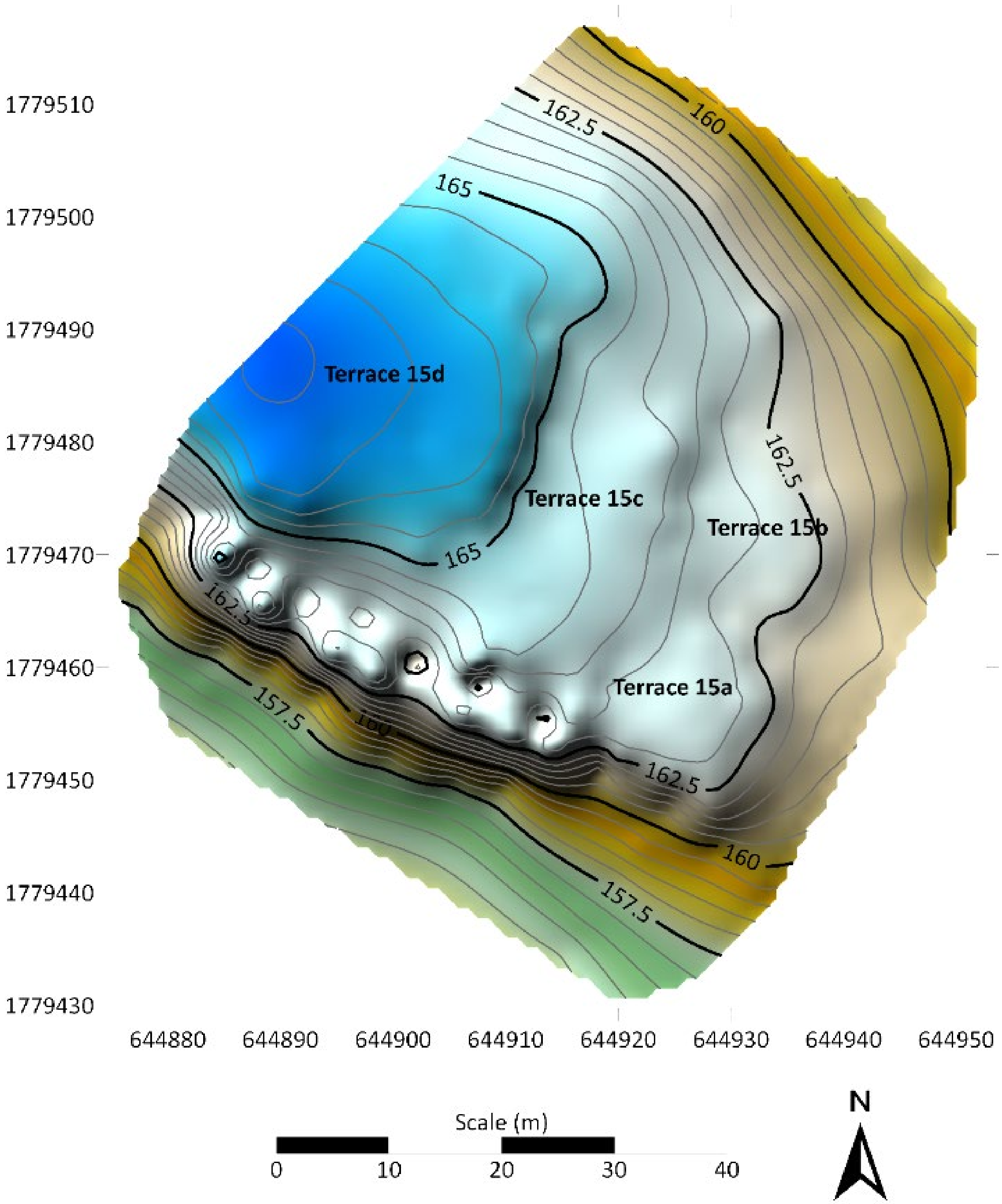


Figure 1.5: Topographic/colored relief map of Complex E/Terrace 15 with sub-terraces labeled.

The data collected and analyzed during this dissertation came primarily from excavations conducted during two archaeological projects. The first was carried out in 2013 under the auspices of the Rio Verde Project (abbreviated "PRV" after the Spanish translation, "Proyecto Rio Verde"), an archaeological project directed by Drs. Arthur A. Joyce and Sarah B. Barber and funded by a Religion and

Innovation in Human Affairs Grant from the Historical Society (with support from the Templeton Foundation). The main goals of the PRV13 were to investigate public architecture at three archaeological sites with substantial Terminal Formative occupations, including Rio Viejo, Loma Don Genaro, and Cerro de la Virgen. I directed the field operations for the PRV13 research at Cerro de la Virgen as my dissertation pilot study, which focused on the ceremonial core of the site, located on the shallower western slope of the hill. Excavations conducted during the PRV13 were focused on Complex A, Structure 1, the ballcourt, and the Terrace 2 Plaza. A second field season of excavations was conducted in 2016 with funding secured from the National Science Foundation, the Tinker Foundation, and the University of Colorado Anthropology Department. The project was titled, "The Rio Verde Hinterland Project", which is abbreviated here as "PTRV" for the Spanish translation "Proyect Traspais del Rio Verde". The PTRV16 continued excavations in the ceremonial center of the site, specifically targeting Complex B and further test excavations in the plaza. In addition, excavations were conducted in Complex E. For the methodological rationale for excavating the locations listed above, see Chapter 3.

QUESTIONS AND GOALS OF THE PROJECT

Researchers in the lower Rio Verde Valley have attempted to move beyond identifying the indices of social complexity (i.e., asking 'is a society complex?') and toward examining the dynamic ways in which people of varying levels of social status negotiate the terms of political organization (i.e., asking 'how is a society complex?'; Barber and Joyce 2007; A. Joyce 2000, 2006, 2010; Joyce and Barber 2015; Levine 2011). To determine what led to the political dissolution marked at the end of the Formative on the coast of Oaxaca, this dissertation examines the organization of the Río Viejo polity through the lens of political integration, defined as the degree to which rulers at a political center maintained authority over subordinates in outlying areas (DeVree 1972; Sharer and Golden 2004). The project's main goal is to address the following question:

At what scale were political, economic, and religious resources mobilized as sources of power by rulers of Rio Viejo in the polity's hinterland communities?

Examining regional integration in the Terminal Formative Río Viejo polity allows us to explore an instance where regional rulership may have been tenuous and short-lived rather than strong and historically durable. Previous research indicates a lack of evidence for environmental crises (Goman et al. 2005; Joyce et al. 2014; Mueller et al. 2013) or a disruption caused by the intrusion of an external polity during the Terminal Formative period (Joyce 2014; Workinger and Joyce 2009; Zeitlin and Joyce 1999). Archaeological evidence from the Río Viejo acropolis suggests polity leaders were able to attract people from around the valley to participate in communal practices such as collective labor projects and ritual feasting (Joyce 2006; Levine et al. 2011; Joyce and Barber 2015a; Joyce et al. 2013, 2016). However, prior to this dissertation project, we have lacked a complementary dataset from a rural community that (1) persisted until the Early Classic Period (250-500 CE) and (2) tested multiple public architectural complexes such that we may evaluate the degree to which ruling institutions permeated life in secondary communities. Data are available from hinterland communities such as San Francisco de Arriba, Charco Redondo, Loma Don Genaro, and Yugüe, but a broader sample from individual sites was needed to discuss regional integration from multiple lines of inquiry.

I hypothesize in this dissertation that the Rio Viejo polity was short-lived and unstable because hinterland populations retained a relative level of local autonomy and were only loosely integrated with leaders and the social institutions they controlled at Rio Viejo (Barber and Joyce 2007; Joyce 2010; Joyce et al. 2016). To assess political integration from a hinterland perspective, it is necessary to identify the sources of power (Blanton 1998; Mann 1986, 2008) through which secondary communities negotiated with incipient polity leaders and the political capital they controlled. More specifically, we must determine whether certain sources of power were controlled on the local level (e.g., by local elites or commoners at Cerro de la Virgen) or the regional level (e.g., by leaders at Río Viejo). The project four basic funds of power representing ritual, labor, exchange, and production resources (see Chapter 3).

Given the lack of evidence for coercive control through violence (Joyce 2010), these social fields provide the best chance at generating quantifiable data to test the hypothesis that the Río Viejo state was loosely integrated and unstable. Though people were certainly tied together through cultural institutions, rules, and obligations that went beyond economic commitments to elites, my perspective pushes integration a step further by considering the complex relationships between humans and the material world that enabled and constrained social life (Hodder 2012; Joyce and Barber 2015a). In addition to modeling resource control from varying levels of power, this research explores the entanglements of humans and things that instantiated political authority at the end of the Formative.

ORGANIZATION OF THE DISSERTATION

In the subsequent chapters, I develop the ideas presented in this introduction, present the data collected during the PRV13 and the PTRV16, and make interpretations with an eye toward informing an analytical model that is broadly applicable to archaeological research in ancient Mesoamerica. I begin in Chapter 2 by discussing the development of archaeological theories on political organization, focusing on the complex societies that developed during the later Formative Period in Oaxaca, Mexico. I address two major trends in theorizing of ancient sociopolitical complexity that have led to partial or incomplete interpretations of how early Mesoamerican polities formed, operated, and collapsed. First, the majority of Mesoamerican research on ancient polities during the 20th century has focused on either the strategies that leaders employed to maintain their authority (Blanton et al. 1996) or classifying polities as either centralized or decentralized (Fox et al. 1996; Marcus 1998). While these frameworks have promoted advances in understanding political organization, their emphasis on classification has provided little interpretive space for the contingency involved in social interactions that often occurred at multiple scales between people of varying levels of power (Blanton and Fargher 2008; Joyce and Barber 2015a; Joyce et al. 2016). Second, many scholars have overemphasized leaders' domination at the expense of theorizing the agency of commoners and rural populations, which has resulted in top-down interpretations of political organization that have discount the engagement of hinterland populations in social negotiation(Barber 2005; Barber and Joyce 2007; Carballo 2013; Iannone and Connell 2003; Lohse and Valdez 2004; Robin 2002; Yaeger 2003; Yaeger and Robin 2004). I propose an alternative theoretical framework informed by theories of practice, power, materiality, and ontology that considers the myriad ways in which people of varying levels of social status negotiate the terms of political organization (Barber & Joyce 2007; A. Joyce 2000, 2006, 2010; Joyce & Barber 2015a; Levine 2011).

In Chapter 3, I lay out the methodological and analytical framework with which I evaluate the political organization of the Rio Viejo polity during the Terminal Formative Period. To determine what led to the polity's dissolution at the end of the Formative, I evaluate the degree of political integration in the region by examining the ways in which people were tied together by social, political, economic, and religious institutions. Rather than reifying the Rio Viejo polity as a bounded entity that existed at any particular moment, I instead focus on the social practices, ideas, things, and their entanglements through which complex polities are constituted. I describe the excavation strategies selected to evaluate the main hypotheses posed by the dissertation and discuss the types of material correlates that would indicate whether or not the hypotheses were supported.

In Chapters 4-6, I present the results of the excavation program carried out during the PRV13 and the PTRV16. Beginning in Chapter 4, I discuss the results of excavations that took place in the northeastern quadrant of the ceremonial center, including those focused on Complex A (Terrace 11) and Structure 1 (Terrace 10). Chapter 5 includes excavations that were situated in the northwest and central areas of the ceremonial center, including operations that investigated the plaza and the interior patio of Complex C (Terrace 2), as well as Complex B and the Ballcourt (Terrace 12). Finally, Chapter 6 focuses on excavations that took place outside of the ceremonial center in Complex E, located about 150 m to the north. Each chapter presents plan maps of excavation units and relevant archaeological features, stratigraphic profiles and tables describing each natural layer and cultural feature in detail, and a narrative of the main findings involved in every archaeological operation.

In Chapter 7, I present a comparison and synthesis of the regional corpus of archaeological data on communal practices in public buildings in the lower Rio Verde Valley, focusing on how the data from Cerro de la Virgen situates the hinterland community within the incipient Rio Viejo polity. The chapter evaluates the scale at which labor, ritual-religious, production, and exchange resources were controlled in the region at the end of the Formative. Following the regional comparison, Chapter 8 provides interpretations of how and at what scale people were tied together through social, political, economic, and religious institutions at the end of the Formative. This section mobilizes theories of practice, power, materiality, and ontology to argue that political authority and identity was constituted through entanglements of people, practices and things that converged on public buildings. In Chapter 9, I provide a summary of the major findings of the dissertation and suggest some additional avenues for future research on the problem of political integration in the Terminal Formative Period.

The concluding chapter is followed by five appendices that present laboratory and archaeometric data relevant to the questions raised and hypotheses proposed in the dissertation. Appendices A and B present the results of formal ceramic and lithic analyses, respectively. Appendix C provides the results of archaeometric studies completed on select artifacts from the dissertation, including Instrumentational Neutron Activation Analysis (INAA) completed on pottery and X-Ray Fluorescence (XRF) analyses completed on a sample of obsidian from Cerro de la Virgen. Appendix D presents the results of paleoethnobotanical studies completed on residues from five ceramic vessels collected from offerings excavated in 2016. Finally, Appendix E presents osteological studies of human remains recovered during both seasons of the project.

PROJECT SIGNIFICANCE

The research presented in this project is of broad interest to archaeologists, anthropologists, and political scientists studying the process by which humans organize themselves into political formations, particularly concerning the production, reproduction, and contestation of institutionalized political authority. Researchers in a number of fields have increasingly argued that the development of large, socially stratified societies involves complex negotiations among members of varying levels of status than many top-down, coercive models of political centralization would imply (Blanton and Fargher 2008; Carballo 2013; Joyce et al. 2016; Levi 1988; Ostrom 1990; Poteete et al. 2010). In moving beyond typological exercises in political organization and toward a framework that models the entanglements of people, places, and things that constitute political identities and authority, this research provides a methodological framework that can generate data that break down political variability into its constituent parts. Further, this study utilizes archaeologically testable expectations for political integration in a complex society that does not have a known or deciphered writing system. The framework and results of the project are amenable to studies of the development of early complex societies worldwide because it explicitly addresses why humans find it difficult to build and maintain stable political regimes. It also calls attention to the ways in which governments succeed or fail to institutionalize control over rural populations, which directly concerns scholarship in anthropology and political science globally. In the next chapter, I discuss the development of archaeological thought on the study of political organization and orient my theoretical perspective within this debate.

II. THEORETICAL BACKGROUND

INTRODUCTION

In this chapter, I trace and critically analyze the theoretical trends and analytical frameworks through which archaeological thought on political organization has developed, focusing on Formative-period Oaxaca, Mexico, a geographic and temporal context in which several large, complex polities first developed. Traditionally, Mesoamerican archaeologists have categorized the organization of complex societies as either centralized or decentralized (Fox et al. 1996). Over the past two decades, research has focused on the strategies that leaders employed to maintain their authority (e.g., network vs. corporate; Blanton et al. 1996), as well as the "cycles" of increasing and decreasing centralization exhibited within complex polities (Marcus 1998). While these frameworks have promoted advances in understanding political organization, archaeological, ethnographic, and ethnohistoric evidence demonstrates that these perspectives are flawed, as early complex polities involved dynamic political settings in which people interacted at multiple and occasionally conflicting scales that often defy attempts at categorization, even on a continuum (Blanton & Fargher 2008; A. Joyce 2000; Joyce et al. 2001, 2016). Further, there has been inadequate consideration of the confluence of practices, meanings, and material relations through which social institutions are constituted in complex societies, particularly those involving negotiations between people of varying levels of status (Barber 2013; Joyce & Barber 2015a).

A second major trend in research on political organization in ancient Mesoamerica involves an emphasis on domination over negotiation, which has resulted in attributing causal primacy to rulers at political centers over rural communities in their hinterlands. This development reflects a bias toward conceptualizing leaders as strategically active and commoners as passive and lacking agency (Blanton & Fargher 2008; Carballo 2013; papers in Lohse and Valdez 2004). Research on Formative-period Mesoamerican societies has indicated that hinterland communities often engaged in practices that were distinct from urban centers (Barber 2005; Barber and Joyce 2007; Ehrenreich et al. 1995; Feinman et al.

2002; Hester and Shafer 1994; Iannone and Connell 2003; Yaeger 2003; Yaeger and Robin 2004). Despite this knowledge, studies of ancient Oaxacan complex societies have tended to focus on political seats of power, only tangentially incorporating secondary centers to highlight the authoritative reach of polity leaders (Barber 2013; Joyce et al. 2016). While a top-down perspective that focuses on polity leaders is compulsory in theorizing early complex polities, political integration often appears differently outside of a polity's "core" (Barber 2013; A. Joyce 2010, 2013).

I propose an alternative theoretical framework informed by theories of practice, power, and materiality that considers the dynamic ways in which people of varying levels of social status negotiate the terms of political organization (Barber & Joyce 2007; A. Joyce 2000, 2006, 2010; Joyce & Barber 2015; Levine 2011). As a case study, I will focus on the complex society that developed in the lower Río Verde Valley of Oaxaca, Mexico during the Terminal Formative period (150 BCE – CE 250). The "polity" centered at the urban site of Río Viejo emerged at ca. CE 100, but collapsed little more than a century later at ca. CE 250. To determine what led to this political dissolution, I examine the organization of the Río Viejo "polity" through the lens of political integration, defined as the degree to which people throughout a complex polity were tied together by social, political, economic, and religious institutions (DeVree 1972; Sharer and Golden 2004). Rather than reifying the "polity" as a bounded entity that existed at any particular moment, I instead focus on the social practices, ideas, things, and their entanglements through which complex polities are constituted. This research moves beyond simply identifying social complexity in the past and addresses why complex polities follow variable historical paths by paying attention to how people and things collectively participate to develop, maintain, reproduce and rework social institutions

Explaining the formation and organization of complex polities has been a challenging task for Mesoamerican archaeologists. Debate has persisted over such issues as the scale of early complex polities, the nature of the political relationships through which they were constituted and maintained, and the ways in which they collapsed or transformed through time (Brumfiel 1995; Chase et al. 2009; Feinman and Nicholas 2015; Fox et al. 1996; Hutson et al. 2015; A. Joyce 2000, 2010; Joyce et al. 2016; Lucero 1999; Feinman and Marcus 1998; Price and Feinman 2008; Sharer and Golden 2004). While there is general agreement among Mesoamericanists on the presence of large complex polities and residential populations in the tens of thousands at sites in the region from the Formative to the Postclassic, there is little consensus on the scale and institutions through which political authority was constituted and negotiated (Fox et al. 1996). I concentrate on models proposed to explain political organization in ancient Mesoamerica, with a specific focus on the early complex polities of Oaxaca, Mexico, including the Zapotecs of the Valley of Oaxaca, Mixtecs of the Mixteca Alta and Mixteca Baja, Chatinos of the lower Río Verde Valley. I also discuss the models describing the Maya in the southern lowlands and Pacific highlands and Teotihuacanos and Aztecs of the Valley of Mexico. All of these societies exhibited nucleated urban populations, monumental architecture, households that differed in markers of status and wealth, and hinterland communities that were integrated with the broader political system to varying degrees (Chase and Chase 1992; Joyce 2010; Marcus 1983; Yaeger 2003). Certainly, these societies differed tremendously, but the goal of the project is to understand this variation by developing a theoretical and methodological framework applicable to any complex polity.

In the following sections, I discuss the major trends in archaeological thought on political integration through the development of the discipline. I divide these into four general approaches, although I concede that some overlap in various ways. The first path pertains to positivist models of cultural ecology and systems theory that hold that integrated polities are adaptive in certain situations. The second path draws from Marxist and systems theory perspectives in prioritizing the “top-down” leadership strategies of rulers in organizing and integrating complex polities. The third path draws on modern economic theory and concepts of rational choice to problematize the collective action problems that arise in complex societies by modeling institutionalized political authority as the result of complex negotiations between leaders and followers. Finally, the fourth path, though informed by a diverse set of social theory perspectives, generally views political integration as resulting from social and material relations that constitute and define meaningful collectivities of people. At the end of Chapter 2, I lay out an approach that incorporates the basic tenets of the fourth path and emphasizes the agency of outlying communities, and the social and material entanglements that constituted them, in enabling or constraining the development of political integration and instantiating social formations characterized by varying degrees of integration.

PRIME MOVERS, SYSTEMS, AND RESILIENCE: PROCESSUAL APPROACHES TO POLITICAL ORGANIZATION

Despite the lack of a common goal or coherent theory, archaeologists have been concerned with explaining political integration since at least the 1950s. The ecological basis of social organization, paramount to later cultural ecologists, may find its roots in late 19th century anthropology. For example, Lewis Henry Morgan (1985 [1877]) posited that the easiest way to see the progression of civilization was to examine technological subsistence techniques, for these were the key to progressing past an evolutionary stage mired in foraging for wild vegetable foods toward "organized" subsistence. Despite the emphasis on technology (and by association, subsistence) as a salient indicator of the level of complexity of a society, there was little focus on human-environmental interaction, a theoretical orientation that characterized the second half of the 20th century.

The theoretical turn toward the culture-environment relation stemmed from foundations laid by Julian Steward (1955a) and Leslie White (1959), who called for anthropologists to focus on how certain cultural traits originated from relationships between the culture and its local environments. For Steward (1955a), cultural adaptations occurred within a system, the "super-organism," that existed outside of individual human organisms; this is what segregated biological from cultural ecology—the idea that cultural patterns were not genetically derived and could not be analyzed in the same way as organic features. Of particular relevance to Steward's framework was the recognition of cross-cultural similarities in subsistence activities and economic arrangements (the "culture core") that grew out of adaptive responses to similar environments. Cultural ecologists sought to explain the origin of particular cultural features and patterns by examining how people utilized the local environment in "culturally prescribed" ways (Steward 1955a). Examining the relationship between people and the environment was particularly important for explaining the adaptive benefit of political integration, one of the cornerstones of a cultural-ecological perspective that turned attention toward the material and technological base of society.

Characteristic of the cultural-ecological paradigm was the pursuit of a single, elegant, explanation for the development of political integration. Perhaps the most prominent—and disputed—outgrowth of this effort was the "hydraulic hypothesis," which postulated that societies with large-scale, irrigation-based agricultural economies that developed in arid environments were responsible for the appearance of centralized political authority in early states (Steward 1949, 1955a; Wittfogel 1955, 1957; Wittfogel & Goldfrank 1943). In *Oriental Despotism*, Karl Wittfogel (1957) argued that the development of irrigation works in areas such as Mesopotamia, China, Mesoamerica (specifically Mexico), and Egypt required substantial and centralized control maintained by bureaucrats that monopolized political and economic power. According to Wittfogel, rulers and bureaucrats typically identified with the dominant religion of the state. Julian Steward (1949) also postulated the primacy of irrigation in the development of political authority, noting that the "irrigation civilizations" (he added the central Andes to Wittfogel's list) had common cultural features and developmental sequences because their adaptation to an arid or semiarid environment required large-scale irrigation.

Indeed, the articulation between irrigation and political authority was first made explicit over one hundred years earlier by Marx and Engels (1970 [1845]) who suggested that the role of the state in Asiatic societies was one of domination, by control over land ownership and irrigation systems, resulting in the isolation of villages from one another. Criticism of the Asiatic mode of production waxed and waned with changes in the world's political environment, and Wittfogel's later anticommunist writings make it difficult to separate his aversion to totalitarianism from his theoretical contributions (Price 1994). However, at the base of the hydraulic hypothesis, Wittfogel (1957) emphasized that certain tasks involved in irrigation projects, such as digging and cleaning canals, damming watercourses, and maintaining water catchment areas, required organizational changes involving management and domination by elites (and subsequently, cooperation):

> "A large quantity of water can be channeled and kept within bounds only by the use of mass labor; and this mass labor must be coordinated, disciplined, and led. Thus a number of farmers eager to conquer arid lowlands and plains are forced to invoke the organizational devices which—on the basis of premachine technology—offer the one chance of success: they must work in cooperation with their fellows and subordinated themselves to a directing authority."

Wittfogel (1957) did leave room in the hydraulic hypothesis for the formation of societies rooted in irrigation agriculture that *lacked* an autocratic form of centralized government, arguing that "hydroagriculture," or farming based on small scale irrigation, increased the food supply but did not involve centralized political control. However, there is question as to whether he applied the distinction between hydraulic and hydroagricultural societies consistently in all historical cases (Price 1994). For example, Edmund Leach (1959) argued that ancient Ceylon (modern Sri Lanka), classified by Wittfogel as "hydraulic," exhibited no evidence that centralized authorities beyond the village level were concerned with water management. Further, Leach (Leach 1959) suggests that we cannot make inferences about the proportion of the population that was provisioned by the irrigation system, nor about the nature of political authority considering the construction of the Ceylon irrigation system was spread over many centuries.

A host of scholars was to follow Leach in his critique. For instance, Adams (Adams 1960, p.280, 1966) also argued that in Mesopotamia and Mesoamerica, large-scale irrigation was a “consequence” rather than a “cause” of political centralization, citing the chronological primacy of the centralized state in these regions.[3] This argument was echoed by Steward (Steward 1955a, 1955b, 1968), who had revised his hypothesis to deemphasize irrigation and add other causal factors, such as the control of specialized production and trade in ancient Mesoamerica, which he attributed to the emergence of centralized states in the region. Sanders and Price (1968) also argued for the preeminence of irrigation agriculture as the mechanism for state formation in Mesoamerica, though they never fully address whether their model was applicable for the nonhydraulic societies of the Gulf Coast, lowland Maya area, and Oaxaca (but see Sanders and Nichols 1988), or whether irrigation systems of highland Mesoamerican societies were large enough in scale to account for urbanization and centralization of political authority. For the central Andes, large-scale irrigation works predominantly followed the appearance of centralized governments (Mason 1968; Rowe 1963), though in some areas such as the Ayacucho basin, the development of water control may have occurred early (MacNeish 1969; Mitchell and Guillet 1994). Robert Hunt (1988, 1989) compiled a suite of historical examples spanning the globe to contradict the hydraulic hypothesis by arguing for the idea that small-scale irrigation was managed with frequency on the “national” (or hierarchically highest) level. However, it is unclear whether Hunt took into account Wittfogel’s distinction between hydraulic and hydroagricultural societies or how people used different technologies to create and maintain different irrigation systems (Price 1994:193–198).

In its various forms, the hydraulic hypothesis rests on a basic premise: that, at some point in their history, people voluntarily gave up their autonomy and united with other communities to form

[3] It should be noted that Adam’s conclusions were primarily based on his research in Mesopotamia, which was then applied comparatively to the Mesoamerican complex societies he discussed.

larger political units. This assumption also applies to theories of state formation that hold that the invention of agriculture and the resultant surpluses in food allowed some individuals to pursue activities not related to food production, which led to specialization of labor tasks and, eventually, political integration (Childe 1950). However, ethnographic data from multiple preindustrial societies indicate that the surpluses and resultant leisure time inferred for agricultural societies is largely a myth; rather, hunter-gatherers were often observed to have the most leisure time (Carneiro 1970; Sahlins 1972). Robert Carneiro (1970:734) was among the most outspoken scholars to criticize the “voluntaristic theories” of state formation, citing recurring examples of autonomous political units—ranging from villages to empires—that were unable to relinquish their sovereignty without an external stimulus. Carneiro argues that warfare, not labor specialization or cooperation, resulting from competition over circumscribed arable land or other sets of vital resources played the pivotal role in the development of political integration and the state (also see Marcus & Flannery 1996; Spencer 1982). In this “coercive” theory of political integration, Carneiro (1970:735) linked the rise of states to places where the availability of agricultural land is circumscribed, or limited by ecological boundaries such as a desert, ocean, or mountain range. Without these boundaries, competition and resulting conflict over access to land would result in a dispersal of villages because the basic means of subsistence can be found elsewhere. Carneiro also posited that societies could be socially circumscribed, or surrounded by hostile or competitive neighbors.

As the limits of arable land, friendly territory, or population pressure are reached, villages can no longer move into other viable areas when threatened. Warfare arises out of the need to acquire agricultural resources, and some villages inevitably dominate and subjugate others. Carneiro (1970:736) argues that social stratification and inequality were directly related to warfare, with some individuals forming the nucleus of an “upper class” because of upward social mobility facilitated by exploits in war. A lower social stratum also emerged as the victors of warfare took prisoners, who eventually became servants and slaves. As a corollary to the circumscription theory of state formation, Carneiro argues that the concentration of vital resources and/or population pressure may also be conditions in which warfare occurs. For example, the availability of food in an area may become so restricted that exploitable areas become saturated with settlements, resulting in intensified conflicts to the extent that political communities unite and, eventually, form a state.

Later frameworks of political centralization posited that the transition from egalitarian/middle-range societies (bands and tribes) to ranked/complex societies (chiefdoms and states) reflected a collective response to economic needs (Flannery 1972; Fried 1967; Sahlins & Service 1960; Service 1962, 1975; Wright 1977). For example, in contrast to coercive theories of state formation, Elman Service (1975) hypothesized a more variable social process in which centralized leadership becomes institutionalized through the development of a government bureaucracy and legal system that was able to monopolize (and mobilize) force. According to Service (1962), this process is impossible in egalitarian societies because leadership is tenuous, dependent more on a leader's charismatic qualities and kin relations than the inherent power the position holds. However, as the number of people in a society exceeds the available social roles, hierarchical relationships begin to form among people of different levels of influence, most often related to differences in age (Service 1962). In chiefdoms, these hierarchical relationships become more concrete, forming offices that mediate disputes and redistribute goods and services to the community, thereby institutionalizing political authority.

Some scholars identified variability among chiefdoms and their constituent social hierarchies, separating the category into "simple" and "complex" chiefdoms (e.g., Earle 1978, Earle 1989; Wright 1984). Simple chiefdoms exhibited mechanisms of resource redistribution tribute to a single chiefly center within a two-tiered settlement hierarchy, and disputes were largely resolved through informally sanctioned customs based on territorial group sentiments (Earle 1989). On the other hand, complex chiefdoms, characterized by three-tiered settlement hierarchies and a greater amount of power vested in “paramount” chiefs, exhibit a more diverse set of hierarchical relationships. Wright (1984:69) argues that the competition over alliances and resources that characterizes complex chiefdoms generates an “ideology of chiefly sanctity” that not only structures the tributary demands on commoners, but also the relationships *between* chiefly centers. Disputes are largely resolved through informally sanctioned customs based on territorial group sentiments. Chiefdoms are an intermediate stage in the transition to states, which have governments that mediate disputes by threatening or exerting force both internally, by means of a formalized judicial system and/or bureaucratized government, and externally, through an organized and permanent military (Wright 1977).

While Service’s theory of state formation, like Max Weber’s (1947 [1924]) on which he drew considerably, does not deny the significance of coercive force in the formation of the state, of greater import is the differentiation of political roles that must occur to manage and sustain that force. Critics would later argue that the social typologies proposed by Fried and Service were examples of the use of dichotomous rather than continuous variables that merely identified traits in the archaeological record rather than pursue the processes of social change (Feinman and Neitzel 1984; Joyce 2010:17–34; Leonard and Jones 1989; Pauketat 2007). Close examination of the ethnographic record reveals scores of examples of societies that did not fit Service’s social typology (e.g., Cordy 1981; Earle 1987; Kolb 1994; Liep 1991; Trigger 1990).

Calls for a more dynamic, process-driven model of political organization stemmed from the mood of dissatisfaction among archaeologists with the limitations of the “prime mover” explanations outlined above (Flannery 1972; Webster 1975; Wright and Johnson 1975). Despite these critiques, the “new” archaeologists of the 1960s and 70s continued to embrace the principles of ecology or cultural evolution, for it was still widely accepted that culture was humanity’s “extrasomatic means of adaptation” (Binford 1962; White 1959). Human subsistence and economic practices, mediated through technology, were interpreted as the fundamental means by which cultures adapted to their surroundings; ideology and religion were considered epiphenomenal in cultural change (Chapman 2003:45–46).

In an influential paper that drew on Roy Rappaport's (1968) systems ecological approach, Kent Flannery (1972) argued that emphasizing technological and environmental factors had been successful in studying exchanges of matter and energy in "simpler" societies, such as hunter-gatherers, but these methods failed to explain the organization of more complex societies. Equally unsuccessful were what Flannery called "humanistic" studies of information exchange that focused on art, religion, ideology, writing, and the like, which did not sufficiently examine ecological factors such as subsistence strategies. To better problematize the development of complex societies, archaeologists began to integrate these seemingly opposed perspectives by considering human society as one class of a living system, applying to it a general processual model (Binford 1968; Flannery 1972; Glassow 1972; Webster 1975; Wright & Johnson 1975; cf. Gall & Saxe 1977). In this model, a "system" is composed of an inter-communicating network of social entities or institutions (sub-systems) that has the goal of maintaining equilibrium in relation to external stimuli. Systems imply a patterned set of relations or way of doing things that are self-regulating, have some durability in time, and are bounded in nature. Within a systems theory perspective, cultures manifest as adaptations to an external environment, and preference is given to building models of society based on correlations between interdependent subsystems. For the archaeological study of complex societies, the unit of study was "the polity," within which control hierarchies allowed for larger populations to be integrated.

Because states are politically centralized and socially stratified phenomena, studying them required a focus on decision-making hierarchies that developed in response to the needs of greater communication and regulation (Wright and Johnson 1975). Wright and Johnson (1975:267) operationalized political integration under two types of *specialized* administrative institutions that governed the most basic decision-making processes involved in state-level societies:

> "there is a hierarchy of control in which the highest level involves making decisions about other, lower-order decisions rather than about any particular condition or movement of material goods or people. Any society with three or more levels of decision-making hierarchy must involve such specialization because the lowest or first-order decision-making will be directly involved in productive and transfer activities and second-order decision making will be coordinating these and correcting their material errors. However, third-order decision-making will be concerned with coordinating and correcting these corrections."

In addition to bureaucracies that controlled local administrators and primary producers, systems theorists posited that the practice of processing information became more specialized as the system became more stressed (Flannery 1972; Johnson 1978, 1982; Wright & Johnson 1975).

Flannery (1972) hypothesized that states develop when subsystems become more segregated (i.e., differentiated and specialized) and higher order systems exhibit more centralized control over sub-systems. Wright (1977) also argues that while centralized, "non-state" societies (e.g., chiefdoms) may exhibit externally differentiated decision-making systems (e.g., subjugation of one chiefdom over another), what makes states more complex is that they are contain internally differentiated decision-making levels. The bureaucracy described by Wright has been used by Oaxacanists to explain the rise of the Zapotec state, "the state formed in the context of a group of competing chiefdoms when one of those chiefdoms succeeded in subjugating its neighbors, turning them into the provinces of a larger, unitary state" (Marcus and Flannery 1996; Spencer 1982).

For Flannery (1972:414–420), social systems "evolve" when certain institutions are promoted to a higher level within the control hierarchy, when lower-order controls are bypassed by higher-order controls ("linearization"), or when subsystems are increasingly tied to higher levels of control ("centralization"). Collapse of the system occurs when certain "pathologies" occur, such as when the direct control of higher order institutions negatively affects the ability of lower order institutions to function independently (Flannery 1972:420). Eventually, these pathologies can cause a state of hypercoherence, during which the autonomy of subsystems breaks down. In this model, the development of social hierarchies is a systematic response that "selected" for institutions that were better suited to solve particular problems (Reynolds 1984:188). Larger, more populous communities comprised of smaller units that depend on one another require these control hierarchies to be strengthened to facilitate orderly interaction and minimize conflict internal to the system (Martín and Murillo Herrera 2014). However, a larger population implies less of a cost to the overall system if some individuals withdraw from practices related to subsistence to focus solely on administrative tasks (Martín 2010). Thus, from a systems perspective, political integration is a direct result of conditions (e.g., settlement nucleation) expected to encourage functional interdependence in productive strategies (Shennan 1999).

Contemporary efforts to understand political integration in an ecological frame have taken on the banner of "resilience theory," which holds that the underlying interactions between humans and their biophysical environments derive from the legacies of past choices, beliefs, and actions (Gunderson and Holling 2002; Faulseit 2015; Fisher and Feinman 2005; Redman 2005). Resilience ideas focus on societal adaptations by evaluating the ability of a system to absorb change while retaining its essential structure and function. Responses to a particular stimulus are gauged by how the system progresses through stages of the "adaptive cycle," from flexible, but weakly interconnected and organized to stable, but rigidly organized. Depending on the severity of the stimulus, a social system can break apart (i.e., collapse) and reorganize. This rupture is referred to as the "threshold" of the adaptive cycle that, when crossed, precludes continuation of the current system. One key difference between resilience theory and the ecologically functionalist approaches that came before it is the acknowledgement that social systems exist and function at multiple, hierarchically structured scales of space, time and social organization, the interactions of which Gunderson and Holling (Gunderson and Holling 2002) term "panarchy."

Iannone and colleagues (2014) apply a resilience theory approach to elucidating the conditions that led to the collapse of the Classic-period Maya centers in the southern lowlands of Mexico, Belize, and Guatemala by examining the trajectories of smaller communities located in hinterlands between political centers. Rather than viewing hinterland communities as simply small cogs in a larger political system centered at more prominent centers, Iannone et al. (2014) argue that each community had specific strengths and weaknesses, which provided them with specific coping mechanisms to deal with the abrupt changes that occurred in the 9th century CE. They argue, for example, that the inland site of Uxbenká was in an area of higher than normal agricultural fertility, which provided it a degree of resilience through reduced fallow periods and the lack of need for large-scale agricultural intensification. The coastal site of Santa Rita Corozal, on the other hand, exhibited a different set of ecological advantages that made it more resilient as a community, such as its unfettered access to fresh water and marine resources, which would have afforded it a degree of resilience to food shortages and agricultural uncertainties.

Though they provide a simple framework to explain how complex polities operated, functionalist frameworks have limited analytical value because they can only explain political integration as a mechanism of keeping the larger system going. For example, we may explain elites' consolidation of power in reference to decision-making functions, but from where did these elites originate? What accounts for the variability that we see in the ways in which collectivities of people were tied together? Further, external stimuli such as population pressure and resource shortages, which are central to functionalist models of political organization, are often insufficient in explaining why polities become more complex (Brumfiel 1994; Hodder and Hutson 2003). When the adaptive value of political centralization is assumed, rulers derive power from the regulation and control of the subsistence economy and fall from power only when their activities impede it from operating at peak efficiency (Brumfiel 1992). However, there is no explicit analysis of the practices required to *build* relationships of power and authority, and there is no consideration of the conflicts and compromises that arise among people with different “problems” and “possibilities” (Brumfiel 1992). Functionalist arguments also deeply depend on functional linkages between sub-systems, which can be tenuous and prone to fragmentation (Johnson 2010).

TOP-DOWN, ELITE-FOCUSED MODELS OF POLITICAL ORGANIZATION

This section discusses the field’s paradigmatic shift toward “leader-focused” models of political organization in early complex societies, which have common roots in Marxist and neo-functionalist theoretical orientations. Beginning in the mid-1970s, many archaeologists frustrated with the implication that people were faceless and subsumed in a supposedly overarching, adaptive social system looked to the writings of Marx for new insights into the political conflicts that were often observed, but undertheorized, in early complex societies (Frankenstein and Rowlands 1978; McGuire 1983, 1992, 1993; McGuire and Saitta 1996; Patterson 2003; Shanks and Tilley 1987; Spriggs 1984; Trigger 2006). For those that subscribed to a “classical” (i.e. historical materialist) interpretation of Marx’s writings, to understand early complex societies is to situate economic relationships in the broader social, political, and historical context within which they are embedded (Trigger 2006). The interactions that take place between people, communities, and institutions concern the practical, material engagement with the world—what Marx (1976 [1845]) defined as “praxis.”

Marx also incorporated a structural component in his writings on political organization. For example, Marx (1978 [1852]:99) noted that people make their own history through the things they do, “but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly encountered, given and transmitted from the past.” Core elements of praxis, as it related to political organization, included the notion that society is a plurality of individuals organized around everyday material production, that the structural conditions of society have a strong material basis, and that cultural histories are produced by earlier conditions that have the potential to shape, integrate, or dissolve social formations (Dobres and Robb 2000:5). In contrast to systems theory, which modeled change based on a social system's adaptive responses to ecological pressures, Marxist archaeologists posited that the conflicts arising between social groups derive from contradictions involved the way people produce wealth—an *internal* condition of a given society (Patterson 2003; Rosenswig 2012). Social change is therefore the outcome of explicitly rational decision-making by individuals based on calculations of self-interest.

The Marxist perspective in archaeology highlights the strategic relationships involved in the deploying and managing of labor by those in power. It takes as its focal point a society's mode of production, defined as the social field through which labor is deployed for economic pursuits, usually with political motivations and consequences (Wolf 1982:75; Rosenswig 2012). Eric Wolf (2001:342–352) defined three modes of production—capitalist, tributary, and kin-ordered—that have been employed by some archaeologists to examine political organization in the past (e.g., Arnold 2000; Gilman 1995; Kristiansen 1998). A capitalist mode of production is characterized by the separation of producers from the means of production (e.g., tools, land) by holders of wealth who can dictate the terms under which they allow producers to operate the means of productions. Workers use the wages gained from their labor to purchase what they need to survive, while wealth-holders accumulate surpluses that are reinvested to improve productive technologies and create more wealth.

In contrast, the tributary mode of production is a form of political-economic organization where producers are not separated from the means of production. Instead, wealth-holders extract surpluses directly from producers through military or political coercion. Societies characterized by the tributary mode of production tend to generate similar justifying ideologies based on the structure of economic mobilization (Trigger 2003; Wolf 2001). Ideology justifies and legitimates ruling groups and resolves tensions by masking or misrepresenting the true reality of the working class with an alternative reality that presents subjugation as a phenomenon that naturalizes, reifies, or denies social contradictions

(Giddens 1979; Leone 1982). Social change occurs within specific historical contexts, and the interests of the ruling class are maintained not only by physical coercion, but also by an ideology that represents its interests as those of all classes. Finally, the kin-ordered mode of production is defined by its use of kinship relations as the key to mobilizing resources, which determine who can direct the labor of others, who has access to productive land, who can marry whom, and so on.

We may turn to an example to examine the utility of an interpretive framework based on Wolf's scheme. In his analysis of the development of complex societies of the Formative-period Soconusco region, Rosenswig (2012) uses Wolf's modes of production not merely as a series of descriptive states of economic organization, but rather as the *process* of integration that encompassed subsistence practices, political organization, and ideology. Rosenswig argues that the emergence of the Conchas phase (1000-850 BCE) La Blanca polity, characterized by more explicit forms of hierarchy than previous societies of the Soconusco (e.g., monumental construction, distribution of secondary political centers around a primary center), can be explained by applying the tributary mode of production as an organizational model. According to Rosenswig, people likely nucleated in the previously abandoned coastal zone of the Soconusco seeking conflict resolution (presumably pertaining to resource control) beyond what could be provided through kinship ties. As the region became more densely populated, elites mobilized surplus labor in the form of monumental building projects that united the population, both within the La Blanca center and among different tiers of sites in the polity, through a coordinated endeavor purported to benefit everyone. The timing of a greater commitment to large-scale food production, exemplified by an increased ubiquity of food-related iconographic motifs on ceramic vessels, is argued to reflect an ideology of production that obscured the material contradictions among people of varying statuses in the La Blanca polity.

By taking into account the relationships of power that characterize early complex polities, Rosenswig's interpretation provides a more sophisticated explanation for political integration that goes beyond adaptive advantage to the environment. However, it is not without its own pitfalls. First, though the framework considers processes beyond the purely ecological, it is still inherently a descriptive, typological framework in which societies "fit" into "types," as described by Wolf, Marx, and others. Second, agency is afforded to elites in the La Blanca polity, but little consideration is given as to whether commoners, particularly those living in outlying settlements, had the ability to contest these developments. Rosenswig (2012:28) presents data from Cuauhtémoc, a small site in the La Blanca hinterland that expanded rapidly during the Conchas phase, but it is always through the lens of the political center (La Blanca) that we are directed to view these data:

> "When the La Blanca polity initially coalesced, pre-existing elites in the southeast end of the Soconusco, such as those at Cuauhtémoc, must have seen the opportunities provided by an alliance with their expanding neighbor as well as the potential dangers of failing to align themselves. Alternatively, the rulers of La Blanca could have employed some form of threat or supported a rival faction within smaller surrounding centers such as Cuauhtémoc."

In this interpretation, a degree of intentionality is assumed for leaders of La Blanca, with the goal being a more integrated, and therefore advantageous, polity ripe for exploitation. There are several problems with implying intentional, strategic actions of elites. First, the mechanism through which domination (and subsequently, integration) is carried out involves a unidirectional, top-down model of political organization in which elites promulgate an ideology that portrays resource extraction (i.e. via goods or labor) as a natural phenomenon. Little attention is paid to the daily, mundane practices of commoners that may have played a part in the constitution of an integrated society. Rosenswig's example of the increased ubiquity of food-related motifs on ceramic vessels appears incomplete without critically analyzing who made iconographic pottery on a regular basis and in what contexts it was used. Though Rosenswig notes the widespread adoption of food-related motifs in a relatively short period, he assumes *a priori* that the artistic flourish was promulgated by elites without clear evidence of such a situation.

Finally, the framework appears to view integration as a teleological resolution of intrasocietal conflict, rather than one of many possible outcomes.

Influenced by the turn toward historical materialism, many Mesoamerican archaeologists in the 1980s and 1990s integrated an elite-focused “actor theory” orientation with more traditional, neo-evolutionary frameworks that classified the degree to which complex societies were centralized based on suites of attributes related to the political power of leaders. The most common classificatory scheme employed for the organization of Mesoamerican polities has been based on a dichotomy that situates centralized polities with powerful bureaucracies at one pole and relatively decentralized polities with diffuse political structures at the other. Centralized models typically describe stable polities comprised of tightly interrelated components in which rulers subjugate local groups and institute highly specialized bureaucracies to manage them (Chase and Chase 1996; Flannery 1972; Haas 2001; Spencer 1982; Wright 1977). In contrast, decentralized polities occupy small territories and exhibit political structures characterized by loosely integrated social institutions (Ball & Taschek 1991; Demarest 1992; Fox et al. 1996; also see Yoffee 2005).

Leaders of centralized polities are hypothesized to have appropriated the responsibilities of subordinated groups in order to gain and maintain political power (Balkansky 1998; Feinman and Marcus 1998; Marcus and Flannery 1996; Redmond and Spencer 2006; Spencer and Redmond 2001). These leaders sat at the top of managerial hierarchies that handled the mobilization of vital resources and the distribution of basic goods to these dense populations. For states defined by a functioning bureaucracy, the governmental structure went beyond ideological, ritual, and kinship practices by controlling the economic and administrative workings of the polity (Chase and Chase 1992).

Several scholars have proposed a top-down, leader-driven model of political organization for the development of Monte Albán, the political seat of a polity that may have dominated the Valley of Oaxaca and several nearby areas by the Terminal Formative period (Marcus and Flannery 1996;

Redmond and Spencer 2006; Spencer 1982). The events that led to this transformation have been inferred from archaeological evidence in the Valley of Oaxaca dating to the late Middle Formative Rosario phase (700-500 BC). During this time, the political climate in the region became volatile, characterized by warfare and shifting relationships between communities that threatened the power held by community leaders. The high frequency of burned daub at Rosario-phase sites such as San José Mogote, the most prominent and influential community in the valley during the Early/Middle Formative, as well as El Mogote in the Valle Grande and Yegüih in the Tlacolula arm, suggests an increase in structures destroyed by fire, presumably due to warfare. The strongest evidence for political crisis comes from San José Mogote, during which the community's most restricted and sacred religious building, Structure 28, was destroyed at ca. 600 BC, which Marcus and Flannery (Marcus and Flannery 1996) argue was the result of a raiding party. At about the same time, Monument 3 was also erected at the site, depicting a high-status captive that was sacrificed.

In the wake of the political crisis at San José Mogote, Monte Albán was founded on several previously unoccupied hilltops at the confluence of the Valle Grande, Tlacolula, and Etla arms at the center of the Valley of Oaxaca. Similarities in architecture, iconography, and mortuary practices between the sites indicate that people from San José Mogote moved to and founded Monte Alban at about 500 BC. Most archaeologists focus on the concerns of leaders at San José Mogote to establish a more defensible community in the face of endemic warfare as the primary cause for founding Monte Alban (Marcus and Flannery 1996; Spencer 2003; Spencer and Redmond 2004; Winter 2006). Indeed, the site's location on a hilltop in the center of the valley afforded a naturally defensible position, as well as a panoptic view of the surrounding terrain. Iconographic depictions of sacrificed war captives on carved monuments in the Main Plaza also suggest evidence for the military conquest of neighboring communities. Marcus and Flannery (Marcus and Flannery 1996) account for the relatively quick and geographically extensive integration of the Valley of Oaxaca by drawing on an analogy from classical

Greece *synoikism* (see Demand 1990), during which whole groups of villages left their rural settings and came together to form cities where none had previously existed, usually in response to an overwhelming external threat. This integrative process is argued to have required the formation of a state bureaucracy and been facilitated by territorial expansion through warfare and the subjugation of hinterland communities directed by leaders at Monte Alban (Redmond and Spencer 2006).

Elite-driven models of political integration similar to those proposed for the Valley of Oaxaca have also been promoted for the development of complex polities in the Mixteca Alta (Balkansky 1998; Balkansky et al. 2004; Kowalewski et al. 2009). Prior to the 1990s, the main theoretical debate over the political development of the Mixteca Alta concerned the degree to which Monte Albán was involved as an imperial power in the region (Bernal 1965; Byland & Pohl 1994; Flannery 1983; Paddock 1966; Plunket 1983; cf. Spores 1983a).[4] Based on the presence of Monte Albán-style ceramics, particularly grayware serving vessels (e.g., G.35 bowls), several scholars have argued for a coercive model in which Zapotec tribute demands were the catalyst for the formation of political centers in the region, such as Yucuita (Plunket 1983:105–106), and Hua Chino (Byland and Pohl 1994:56–60).

More recent research has taken an approach that focuses on the local development of social complexity in the Mixteca Alta (Balkansky 1998; Balkansky et al. 2004; Joyce 2010; Kowalewski et al. 2009; Pérez Rodríguez et al. 2011). Balkansky (1998) has applied the synoikism model to the Mixteca Alta, but rather than arguing for a conquest model of Monte Albán expansion in the region, he proposed that the movement of populations to urban sites in the Huamelulpan Valley were a local response to the imperial aspirations of Monte Albán's rulers. According to Balkansky (1998:39), the social transformations witnessed after 500 BC were not gradual but rapid, set in motion by "specific human actors," or in other words, *local leaders*. In this interpretation, Huamelulpan's placement in the center of

[4] Much debate about Zapotec imperialism has also revolved around whether Monte Albán conquered the coast of Oaxaca, but most of these arguments have been rejected in favor of explanations that indicate local development of social complexity (Joyce 1991a, 2003, 2014; Levine 2013; Workinger 2013; Zeitlin and Joyce 1999).

the valley served a strategic, administrative function of overseeing several secondary centers, such as Cerro Yucusavi, and other smaller sites distributed throughout the valley within a highly integrated polity.

Evidence for control in centralization models generally derives from settlement pattern analysis of urban areas and their hinterlands, although some scholars have relied on ethnographic analogy to flesh out the details of the organization and function of “state-level” societies (e.g., Flannery 1972; Spores 1974). Based on pictographic and other historic documents from the Postclassic to the Colonial period, Spores (1974) has argued that Mixtec royal marital alliances were vital to the maintenance of complex polities in the region, particularly through the creation of social, political, and economic networks that integrated numerous communities into the broader political system. Though Spores (1974:306) focused on marriage arrangements of rulers, he argues that Mixtec polities in the Postclassic were characterized by “limited extension of authority, reliance on voluntary compliance with royal directives, dependence on reciprocal arrangements among ruling families….and a dependency on alliance formation through spouses [and] offspring.” According to Spores, the decentralized flexibility of the Mixtec political system allowed for adaptation but discouraged centralized hierarchies. Projecting the ethnohistoric back to the Late/Terminal Formative, Spores (1983b:123) argued for the presence of a ruling family at the Late Formative urban center of Yucuita that served to internally integrate the polity:

> “The ruling couple exercised political control over Yucuita, its lands, waters, and resources, and received personal services and tribute from residents of the center. They also probably ruled one or more dependencies administered by lower-ranking members or descendants of the royal family placed in those settlements by royal direction.”

According to Spores, the family would have been linked to similar elite families at other centers in the Nochixtlán Valley, the Mixteca, and other parts of Mesoamerica through alliance networks that facilitated the arrangement of royal marriages and the acquisition of non-local prestige goods.

Despite the abundance of regional survey and ethnohistoric data for the Mixteca, there is a relative scarcity of excavation data from Late and Terminal Formative sites, making it difficult to infer particular details of how the region was organized politically. The data available indicate, however, that differences in wealth, status, and power in the Mixteca Alta were not as distinct as in the Valley of Oaxaca during the Yucuita and Ramos phases (500 BCE-CE 300). Based on evidence of local mortuary and residential patterns, Joyce (2010:163) argues that political authority may have been vested in multiple corporate groups within each of the region's small polities, rather than in the hands of rulers. For example, early centers in the Mixtec highlands do not have a single public space serving as the focal point of the site, as is the case for the Main Plaza at Monte Albán. Instead, urban sites in the Mixteca Alta contained clusters of residences surrounding separate public spaces, which may have constituted a form of "corporate-group organization consisting of families of different status levels" (Joyce 2010:163). Additional investigations of smaller hinterland communities are necessary to better understand these differences.

I now turn to research on political organization informed by research outside of Oaxaca. For the Classic-period Maya of the southern lowlands, scholars emphasizing top-down, centralized political authority see rulers of major political centers as the administrators of a number of integrative institutions, but focus on craft specialization as the driving force of regional integration (Chase and Chase 1996; Lucero 2006; Marcus 2003; Martin and Grube 2008). According to the centralized model of political authority for the Classic Maya, labor was organized according to Emile Durkheim's (1964 [1893]) principle of organic solidarity, defined as the mechanism of social integration by which people rely on the labor of others to produce things they themselves do not produce. Organic solidarity is contrasted with mechanical solidarity, which refers to cohesion and integration stemming from the homogeneity of labor performed by individuals wherein people feel connected through similar work practices. Thus, centralized polities are characterized minimally by two endogamous classes (i.e., elite and commoner), but subsequent developments of intermediate economic positions may have led to middle classes (or, what Chase and Chase [1992, p.11] have termed a "bourgeoisie") that promoted and benefited from the workings of the state.

The distribution of economic resources not only affects how people settle across the landscape, but also how they are organized socially and politically (Roscoe 1993). In centralized states, power is manifested by the ability of elites to acquire tribute or taxes from subjects in the form of raw productive materials, crafted goods, and labor for construction projects, as well as the ability to restrict other groups' access to these things (Earle 1997). Centralized models typically posit the presence of ideological sources of power that derive from the ability of leaders to redefine worldviews and codes of social behavior to explain why differential access to resources, and special rights and obligations, exist (Earle 1997). Lucero (1999:36) argues that these premises for power provided the means for leaders to emerge in the Maya area beginning in the Late Formative period (ca. 400 BCE – CE 250), particularly through controlling the economic and ideological mechanisms used to manage vital resources such as fresh water:

> "In addition to building immense reservoirs to provide water during annual drought (January through April/May), Maya leaders sponsored large-scale ceremonies and feasts at temples, plazas and ballcourts. These events unified people physically and emotionally, and at the same time legitimized political agendas and increased the prestige of Maya elites and nascent rulers…By directly associating themselves with vital forces of day-to-day life, Maya rulers extended their influence beyond the ceremonial events themselves."

In this model, leaders appropriated the control of sources of water as well as traditional water rituals, which were performed in large public spaces. Water rituals served to unite people around a common concern—access to clean water. Rulers received tribute in return for providing water and for sponsoring water rituals, but this power dynamic required certain "hallmarks" of legitimation, such as the construction of monumental architecture for potent public rituals, that served to persuade people not to leave the confines of the greater polity (Lucero 1999:43).

Perhaps the best case for centralized political organization for ancient Mesoamerica comes from Terminal Formative-Early Classic Teotihuacan, a powerful polity that administered a noncontiguous territory in central Mexico that has been conservatively estimated to have spanned 25,000 km^2 (Charlton and Nichols 1997; Millon 1992). Marcus (1998, p.72; also see Cowgill 1997; Santley 1983) argues that, like Monte Alban, Teotihuacan expanded into areas beyond its immediate region, establishing a secondary center at Chingú in Hidalgo and relationships with several other polities from modern-day Veracruz to Guatemala (Marcus 1998:72). Marcus has argued for a coercive model of Teotihuacan domination through overwhelming military force, as indicated by the presence of a "military colony" at Matacapan, as well as elite enclaves at Mirador, Los Horcones, and Kaminaljuyú, although the extent and nature of control by Teotihuacan over these polities has been called into question (Braswell 2004; Smith and Montiel 2001).

At the other end of the spectrum, decentralized models hypothesize that some early complex polities occupied small territories and had diffuse political structures (Fox et al. 1996; Iannone 2002; Charlton and Nichols 1997; Trigger 2003). Proponents of a decentralized model argue that Mesoamerican states were loosely integrated through ritual and kinship, exhibiting scant evidence of economic or administrative specialization (Ball and Taschek 1991; Demarest 1992; Fox et al. 1996; Houston 1993; Lind 2000; Trigger 2003). Decentralized polities are also characterized by fluctuating political alliances and "regal-ritual centers" of various sizes (Fox et al. 1996:801). Emphasizing analogies drawn from ethnohistory that stress commonalities among all periods, Mayanists espousing a decentralist model propose that rulers were an additional layer in a highly redundant political and economic hierarchy unified through ritual practices and kinship (Fox et al. 1996). Potter and King (1995) argue for a heterarchical model of political organization in the Maya lowlands, exemplified by resource exchange that flowed between local neighbors rather than through permanent central markets. Though many terms have been applied to decentralized polities, they have been most often described in Mesoamerica as "city-states" (Thompson 1954), and "galactic polities" (Demarest 1992), or "segmentary states" (Ball 1993; Fox 1988).

City-state models focus on the spatial relationships between urban centers and a limited rural hinterland and, unlike the segmentary state model, view early complex polities as organizationally distinct from earlier political forms (Charlton and Nichols 1997; Hayden 1995; Hodge 1997; Smith and Schreiber 2006; Yoffee 2005). Hansen (2000:19), who compiled a corpus of analyses of city-states throughout the world, defines the city-state as "a highly institutionalized and highly centralized micro-state consisting of one town…with its immediate hinterland…settled with a stratified population." Although most of the population lives in an urban setting characterized by a specialized economy, the rest live in hinterland villages no more than a day's walk from the center (Hansen 2000:19). City-states are self-governing, but may be under the hegemony of other city-states. Hansen (Hansen 2000:16) identifies a type of "city-state culture" in which a number of city-states in close proximity may have common histories, speak the same language, and have similar social practices, rituals, worldviews, and the like. Some scholars have applied Hansen's city-state model to the Zapotecs (Oudijk 2002) and Mixtecs (Lind 2000) in the highlands of Oaxaca during the Postclassic period. For example, Oudijk (2002:77–81) argues that upon the arrival of the Spanish, the Valley of Oaxaca was divided into thirteen city-states, each headed by a male hereditary ruler who resided in a palace in the capital. Rulers and their wives appointed nobles, who traced their shared descent from a real or mythical founder of their noble house, to rule the city-state's subject communities (Oudijk 2002; Whitecotton 1977). The city-state model has even been applied to the Early Classic polity of Teotihuacan (Trigger 2003), though some scholars suggest that the application of the term for a sprawling polity such as Teotihuacan demonstrates that the idea has little utility (see Marcus 1998).

Somewhat related to the city-state model is the “peer-polity interaction” approach (Renfrew and Cherry 1986), which draws from scholarship on early polities in the Aegean. This perspective suggests that the key to understanding the origins and development of complex societies involved understanding the synergistic interactions (e.g., warfare, exchange, etc.) that took place among small, autonomous, densely clustered polities that were “peers” with one another (Rice 2004). These “peer polities,” or what Rice (2004:25) calls “statelets,” compete against one another without any particular one able to gain clear dominance (Freidel 1986; Sabloff 1986). Another external analogy applied to Mesoamerican complex polities is the “segmentary state” model (Fox et al. 1996; Iannone 2002). The basic component of the segmentary state is the segmentary lineage, a unit of social organization first described in societies of Northern and Eastern Africa, such as the Nuer (Evans-Pritchard 1940) and the Alur (Southall 1956), in which close kin tend to stand together against kin that are more distantly related. Local autonomy is expected in the segmentary state model because specialized bureaucracies did not develop (Southall 1956).

The galactic polity model draws on the organization of early polities in Southeast Asia, which are characterized as unstable and fluid (Bentley 1986; Tambiah 1977). Galactic polities in Mesoamerica expanded and contracted as the result of structural constraints on the power of rulership (Demarest 1992; Houston 1993). In such systems, authority would have been determined by birth and heredity, with lineage affiliation dictating the membership of specific political positions (Fox 1987; see discussion in Sharer 1994). For example, for the Quiche Maya, elite lineages were ranked, with the highest-ranking lineage furnishing the supreme ruler and subordinate lineages filling other offices in the political and religious hierarchy (Demarest 1992). The galactic polity model emphasizes the importance of elites’ mobilization of ideology, through which political centralization occurs through ritual, rather than political, mechanisms (Sharer 1994). What results is a political landscape replete with unstable polities that share a common identity predicated on a shared religious ideology but conflict within certain economic spheres.

Some scholars have noted that some states were defined variably as centralized or decentralized depending on the perspective of the researcher (Marcus 1998; cf. Trigger 2003, p.93). Marcus' (1998:59–94) "dynamic model" of state formation addresses this variability by theorizing that episodes of large-scale integration and disintegration were simply "different stages in the dynamic cycles of the same state." Marcus has applied this diachronic perspective to a number of ancient Mesoamerican societies, including complex polities of the Oaxacan highlands, the Maya lowlands, and the Basin of Mexico.

According to the dynamic model, the breakdown of early complex polities such as Monte Alban in the Valley of Oaxaca (Kowalewski et al. 1989; Marcus and Flannery 1996) and Yucuñudahui (Kowalewski et al. 2009; Spores 1983c) resulted in formerly integrated hinterland populations transitioning into a series of autonomous polities. These former provinces were much smaller in territory than the early "states" to which they belonged and were managed by rulers who referred to themselves as "kings" despite their much smaller realms (Marcus 1998:60). Occasionally, these small territories were reunited into larger polities, as was the case for the Postclassic Mixtec Empire under the rule of Lord 8 Deer. Similarly, the smaller units into which polities in the Maya area such as Tikal, Calakmul, and Copan occasionally fragmented were not politically integrated, but rather were unconsolidated principalities or "petty kingdoms" (Marcus 1998:63). Finally, Marcus argues that central Mexico also went through cycles of centralization similar to polities in Oaxaca and the Maya area. Teotihuacan, the first large-scale complex polity to develop in the region, integrated hinterland communities such as Chingú, and possibly Matacapan, Mirador, and Kaminaljuyú into their broader political system, although many scholars disagree that the latter three were incorporated into the imperial Teotihuacan polity (see Braswell 2004; Smith & Montiel 2001). Other polities such as Cantona in eastern Puebla may have resisted integration, but Marcus does not describe in any detail how this may have taken place. Marcus concludes that as Teotihuacan collapsed at the end of the Early Classic, other central Mexican polities such as Xochicalco, Cacaxtla, and Tula began to grow in size by expanding into areas formerly controlled by Teotihuacan. Further, the implicit assumption that the “state” always begins as a centralized one complicates any interpretation of resistance or negotiation.

While Marcus’ dynamic model takes a broad, adaptive view of change in complex polities, other theoretical frameworks that became popular in the late 20th century concentrated on the strategies leaders used to control complex polities. Actor-focused frameworks such as Blanton and colleagues’ (1996; also see Feinman 2000) “dual-processual” model examine the specific leadership strategies—network vs. corporate—employed by leaders to manipulate and manage sources of power, which could vary from the objective (e.g., wealth, resources) to the symbolic (e.g., ideology, religion). The manipulation of the production, exchange, and consumption of valuable objects and materials by emergent elites, as well as the limiting of the number of households that may acquire preeminence by participating in these practices, was fundamental to political strategies considered “exclusionary” in nature (Blanton et al. 1996:4–5; Brumfiel and Earle 1987; Peregrine 1991). In the network strategy, personal or group access to valued goods and esoteric knowledge from external sources enabled the development of local political authority and economic prominence (Blanton et al. 1996; Feinman 2000). States with political authority based on network strategies were often decentralized and unstable because of factional competition.

In contrast, corporate strategies focused on control of local resources and infrastructure while limiting overt expressions of hierarchy (Blanton et al. 1996). States with political authority based on a corporate strategy were often centralized and large because leaders could overcome factional competition through a variety of social institutions, such as group assemblies (Blanton 1998:154–155) or heterarchical relationships between social groups (Crumley 1995). For example, Beekman (2008, 2016) has identified the Late Formative to Early Classic period political system of the Tequila valleys of central Jalisco as a likely example of a corporate political strategy organized around similar yet counterpoised lineages.

The dynamic and dual-processual models represent significant contributions to the study of early complex societies, but their interpretive value remains incomplete. Their emphasis on classification leaves little interpretive space for polities that do not fall near a model's poles or that change through time depending on historical contingency (Kintigh 2000; Smith and Schreiber 2006). The centralized/decentralized model also tends to concentrate on the origins and endpoints of that result from cultural change, but does not pay significant attention to the "in-between spaces" during which political negotiations are actually carried out. The dichotomous language of these models encourages researchers to treat complex polities as static entities in time and space, rather than as dynamic social phenomena that may have changed from inception to collapse. Though their incorporation of power dynamics provides nuance to our understanding of integrated polities, most actor-based frameworks promote a "top-down" model that prioritizes the agency of leaders over commoners by assuming the goal of political organization is integration. Following Joyce (2000), I argue that integration is never complete; rather, complex polities are always in a state of becoming, contingent on both the discursive and mundane practices of people, as well as the relational fields through which people and things collectively constitute society.

Elite-based models of political organization also tend to view people living in outlying communities as passive members of larger political formations. Data are needed from hinterland areas to consider the scale, integration, hierarchy, and heterarchy of complex polities. These settings are too often only viewed through broader settlement data, which limits researchers to questions concerning local chronologies, artifact distributions and the *longue durée* of political transformations. These pursuits do not particularly lend themselves well to forming or discussing models of political centralization. Despite calls by many Mesoamerican scholars to focus analyses on smaller scales, simplistic views of the hinterland continue to complicate efforts of archaeologists to understand broader social processes (de Montmollin 1988; Tourtellot 1993; Yaeger 2003; Yaeger and Robin 2004). As Schwartz and Falconer (1994:7) have argued, “rural studies are compelling not only because they may be unorthodox but also because they allow us to reject, revise, and refine previous interpretations of ancient societies in a way we cannot always anticipate.”

The concepts of “rural complexity” and “hinterland heterogeneity” have been employed by researchers in the Maya area to challenge the dichotomy between urban and rural by emphasizing the variability that existed within the outlying areas of a complex polity (see discussion in Iannone & Connell 2003, pp.1–6). In general, I consider this a useful concept, but despite the acknowledgement that communities outside of primary political centers exhibited social complexity, Classic Maya scholars still view rural communities as tightly integrated within a state system dominated by the center. For example, Chase and Chase (2003) demonstrate how “minor centers” under the control of Classic-period Caracol were not all separate entities, but were instead functional, though spatially distinct, parts of major centers. The term “minor centers” (*sensu* Bullard 1960) refers to a variety of architectural features in a concentrated area ranging from non-residential buildings to elaborate residences to clusters of house mounds, and implies that there existed larger “major centers” which occupied a superordinate status within an administrative hierarchy. During the Late Classic, Caracol exhibited a dense urban population as well as a number of causeways that radiated outward from the center of the site to one of three types of smaller communities, or “causeway termini”—special-function administrative plazas, pre-existing centers engulfed by Caracol’s expansion, and residential groups. These termini were arranged in two rings, with formal, non-residential termini located approximately 3 km from the center of Caracol, and a second level of communities ranging from 4.6 to 7.6 km from the center that consisted of engulfed, formerly independent centers and large elite compounds. Chase and Chase argue that based on their connections to the center of Caracol via causeways, these smaller communities were fully embedded in a large, expansive, and integrated settlement matrix by the end of the Late Classic period.

Tourtellot and colleagues (2003) used a similarly broad perspective to examine how “minor ceremonial centers” were situated in concentric circles surrounding Late-Terminal Classic La Milpa, Belize, forming a cardinally aligned cosmogram on the landscape. In a spatial organization similar to Caracol’s, smaller centers surrounding La Milpa were arranged in two rings—one situated at 3.5 km from the center and one sitated at 7.5 km from the center. Tourtellot et al. (2003) posit that this distribution of sites on the landscape conveys the centralized, planned establishment of mid-level centers by the “core” that together oversaw the La Milpa community. The mid-level sites in the more distant ring suggests that they held some degree of local autonomy, but may have served as intermediaries between La Milpa and major centers outside the provincial limits. Minor centers closer to La Milpa were not simply redundant smaller versions of the larger center, but rather exhibited heterarchical characteristics. For example, evidence from La Milpa East suggests it was a locus of the temple and stela-altar ritual, its position on the eastern horizon from La Milpa Center suggesting it emphasized a potentially sacred state under the rising sun. Tourtellot et al. note that the presence of stela and altars marks a direct interest of La Milpa’s rulers because monuments were a highly restricted class of politically significant items. In contrast, evidence from La Milpa South and two adjacent settlement groups suggests that polity rulers were not directly involved in working the land around them. Rather, they were more directly involved in community-wide issues and foreign affairs, staying out of provincial life unless it affected the central core.

Non-elites in many Mesoamerican societies consisted of a heterogeneous group whose members were variably willing and able to resist elite pretensions or to ally themselves with other rising leaders (Joyce et al. 2001; Joyce and Weller 2007; Yaeger 2000). Evidence from hinterland sites in the Late Classic Xunantunich state in the southern Maya lowlands demonstrate that certain public ritual complexes were commissioned by rulers as a strategy to integrate the regional polity (Robin 2002; Yaeger 2003; Yaeger and Robin 2004). Though demonstrating that complexity existed within the lower and middle "levels" of society is certainly important to examining complex societies, the perspectives taken by Chase and Chase (2003) and Tourtellot and colleagues (2003) still relies on elite-based, functionalist interpretations of settlement distribution around a political center. Though rural communities are shown to have been complex in a variety of ways, these approaches assume rural communities were tightly integrated within a state system. I argue that we cannot assume these relationships of political integration *a priori*, and we must take into consideration the complex ways in which people could cooperate with, or contest, the strategies of leaders. In the next section, I discuss a theoretical approach that has recently received increased attention as a way to model the negotiations that occurred between leaders and other collectivities in complex societies, including commoners and hinterland communities.

RATIONAL CHOICE AND COLLECTIVE ACTION THEORY

Recently, some archaeologists have turned toward the comparative methods of the political sciences for insights into the dynamics of political systems in the past. Blanton and Fargher (2008) have argued that the growing chasm between anthropology and political science reflects a perceived "evolutionary leap" from autocracy (i.e., dictatorship) to democracy that is not supported by research on "pre-modern" complex societies. Citing potentially useful theoretical tenets of Collective Action Theory (CAT), a branch of political science rooted in rational choice theory, many archaeologists have begun to view the development of integrated, complex societies as the result of overcoming specific collective-action problems in which there is a divergence between the interests of rulers and followers (Levi 1988; Olson 1965; Ostrom 1990). Rational choice theorists argue that the social mechanism at the heart of collect-action problems (e.g., ethnic conflict) involves individuals' attempts to maximize their personal utility, which assumes the following: (1) all actors hold a set of logically consistent beliefs about the outcomes of their actions and the existing state of the environment in which they exist, (2) actors have preferences that place the outcomes of social situations in an unambiguous order, and (3) actors will choose the action believed to lead to the outcome with the highest utility (Chai 2001:5–10).

As many political scientists have noted, collective-action problems are typically rooted in the exploitation of common-pool resources (i.e., resources shared by groups of people such as forest timber, fish, labor, agricultural products, etc.) and the conditions under which resource users and communities are able to generate effective rules to manage them (Acheson 2011; Levi 1988; Olson 1965; Ostrom 1990). The basic postulate of CAT is that humans find it difficult to build and maintain stable political regimes, given the potential for disorder to be found in the conflicts that ensued from their rational, but often selfish, social actions (Blanton and Fargher 2008). Blanton and Fargher (2008), whose seminal work, *Collective Action in the Formation of Pre-Modern States,* provides the model for the archaeological application of CAT, argue that while common-pool resources can benefit all people in a society, they are allocated according to a social contract representing a consensus between rulers and followers with divergent interests and goals. For Blanton and Fargher, these conditions beg the question: how is it even possible to build a state, much less a collective one?

For neoevolutionists, states formed when incipient elites shed the constraints of egalitarianism to become the builders of a hierarchical society, their lofty position legitimated through their appropriation of powerful symbols and ideologies. Economies in this model consisted of two main processes: the flow of tribute from producers to elites and the integration of rural communities with different resources and environmental conditions for the benefit of state-organized redistribution. These economic strategies were vested by a strong regulatory or military force. From a CAT perspective, this top-down view is overly deterministic, relying too heavily on the institution of centralized political control mobilized by elites. This focus on domination has led archaeologists, particularly those espousing theoretical orientations informed by functionalism or Marxism, to ignore the role of cooperation in the development of complex polities. CAT theorists argue that, under some conditions, state formation will reflect rational agreements and mutual consent between rulers and followers of a political community.

To varying degrees, the political stability of early states was often dependent on the development of strong integration along collective (horizontal) and hierarchical (vertical) axes of social interaction (Blanton 1998). Research under the umbrella of CAT argues that collective polities are built on the cooperation between individuals and groups making up a political community (Blanton 1998; Blanton and Fargher 2008; Blanton et al. 1996; Carballo 2013; Feinman 2000). Blanton and Fargher (2008:13) define a collective polity as a "complex society in which the government… provides services ('public goods') in exchange for the revenues (including labor) provided by compliant taxpayers." Thus, political power in the CAT perspective is almost exclusively related to sources of state revenue. In polities characterized by a greater degree of collective action, the control of revenue by taxpayers constrains the agency and power of rulers. Taxpayers endowed with resources find themselves in an advantageous position to make demands on rulers to the degree that rulers reciprocally depend on them to achieve goals of collecting revenue. In less collective polities, leaders derive revenue by directly controlling foreign trade or productive land and labor (Blanton and Fargher 2008). In these instances, taxpayers are in a weak position to demand public goods and effective governance because they are not the polity's main source or "fund" of power (Blanton 1998).

Though it is linked to the dual-processual model of Blanton and colleagues (1996), CAT attempts to deconstruct the dimensions of corporate-network polities by drawing less attention to the strategies employed by elites to maintain authority and instead focuses on the ways in which cooperation may have developed between rulers and followers. We may turn to an example from central Mexico during the late Postclassic period to illustrate how CAT is employed archaeologically. Fargher and colleagues (2010) discuss the development of Tlaxcallan, a polity that resisted the imperial consolidation of the Basin of Mexico by the Mexica Triple Alliance, as a case study in collective action. Prior approaches to understanding the formation of Tlaxcallan have taken the Colonial-period *cabildo* (Spanish municipal government) as a model for its political organization (e.g., Gibson 1952), whereas more recent research has argued that Tlaxcallan was an example of a complex altepetl characterized by a *tlatoani* (dynastic ruler) and *calpulli* (corporate landholding groups; Lockhart 1992). Fargher and colleagues (2010) propose that these models are not tenable because they are based on a system of governance that was developed during the early Colonial period that reflected the influence of Spanish imperial policies, nor is there evidence of a *tlatoani* or *calpulli*.

Fargher and colleagues propose an alternative approach that accounts for Tlaxcallan's resistance to Mexica imperialism by focusing on two aspects of Tlaxcaltecan society that made it unique among Nahua-speaking groups. The first feature refers to the "flexible and adaptive" governing system that characterized Tlaxcallan. Unlike the typical *altepetl* in which power was consigned exclusively to a *tlatoani*, evidence suggests that political authority was vested in a governing council comprised of elites that earned their status. The governing council appears to have had the ability to declare war, appoint political and military officials, propose alliances, and send ambassadors. Fargher et al. (2010:234–239) cite a range of ethnohistoric and linguistic evidence indicating that there was a great degree of social mobility within Tlaxcaltecan society, which precluded the monopolization of power in a small group of leaders or prominent families. There were also social institutions that actively limited the power of the ruler, such as rigorous ruler-elect ceremonies, through which competing claims to govern society were played out in myth and ritual.

The central problem of collective action theory as a framework is that it hinges on the notion that people are inherently pragmatic beings whose actions are motivated by selective pressures of the environment or the overarching social system. Research from a variety of social science fields, including anthropology (Bourdieu 2005; Wilk and Cliggett 2007), evolutionary biology (Gigerenzer and Selten 2001), and political theory (Green and Shapiro 1994; Schram and Caterino 2006), indicates that people never act in perfectly rational, predictable ways. Rationality varies culturally, and people are imperfect, often impractical, and embedded in their cultural milieu. In addition, CAT frameworks do not explain why people seem to follow social norms and rules that lead them to act in ways that overrides their self-interest. While they focus attention on the interaction between people of varying social positions, CAT does not give much guidance as to how these interactions take place beyond a "transactional" bargaining situation involving public goods and services provided by rulers in return for revenue provided by subordinates. Though it accepts that the political process may require negotiation and compromise, CAT prioritizes narrowly economic interests and views integration as the *goal*, rather than one of many possible outcomes. Integration is never actually complete because there are always tensions between attempts by elites to gain compliance and the interests and actions of followers (A. Joyce 2000). Therefore, integration is always partial to varying degrees.

Finally, though many CAT theorists have called for the incorporation of subjects (and their agency) into collective action models, CAT frameworks tend to homogenize the makeup of social groups, lumping people into dichotomous categories such as "leaders" and "taxpayers." People in the past, like today, belonged to multiple, overlapping, intersecting, and sometimes conflicting social groups, or "communities," that collectively make up a society (Watanabe 1989). Following Yaeger and Canuto (2000:5–6), the "community" is a flexible construct that can be understood as a confluence of people, place, and historical context in which peoples' identities are constituted by their interactions in time and space. Communities are constructed through social practices, ranging from the mundane of the everyday to discursive events that are more salient (Yaeger 2000). In the next section, I argue that a much more comprehensive data set with which researchers may evaluate integration involves the complex entanglement of social and material relationships that constitute communities in the past, which comprise more than merely resource-based negotiations.

THEORIES OF PRACTICE, POWER, AND MATERIALITY IN POLITICAL ORGANIZATION

Over the past thirty years, many archaeologists have critiqued earlier systems-based, process-driven models of social complexity, calling for a more diverse set of methodologies that draw greater attention to the social negotiations that are fundamental to historical processes (Dobres & Robb 2000; Hodder 1999; Hodder & Hutson 2003; A. Joyce 2000; Janusek 2004; Johnson 2010; Pauketat 2001; Yoffee 2005; Wylie 2000). Rather than focusing solely on the ways in which societies adapt to cultural-ecological stimuli (i.e., through cultural evolution or devolution [Flannery 1972], archaeologists have called for interpretation of archaeological data to be hermeneutic, that is, paying equal attention to meanings, symbols, practices, and ideas (Hodder 1982, 1999; Hodder and Hutson 2003; Robb 1999; Shanks & Tilley 1992). Many of the recent trends in archaeological theory have been influenced by poststructural theories of practice (Bourdieu 1977; Giddens 1979; Ortner 1984), power (Foucault 1977; Gramsci 1971), subaltern studies (Scott 1990), agency (Ortner 1996), and feminist theory (Butler 1993). Though these theoretical orientations differ slightly, generally they view the affiliations, tensions, and conflicts that arise from "differently positioned actors" as the key to explaining social complexity in the past (see discussion in Joyce 2010:17–34). In this section, I discuss the field's paradigmatic shift toward models of political organization informed by social theory, identifying some of the key tenets that will inform my dissertation's theoretical perspective.

Archaeologists have drawn inspiration from sociological theorists such as Anthony Giddens (1979, 1984) and Pierre Bourdieu (1977) by viewing the recursive relationship between peoples' practices and the broader structural conditions of society as integral to social life. Social practices are embedded within structure--the ideas, rules, and material conditions--of a society such that structure is both the means *and* the result of the reproduction of practices, a process Giddens (1979:5) terms "the duality of structure." Structure also involves the interplay of sets of cultural resources (i.e., both human and non-human) and rules that are durable in time and space and internalized in peoples' knowledge and dispositions, or what Bourdieu (1977) calls “habitus.” The idea that practices are embedded in a culture’s social structure differentiates theories of practice with systems theory and collective action theory. For example, a systems theory perspective more narrowly views what people do as an adaptive behavioral reaction to external stimuli (esp. ecological), through which the broader social system is brought back into equilibrium with the environment; if an equilibrium state is not possible, then cultural (de)evolution may occur. Collective action theory, while accounting for the motivations of differently placed actors, assumes that rationality is culturally contingent wherein people act in their own self-interest, despite a rich ethnographic and archaeological record of peoples’ beliefs, knowledge, and dispositions that cannot always be considered rational or intentional (R. Joyce 2004; Wilk and Cliggett 2007).

Poststructural theory also differs from neofunctionalist and collective action theories in that it incorporates a theory of subjectivity, or the idea that the development of the self is unique to each individual, but also contingent on the social and material settings in which the individual is positioned. Vital to any discussion of political integration is the concept of identity, which describes people’s affiliations with various collectivities that embody a distinct network of power relations (Janusek 2004:17; Jenkins 1996; Meskell 2001). Membership in meaningful collectivities such as local communities or status groups is the outcome of social identity formation and maintenance (Barber 2013). Identities can range from mutually exclusive/contradictory to nested and/or overlapping, depending on the sets of social and material relations that constituted particular collectivities. People also have the ability to foreground or conceal different aspects of identity based on the circumstance. In this way, identities are never fixed. They are continuously reproduced though practices that embody and transform pre-existing cultural principles, rules, and relations (Butler 1993). For example, Joyce (2010:24) notes that in Late Postclassic Oaxaca, rulers used language, dress and ritual practices to foreground an “international” identity that connected them with powerful nobles from other polities, while at other times would foreground a “local” identity in which they acted as the “father or mother” of the community.

In addition to the strategic goals of leaders in legitimizing political authority, we must also consider identity as a modality of integration that works at various scales, encompassing and cross-cutting various collectivities such as “commoners” and “hinterland communities.” The dichotomy invoked when discussing “commoners” as a bounded social category implies a diametrically opposed category of nobles/elites, which likely obscures some of the “messiness” of identity construction within a society. Nevertheless, scholars have found the concept to be a useful heuristic device to frame research on the nature of political authority (Chase and Chase 1992; Gonlin and Lohse 2007; Lohse and Valdez 2004; Plunket 2002). Further, contrary to western identity constructs that often speak in dualities (e.g., male vs. female, rural vs. urban), ancient Mesoamerican identities were fluid. Rosemary Joyce (2000) has demonstrated that for Mexica society during the Late Postclassic, heterosexual genders were informed by the age of the subject and crafted from birth through labor roles. She (2000) cites the abstinence of religious specialists as an example of how identities are constructed through a variety of intersecting modalities (e.g., gender, age, labor, and sexuality). Thus, conceptualizing integration in terms of identity construction allows researchers to deconstruct the seemingly rigid, teleological processes of neofunctionalist perspectives, as well as the homogenous, Western-economic social categories used by collective-action theorists, to arrive at a more nuanced understanding of how people were tied together.

One piece of common ground held by post-processualist archaeologists was the claim that historical contexts of social and material interaction, as well as non-discursive perceptions of the world, served as the conditions within which people negotiated their world—a concept commonly referred to as “agency” (Dobres and Robb 2000:7). Though the invocation of the term has been somewhat broad in archaeology, an agency-based framework acknowledges the constraining and enabling influence of social, symbolic, and material structures on how, when, where, and why people are able to act. The biggest divide among archaeologists over the theoretical application of agency involves the intentionality of individual actors--between those who stress the intentional actions of powerful agents, particularly rulers and elites, as the driving force of change (e.g., Clark & Blake 1994; Flannery 1999) and those who stress the discursive and quotidian practices through which people contested rulers and dominant ideologies (Scott 1990; Shackel 2000). Joyce (2010:26) argues that debates over which segment of society could be afforded agency miss the point at the heart of practice theory--the idea that people's ability to act involves the "recursivity of social life and the inseparability (duality) of the subject and society, including their ideational and material dimensions."

Following Joyce (2010), agency is best understood as a constant negotiation over cultural rules, principles, and resources between variably positioned actors who embody different identities and motivations. Fundamental to social negotiations are relationships of power and authority, which include practices defined by domination and contestation (Joyce et al. 2001; Miller and Tilley 1984; Scott 1990). Early sociological views of political authority argued for a naturalistic view in which domination implies, at the very least, an interest in voluntary compliance such that commands given by those at higher social positions are *chosen* to be obeyed by subordinates (Weber 1978 [1922]:212). Later poststructural scholars such as Michel Foucault (1970) have argued that human subjectivity (and therefore, agency) is dependent on discourses of knowledge and power that do not necessarily always descend from a dominant group. Though historical periods are often marked by dominant discourses, domination is never total; subordinates can penetrate and resist dominant discourses (de Certeau 1984; Foucault 1977; Gramsci 1971). What we must focus on here is that leaders' subordinates have the potential to participate in practices that constitute meaningful collectivities that: (a) may foment social solidarity and group identity among non-elite individuals, such as commoners or people living in hinterland communities (Plunket 2002), or (b) may undercut elite authority as an expression of autonomy rather than solidarity (Lohse and Gonlin 2007). A relevant question to pose regarding integration at this point would be: ‘how might we identify practices in the past that promoted group identity and/or contested dominant discourses?’

We may turn to recent theories on Formative-period political integration in the Valley of Oaxaca as an example of an approach rooted in theories of practice and power that directly critiques the leader-focused, top-down model of synoikism. The synoikism model for the founding of Monte Albán (see Section 2.2) hinges on the threat of warfare as the primary cause of the systemic societal response to found Monte Albán, with the strategic efforts of rulers serving as the mechanism that led to the abrupt change (Balkansky 1998; Marcus and Flannery 1996; Winter 2006). There is evidence that external conflict factored into peoples’ decision to move from San Jose Mogote, a community that had existed for more than 1000 years previously, but warfare alone does not adequately consider the social and material entanglements involved in moving to an unoccupied hilltop. Perhaps most glaringly, the top-down, elite-focused model does not consider why commoners would have left their traditional homes and relocated to the agriculturally unproductive hills in the center of the Valley of Oaxaca. Joyce (2010:129–141) argues that it is important not to diminish the impact of such a move, which would have involved people leaving their communities, agricultural fields, and buried ancestors behind. Though moving to a more defensible position may have been politically and economically advantageous for leaders, relocation would have created many economic challenges for commoners. Living on the barren hills of Monte Albán would have required farmers to travel a greater distance to their agricultural fields, and increased tributary demands would have provided additional economic stress. Joyce (2010:130) argues that the political crisis at San José Mogote likely involved a confluence of factors that motivated the move to Monte Albán, including the erosion of support for leading families due to disruptions in long-distance trade, the threat of raids aimed at destroying the ceremonial center of the community

(Mound 1), the development of a religious worldview in which rulers had privileged access to the divine realm, and the social tensions that accompanied emerging hereditary status distinctions.

Archaeological evidence from the Main Plaza at Monte Albán (and beyond) also calls into question the synokism model, particularly the argument that defensible positioning was the prime cause for the site's founding. The labor involved in constructing the ceremonial center, as well as the spatial arrangement of architecture and iconography present there, indicate that religious beliefs and practices were vital to the constitution of the new community (A. Joyce 2000, 2004). Religious imagery from the southern end of the Main Plaza references themes of sacrifice, warfare and the underworld, including the so-called "*danzantes*," a sculptural program associated with Building L-sub depicting naked individuals with signs of genital mutilation or disembowlment. Most researchers have interpreted the personages to be victims of human sacrifice, presumably nobles from surrounding communities conquered by Monte Albán (Flannery and Marcus 1983; Marcus 1992). More recently, some scholars have argued that the monuments depict religious specialists engaging in autosacrifice (i.e., through bloodletting of the genitals) to contact and communicate with deceased ancestors (Urcid 2011; Urcid and Joyce 2014). The northern end of the Main Plaza included iconographic references to sky, rain, and lightning, suggesting an association with the celestial realm. Joyce (2010:139) argues that the Zapotec view of the cosmos was "materially inscribed" on the art and architecture of the Main Plaza, an exercise in "place-making" that provided a setting for thousands of people to participate in potent rituals related to human sacrifice and ancestor veneration. The Main Plaza therefore embodied a new corporate identity through discursive and potent religious practices that was embedded in a new religious movement centered on the sacred covenant.

Population in the Valley of Oaxaca rose dramatically by the Late Formative-period Pe phase (300-100 BC) as Monte Albán became an urban center connected to its hinterland through political, economic, and religious relations. Many researchers have argued that the increased demand for agricultural surpluses needed to provision the populace at the hilltop site led rulers to solidify economic ties with surrounding communities (Kowalewski et al. 1989; Marcus and Flannery 1996). Again, this top-down perspective inherently assumes a political discourse characterized by domination in viewing rural communities solely as a tributary source for leaders at Monte Albán. For example, Marcus and Flannery (Marcus and Flannery 1996) suggest that the high-status residence at Tomaltepec, a community located 15 km to the east of Monte Albán, was built by representatives of the Monte Albán leadership to administer the smaller site. Indeed, during the Pe phase, the residence was rebuilt to resemble elite residences from Monte Albán (Whalen 1981:88–105). However, as Joyce (2010:147) suggests, it could be equally plausible that the inhabitants of the high-status residence at Tomaltepec were descendents of earlier prominent families at the site, which would present a more complicated situation to untangle regarding political affiliation and integration.

While people living in communities throughout the Valley of Oaxaca were probably tied to the rulers of Monte Albán to varying degrees during the Late Formative, evidence suggests that the polity was not well integrated or tightly administered (Joyce 2010:158–159). Variability in public architecture and building orientations between Monte Albán and sites in the Valle Grande during this time has been argued to reflect the persistence of local traditions and may indicate contestation toward the hegemony of Monte Albán's rulers (Sherman 2005). Settlement pattern evidence also indicates that there was little integration among local political centers despite their political and economic ties to Monte Albán (Kowalewski et al. 1989). As Joyce (2010:158) notes, the rulers of Monte Albán likely had little-to-no control over the daily practices of people living in the hinterland beyond the symbolic omnipresence of the site overlooking the valley in the distance. Future research on the Late Formative in the Valley of Oaxaca must attempt to capture evidence of the tensions that likely arose between local communities and leaders (e.g., at Monte Albán) and to document rather than assume social, political, and economic relations between centers and the hinterland.

An implicit focus on domination over exploring practices of negotiation reflects a bias toward theorizing elites as "strategically active" and non-elites as "behaviorally inert" (Blanton & Fargher 2008:13; Carballo 2013; Joyce et al. 2001; Lohse & Valdez 2004). For example, though Zapotec society was certainly hierarchical, traditional models of political ideology suggest that commoners lacked agency:

> "Zapotec society was extremely hierarchical, with the ruler's will communicated to the commoners through several levels of nobles. No one at any level doubted that this was the way the world should be, because the Zapotec belived that nobles and commoners had separate origins far back in time…Commoners were born of commoners. They lived; they worked; they died; their immediate ancestors were important only to those who had actually known them; their distant ancestors were nameless" (Marcus and Flannery 1996:21).

Further, the argument that regional integration stems from leaders situating non-replicative centers in the associated hinterland stresses a top-down approach that privileges the forethought and organization of leaders over the local affiliations of rural/hinterland people.

Many researchers have argued that during the Pe phase, the Monte Albán polity was integrated through a three-tiered administrative hierarchy with a bureaucracy that may have been overseen by a single ruler (Flannery and Marcus 1983; Marcus and Flannery 1996; Spencer and Redmond 2004). In terms of evidence, these works focus on settlement hierarchy as a proxy of an established administrative hierarchy. The "strikingly regular" distances between Monte Alban and towns in the second rung of the settlement hierarchy, including San José Mogote, Dainzú, and SMT-23, all spaced 15-22 km from Monte Alban, have been argued to indicate that these were the major administrative centers for the Etla, Tlacolula, and Valle Grande regions, respectively (Marcus and Flannery 1996:174–175). Though there is evidence for uniformity in art and architecture in public buildings and elite residences during the Pe phase, these data do not necessarily indicate the presence of unifying political and religious institutions (Joyce 2010:220). For example, Urcid's (2005a) analysis of Classic-period ruling genealogies found no evidence that smaller political centers such as Cerro de la Campana or Lambityeco were ruled by the dynasty at Monte Albán, despite indications of a four-tiered settlement hierarchy. There is also a lack of evidence that rulers at Monte Albán controlled practices and institutions associated with large-scale economic systems, such as markets or specialized craft production. Research conducted by Feinman and Nicholas (2004) at El Palmillo, a hilltop site located at the eastern edge of the Tlacolula arm of the valley, has suggested that products produced by craft specialists at the site likely circulated through market exchange more than through institutions integrated with the Monte Albán dynasty, such as tribute or redistribution. Evidence indicates that craft specialization at El Palmillo was not managed by bureaucratic elites, but rather carried at the household level, with residences exchanging products with other residences.

Archaeologists often point to monumental constructions such as temples or palaces as symbols of leaders' domination (DeMarrais et al. 1996; Pearson and Richards 1994; Trigger 1990:125). Indeed, landscapes are broadly important for archaeologists interested social change because they are always in the state of becoming (Ashmore and Knapp 1999; Zedeño and Bowser 2009). Zedeño and Bowser (2009:9) note that the transformation of a place into a landmark involves a series of activities and interactions that crosscut various realms of social and individual life, including those that involve rituals and religions that accumulate through time. Joyce (2009) traces the 2500-year life history of the Main Plaza at Monte Albán from its founding through its major period of occupation as a political and religious center and on to the present day. Ceremonial precincts like the Main Plaza at Monte Albán often materialized a shared religious worldview of the cosmos for precolumbian societies in Mesoamerica, serving as an axis mundi where the cosmic planes of earth, sky, and underworld intersected (Joyce 2009; Pauketat 2013). Joyce (2009) argues that the power of ceremonial precincts was not merely derived from ideas they embodied (as symbols) but was produced, experienced, maintained and transformed through the practices of people.

People came to identify with places like the Main Plaza through emotionally charged ritual performances (Inomata and Coben 2006; Joyce 2009; Urcid and Joyce 2014). For example, A. Joyce (2000) argues that the founding of Monte Alban, construction of the Main Plaza, initiation of large-scale public rituals, and ritualistic warfare were led by powerful nobles looking for dramatic new ways of communicating with the divine world, demonstrating their generosity to commoners, and legitimizing their power during the Late Formative period (400 – 100 B.C.). Human sacrifice, a particularly potent Mesoamerican ritual practice that re-enacted the cosmic creation, were carried out on the Main Plaza; the practice of these rituals placed an emphasis on public spaces and cosmic symbolism (e.g. warfare, sacrifice, and the celestial realm) and stressed symbols of an emerging corporate identity associated with the Main Plaza (A. Joyce 2004).

The openness of the Main Plaza communicated a sense of accessibility to commoners through which dominant ideologies were open to discursive penetration (Foucault 1977). However, Joyce demonstrates that during the Terminal Formative and Classic periods (100 B.C. – A.D. 800), the Main Plaza was closed off to commoners, and the viewing of rituals carried out in this space was restricted to nobles. This re-interpretation of public, ceremonial space indicates that nobles inscribed new meanings on the ceremonial precinct. For instance, the Main Plaza was no longer primarily a public space that embodied corporate symbols. Instead, rituals were restricted and the formerly public space was dedicated to elite residences (A. Joyce 2000). Interaction with the divine world was associated predominantly with the sacred power of nobles to carry out ceremonies in private rather than the emotionally charged public ceremonies of the Late Formative (Joyce 2009).

While monumental constructions inscribe the landscape with messages that legitimate and strengthen the status of powerful leaders such as those at Monte Alban, strategies of domination often miss their mark or are actively subverted by people of lower status positions (Hutson 2002). Hutsons's examination of changing patterns of domestic architecture at Monte Alban shows that the sequential development of more private, inward-looking household units accompanied the deployment of strategies of spatial techniques of domination. Prior to the Pe phase (300-100 BC), household units consisted of single structures surrounded by an open area (Winter 1974). However, the Pe phase marks a trend toward more guarded domestic spaces, with many households exhibiting separate structures placed corner to corner, forming an L-shape with a semi-closed patio. By the Late Classic, this trend reaches its height as closed households with multiple, perpendicularly placed rooms around a square patio become ubiquitous. Hutson (2002:68) suggests that the prevalence of towering landmarks like monumental constructions (e.g., the Main Plaza) permits "panoptic surveillance," with the act of household enclosures creating a "concealed site of assembly and a breeding ground for hidden transcripts of resistance." By enclosing the space of their daily activities, people at Monte Alban "sculpted" their built environments to include only familiar and dear landmarks, particularly ones that invoked the life histories of its inhabitants. Hutson (2002:68; also see Urcid 2005) notes that the Late Classic shift toward mortuary practices carried out within enclosed domestic spaces at Monte Alban reinforced local collectivities and identities related to the veneration of kin-based ancestors.

The hermeneutic turn toward considering ideas and meaning as more than mere epiphenomena has been crucial in identifying the myriad ways in which complex societies were integrated. People were tied together through cultural institutions, rules, and obligations that went beyond collectivities defined by economic obligations to elites. Knowing this, we may push our theories of integration a step further by considering the complex relationships between humans and the material world that enabled and constrained social life. Scholars of materiality have recently turned attention to the "thingly" nature of human existence by reacting against the caricature of things as inert objects that can only be given power by humans (Hodder 2012; Latour 2005; Olsen 2010; Pauketat 2013; but see Heidegger 1973; Merleau-Ponty 1962). In ancient Mesoamerica, humans and their other-than-human counterparts, which included ritual paraphernalia, sacred buildings, religious texts, musical instruments, deceased ancestors, and deities, were inextricably bundled together to form networks of relationships, or entanglements that constituted society (Barber and Olvera Sánchez 2012; Hepp et al. 2014; Inomata 2006; Joyce 2009; Joyce and Barber 2015a; Love 1999). Rather than being mere placeholders for meaning, things co-produce society through their entanglements with people (Hodder 2012).

Though they have different connotations, terms such as “entanglement,” “network,” and “bundle,” generally refer to the relations between people and things that actively enabled or constrained social life (Hodder 2012; Joyce and Barber 2015a; Latour 2005; Olsen 2010; Pauketat 2013). I prefer the concept of “entanglement,” because unlike the other terms, a defining aspect of entanglement involves a “double bind” relationship in which humans depend on things that, in turn, depend on humans. Because things (as humans want them) have a limited ability to produce themselves, they become dependent on humans, who then become entrapped in their dependence on the things they produce. Hodder (2012) describes this relationship as a dialectic between dependence (reliance) and dependency (boundaries and constraints) as things and humans reach various limits that are overcome by further investment in that same relationship. The perspective fits particularly well within Giddens’ theory of structuration--that structure (in this case the human-thing relationship) influences practice (the production and maintenance of a thing by humans), which reproduces structure (via dependence and dependency).

One productive development of the “return” to theorizing the social-material relationships in the past involves considering the innovative and agentive aspects of religion in constituting complex societies. The relevance of the archaeological study of ritual and religion is profound, for as Timothy Insoll (2004:5) has argued, “a ‘spiritual’ dimension would seem to be important to humankind since at least the Upper Paleolithic period.” According to Fogelin (2007), there is a widespread understanding among archaeologists that ritual is a form of human action that leaves material traces, whereas religion is a more abstract symbolic system consisting of beliefs, myths, and doctrines. Rather than attempt to define concepts such as ritual and religion, which are notoriously prone to reformulation (Sundstrum and DeBoer 2012:2), I follow Joyce's and Barber's (2015a:820–821) assertion that "religion must be addressed in particular historical and cultural settings." Of particular importance to a materiality perspective on religion is recognizing the social and agential potential of not only humans, but also other-than-human beings, in the relational ontologies that characterized many Native American groups, including ancient Mesoamericans (Barber and Olvera Sánchez 2012; Joyce and Barber 2015a; Pauketat 2013; Zedeño 2009).

Religion has been factored into models of political centralization to varying degrees throughout the development of the discipline (Drennan 1976; Flannery 1972; Marcus and Flannery 1976). Binford's (1962) systems approach theorized religion as functioning to stabilize developing political hierarchies, but this framework implicitly views religion as epiphenomenal, or secondary to economic-ecological factors (e.g., resource acquisition in the context of population pressure). An example of Binford's (1983) neglect of religion as one of the "big questions of archaeology" is apparent in his ethnoarchaeological research with the Nunamiut of modern-day Alaska. Binford identified several behavioral regularities between the subsistence strategy of a society and the elaboration of that society's mortuary ritual. He interpreted his results as indicating that as societies move from hunter-gatherer to settled agricultural lifeways, burial practices increased in symbolic complexity. Ian Hodder (1991) critiqued this explanation, arguing that Binford elaborated in detail on the seasonal rotation of occupation areas, land use, site types, hunting and processing activities and patterns, but gave the impression that these institutions existed within a secular society. More recent ethnographic research conducted separately by Vitebsky (1995) and Lowenstein (2011) has largely debunked these claims, instead orienting Nanumiut society within a shamanistic system that was, and continues to be, vital to Inuit beliefs. Binford's method ultimately saw mortuary rites and symbols as passive displays of social reality, reflecting social roles, social structure, and complexity but having no active role in the production and reproduction of culture or society.

Religious beliefs, cosmology, and institutions of state control were intimately connected in ancient Mesoamerica (Freidel et al. 1993; A. Joyce 2000; Schele & Freidel 1990), so it is not a surprise that the link between religion and ideology has been used to explain the legitimization of power in Pre-Columbian societies. In contrast to a systems theory orientation, leader-focused models of political organization view religion as playing a more formative role in society in which leaders constituted their political authority through their specialized access to the divine realm (Schele and Freidel 1990). However, as some Mesoamerican archaeologists have argued, the emphasis on leaders' primary role in religion has limited consideration of the ways in which other collectivities (e.g., commoners, outlying communities, cults, etc.) with divergent religious practices may have negotiated and contested political authority (Joyce and Barber 2015a; Lohse 2007; McAnany 1995).

We may turn to an example from Pre-Columbian Oaxaca to illustrate how religion affected social change. Joyce and Barber (2015a) employ fundamental concepts of materiality theory (e.g., entrapment) as an interpretive frame to demonstrate that, during the later Formative Period in coastal Oaxaca, religion was not necessarily a unifying factor. Rather, they argue that religion, including the practices, meanings, and materials it encompassed, could be a "crucible of tension and conflict" that could constrain or enable sociopolitical change. In both the lower Rio Verde Valley and the Valley of Oaxaca, religious belief, practice, and the material items and settings in which religion was enacted were crucial to the political changes of the period. Joyce and Barber (2015a:821–828) posit that religion constrained the development of a large-scale, integrated polity during the later Formative in the lower Verde. By the Late Formative, public buildings were essential in the constitution of local communities. Joyce's (1991a) research at the site of Cerro de la Cruz indicates that communal practices associated with public buildings, including ritual feasting, cemetery burial, and collective labor projects, defined meaningful collectivities comprised of households or perhaps entire communities. Expressions of social status were muted, suggesting that the local community was more important to the construction of social identities in the region.

The regional population in the lower Verde rose dramatically during the later Formative, with the total regional settlement area increasing from 344 ha in the Late Formative to 775 ha by the end of the Terminal Formative (Hedgepeth and Koukopoulos 2012; Joyce 2010). The regional seat of power shifted to the floodplain site of Río Viejo, which increased in size from 25 ha in the Late Formative to 200 ha by the late Terminal Formative. Communal practices involving collective labor projects and public rituals (e.g., feasts, cemetery burials, ceremonial caching) continued to be instrumental to the constitution of suprahousehold identities (Barber et al. 2014). Evidence from Río Viejo has begun to suggest that, to some extent, polity leaders were able to extend their influence across the region, illustrated by the growth of the site into an urban center and the construction of the massive Mound 1 acropolis—the late Terminal Formative civic-ceremonial center (Joyce 2006, 2013; Joyce & Barber 2011). The scale of Mound 1, with a construction volume of 455,050 m^3, indicates a substantial investment of labor (Joyce et al. 2013). Research at Mound 1 also demonstrates variability in its construction methods, which may indicate that rulers mobilized a labor force from multiple communities that used slightly different methods (Joyce et al. 2013). At least 5 distinct forms of fill used to build the acropolis have been identified, including unconsolidated basket-loads of sediment, rammed earth, puddled adobe, and two types of fill utilizing adobe blocks (Joyce and Barber 2011; Joyce et al. 2013).

Monumental buildings were also constructed at nine other sites in the valley (Joyce et al. 2016). At outlying sites such as Cerro de la Virgen, Yugüe, and San Francisco de Arriba, communal ceremonies associated with public buildings increased in scale from those that took place in the Late Formative. Evidence from these sites indicates that people engaged in ritual feasting, mortuary ceremonialism involving cemetery burial, and the emplacement of communal offerings of objects that ranged from the mundane to the exotic (Joyce et al. 2016). At Yugüe, excavations uncovered several offerings of cylindrical ceramic vessels within Substructure 1, including a large offering of 50 coarse brownware cylinders (Barber 2013). Several caches of objects were deposited into the construction fill of public buildings at San Francisco de Arriba, including a cache of 500 greenstone beads, greenstone and rock crystal pendants, fragments of iron ore, and elaborately carved miniature jars (Workinger 2002:184–214). Communal cemeteries have been found in public buildings at Yugüe and Charco Redondo (Barber et al. 2013). Evidence of feasting, mortuary ceremonialism, and caching ceremonies also comes from Cerro de la Virgen (Brzezinski 2015; Brzezinski et al. 2017).

The evidence from outlying sites in the lower Verde demonstrates that not only was there a great deal of time and labor invested into the construction, maintenance and use of public buildings, but these settings were also "focal nodes in entanglements involving communal labor, ritual feasting, ceremonial caches, and bodies of the dead, through which local communities were constituted" (Joyce and Barber 2015a). Joyce and Barber account for the importance of public buildings by situating them within the relational ontology characteristic of ancient Mesoamerican religions, which recognized the agency of both humans and other-than-human entities. In relational ontologies such as those of Pre-Columbian Mesoamerica, objects had the potential to possess a life force that endowed them with the ability to engage with numerous other animate beings, to animate other entities, and to manifest powerful deities or ancestors (Freidel et al. 1993; Furst 1995; Joyce and Barber 2015a; López Austin 1988; Mock 1998). Like humans, some other-than-human entities experienced a life cycle marked by ritual acts, such as birth and death ceremonies as well as the intake of spiritual sustenance required to maintain their animacy (Stross 1998). This ontological condition was especially true for buildings in ancient Mesoamerica, as rituals of ensoulment and termination often involved the emplacement of objects such as ceramic vessels, carved stone, and other objects (also see Mock 1998). Joyce and Barber (2015; also see Hendon 2000) view cemeteries in a similar context as ceremonial offerings, arguing that the interment of the dead may have involved a "transference" of souls between the living, the dead, and animate spaces such as public buildings and the deities with which they were associated.

The framing of relational ontology described above fundamentally changes the way we look at how meaningful collectivities come together and how identities are constructed. Rather than seeing a community as merely a confluence of humans' affiliations and practices, Joyce and Barber (2015a) argue that communities are made up of entanglements of social *and* material relationships dependent on humans and other-than-human entities such as deceased ancestors, "ensouled" buildings and deities. In this sense, relations among people and things constitute the social. Humans' relationships with animate beings such as public buildings created continuous relationship that required physical maintenance (e.g., preserving structural integrity) and spiritual maintenance (e.g., ritual feeding). Thus, for the lower Verde, Joyce and Barber (2015a) hypothesize that local communities were defined through communal practices such as collective labor projects and religious ceremonies that were intimately focused on public buildings. In the next section, I lay out the methodology of the Río Verde Hinterland Project, which addresses the degree of regional integration in the lower Verde during the Terminal Formative Period from the perspective of the hinterland community of Cerro de la Virgen.

To model political integration in the past, archaeologists must go beyond explanations based solely on ecological advantages, top-down strategies of leaders at political centers, narrow economic solutions to collective action problems, and typological dichotomies that obscure variability in social organization. An approach that does this effectively must: (1) pay greater attention to the agency of collectivities of commoners and rural populations, (2) consider the social *and* material relations that defined meaningful collectivities, and (3) consider the ways in which social institutions such as religion could alternatively enable or constrain political integration. Rather than assuming integration was the goal of complex societies, this project considers the entangled people, practices, and things through which political authority and its reach were constituted.

III. METHODOLOGY OF THE DISSERTATION

INTRODUCTION

The incipient polity that emerged in the lower Río Verde Valley during the Terminal Formative is an ideal setting to study early political organization because current evidence suggests that the polity does not conform to standard models of political centralization. To address the nature of political authority in the region during this time, this dissertation archaeologically investigated public and domestic architecture at Cerro de la Virgen, a hilltop site that was occupied continuously from the beginning of the Terminal Formative to the Early Classic (150 BCE – CE 500). Lower Verde researchers have examined regional integration in the Terminal Formative through regional survey and intensive excavation of sites such as Río Viejo, San Francisco de Arriba, Charco Redondo, Yugüe, and others (Hedgepeth and Koukopoulos 2012; Joyce 2010, 2013; Joyce et al. 2009). Despite the growing regional database, we have lacked crucial data on the degree to which polity leaders at Río Viejo controlled the ritual and political economies of secondary communities. Previous research at the site carried out by myself (Brzezinski 2015) and by Barber (2005) demonstrate that cultural features dating to the Terminal Formative are buried at a relatively shallow depth, often less than 1 m below the modern surface, making large-scale excavations at Cerro de la Virgen more feasible.

This chapter summarizes the phases of research, field and laboratory methods, and mapping carried out during the PRV13 and PTRV16 and lays out the dissertation's main objectives and hypotheses. Paired with each hypothesis is a brief discussion the types of material correlates necessary to evaluate them for future applications of this research model. I finish the chapter with a few definitions for select terms used throughout the dissertation. The site of Cerro de la Virgen was first recorded during the regional survey completed in the 2000 field season of the Rio Verde Project (Joyce et al. 2009). Informal site reconnaissance conducted during the survey identified the site's ceremonial center and several architectural features, including Residence 1, the masonry stairway, the ballcourt, and the architectural complexes surrounding the open plaza. Research was continued in 2003 during Sarah Barber's (2005) dissertation, which included GPS mapping of the site core, additional reconnaissance, and horizontal clearing excavations of Residence 1. Results of Barber's project showed that some of the sites elites were able to mobilize a substantial labor force to build Residence 1 and the terrace that supported it. Excavations also uncovered several modest ritual caches (e.g., offerings of ceramic vessels) and food preparation and discard features such as *manos* and *metates*.

In 2009, I spent three days mapping the ceremonial center of the site, the results of which were instrumental in applying for funding for future projects. I returned to the site in 2013 for additional total station mapping of the ceremonial center and the execution of a pilot excavation project which involved a test pitting program in Terrace 2, the Plaza, and the Ballcourt, and block excavations in Complex A and Structure 1. In total, the pilot excavations covered an area of 118.25 m^2, which was allocated as follows: Complex A and Terrace 11: 89.25 m^2; Structure 1 and Terrace 10: 15 m^2; Terrace 2 and the Plaza: 10 m^2; Ballcourt and Complex B: 4 m^2. Immediately following the excavation season, I conducted a short laboratory season that focused on reconstructing, photographing, and recording quantitative and qualitative attributes of the contents of the extensive ceremonial offerings found during the project (see Chapters 4-5, Appendix A). These laboratory studies focused on the 338 complete or partially complete ceramic vessels recovered from excavations, reconstructing the broken stone objects of the "mask cache" recovered at the base of Structure 1 with conservator's glue (Chapter 4; also see Brzezinski et al. 2017), and analyzing the burned daub recovered during the project. Ceramic dates of stratigraphic levels and features were assigned according to the regional ceramic typology (Joyce 1991a:121–173), under the supervision of Drs. Joyce and Barber. All ceramic contexts were washed, dried, and then separated into paste types (i.e., coarse brown, fine brown, gray, orange, etc.). Each lot was counted and weighed for future comparisons of sherd density or size, where applicable. Osteological analysis of the one collection of human remains recovered during the project were completed by Dr. Arion Mayes (San

Diego State University; see Appendix E). Finally, flotation samples taken in the field were processed by Dr. Shanti Morrell-Hart (McMaster University) using a modified automatic flotation system. Flotation samples were curated and separated by light and heavy fractions for future analysis.

The data and interpretations gleaned from the PRV13, as well as Barber's work in 2003, were used to formulate hypotheses and apply for external funding for a second field season, which took place over four and a half months (January-June) in 2016. The 2016 field season of the Rio Verde Hinterland Project (PTRV16) expanded excavations in Complex B, continued a transect of test units in the Plaza, and investigated Complex E, located to the north of the ceremonial center. The operations carried out in Complexes B and E involved block excavations in various parts of the architecture. The operations carried out in the Plaza were oriented in a transect that extended east-west, articulating with the transect of excavations carried out during the PRV13, which ran north-south in the eastern part of the plaza. In total, the PTRV16 excavations covered an area of 230 m^2, which was allocated as follows: Complex B: 77 m^2; Terrace 2 and the Plaza: 9 m^2; and Complex E: 144 m^2. A brief laboratory season was completed following the end of the excavation program, which focused on dating the ceramics of each excavated context and reconstructing, photographing, and recording qualitative and quantitative measurements of complete or partially complete vessels found in offerings. A total of 171 complete or partially complete vessels were recovered during the project, bringing the total number collected during the two projects to 509 vessels (see Appendix A). These vessels were analyzed by CU Master's student, Vanessa Monson, as part of her thesis data collection. Primary contexts of ceramics that were not considered to be offerings were examined in detail in the field laboratory, wherein formal and technological attributes were recorded. As in the PRV13 laboratory season, all ceramic contexts were washed, dried, separated into paste types, counted and weighed. Flotation samples were taken following the same technique as was used in the PRV13. Osteological analysis on three collections of human remains recovered during the project were completed by San Diego State University Master's student, Aaron Young (Appendix E). All artifacts, ecofacts, and human remains were placed in the INAH laboratory and storage facility at the Ex-Convento in Cuilapan de Guerrero, Oaxaca.

From July to August of 2017, I returned to the INAH laboratory in Oaxaca to complete additional artifact analyses and export select artifacts for archaeometric and paleoethnobotanical studies. Artifact analyses were focused on recording qualitative characteristics and quantitative measurements of all obsidian and ground stone artifacts recovered during the PRV13 and PTRV16 projects (see Appendix B). A sample of 40 obsidian artifacts from primary archaeological contexts were also selected for export to the University of Missouri Research Reactor lab to undergo XRF analysis (see Appendix C). In addition, a sample of 30 figurines and 25 gray ware sherds from primary contexts were selected to undergo INAA at the MURR lab. All figurines recovered from the two projects were analyzed by CU undergraduate student, Rachael Wedemeyer (2018), as part of her Honor's thesis data collection. Wedemeyer selected an additional 30 figurines from primary contexts on the Rio Viejo acropolis to add to the data set, the analysis of which explored the scale at which figurine manufacture and distribution was controlled during the Terminal Formative period. Preliminary results of these studies can be found in Appendix C. Finally, a small sample of five ceramic offering vessels were processed for microbotanical extractions by McMaster University Master's student, Eloi Berube (see Appendix D). The exported samples of obsidian, ceramics, and microbotanical remains were exported with permission from the Centro INAH Oaxaca (see Appendix F for documents).

OBJECTIVES AND HYPOTHESES

Several Oaxacan archaeologists have suggested that a significant factor explaining the variable histories and durations of early states was the inability of rulers to integrate regional populations into salient polities (Barber 2013; Barber and Joyce 2007; Joyce 2010; Joyce et al. 2016; Pérez Rodríguez et al. 2011). Terminal Formative Monte Albán, a powerful state in the Valley of Oaxaca, presents a case in which leaders in a political center may have integrated hinterland populations through certain social fields, but not others. With the founding of Monte Alban in the Late Formative (400 – 100 BCE), many people left their homes and migrated to new communities tied to the city through shared communal rituals, labor projects, participation in military campaigns, tributary relationships and market exchange (Joyce 2010:146–155). Leaders at Monte Albán mobilized labor from outlying communities to construct public buildings and collected tribute in the form of agricultural surpluses to provision the urban center (Kowalewski et al. 1989). However, until the Terminal Formative, there appears to have been less integration in the form of elite control over the exchange of non-local prestige goods and the production and distribution of locally made prestige items (Joyce 2010). In fact, evidence from El Mogote and El Palenque, sites located well within Monte Alban's sphere of influence, indicates that these communities resisted integration or incorporation for several centuries (Spencer 2003; Spencer and Redmond 2001).

As described in Chapter 1, examining the social and material relations that defined communities in the lower Río Verde Valley in the Terminal Formative affords a unique perspective on political integration because regional rulership may have been tenuous and short-lived rather than strong and historically durable (Joyce and Barber 2015a; Joyce et al. 2016). Previous research on the later Formative in the lower Verde has indicated that the entanglements of people, things, and practices associated with public buildings at outlying sites were foundational in constituting community identity and political affiliations (Barber 2005, 2013; Barber et al. 2014; Joyce 1991b, 2010; Joyce and Barber 2015a; Joyce et al. 2016). To assess political integration from a hinterland perspective, it is imperative to identify the funds of power (*sensu* Blanton 1998; Mann 1986) through which secondary communities negotiated with polity leaders and the political capital they controlled. The main objective of the research conducted during the PRV13 and the PTRV16 was to determine whether certain funds of power were controlled on the local level (e.g., by local elites or commoners at Cerro de la Virgen) or the regional level (e.g., by polity leaders at Río Viejo). I examined four funds of power representing ritual-religious, labor, exchange, and production resources. Given the lack of evidence for institutionalized control through violence (Joyce 2010), these social fields provided the best chance at generating quantifiable data to test the hypothesis that the Río Viejo polity was loosely integrated and unstable. In the section that follows, I present the hypotheses and material correlates expected for tight and loose modalities of regional integration, separated each set of resources (or, "funds of power") vital to the project, followed by the excavation and laboratory analysis strategies that were carried out to produce the relevant archaeological data.

Ritual-Religious Resources

Greater regional integration is associated with large-scale incorporative rituals that create vertical and horizontal bonds among social groups, particularly between polity leaders and hinterland communities. Archaeological data from Río Viejo as well as from secondary centers in the region, including San Francisco de Arriba, Charco Redondo, and Yugüe, show that public buildings were places of ritual feasting, cemetery burial, and caching ceremonies (Barber and Joyce 2007; Barber 2013; Workinger 2002). Evidence from the Río Viejo acropolis suggests that elites may have attempted to "scale up" communal practices (e.g., collective labor, feasting) that were traditionally carried out in local communities (Barber 2013; Joyce et al. 2013). Lower regional integration would be indicated by communal practices at secondary centers that reproduced local affiliations independent of ruling institutions (Joyce et al. 2016).

Differences in the control of ritual resources have distinct archaeological signatures requiring data from the ceremonial center at Cerro de la Virgen. If polity leaders controlled ritual resources and the civic-ceremonial center was used for practices that indexed affiliations to the polity, then we should expect to see evidence of uniformity in communal practices such as feasting, mortuary ceremonialism, and caching throughout the valley. Regionally uniform ceremonies would include large feasting middens, cooking features, public cemeteries, and expansive ceremonial caches with artifact/ecofact distributions like those recorded on the Río Viejo acropolis and other secondary centers. For example, if polity leaders sponsored feasts, then we would expect evidence of similar diversities in plant and animal species from cooking features (e.g., hearths, earth ovens) at Cerro de la Virgen compared to analogous features at the Río Viejo acropolis. If there were regional conventions for the types of serving wares used during feasts, then we should also expect uniformity in the ceramic assemblages of feasting middens at the two sites (e.g., statistically similar proportions of fancy, carved serving wares vs. utilitarian serving wares). Finally, if the polity was tightly integrated, then we should expect to see similar caching practices at Río Viejo and hinterland sites (e.g., similar types of objects placed in uniform spatial patterns or stratigraphic contexts). Evidence of certain communal practices such as mortuary ceremonialism within public buildings will indicate local control of ritual resources. Barber and colleagues (Barber, Joyce, et al. 2013; Joyce and Barber 2015a) have interpreted the occurrence of public cemeteries at lower Verde sites as reflective of persistent local affiliations. Cemeteries and caches have not been found on the Río Viejo acropolis. Lower regional integration would be indicated by the presence of a cemetery located within a public building at the civic-ceremonial center of Cerro de la Virgen.

Labor Resources

Greater regional integration is associated with the construction of public facilities used for polity-related activities at secondary centers, which would enable ritual practices to be accessible to diverse social groups (Yaeger and Robin 2004). Lower regional integration is associated with variability in the architecture of public complexes at secondary centers. Differences in the control of labor resources will have distinct archaeological signatures requiring data from the civic-ceremonial center at Cerro de la Virgen. If polity leaders controlled labor resources and sponsored building projects at secondary centers, then there should be a spatial layout of buildings within this public space that is similar to the organizational plan at the at the Río Viejo acropolis (Barber and Joyce 2012; Joyce et al.

2013; Joyce and Barber 2015a). If labor resources were controlled locally, then we should expect diversity in the architectural layout of ceremonial precincts at sites throughout the valley. Because the construction and use of the civic-ceremonial center at Cerro de la Virgen is not fully understood from surface data alone, excavation data were needed to determine whether buildings in this area were used for domestic or communal practices.

Exchange Resources

Greater regional integration is associated with polity leaders' control over redistribution networks or sponsorship of market exchange, both of which would enable leaders to control or influence the distribution of goods to people throughout the valley (Blanton and Fargher 2008; Feinman and Nicholas 2004; Garraty and Stark 2010; Masson 2000). While detecting market systems in Pre-Columbian Mesoamerica is a notoriously difficult task, identifying the sources of imported goods has proven useful in illuminating the power dynamics involved in interregional exchange networks (Garraty and Stark 2010; Joyce et al. 1995, 2006). If polity leaders imported products such as obsidian and non-local pottery, then we expect the greatest quantity regionally (defined as a ratio of # per 1000 sherds) of imported items at Río Viejo since rulers would have had greater "purchasing power" (Hirth 1998:456).

Differences in the control of exchange resources will have distinct archaeological signatures requiring data from the civic-ceremonial center and residential terraces at Cerro de la Virgen. Previous research in the lower Verde indicates that over 99% of lithic tools were made of obsidian, a resource that was not available locally (Joyce et al. 1995; Williams 2012). If polity leaders controlled the importation of obsidian and non-local ceramics, then we should expect assemblages of these artifacts at Cerro de la Virgen to share similar source profiles as those from Río Viejo. If local leaders utilized trade routes that were independent of those established and maintained by leaders at Río Viejo, then we should see a significant difference in the sources of obsidian materials at Cerro de la Virgen compared to valley-wide trends. For prestige good exchange, if polity leaders controlled the distribution of luxury materials such as ornamental shell, greenstone, iron ore, and rock crystal, then we expect the greatest quantity and highest regional diversity (quantified by statistical "richness" [*see* (Leonard and Jones 1989]) of these items at Río Viejo. In contrast, if the importation of prestige goods was controlled locally, then we would expect to see a different source profile of luxury materials at Cerro de la Virgen.

Production Resources

Greater regional integration is associated with polity leaders' control over the acquisition of raw materials or the production of valued utilitarian items requiring workers with special skills. These resources would have had wide distribution and increased the degree to which polity leaders were able to control local economic relationships (Blanton 1998; Blanton et al. 1996; Masson 2000). While control of utilitarian production by elites is rare in Mesoamerica (Feinman and Nicholas 2004; King and Potter 1994; Rice 1987), attached production of obsidian tools could have occurred at Cerro de la Virgen. Previous research at the site indicates that craft production did not take place within a high status residence at the top of the hill (Barber 2005) or within public facilities in the northeastern section of the civic-ceremonial center (Brzezinski 2015; Brzezinski et al. 2015). However, previous research has lacked extensive data from public buildings located outside of the hinterland sites' ceremonial centers, which have the potential to shed light on the production resources controlled on the local level.

Differences in the control of production resources will have distinct signatures requiring data from the civic-ceremonial center and residential terraces at Cerro de la Virgen. If obsidian tool production was controlled on the local level, then we expect to see workshop facilities and production byproducts in the form of debitage, exhausted cores, core platform rejuvenation flakes, flakes with cortex, and specialized tools used in lithic reduction (e.g., deer antlers, hammerstones). Further, if obsidian tools were made locally, we would also expect to see a relatively high ratio of prismatic blade fragments to exhausted polyhedral cores at the site. If control over the manufacture of elaborate grayware pottery used in feasting ceremonies was organized at the community level, then we may expect to see evidence of fancy gray ware production (e.g., kilns, polishing stones, wasters, etc.) in public buildings at Cerro de la Virgen, perhaps similar in scope to features recorded at the Main Plaza of Monte Alban (Elson and Sherman 2007). If production of lithic tools and pottery was not controlled locally, there should be limited evidence of specialist craft production; however, this scenario would not preclude a mode of production of fancy gray wares organized at the household level.

EXCAVATION METHODS

Excavations carried out during the PRV13 and the PTRV16 at Cerro de la Virgen employed standardized procedures used during previous projects in the lower Rio Verde Valley (Barber 2005; Joyce and Barber 2011; Joyce 1991a; Joyce et al. 2009, 1998; Levine 2011b; Workinger 2002; Butler 2018). The numbering of excavation units built upon the system employed for the PRV00, PRV09 and PRV12 excavations at Rio Viejo, during which all 1 m x 1 m units were assigned a number and letter (Barber and Joyce 2012; Joyce and Barber 2015b). Units were situated on a Cartesian grid aligned with the general site orientation (north-south azimuth of 25°-205°) and given a number-letter designation. The decision to align excavations to the general site orientation was strategic in that we were able to follow certain architectural features (e.g., wall lines) more efficiently by opening up fewer excavation units. On the Cartesian grid, unit numbers increased in value from west to east and unit letters increased sequentially from south to north, beginning with unit 0A. For example, the unit directly adjacent to the east of unit 0A is “1A”; the unit directly adjacent to the north of unit 0A is “0B.” In cases where a feature occupied space within more than one arbitrary unit, a “multi-unit” number was assigned. A letter was given to each distinct stratum to distinguish natural strata from cultural features (abbreviated F for cultural features or N for natural layers). Frequently, excavations identified sub-strata within larger deposits (abbreviated “s” for sub-strata). For example, a culture feature labeled “F1-s1” would refer to “Feature 1, sub-stratum 1”. Objects identified as part of special contexts such as offerings were assigned “object numbers,” where the object number (e.g., “Ob1” in “F17-Ob1” from Operation A) refers to the object and the feature number (e.g., “F17” in “F17-Ob1” from Operation A) refers to the overall feature.

Sediment was removed from test units using trowels and soft bristle brushes and sifted for artifacts using 1/4 in. (6.35 mm) mesh screens. Artifacts of different materials (e.g., ceramics, lithics, bone, etc.) were placed in separate bags and labeled with the corresponding provenience information, including the Operation #, Unit #, Lot #, Field Specimen #, material type, and the date of excavation (Figure 3.1). Where it was possible to identify distinct cultural strata, excavators removed sediment and artifacts corresponding to each cultural stratum as a single “lot.” Within exceptionally thick cultural strata (e.g., construction fill layers thicker than 10 cm), sediment was removed in 5-10 cm lots to retain vertical control. Field Specimen numbers were given to objects of similar artifact classes (e.g., lithics, ceramics, bone, etc.) within each excavated lot. Primary deposits rich in botanical remains (e.g., carbonized seeds) and faunal remains (e.g., bone) such as hearths, middens, earth ovens, and occupational surfaces were passed through fine-gauge 1-mm and 2.5-mm mesh. Sediment samples (minimum 10 liters each) were taken from these types features as well as from control contexts (e.g., construction fill) for flotations to record the background fauna/flora of the site.

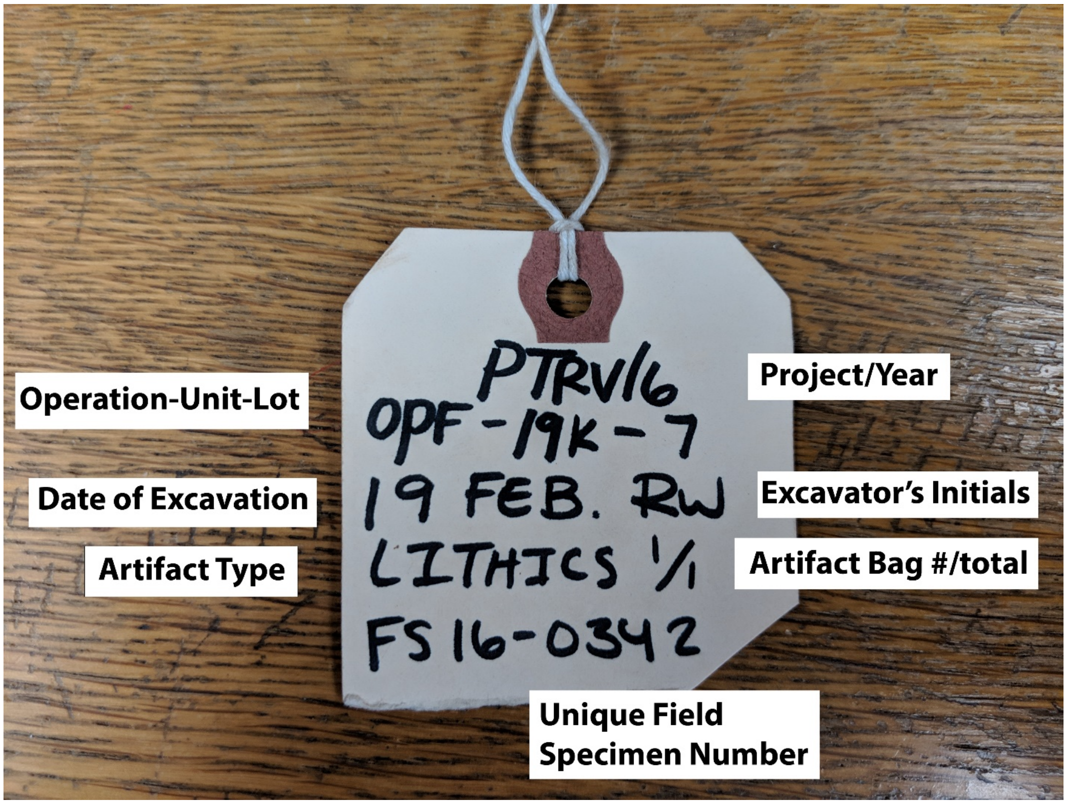


Figure 3.1: Sample artifact bag tag from excavation carried out during the PTRV16.

An arbitrary datum from which the opening and closing measurements of each excavated lot were measured was created within each operation, some having multiple such datum points across the extent of the excavation. Datum points were designated by driving a long piece of re-bar into the modern surface at a higher elevation than the proceeding excavations and fastening a reinforced string at a permanent, secure location on the re-bar. Depth was recorded by measuring down from the level of the string using a line level and measuring tape. The location of each datum was recorded in UTM coordinates and elevation above sea level using a total station.

OVERVIEW OF FIELD OPERATIONS

The main goal of the excavation program carried out during the PRV13 and PTRV16 was to examine the construction and use of public architecture within and outside of the ceremonial center at Cerro de la Virgen. More specifically, excavations in public buildings were placed to: (1) determine the chronology of construction, use, and abandonment of each structure or complex, (2) examine the types of construction methods utilized to build each building/terrace; and (3) examine the types of communal practices carried out at each building (e.g., feasting, object caching, mortuary ceremonialism, craft production and/or maintenance, etc.). Overall, the following excavation strategies were used:

- *Strategy #1*: Discrete 1 x 1-meter test units placed in particular areas to evaluate the chronology of the construction and use of the site.
- *Strategy #2*: Transects of 1 x 1-meter test units placed every five meters to locate/examine features of political, economic, or religious-ritual interest (e.g., hearths, middens, burials, sub-surface architecture, caches, and ceramic/lithic production debris). Excavations were expanded around features of interest.
- *Strategy #3*: Block/horizontal clearing excavations of architecture and important features such as offerings.

The excavation program was divided into eight operations during the PRV13 and seven operations during the PTRV16. The goal of PRV13-Ops A, B, C, D (Chapter 4), E, F, G, and H (Chapter 5) and PTRV16-Ops F and G (Chapter 5) was to test the scale at which resources and communal practices associated with the ceremonial center were controlled. PTRV16-Ops A-E (Chapter 6) examined control of resources and evidence for communal practices associated with public buildings away from the site's ceremonial core. This point of comparison also informs our understanding of the degree of integration *within* the community of Cerro de la Virgen. In the sub-section that follows, I briefly describe the rationale for each excavation carried out during the two field projects by detailing the type of resource (i.e., religious-ritual, labor, production, exchange) that each operation was aimed at addressing. Displaying the expected material correlates in this fashion aids in applying this analytical framework to future projects, particularly those examining political authority in the lower Verde (see Conclusion). In Chapters 4-6, I present the locations, methods, and results of each excavation operation individually and in greater detail.

Excavation Methodology

PRV13-Op A, PRV13-Op B, and **PRV13-Op C** consisted of block excavations in various locations of Terrace 11, which supports architectural Complex A. Ops A and B are located in the north and south sections of the complex, respectively. These excavations were placed to collect data on **ritual resources** by conducting horizontal and test excavations of a prominent, accessible public building in the ceremonial center. If ceremonial practices were predicated on regional conventions dictated by polity leaders, then we would expect to see uniformity in the types of collective rituals (e.g., object caching, burials patterns, feasting features, etc.) at Complex A compared to other sites in the region. Op C was placed at the base of the terrace to the west to examine evidence for trash discard and refuse. If feasting practices at Complex A were sponsored by polity leaders, then we would expect to see evidence of the discard of fancy serving vessels in higher proportions than typical domestic middens and containing similar styles and iconographic designs as those recorded in feasting middens on the Rio Viejo acropolis.

PRV13-Op D consisted of block excavations in the restricted--but public--space on Terrace 11, which supports Structure 1. These excavations were placed to collect data on **ritual resources** within a prominent, but restricted, public building in the ceremonial center. If ceremonial practices were predicated on regional conventions dictated by polity leaders, then we would expect to see uniformity in the types collective rituals (e.g., object caching, burials patterns, feasting features, etc.) at Structure 1 compared to other sites in the region.

PRV13-Op E, PRV13-Op G, PRV13-Op H and **PTRV16-Op G** consisted of excavations (single 1 m x 1 m test units and transects of 1 x 1 m units) placed at various locations on Terrace 2--the broad, open base of the ceremonial center. Research at Río Viejo demonstrates that people participated in ritual feasts on the acropolis, indicated by stratified middens that reflect long-term events as well as a large earth oven (Joyce et al. 2016). PTRV16-Op G and PRV13-Op H were designed to collect data on the control of **ritual resources** by sampling a large area of the plaza for evidence of feasting features (e.g., stratified middens, large hearths, earth ovens, etc.). If polity leaders sponsored large-scale feasts at secondary communities, then we should expect that feasting practices at Cerro de la Virgen should be similar to those at Río Viejo. Evidence of uniformity would be indicated by a statistically similar diversity of plant and animal species recovered from feasting features in the plaza. Op A will also collect data on the types of materials used during feasts, such as grayware serving pottery. While grayware technology was available to all social strata during the Terminal Formative and probably used on a daily basis (Levine 2013), finely carved grayware pottery with elaborate iconographic designs has been found in larger quantities in feasting middens (Barber 2005; Brzezinski 2011; Joyce et al. 2016). If feasting practices were uniform, then we expect to see similar vessel forms and iconographic motifs on pottery recovered from feasting middens in the plaza, particularly if polity leaders distributed these materials. Extensive evidence of large-scale feasts in the area of Terrace 2 like earth ovens, hearths, and feasting middens would indicate low regional integration, as feasts would have facilitated the affiliation and participation of communities around Cerro de la Virgen.

PRV13-Op F and **PTRV16-Op F** were combined into one contiguous series of block excavations situated in Complex B. The direct spatial association between Complex B and the ballcourt--an architectural feature often associated with death, sacrifice, and the underworld--to the west suggested that the architectural complex had a strong possibility of containing human remains. PRV13-Op F and PTRV16-Op F were designed to collect data on the control of **ritual resources** by testing whether Complex B served as a community cemetery, a mortuary pattern witnessed at other secondary centers in the region, including Yugüe and Charco Redondo (Barber, Joyce, et al. 2013). Community cemeteries at these sites included individuals of varying social statuses, many of which were disturbed by later interments. Barber and colleagues (2013) interpret this pattern to represent strong ties to the local community. If mortuary resources were controlled locally, then we expect to see variation across the valley in burial practices, particularly interments in public buildings that do not resemble the community cemeteries seen at other sites. Mortuary practices taking place strictly on the household level would indicate stronger ties to domestic units like extended families.

PTRV16-Op A, PTRV16-Op B, PTRV16-Op C, PTRV16-Op D, and **PTRV16-Op E -** Excavations in Complex E utilized block excavations to explore a large area of the three-tiered terrace to examine **ritual resources** in the same manner as detailed above for the ceremonial center. If there was a higher degree of integration among residents of Cerro de la Virgen, then we would expect to see similar evidence of communal practices at Complex E compared to the ceremonial center.

All operations in the ceremonial center were designed to address the organization of **labor resources** by testing whether the overall organization, style, and form of architecture and public space varied across the region. If polity leaders controlled the labor resources required to build the ceremonial center at Cerro de la Virgen, then we would expect uniformity in the architectural layout of this space compared to the Río Viejo acropolis. If polity leaders controlled labor resources, then we do not expect to find households in the ceremonial center, since the Río Viejo acropolis lacks domestic structures of any kind (Joyce et al. 2013). Signatures of households would include middens with typical domestic refuse, small-scale cooking features, and burned daub wall segments. All operations were also designed to test the scale at which **exchange resources** and **production resources** were controlled by collecting obsidian and imported ceramic artifacts from primary deposits (e.g., occupational surfaces, middens, caches, etc.). If polity leaders controlled the importation and distribution of these materials, then we expect to see similar source profiles at Cerro de la Virgen compared to Río Viejo. If local leaders imported obsidian and ceramics, then we expect to see variability in the source profiles of these materials compared to analogous assemblages from Rio Viejo. If production resources were controlled on the local level, then we expect to see evidence of obsidian tool and/or ceramic production workspaces associated with public architecture within and/or outside of the site's ceremonial center. We would also expect to see evidence of ceramics with distinct paste characteristics and local source profiles.

LABORATORY METHODOLOGY

All artifacts recovered during the 2016 field season were brought back to the field laboratory, located at the project residence in San José del Progreso. Functional analyses of ceramic/lithic artifacts were designed to examine the scale and nature of ceremonial, domestic, and craft production activities. For example, unusually large cooking vessels and high frequencies of serving vessels that exceed those in residences would indicate feasting (Bray 2003; Dahlin et al. 2010; Dietler and Hayden 2010). In the case of obsidian, unusually large, concentrated collections of early-stage core reduction debris would indicate the importation of unprepared obsidian cores in raw form.

Artifact Analyses

The ceramic and lithic analyses completed in this dissertation were limited to basic formal analyses of sherds, obsidian and ground stone. These categories represented the majority of artifacts recovered during the project, the analysis from which has the potential to illuminate quotidian and ceremonial aspects of social life at Cerro de la Virgen. Ceramic analyses were completed on primary deposits and all offering vessels recovered during the 2013 and 2016 projects (see Appendix A). Obsidian and ground stone artifacts were subjected to basic quantitative and qualitative analyses aimed at determining the general types of lithic reduction practices carried out at the site (in the case of obsidian) as well as the most prevalent types of finished products into which obsidian and other stone were manufactured (see Appendix B). Modalities of exchange were addressed through the determination of obsidian sourcing by way of x-ray fluorescence spectroscopy (see next section; Appendix C). Function as determined by microscopic use wear analyses was not addressed in this study, but would make for an interesting dataset, or sub-set of a larger dataset, that could address the day-to-day practices that residents carried out using lithic tools.

Archaeometry

As described in the beginning of this chapter, studies of complex societies in ancient Oaxaca have tended to focus on political seats of power at the expense of smaller, outlying communities. Though the examination of the largest, most powerful sites is certainly necessary, political integration often appears differently through the lens of the hinterland. Obsidian and ceramic sourcing studies have the potential to shed light on the ways in which political authority was constituted in early complex societies by focusing attention on the scales at which these essential resources were controlled. The purpose of conducting x-ray fluorescence (XRF) spectrometry on obsidian and instrumental neutron activation analysis (INAA) on ceramic figurines and sherds is to identify the level at which exchange and production resources were controlled in the lower Rio Verde Valley during the late Terminal Formative period. At present, there is no evidence for the presence of markets in the lower Verde during the Terminal Formative, suggesting that long-distance goods were distributed via a command economy managed by polity leaders, or were procured on the local level.

In Appendix C, I present results of the archaeometric studies on the Cerro de la Virgen artifacts. The source profile created for the Cerro de la Virgen obsidian sample is compared with known source profiles of other lower Verde sites for the Chacahua phase. Control over locally produced goods such as gray ware serving vessels and ceramic figurines will be assessed by compositional analysis of pastes to determine whether similar or different clay sources were used among lower Verde sites. Broader implications of the results of the archaeometric studies are discussed in Chapters 7 and 8.

X-Ray Fluorescence (XRF) Spectroscopy: Control over long-distance trade relationships was examined by XRF spectrometry of obsidian--a material not locally available on the coast of Oaxaca--obtained by residents of Cerro de la Virgen. XRF is a technique with a broad application across the sciences that is based on the principle that individual atoms will emit x-ray photons of a specific energy or wavelength when excited by a source of external energy (Glascock et al. 1994). XRF instruments come in a variety of configurations, but the basic process involves the release thermal electrons from a heated cathode within an evacuated chamber, which accelerate toward an anode within a sample chamber. A detector quantifies the specific energy of the emitted x-rays, thereby identifying the type and amount of source elements present in a given sample. The advent of portable XRF (PXRF) instruments has greatly expanded the range of samples suitable for analysis in that there is no longer a need to fit a sample in a small chamber. The samples analyzed by Dr. Michael Glascock at the University of Missouri Research Reactor (MURR) for this study were completed with a PXRF instrument (see Appendix C). PXRF tends to be the most cost effective method for obsidian sourcing, and dissertation projects with National Science Foundation funds receive subsidized rates from MURR following the approval of a “mini” research proposal.

Obsidian sourcing using XRF has been proven to be especially effective in studies of Pre-Columbian exchange because chemical characterization can identify source locations of artifacts anywhere in Mesoamerica with 99 to 100 percent accuracy (Cobean et al. 1991; Glascock et al. 1994).

No sources of obsidian have been found within the state of Oaxaca, making XRF ideal to examine access to trade route among communities in the lower Verde. For example, Workinger (2013) has demonstrated that comparisons of Late Formative obsidian sourcing data (XRF and INAA) from various regions of Oaxaca show similarities between the lower Rio Verde and the southern Isthmus of Tehuantepec, indicating obsidian was traded south across the isthmus from Gulf coastal sources. Joyce and colleagues (1995) demonstrated that most of the obsidian imported to the lower Verde from the Middle Formative to Late Classic periods (800 BCE - CE 900) came from the Basin of Mexico and Michoacan. Williams's (2012) broad study of obsidian sourcing also suggests that, based on the elevated frequencies of obsidian from the Pachuca, Paredón, and Otumba sources in Terminal Formative assemblages, long-distance trade with the central Mexican polity of Teotihuacán likely significantly increased, with the latter perhaps receiving coastal resources such as shellfish, cotton, and cacao in return.

A sample of 40 pieces of obsidian recovered during the 2013 field season of the RVPP and 2016 field season of the RVHP will be subjected to XRF. All pieces of obsidian were recovered from primary excavated contexts (e.g., burials, hearths, offerings, etc.) securely dated according to the late Terminal Formative period ceramic chronology developed by Joyce (1991a). Obsidian recovered from domestic contexts at Complex E and public contexts surrounding the Terrace 2 Plaza are included in the sample. The source profile generated by XRF analysis of the Cerro de la Virgen sample was compared to known source profiles of obsidian from other Terminal Formative period sites, including Rio Viejo. A significantly different source profile of obsidian from Cerro de la Virgen compared to Rio Viejo and other sites in the region would indicate that the importation of this material was controlled on the local level. If source profiles are similar between Cerro de la Virgen and other sites in the region (particularly Rio Viejo), then it is likely that polity leaders managed long-distance trade relationships as a fund of power.

Instrumental Neutron Activation Analysis (INAA): In this study, regional control over the production of ceramic objects was examined via INAA on a sample of figurines and locally made gray ware vessels. Neutron activation analysis (NAA) is a highly reliable analytical technique used across the sciences to detect and quantify multiple elements in a given sample of material. The basic application of NAA involves firing a neutron at a target (sample) nucleus, the collision of which results in a compound nucleus in an excited state. Almost instantaneously, the compound nucleus de-excites into a more stable configuration following the emission one or more "prompt" gamma rays. Often, the new configuration of the sample nucleus becomes radioactive, which decays by emitting one or more "delayed" gamma rays. Measurement of the gamma rays can occur during irradiation (prompt gamma-ray neutron activation analysis, or PGNAA) or following radioactive decay (delayed gamma-ray neutron activation analysis, or DGNAA), with the latter being most commonly used. The application of purely instrumental procedures to detect or count gamma-ray emission is known as instrumental neutron activation analysis (INAA)--the procedure used by the MURR researchers that processed this study's samples.

NAA has been used broadly in the archaeological sciences to characterize materials such as pottery and obsidian, and to pair the artifacts to particular sources through matching chemical signatures. Several laboratories across the globe have compiled large databases of chemical fingerprints for clays from various regions of the world. The Mesoamerican database compiled by MURR is one of the most detailed for the Pre-Columbian New World. The combination of a robust database with multivariate statistical methods (see Appendix C) allows clays and ceramic pastes to be sourced with a high degree of confidence.

The use of compositional analysis of ceramic pastes with INAA to identify exchange and interaction spheres in Pre-Columbian Oaxaca has been instrumental in examining economic and political relationships within and between several regions (Balkansky 2002; Joyce et al. 2006; Minc et al. 2016; Redmond 1983; Shepard 1967; Barber, Workinger, et al. 2013). For example, the presence of Gulf Coast pottery at Mixteca Alta and Valley of Oaxaca sites during the Early Formative period has been used to argue for and against Olmec influence (Blomster et al. 2005; Sharer et al. 2006). Several studies of sherds and clay sources dating to the later Formative period (400 BC – AD 250) demonstrated that ceramics were among the trade goods circulating among several areas of Oaxaca at that time (Joyce et al. 2006; Redmond and Harbottle 1983; Workinger 2002). The use of petrography to examine ceramic exchange has also been employed (Joyce 1991a). Recent analysis of Mixteca-Puebla polychromes from Tututepec demonstrates the local production of these wares and their distribution through a market at the Mixtec imperial capital (Levine et al. 2016). Most of these analyses have employed INAA to identify compositional groups, creating an extensive database for Oaxacan pottery. The RVHP sample will take advantage of these existing data and augment them by adding to the sample derived from the lower Verde.

A sample of 25 local gray ware sherds recovered during the PRV13 field season (Brzezinski 2015) and the 2016 field season of the RVHP was subjected to INAA (Appendix C). All sherds were recovered from primary excavated contexts (e.g., burials, hearths, offerings, etc.) securely dated to the late Terminal Formative period using the lower Verde ceramic chronology. The clay sources for the Cerro de la Virgen sample will be compared to the existing gray ware source database for the Terminal Formative in the lower Verde (Joyce et al. 2006; Joyce 1991a; Workinger 2002). If the clay sources used to make fancy gray wares at Cerro de la Virgen was different than those used for gray wares recovered at Rio Viejo and other sites, then it is likely that this raw material was a fund of power controlled on the local level.

A sample of 60 ceramic figurines of various paste types (e.g., coarse brown, fine brown, gray) was also be subjected to INAA as part of CU undergraduate student Rachael Wedemeyer's (2018) honor's thesis. Thirty figurines were sampled from excavations on the Rio Viejo acropolis (Rio Verde Project 2012 [Barber and Joyce 2012]) and 30 figurines were sampled from excavations at Cerro de la

Virgen (PRV13 and PTRV16). Figurines from the Rio Viejo acropolis were recovered exclusively from middens that dated to the late Terminal Formative. Figurines from Cerro de la Virgen were recovered from primary deposits, including offerings, hearths, and occupational surfaces from domestic and public buildings. If the clay sources used to make figurines were different between the two sites, then it is likely that the control of this raw material was a fund of power controlled on the local level.

TERMINOLOGY

The terminology used during the PRV13, PTRV16, and in this dissertation follows that of Joyce (1991a:85-94), Barber (2005:142-148), and Workinger (2002:81-84)--studies from which this research draws heavily (also see Hepp 2015). Throughout this dissertation, I use technical terms to refer to certain types of features, artifacts, and contextual relationships, consistent with standard archaeological practices (Banning 2000; Roskams 2001). In most cases, I define terms upon their first use in the dissertation, but below is a brief list of terms that I use regularly for added clarity:

- Occupational surface: refers to a stable interface between stratigraphic levels on which daily activities were carried out in the past, identified by ceramic sherds found in a horizontal position, alignments of architectural stones, thin layers of ash involved in clearing vegetation, etc.
- Floor: a flat occupational surface that was located inside of a structure.
- Soil: sedimentary formation on a stable surface identified by dark color, organic content, and soil or pedogenic structure
- Domestic space: term is applied to living areas associated with residences and utilitarian artifacts such as ceramics, animal bone, and ground stone. Chipped stone would not be found in abundance due to the possibility of cutting one's foot on sharp edges (however, taphonomic processes may introduce chipped stone to these settings)

- Midden: locus of trash accumulation associated with domestic or public practices, containing various amounts of ceremics, lithics, animal bone, ash, charcoal, and shell.
- Construction fill: redeposited sediment used to construct earthen platforms, mounds, or otherwise raised living spaces.
- Offering/cache: these terms are used interchangeably in this dissertation to refer to intentionally deposited collections of objects meant to serve either a ritual purpose.

SUMMARY

In this chapter, I summarized the analytical approach of the dissertation, including the objectives, hypotheses and methods of excavation and laboratory operations. Overall, this framework uses archaeologically testable expectations for political integration in a complex society that does not have a known or deciphered writing system, making it amenable to addressing the nature of political authority across time and space. In the next three chapters, I detail the results of excavations carried out during the 2013 and 2016 projects.

IV. COMMUNAL PRACTICES IN CEREMONIAL BUILDINGS: EXCAVATIONS IN COMPLEX A AND STRUCTURE 1

INTRODUCTION

This chapter presents the results of excavations carried out during the PRV13 on Terraces 10 and 11, located in the northeast section of the ceremonial center at Cerro de la Virgen. While Terraces 10 and 11 were located adjacent to one another, and therefore grouped together in this chapter, archaeological investigations of the spaces revealed slight variability in the types of ritual activities carried out in each area. Terrace 10 was the smallest terrace in the ceremonial center, occupying an area of just 375 m^2, forming the surface on which Structure 1—a ceremonial building that likely constituted a “temple”—would later be built. Structure 1 and the adjacent patio were public spaces used for ritual practices such as vessel caching, but participation in these practices may have been restricted to a smaller, more select group of individuals than those that participated in activities in the more spacious and accessible architectural complexes surrounding the Terrace 2 plaza below (Brzezinski 2015; Brzezinski et al. 2017). The elite family living in Residence 1, which was at the same elevation and situated 35 m to the east, may have controlled access to Terrace 10 and Structure 1 (Barber 2005).

Located at the base of the monumental stairway to the west, Terrace 11 occupied more than twice the area (820 m^2) of Terrace 10 and housed Structures 2 and 3 as well as patios at the north and south ends of the terrace. Collectively, the public spaces and architecture supported by Terrace 11 is termed “Complex A”. Complex A and the activities carried out within it were accessible and perhaps more visible to people that congregated in the ceremonial center for large-scale rituals like feasts or ballgame events. In contrast to the discrete offerings and features that characterized the ritual activities surrounding Structure 1, Complex A was home to much larger offerings that were likely placed over extended periods of time. Associated with the offering events in Complex A were feasting practices, indicated by cooking features such as small hearths that were interspersed within a large offering of 260 ceramic vessels and hundreds of thin stone slabs in the north patio, as well as larger, deeper hearths located in the south patio.

The sub-sections that follow summarize the goals and results of each operation carried out in the northeastern quadrant of the ceremonial center. At the beginning of each section, I describe the spatial context and provide a brief overview of the major findings of the operation, followed by a detailed chart describing each cultural and natural stratum identified during the excavations, beginning with the latest and ending with the earliest. Next, I provide a narrative of the occupational history in each operation and reference particular natural and cultural features in sequence as they were deposited over time. I then end the chapter with a summary of the excavation results.

COMPLEX A

PRV13 - Operation A

Operation A was a large horizontal excavation (75.25 m^2, total area cleared) located on the northern half of Terrace 11 that cleared a small area (6 m^2) inside the retaining walls of Structure 2, a 4 m x 13 m modular public building oriented east-west (115°-295°; see Figures 4.1-4.3). Excavations also cleared a large area (69.25 m^2) in the patio to the north of Structure 2, exposing an expansive offering consisting of thin stone slab compartments that housed an offering of 260 ceramic vessels of different forms and sizes. An additional possible building (Structure 3) was located adjacent to the northeast and slightly uphill, oriented perpendicularly to Structure 2. Structure 3 was not excavated. Structures 2 and 3 and the north and south patios form Complex A.

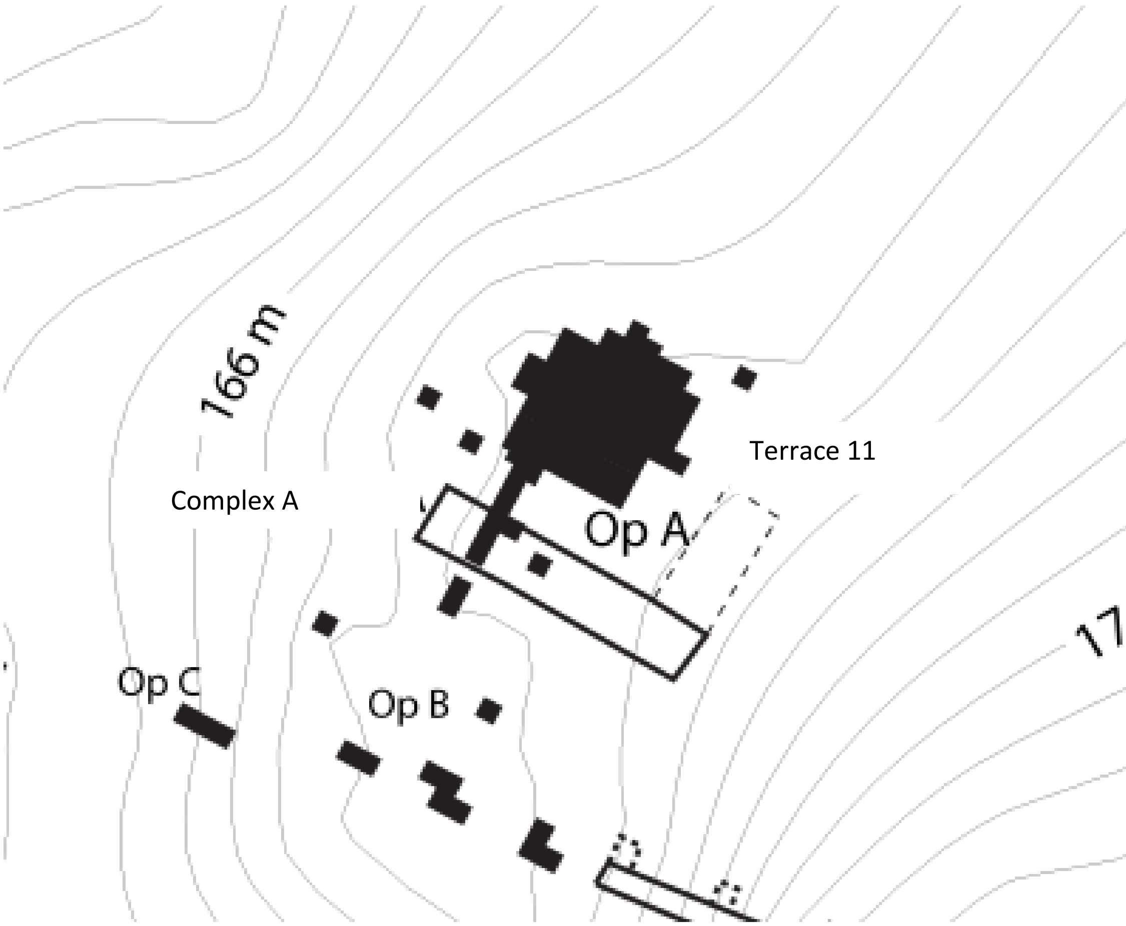


Figure 4.1: Topographic map with units excavated in PTRV16-Op A shaded in black.

Excavations in PRV13-Operation A had three goals:

1. Identify the construction techniques and materials used to build Terrace 11 and Structure 2.
2. Identify activities carried out within Structure 2 and in the north patio.
3. Penetrate to bedrock in several areas to investigate the earliest occupation and construction episodes of the area.

The initial construction of Terrace 11 began during the Terminal Formative period. First, builders raised and leveled the ground surface by depositing as much as 1.2 m of fill on top of bedrock, which created the flat surface of Terrace 11 (see Figure 4.3). Builders then constructed a small mound in the center of the terrace, which provided a platform on which Structure 2 was built. During the construction of Structure 2, a thick layer of loosely packed sandy fill was deposited to the north of the building, covering the entire patio. The layer of fill would provide the medium into which Cerro de la Virgen residents would place a massive offering of 260 ceramic vessels within stone slab compartments. While it is unclear how many distinct caching ceremonies were involved in the placement of the vessels and compartments, stratigraphic evidence indicates that they were placed sequentially over time. Unfortunately, the mottled composition of the fill covering the offering precluded identifying particular pits into which the caches were deposited.

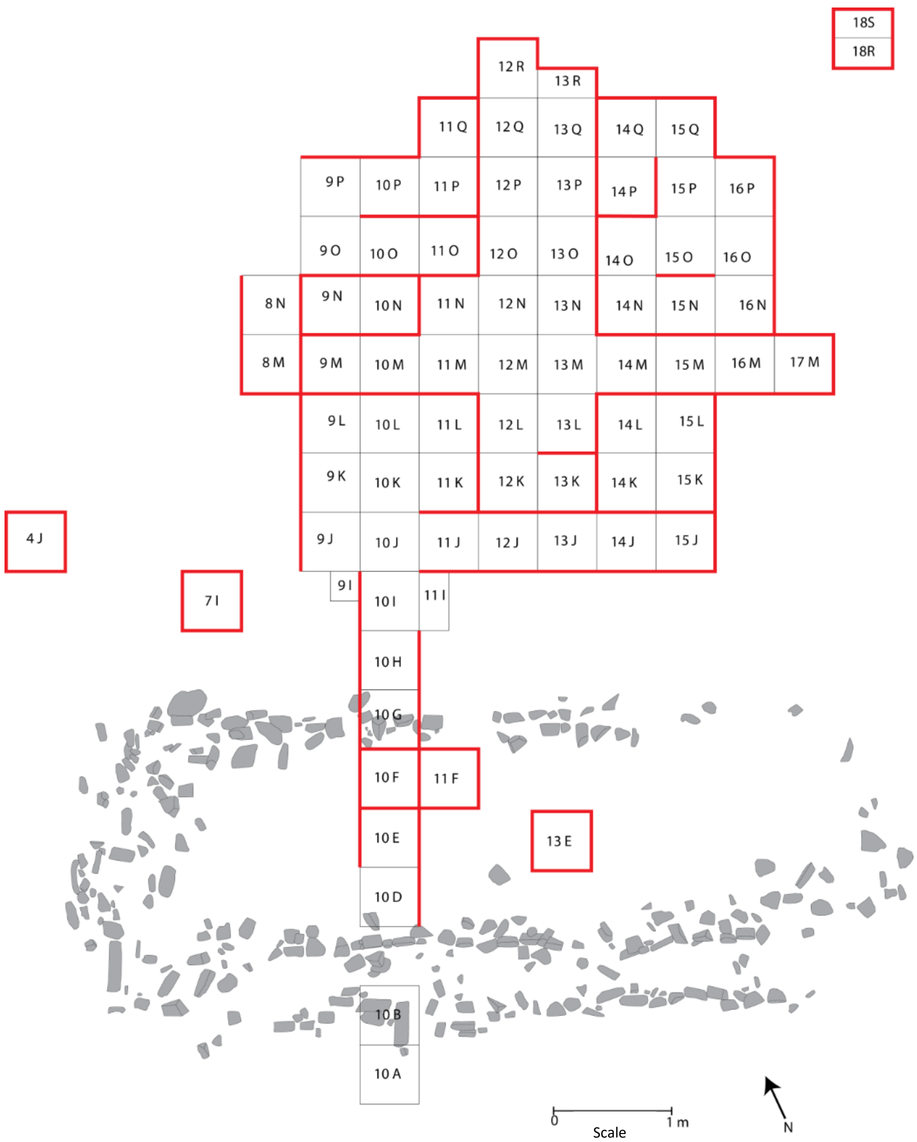


Figure 4.2: Plan view of Structure 2 and units excavated in Operation A. Drawn profiles indicated by bolded lines. Excavation units aligned to site orientation—25° east of north (magnetic).

Figure 4.3: Photo of excavated units in Operation A with north retaining wall and drain of Structure 2 in the foreground and offering area in the background. Units 10A, 10B, 10D, and 10E not visible in photo.

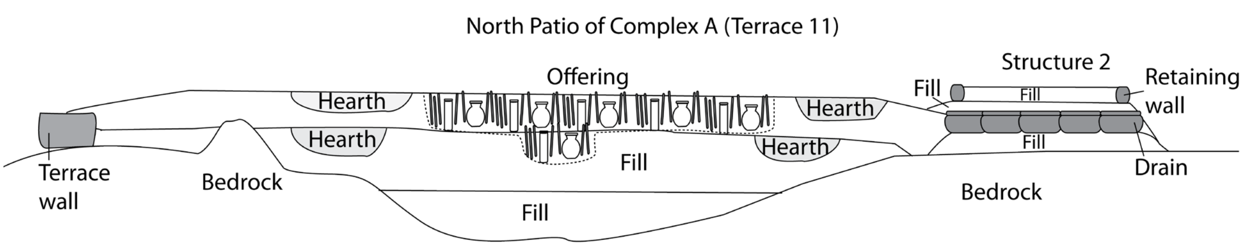


Figure 4.4: Idealized drawing of east-facing cross-section of north patio and Structure 2; Not drawn to scale.

A great deal of care went into preserving the composition and integrity of the offering and its overlying fill. Builders included a stone drain at the base of Structure 2 that directed water away from the offering area toward the southwest and off the terrace. Thus, ceramic vessels recovered from the offering were in relatively good condition and provide the best date for the construction and use of Complex A. Although the majority of vessels included in the cache were non-diagnostic, those that could be dated indicate that the offering began during the transitional period between the Miniyua and Chacahua phases and continued into the latter period. The offering assemblage includes both Miniyua phase fine brown ware and Chacahua phase gray ware vessels. Alternatively, the Miniyua phase vessels may have been heirlooms that were deposited later, perhaps exclusively during the Chacahua phase. As I explain below, I lean toward the former scenario, given the relatively higher proportion of diagnostic Miniyua phase vessels to Chacahua phase vessels.

Finally, in addition to caching ceremonies, residents of Cerro de la Virgen also carried out cooking activities involved in feasts that took place in the area of Complex A. Several hearths were excavated down from the top of the offering fill layer, suggesting that caching ceremonies were associated with ritual feasting that may have engaged larger groups of people, or perhaps the community at large. Dating carbon recovered from the hearths in Complex A may provide additional clarity on the date of Complex A. The north patio of Complex A appears to have fallen out of use as ritual practices and construction ceased at the end of the Chacahua phase. Table 7.1 provides a detailed list of stratigraphic levels in Op A, beginning with the most recent and ending with the oldest.

Table 4.1: List of stratigraphic levels in PRV13-Operation A.

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F1	All units	10 YR 3/1; very dark gray loamy san	Modern	Soil formed in colluvium (F2)	Thin layer of humus forming at modern surface; highly disturbed and contains large amount of organic material, gravel, coarse sand and sherds; see Figures 4.5 – 4.14, 4.19 – 4.22
F2	All except 10D, 10E, 10F, 13E	10 YR 3/2; very dark grayish brown sandy loam	Post-Formative or Modern	Colluvium	Colluvium (25 – 45 cm thick) deposited atop final occupational strata in Op A; contains poorly sorted sandy loam sediment with coarse inclusions of sand and crushed rock, mica, eroded sherds, rocks, fallen stones from higher elevations and daub; contains high frequency of animal burrows and root disturbances; very loosely packed; see Figures 4.5 – 4.11, 4.13, 4.19 – 4.22
F3	11J	10 YR 2/1; black sandy loam	Late Miniyua-Chacahua	Hearth	Shallow hearth of unknown diameter excavated down from top of F17-s1 in unit 11J; filled with dark loamy sediment, organic material, some ash, sherds and small stones; see Figures 4.22, 4.32
F4	9O, 10O	10 YR 3/2; very dark grayish brown loamy sand	Late Miniyua-Chacahua	Pit fill	Small, shallow (25 cm deep) pit excavated down from the top of F17-s1 and slightly into F26-s1; pit filled with sediment very similar to F17-s1 but with coarser inclusions and fewer sherds; sediment is darker than F26-s1; few artifacts; delineation between F4 and F17-s1 unclear; see Figure 4.22
F5	10H	10 YR 3/3; dark brown sandy loam	Late Miniyua-Chacahua	Pit fill	Broad, approximately 22 cm-deep pit excavated from the top of F17-s3; pit filled with poorly sorted sandy loam with angular-subrounded grains and inclusions of coarse sand, mica, and sherds; fewer inclusions than F17-s3; loosely packed (looser than F17-s3); see Figure 4.11
F6	17M	10 YR 2/1; black silt loam	Late Miniyua-Chacahua	Hearth	Broad, shallow (18 cm deep) hearth dug down from the top of F17-s1; consists of very organic, fine ashy sediment with higher silt content than other hearths in Op A (F7, F8, F9 and F10); very little sand included in matrix; charcoal also detected; high concentration of sherds; not detected in profile; see Figure 4.32

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F7	8M, 8N, 9M, 9N	10 YR 3/1; very dark gray sandy loam	Late Miniyua-Chacahua	Hearth	Broad, shallow (15 cm deep) hearth cuts down from top of F17-s1 and slightly into F26-s1; upper part of hearth filled with small- and medium-sized stones; stones not fire-cracked; sediment is ashy and organic with inclusions of brittle, crushed rock and eroded sherds; not visible in profile; see Figure 4.32
F8-s2	15N, 15O	10 YR 3/2; very dark grayish brown sandy loam	Late Miniyua-Chacahua	Hearth	Upper sub-stratum of a broad, 30 cm-deep hearth dug down from top of F17-s1 and slightly into F26-s1; contains some organic material and a high concentration of ash; well sorted; contains some coarse sand; less organic and lighter in color than F8-s1; contains fire-cracked stones (small- and medium-sized); see Figures 4.25, 4.32
F8-s1	15N, 15O	10 YR 2/1; black loam	Late Miniyua-Chacahua	Hearth	Lower sub-stratum of hearth dug down from top of F17-s1, cutting slightly into F26-s1; consists of very organic loam with a very high concentration of ash, some bits of charcoal, mica and coarse sand inclusions as well as small brittle rocks and sherds; see Figure 4.25, 4.32
F9-s2	9N, 10N	10 YR 3/1; very dark gray silt loam	Late Miniyua-Chacahua	Hearth	Upper sub-stratum of hearth dug down from top of F17-s1 and slightly into F26-s1; contains some organic material and ash; well sorted; contains some coarse sand; less organic and lighter in color than F9-s1; see Figures 4.21, 4.25, 4.32
F9-s1	9N, 10N	10 YR 2/1; black loam	Late Miniyua-Chacahua	Hearth	Lower sub-stratum of hearth dug down from top of F17-s1, cutting slightly into F26-s1; consists of very organic loam with ash, charcoal, mica and coarse sand inclusions as well as small brittle rocks and sherds; see Figure 4.21, 4.25; 4.32
F10	12Q, 12R	10 YR 2/1; black loamy sand	Late Miniyua-Chacahua	Hearth	Hearth dug down from top of F17-s1 and into the upper part of F26-s1; filled with dark loamy sand with inclusions of gravel, ash, carbon, small- and medium-sized stones, and eroded sherds; many stones included in hearth appear to have been cut, perhaps as a result of reduction of larger stones for masonry (see Ch. 5); sediment is loosely packed; hearth is broad at the interface with F17-s1 and narrows at the base; see Figure 4.5, 4.32

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F18-s1	All except 4J, 10A, 10B, 10D, 10E, 10F, 10G, 10H, 10I, 11F, 13E, MU1	No Munsell; ceramic offering vessels	Late Miniyua-Chacahua	Offering vessels	Cache of 260 ceramic vessels deposited into F17 as an offering over an extended period; vessels were placed within compartments (F18-s2) made of thin stone slabs; majority of the assemblage (94%) consists of non-diagnostic coarse brown ware vessels; diagnostic vessels include seven fine brown ware dating to the Miniyua phase, five Chacahua phase grayware bowls with incised plastic decorations, three incurving wall grayware bowls possibly dating to transitional period between Miniyua-Chacahua phases, and one grayware bowl possibly dating to the earliest part of the Early Classic based on morphological similarities to Coyuche phase graywares (this date is tentative); vessel forms vary but primarily consist of cylindrical vessels of varying sizes, short-necked or neckless jars of varying sizes, and miniature jars; several vessels contain lids, sometimes made of a different paste type than the offering vessel; see Figures 4.7, 4.24, 4.27 – 4.30

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F18-s2	All except 4J, 10A, 10B, 10D, 10E, 10F, 10G, 10H, 10I, 11F, 13E, MU1	No Munsell; stone (granite) slabs	Late Miniyua-Chacahua	Offering markers or compart-ments	Carved or naturally exfoliated stone slabs ranging from less than 1 cm to over 4 cm in thickness placed in a vertical position within offering fill (F17-s1, F17-s3); post-depositional movement likely accounts for occasional slabs oriented horizontally; slabs often oriented in square or triangular "compartments" into which offering vessels (F18-s1) were placed; also placed in rows of several vertical slabs possibly indicating a convention used to mark particular offerings; upper parts of some slabs appear to have been chipped or broken, possibly indicating trampling occurred; types/sizes of slabs do not appear to be standardized; compartments occasionally placed atop earlier compartments; slabs predominantly oriented with, or perpendicular to, site orientation (25°-205° along North-South azimuth); contains several presumably individual compartments, but for convenience they are assigned a single feature number; see Figures 4.5, 4.7, 4.9, 4.19 – 4.21; 4.23 – 4.28, 4.21 – 4.22, 4.27 – 4.30
F11-s1	10D, 10E, 10F	10 YR 3/3; dark brown silt loam	Late Miniyua-Early Chacahua	Construction fill	Fill deposited over drain (F20) on west side of Structure 2 in Complex A; consists of poorly sorted silt loam with angular-subangular grains and inclusions of mica, coarse sand, gravel, rocks and sherds; high number of root disturbances present; sediment is very hard packed and coarse but contains pockets of fine silt; sub-stratum is mottled in profile; harder packed than F11-s2 and F19; fill is retained by stone retaining walls F13, F14, F15, and F16; see Figure 4.11 – 4.13
F11-s2	11F, 13E	10 YR 3/3; dark brown silt loam	Late Miniyua-Early Chacahua	Construction fill	Fill deposited over F19 in 11F and F11-s3 and F21-s9 in unit 13E; likely from similar source as sediment comprising F11-s1; consists of poorly sorted silt loam with sherds, rocks and gravel inclusions; fewer inclusions than F11-s1; grains generally appear to be more rounded than those in F21-s5; fill is retained by stone retaining walls F13, F14, F15, and F16; see Figures 4.12, 4.14,

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F11-s3	13E	10 YR 4/3; brown sandy loam	Late Miniyua-Early Chacahua	Construction fill	Fill deposited over F21-s9 in unit 13E; delineation between F11-s3 and F11-s2 unclear; consists of moderately sorted sandy loam with angular-subrounded grains and inclusions of gravel, mica, and sherds; lighter in color than F11-s2; fill is retained by stone retaining walls F13, F14, F15, and F16; see Figure 4.14
F12	10A, 10E	No Munsell; granite stone	Late Miniyua-Early Chacahua	Possible step	Line of stones to south of, and running parallel to, south foundation wall (F14) of Building 1 in Complex A; possibly a step or plinth; sediment retained by F12 not excavated; see Figure 4.15
F13	n/a	No Munsell; granite stone	Late Miniyua-Early Chacahua	Platform retaining wall	East wall of Structure 2 in Complex A; runs north-south for approximately 4 m; detected on surface only (not excavated); wall likely retains sediment deposited in F11 fill episode; see Figure 4.15
F14	n/a	No Munsell; granite stone	Late Miniyua-Early Chacahua	Platform retaining wall	South wall of Structure 2 in Complex A; runs east-west for approximately 13 m; detected on surface only (not excavated) ; wall likely retains sediment deposited in F11 fill episode; see Figure 4.15
F15	n/a	No Munsell; granite stone	Late Miniyua-Early Chacahua	Platform retaining wall	West wall of Structure 2 in Complex A; runs north-south for approximately 4 m; detected on surface only (not excavated) ; wall likely retains sediment deposited in F11 fill episode; see Figure 4.15
F16	10G	No Munsell; granite stone	Late Miniyua-Early Chacahua	Platform retaining wall	North wall of Structure 2 in Complex A; wall consists of two courses of cut stones running east-west for approximately 13 m; constructed on top of stone drain (F20); wall retains sediment deposited during F11 fill episode; see Figure 4.11 – 4.13, 4.15

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F17-s1	All except 10A, 10B, 10D, 10E, 10F, 10G, 10H, 10I, 11F, 13E, MU1	10 YR 3/2; very dark grayish brown loamy sand	Late Miniyua-Early Chacahua	Offering fill	Sub-stratum of fill covering stone slab compartments/markers (F18-s2) and offering vessels (F18-s1) in patio north of Structure 2; deposited and reworked over extended period of time; sediment consists of poorly sorted loamy sand with subangular-subrounded grains and inclusions of small rocks, stones, sherds, gravel, burned daub, coarse sand and mica; softer packed than sub-strata in F26; harder packed than overlying colluvial fill (F2) but contains fewer inclusions and disturbances; stone drain (F20) constructed to drain water away from F17; see Figure 4.5 - 4.10, 4.19 – 4.28, 4.21 – 4.22
F17-s2	18R, 18S	10 YR 2/2; very dark brown sandy loam	Late Miniyua-Early Chacahua	Offering fill	Very similar sediment as F17-s3, but no stone compartments (F18-s2) or offering vessels (F18-s1) found in this area; see Figure 4.29
F17-s3	10G, 10H	10 YR 2/2; very dark brown sandy loam	Late Miniyua-Early Chacahua	Offering fill	Sub-stratum of fill associated with F18 offering; abuts fill layer on which Structure 2 is constructed (F26-s1); no offering vessels (F18-s1) or stone slabs (F18-s2) detected within F17-s3; sediment consists of poorly sorted sandy loam with angular grains and inclusions of mica, coarse sand and sherds; delineation between F17-s3 and F17-s1 unclear to the north of 10H; harder packed and darker than F17-s1; see Figure 4.11
F17-s4	10H	5 YR 4/6; yellowish red sandy clay loam	Late Miniyua-Early Chacahua	Offering fill	Small lens/sub-stratum of fill deposited during deposition of F17-s3; contains poorly sorted sandy clay loam with angular grains and inclusions of crushed sherds and gravel; possibly disintegrated bajareque; clay may have been hard-fired; see Figures 4.11, 4.13
F17-s5	16N, 16O, 16P	10 YR 4/2; dark grayish brown loamy sand	Late Miniyua-Early Chacahua	Offering fill	Sub-stratum of fill covering stone slab compartments/markers (F18-s2) and offering vessels (F18-s1) in patio north of Structure 2; deposited and reworked over extended period of time; very similar to F17-s1 in composition but lighter/grayer in color; delineation between F17-s1 and F17-s5 unclear; see Figure 4.10

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F17-s6	13N, 13O	10 YR 3/3; dark brown sandy loam	Late Miniyua-Early Chacahua	Offering fill	Small lens of fill deposited during deposition of F17; likely fills in a shallow pit or depression; sediment consists of poorly sorted sandy loam with subrounded grains and inclusions of mica gravel, small rocks and sherds; higher concentration of mica than F17-s1; see Figure 4.7
F19	11F	10 YR 4/4; dark yellowish brown sandy loam	Late Miniyua-Early Chacahua	Construction fill	Fill deposited atop stone drain (F20); sediment matrix consists of moderately sorted sandy loam with subangular grains and inclusions of mica, coarse sand, gravel and eroded sherds; lighter, more yellow in color, and contains more gravel than F21-s1; harder packed than F11-s2; fill is retained by building foundation wall (F13, F14, F15, F16); see Figure 4.12
F20-s1	10D, 10E, 10F, 10G	No Munsell; granite stone	Late Miniyua-Early Chacahua	Stone drain	Base of square-shaped stone drain underlying building in Complex A; granite slabs deposited horizontally atop F21-s1; covered by F19 fill; constructed to drain water away from F18; see Figure 4.12
F20-s2	10D, 10E, 10F, 10G	No Munsell; granite stone	Late Miniyua-Early Chacahua	Stone drain	East side of square-shaped stone drain underlying building in Complex A; single row of granite slabs deposited vertically atop F20-s1 and/or F21-s1; covered by F19 fill; constructed to drain water away from F18; see Figures 4.11 – 4.12
F20-s3	10D, 10E, 10F, 10G	No Munsell; granite stone	Late Miniyua-Early Chacahua	Stone drain	West side of square-shaped stone drain underlying Structure 2; single row of granite slabs deposited vertically atop F20-s1 and/or F21-s1; covered by F19 fill; constructed to drain water away from F18 offering; see Figure 4.12
F20-s4	10D, 10E, 10F, 10G	No Munsell; granite stone	Late Miniyua-Early Chacahua	Stone drain	Capstones of square-shaped stone drain underlying Structure 2; single row of granite slabs deposited horizontally atop F20-s1 and/or F21-s1; covered by F19 fill; constructed to drain water away from F18; see Figure 4.12

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F21-s1	11F, 10G, 10H	10 YR 4/3; brown sandy loam	Late Miniyua-Early Chacahua	Construction fill	Initial sub-stratum of fill deposited atop bedrock (N1) in unit 11F; consists of poorly sorted sandy loam with angular-subrounded grains and inclusions of gravel, mica, coarse sand, small crushed rocks, and sherds; moderately packed and slightly silty; darker in color than F21-s4, F21-s5 and F19; very similar in composition to F21-s3; lighter in color than F21-s2; contains very few sherds, most of which are highly eroded; F20 (drain) constructed on top of F21-s1; see Figure 4.11 - 4.13,
F21-s2	11F	10 YR 3/1; very dark gray sandy loam	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill atop F21-s1; includes redeposited debris from burning event early in construction sequence in Complex A; consists of moderately sorted sandy loam with burned organic material, ash, mica, and sherds; mica content elevated compared to other sub-strata in F21; darker and softer than surrounding sub-strata; alternatively, may represent a pit dug into F21-s1 and quickly filled during the F21 construction period; see Figure 4.12
F21-s3	11F	10 YR 4/3; brown sandy loam	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill very similar to F21-s1; contains poorly sorted sandy loam with subangular grains and inclusions of mica, coarse sand and sherds; likely represents a basketload of fill deposited atop F21-s2; lighter in color than F21-s2 but darker than F21-s4; see Figure 4.12
F21-s4	11F, 13E	10 YR 4/3; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill deposited atop F21-s3; contains poorly sorted loamy sand with angular grains and inclusions of mica, coarse sand, and sherds; lighter in color and contains fewer inclusions than F21-s1 and F21-s3; overall, few inclusions present; see Figure 4.12
F21-s5	11F	10 YR 4/4; dark yellowish brown sandy loam	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill deposited atop F21-s1, F21-s2, and F21-s4 in unit 11F; contains poorly sorted sandy loam with subangular-rounded grains and inclusions of mica, sherds and gravel; more loosely packed than F21-s1 and F19; contains comparatively higher amount of sherd inclusions; see Figure 4.12

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F21-s6	13E	10 YR 4/3; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill deposited atop bedrock in area of unit 13E within building; analogous to F21-s1; contains poorly sorted loamy sand with subangular-subrounded grains and inclusions of mica, coarse sand and sherds; contains fewer crushed rocks than F21-s1; lighter in color than F21-s7; moderately packed; looser than F21-s8 but more densely packed than F21-s7; see Figure 4.14
F21-s7	13E	10 YR 4/3; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill deposited atop F21-s6; likely corresponds to same burning event represented by F21-s2; lens consists of moderately sorted loamy sand with subrounded grains and inclusions of ash, coarse sand, small rocks and eroded sherds; lens does not contain as much burned organic material as F21-s2, no charcoal was detected during excavations; moderately packed; more loosely packed than F21-s9 and F21-s8; see Figure 4.14
F21-s8	13E	10 YR 4/3; brown sandy loam	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill deposited atop F21-s7; consists of poorly sorted sandy loam with subangular-rounded grains and inclusions of gravel, small angular rocks, and eroded sherds; lighter in color than F21-s9 and F21-s7; sediment is very hard packed and generally contains few inclusions; see Figure 4.14
F21-s9	13E	10 YR 4/3; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of fill deposited atop F21-s7 and F21-s8; consists of poorly sorted loamy sand with angular grains and inclusions of gravel, mica, angular rocks, and sherds; significant increase in inclusions compared to underlying F21 sub-strata and overlying strata; sediment is very hard packed; see Figure 4.14
F21-s10	11F	10 YR 4/4; dark yellowish brown sandy loam	Late Miniyua-Early Chacahua	Construction fill	Consists of unconsolidated chunks of moderately sorted sandy loam sediment with mica, coarse sand, and sherd inclusions; deposited during deposition of F21-s5; see Figure 4.12

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F22	12L	10 YR 2/1; black loamy sand	Late Miniyua-Early Chacahua	Hearth	Small, shallow hearth dug down from top of F26-s1 in unit 12L; approximately 10 cm deep; consists of very organic loamy sand with burned organic material, carbon, ash and small-medium stones; stones do not appear to be heat treated; not visible in profile view; see Figure 4.39
F23	15L	10 YR 2/2; very dark brown loam	Late Miniyua-Early Chacahua	Hearth	Small, shallow hearth dug down from the top of F26-s1 in unit 15L; shallower than F24; consists of loamy sediment with organic material, some ash, mica, coarse sand, and eroded sherds; sediment is moderately sorted; lighter in color than F24; see Figure 4.8, 4.33
F24-s1	15K, 15L	10 YR 2/1; black loam	Late Miniyua-Early Chacahua	Hearth	Lower sub-stratum of hearth dug down from the top of F26-s1; consists of well sorted loam with very high concentration of burned organic material, carbon, and ash; contains coarse sand, mica and small, eroded sherds; slightly darker and harder packed than F24-s2; see Figure 4.8, 4.33, 4.38
F24-s2	15K, 15L	10 YR 2/1; black loam	Late Miniyua-Early Chacahua	Hearth	Upper sub-stratum of hearth dug down from the top of F26-s1; consists of well sorted loam with ash, mica, coarse sand, and sherds; carbon not as prevalent as in F24-s1; lighter in color, finer, and softer packed than F24-s1; possible heating stones also included in this sub-stratum, but no evidence of fire-cracking detected; see Figure 4.8, 4.33, 4.38
F26-s1	All except 10A, 10B, 10D, 10E, 10F, 10G, 10H, 11F and 13E	10 YR 4/3; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Construction fill stratum upon which the large offering in Op A (all sub-strata within F17) was deposited; consists of a very coarse, moderately sorted loamy sand matrix with angular grains and inclusions of gravel, mica, and sherds; stratum contains more inclusions (sherds and gravel) than F27, but fewer than F17-s1; sediment is more densely packed and coarser than F6-s1; sediment is lighter in color than F27; see Figures 4.5 - 4.9, 4.19 – 4.28
F26-s2	16O	10 YR 4/4; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Unconsolidated fill similar to F26-s1 and F26-s5; see Figure 4.10, 4.23

Stratum	Units	Sediment Description and Munsell	Probable Date	Formation Process	Comments
F26-s3	13K, 13L, 14M	10 YR 5/3; brown loam	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of F26 fill episode overlying F26-s4 in southeast corner of north patio in Complex A; consists of moderately sorted loam with inclusions of coarse sand, mica, rocks and sherds; see Figures 4.7, 4.9,
F26-s4	13K, 13L, 14M	10 YR 3/3; dark brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of F26 fill episode in the southeast corner of north patio in Complex A; consists of poorly sorted loamy sand fill with subangular grains and inclusions of coarse sand, mica and sherds; also contains small cut stones, some of which are fire-cracked; no ash present; see Figures 4.7, 4.9
F26-s5	8M, 9M	10 YR 4/3; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Unconsolidated construction fill very similar to F26-s1, but contains coarser grains and generally fewer artifacts; see Figure 4.9
F27	12O	10 YR 5/3; brown loamy sand	Late Miniyua-Early Chacahua	Construction fill	Sub-stratum of earliest episode of construction fill in area of Op A; consists of coarse loamy sand with subangular grains and inclusions gravel, particulate mica, and sherds; approximately 40 cm thick and slopes downward to the north; see Figure 4.5
N1	4J, 10H, 11F, 12J, 12O, 13J, 13L, 14J, 14M, 15J, 15K, 15L, 15M, 16O, 16P,	No Munsell; coarse granulated bedrock (grüs)	N/A	Natural bedrock	Naturally occurring bedrock; no artifacts; units listed indicates areas in which bedrock was removed; excavation of all other units stopped upon reaching bedrock, unless noted otherwise; see Figures 4.5 - 4.10, 4.12, 4.20

The earliest evidence of occupation in the northern area of Complex A is F27, a 40 cm-thick level of loamy sand construction fill that was deposited directly atop bedrock (N1). Stratigraphic evidence from unit 12P (the only test unit in which F27 was exposed) indicates the surface of N1 in the center of Op A was considerably lower compared to areas to the east and south. Builders deposited F27 to raise the ground surface by 50-60 cm to an elevation of 168.7-168.8 m a.s.l., which provided a level foundation for future construction episodes (Figure 4.5). The remaining units in Op A were not excavated to bedrock, so it is unclear how far F27 extends beyond unit 12P. Though several sherds recovered from F27 dated to the Minizundo phase, diagnostics dating to the Chacahua phase were also detected in the fill, indicating the sediment was likely mined from Minizundo phase deposits outside Complex A and deposited during the Terminal Formative period.

After finishing F27, builders began another episode of construction that included fill layers F21 and F26. F26 elevated the surface of the north patio by an additional 20 – 50 cm, covering F27 in the center of the patio (unit 12P; Figure 4.5) and N1 to the north, south and east in the areas exposed by units 4J (Figure 4.6), 13L (Figure 4.7), 15J, 15K, 15L (Figure 4.8), 15M (Figure 4.9), and 16P (Figure 4.10). All other excavated units in the northern part of Op A did not reach bedrock. Excavations in unit 12P did not detect occupational debris or a preserved floor between F27 and F26, indicating that a short period elapsed between the construction phases. F26 is largely represented by sub-stratum F26-s1, a hard-packed, dark yellowish-brown layer of unconsolidated loamy sand that raised the surface of the north area of Complex A to an elevation of 169.2-169.6 m a.s.l.[5] F26 was probably deposited using basket loads of fill mined from nearby deposits of sediment. During this time, the northern area of Terrace 11 became a locus of cooking activities that probably provisioned feasting events taking place in the ceremonial core. Several hearths were excavated down from the top of F26-s1, including F24 in units 15K and 15L (Figures 4.8), F23 in unit 15L (Figure 4.8), and F22 in unit 12L (not pictured in profile). Each hearth was filled with very dark, organic, loamy sediment containing ash and occasionally bits of charcoal. Macrobotanical analyses of F22, F23, and F24 are planned for a later date.

[5]Some variation in sedimentary composition in F26 was observed. See descriptions in Table 4.1 for F26-s3 and F26-s4 in units 13L, 13K, and 14M, F26-s5 in units 8M and 9M, and F26-s2 in unit 16O and F2-s5 in units 8M and 9M.

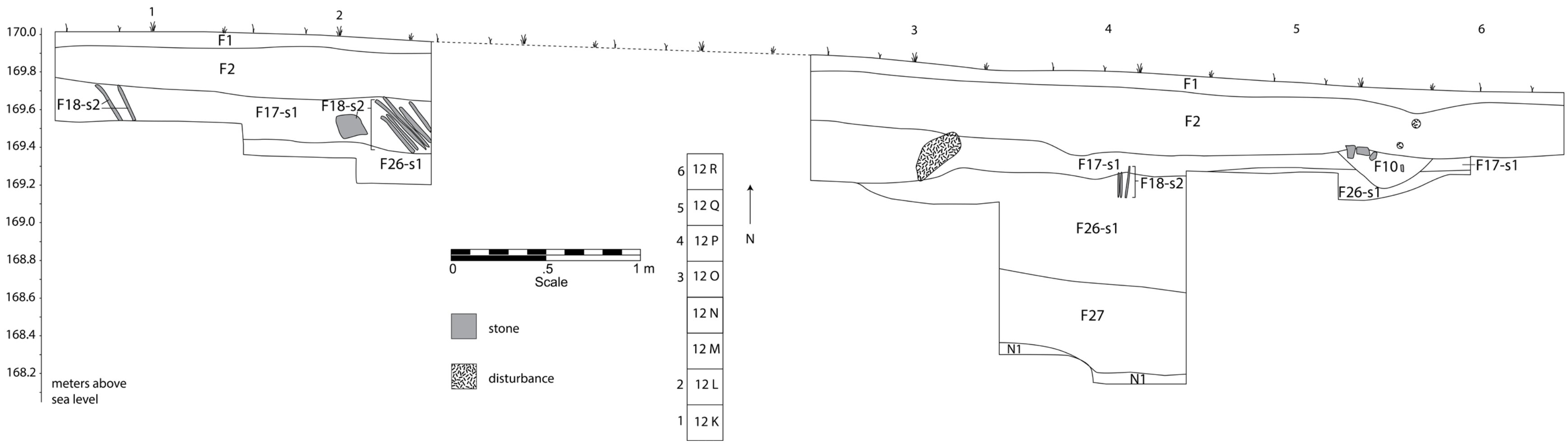


Figure 4.5: Stratigraphic profile of west walls of units 12K, 12L, 12O, 12P, 12Q, and 12R.

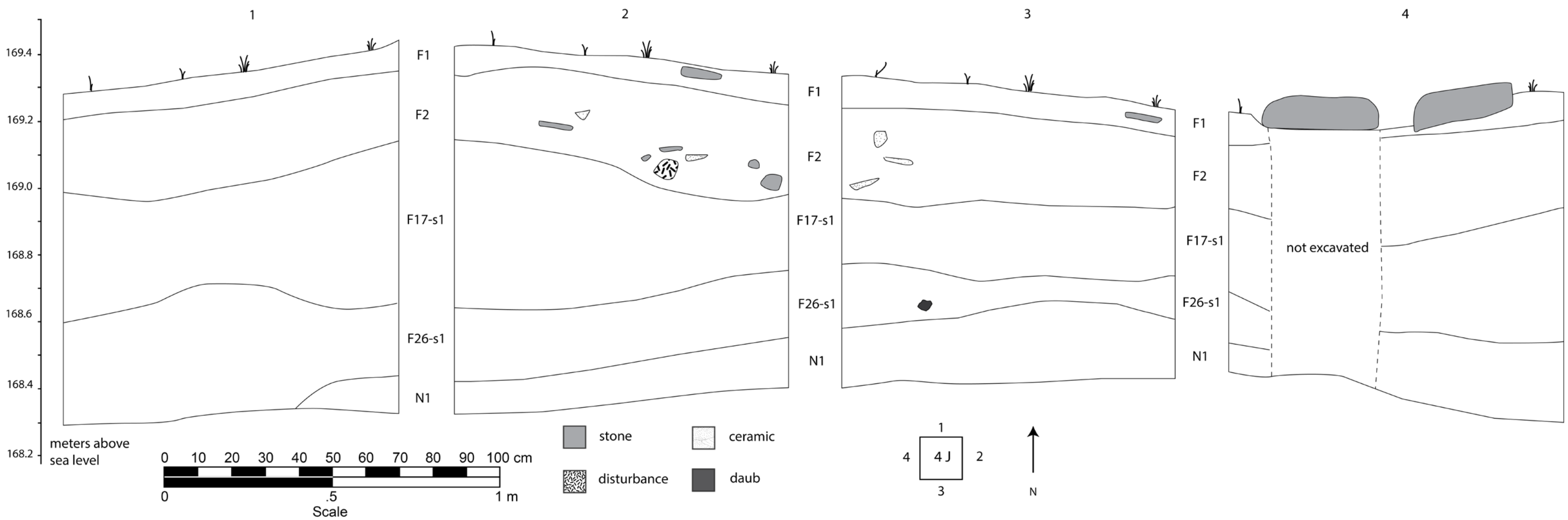


Figure 4.6: Stratigraphic profile of unit 4J

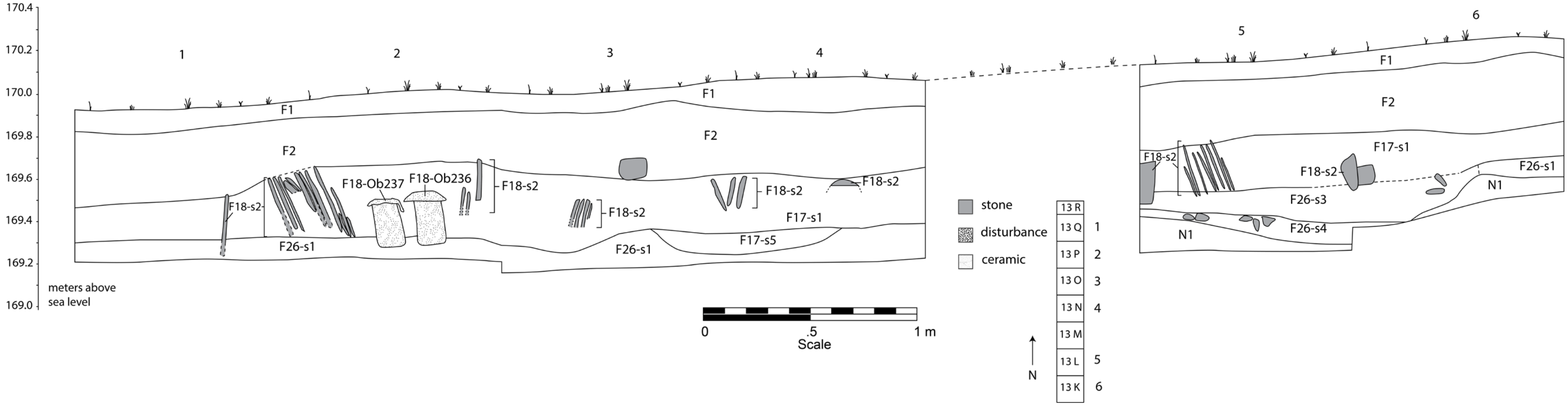


Figure 4.7: Stratigraphic profile of east walls of units 13K, 13L, 13N, 13O, 13P, and 13Q

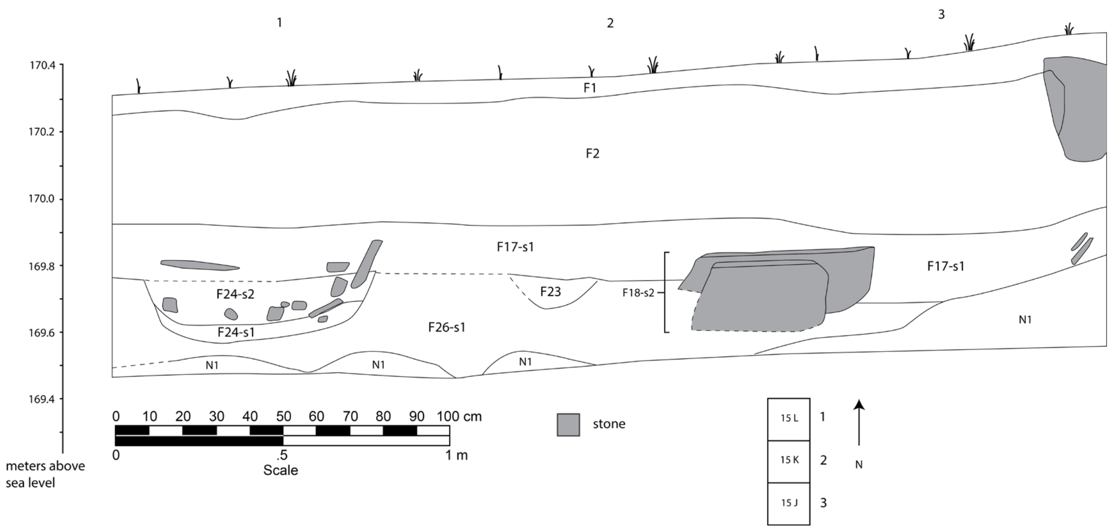


Figure 4.8: Stratigraphic profile of east walls of units 15J, 15K, and 15L

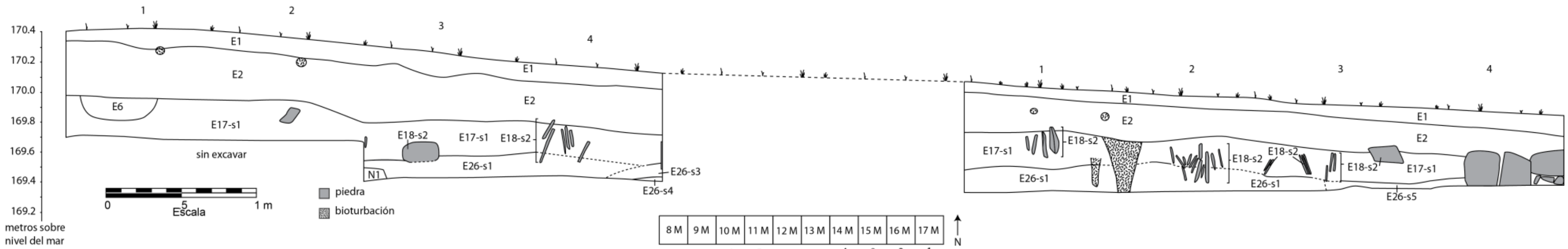


Figure 4.9: Stratigraphic profile of units 8M, 9M, 10M, 11M, 14M, 15M, 16M, and 17M

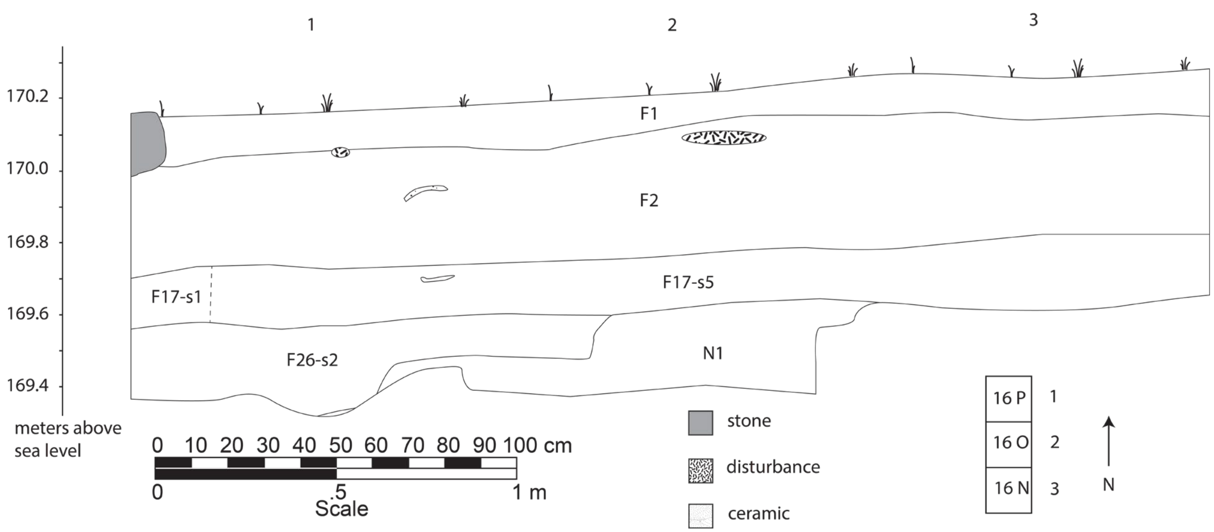


Figure 4.10: Stratigraphic profile of east walls of units 16N, 16O, and 16P

To the south of F26, builders deposited F21, a series of sandy fill layers of variable composition that covered bedrock with 50-60 cm of sediment (units 10F, 10G, 10H, 11F, and 13E; see Figures 4.11, 4.12, 4.13, and 4.14). F21 raised the ground surface to approximately 169.7 m a.s.l., creating a low mound or platform. Similarities in the composition of sediments in F21 and F26, particularly comparable amounts of coarse sand inclusions in each stratum, indicate builders mined the sediment from local sources on the hill. While very few diagnostic sherds were recovered F21, ceramic evidence from unit 13E, which reached bedrock, demonstrates that F21 dates to the Terminal Formative period. Sub-strata within F21 varied considerably. For example, the presence of ash and charred organics in the matrix of F21-s2 (unit 11F) and F21-s7 (unit 13E) differs from the coarser, sandier fill layers (F21-s1 and F21-s6) they cover, both of which did not contain burned material. The variability in sediment content suggests builders deposited basket loads of unconsolidated fill, some of which included burned organic material, to build the low mound. Excavators did not detect an occupational surface at the top of F21, indicating that construction on Structure 2 continued shortly after the mound was completed.

At the surface of F21, builders constructed a square-shaped stone drain (F20) that directed water off the terrace (Figures 4.11, 4.12, 4.15, and 4.16). Excavators uncovered the entry point of the drain in unit 10G but were unable to locate the opposite end, which probably turned to the west to carry water off the western side of Terrace 11 (Figures 4.17 and 4.18). The drain was covered with a layer of sandy loam fill (F19) that also overlaid F21. F21 and F19 formed the surface on which builders constructed Structure 2, a 4 m x 13 m rectangular platform with a stone retaining wall that likely contained a wattle and daub superstructure.

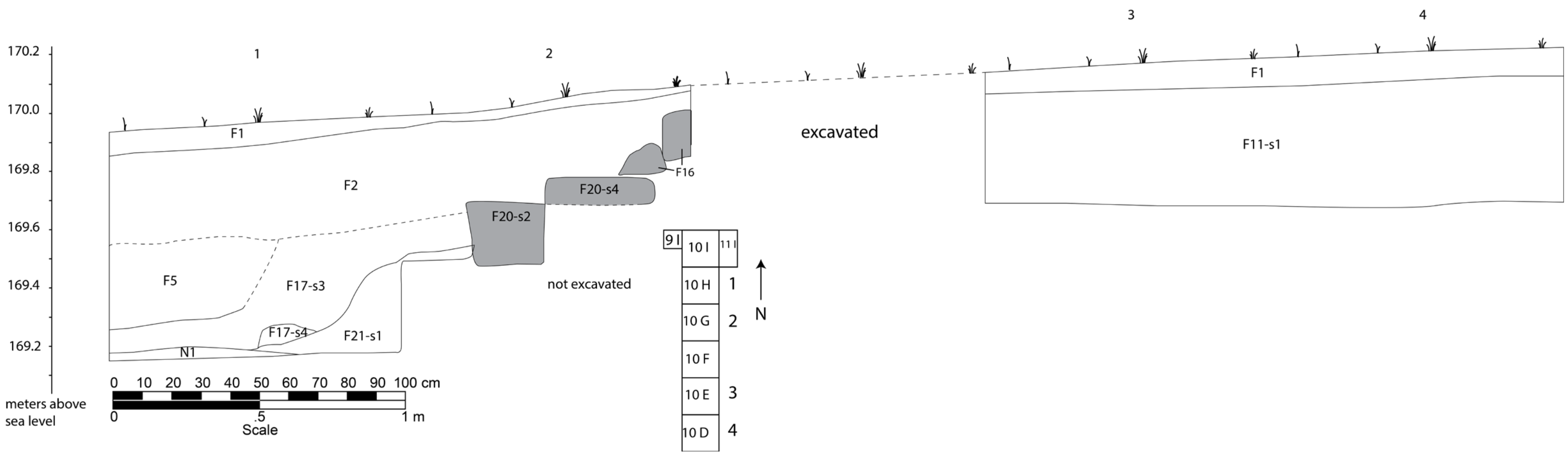


Figure 4.11: Stratigraphic profile of east walls of units 10D, 10E, 10G, and 10H

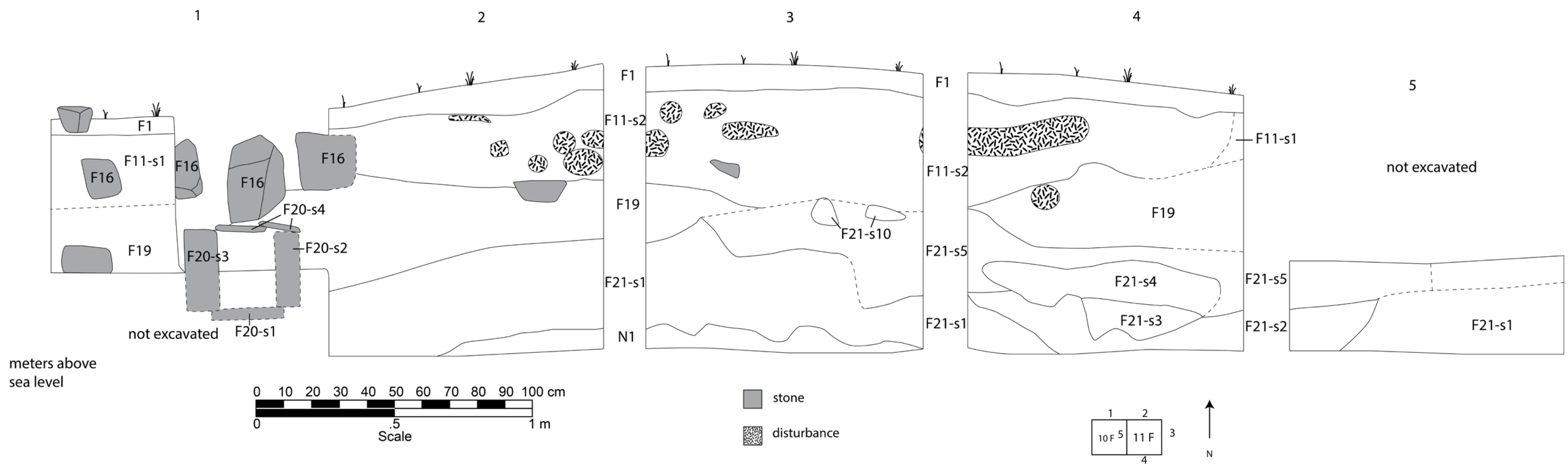


Figure 4.12: Stratigraphic profile of units 10F and 11F

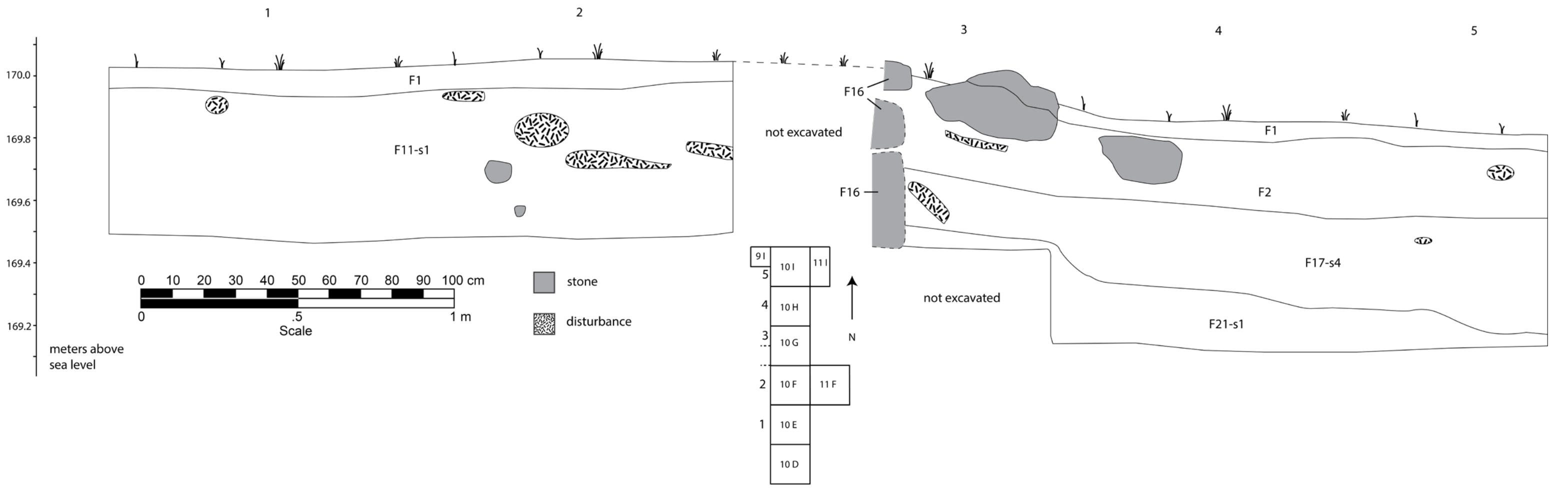


Figure 4.13: Stratigraphic profile of units 10G, 10H, 10I and interior of Structure 2 (units 10F and 10E)

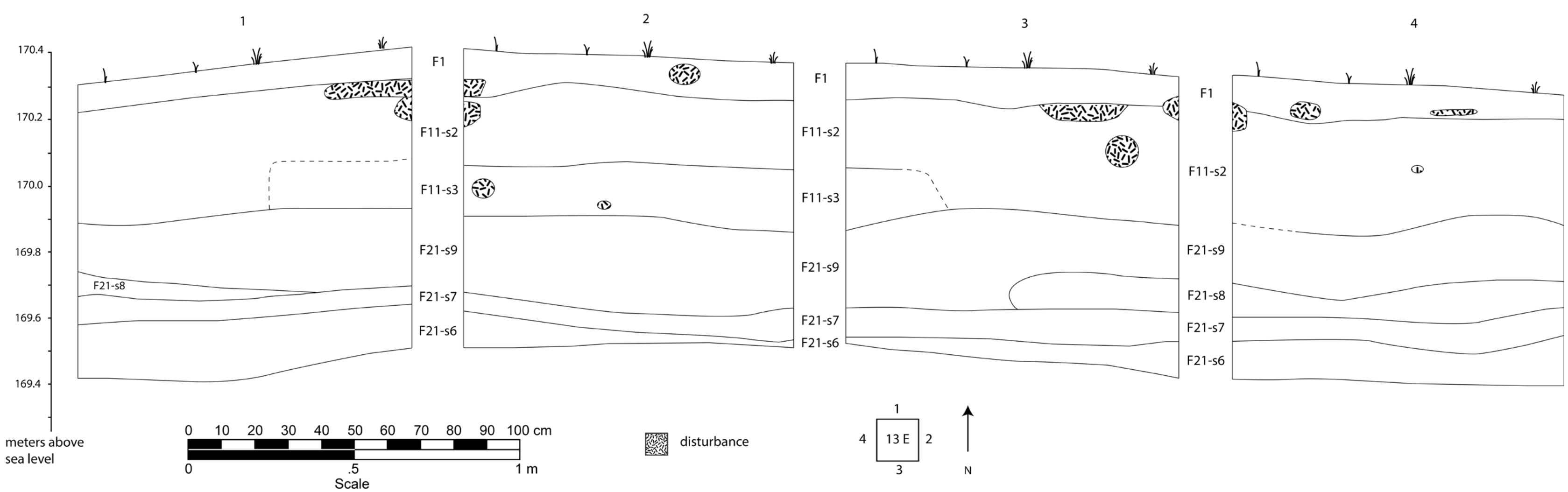


Figure 4.14: Stratigraphic profile of unit 13E

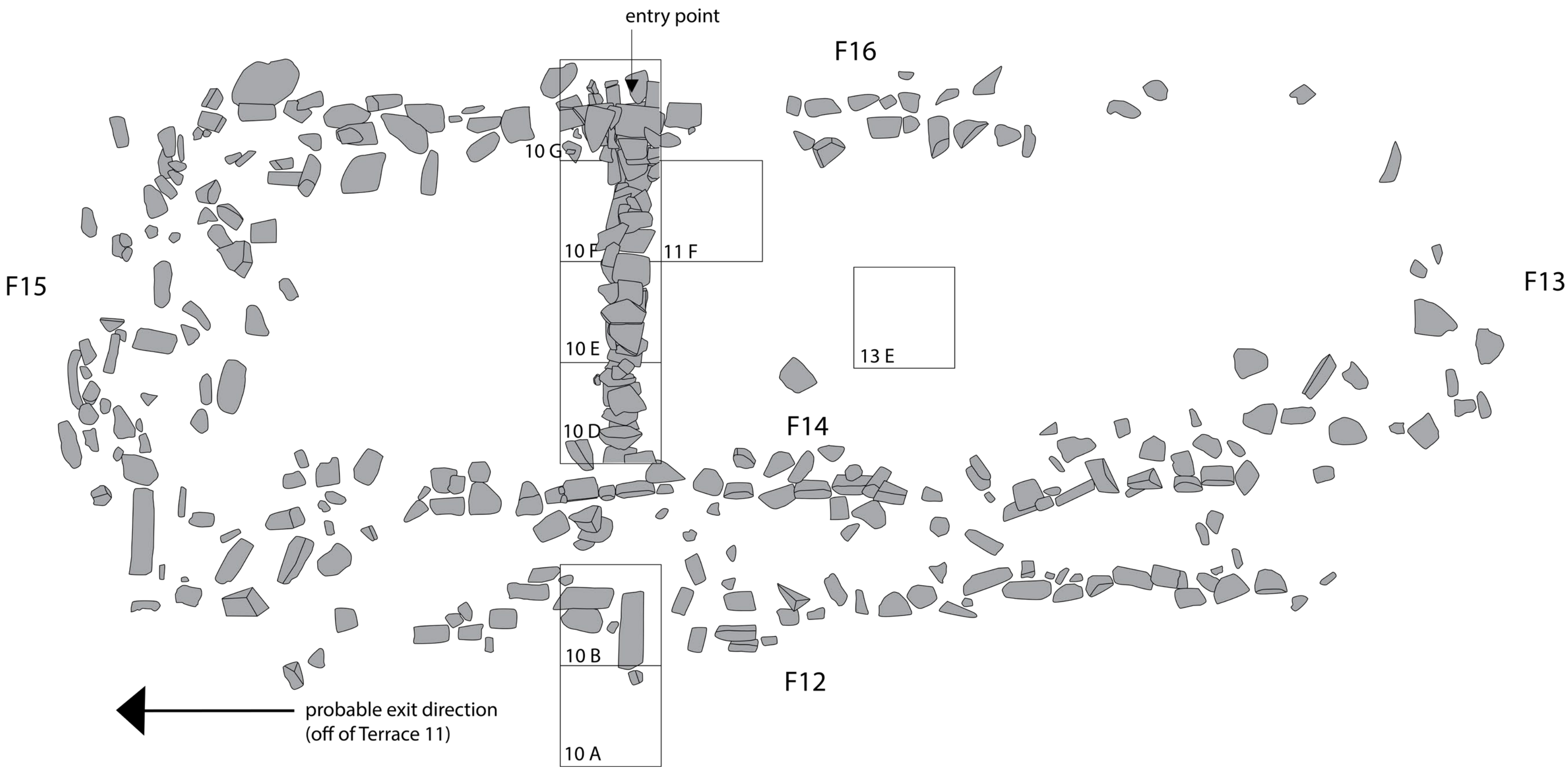


Figure 4.15: Plan map of Structure 2 with drain (F20) and direction of water flow labeled.

Figure 4.16: Photograph of stone drain (F20).

Figure 4.17: Entry point of stone drain (F20)

Figure 4.18: Entry point of stone drain (F20)

Builders then constructed Structure 2 atop the low platform created by F21 and F19. The building consists of four retaining walls with two courses of stones each (F16 corresponds to the north wall, F15 to the west wall, F14 to the south wall, and F13 to the east wall), which form a 4 m x 13 rectangular set of retaining walls for a low platform. F16, F15, F14, and F13 retain F11, an episode of construction that filled the interior of Structure 2 with hard-packed loamy sediment. It is likely that the interior occupational surface of Structure 2 sat atop F11, but any floor or debris had long washed away. Below and to the south of F14, builders constructed a step (F12) leading up to the building foundation, which may indicate the entrance to the building was located on the southern wall. Excavators did not detect a collapsed superstructure atop the building foundation, but this may be due to decay or erosion of building materials. Fragments of burned daub with cane impressions were found in the adjacent fill layer to the north (F17; see below) in units 10O and 8M, which may represent debris from a collapsed wattle and daub superstructure. The lack of burned daub in the upper layers of fill in Structure 2 indicates that if there was a wattle-and-daub superstructure, it was not burned prior to its abandonment. The samples of daub were small (22g and 16g) and could have been redeposited from other parts of the site.

During the construction of Structure 2, the north patio was resurfaced by adding 20-40 cm of loosely packed sand (F17), which covered F26 and raised the ground surface to 169.5-169.9 m a.s.l. (see Figures 4.19-4.31). The surface of F17 articulated with the top of the drain in unit 10G, indicating the drain was used to channel excess water away from the occupational surface and off Terrace 11. At this time, residents of Cerro de la Virgen began to carry out ritual caching ceremonies in the north patio, which included the placement of an elaborate offering (F18) within F17. F18 also intruded slightly into F26. F18 consisted of 260 ceramic vessels (F18-s1) placed sequentially over time in stone slab compartments (F18-s2) interspersed throughout the north patio. The slabs, which ranged from 0.8 cm to over 5.0 cm in thickness, were carved from local outcrops of granite or were collected as they exfoliated naturally (Raymond Mueller 2014, personal communication). The sand in F17 likely allowed water to perculate through the offering more readily and would have also been easier to move around for subsequent placements of offerings (see below).

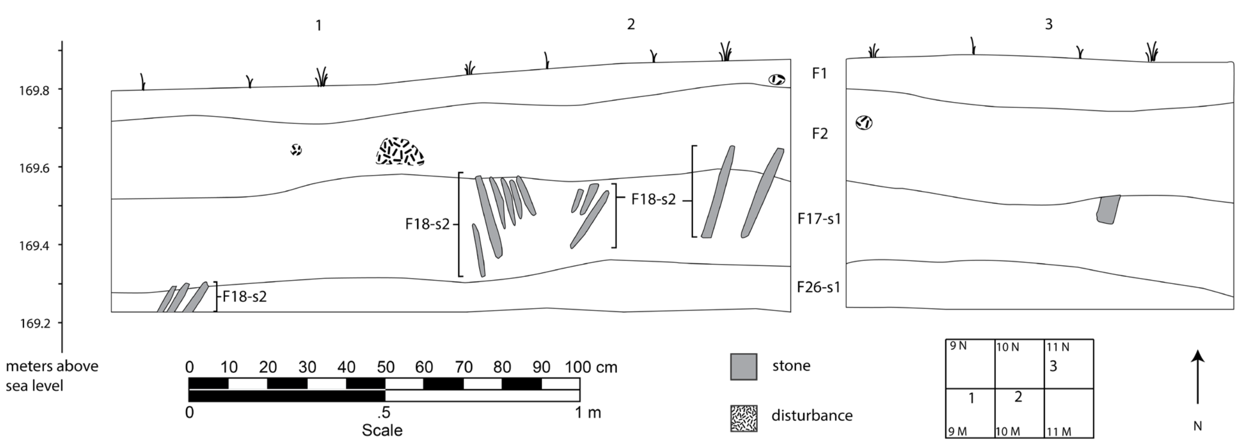


Figure 4.19: Stratigraphic profile of units 9M, 10M and 11N

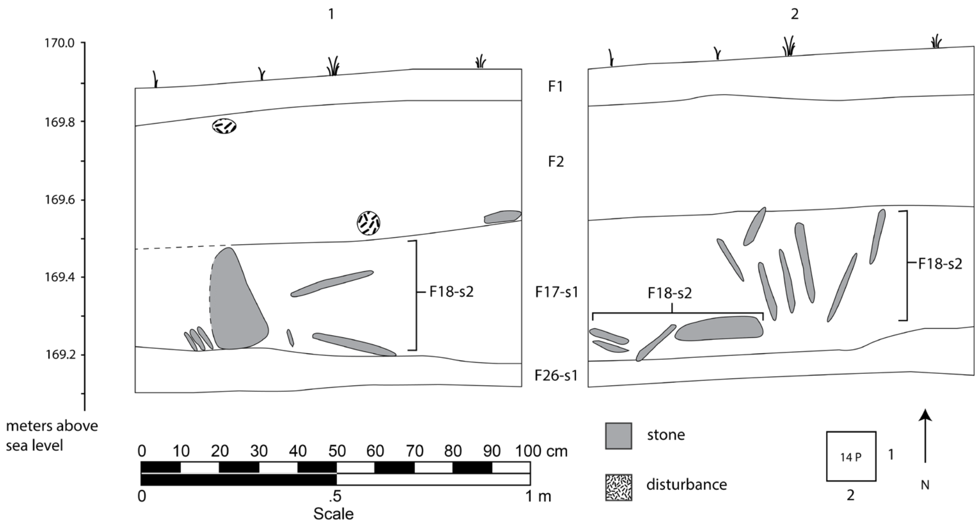


Figure 4.20: Stratigraphic profile of east and south walls of unit 14P

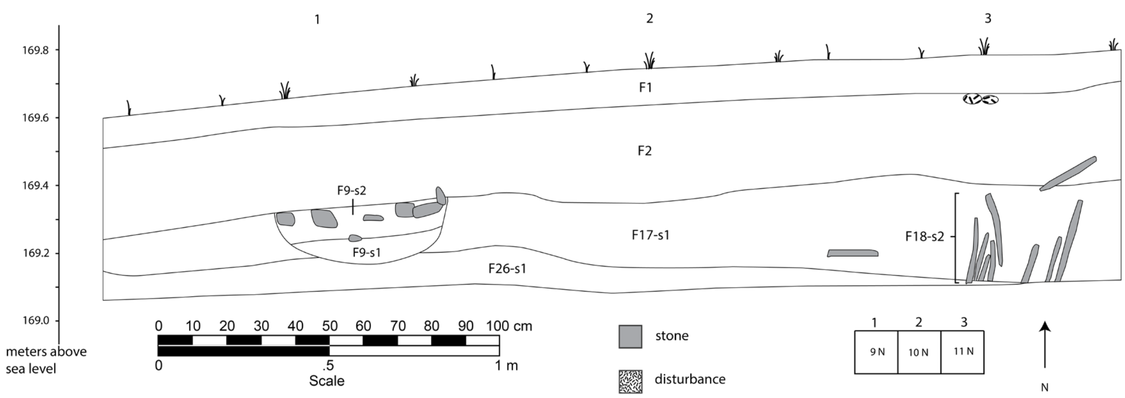


Figure 4.21: Stratigraphic profile of units 9N, 10N, and 11N

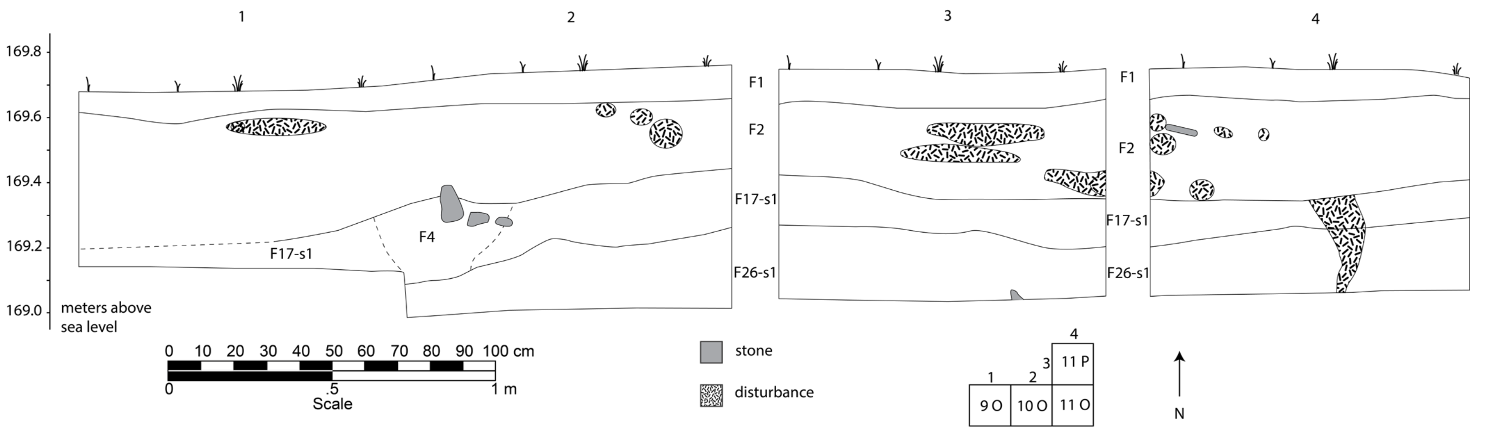


Figure 4.22: Stratigraphic profile of units 9O, 10O and 11P

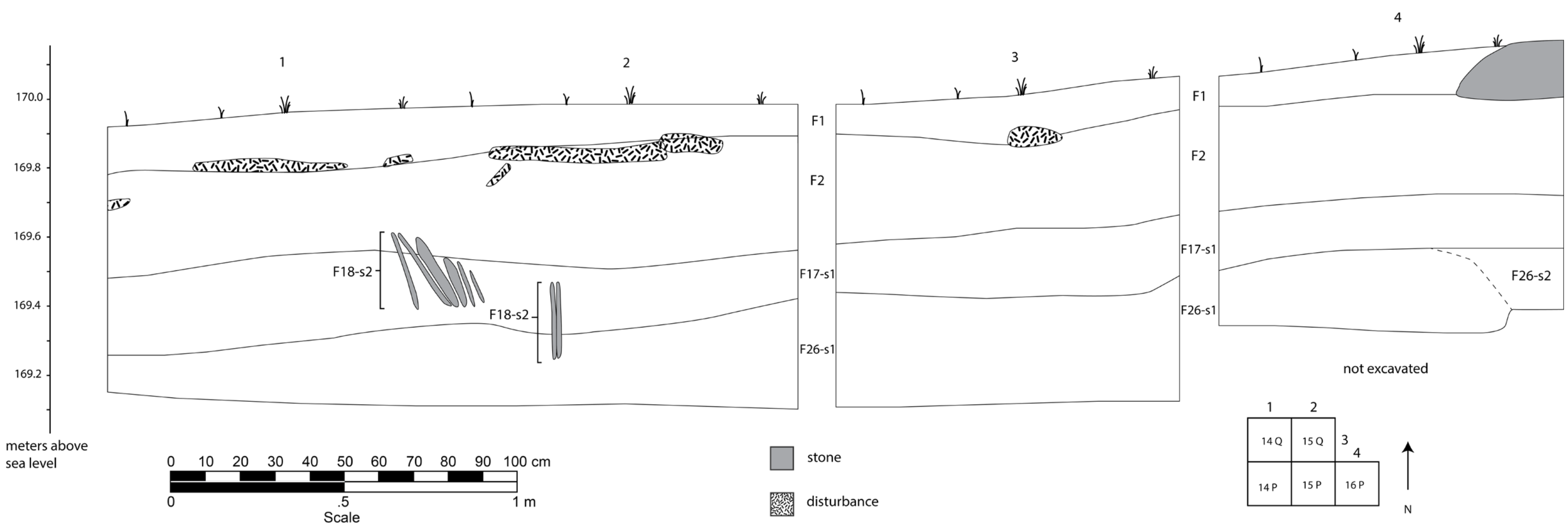


Figure 4.23: Stratigraphic profile of units 14Q, 15Q, and 16P

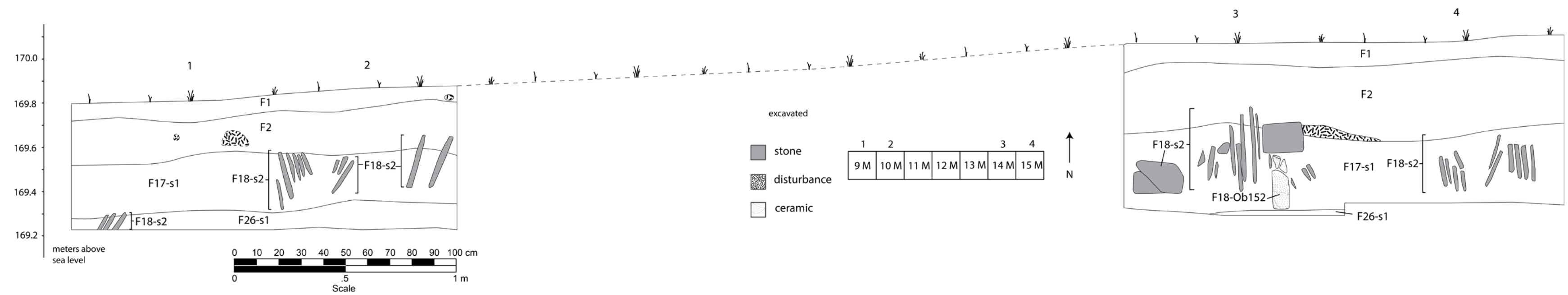


Figure 4.24: Stratigraphic profile of units 9M, 10M, 14M, and 15M

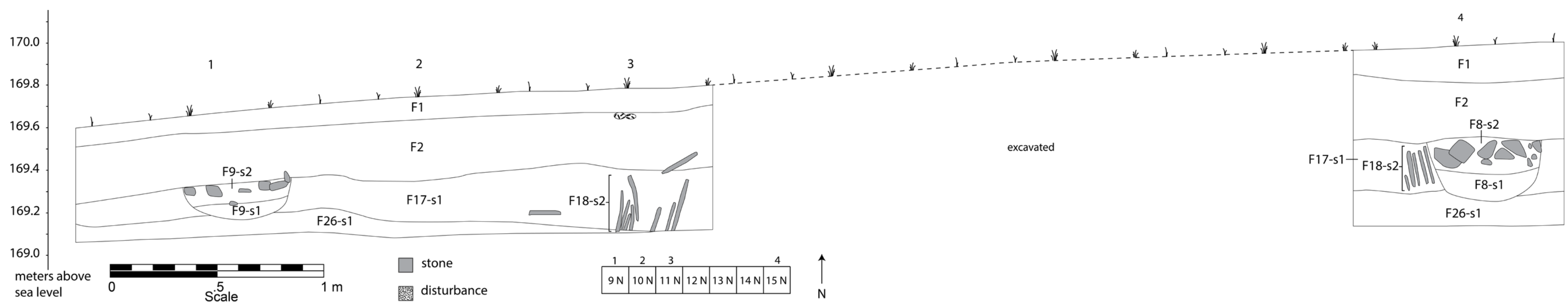


Figure 4.25: Stratigraphic profile of units 9N, 10N, 11N, and 15N

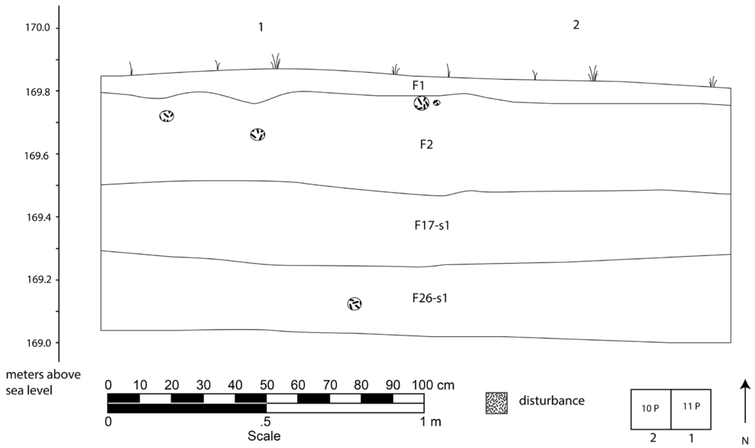


Figure 4.26: Stratigraphic profile of units 10P and 11P

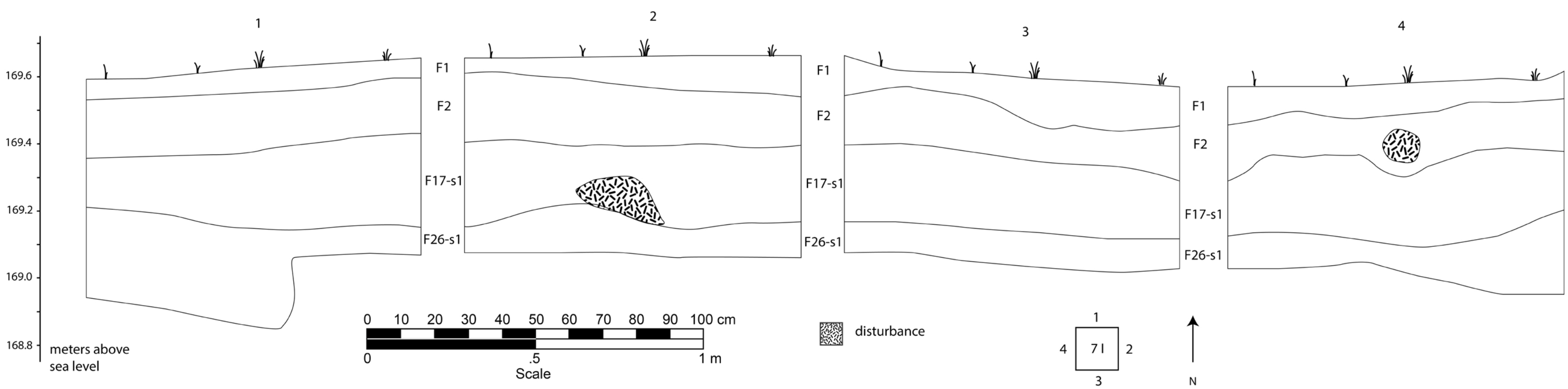


Figure 4.27: Stratigraphic profile of unit 7I.

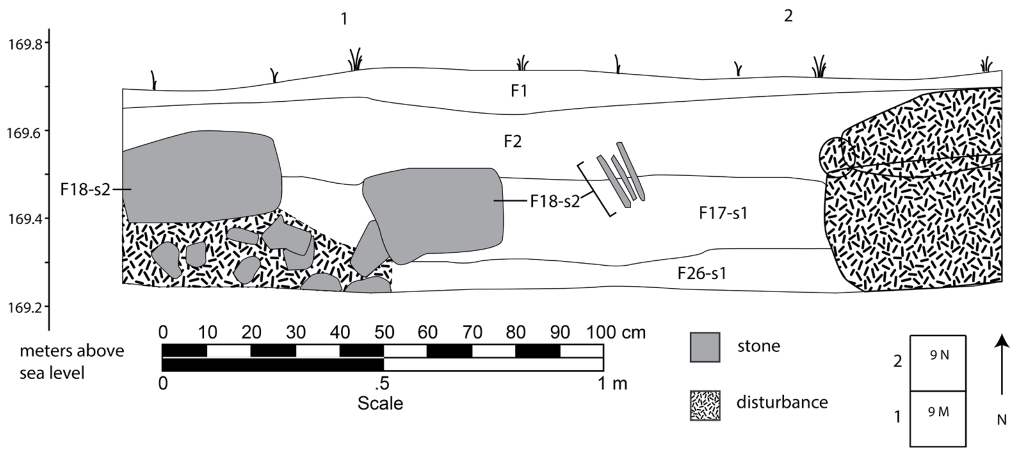


Figure 4.28: Stratigraphic profile of units 9N and 9M

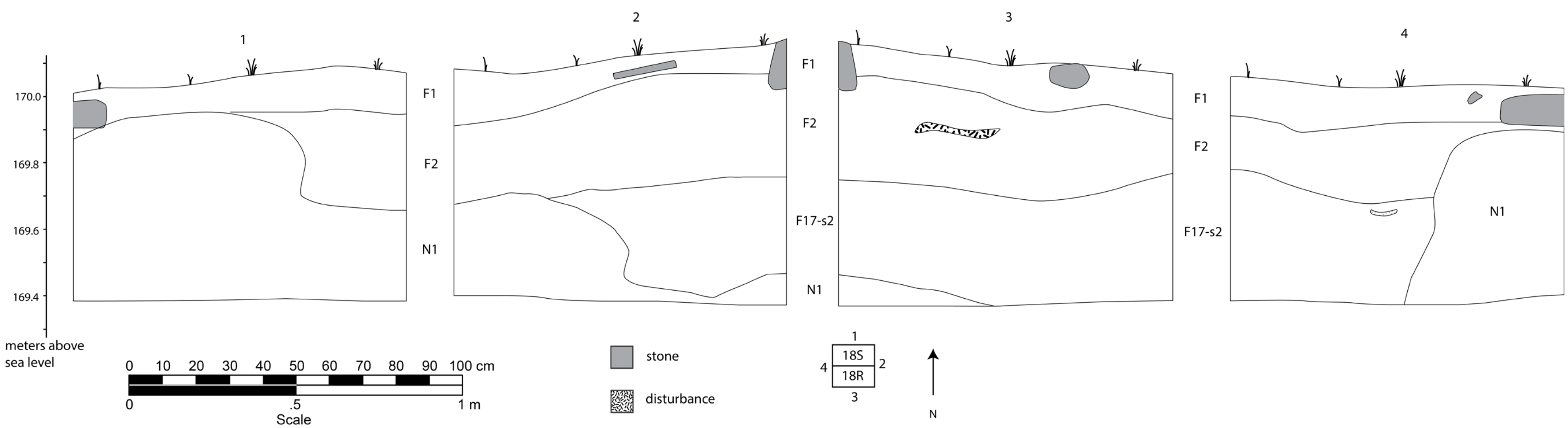


Figure 4.29: Stratigraphic profile of units 18S and 18R

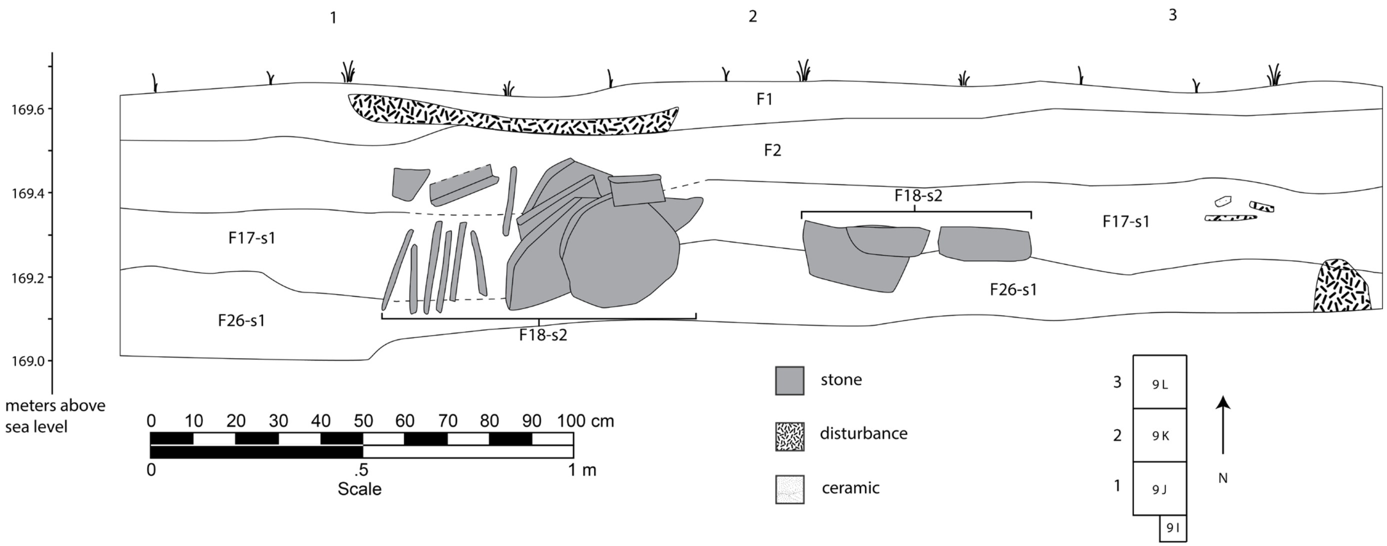


Figure 4.30: Stratigraphic profile of units 9J, 9K ,and 9L

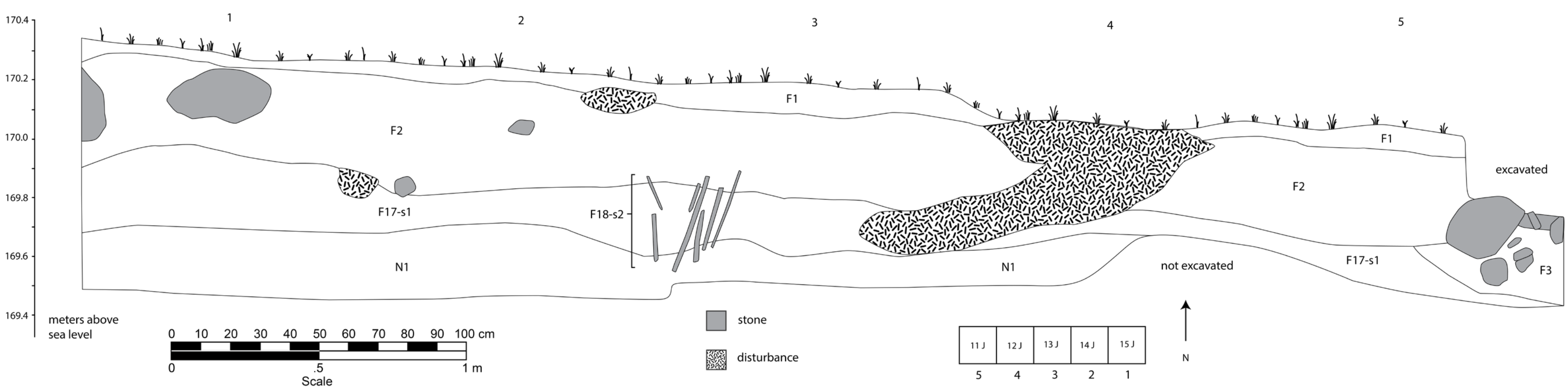


Figure 4.31: Stratigraphic profile of units 11J, 12J, 13J, 14J and 15J

Although the majority (94%; n=244) of the F18-s1 assemblage consisted of non-diagnostic coarse brown ware vessels, diagnostic vessels included in F18 dated to both the Miniyua and Chacahua phases. Diagnostic vessels in the cache include seven fine brown ware vessels of various forms dating to the Miniyua phase, five grayware bowls with incised plastic decorations dating to the Chacahua phase, three incurving wall grayware bowls that may date to a transitional period between the Miniyua and Chacahua phases. One of the Chacahua phase gray ware bowls may date to the earliest part of the Early Classic period based on morphological similarities to Coyuche phase graywares.

Stratigraphically, the earliest vessels were placed just below the interface between fill layers F17 and F26 (169.4 m a.s.l.) in the area exposed by units 12L, 13L, and 14L (Figures 4.37, 4.38). Residents excavated several small pits down from the top of F17-s1 and emplaced four coarse brown ware cylindrical vessels (F18-Ob256, F18-Ob258, F18-Ob259, and F18-Ob260), two coarse brown ware short-necked jars (F18-Ob254 and F18-Ob255; Figure 4.40) and one fine brown ware short-necked jar (F18-Ob257). Though F18-Ob257 dates to the Miniyua phase, the presence of Chacahua phase sherds in the fill layers underlying F17 suggests that F18-Ob257 may have been a curated Miniyua phase vessel placed during the Chacahua phase. Measurements of the uppermost elevations of three stone slabs associated with the seven vessels detailed above indicate that they would have projected out above the surface of F26; these slabs did not appear to be damaged or worn by weather, indicating F17 was already in place when the deposition of the offering began. An alternative interpretation of the chronology of the offering would involve a narrower sequence spanning the transition between the Miniyua and Chacahua phases when both types of vessels were simultaneously in use.

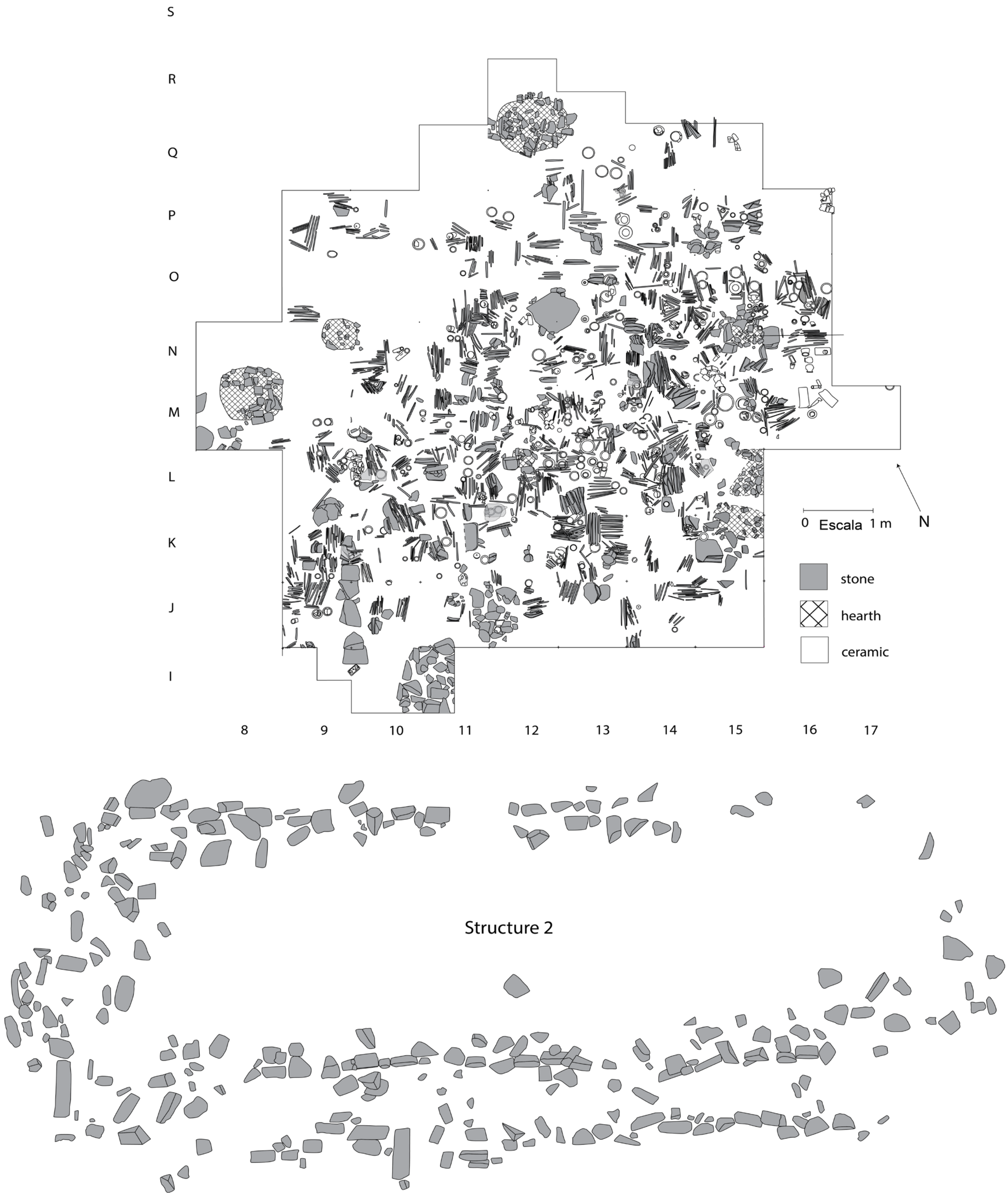


Figure 4.32: Plan map of offering area in north patio of Complex A

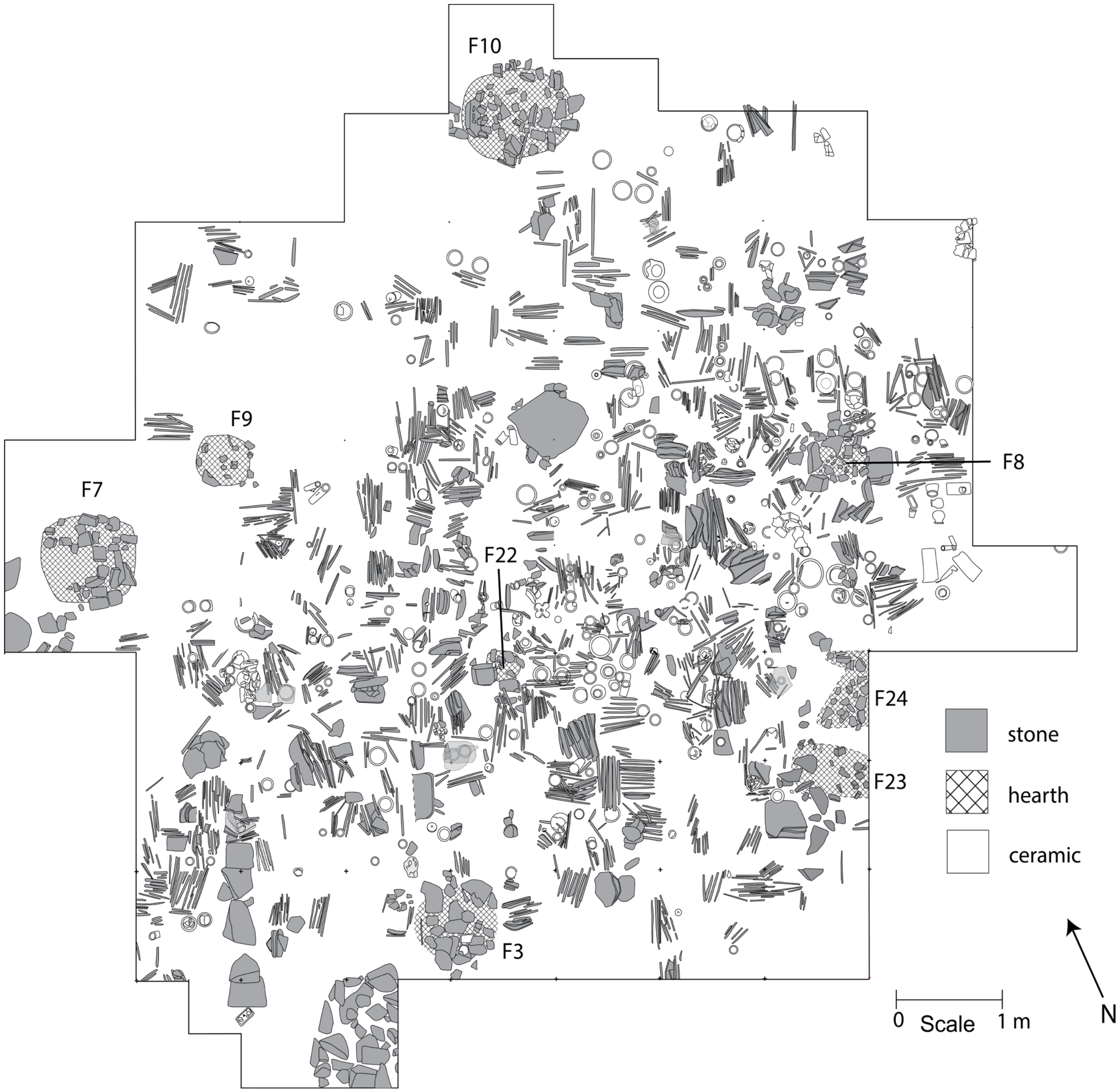


Figure 4.33: Plan map of offering area with hearths (F3, F7, F8, F9, F10, F22, F23, and F24) labeled


Figure 4.34: Photograph of offering vessels and stone compartments (pictured: units 16N and 16O)


Figure 4.35: Photograph of offering vessels and stone compartments (pictured: units 13P and 13Q)

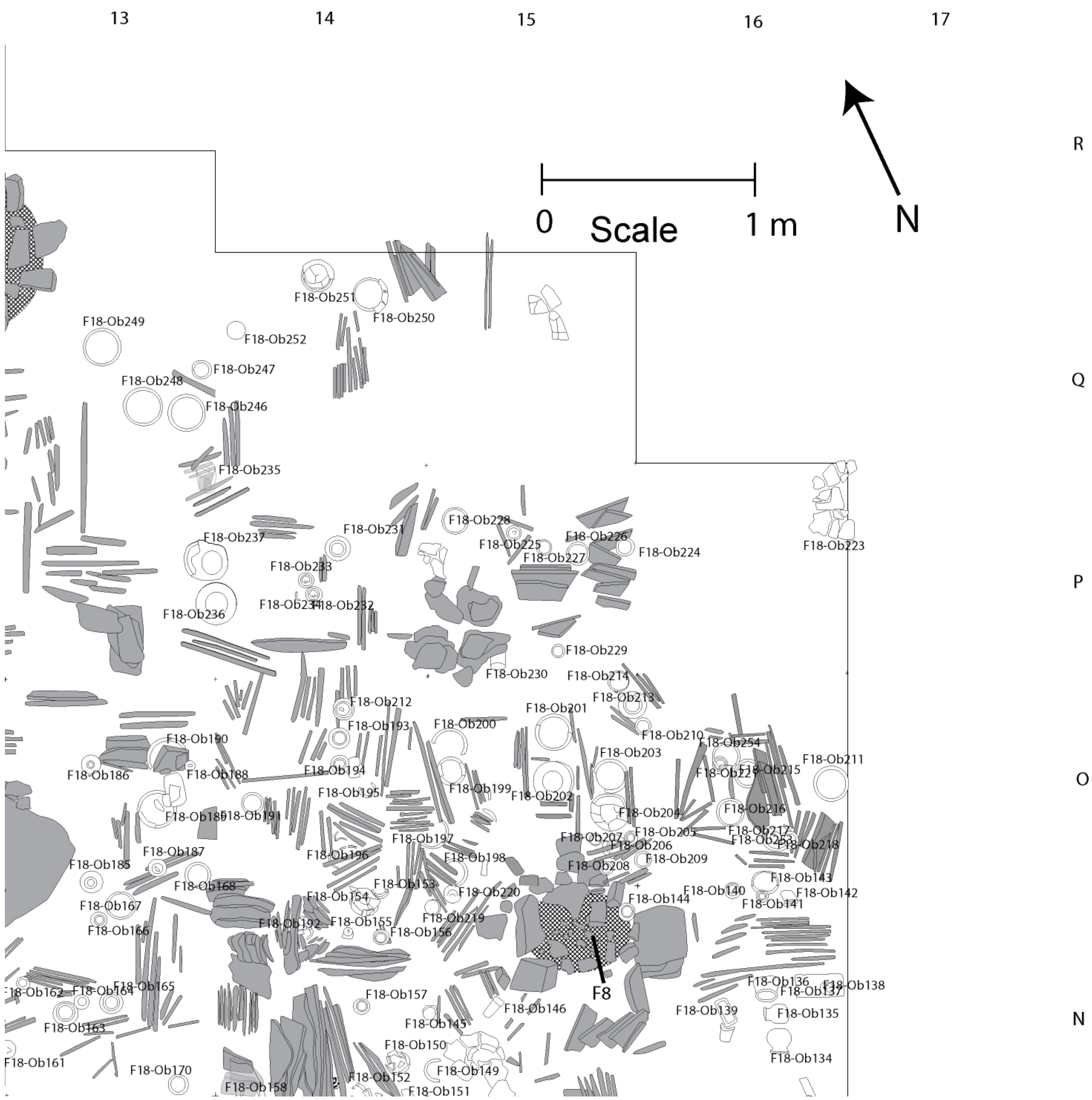


Figure 4.36: Plan map of northeast quadrant of offering area with individual vessels labeled.

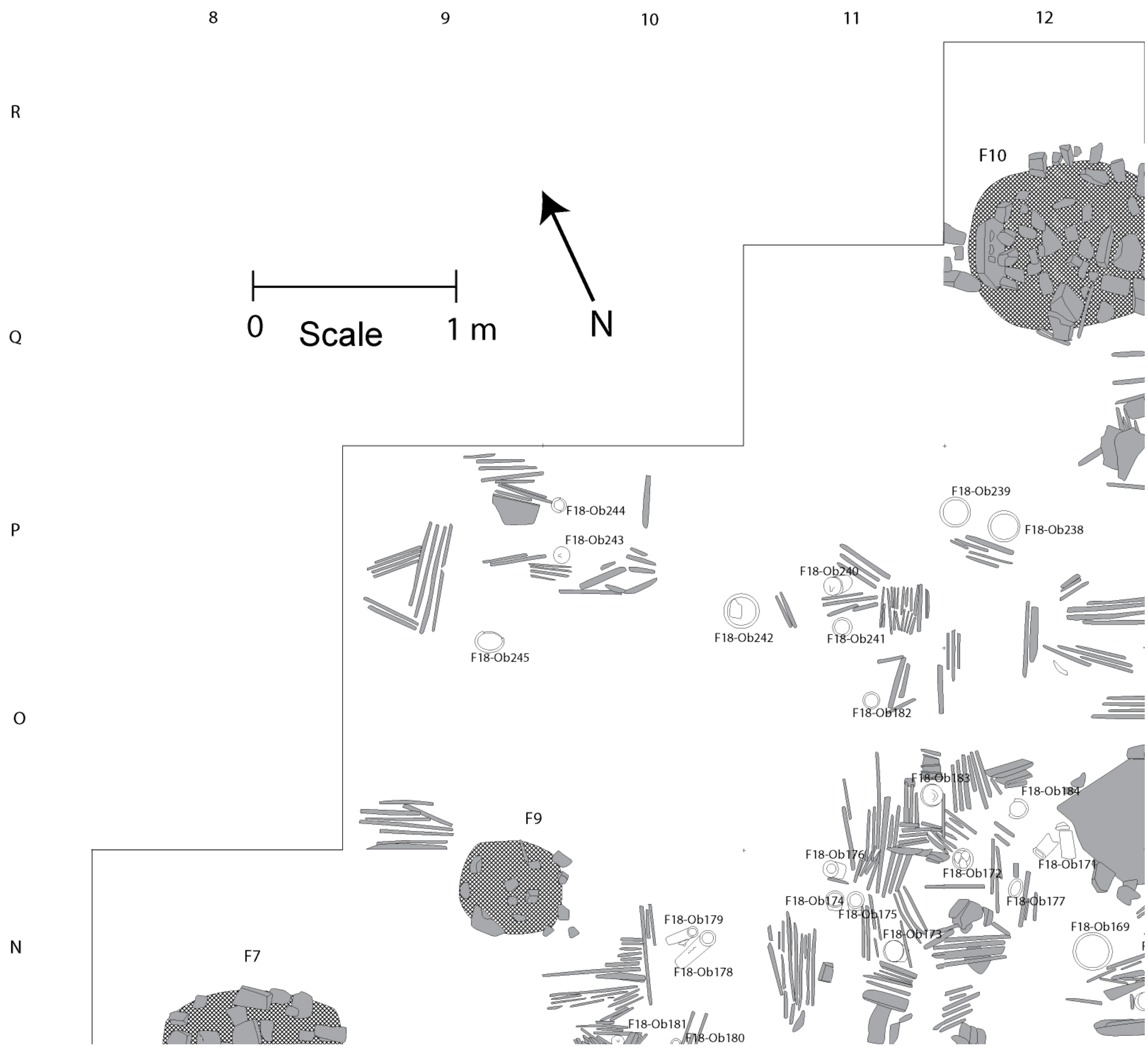


Figure 4.37: Plan map of northwest quadrant of offering area with individual vessels labeled

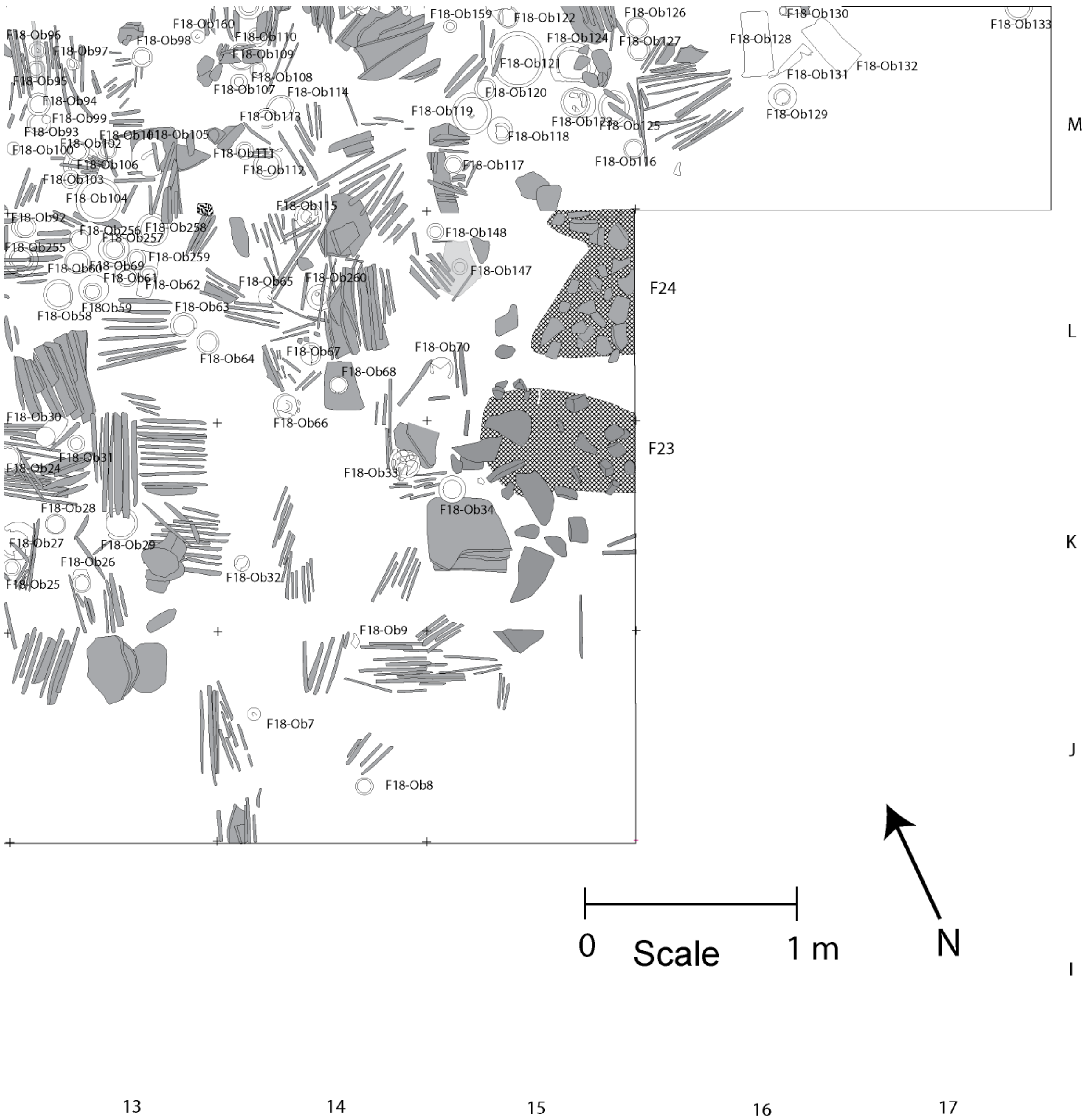


Figure 4.38: Plan map of southeast quadrant of offering area with individual vessels labeled.

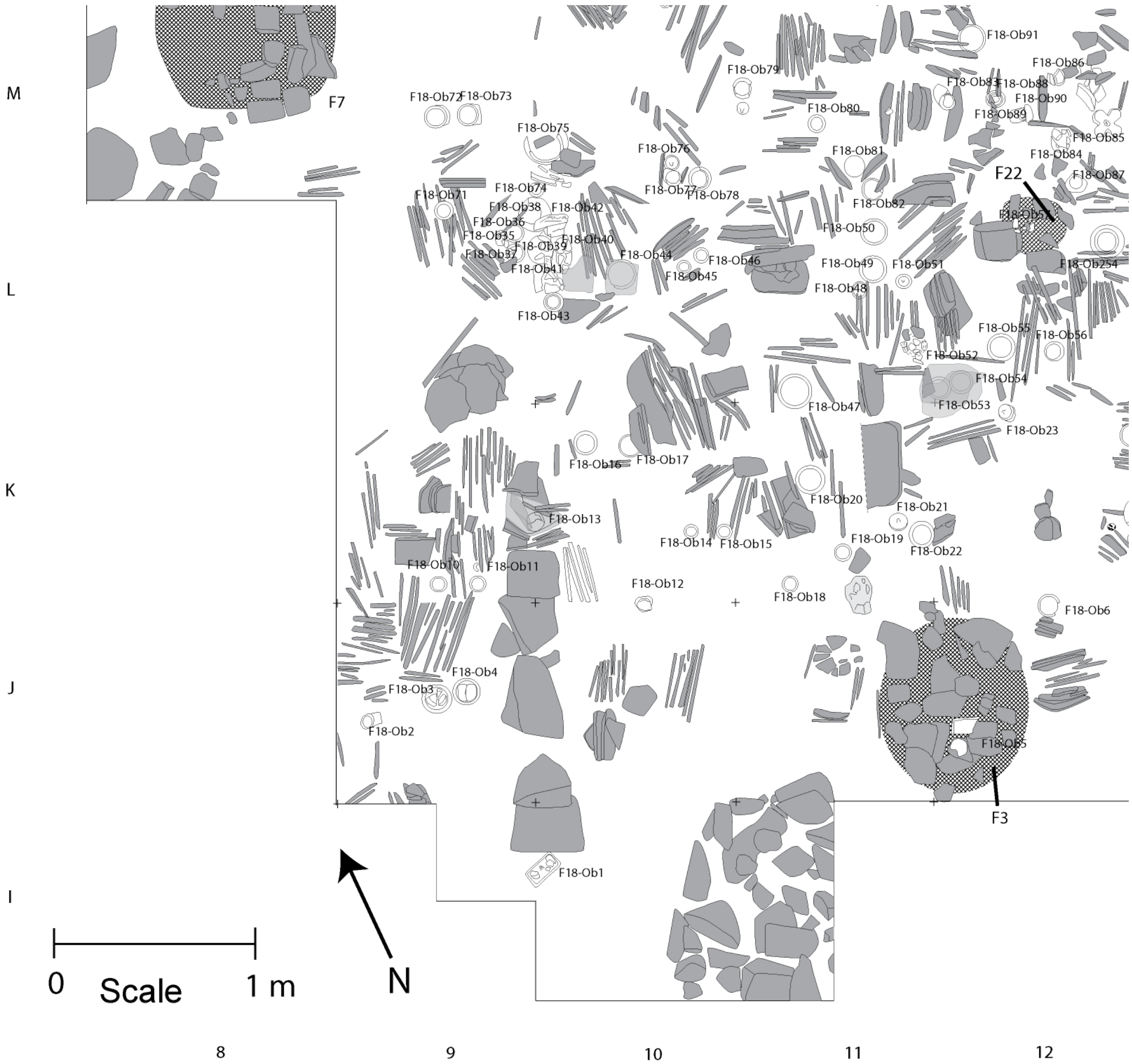


Figure 4.39: Plan map of southwest quadrant of offering area with individual vessels labeled.

Figure 4.40: Photograph of pair of short-necked jars placed in stone compartment in unit 12L

Figure 4.41: Photograph of pair of cylindrical vessels placed in area of 9M

Figure 4.42: Photograph of cylindrical vessel in offering compartment in unit 10K.

Figure 4.43: Photograph of cylindrical vessel with pointed lid in offering compartment in unit 14N.

Figure 4.44: Photograph of cylindrical vessels in offering compartment separated by single slab in unit 13K.

Figure 4.45: Photograph of broken Chacahua phase grayware sherds inside triangular offering compartment in unit 14O; grayware sherds and upper stone slabs placed atop earlier offering vessel (F18-Ob196; see Figure 7.1.45).

Figure 4.46: Photograph of offering compartment placed atop earlier offering vessel (F18-Ob196).

Figure 4.47: Photograph of offering vessel (F18-Ob61) placed atop earlier offering vessel (F18-Ob67).

Figure 4.48: Photograph of cylindrical vessels from F18 offering.

Figure 4.49: Photograph of short-necked jars in F18 offering.

The scale of F18 increased with time as additional deposits of vessels and compartments were emplaced (Figures 4.40-4.45). Excavators recovered an additional 253 vessels deposited entirely within the fill of F17. The sandy fill (F17-s1, F17-s2, F17-s3, F17-s4, F17-s5, and F17-s6) covering the offering was loosely packed and mottled, indicating residents continuously deposited, excavated, and reworked F17 to emplace new offerings and perhaps move around ones already in place (Figure 4.46). Excavations exposed several instances in which vessels and slabs were placed directly on top of previous offerings. For example, in the area of the offering exposed by unit 13L, a coarse brown ware cylindrical vessel (F18-Ob61) was placed directly atop an earlier cylindrical vessel (F18-Ob67; Figure 4.47).

The thin stone slabs (F18-s2) were often arranged into square or triangular “compartments” that contained one or more offering vessels. Compartments could also consist of rows of two to over a dozen parallel slabs. Most groups of parallel slabs were oriented vertically, although post-depositional movement caused some to fall or lean to one side. One example of a stone compartment lacking an offering vessel was recorded, which may indicate offering vessels were removed or replaced at various times or that the compartments were constructed in anticipation of future offerings. The mottled sediment in F17 precludes determining whether people deposited each slab in a particular group at the same time or individually over an extended period. Many of the offering vessels were accompanied by ceramic lids, some with circular, flat or pointed handles, suggesting people may have put items or perishable materials inside the vessels (see Figures 4.48 and 4.49). Lids of smaller short necked jars, neckless jars, and cylindrical vessels with small diameters were typically flat with pointed, rectangular or circular handles, or lacked a handle. Larger jars and cylindrical vessels were occasionally paired with small cylindrical bowls with outleaning or outcurving walls that acted as lids. Many vessels did not appear to have lids, but it is possible that the lids of some of these vessels broke and fell into the interior of the vessel. While the interior sediment of most preserved vessels from the North patio were preserved for future analyses, ten vessels from the offering area were excavated to investigate their contents. None had special objects or materials detectable by the naked eye, which likely indicates the vessels contained perishable materials or were perhaps empty (see Appendix D). Excavations carried out inside Structure 2 did not reveal similar deposits within the building, suggesting the north patio was the primary locus for ritual offerings.

During the deposition of the F18 offering, residents of Cerro de la Virgen also carried out other activities in the north patio, including cooking for feasting events. At least six hearths (F10 [Figures 4.5 and 4.50], F9 [Figure 4.23], F8 [Figure 4.25], F7 [Figure 4.51], F6 [Figure 4.9], and F3 [Figure 4.31]) were excavated down from the top of F17-s1, all of which were filled with dark, loamy sediment with burned organic matter, ash, and occasionally charcoal and fire-cracked rock. Results of radiocarbon tests of samples from these hearths are pending. In addition, two broad, shallow pits were excavated, one down from the top of F17-s1 in units 9O and 10O (F4; Figure 4.22) and the other cutting through F17-s7 in units 11H and 11I (F3; Figure 4.33). F3 and F4 were filled with loamy sand sediments similar to F17-s1, but do not appear to have been used for burning or cooking activities.

Figure 4.50: Photograph of hearth (F10) with heating stones in north part of north patio

Figure 4.51: Photograph of hearth (F7) with heating stones removed by excavators in units 8M, 8N, and 9M

Later in the Chacahua phase, following the end of caching and feasting practices in Complex A, the area fell out of use. Maintenance of the F17 surface ended as the stone drain (F20) under Structure 2 was blocked with sediment and the area was covered with a 25-40 cm thick layer of loosely packed, grayish brown colluvium (F2). The colluvium likely flowed down from Terrace 10 and the patio surrounding Structure 1 and pooled in the flat surface of the north patio. Excavators recovered several lots within F2 containing Coyuche phase ceramics, indicating people may have continued to visit the site during the Early Classic period. Alternatively, the Coyuche phase sherds, which were small and eroded, may have also washed down with the colluvium from above. Finally, a layer of topsoil (F1) developed at the surface of F2.

PRV13-Operation B

Operation B consisted of a transect of test units running east-west in the south patio of Terrace 11 in Complex A as well as two 1 m x 1 m test units located to the north of the transect, approximately 7 m south of Structure 2 (Figures 4.52 and 4.53). The south patio of Complex A was less restricted than the north patio, providing direct access to the monumental staircase leading up to Terrace 10 and Structure 1. To the south and west of the south patio, the Terrace 11 slopes downward sharply into the Main Plaza. Activities carried out on the south patio likely would have been visible from vantage points throughout the Main Plaza. Excavations in Op B cleared 11 m^2 in the south patio and penetrated to underlying bedrock in four units (11J, 6J, 1O, and 10O). Excavations in Operation B had three main objectives:

1. Identify the construction techniques and material used to build the southern area of the Complex A terrace.
2. Identify activities carried out in the South patio.
3. Penetrate to bedrock in several areas to investigate the earliest occupation and construction episodes of the area.

Evidence from Op B indicates large-scale construction of Terrace 11 began in the Terminal Formative period, perhaps by as early as the late Miniyua phase. Builders mined local deposits for loamy, sandy sediments to use for construction, including areas that were occupied during the Late Formative Minizundo phase. During the Chacahua phase, feast preparation activities were carried out in the south patio that were associated with caching practices that were carried out in the north patio (see previous section). Excavators exposed two hearths in the central transect of test units, both of which utilized granite stones as heating implements. By the end of the Chacahua phase, the area fell out of use. Inhabitants of the site may have ritually terminated the use of the south patio by interring a small offering consisting of a ceramic jar, a figurine head, and a collection of stone slabs similar to those found in the north patio near the Chacahua-phase surface. Like the north patio, the south patio was covered with colluvium washing down from Terrace 10 after the site was abandoned.

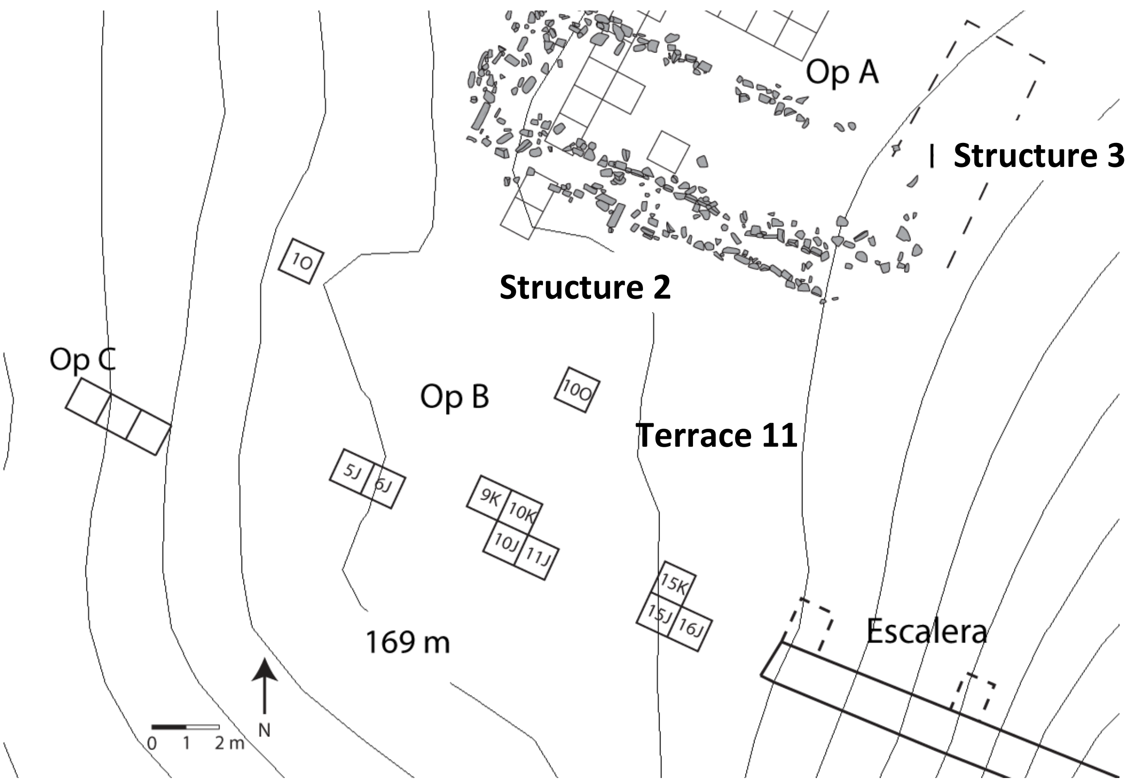


Figure 4.52: Plan map of units excavated in Operation B (contour = 1m)


Figure 4.53: Photograph of excavated units in Operation B looking south; unit 1O not pictured

In Op B, excavators began with a transect of 1 m x 1 m test units along the east-west axis of the south patio (units 5J, 10J, and 15J). Each unit was expanded based on features discovered. For instance, units 5J and 10J were expanded to the east to excavate two hearths (F6 and F4, respectively). Unit 10J was also expanded to the west to excavate a small offering (F3) of stone slabs, a short-necked jar, and the head of a figurine. The units to the east (units 15J, 15K and 16J) were expanded around several stone features, which were determined to be rock fall from the monumental stairway to the east. Units 1O and 10O were excavated to explore the occupational history of the area between the east-west transect and Structure 2. Table 4.2 provides a detailed list of stratigraphic levels in Op B, beginning with the most recent and ending with the oldest.

Table 4.2: List of stratigraphic levels in Operation B

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F1	All units in Op B	10 YR 3/2; very dark grayish brown loam	Modern	Soil formed in construction fill (F8)	Loamy topsoil with plant material, large disturbances and gravel, rock, and sherd inclusions; generally thicker toward base of stairway and mound leading to Structure 1; see Figure 4.54 – 4.58, 4.66
F2	All units in Op B	10 YR 2/2; very dark brown sandy loam	Post-formative to Modern	Colluvium	Moderately sorted sandy loam colluvium with sub-rounded grains; contains inclusions of small rocks, gravel, coarse sand, sherds and large stones (many falling from monumental stairway to the east); see Figures 4.54 – 4.58, 4.66
F3-s1	10J and 10K	No Munsell; ceramic objects	Chacahua	Offering	Possible termination offering associated with final activities in south patio of Complex A; consists of two ceramic objects including a Formative-period figurine fragment (head; F3-Ob1) and a non-diagnostic coarse brown ware short-necked jar (F3-Ob2); figurine and jar were placed directly abutting hearth (F4) in unit 10J; offering emplaced after fill layer F9-s2 was finished, just 5-7 cm below surface of F9-s2; covered with same sediment (not detected in profile); see Figure 4.59
F3-s2	10K	No Munsell; stone slabs	Chacahua	Offering	Possible termination offering associated with final activities in south patio of complex A; consists of nine thin stone slabs emplaced in parallel rows to north of F3-s1; grouping of slabs is similar to stone compartments in Op A-F18-s2; not detected in profile; see Figure 4.59

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F4-s2	10J, 10K, 11J	10 YR 3/1; very dark gray sandy loam	Chacahua	Hearth	Upper sub-stratum of deep (approximately 50 cm in depth) hearth filled with moderately sorted sandy loam with subrounded grains; contains inclusions of mica, gravel, fire-cracked rocks (angular), crushed rock, charcoal, ash, and sherds; sediment is hard packed, but softer than F4-s1; pit cuts down through F9-s2, F9-s1, and slightly into F10-s1; stones left in hearth refuse may have been used as heating elements; see Figure 4.55 – 4.56, 4.59
F4-s1	11J, 10J	10 YR 3/2; very dark grayish brown loamy sand	Chacahua	Hearth	Lower sub-stratum of F4 hearth consisting of loamy sand with coarse sand inclusions and particulate mica; hard packed (more compact than F4-s2) and well sorted; lens likely deposited just prior to first use of the hearth; sub-stratum does not appear to have charcoal or ash inclusions in the loamy sand matrix; see Figure 4.55
F5	10O	10 YR 3/3; dark brown loam	Chacahua	Pit fill	Shallow (approximately 25 cm in depth) pit cuts down from the top of F8 and slightly into N1 in unit 10O; pit filled with poorly sorted loam with subangular-angular grains; sediment loosely packed; contains inclusions of mica, coarse sand, and eroded sherds; does not appear to contain charcoal or ash; darker than F8 and N1; see Figure 4.57
F6-s2	5J, 6J	10 YR 2/1; black loam	Chacahua	Hearth	Upper sub-stratum of hearth that cuts down from the top of F9-s2 and slightly into F10-s1; filled with softly packed, moderately sorted loam with charcoal, ash, gravel, and sherd inclusions; much darker in color and more organic in composition than F6-s1; multiple sub-strata may have been related to multiple uses as a cooking feature; see Figure 4.54

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F6-s1	5J, 6J	10 YR 3/3; dark brown sandy loam	Chacahua	Hearth	Lower sub-stratum of hearth that cuts down from the top of F9-s2 and slightly into F10-s1; contains several disturbances at bottom of sub-stratum probably caused by rodent burrows; filled with softly packed sandy loam containing sherds, gravel, ash, and coarse sand; no charcoal detected in profile; lighter in color than F6-s2, but darker than F9-s2; more lightly packed than F9-s2, but harder packed than F6-s2; multiple sub-strata may have been related to multiple uses as a cooking feature; see Figure 4.54
F7	1O	10 YR 3/3; dark brown loamy sand	Chacahua	Construction fill	Moderately sorted loamy sand fill with inclusions of gravel, particulate mica, charcoal and sherds; may correlate with F9 and F8; thicker and contains finer sediment than F9 and F8; see Figure 4.58
F8	10O	10 YR 3/3; dark brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand fill with subrounded-rounded grains; contains inclusions of coarse sand, gravel, mica, sherds, and small rocks; likely analogous to fill strata F9 and F7; see Figure 4.57
F9-s2	5J, 6J, 10J, 11J	10 YR 4/2; dark grayish brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand fill with subrounded grains; contains inclusions of gravel, coarse sand, eroded sherds, and small rocks; likely analogous to fill strata F8 and F7; stratigraphic break between F9-s2 and F9-s1 in unit 5J probable but not clearly delineated; F9-s2 darker in color, sandier, and slightly less compacted than F9-s1; F9-s2 not present in unit 6J; see Figures 4.54 – 4.56, 4.59
F9-s1	5J, 10J, 11J	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with subangular grains; contains inclusions of mica, gravel, coarse sand, and eroded sherds; lighter in color and more compacted than F9-s2; contains less sand than F9-s2; deposited directly atop bedrock, F10-s1 and F10-s2 in units 5J and 6J; see Figures 4.54 – 4.55

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F10-s1	5J, 6J, 11J	10 YR 4/3; brown loamy sand	Transitional Miniyua-Chacahua	Construction fill	Thick layer of poorly sorted loamy sand construction fill with subrounded grains and inclusions of gravel, sherds, and small rocks; fill stratum is as thick as 45 –50 cm to the east and slopes downward sharply toward the west; see Figures 4.54 – 4.55
F10-s2	5J, 6J	10 YR 3/3; dark brown loamy sand	Transitional Miniyua-Chacahua	Construction fill	Thin lens of dark sediment at top of F10-s1; sediment is similar to F10-s1 but may have been burnt; possible occupational surface or "clean out" debris from hearth; covered by F9-s1; see Figure 4.54
N1	5J, 6J, 11J, 1O, 10O	No Munsell; coarse granulated bedrock (grüs)	N/A	Natural bedrock	Naturally occurring bedrock; no artifacts; see Figure 4.57

The earliest level of occupation in the area of Operation B is F10, a 45-50 cm layer of loamy sand fill that builders deposited atop bedrock (N1). Builders likely deposited F10 late in the Miniyua phase or early in the Chacahua phase. In unit 5J, excavators uncovered well-preserved Miniyua phase sherds in F10 as well as eroded and fragmented Minizundo phase sherds. F10-s1, which represents the majority of F10, slopes downward sharply toward the west (Units 5J, 6J and 11J (Figures 4.54 and 4.55). The angled surface of F10-s1 may represent the side of an early platform built in the southern area of Terrace 11. A thin lens of burned sediment (F10-s2) was found at the top of F10-s1, indicating activities were carried out on the mound such as burning to clear vegetation. The surface of F10 was situated at an elevation of 168.5 m a.s.l., which is within 30 cm of the surface of the earliest fill layer (F27) in Op A (168.8 m a.s.l. [Figure 4.5]). Given its stratigraphic position on top of bedrock, the presence of Miniyua phase pottery, and an elevation comparable to the earliest fill episode in the north patio of Complex A, it is likely that F10 dates to the transitional period between the Miniyua and Chacahua phases.

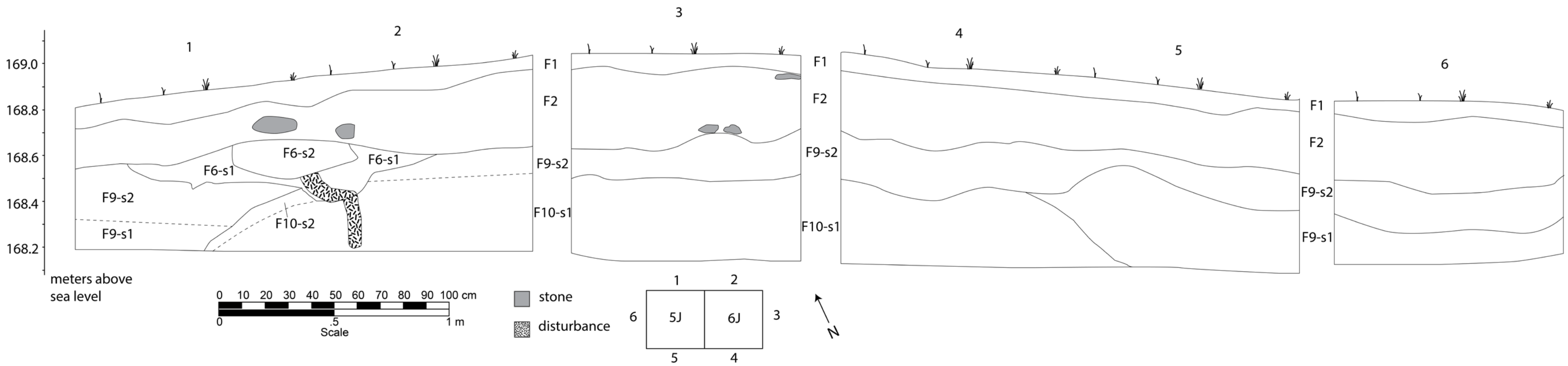


Figure 4.54: Stratigraphic profile of units 5J and 6J

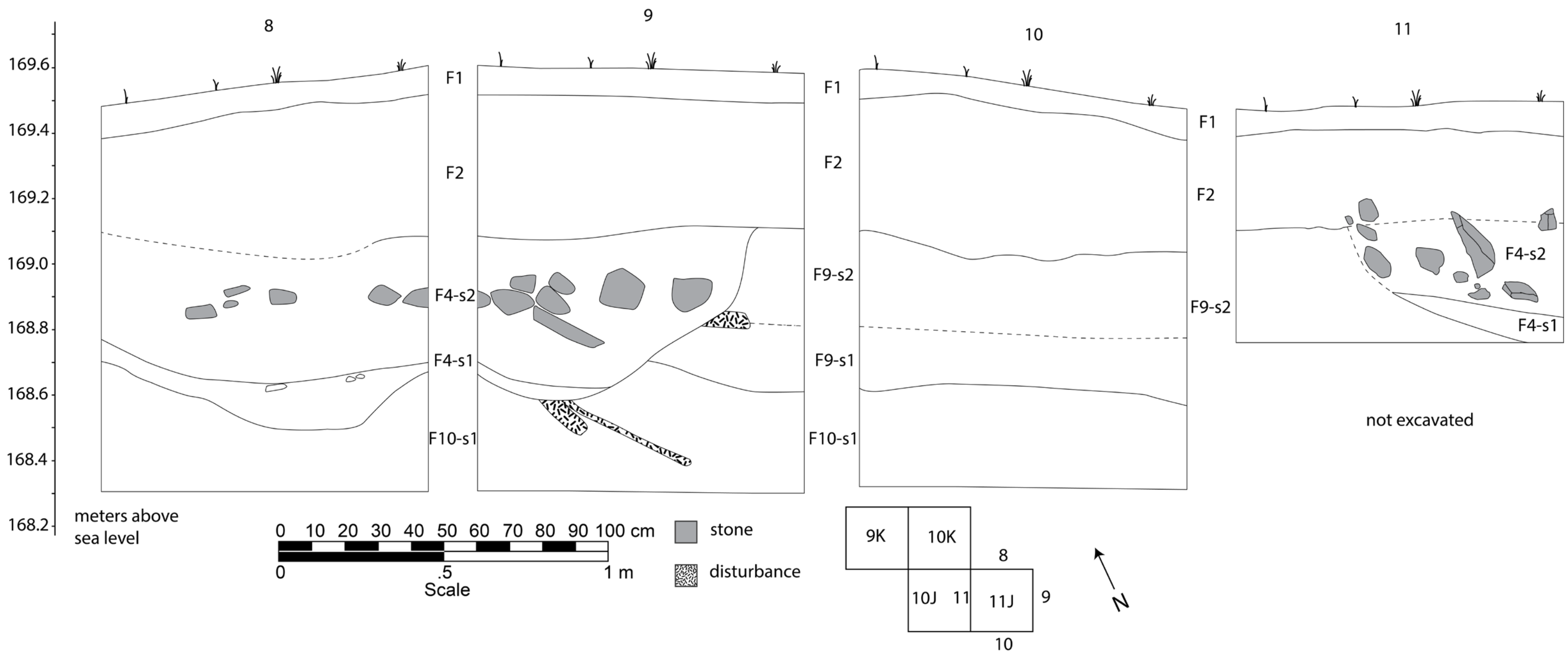


Figure 4.55: Stratigraphic profile of unit 11J

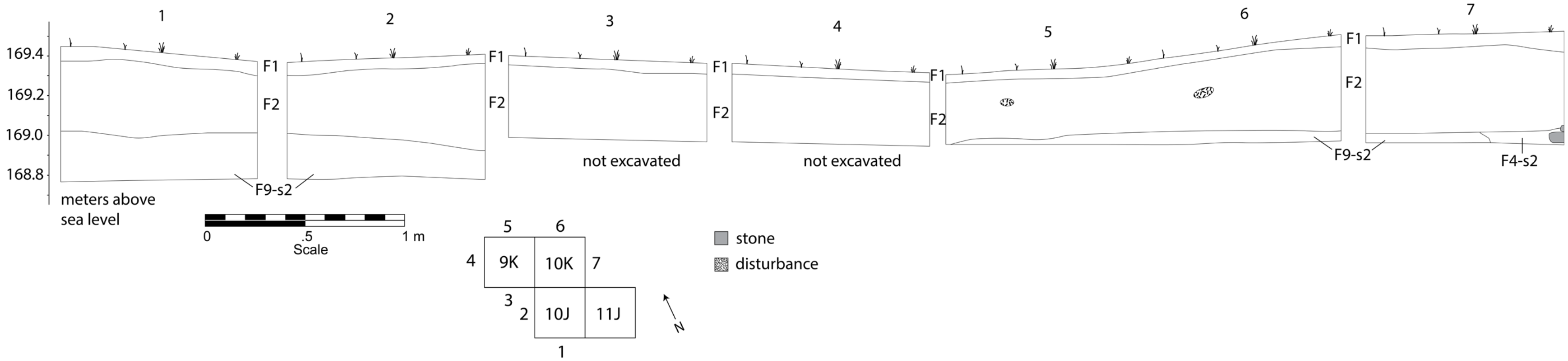


Figure 4.56: Stratigraphic profile of units 9K, 10K, and 10J

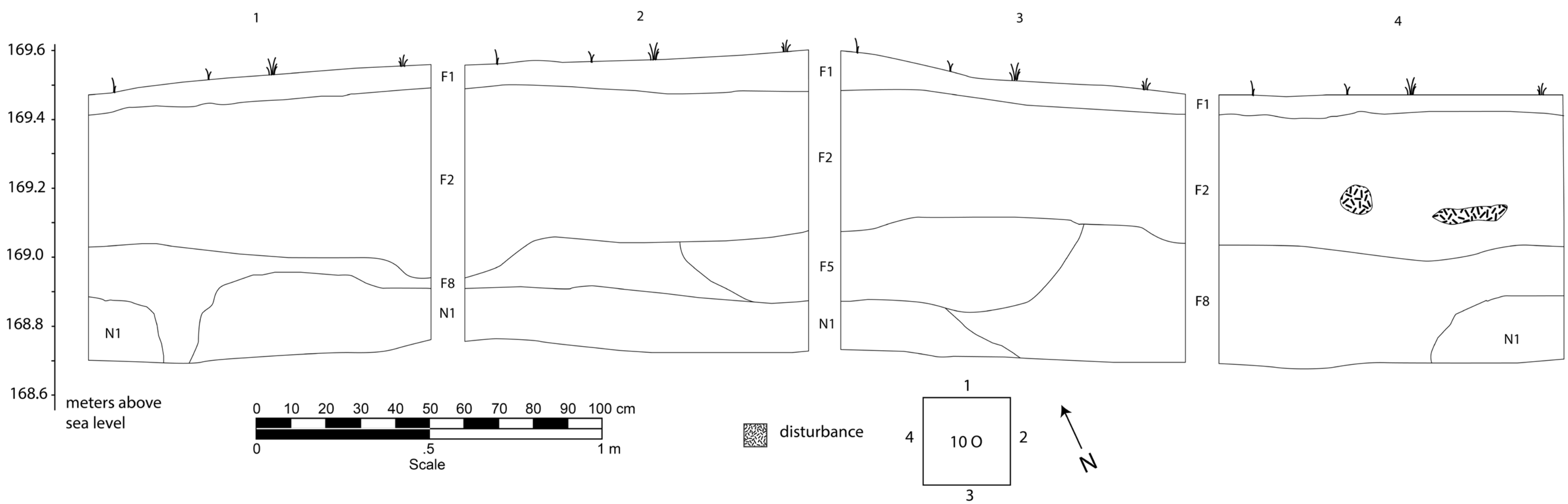


Figure 4.57: Stratigraphic profile of unit 10 O

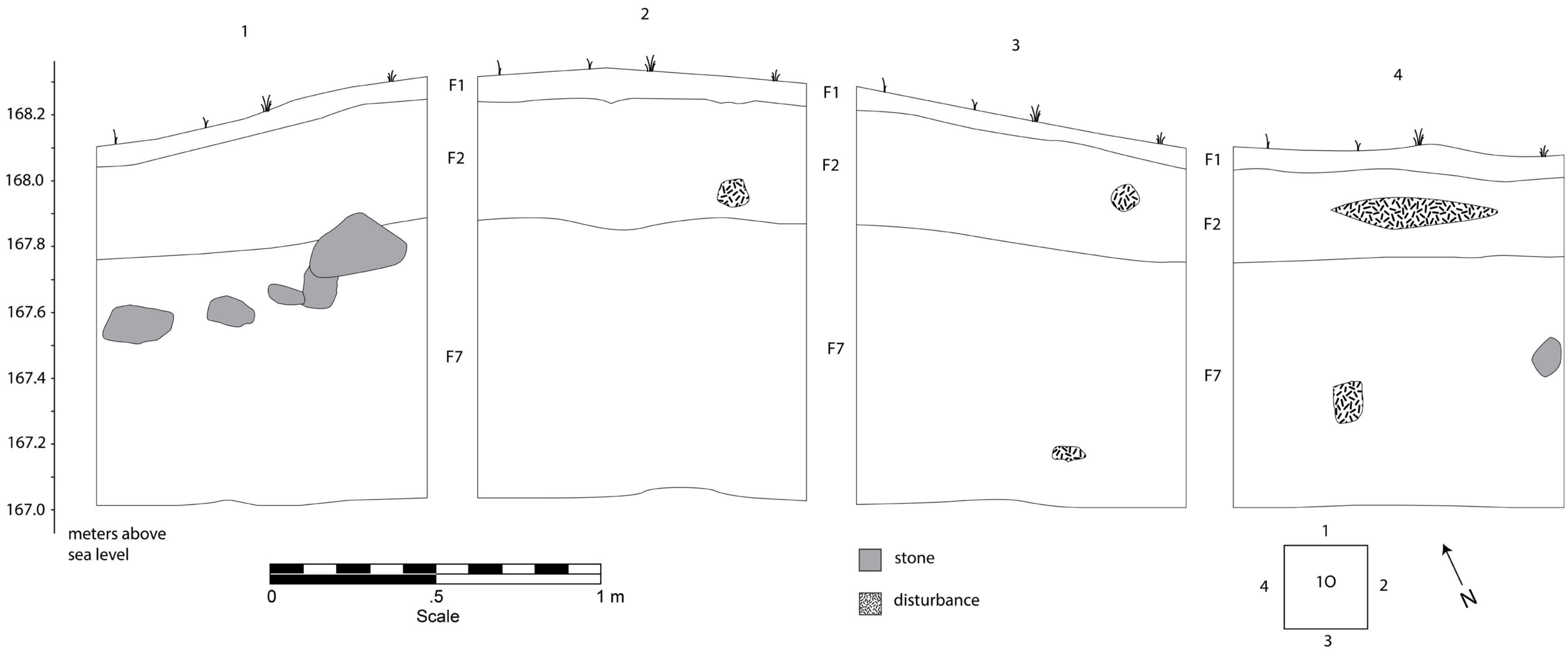


Figure 4.58: Stratigraphic profile of unit 1O

Following the F10 construction phase and use of the possible platform, building activities in the southern area of Complex A intensified as builders broadened the occupational surface, creating the south patio of Complex A. Builders deposited F9 early in the Chacahua phase, indicated by the large proportion of well-preserved Chacahua phase sherds to eroded Miniyua phase sherds recovered from F9 contexts in units 5J, 6J, 10J, and 11J (Figures 4.54-4.56). In the area of unit 5J, F9-s1 was deposited atop F10-s1 and F10-s2, which raised the area to the west of the Complex A terrace by as much as 40 cm and lengthened the surface of Terrace 11 to the west. F9-s2 raised the level of the south patio by an additional 20 – 30 cm and created an occupational surface that sloped downward at a shallow angle to the west. F9 consists of sandy, loamy sediment of probable colluvial origin.

Chacahua phase construction activities in Op B also included the deposition of fill layers in the northern part of the south patio. In the area of unit 10O (Figure 4.57), located 7 m south of the southern step (Op A-F12) of Structure 2, builders deposited F8. F8 is a layer of loamy sand fill placed to raise the level of the plaza 10- 30 cm above bedrock (N1) to an elevation of 169.1 m a.s.l. Around the same time, builders also deposited F7 atop bedrock in the area of unit 1O, which raised the elevation of the surface to 167.8 m a.s.l. (Figure 4.58). F7 is up to 80 cm thick, indicating people built the South patio relatively quickly during the second major construction episode in the area (corresponding to F7, F8, and F9). The surface of F7 and F8 differ by almost 1.3 m, indicating that although the south patio was relatively level in the area of units 5J, 6J, 10J, 11J, 9K, and 10K, it sloped downward toward the west, off Terrace 11. F7, F8, and F9 contained very similar sediments and were likely mined from similar locations and deposited at the same time.

Following the second major building episode (F7, F8, and F9), construction in the South patio ceased, and evidence indicates people began to carry out other activities in the area. People likely carried out cooking activities in the South patio, indicated by two hearths (F4 [units 10J, 11J, and 10K; Figures 4.55, 4.59, 4.60, and 4.61] and F6 [units 5J and 6J; Figures 4.54, 4.62, and 4.63]) excavated down from the top of F9-s2 during the Chacahua phase. F6 is a broad, shallow (approximately 1.35 m in diameter and 15 – 20 cm deep) hearth comprised of a sandier, ash-filled lower sub-stratum (F6-s1) and a burned, organic, loamy upper sub-stratum (F6-s2). During the use of F6, inhabitants of the site utilized granite stones as heating elements. To the northeast in unit 10O, a small, shallow pit was excavated down from the top of F8 and later filled with dark, loamy sediment (F5; Figure 4.57). The use of the pit filled by F5 is not clear. Inhabitants of Cerro de la Virgen also used a second hearth (F4) located in the center of the south patio. F4 is a broad, deep (1.25 m in diameter, 0.53 m in depth) hearth comprised of a thin lens of dark sediment (F4-s1) at its base covered by a thicker layer of darker, ashier sediment (F4-s2). Among the inclusions associated with F4-s2 were charcoal, ash and eroded sherds as well as angular, fire-cracked rocks used as heating elements. Given the evidence for small-scale cooking features in the north patio of Complex A, it is probable that the presence of multiple sub-strata in hearths F4 and F6 accounts for multiple uses of the cooking features, perhaps as the ritual use of Complex A intensified during the Chacahua phase.

At some time during or after the use of F4, inhabitants of Cerro de la Virgen placed a small offering (F3) near the edge of the hearth just below the upper surface of F9-s2 (Figures 4.59, 4.64 and 4.65). The F3 offering included two ceramic objects (F3-s1) and a collection of thin stone slabs oriented vertically in rows (F3-s2). F3-s1 consisted of a zoomorphic (possibly deer) figurine fragment (F3-Ob1) and a small coarse brown ware jar (F3-Ob2). F3-s2 was placed in a pattern similar to the stone slabs and vessel compartments in the north patio of Complex A. Given its proximity to the adjacent hearth (F4), F3 may be associated with feasting activities carried out in the south patio. Alternatively, the offering may have been placed as a termination deposit during the abandonment of the site.

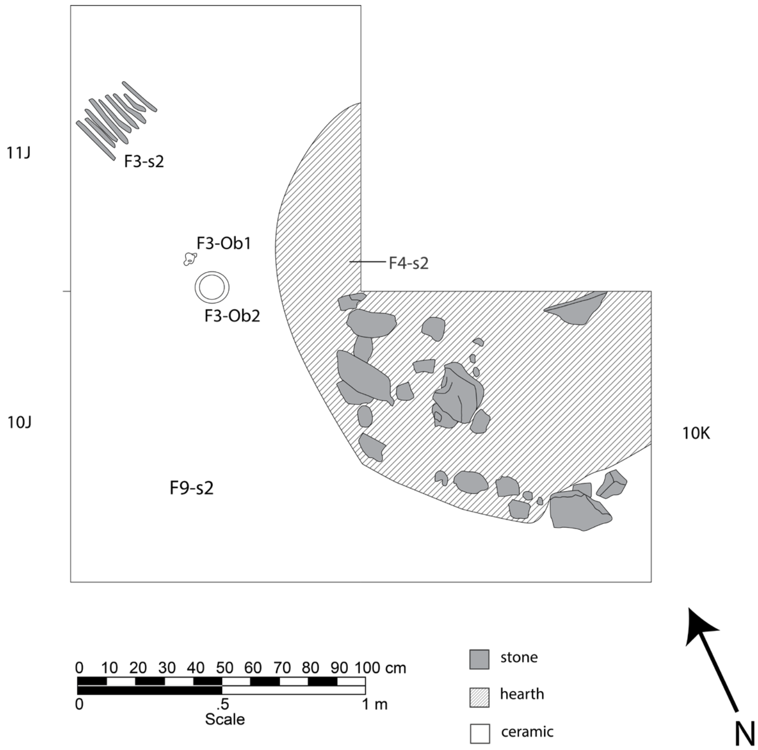


Figure 4.59: Plan map of F3 offering and upper stratum of hearth (F4-s2); F3-s1 consists of figurine fragment (F3-Ob1) and jar (F3-Ob2), F3-s2 consists of collection of thin stone slabs

Figure 4.60: Photograph of F4 hearth in plan view.

Figure 4.61: Photograph of F4 hearth in north and east profiles of unit 11J

Figure 4.62: Photograph of F6 hearth in plan view.

Figure 4.63: Photograph of hearth (F6) in north profile of units 5J and 6J.

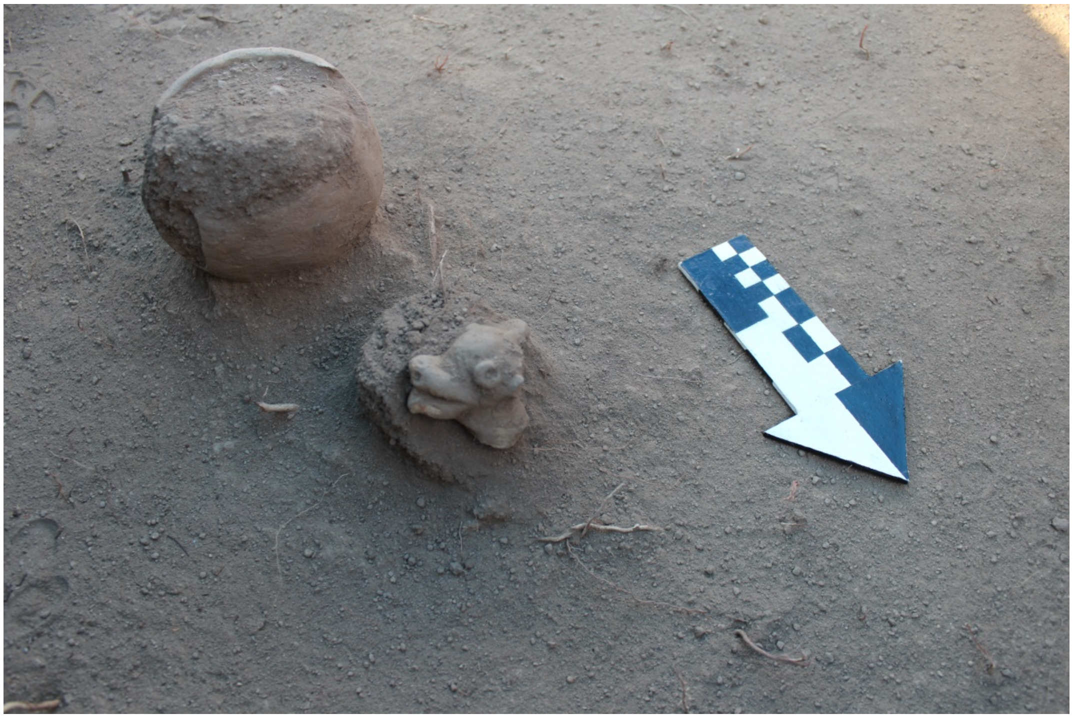


Figure 4.64: Photograph of figurine head (F3-Ob1) and neckless jar (F3-Ob2).

Figure 4.65: Photograph of stone slabs included in F3 offering (F3-Ob3)

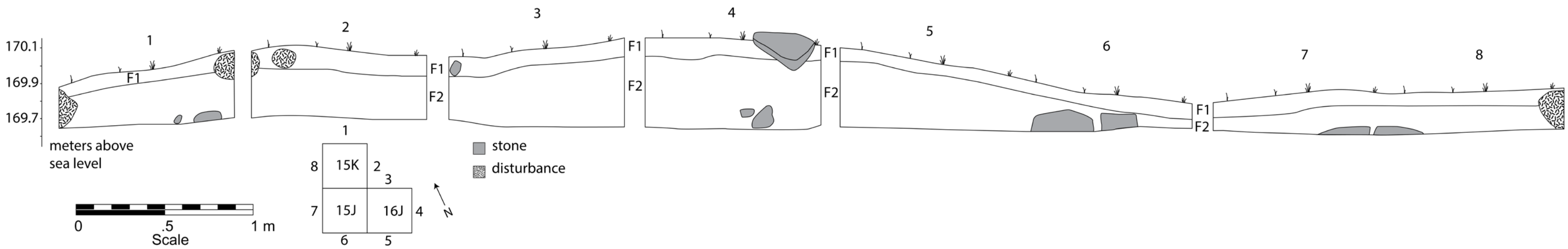


Figure 4.66: Stratigraphic profiles of eastern block in Op B, including west profiles of units 15J and 15K; north and east profiles of unit 15K and 16J; south profiles of units 15J and 16J.

After the caching and cooking activities carried out on the South patio of Complex A ceased, the area appears to have fallen out of use. A thick layer of colluvium (F2) washed down from Terrace 10 over an extended period, covering the F9-s2, F8, and F7 surface, as well as the remnants of hearths F4 and F6, with a 30 – 40 cm thick layer of dark sandy loam. Units 15J, 15K, and 16J (Figure 7.67) exposed stone rubble at the base of the staircase after maintenance of this architectural feature ceased. Later, a soil (F1) formed in the upper part of the colluvium.

PRV13 - Operation C

Operation C was a small test excavation (3m x 1m) located immediately to the west of Complex A at the base of Terrace 11. The line of 1 m x 1m excavations ran east-west (115°-295° azimuth) in line with the orientation of the site (Figure 4.67). Excavations in Operation C had the following goals:

1. Identify the construction techniques and materials used to build the northeast section of the plaza on Terrace 2.
2. Identify activities carried out at the base of Terrace 11 (e.g., occupational refuse or middens).
3. Penetrate to bedrock to investigate the earliest occupation and construction episodes of the area.

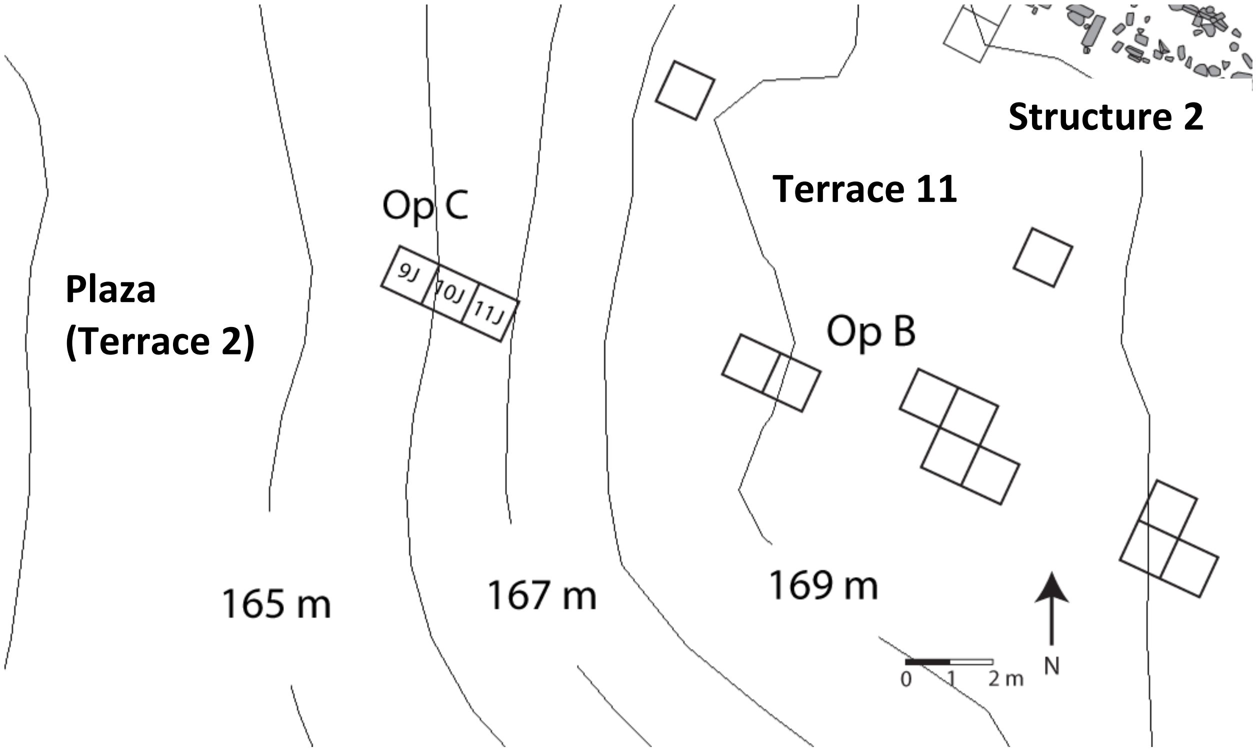


Figure 4.67: Plan map of Operation C excavations (contour = 1 m)

The excavations carried out in Op C exposed a series of fill layers in the northern area of the Terrace 2 plaza, to the west (and outside) of the Terrace 11 retaining wall. Evidence from Op C indicates builders deposited several layers of sandy, loamy sediment that sloped downward to the west. Included in the early fill layers were the possible remains of a destroyed wattle and daub building that contained burned daub with cane impressions and preserved surfaces (F5). While 10J was the only unit in Op C that penetrated to bedrock, units 9J and 11J exposed the uppermost fill layers, illustrating the slope of a buried soil (F3) and the overlying colluvium (F2) deposited after Complex A fell out of use. Op C did not detect a midden at the base of Terrace 11. Table 4.3 provides a detailed list of stratigraphic levels in Op C, beginning with the most recent and ending with the oldest.

Table 4.3: List of stratigraphic levels in PRV13-Operation C

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F1	9J, 10J, 11J	10 YR 3/2; very dark grayish brown sandy loam	Modern	Soil formed in colluvium (F2)	Poorly sorted sandy loam humus; contains gravel, coarse sand, and sherd inclusions as well as root disturbances and organic material; thin layer of topsoil; highly disturbed; see Figures 4.68 – 4.70
F2	9J, 10J, 11J	10 YR 3/1; very dark gray loam	Coyuche or later	Colluvium	Moderately sorted loamy colluvium with angular-subrounded grains; contains inclusions of coarse sand and sherds; see Figures 4.68 – 4.70
F3	10J	10 YR 3/3; dark brown loam	Coyuche or Chacahua	Buried soil formed in colluvial fill (F4)	Poorly sorted loamy soil formed in colluvial fill; contains inclusions of mica, coarse sand, and eroded sherds; sediment is clumpy, breaking apart in hexagonal peds; generally contains fewer inclusions than F2 and F4; fragments of green obsidian also found in upper part of F3; soil likely formed in construction fill; see Figures 4.68 – 4.70
F4	10J	10 YR 4/4; dark yellowish brown loamy sand	Chacahua or later	Colluvial fill	Poorly sorted sandy loam fill with angular grains; contains inclusions of gravel, mica, and small eroded sherds; softer packed than F3 and F5; associated with final building episode of Terrace 2; see Figures 4.68 – 4.70
F5	10J	5 YR 4/4; reddish brown loamy sand	Chacahua	Colluvium with debris from collapse building	Poorly sorted loamy sand fill with significant amount of burned daub, many of which contain cane impressions; likely deposited following destruction of wattle and daub structure (possibly from Complex A); also contains inclusions of coarse sand, mica, and sherds; sediment matrix contains angular grains; very hard packed and more reddish in color than F6 and F4; see Figures 4.68 – 4.70

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F6	10J	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with angular grains; contains inclusions of gravel, mica, and sherds; Less compact than F5, but more compact than F7-s1; corresponds to the end of the first building phase of Terrace 11 (Complex A) ; see Figures 4.68 – 4.70
F7-s2	10J	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with angular grains; contains inclusions of gravel, mica, coarse sand, and sherds; loosely packed; possibly associated with initial building episode of southern patio of Complex A (Terrace 11) ; see Figures 4.68 – 4.70
F7-s1	10J	10 YR 4/4; dark yellowish brown sandy loam	Chacahua	Construction fill	Thin lens (6 cm thick) of poorly sorted sandy loam fill with angular grains; contains inclusions of mica, coarse sand, and sherds; more softly packed and lighter in color than F6 and F7-s2; see Figures 4.69 – 4.70
F7-s3	10J	10 YR 4/4; dark yellowish brown loamy sand	Chacahua	Construction fill	Thin lens (5 cm thick) of poorly sorted loamy sand fill with angular grains; contains inclusions of mica, coarse sand, and eroded sherds; lighter in color and sandier than F7-s2, but not as sandy as F7-s5; see Figures 4.69 – 4.70
F7-s4	10J	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Thin lens of dark, poorly sorted sandy loam sediment with angular grains; contains elevated concentration of carbon; contains additional inclusions of gravel, mica, angular rocks, and eroded sherds; darker in color than F7-s2 and F7-s3; softly packed; see Figures 4.69 – 4.70

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F7-s5	10J	10 YR 5/3; brown sand	Chacahua	Construction fill	Thin lens (8 cm thick) of poorly sorted sandy fill with angular grains; contains gravel inclusions and a very low concentration of sherds; lighter in color, softer packed, and sandier than F7-s2; see Figure 4.70
N1	10J	No Munsell; naturally occurring bedrock (grüs)	N/A	Natural bedrock	Naturally occurring bedrock (grus) ; see Figures 4.68 – 4.70

Op C exposed a series of fill layers outside of the retaining wall of Terrace 11. The earliest level of construction exposed in Op C is F7, a 20 to 60 cm-thick layer of sandy, loamy sediment deposited directly atop bedrock (N1). F7 consists of several lenses of dark yellowish sandy sediment that created a surface sloping downward to the west (Figures 4.68, 4.69, 4.70, and 4.71). This surface peaked at an elevation of 164.3 m a.s.l. Although it is unclear how far F7 extends to the east, the deposition of the fill layer may have provided a base on which builders constructed the southern patio of Terrace 11. Further investigation of the Terrace 11 retaining wall is required to identify whether F7 was placed contemporaneously with fill layers in the southern patio or was deposited after the retaining wall was in place. Ceramic evidence from F7 demonstrates the fill layer dates to the Chacahua phase, which suggests it may have been deposited at nearly the same time as Op B-E9 (see previous section).

Shortly after F7, builders placed another layer of sandy loam fill (F6) that raised the level of the western edge of Terrace 11 an additional 10 – 30 cm to an elevation of 164.4 m a.s.l. Excavations did not detect occupational debris or a surface between F7 and F6, which suggests the fill layers were deposited in immediate succession as part of the same building phase. Following F7 and F6, inhabitants of Cerro de la Virgen deposited a loamy sand fill layer with a high concentration of burned daub inclusions (F5), which varied between small fragments of less than 0.5 g to large fragments weighing as much as 160 g. Some of the preserved burned daub fragments exhibited cane impressions, which varied from 6.8 mm – 12.8 mm in width, as well as occasional fiber impressions. Excavators recovered several examples of preserved wall fragments, one of which contained two flat surfaces intersecting at a right angle, which may represent a corner of a wattle and daub building. The majority of burned daub fragments in F5 were well preserved, indicating they were exposed to the elements for only a short period, if at all, and that the building from which they were taken was located in close proximity to the edge of Terrace 11. Excavations did not detect intact panels with an exterior and interior surface, so estimates of wall widths could not be made. The F5 fill episode is likely associated with the final occupation of Terrace 11.

F5 follows the topography of F7 and F6 by sloping slightly downward to the west, reaching an elevation as high as 164.5 m a.s.l. Although diagnostic sherds were few in F5, ceramic evidence indicates the fill layer also dates to the Chacahua phase. Stratigraphic evidence suggests that sometime after the deposition of F5, likely during the Early Classic period, Complex A fell out of use and a series of layers of colluvium covered the area in succession. The first of these was a layer of loamy sand (F4) that raised the surface to an elevation of 165.0 m a.s.l. An additional layer of colluvial sediment (F3) overlaid F4, which eventually developed into a soil. F3 was followed by another a layer of loamy colluvium (F2) flowing down from Complex A, after which a thin layer of loamy, organic soil (F1) formed in the colluvium.

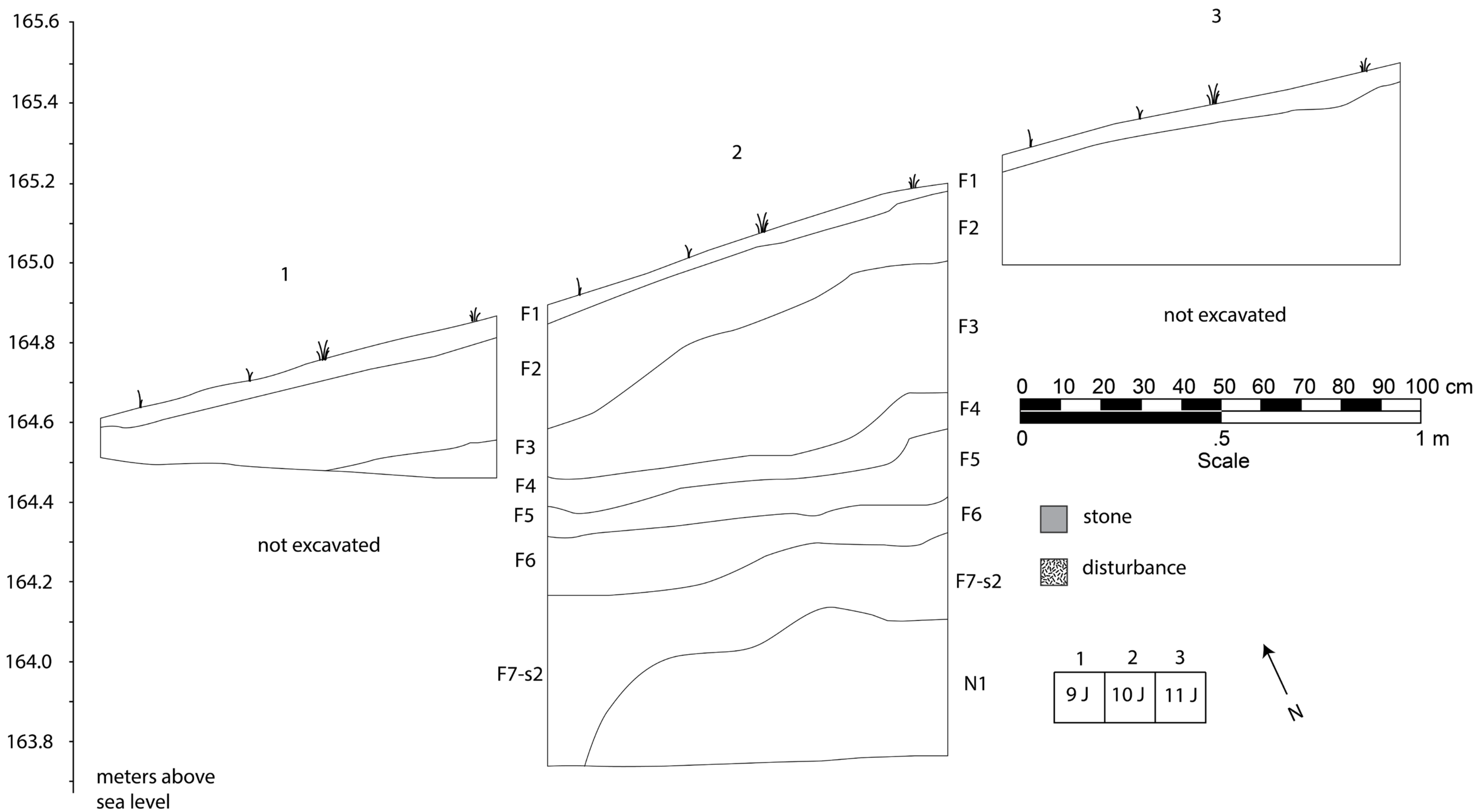


Figure 4.68: Stratigraphic profiles (north) of units 9J, 10J and 11J

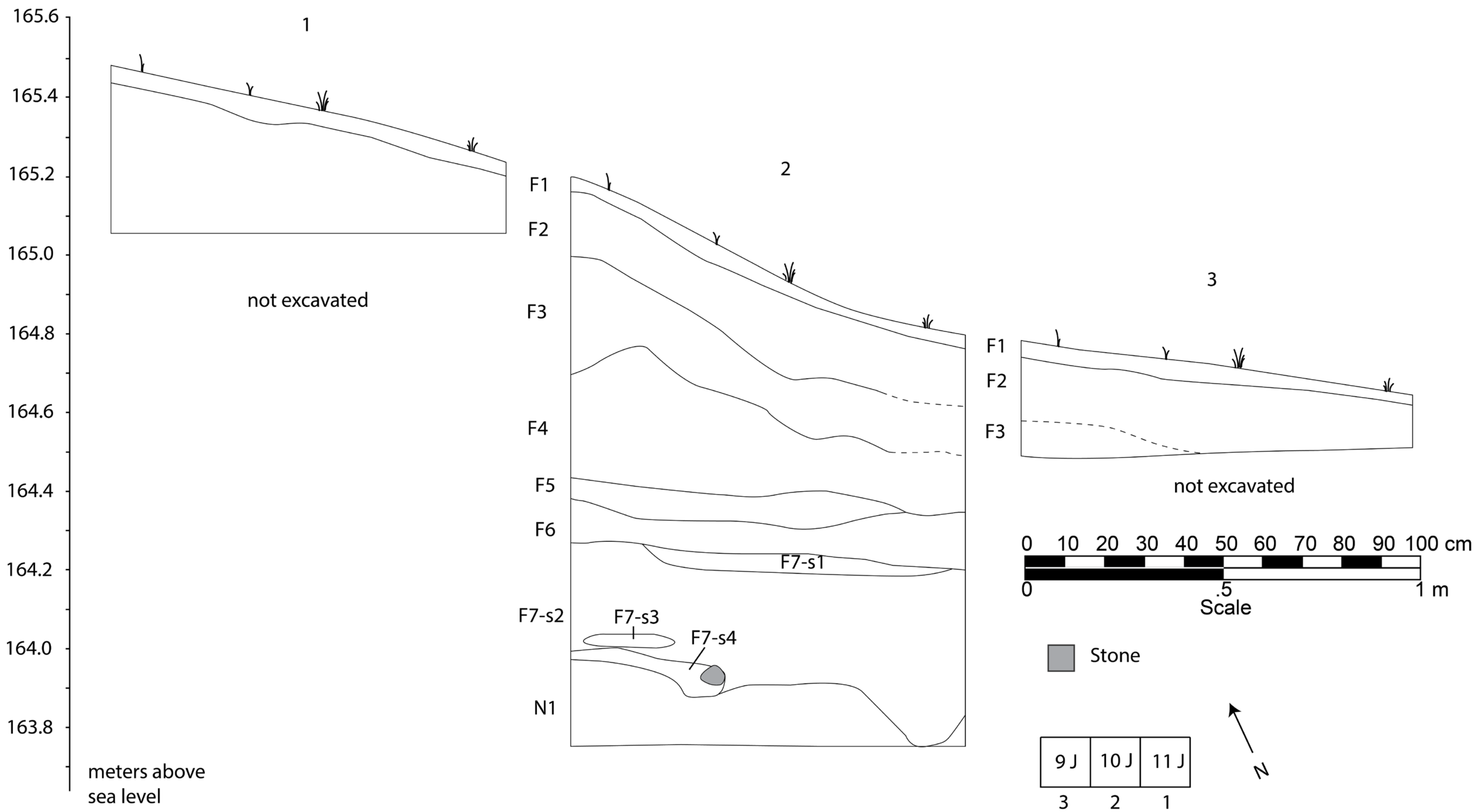


Figure 4.69: Stratigraphic profiles (south) of units 9J, 10J and 11J

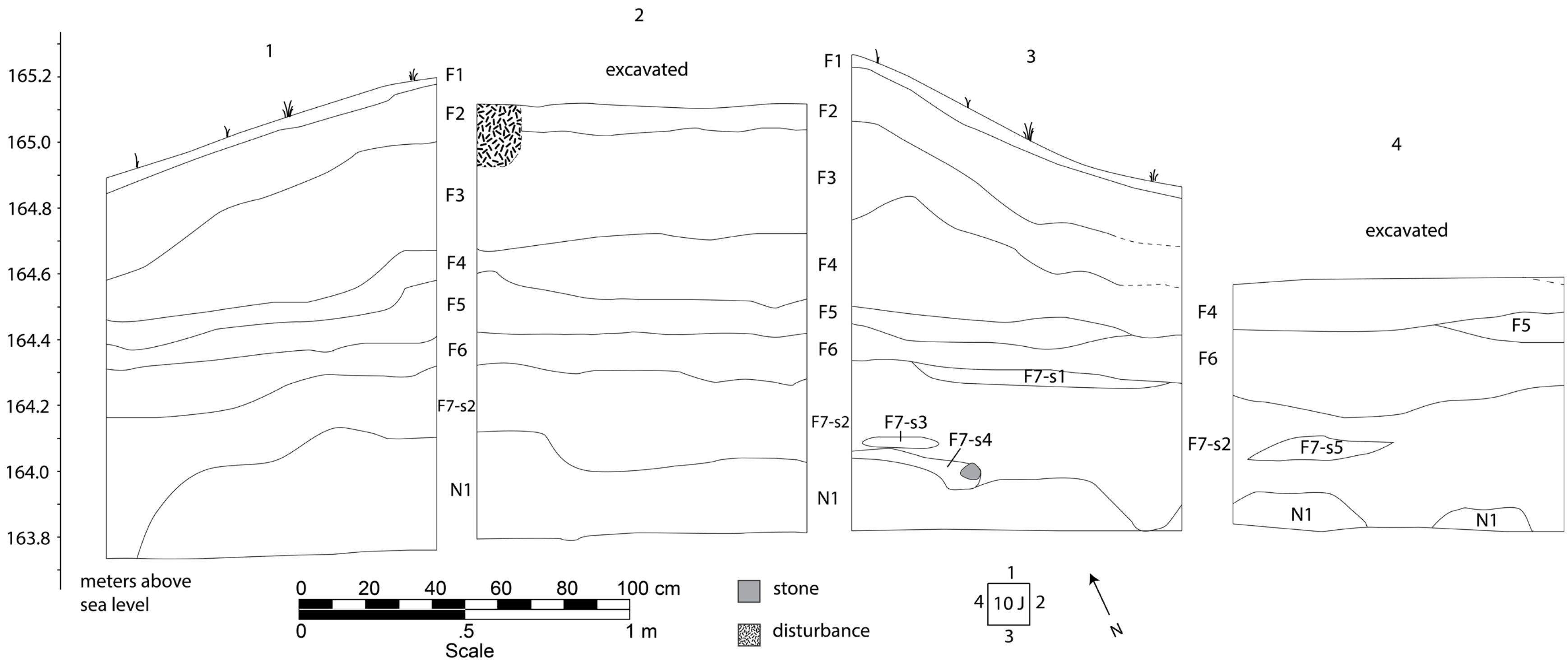


Figure 4.70: Stratigraphic profile of unit 10J

Figure 4.71: Photograph of east profile of unit 10J with stratigraphic levels labeled

STRUCTURE 1

PRV13 - Operation D

Operation D consisted of test excavations on Terrace 10, a level surface built during the Terminal Formative period that supported Structure 1, a modular public building that underwent at least one major renovation during the Terminal Formative period. Terrace 10 was located directly to the east of Terrace 11, connected by a monumental stairway that led up 9.5 meters from the surface of the south patio of Complex A to the patio adjacent to Structure 1 (Figures 4.72 and 4.73). Op D excavations were separated into two main groups—the "Structure 1 block," which investigated the construction and use of Structure 1, and the "patio transect," which investigated the patio adjacent to Structure 1. The Structure 1 block exposed an area of 7 m^2 inside Structure 1, and the patio transect consisted of three 1 m x 1 m test pits in the small patio to the west of Structure 1, one unit of which was expanded to expose 6 m^2 in the center of the patio.

Figure 4.72: Photograph of excavations in Operation D taken from above the southeast corner of Structure 1 (visible in foreground); transect of excavations in patio visible in background.

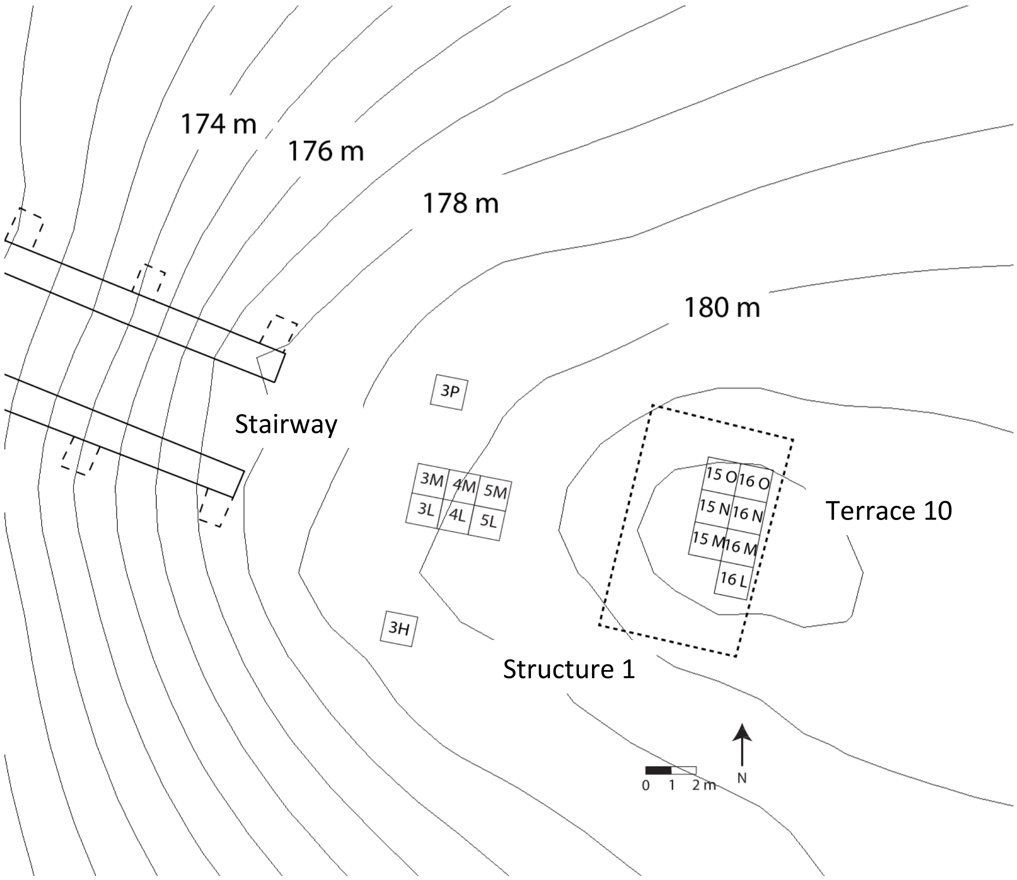


Figure 4.73: Plan map of Operation D excavations and Terrace 10 (contour = 1m)

Excavations in Operation D had three goals:

1. Identify the construction techniques and materials used to build Structure 1 and Terrace 10.
2. Identify activities carried out within Structure 1 and in the adjacent patio to the west.
3. Penetrate to bedrock inside Structure 1 and in the patio to the west to investigate the earliest occupation and construction sequences of the area.

The results of excavations carried out in Op D demonstrate that inhabitants of Cerro de la Virgen began building Terrace 10 during the Miniyua phase, a process that was initiated by the placement of a dedicatory offering directly on top of bedrock (Figure 4.74). The offering consisted of a cache, probably bundled in cloth, of intentionally broken stone objects that included a nearly complete carved stone mask, fragments of another mask, two miniature stone thrones, a stone figurine as well as several miniature ceramic vessels. The offering immediately preceded the earliest construction of Terrace 10, during which builders created a flat occupational surface extending out to the west. Excavations recovered burned daub from the earliest fill layers of Terrace 10, suggesting a wattle and daub superstructure may have been built in the vicinity prior to this. This superstructure may have been ritually terminated with an offering of ceramic vessels.

Each subsequent phase of construction and use of Terrace 10 was marked by rituals of dedication (or “ensoulment”) and termination (or “closure”). Construction continued on Terrace 10 during the Chacahua phase with the building of a substructural platform (Structure 1-sub 1) with stone retaining walls that was dedicated with an offering of ceramic vessels. Later, Structure 1-sub 1 was ritually terminated with another offering of ceramic vessels placed in a pit excavated into the surface of the building. Builders then renovated platform by erecting a second series of retaining walls and covering the earlier structure with unconsolidated fill and a dedicatory offering of vessels. The final form of the building--Structure 1--most likely supported a wattle and daub superstructure, but excavations did not detect the remains of perishable building materials. At this time, people also began to utilize the patio on the western side Terrace 10 for object caching, indicated by an offering of ceramic vessels deposited just below the surface of the patio during the Chacahua phase. Given the remarkably shallow depth at which the patio offering was found below the modern surface, it likely constituted a termination ritual that closed the terrace and its ceremonial architecture, though it is also possible that the Chacahua-phase surface has been deflated. Activities associated with Structure 1 and the patio likely ceased at the end of the Chacahua phase, indicated by the absence of Classic-period artifacts on Terrace 10. Table 4.4 provides a detailed list of all natural and cultural features identified in Operation D, beginning with the latest and ending with the oldest strata.

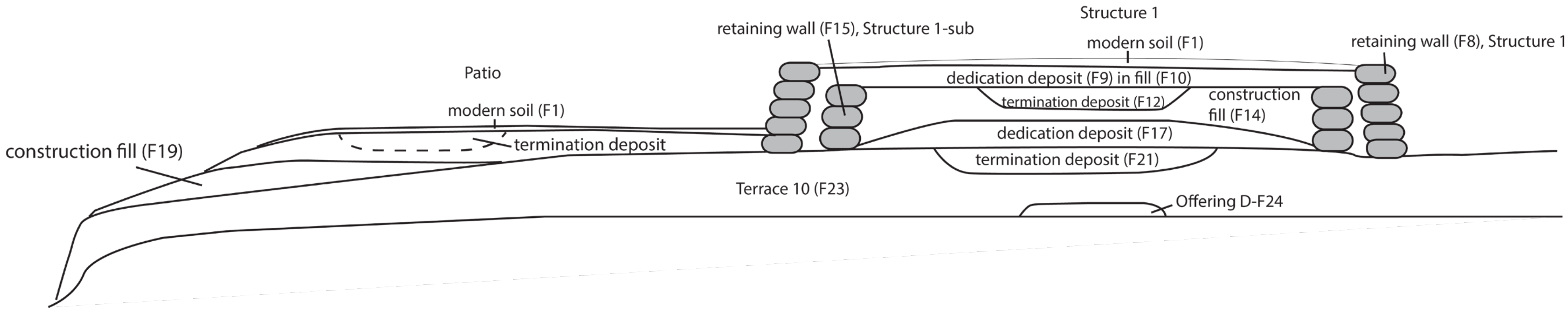


Figure 4.74: Diagram of Terrace 10 and Structure 1 with view to the north; not to scale

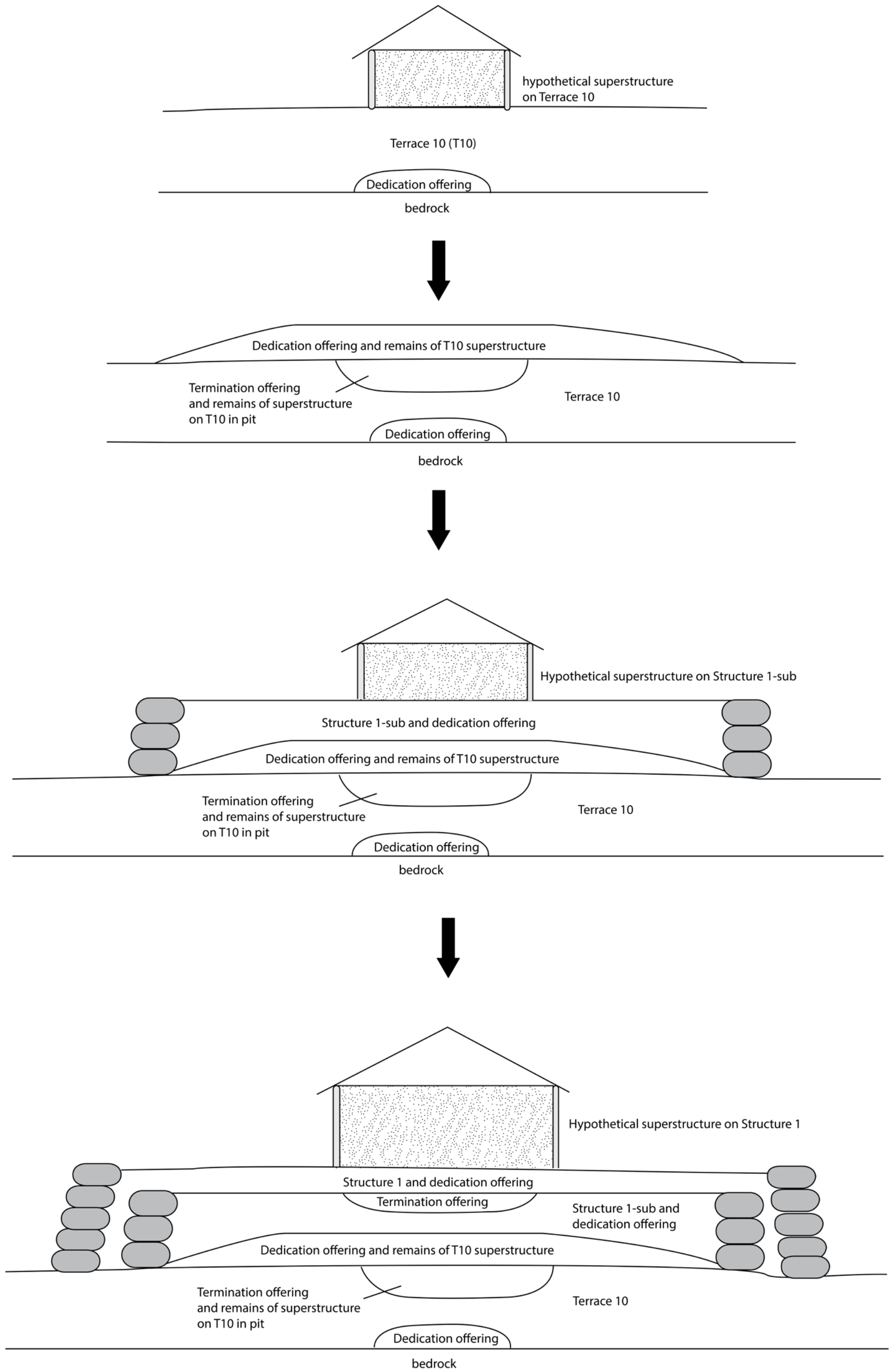


Figure 4.75: Hypothetical sequence of construction and ritual offerings associated with Terrace 10 and Structure 1; diagram not to scale

Table 4.4: List of stratigraphic levels in Operation D

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F1-s1	16N, 16O,	10 YR 3/3; dark brown sandy loam	Modern	Deflated modern soil	Medium-sorted sandy loam humus with sub-rounded grains; contains moderate amount of plant material and inclusions of sherds, gravel, rocks, and large stones; several root disturbances present; soil clods appear to have been dislodged, probably due to detrusion; see Figures 4.76, 4.77
F1-s2	3H, 3L, 3M, 3P, 4L, 4M, 5L, 5M	10 YR 3/2; very dark grayish brown sandy loam	Modern	Deflated modern soil	Identical to F1-s1 but lighter in color; see Figure 4.88 - 4.90
F2-s1	3L, 3M, 4L, 4M, 5L, 5M	No Munsell; ceramic offering vessels	Chacahua	Offering	Cache of 24 ceramic vessels including 16 short-necked or neckless jars, seven bowls, and one *comal* (all non-diagnostic coarse brown wares) deposited in small pits excavated into F3; not visible in profile; see Figure 4.101
F2-s2	4M, 5M	No Munsell; thin granite slabs	Chacahua	Offering	Thin, flat slabs of granite cut from local bedrock oriented vertically in fill sediment (F3); may have served as markers for particular offerings, but do not appear to have been oriented into compartments; not visible in profile; see Figure 4.101
F3	3H, 3L, 3M, 3P, 4L, 4M, 5L, 5M	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Softly packed, poorly sorted sandy loam fill with subrounded grains; contains inclusions of eroded sherds, daub, lithic material (obsidian), gravel, small angular rocks, large stones, organic material and fragmented animal bone; covers F19; F2-s1 (vessel cache) and F2-s2 (granite slabs) placed into F3 after it was deposited; darker and more loosely packed than F19; highly disturbed (roots and rodent burrows); raised ground surface by 20-25 cm; see Figure 4.88 - 4.90, 4.101

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F4	5L	10 YR 4/2; dark grayish brown sandy loam	Chacahua	Pit fill or possible offering	Small, shallow (approximately 12 cm deep) pit dug down from the top of F19; lined with thin granite slabs and filled with a poorly sorted, softly packed sandy loam sediment with traces of ash; sediment contains inclusions of sherds (most sitting directly atop a flat-lying stone slab at the base of pit), gravel, and small angular rocks; sherds were non-diagnostic coarse brown wares but included a possible brazier handle; covered by F3; see Figure 4.88, 4.101
F5	12Q, 13Q, 14Q, 15Q, 16Q, 17Q	No Munsell; granite stone	Chacahua	Retaining wall of Structure 1	North wall oriented east-west (117°-297° azimuth) sitting atop F10; corresponds to final building phase of the substructural platform of Structure 1; not visible in profile; visible on modern surface; see Figure 4.76
F6	12J, 12K, 12L, 12M, 12N, 12O, 12P, 12Q	No Munsell; granite stone	Chacahua	Retaining wall of Structure 1	West wall oriented north-south (27°-207° azimuth) sitting atop F10; corresponds to final building phase of the substructural platform of Structure 1; not visible in profile; visible on modern surface; see Figure 4.76
F7	12J, 13J, 14J, 15J, 16J	No Munsell; granite stone	Chacahua	Retaining wall of Structure 1	South wall oriented east-west (117°-297° azimuth) sitting atop F10; corresponds to final building phase of the substructural platform of Structure 1; not visible in profile; visible on modern surface; see Figure 4.76
F8	16M, 16L	No Munsell; granite stone	Chacahua	Retaining wall of Structure 1	East wall oriented north-south (27°-207° azimuth) that retains fill layers F11 and F10; corresponds to final building phase of the substructural platform on Terrace 10 (Structure 1); visible on modern surface (see Figure 4.76); visible in east profile of unit 16M and 16L; see Figures 4.76

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F9	15M, 15N, 16L, 16M	No Munsell; ceramic vessels	Chacahua	Offering	Offering of nine small ceramic vessels, including three coarse brown ware short-necked jars, five coarse brown ware cylindrical vessel, and one gray ware cylindrical vessel deposited during F10 construction phase; not displayed in profile; see Figures 4.99, 4.100
F10	15M, 15N, 16N, 16O, 15O,	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Medium-sorted sandy loam with sub-rounded grains; contains inclusions of sherds, coarse sand, gravel, small-large sized rocks, and small-large sized stones; several root disturbances present; covers F14 and F15; pertains to construction of final version of the substructural platform on Terrace 10 (Structure 1); retained by F8; see Figures 4.76, 4.77
F11	16O	10 YR 4/4; dark yellowish brown sandy clay loam	Chacahua	Construction fill	Moderately sorted sandy clay loam fill with subrounded grains and inclusions of gravel, mica and sherds; sediment is finer than surrounding strata; deposited outside (to the east) of retaining wall F15; pertains to construction of final version of the substructural platform on Terrace 10 (Structure 1); fill is retained by F8; see Figure 4.76
F12	15M	No Munsell; ceramic vessels	Chacahua	Offering	Offering of one miniature coarse brown ware jar deposited as pit was filled with F13; see Figures 4.76 - 4.77
F13	15M	10 YR 3/3; dark brown loamy sand	Chacahua	Pit fill	Broad, shallow (27 cm deep) pit that cuts down from top of F14-s1; filled with poorly sorted loamy sand containing inclusions of sherds, mica, and coarse sand; pit fill also includes F12 offering (one miniature coarse brown ware vessel); see Figures 4.76, 4.77

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F14-s1	15M, 15N, 15O, 16M, 16N, 16O	7.5 YR 4/3; brown sandy loam	Chacahua	Construction fill	Moderately sorted, hard packed sandy loam fill with sub rounded grains containing inclusions of sherds, small angular rocks, and pulverized or disintegrated sherds or small chunks of clay; more reddish in color than all surrounding strata; matrix contains some silt; harder packed than F14-s2 and F14-s3; retained by F15; F14 (fill) and F15 (retaining wall) correspond to the first substructural platform on Terrace 10 (Structure 1 – sub 1) ; see Figures 4.76, 4.77
F14-s2	15M	2.5 Y 3/3; dark olive brown sandy loam	Chacahua	Construction fill	Chunk of poorly sorted sandy loam fill deposited during F14-s1 construction phase; contains gravel and coarse sand, but sample too small to determine whether it contained sherds as inclusions; see Figure 4.77
F14-s3	15M, 15N	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Thick lens of sandy loam fill deposited within F14-s1; sediment is moderately sorted and contains coarse sand and sherd inclusions; sub rounded grains; looser than F14-s1; see Figure 4.77
F14-s4	15O, 16O	10 YR 4/4; dark yellowish brown loamy sand	Chacahua	Construction fill	Layer of poorly sorted loamy sand fill with rounded-subrounded grains deposited during the F14 construction phase; sediment fills in a possible pit or depression at the top of F18-s1; contains inclusions of mica, coarse sand and small, eroded sherds; softer packed and lighter in color than F14-s1 and F14-s5; ; see Figure 4.76
F14-s5	15O, 16O	10 YR 4/2; dark grayish brown sandy loam	Chacahua	Construction fill	Lens of moderately sorted, hard packed sandy loam fill with subrounded grains deposited atop F14-s4 during the F8 construction phase; contains inclusions of sherds, small rocks, mica, and coarse sand; darker and grayer than F14-s1; see Figure 4.76

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F15	16M, 16N, 16O	No Munsell; granite stone	Chacahua	Retaining wall of Structure 1-sub 1	Stone wall of unknown number of courses oriented north-south (27°-207° azimuth); corresponds with the first building phase of the substructural platform of Structure 1 (Structure 1-sub 1); retains F14 fill; F14 (fill) and F15 (retaining wall) correspond to the first substructural platform on Terrace 10 (Structure 1 – sub 1); see Figures 4.76 and 4.77
F16	15M, 15N	No Munsell; ceramic vessels	Chacahua	Offering	Offering of five ceramic vessels, including four coarse brown ware cylindrical vessels and one miniature coarse brown ware bowl; vessels placed on top of F18 and immediately covered with F14; possible "ensoulment" offering; not visible in profile; see Figure 4.98
F25	15N	10 YR 2/1; black sandy loam	Late Miniyua or early Chacahua	Pit fill	Small, shallow (11 cm deep) pit or hearth excavated down from top of F18-s1; filled with poorly sorted loamy sediment with burned organic matter and ash containing inclusions of coarse sand and angular gravel; delineation unclear in profile; visible in plan view; see Figure 4.98
F18-s1	15M, 15N, 15O	10 YR 3/3; dark brown loam	Late Miniyua or early Chacahua	Offering fill (burned)	Softly packed, poorly sorted loamy fill with angular grains; contains inclusions of burned daub, significant amount of charcoal, rocks (some fire-cracked), thin stone slabs oriented vertically or horizontally and sherds; burned daub inclusions may represent remains of a ritually terminated building; covers offerings of ceramic vessels (F17); deposited atop F20 and F23, possibly resulting in a low mound (see interface between F18 and F20/F23 in south profile of unit 15M) ; see Figure 4.76, 4.77, 4.93
F18-s2	15M	10 YR 3/2; very dark grayish brown	Late Miniyua or early Chacahua	Offering fill (burned)	Softly packed, poorly sorted loam with dark organic inclusions consisting of charcoal and ash as well as coarse sand or gravel; situated between two sets of thin granite slabs and beneath a broken coarse brown ware vessel (F17-Ob1) detected in profile (south profile of 15M) ; see Figure 4.76, 4.77

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F17-s1	15M, 15N, 15O	No Munsell; ceramic vessels	Late Miniyua or early Chacahua	Offering in fill	Offering of 14 coarse brownware ceramic vessels placed prior to deposition of F18; all vessels are non-diagnostic (dating based on stratigraphic position); covered with F18; see Figure 4.76, 4.77, 4.93
F17-s2	15M, 15N	No Munsell; thin granite slabs	Late Miniyua or early Chacahua	Stone compartments or markers	Thin granite slabs oriented vertically within F18 offering fill; may have protected or delineated offering vessels (F17-s1); Covered with F18; see Figure 4.76, 4.77, 4.93
F19	3H, 3L	10 YR 5/3; brown sandy loam	Late Miniyua or early Chacahua	Construction fill	Hard-packed, well sorted sandy loam fill with angular grains; contains inclusions of eroded sherds, mica and gravel; darker in color and softer packed than F22-s1; may indicate maintenance of Terrace 10 surface due to erosion; see Figure 4.88, 4.89
F20-s1	15M, 15N	10 YR 4/4; dark yellowish brown silt loam	Late Miniyua or early Chacahua	Pit fill	Moderately sorted silt loam with inclusions of coarse sand, mica, sherds, and small flecks of carbon; angular grains; sediment fills pit that cuts down from the top of F23-s1 (see east profile [#1] of unit 15M); high concentration of clayey material with coarse temper; possible disintegrated adobe building material from wattle and daub superstructure; see Figure 4.76, 4.77, 4.91
F20-s2	15M	10 YR 5/6; yellowish brown sandy clay loam	Late Miniyua or early Chacahua	Pit fill	Moderately sorted sandy clay loam sub-stratum within F20-s1; sub-rounded grains; contains gravel and mica inclusions; sediment may have been burned prior to placement (see description for F20-s3 below); possible remains of a wattle and daub superstructure; see Figure 4.76, 4.77
F20-s3	15M	5 YR 4/3; reddish brown clayey loam	Late Miniyua or early Chacahua	Pit fill	Thin lenses of reddish, possibly burned clayey material within a loamy matrix; possibly burned sections of F20-s2; possible remains of a wattle and daub superstructure; see Figure 4.76

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F20-s4	15M	10 YR 2/1; black sandy loam	Late Miniyua or early Chacahua	Pit fill	Thin lens of dark, burned organic material within a sandy loam matrix; not detected in plan and only visible in south profile of unit 15M; possible remains of a wattle and daub superstructure; see Figure 4.76, 4.77
F20-s5	15M	10 YR 4/3; brown sandy clay loam	Late Miniyua or early Chacahua	Pit fill	Small section of pit fill consisting of moderately sorted sandy clay loam with inclusions of mica and gravel; softer packed than surrounding sediment (F20-s1); not detected in plan; alternatively, sub-stratum may be a disturbance; see Figure 4.76, 4.77
F21	15M, 15N	No Munsell; ceramic vessels	Late Miniyua or early Chacahua	Offering in pit fill	Offering of 12 ceramic vessels and one human long bone deposited as an offering in the F20 pit fill episode; detected in south profile of 15M and in plan view; consists of 11 miniature jars (10 non-diagnostic coarse brown wares and one probable Miniyua phase fine brown ware) and one non-diagnostic coarse brown ware cylindrical vessel; vessels arranged in a group in the center of unit 15M; offering also includes a human long bone (possible heirloom; F21-Ob13) placed atop a coarse brown ware miniature jar (F21-Ob12); offering covered with F20-s1; likely a dedication offering that included the remains of a wattle and daub and preceded the construction of Structure 1 – sub 1; see Figure 4.76, 4.91
F22-s1	3H, 3L, 3P	10 YR 3/6; dark yellowish brown loamy sand	Late Miniyua or early Chacahua	Construction fill	Thick layer of poorly sorted loamy sand fill with subangular grains and inclusions of mica, gravel, coarse sand, and small, eroded sherds; very few diagnostic sherds; more compact and contains more gravel than F19; pertains to the initial construction of Terrace 10 in the western area of Op D; articulation with F23 to the east is unclear; see Figure 4.88 – 4.90

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F22-s2	3H	No Munsell; redeposited bedrock	Late Miniyua or early Chacahua	Construction fill	Small pockets of redeposited grüs or fragmented bedrock; only appears in unit 3H; deposited during the ongoing deposition of F22-s1; see Figure 4.89, 4.90
F23-s1	15M	10 YR 3/3; dark brown loamy sand	Late Miniyua or early Chacahua	Construction fill	Hard packed, poorly sorted loamy sand fill with sub-angular grains containing mica, gravel and sherd inclusions; covers F24-s1 (offering bundle) and F24-s2 (offering vessels) in unit 15M; represents the initial construction of Terrace 10 surface in eastern area of Op D; level of F23 surface is approx. 2 m higher than surface of Terrace 10 in western side of Op D (F22); articulation with F22 is unclear; see Figure 4.76, 4.77
F23-s2	15M	10 YR 3/3; dark brown sandy loam	Late Miniyua or early Chacahua	Construction fill	Lens of softly packed, moderately sorted sandy loam fill with rounded and subrounded grains; contains inclusions of gravel, burned organic material, ash and fragmented/pulverized sherds; delineation between F23-s2 and F23-s1 unclear; see Figure 4.77
F24-s1	15M	N/A	Late Miniyua or early Chacahua	Offering (possible bundle)	Offering consisting of two incomplete stone masks (F24-Ob1 and F24-Ob5), two miniature stone “thrones” (F24-Ob3 and F24-Ob4), and one carved stone figurine (F24-Ob2) possibly deposited in a bundle; masks and thrones likely broken prior to placement (not due to post-depositional movement or pressure); not visible in profile; covered by F23-s1 fill layer; deposited at same time as F24-s2; see Figure 4.78 – 4.87
F24-s2	15M	N/A	Late Miniyua or early Chacahua	Offering	Offering of nine miniature ceramic vessels (eight short-necked or neckless miniature jars [F24-Ob6 – F24-Ob13] and one slender cylindrical vessel [F24-Ob14]) deposited alongside broken stone objects (see F24-s1); covered by F23-s1; see Figure 4.78, 4.80
N1	15M, 3H, 3L, 3P	No Munsell; finely granulated bedrock (grüs)	N/A	Natural bedrock	Bedrock; no artifacts; see Figure 4.76, 4.77, 4.89, 4.90

The earliest activities carried out on Terrace 10 included the placement of a cache of stone objects (F24-s1) and ceramic vessels (F24-s2) directly on bedrock (N1) near the end of the Miniyua phase or early in the Chacahua phase (Figures 4.76 – 4.80). F24 was a dedicatory offering that ritually "ensouled" the surrounding area and immediately preceded the earliest construction of Terrace 10 (F22 and F23, see below). Alternatively, the placement of F24 may have ensouled Terrace 10 itself. F24-s1 consisted of several stone objects (Figure 4.81) including a nearly complete mask depicting a rain deity (F24-Ob1; Figures 4.82 and 4.83), a carved figurine depicting a deceased person or ancestor (F24-Ob2; Figure 4.84), two miniature thrones (F24-Ob3 and F24-Ob4; Figures 4.85 and 4.86), and a smaller, partial mask (F24-Ob5; Figure 4.87). All of the objects were broken prior to their ultimate placement, with the exception of the figurine (F24-Ob2), and may have been bundled together with a cloth- or twine-like perishable material. Excavations did not detect traces of bundling materials *in situ*. In addition to the stone objects, at least nine miniature ceramic vessels (F24-s2), including eight short-necked or neckless jars and one cylindrical vessel, were placed alongside F24-s1 (Figure 4.78 and 4.80). The cylindrical vessel (F24-Ob14) has been dated tentatively to the Miniyua phase, but the date of the offering remains uncertain.

The physical and iconographic characteristics of each object included in D-F24 demonstrate a range of phenomenological and semiotic themes that are discussed in greater length by Brzezinski and colleagues (2017). A physical examination of D-F24-Ob1, the nearly complete mask, indicates that the object fitted the human face and was iconic of the rain deity. Measuring 18.5 cm in length, 16.1 cm in width and weighing about 1.5 kg, the mask was carved from a single piece of non-local, fine-grained siltstone. The face has eight drilled holes—five 'sensory' holes for the eyes, nostrils and mouth that allowed the wearer to see, smell, breathe, speak and taste, and three 'strapping' holes that secured the mask to the face. The eyes are sunken slightly into the face, but each hole is wide enough to provide almost a full field of vision. The nose is broad and angular, with flared nostrils and small holes for inhaling and exhaling. The mouth is open and slightly covered by two sets of pointed fangs, the tips of which were not found in the cache, suggesting they were broken prior to placement. Between the fangs are the central and lateral incisors, which had circular depressions presumably for inlays, as has been found with human burials in the lower Verde (Barber, Joyce, et al. 2013; Mayes and Barber 2008). Excavations did not recover inserts resembling dental inlays (e.g., jade, shell or coral), but these may have been removed prior to the mask's final placement.

The anatomical features of D-F24-Ob1 made it life-like in appearance and afforded a comfortable fit to the wearer's face. The artist ground a small platform on the inside of the mask on which the chin could rest, and the rim of the mask fitted snugly around the temples, cheeks, jaw and chin. The figure's ears are highly stylized, depicted by raised rectangular plaques with curvilinear incisions. Just below each ear are small (4 mm diameter), bilaterally drilled holes that guided securement straps around the back of the head. At the forehead, a small drilled hole formed a third strapping point that prevented ventral movement.

While the physical characteristics of the mask indicate that the object was worn, an analysis of the mask's iconography allows us to elaborate on its geographic origin and cosmological significance (Brrzezinski et al. 2017). In addition to anthropomorphic features, the artist also depicted characteristics indicating divine status, including a raised plaque with three protrusions above the eye, a square plaque on the forehead and fangs emanating from the mouth. We argue that these artistic elements, detailed below, represent fundamental religious principles pertaining to the practice of petitioning the divine for agricultural fertility, embedding the mask within prevalent Mesoamerican rain, wind and agriculture deity complexes (Barber and Olvera Sánchez 2012; Taube 2001).

Perhaps the most recognizable iconographic feature of the mask is the supraorbital plaque, a design with a history reaching back to the Middle Formative period (900–400 BC; Urcid 2002). In his diagram of the iconographic development of Mesoamerican rain deities, Miguel Covarrubias (1946) first described the motif as the 'flamed eyebrow', named for its protruding upper lobes. Flamed eyebrows and exaggerated fangs appear well into the Late Formative, particularly on rain god imagery from highland Oaxaca (Covarrubias 1946; Urcid 2002). They are found frequently on depictions of Cociyo, the Zapotec rain deity and vital force of agricultural fertility, responsible for casting lightning bolts through the sky, splitting apart the clouds and allowing rain to fall (Boos 1966; Caso and Bernal 1952; Sellen 2007; Urcid 2002). Several examples from the Mixteca Alta also depict rain deities with fangs and trilobed icons, including Monument 1 from Yucuita (Joyce 2010), and a ceramic urn from Huamelulpan that was part of a larger offering placed below the Altar de los Craneos (Gaxiola 1984:51–52).

Several masks held in museum and private collections depict Cociyo, including a Late Formative-period mask at the Peabody Museum at Harvard University (Urcid 2002). The mask bears a striking resemblance to the figure depicted in the Cerro de la Virgen mask, exhibiting a similar flamed eyebrow, rectangular forehead plaque and fanged teeth (see discussion in Brzezinski et al. 2017). While the 2013 excavations at Cerro de la Virgen failed to recover a large section of the mask's forehead, the remaining elements near the brow line suggest that the figure may have been equipped with a variation of Zapotec Glyph C, the sign for the calendrical day name 'Water'. Glyph C appeared commonly on Zapotec media depicting Cociyo, particularly on the finely carved stone masks during the Formative and on Classic Period (AD 250–800) urns and effigy vessels (Boos 1966; Caso and Bernal 1952; Sellen 2002; 2011).

In addition to the nearly complete mask, a fragment of a second mask (D-F24-Ob5) was also included in the offering. D-F24-Ob5 was carved in a style similar to the rain deity mask, but was broken along a line that begins in the center of the forehead and extends down the left cheek and around the nose and mouth. The pockmarked indentation for the left eye is of similar size and oval shape as the eyeholes of the rain deity mask, suggesting it was intended to be an eyehole as well. Two holes, one drilled at the jaw line and the other in the center of the forehead, were likely strapping holes. In the process of making the biconically drilled forehead hole, the mask broke, which suggests that the object may have been carved or modified locally. A lack of stylistic evidence precludes an iconographic analysis of the mask.

D-F24-Ob2, a small, cylindrically shaped figurine, was the only unbroken stone object in the offering. The figurine measures 5.1 cm in height and 2.8 cm in diameter at its base, carved from andesite that occurs naturally in the many outcrops at Cerro de la Virgen. The figure appears in a crouched position, with the hands placed on the knees directly above the feet, sitting on a circular pedestal or platform. The eyes are swollen and closed, and the mouth is turned downward. On the ventral side of the figure, carved parallel lines run vertically from the pedestal to the top of the head and wrap around the sides. Under the base of the figurine is a carved indentation that may have served as a stabilization inset, or perhaps as an attachment point for hafting onto another hand-held object.

Given the physical and iconographic characteristics of the figurine, Brzezinski and colleagues (2017) interpreted it to represent a deceased person, possibly an ancestor, linking the object to cosmological themes of death, mortuary ceremonialism and, perhaps, ancestor veneration (Barber and Olvera Sánchez 2012; Gillespie 2001; Urcid and Joyce 2014). The posture of the figure is reminiscent of mortuary bundle imagery from highland Oaxaca as well as the Basin of Mexico (Blomster 2011; Headrick 1999; Hermann Lejarazu 2008). The 'mantle' that covers the back of the figure resembles the silk and husk of a maize cob, suggesting a reference to personified maize, with the front section removed to display the figure's body. Although physical evidence of funerary bundles does not occur until the Postclassic in Oaxaca, imagery suggestive of an early inauguration of this practice comes from Early Classic Monte Alban, where deceased rulers may already have been depicted as sacred bundles to be displayed and venerated (Blomster 2011:132–3). This iconographic convention also appears frequently in the Mixtec codices (Anders et al. 1992; Blomster 2008).

The remaining objects in the offering at Cerro de la Virgen include two miniature four-footed table altars (D-F24-Ob3 and D-F24-Ob4) made from local stones, which, like the masks, were broken into several pieces. D-F24-Ob3 is made of light grey sandstone, measuring 8.8 cm in length, 5.5 cm in width and 1.7 cm in height. No carved designs are present on the exterior of the object, which may be the result of wear or erosion during use. D-F24-Ob4 consists of light grey granodiorite and is slightly larger, measuring 9.6 cm in length, 5.8 cm in width and 1.7 cm in height. While the feet of D-F24-Ob3 are short and rounded, D-F24-Ob4 has pyramidal-shaped feet that taper toward the base. Delicate curvilinear designs adorn the surface near its edges, which curve slightly upward.

Brzezinski and colleagues (2017) interpreted the miniature table altars to represent scaled-down versions of 'thrones' of rulership, which pervade Mesoamerican iconography from the Formative period to the Conquest (Guernsey Kappelman 2000; Kaplan 1995, 2000; Parsons 1986). Life-sized table altars became prevalent in central Mexico during the Middle Formative, with the earliest evidence for their use coming from the Early Formative Olmec sites of San Lorenzo and Portrero Nuevo, located on the Gulf Coast (Coe and Diehl 1980). David Grove (1973:134–135) has argued that the assemblage of life-sized altars from the Middle Formative site of La Venta were thrones that conveyed the leaders' 'divine right of rulership', which he linked to mythological themes of fertility and the underworld.

During the later Formative, table altar-style thrones continued to be used as formal, emblematic seats for rulers in southeastern Mesoamerica, a region that may have been connected with polities on the coast of Oaxaca via coastal trade routes (White and Barber 2012). The miniature stone thrones from Cerro de la Virgen closely resemble four-footed thrones found at Kaminaljuyú, Izapa and Takalik Abaj in the Soconusco coast and Guatemalan highlands that are Late Formative in date (Kaplan 1995; 2000). Kaplan's (1995) analysis of an assemblage of life-sized thrones from these sites indicates they are similar in proportion to D-F24-Ob3 and D-F24-Ob4, but dwarf them in overall size and show rulers seated on them. For example, the surfaces of the Cerro de la Virgen thrones have areas of 48 sq. cm and 57 sq. cm, respectively, whereas the surface of the Incienso Throne from Kaminaljuyu has a much larger surface area of 14,000 sq. cm (1.4 sq. m: Kaplan 1995:186). Kaminaljuyu Monument 65 depicts three presumed rulers seated on footed thrones stretching out a hand to issue a command to bound captives. In another scene carved in relief on Kaminaljuyu Altar 1, the central figure wears the elaborate headdress of a ruler and engages in genital bloodletting (Parsons 1986). The bevelled edge of the throne also displays an early version of an ahau glyph, a symbol of divine rulership in the Maya area (Kaplan 1995). It is unlikely that a secondary community like Cerro de la Virgen had rulers equivalent to those of sites like Kaminaljuyu. While thrones were important components of authority in the later Formative, they may have been deployed in the lower Río Verde Valley in ways that divereged from regions to the south where powerful, hierarchical rulers are indicated.

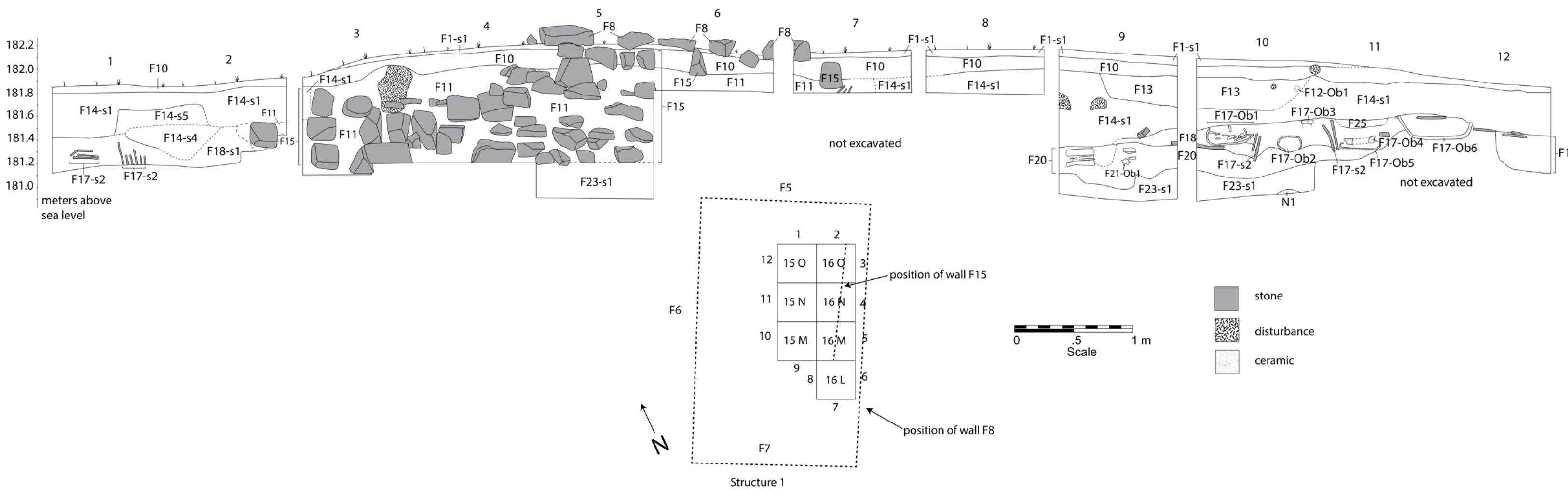


Figure 4.76: Stratigraphic profiles of excavation block at Structure 1. Sub-strata in F17, F18 and F20 not labeled (see Figure 4.77).

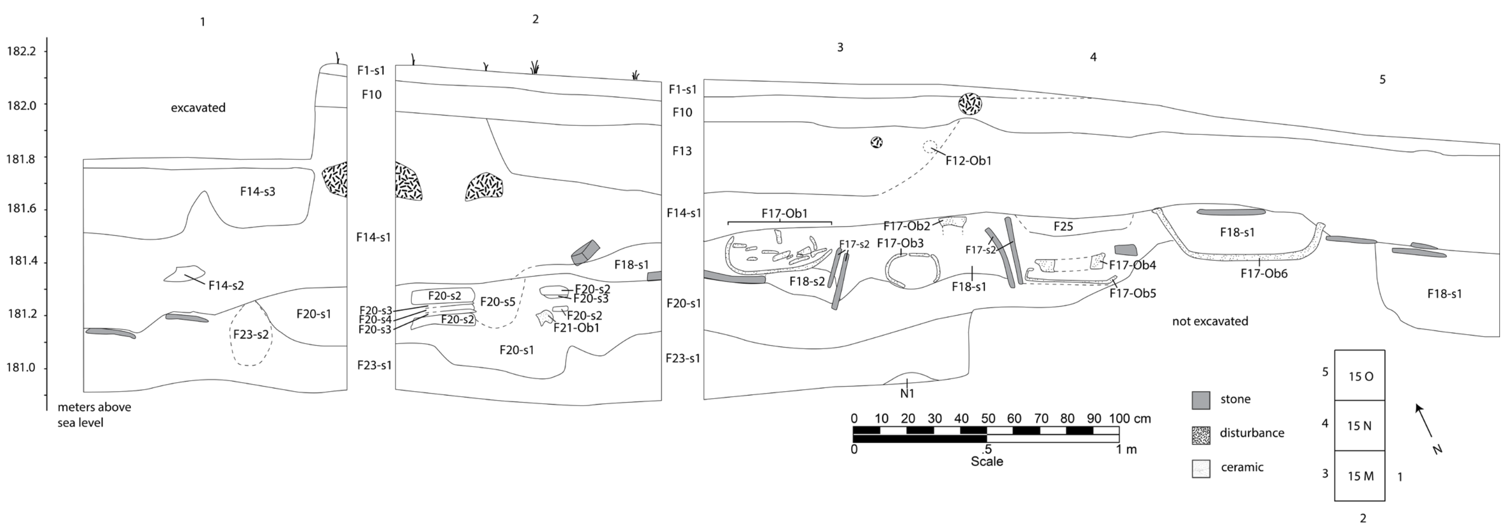


Figure 4.77: Stratigraphic profiles of units 15M, 15N, and 15O.

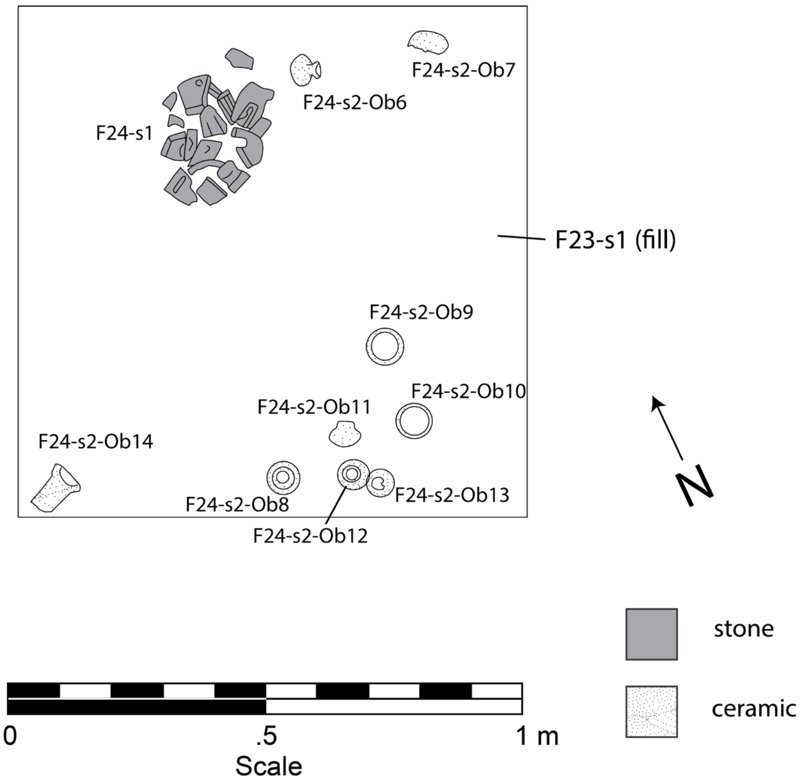


Figure 4.78: Plan map of F24 offering in unit 15M, including bundle of stone objects (F24-s1) and ceramic vessels (F24-s2-ob#)

Figure 4.79: Photograph of F24-s1 in situ.

Figure 4.80: Photograph of F24-s2 in situ (with F24-s1 removed).

Figure 4.81: Photograph of reconstructed objects in F24-s1 offering; from top left, clockwise: F24-Ob1 (rain deity mask), F24-Ob5 (partial mask), F24-Ob3 (miniature throne), F24-Ob2 (figurine), and F24-Ob4 (miniature throne)

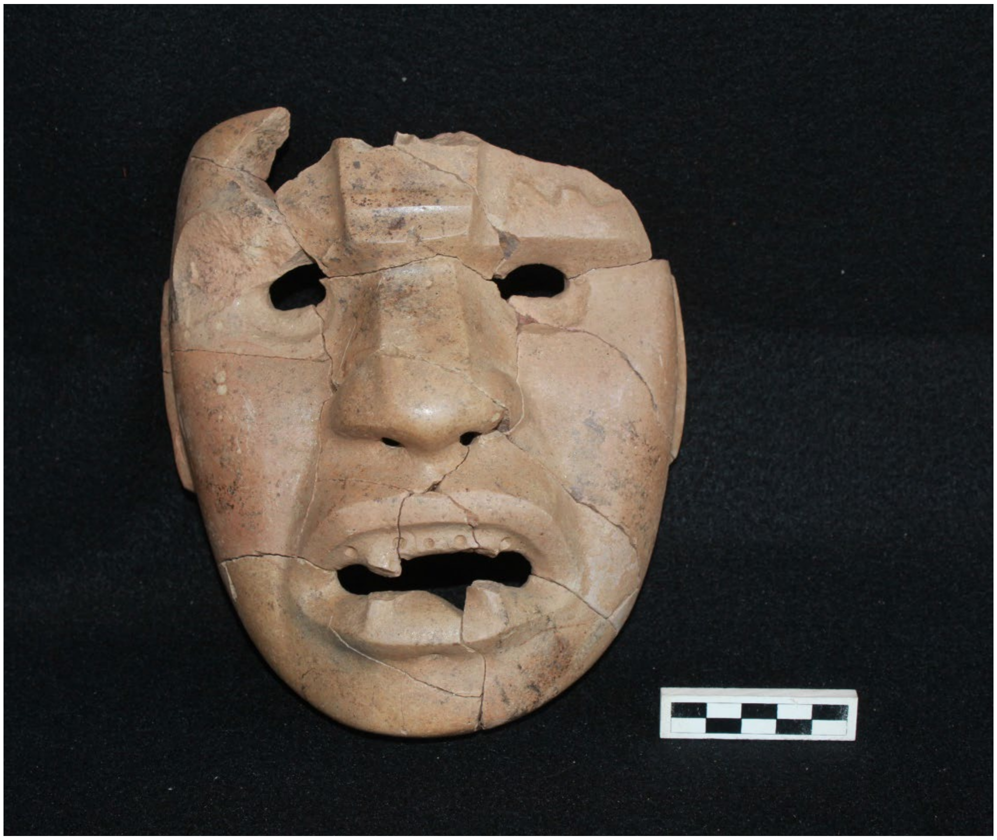


Figure 4.82: Photograph of front view of rain diety mask (F24-Ob1)

Figure 4.83: Left: photograph of fangs and inlaid teeth in mouth of mask (F24-Ob1); Right: photograph of interior of mask with drill holes for string or twine and indentation for "chin rest" for securement on face

Figure 4.84: Left: Photograph of front view of figurine (F24-Ob2); Right: side view of figurine.

Figure 4.85: Left: top view of miniature stone throne (F24-Ob3); Right: bottom view of stone throne

Figure 4.86: Left: top view of miniature stone throne (F24-Ob4); Right: side view of stone throne

Figure 4.87: Photograph of front view of partial stone mask (F24-Ob5).

Immediately after placing F24, builders covered the offering and surrounding bedrock with a layer of construction fill consisting of hard-packed loamy sand (F23-s1), creating the first occupational surface on Terrace 10. F23 was only detected in unit 15M, measuring at an elevation of 181.1 m a.s.l. in that area. To the west, builders also deposited F22 using loamy sand mined from a similar source as F23 (Figure 4.88 – 4.90). In addition to the loamy sand sediment (F22-s1), fill in the western part of Terrace 10 also included pockets of redeposited or pulverized grüs (F22-s2). The placement of F22 created a patio to the east of the monumental stairway by raising the surface as much as 0.5 to 0.6 m above bedrock, to an elevation of approximately 179.0 m a.s.l. F22 was detected in all units in the patio (3H, 3M, and 3P; see Figures 4.88, 4.89, and 4.90) excavated below 179.2 m a.s.l. The surface of F23-s1 was roughly 2 m higher than the surface of F22-s1, suggesting there may have been a step leading up to the eastern area of Terrace 10. Alternatively, F23 may represent a decayed wattle and daub superstructure;

however, the delineation between F22 and F23 is unclear. Ceramics from F22 and F23 were fragmented and eroded, and only four sherds were diagnostic, one dating to the Minizundo phase and three to the Miniyua phase. While these data suggest Terrace 10 dates to the Miniyua phase, it is equally possible that the fill originally came from Miniyua phase deposits but dates to the Chacahua phase. Given the Miniyua phase date of the cylindrical vessel (F24-Ob14) in the offering below F23, it is probable that the offering and the overlying fill were placed at the end of the Miniyua phase or early in the Chacahua phase.

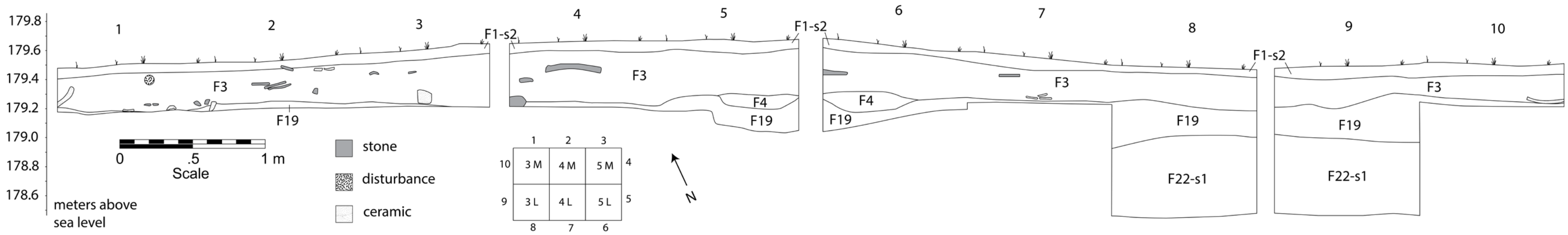


Figure 4.88: Stratigraphic profiles of central excavation block in patio west of Structure 1.

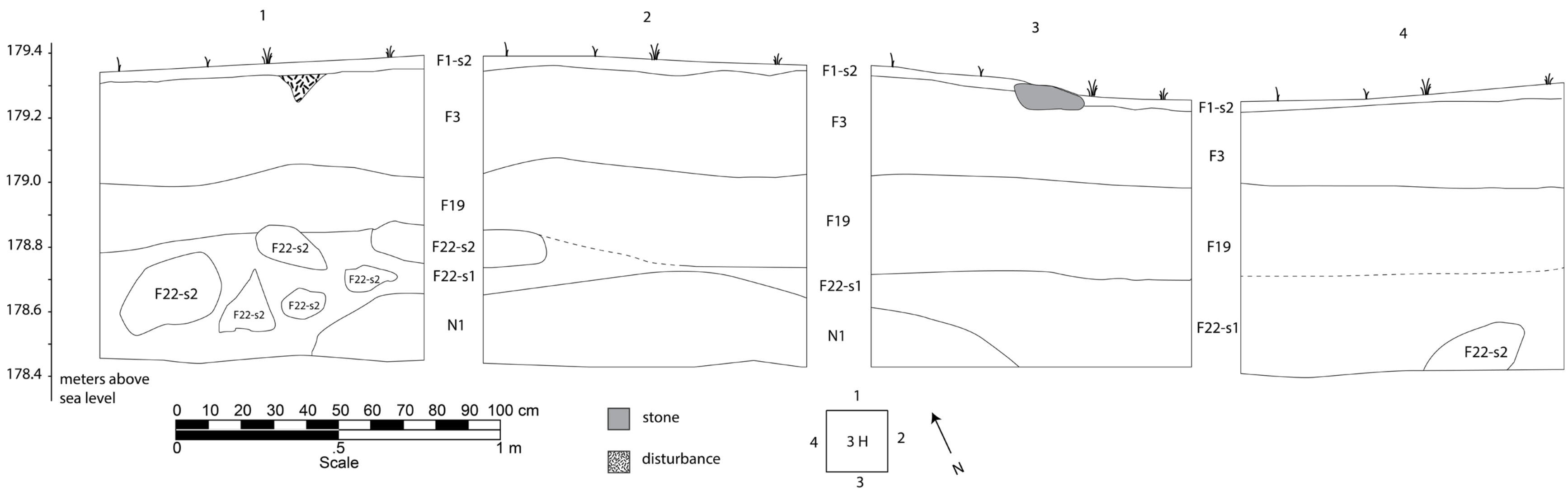


Figure 4.89: Stratigraphic profiles of unit 3H.

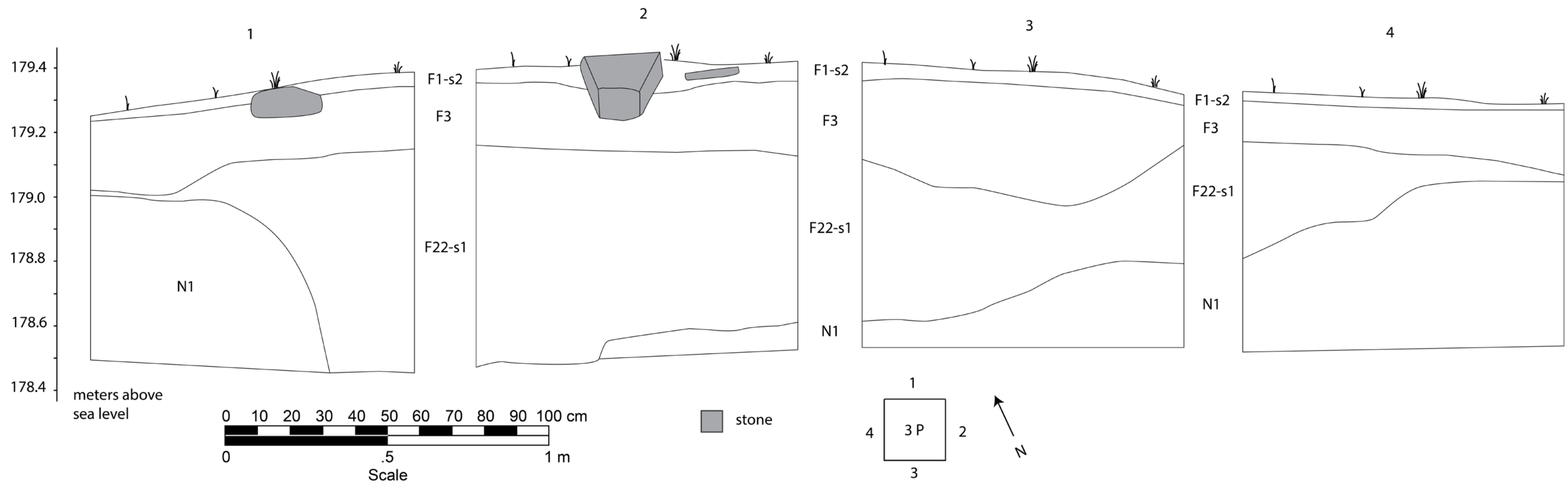


Figure 4.90: Stratigraphic profiles of unit 3P.

Stratigraphic evidence suggests that sometime after F23 was deposited, a wattle and daub superstructure was built in the eastern area of Terrace 10. Two layers of fill (F20 and F18, see below) found overlying F23 contained a large amount of disintegrated burned daub inclusions, which may be the remains of at least one superstructure. The use of the possible superstructure is unclear, but given the absence of domestic debris on Terrace 10, the building was likely used for ritual purposes. Prior to terminating the use of the possible superstructure, residents of Cerro de la Virgen excavated a large, shallow pit into the surface of F23. The pit was filled with an offering of twelve ceramic vessels and a human long bone (F21), as well as burned debris from a possible burned wattle and daub wall (F20-s2, F20-s3, F20-s4, F20-s5) and silty loam fill with a high concentration of clayey inclusions (F20-s1; see Figures 4.91). F21 consisted of eleven miniature jars, one small cylindrical vessel, and the remnants of a human long bone (Figure 4.92). The human long bone (F21-Ob13) was placed on top of a miniature jar (F21-Ob12), and the remaining vessels were placed in a group to the southwest. F21-Ob13 was probably an heirloom, perhaps taken from the remains of an important ancestor (see Hamann 2008; R. Joyce 2000). With the exception of one miniature jar (F21-Ob4) identified as a Miniyua-phase fine brown ware, all vessels in F21 were non-diagnostic coarse brown wares. Therefore, dating of F21 also remains uncertain, with a tentative date placed at the end of the Miniyua phase or early in the Chacahua phase. Evidence indicates that the clay inclusions in F20-s1 were fired and contained coarse temper, suggesting they may have been disintegrated pieces of adobe from a burned superstructure. We interpret F21 and F20 to represent a termination deposit that marked the ritual closure of the possible superstructure.

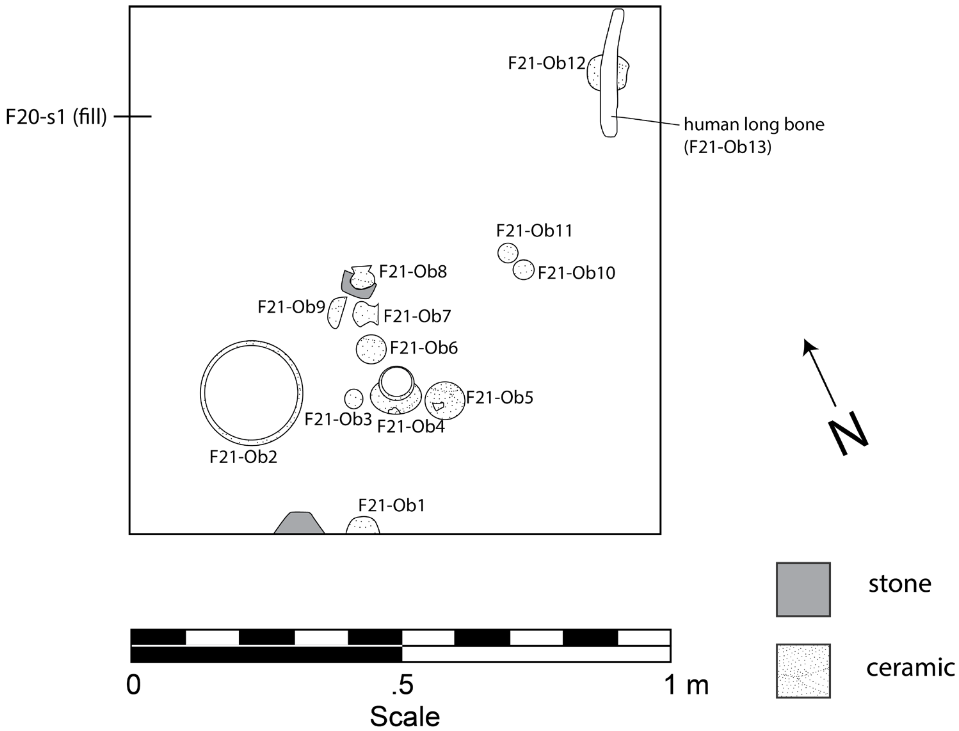


Figure 4.91: Plan map of F21 offering in unit 15M

Figure 4.92: Photograph of human long bone (F21-Ob13) sitting atop ceramic vessel (F21-Ob12) in F21 offering

Prior to burning the presumable superstructure, a dedication offering (F17) was placed on the ground surface above F21 and F20. F17 consisted of 14 ceramic vessels (F17-s1) and several stone slabs (F17-s2) placed as offerings within the fill (see Figures 4.93, 4.94, and 4.95). Although the stone slabs in F17 were generally thicker than the slabs emplaced in the large offering in Complex A (Op A-F18-s2; see section 7.2), they may have been used in a similar way, either as offering compartments, markers, or both. F17-s1 included a very large (65 cm in diameter) coarse brown ware conical bowl (or *apaxtle;* F17-Ob6), four smaller conical bowls (F17-Ob4, F17-Ob5, F17-Ob10, and F17-Ob11) ranging from 16 – 22 cm in diameter, one miniature coarse brown ware jar (F17-s1), and eight coarse brown ware cylindrical vessels of varying sizes (F17-Ob2, F17-Ob3, F17-Ob7, F17-Ob8, F17-Ob9, F17-Ob12, F17-Ob13, and F17-Ob14). In addition, an extremely long, slender cylindrical vessel, measuring 67 cm in length and 14 cm in diameter (F17-Ob8; Figure 4.96), was included in the offering. Excavators discovered F17-Ob8 in its original, vertical position. Given its large size, it is likely that the excavation of small, narrow pit through F20 and slightly into F23 was necessary to place F17-Ob8, but excavators were unable to locate such a feature.

The composition and organization of F17 appears to differ slightly from the offering in the north patio of Complex A on Terrace 11 (Op A-F18), suggesting they may have represented somewhat different types of rituals or events. For example, excavations in Op D did not detect vessels deposited within (or beside) compartments made of thin granite slabs, as in the Complex A offerings. The stones included in the fill (F18) around F17 were much thicker and typically were placed horizontally on their sides rather than vertically. However, despite these differences, the Op A-F18 and Op D-F17 follow intra-site patterns that are unique to those of other Terminal Formative-period sites in the lower Verde. For instance, excavations in Op D-F17 identified two examples of thin slabs oriented vertically and abutting offering vessels in the west profiles of units 15M and 15N (see Figures 4.76 and 4.77), a characteristic shared with Op A-F18. After the vessels were in place, the presumable superstructure was burned, sealing F17 beneath. F18 represents the burned building material and loamy sediment that covered the offering, which created a small mound. F17 did not include diagnostic vessels, so dating the deposit is problematic. However, sherds recovered from F18 suggest the feature was deposited during the Chacahua phase. Finally, a small pit or possible hearth (F25) was excavated down from the top of F18-s1 and filled with burned organic material in a sandy matrix. The use of F25 is unclear.

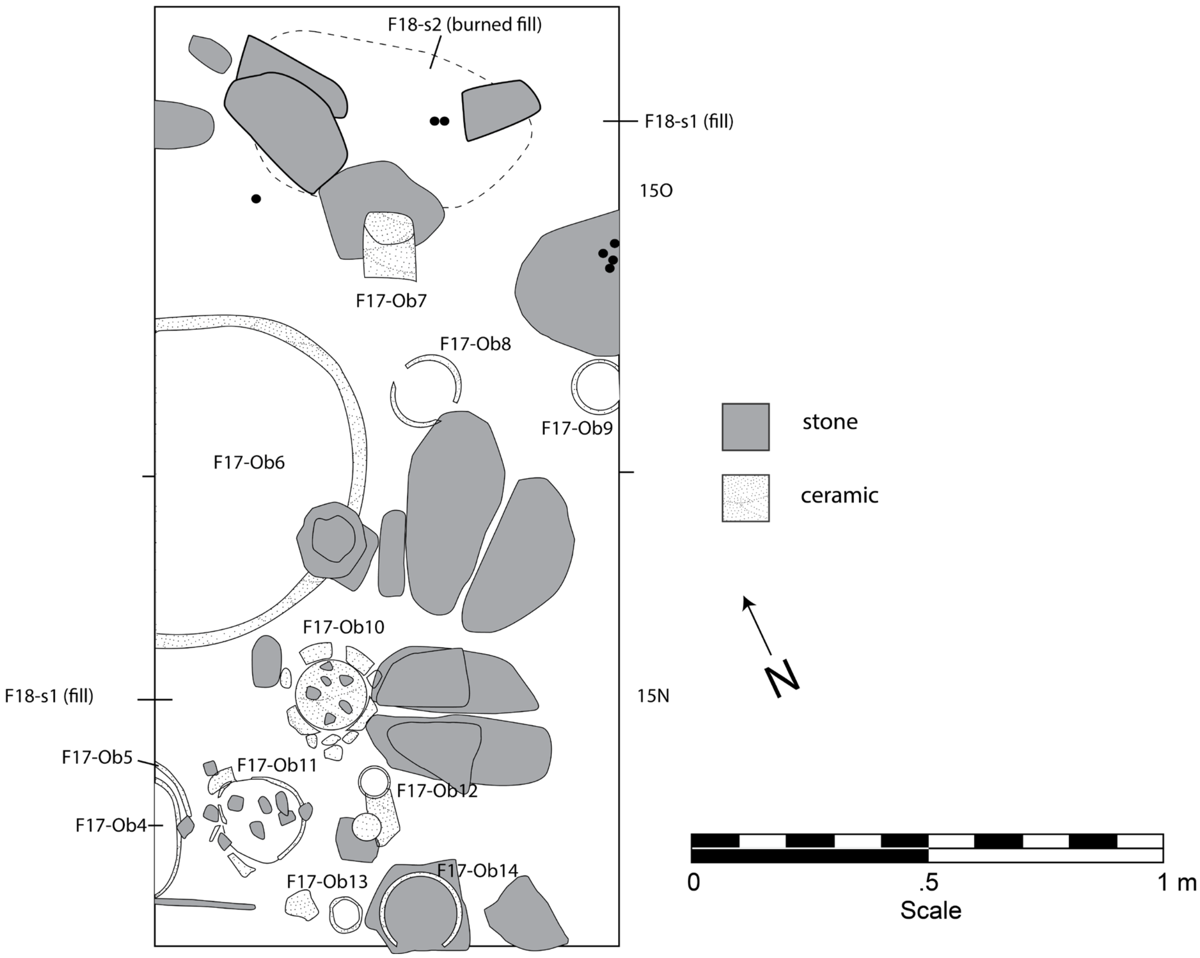


Figure 4.93: Plan map of F17 offering in units 15N and 15O

Figure 4.94: Photograph of F17 offering in association with Structure 1-sub 1 retaining wall (F15)

Figure 4.95: Photograph of relative positions of F24 offering (bottom right), F17 offering (bottom left) and F15 retaining wall (top)

Figure 4.96: Photograph of eccentric cylindrical vessel (F17-Ob8) in unit 15O

To the west of the Structure 1 block, at some point after the initial construction phase of Terrace 10 was completed, builders deposited an additional layer of fill (F19), which covered F22 and raised the level of the patio by 20 – 40 cm to an elevation ranging from 179.0 – 179.2 m a.s.l. Only one diagnostic sherd dating to the Miniyua phase was recovered from lots excavated within F19; therefore, the date of this fill is unclear. It is possible that F19 was deposited to maintain a level surface toward the west, perhaps adding sediment to counteract erosion at the western edge of the terrace. It is also possible that builders constructed the monumental stairway leading down to Complex A at this time, although PRV13 excavations did not expose contexts directly associated with the stairway.

Following the termination of the presumable superstructure, the intensity of construction efforts on Terrace 10 increased, culminating in the construction of a substructural platform (Structure 1-sub 1) that presumably supported a wattle and daub superstructure. Structure 1-sub 1 was built on top of F18 by constructing a set of four retaining walls forming a rectangle that retained as much as 0.65 m of fill (F14; see Figures 4.76 and 4.77). Excavations exposed only the interior face of the east retaining wall (F15; see Figure 4.97) of Structure 1-sub 1 (oriented 27°-207°), but presumably north, west, and south walls would have retained a layer of sandy loam sediment (F14) and provided a surface for a wattle and daub superstructure. As F14 was deposited, builders interred an offering of five ceramic vessels (F16; Figure 4.98) in the fill, including four coarse brown ware cylindrical vessels (F16-Ob1, F16-Ob 3, F16-Ob4, and F16-Ob5) and one small coarse brown ware bowl (F16-Ob2). F16 was probably an offering of ensoulment that took place during that took place during the construction of the building (see Mock 1998). Later, a broad, shallow pit was excavated down from the top of F14-s1 and an offering of at least one miniature coarse brown ware jar (F12-Ob1) was placed inside and covered by loamy sand fill (F13). The F12 offering may have been a termination deposit similar to F21 that brought a close to the activities associated with Structure 1-sub 1 and marked the beginning of the final phase of the building's construction (Structure 1; see Figure 4.74 and 4.75). The presence of a superstructure on Structure 1-sub 1 remains hypothetical, as excavations did not detect architectural remains of a wattle and daub building.

Figure 4.97: Photograph of F15 retaining wall (below) and F8 retaining wall

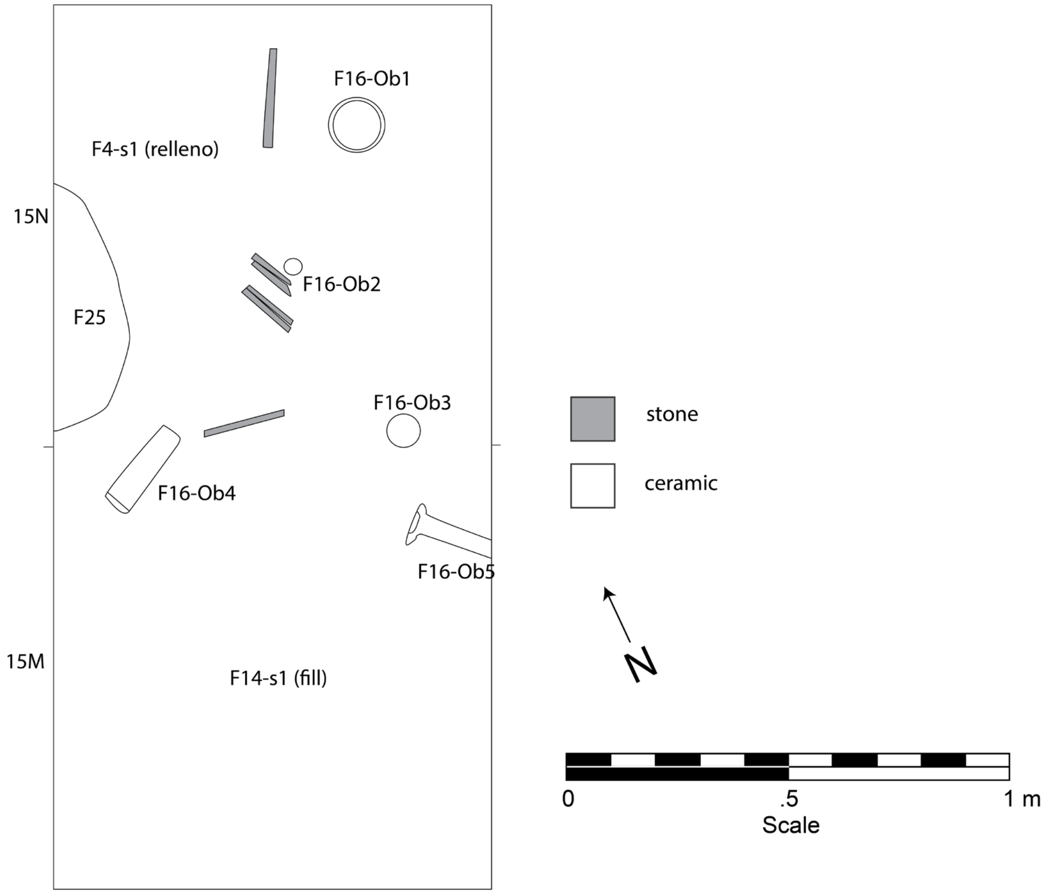


Figure 4.98: Plan map of F16 offering in units 15M and 15N

Following the termination deposit (F12) that closed Structure 1-sub 1, a dedicatory offering of nine ceramic vessels (F9) was emplaced prior to the final construction phase of the building (Structure 1). F9 consisted of three coarse brown ware short-necked jars (F9-Ob1, F9-Ob2, and F9-Ob6) and six coarse brown ware cylindrical vessels (F9-Ob3, F9-Ob4, F9-Ob5, F9-Ob7, F9-Ob8, and F9-Ob9; see Figures 4.99 and 4.100). None of the vessels in F9 were diagnostic. F9 was immediately covered by F10, a 15-20 cm-thick layer of sandy loam that elevated the occupational surface of Structure 1 to 182.15 m a.s.l. It is likely that the original level was higher, but has since been eroded. In addition to F10, builders also deposited a layer of sandy clay loam fill (F11) outside of the Structure 1 – sub 1 retaining walls. F11 was detected to the east of F15. F10 and F11 were retained by a set of stone walls (F5, F6, F7, and F8), forming a base for a presumable wattle and daub superstructure. The east (F8) and west (F6) walls are oriented at an azimuth of 27°-207° (north to south), and the north (F5) and south (F7) walls are oriented perpendicularly, at an azimuth of 117°-297° (east to west).

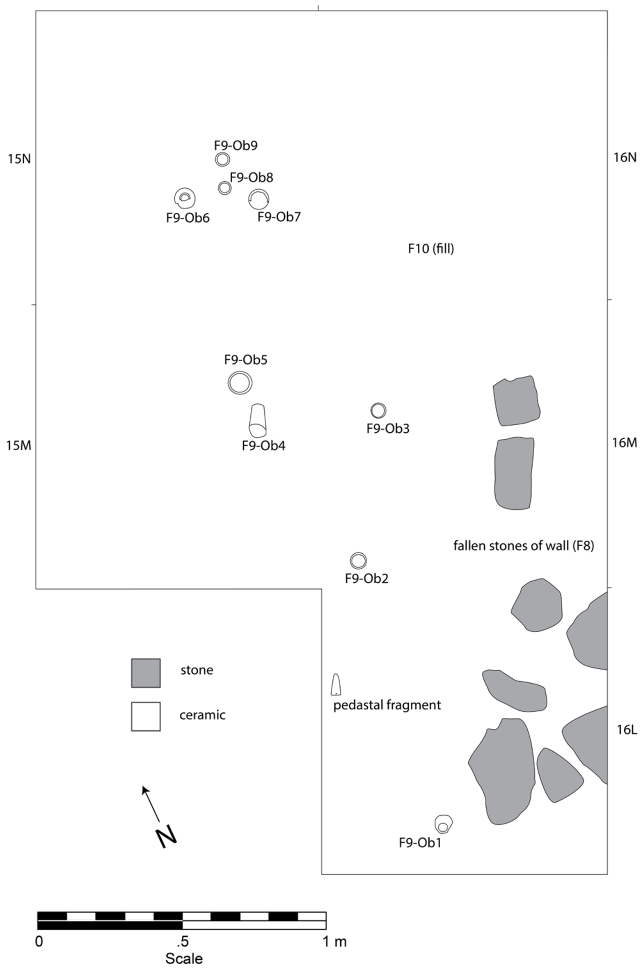


Figure 4.99: Plan map of F9 offering in units 15M, 15N, 16L, 16M, and 16N

Figure 4.100: Photograph of F9 offering vessels (from left to right, F9-Ob9, F9-Ob8, and F9-Ob6)

At some time during the Chacahua phase, inhabitants of Cerro de la Virgen also began to engage in ritual activities on a larger scale outside of the public building. In the small patio to the west, a small, shallow pit (F4) was excavated down from the top of F19 in the area of unit 5L and lined with thin granite slabs as well as poorly sorted, softly packed sandy loam with traces of ash and sherds (Figures 4.88 and 4.105). Whether F4 was used as a hearth, a slab-lined pit, or an offering of some type is not clear at present. The patio was then resurfaced with a 25 cm-thick layer of sandy loam construction fill (F3) over the entire area west of Structure 1, raising the occupational surface to 179.25 m a.s.l. in unit 3P, 179.48 m a.s.l. in the central units of 3L, 4L, 5L, 3M, 4M, and 5M, and 179.45 m a.s.l. in unit 3H. Within this layer of fill, inhabitants of Cerro de la Virgen emplaced a cache of 24 ceramic vessels (F2-s1; Figures 4.101 – 4.104), including 16 short-necked jars, seven bowls, and one *comal. A*ll of the vessels were non-diagnostic coarse brown wares. Several thin stone slabs (F2-s2) were also included in the F2-s1 fill, but did not appear to form compartments like the offerings in Complex A (see Sections 7.2 and 7.3) or dense collections like those found in the plaza (Op G; see Section 7.9). A lack of stratigraphic evidence precludes linking F2, F3, and F4 to a particular period of occupation or use of Structure 1. After the patio fell out of use, a soil (F1-s2) formed at the top of F2-s1 near the surface. A thin soil (F1-s1) also formed at the surface of F10 in Structure 1.

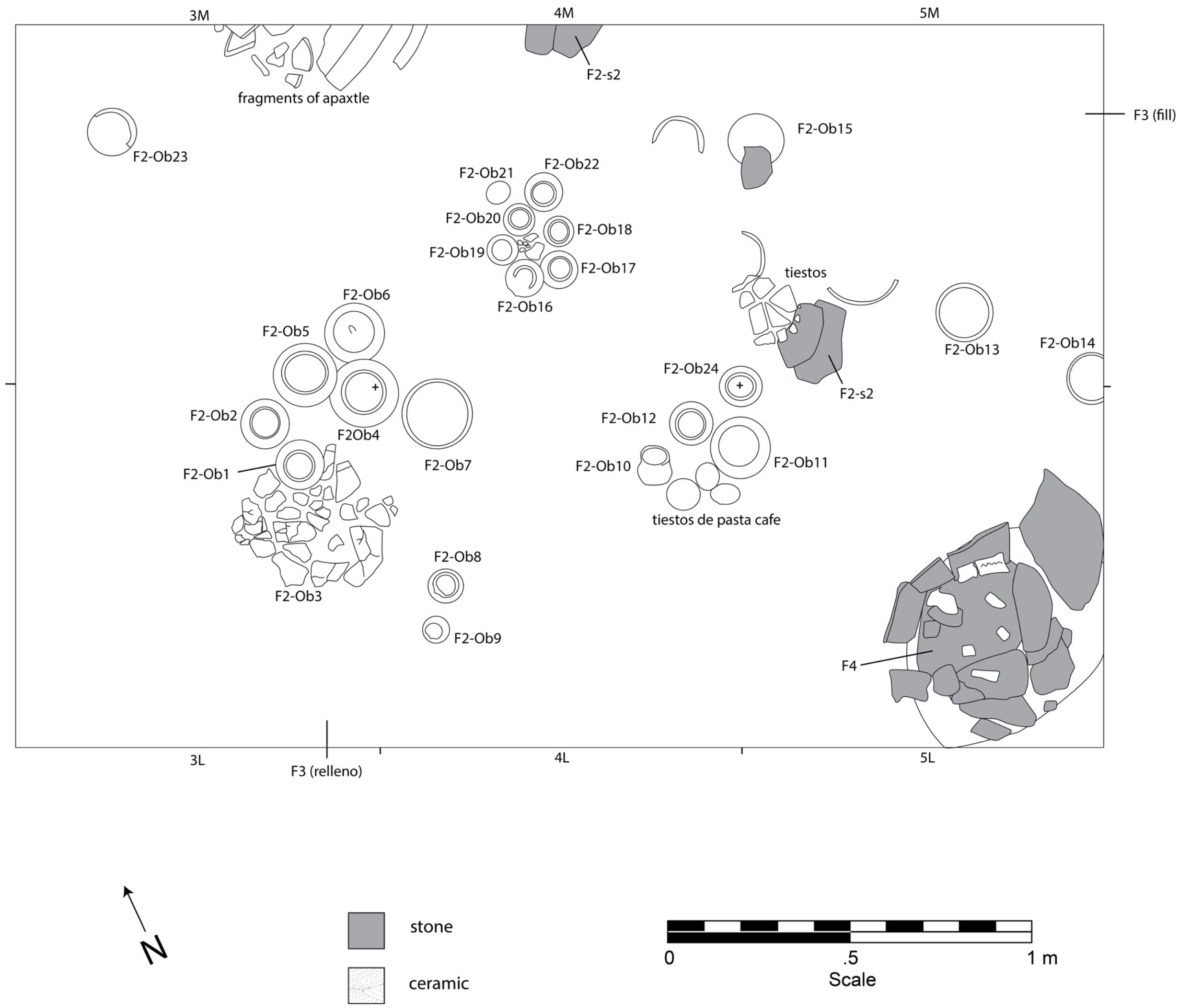


Figure 4.101: Plan map of F2 offering in the central excavation block of Terrace 10 patio.


Figure 4.102: Photograph of F2 offering vessels.


Figure 4.103: Overhead photograph of F2 offering vessels

Figure 4.104: photograph of F2 offering vessels

Figure 4.105: Photograph of possible pit (F4) in patio excavation block

SUMMARY

In this chapter, I presented the results of excavations in public spaces and architecture in the northeast section of the ceremonial center, including Terrace 10 and Structure 1 at the far eastern edge and Terrace 11 and Complex A located immediately to the west. Archaeological evidence from PRV13 Operations A, B, C, and D demonstrates that residents of Cerro de la Virgen engaged in comparable ritual activities in these ceremonial spaces, particularly ceramic vessel caching, and utilized similar architectural techniques to construct the structural platforms supported by both terraces.

The most extensive operations of the PRV13 at Cerro de la Virgen were carried out in Operation A. These consisted of horizontal excavations measuring 69.25 m^2 in the north patio as well as 6 m^2 inside Structure 2. Inhabitants of Cerro de la Virgen used the area extensively during the Terminal Formative for various ritual practices, including ceremonial caching and food preparation for feasting. Sometime during the transition between the Miniyua and Chacahua phases (ca. A.D. 100), builders began to construct the northern part of Terrace 11 by accumulating sediment from local deposits on the hill. Some of the earliest fill layers included sediment from Minizundo phase deposits, which demonstrates that people occupied the site by as early as the Late Formative period. Builders constructed Structure 2 on top of these early fill layers and created a flat patio to the north by depositing a layer of softly-packed sand. Excess water was filtered away from the north patio by a drain that ran underneath Structure 2 toward the south. Horizontal clearing in the north patio revealed a huge cache (62 m^2 in area) of 260 complete offering vessels that were placed in (presumably) shallow pits dug into the soft fill layer. The cached vessels came in a number of forms, including slender cylindrical vessels, short-necked and neckless jars, incurving wall bowls, and several eccentric forms.

Stratigraphic and ceramic evidence suggests people cached the vessels over an extended period, placing them in compartments made of thin granite slabs carved from local bedrock. In addition to caching activities, other ceremonial practices such as ritual feasting also took place in Complex A.

Excavations revealed seven small hearths intermingled with the cache compartments in the north patio as well as two larger, deeper hearths in the south patio. This patterning may suggest practices in the north patio, which would not have been visible from the south patio or the plaza below, were more exclusive than the cooking activities that were carried out in the south patio.

Excavations in Op B further demonstrated that the initial construction of Terrace 11 and Complex A began near the end of the Miniyua phase. During this time, builders were also depositing the initial layers of construction fill in the north area of Complex A, which created an elevated, flat surface across the entire terrace. According to ceramic data recovered from two hearths, cooking activities that took place in the south patio during the Chacahua phase corresponded with an increase in use of the north patio. Given that the south patio is relatively less restricted than the north patio, the activities carried out in the south patio may have engaged a larger part of the Cerro de la Virgen community.

While excavations in Operation C did not locate a midden feature, the stratigraphic sequence identified in units 9J, 10J, and 11J indicate that the northern part of the plaza was built during the Chacahua phase. Inhabitants of Cerro de la Virgen used a variety of building materials, including unconsolidated sandy loams as well as redeposited wattle and daub building debris. Evidence from Operation C also indicates that after the site core fell out of consistent use, perhaps at the end of the Chacahua phase, the area underwent a period of relative stability during which a thick soil (F3) formed in the final construction fill layer (F4). Given the earlier (transitional Miniyua-Chacahua) date of activities on Terrace 11, it is probable that the fill exposed by Op C was deposited after Terrace 11 was built. In addition, evidence from PRV13-Op H and PTRV16-Op G (see Chapter 5) demonstrates that the earliest construction episodes in the center and southern part of the plaza also date exclusively to the Chacahua phase. This may indicate that as ritual caching and feasting associated with Terraces 10 and 11 began to increase in intensity, the plaza may have been constructed to provide a larger, more accessible area for people to come together for communal events.

Operation D focused on determining the construction sequence and range of activities that took place on Terrace 10, within Structure 1 as well as outside in the patio. The absence of domestic features on Terrace 10 indicates that inhabitants of Cerro de la Virgen did not use the area as a residence. Structure 1 and the adjacent patio were public places used for ritual practices such as vessel caching, but participation in these practices may have been restricted to a smaller, more select group of individuals than those that participated in activities in the more accessible Complex A below. Ceramic evidence from the earliest stratigraphic layers in Operation D indicates dedication rituals began in conjunction with the construction of Terrace 10 (see Figure 4.75). Prior to the first construction phase of the building, residents of Cerro de la Virgen emplaced a dedicatory offering (F24) that included a possible bundle of valuable stone objects, including a nearly complete carved stone mask, a partial stone mask, two miniature stone thrones, and a figurine of a deceased person. The stone objects, all of which exhibit markers of elite status, were placed alongside several miniature ceramic vessels as part of a larger offering. A second offering (F20), which included ceramic vessels as well as a human long bone, was placed in a pit that was filled just prior to the end of use of the possible wattle and daub superstructure, marking its ritual termination.

Construction on Structure 1-sub 1 began with the placement of another dedicatory offering (F18), which consisted of a wide variety of ceramic vessels including a large apaxtle, an extremely large cylindrical vessel, and several bowls and shortnecked jars placed alongside granite stones. The use of the stones is unclear, as they do not appear to form compartments similar to those in the north patio of Complex A. Structure 1-sub 1 was enlarged following the placement of F18, indicated by a stone retaining wall that may have raised the surface of the building by as much as 1 m. Excavations did not expose retaining walls on the other three sides of the building, but the symmetry of the building suggests retaining walls would have been present on all sides. The interior of the building was filled with sandy loam as well as several ceramic offering vessels (F16), which may have been part of a "feeding ritual" that provided sustenance to the building. Structure 1-sub 1 was ritually terminated with the placement of F12 in a pit near the surface.

Structure 1, the final version of the building, exhibited low stone foundation walls that sat atop a layer of fill, which covered Structure 1-sub 1. Within the first layer of fill, builders interred a dedicatory offering (F9) that likely marked the last phase of the structure's use. Around this time, people began to use the patio to the west for ritual caching practices. A cache of ceramic vessels (F3) was placed prior to the final construction phase outside the building, which provided a level surface for Terrace 10. Although the meaning of the patio cache is unclear, it is possible that it was a termination offering that ritually closed activities related to Structure 1.

Further comparisons of evidence from Complex A and Structure 1 several important contrasts in communal practices between the complexes. First, the natural landscape and artificial terracing associated with the ceremonial center afforded varying degrees of accessibility to the two complexes. Access to Structure 1 was relatively restricted and probably controlled by an elite family living at Residence 1 immediately to the east. In contrast, Structure 2 was located in a more accessible location about 10 m below Structure 1, adjacent to the open plaza on Terrace 2. The differences in accessibility also reflect several important distinctions in the ways that caching practices were carried out. Evidence from Structure 1 demonstrates that each construction phase of the complex included a dedicatory offering, followed by a termination offering that ritually "closed" the building prior to the next phase (Table 4.5). The inclusion of prestige items such as those in F24 suggests that ceremonies in Structure 1 involved high status elites.

Table 4.5: Summary of offerings in Structure 1/Terrace 10

Cache	Offering Type	Construction Phase	Contents
F24	Dedication	1st (Terrace 10 surface)	carved stone mask of rain deity, fragments of another mask, two miniature stone thrones, a figurine and 11 miniature ceramic vessels
F21	Termination	1st (Terrace 10 surface)	12 ceramic vessels and a human long bone
F17	Termination	1st (Terrace 10 surface)	14 ceramic vessels, granite stone slabs and burned daub
F16	Dedication	2nd (Structure 1-sub1)	Five ceramic vessels
F12	Termination	2nd (Structure 1-sub1)	One ceramic vessel
F9	Dedication	3rd (Structure 1)	Nine ceramic vessels
F2	Dedication	3rd (Structure 1/patio)	24 ceramic vessels and granite stone slabs

Stratigraphic evidence from Structure 2 demonstrates that, as with Structure 1, builders also constructed this complex near the end of the early Terminal Formative period (ca. CE 100). During the construction of Str. 2, a thick layer of loosely packed sandy fill was deposited to the north of the building, covering the entire patio. The layer of fill would provide the medium into which a massive offering of 260 ceramic vessels within stone slab compartments (Table 4.6). While it is unclear how many distinct caching ceremonies were involved in the placement of the vessels and compartments, stratigraphic evidence indicates that they were placed sequentially over time. In addition to caching ceremonies, residents of Cerro de la Virgen also carried out cooking activities involved in feasts that took place in the area of Complex A. Several hearths were excavated down from the top of the offering fill layer, suggesting that caching ceremonies were associated with ritual feasting that may have engaged larger groups of people, or perhaps the community at large. No hearths were found in Structure 1.

Table 4.6: Summary of offerings in Complex A

Cache	Offering Type	Construction Phase	Contents
Op A F18	Continuous	North Patio, Structure 2	260 ceramic offering vessels emplaced in granite slab compartments
Op B F3	Termination?	South Patio	1 ceramic vessel, figurine head, grouped granite slabs

Ceremonies in restricted buildings (e.g., Structure 1) involved single, discrete events, whereas ceremonies in accessible buildings (e.g., Structure 2) involved large, ongoing events. Statistical analyses of ceramic objects interred during cache ceremonies corroborates this distinction. For example, while there were no differences in paste type, offerings in Structure 1 contained a higher percentage of bowls and jars, whereas the offering in Structure 2 contained a high concentration of cylinders ($p < 0.001$). Significant differences were also found between assemblages of jars separated by offering type ($p < 0.05$). Structure 1 was likely the setting for ceremonies involving high status individuals, perhaps a small number of religious specialists. In contrast, Structure 2 may have been a location in which people of varying status distinctions, or perhaps simply a diversity of people in general, participated in religious ceremonies that reflected ties to the local community. The presence of two adjacent but dissimilar ceremonial settings reflects the negotiations that took place between people of varying statuses during the Terminal Formative period in the lower Río Verde Valley.

V. RITUAL AND PRODUCTION INTERTWINED: EXCAVATIONS OF COMPLEX B, THE BALLCOURT, AND THE PLAZA

INTRODUCTION

In this chapter, I present the results of field operations carried out in the central and northern areas of the ceremonial center, including excavations in the plaza of Terrace 2, the ballcourt, and Complex B (Figure 5.1). The base of the ceremonial center consists primarily of Terrace 2, a large open space measuring approximately 5,070 m^2 that supports an open plaza and Complex C--a series of masonry building foundations that were not investigated in depth during the PRV13 or PTRV16. To the north, Terraces 12 and 13 were constructed parallel to each other, forming a gap that constituted the site's I-shaped ballcourt. Terrace 12 and 13 supported architectural complexes B and D, respectively. Complex D was not investigated during the project. Complex B measured approximately 750 m^2 in area and supported an L-shaped building foundation (Structure 4) that enclosed an interior patio in the northeastern quadrant of the terrace. A low platform (Structure 5) overlooking the ballcourt was separated from Structure 4 by a narrow patio.

Excavations in Terrace 2 consisted of transects of test units in various locations, including the southwest corner of the terrace (PRV13-Op G), the plaza (PRV13-Op H and PTRV16-Op G), and an open area to the northwest of Complex C (PRV13-Op E). Generally, these operations were placed to identify the date to which each area was constructed, the building methods utilized, and the types of communal activities carried out by people at the site. More extensive block excavations were conducted on Terrace 12, which focused on dating the ballcourt and Complex B, and identifying the communal activities carried out there. While the best evidence of communal ritual practices at Cerro de la Virgen comes from the large ceremonial features in Complex A and Structure 1 (see Chapter 4), excavations in the plaza and Complex B demonstrate that even the most accessible public buildings constituted a setting for vessel caching, burial practices, and even economic production that involved the community at large.

The archaeological data from these operations shows that a large investment of labor was organized to build the base of the ceremonial center and its surrounding architecture. The most prevalent method of ritual ceremonialism involved the placement of offerings of ceramic vessels, typically coarse brown ware cylinders and globular jars in patterns similar to those recorded in Complex A and Structure 1.

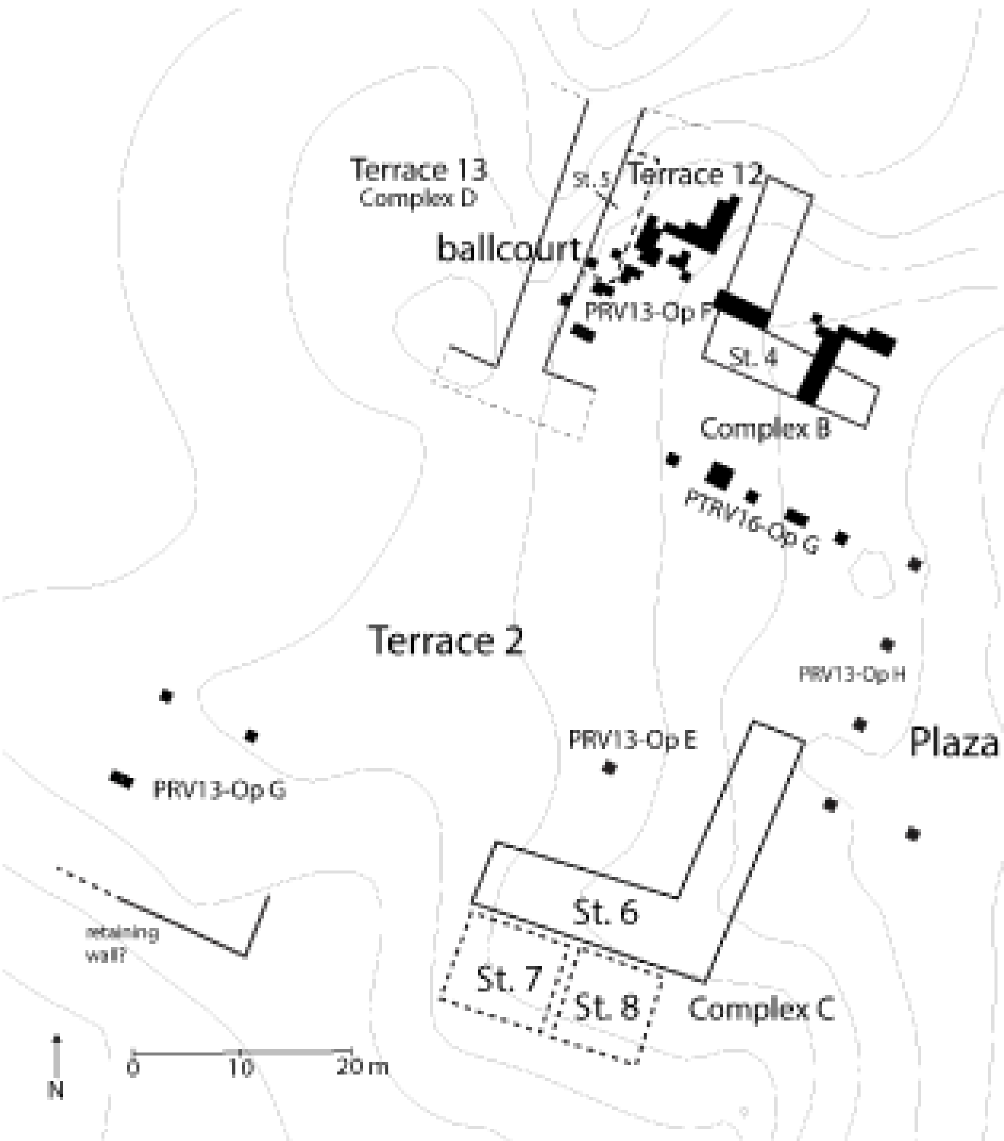


Figure 5.1: Plan map of Terraces 2, 12, 13 and Plaza with excavation operations labelled.

In contrast to the more restricted areas to the east, Complex B exhibited limited evidence that the area was utilized for mortuary practices, exemplified by the remains of at least three individuals recovered there. One of the burials was a primary interment, whereas the others were likely redeposited. All were discrete interments, a pattern that appears to differ from other later Formative communal cemeteries at Cerro de la Cruz (Joyce 1991), Charco Redondo (Butler 2018) and Yugue (Barber 2005) that involved supra-domestic collections of people. However, as I explain in this chapter and in Chapter 7, it should be noted that a lack of evidence of cemetery burial in the excavations reported here does not necessarily mean that residents of Cerro de la Virgen participated in a fundamentally different type of mortuary ceremonialism, as further excavation of the ceremonial center may yet yield evidence of cemetery burial. Excavations in Complex B also indicate that the area was used for the production of shaped granite stones used in the site's numerous terrace retaining walls. A collection of stone tools used to shape the stone blocks was also found in association with Structure 4, as well as several dense collections of debitage deposited as rubble fill, suggesting that the area was used as a "masonry workshop" during the late Terminal Formative Period. In the sections that follow, I elaborate on the excavation goals and strategies and provide a detailed occupational history of each area excavated in the central and northern areas of the ceremonial center.

COMPLEX B AND THE BALLCOURT

PRV13/PTRV16 - Operation F

This section presents the results of excavations carried out on Terrace 12 and the ballcourt, located in the northwest area of the ceremonial center (Figure 5.2). Architecture found on the modern surface of the terrace is collectively referred to as Complex B, including an L-shaped stone foundation (Structure 4), two smaller terraces to the northeast, and a low platform (Structure 5) overlooking the ballcourt to the west. Parallel retaining walls of Terrace 12 and Terrace 13 to the west formed the ballcourt playing lane. Test excavations were first conducted on the terrace during the PRV13 and included two 1 m x 1 m units (units 10F and 12H) and one 1 m x 2 m unit situated on the western edge of Terrace 12 (units 12D and 13D). Excavations were expanded to the east during the PTRV16 to further explore Complex B, including the western patio, central patio, and the interior of the building foundation. Collectively, the PRV13 and PTRV16 excavations covered an area of 77 m^2. The goals of the excavations were to identify the construction techniques and materials used to build Terrace 12 and its associated architecture, to identify the activities carried out in the area, and to date the construction of the architecture. Due to the close proximity of the units excavated in 2013 and 2016, the same Cartesian grid and nomenclature were used for both seasons, all coming under the umbrella of "Operation F" (Figure 5.2).

The PRV13 and PTRV16 excavations showed a large investment of labor in the construction of Terrace 12 and Complex B, as well as a suite of ritual and economic practices that makes the complex unique among Terminal Formative public buildings in the region. Archaeological evidence suggests that the earliest construction and occupation in the area dates to the Minizundo phase. A possible stone building foundation oriented to the cardinal directions, an orientation witnessed at other Minizundo phase sites in the lower Verde, was found deep beneath the surface of the western patio. However, no other primary deposits dating to the Minizundo phase were recovered.

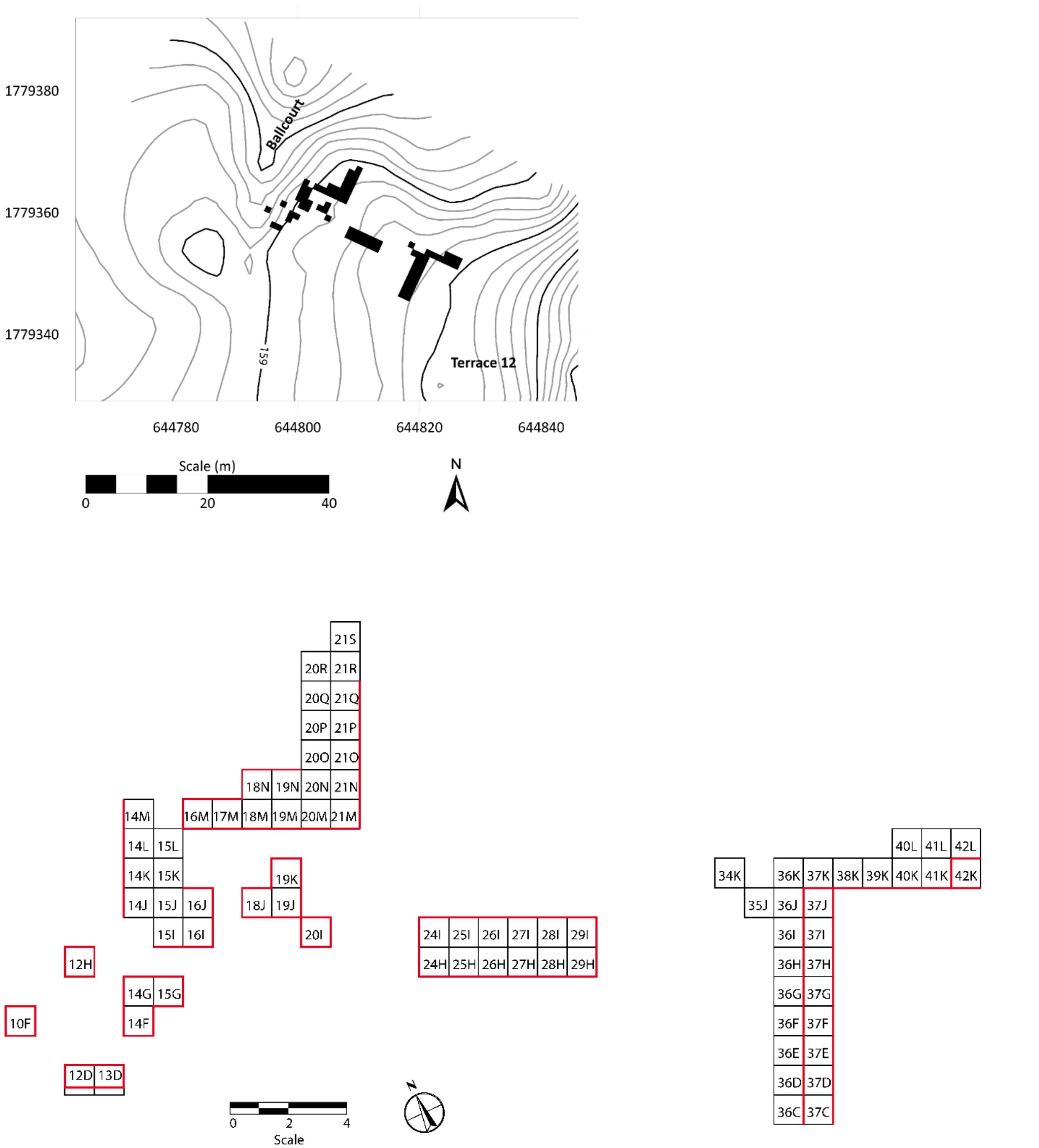


Figure 5.2: (top) Map of Terrace 12 and ballcourt with excavated units shaded (bottom)Unit plan of Op F with drawn profiles marked in red.

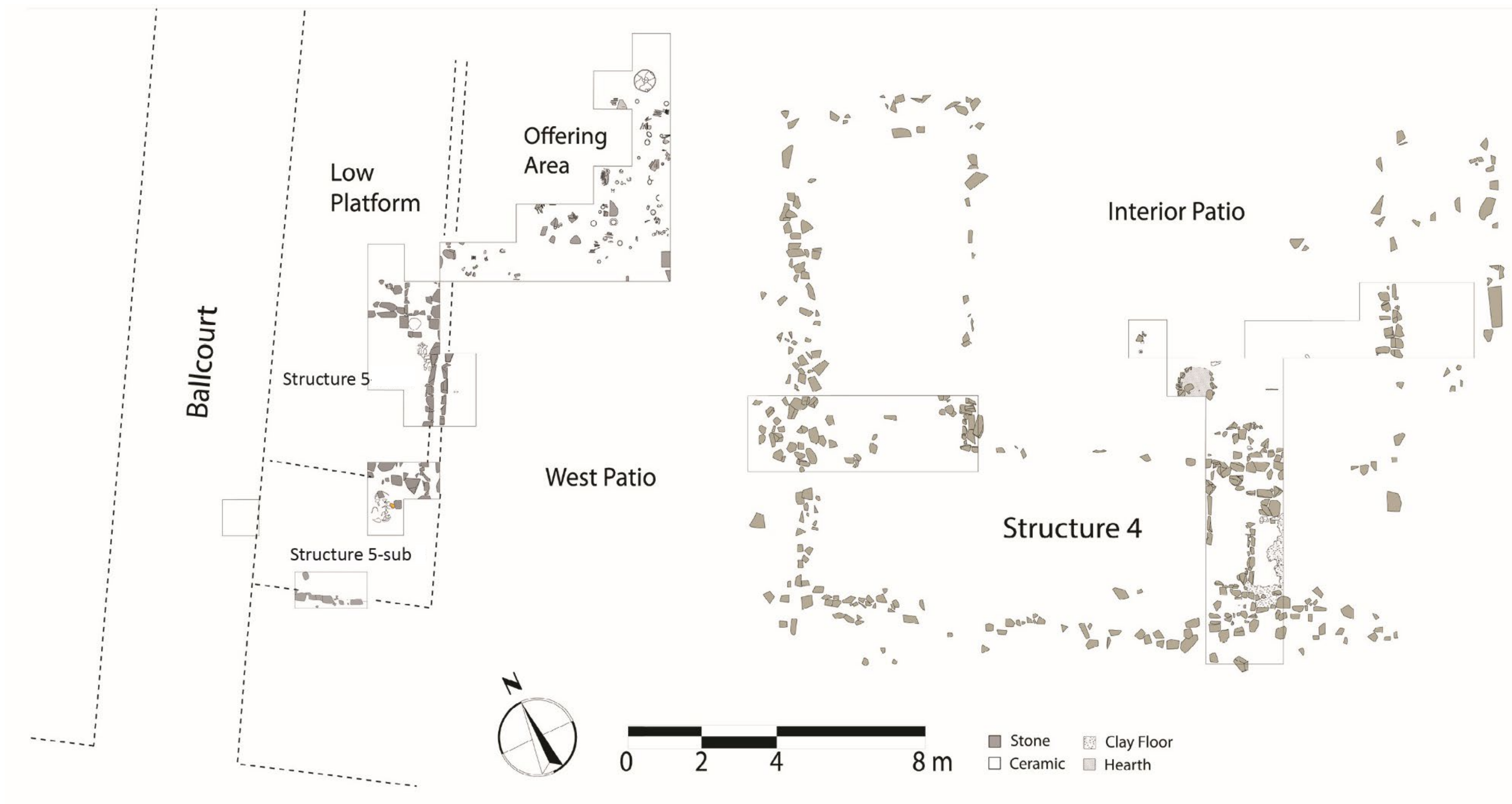


Figure 5.3: Plan diagram of Terrace 12/Complex B and associated architecture..

Construction in the area of Terrace 12 resumed during the Chacahua phase, beginning with the construction of the terrace wall that would become the east boundary of the ballcourt playing lane. Though Terrace 13, located immediately to the west of Terrace 12, was not explored archaeologically during the PRV13 and PTRV16, it is likely that its initial construction dates to the same period. The Terminal Formative date of the ballcourt makes it the only such architectural feature currently known in the lower Verde to predate the Classic period, though ballcourts at the large Chacahua-phase sites of La Humedad and Piedra Ancha may date to the Terminal Formative as well. Ballcourts in Formative-period Mesoamerica are associated with religious beliefs and cosmology, often providing the stage for ritual reenactments of the symbolic journey from the world of the living to the underworld (Schele and Freidel 1991). Evidence from excavations on Terrace 12 indicate that three burials (B1-I1, B2-I2, B3-I3) were placed within discrete layers of fill, which may represent offerings associated with various construction phases of the terrace or related to ritual practices carried out in the ballcourt.

The construction and use of Terrace 12 intensified through the Chacahua phase, during which Structures 4 and 5 were built. Public buildings such as Complex B were active members of the community that often required spiritual maintenance in the form of ritual feeding, such as the placement of offerings of ceramic vessels, human bodies, and other objects and materials (Brzezinski et al. 2017; Joyce and Barber 2015). Offerings at Complex B generally dated to the early Chacahua phase and contained collections of thin granite slabs like several other buildings at the site (e.g., Structure 1, Complex E); however, none of the offerings examined at Complex B contained stone slab compartments like those observed at Complex A.

Results of the 2016 project indicated that Complex B was used for material production as well as ceremonial activities. A collection of ground stone tools associated with Structure 4 and the surrounding patios, though not found together in a single cache, represent a “toolkit” employed to create the large, faced stones that comprise the site’s many terrace retaining walls. Obsidian tools, flakes, and debitage recovered from Complex B suggest that a range of activities related to obsidian tool maintenance and use occurred there. It is possible that residents of Cerro de la Virgen may not have distinguished between ritual ceremonialism and craft production. Nevertheless, the combination of religious and economic practices make Complex B a unique public building, both among other public buildings in the region as well as compared to other public buildings at Cerro de la Virgen. Table 5.1 provides a detailed description of the stratigraphic levels recorded in Operation F.

Table 5.1: List of stratigraphic levels in PRV13/PTRV16 Operation F

Stratum	**Units**	**Sed. Desc.& Munsell**	**Probable Date**	**Formation Process**	**Comments**
F1-s1	10F	10 YR 2/2; very dark brown loam	Modern	Soil formed in colluvium (F2)	Moderately sorted loamy humus with grains ranging from angular to rounded in shape; contains inclusions of gravel, organic/plant material, sherds, and small rocks; highly disturbed; see Figure 5.8
F1-s2	12D, 12H, 13D	10 YR 2/2; very dark brown loam	Modern	Soil formed in fill (F4)	Similar to F1-s1 but contains more silt; see Figures 5.9 and 5.18
F47	25H-29H	10 YR 3/2; very dark grayish brown sandy loam	Modern	Soil formed in fill (F45)	Soil formed in fill layer F45; slopes downward toward the west due to erosion; see Figures 5.39 and 5.40
F48	All units east of 24 line	10 YR 3/2; very dark grayish brown sandy loam	Modern?	Colluvium	Poorly sorted sandy loam with rounded grains and inclusions of sherds, small stones; colluvial fill that covers F51 in the area of Structure 4; see Figures 5.4, 5.5, and 5.37-5.40
F17	All units west of 24 line	10 YR 2/2; very dark brown loam	Modern	Colluvium	Moderately sorted loamy colluvium with rounded grains and inclusions of sherds and small stones; contains significant root and rodent disturbances; matrix is finer and harder packed than F20-s1; see Figures 5.6, 5.11, 5.23, 5.24, 5.29-5.31, 5.39, 5.40

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F2	10F	10 YR 3/2; very dark grayish brown loam	Coyuche	Colluvium	Well sorted loamy colluvium with rounded grains; contains inclusions of carbon, small amounts of ash, disintegrated rock, coarse sand, and sherds; sediment is loosely packed (similar to F4); difference in composition from F4 may be due to seepage of sediment through stone retaining wall (F12); see Figure 5.8
F3	10F	10 YR 3/3; dark brown loamy sand	Chacahua or Coyuche	Construction fill or possible refuse deposit	Moderately sorted sandy fill with wide range of inclusions including large sherds, small figurine fragments, small pieces of burned daub, coarse sand, gravel, mica, small flecks of carbon, and small rocks; harder packed than F2, but not as hard-packed as F16; animal burrows and root disturbances present; may represent refuse thrown into playing field after ballcourt falls out of use and site is abandoned; see Figure 5.8
F36	35J, 36J	10 YR 2/1; black loamy sand	Chacahua	Hearth	Circular hearth with small to medium sized stones surrounding the exterior; upper surface of hearth at the occupational surface formed by fill episode F51; not visible in profile (sediment samples taken, but not fully excavated); sediment consists of poorly moderately sorted loamy sand with rounded grains and inclusions of ash, charcoal, burned organic material, faunal bone, and sherds; Figure 5.39
F35	37D, 37E, 37F	10 YR 5/2; grayish brown silty clay	Chacahua	Floor	Poorly sorted silty clay with coarse sand inclusions; plaster floor for Structure 4-super 1; contains coarse inclusions, but matrix is extremely hard packed, likely caused moistening the sediment and sun baking; fragmented to the western edge of the superstructure; see Figure 5.42
F33	36F, 37F	No Munsell; granite stone	Chacahua	Standing wall foundation	Standing wall foundation for a divisional wall within Structure 4; could also be a separate superstructure; not visible in profile; see Figure 5.39

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F34	36C, 36D, 37C, 37D, 37E, 37F	No Munsell; granite stone	Chacahua	Structural wall?	West wall of Structure 4 - superstructure 1; retains F35 (floor) to the east; see Figure 5.5, 5.39
F49	37F	No Munsell; granite stone	Chacahua	Structural wall?	North wall of Structure 4- superstructure 1; retains F35 (floor) to the south; see Figures 5.5 and 5.37
F50	36C, 37C	No Munsell; granite stone	Chacahua	Structural wall?	South wall of Structure 4- superstructure 1; retains F35 (floor) to the north; see Figure 5.37
F58	41K, 42K, 41L, 42L	10 YR 2/1; black loam	Chacahua	Possible hearth	Hearth with ashy, loamy sediment with inclusions of small to medium sized stones, charcoal, burned organic material, faunal bone, and sherds; hearth cuts down approximately from the top of F57; only detected in profile in unit 42K (diameter estimated from radius recorded in that unit); see Figure 5.4, 5.39
F29	40/41H-40/41P; excavated in: 40L, 40K	No Munsell; granite stone	Chacahua	Terrace retaining wall	Stone retaining wall of the eastern arm of Structure 4; runs north-south and retains fill episode F57 to the west; wall built on top of F51; see Figure 5.36
F27	43L-43P	No Munsell; granite stone	Chacahua	Terrace retaining wall	Stone wall running north-south that presumably retains to the west, forming a terrace; not excavated; not visible in profile; see Figure 5.39
F57	42K, 42L	10 YR 3/2; very dark grayish brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with angular grains and inclusions of sherds and small stones; Construction fill retained by F29; occupational surface at top of stratum; see Figures 5.4 and 5.36

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F52	36D, 36E, 36F	10 YR 3/3; dark brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand with inclusions of sherds and small stones; Construction fill within interior of Structure 4, retained by F26 (to the north) and F30 (to the south); similar to F45 but coarser; see Figures 5.5 and 5.35
F45	26I-29I, 25H-29H	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with inclusions of sherds and small stones; Construction fill retained by F25 on the western side and F31 on the eastern side; similar to F52, but finer; see Figures 5.37 and 5.39
F32	24-30Q	No Munsell; granite stone	Chacahua	Building foundation wall	Stone retaining wall at the northern edge of Structure 4 running west-east; retains fill episode F45 to the south; presumably built atop F51; not excavated, not visible in profile, but see Figure 5.39
F31	29K-Q; excavated in: 29H, 29I	No Munsell; granite stone	Chacahua	Building foundation wall	Stone retaining wall of the western arm of Structure 4; runs north-south and retains fill episode F45 to the west; wall built on top of F51; see Figures 5.37-5.39
F55-s2	37F	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill (or possible pit fill)	Identical to F55-s1, but matrix is finer and more softly packed; see Figure 5.5
F55-s1	37F	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with angular grains and inclusions of sherds and small rocks; Construction fill upon which Structure 4 is built; analogous to F20 and F51; harder packed and coarser than F55-s2; see Figure 5.5
F30	29-35I; excavated in: 29H, 36G, 36H, 37G, 37H	No Munsell; granite stone	Chacahua	Building foundation wall	Stone retaining wall running west-east abutting interior patio; retains fill episode F52 to the south; wall built on top of F51; see Figure 5.5, 5.37, and 5.39
F26	24C/D - 40C/D, excavated in: 36C, 37C	No Munsell; granite stone	Chacahua	Building foundation wall	Stone retaining wall at the southern edge of Terrace 12 running west-east; retains fill episode F52 to the north; presumably built on top of F51; see Figure 5.5, 5.35, and 5.39

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F25	24/25C - 24/25Q; excavated in: 24H, 24I, 25H, 25I	No Munsell; granite stone	Chacahua	Building foundation wall	Stone retaining wall of the western arm of Structure 4; runs north-south and retains fill episode F45 to the east; probable that at least one or two courses of the wall collapsed to the west, followed by erosion of the surface of F45, indicated by several large, displaced stones found to the west of F25 in units 24H, 24I, and 24M; wall built on top of F20-s1; see Figure 5.37-5.39
F42	14L	No Munsell; ceramic vessel	Chacahua	Offering vessel	Offering of one smashed Chacahua phase grayware jar placed upside down in fill stratum F61; midsection and base of vessel are missing, but rim is completely intact; not visible in profile, but see Figure 5.17
F43	15K	No Munsell; ceramic vessel	Chacahua	Offering vessel	Deposited into F61 within a square compartment formed by F18, F38, F39, and F40; not visible in profile, but see Figure 5.17
F61	15I, 15G, 14J-M	10 YR 3/2; very dark brown silt loam	Chacahua	Construction fill	Construction fill retained to the west by F18; surface is likely very deflated and probably eroded down to the north and west (into the ballcourt playing area); see Figures 5.21-5.23
F40	15K, 15L	No Munsell; granite stone	Chacahua	“Offering” wall	Wall running north-south to the west of F18; likely not a foundation for a standing wall; possibly designating areas for offerings (forms the west “wall” for offering F43); may have been scaled up versions of the thin stone slab compartments at Complex A; not visible in profile, but see Figure 5.17
F39	15K	No Munsell; granite stone	Chacahua	“Offering” wall	Wall running west-east to the west of F18; likely not a foundation for a standing wall; possibly designating areas for offerings (forms the south “wall” for offering F43); may have been scaled up versions of the thin stone slab compartments at Complex A; not visible in profile, but see Figure 5.17

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F38	14L	No Munsell; granite stone	Chacahua	"Offering" wall	Wall running west-east to the west of F18; likely not a foundation for a standing wall; possibly designating areas for offerings (forms the south "wall" for offering F42 and the north "wall" for offering F43); may have been scaled up versions of the thin stone slab compartments at Complex A; see Figure 5.23
F22	14G, 15G	No Munsell; granite stone	Chacahua	Stone retaining wall	Upper stone retaining wall of platform at western edge of Complex B, adjacent to ballcourt playing lane; sits atop F4, retains F61 to the north; runs east to west and likely intersects with ballcourt retaining wall; see Figure 5.22
F18	15I, 16J	No Munsell; granite stone	Chacahua	Stone retaining wall	Upper stone retaining wall of platform at western edge of Complex B, adjacent to ballcourt playing lane; sits atop F4 and retains F61 to the west; unclear whether wall and retained fill were deposited before, after, or concurrently with fill episode F20 and offering vessels (F60-s1) and thin granite slabs (F60-s2); see Figures 5.21, 5.22, and 5.29
F44	14F, 14G	No Munsell; offering vessels	Chacahua	Offering vessels	Five offering vessels deposited immediately south of retaining wall F22 into the F4 fill layer; not visible in profile, but see Figure 5.17
F37-s1	34K	No Munsell; offering vessels	Chacahua	Offering vessels	Offering of two short-necked gray ware jars deposited beneath surface of F51; not visible in profile; see Figure 5.39
F37-s2	34K	No Munsell; Thin granite slabs	Chacahua	Thin stone slabs	Thin stone slabs associated with offering vessels (F37-s1); not visible in profile; see Figure 5.39

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F51	37-42K, 37H-37J, 36I-36J	10 YR 2/2; very dark brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand with angular grains and inclusions of sherds and small stones; construction fill episode on which retaining walls and fill on which Structure 4 is built; likely analogous to F20 and F55 fill episodes; occupational surface exposed at top of stratum in the interior patio of Structure 4; see Figures 5.5, 5.35-5.37
F20-s1	14F, 14G, 15G, 18J, 19J, 19K, 20I,	10 YR 2/1; black loam	Chacahua	Soil formed in construction fill	Moderately sorted loam with angular grains and inclusions of organic material, sherds, small stones and gravel; sediment is finer and less compact than F21 and F17; several large disturbances in this stratum; originally deposited as fill covering vessels in offering area in the west patio of Complex B (similar to F17 in Complex A, north patio); raises level of interior of patio approximately 20 cm; also covers F62 (stone wall); see Figures 5.6, 5.11, 5.21, 5.22, 5.29, 5.38
F20-s2	14F	No Munsell; fragmented grano-diorite	Chacahua	Construction fill	Lens of fragmented grano-diorite deposited during F20 fill episode; see Figure 5.22
F60-s1	16-21M, 18-21N, 20-21O, 21P, 21Q, 20-21R, 18J, 19K	No Munsell; offering vessels	Chacahua	Ceramic offering vessels	Offering of 42 vessels deposited slightly into F21-s1 and covered by F20-s1; likely deposited concurrently with F20 fill episode; not visible in profile, but see Figure 5.30; obs 41 and 42 not recovered in situ
F60-s2	16-21M, 18-21N, 20-21O, 21P, 21Q, 20-21R	No Munsell; thin granite slabs	Chacahua	Stone offering markers or compartments	Thin granite slabs deposited slightly into F21-s1 and covered by F20-s1; likely deposited concurrently with F20 fill episode; no collection forms compartments like those in Complexes A and E; see Figure 5.30
Burial 1, Indiv. 1	12D, 13D	No Munsell; human remains	Chacahua	Human skeletal remains	Individual (B1-I1) interred in F6; recovered in very poor condition with less than 10% of skeletal material present; burial oriented east-west (104°-284°, head-to-toe); not visible in profile; see Figure 5.24

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F6	12D, 13D	10 YR 3/3; dark brown loamy sand	Chacahua	Possible burial pit	Possible burial pit into which B1-I1 was deposited; pit is shallow and cuts down from top of F7-s1; sediment is identical in texture and color to F7-s1 but is much more loosely packed; depth of pit unclear, but likely shallow (less than 30 cm deep); not detected in profile; Figure 5.24
F41	MU A (15J, 15K)	No Munsell; ceramic vessel	Chacahua	Ceramic deposit/possible offering	Deposit of several broken vessels placed within F4/F7 in the platform area adjacent to the ballcourt; deposited prior to the placement of retaining wall F18--located below and to the west of this wall; not visible in profile, but see Figure 5.19
F4	12D, 12H, 13D	10 YR 3/3; dark brown silt loam	Chacahua	Construction fill	Moderately sorted sandy loam fill with sub-rounded grains; contains inclusions of organic material, coarse sand, gravel, and sherds; loosely packed, similar to F2, but varies in composition (F4 contains more silt, but less ash and carbon); see Figures 5.9, 5.16, 5.21, 5.23, 5.25
F7-s1	12D, 13D	10 YR 3/3; dark brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand fill with sub-rounded grains; contains inclusions of gravel, coarse sand, mica, eroded sherds, and small rocks; Fill is retained by small retaining wall (F5), creating a low platform (Structure 5) to the north; likely analogous to F9; see Figure 5.16
F7-s2	13D	10 YR 5/2; grayish brown loamy sand	Chacahua	Construction fill	Thin lens of loamy sand fill within larger fill stratum, F7-s1; sediment is finer and lighter in color than F7-s1; see Figure 5.16
F8	12H	No Munsell; ceramic vessels	Chacahua	Offering in fill	Two small cylindrical offering vessels (coarse brown wares) placed in the fill of F9; accompanied by a possible lid; not visible in profile; see Figure 5.15
F19	15I, 16I, 16J	No Munsell; granite stone	Chacahua	Stone retaining wall	Stone retaining wall running north-south in the west patio of Complex B at orientation of 30˚-210˚; retains F4 and F7 to the west; deposited as final building phase associated with terrace wall F12; sits atop F9/F10/F21, just below and to the east of F18; F18 and F19 together form a shallow “sunken patio” to the east; likely forms corner with F5, but not verified in situ; see Figures 5.21, 5.22, and 5.29

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F5	12D, 13D	No Munsell; stone	Chacahua	Retaining wall of Structure 5 (low platform)	Retaining wall consisting of one course of granite stones running east to west in units 12D and 13D; some stones are large and faced, while others are small and fragmented; wall retains F7-s1, presumably forming Structure 5 (hypothetical, not shown in plan); likely forms corner with F19, but not verified in situ; see Figure 5.16
F62	18J	No Munsell; granite stone	Chacahua	Possible stone wall	Possible low stone wall sitting atop F21-s1; visible in the west profile of 18J; unclear how this wall articulates with walls F18 and F19 to the east; see Figure 5.11
F23-s1	19J, 19K	10 YR 3/3; dark brown loamy sand	Chacahua	Pit fill	Poorly sorted loamy sand with sub-angular grains that fills in pit cutting down from the top of F21-s2 through F21-s1 and slightly into F24-s1; upper stratum of pit fill; pit is approximately 45-50 cm in depth; contains inclusions of small to medium sized stones and sherds; lighter in color than F23-s2; see Figure 5.11
F23-s2	19J, 19K	10 YR 2/1; black loam	Chacahua	Pit fill	Lower stratum of pit fill; well sorted loam with inclusions of ash, burned organic matter, mica, rocks/small stones, and sherds; hard packed but softer than F23-s1 and contains more stone inclusions; burned organic material and unidentified faunal bone present; see Figure 5.11
F9	12H	10YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with angular grains; contains inclusions of mica, coarse sand and eroded sherds; likely analogous to F7-s1; sediment matrix is similar to F7-s1 but is sandier and contains fewer coarse inclusions (gravel, rocks, etc.); see Figures 5.9 and 5.29
F10	12D, 13D	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with angular grains; contains inclusions of mica, coarse sand, gravel and eroded sherds; likely analogous to F11; matrix is similar in composition to F11 but contains more gravel; see Figure 5.16

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
Burial 3, Indiv. 3	14G	No Munsell; human remains	Chacahua	Human skeletal remains	Secondary burial of human remains interred within F21-s1 just south and below retaining wall F22; No burial pit visible--unclear whether interred in pit or during fill episode F21; remains only include long bones of legs; aging and sexing unable to be done; see Figures 5.14 and 5.22
F21-s1	20I, 14G, 15G, 14F	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with angular grains and inclusions of small and eroded sherds and small to medium sized stones; sediment is finer than F24-s1; contains fewer sherd inclusions than F21-s2 and F24-s1; see Figures 5.6, 5.11, 5.21, 5.23, 5.27-5.29
F21-s2	19J, 19K, 20I	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam; identical to F21-s1, but contains slightly more sherds; see Figures 5.6, 5.11, and 5.21
F21-s3	20I	10 YR 3/3	Chacahua	Construction fill	Identical to F21-s1, but slightly darker in color; see Figure 5.6
F21-s4	19J	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Identical to F21-s1, but sediment is slightly darker, and small amounts of mica were present in sediment sample; see Figure 5.11
F54	36J	10 YR 3/2; very dark grayish brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with inclusions of large stones with angular breaks and flat faces, sherds, small rocks, and occasionally ash; large stone inclusions likely debitage from manufacture of stones for retaining walls on terraces in the ceremonial center of the site; deposited atop bedrock; see Figure 5.5
F11	12H	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with angular grains; contains inclusions of mica, coarse sand and eroded sherds; likely analogous to F10; matrix is similar in composition to F10 but contains less gravel; see Figure 5.9
F24-s4	18J	5 YR 3/2; dark reddish brown sandy clay loam	Chacahua	Construction fill or possible pit fill	Identical to F24-s3 but sediment is more softly packed; see Figure 5.11

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F24-s3	18J	5 YR 4/3; dark reddish brown sandy clay loam	Chacahua	Construction fill or possible pit fill	Poorly sorted sandy clay loam with angular grains and inclusions of small fragmented rocks and charcoal; densely packed; possibly burned daub; unclear whether stratum is the melted remains of a wall panel that sat atop F24-s1 or was redeposited at end of F24-s1 fill episode; no evidence of cane impressions; see Figure 5.11
F24-s2	20I	7.5 YR 4/4; brown clayey sand	Chacahua	Construction fill	Poorly sorted clayey sand fill with angular grains; possibly chunks of disintegrated adobe deposited at the top of F24-s1; very few sherds as inclusions; may be analogous to F24-s3 and F24-s4, but darker and contains reddish daub material; see Figure 5.6
Burial 2, Indiv. 2	MU C (18J, 19J, 19K)	No Munsell; human remains	Chacahua	Human remains	Burial of young to middle adult (18-43 years) in a flexed position facing east; placed near the beginning of construction fill episode, F24-s1; oriented along Terminal Formative site orientation (25˚-205˚) with the skull to the south; osteological remains exhibit severe dental attrition, two carious lesions, and hypercementosis; no burial goods or offerings associated with interment; remains lacked intact pelvis--no sex determination; see Figures 5.11 and 5.12
F24-s1	18J, 19J, 19K, 20I	10 YR 4/2; dark grayish brown sandy clay loam	Chacahua	Unconsolidated construction fill	Well sorted sandy clay loam construction fill with sub-angular grains and inclusions of sherds, small fragmented stones, coarse sand, and gravel; very hard packed; darker in color and coarser than F21-s1; inclusions of sherds are larger than those in F21-s1; 0.9 - 1 m in depth, overlying F53; matrix has more clay than surrounding strata; see Figures 5.6 and 5.11
F12	10F	No Munsell; stone	Chacahua	Retaining wall of ballcourt	Granite wall retaining fill layers F11, F10, F9, F7-s1, and F7-s2 to the east; constructed on top of F16; contains 4-5 courses of faced stones of varying size; wall comprises the eastern extent of ballcourt playing field; see Figure 5.8

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F13-s2	12H	10 YR 4/3; brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand fill with angular grains; contains inclusions of mica, coarse sand and sherds; deposited at same time, but directly following deposition of F13-s1; see Figure 5.9
F13-s1	12H	10 YR 5/3; brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with angular-subrounded grains; contains inclusions of mica, coarse sand, sherds and some crushed rock; lighter in color and contains fewer inclusions than F13-s2 and F14; sediment is more loosely packed than F14; see Figure 5.9
F14	12H	10 YR 3/2; very dark grayish brown loamy sand	Chacahua	Pit fill	Poorly sorted, moderately packed loamy sand fill with angular grains; contains inclusions of mica, gravel, coarse sand, sherds, crushed rock, burned rock, small chunks of daub, ash, charcoal, and bone (probably faunal); fills deep pit (60-70 cm deep) cutting into F15; may have been filled with debris from activities carried out on low platform to the east of F12 retaining wall; frequency of bone in the fill increases toward the bottom of pit; see Figure 5.9
F15	12H	10 YR 3/3; dark brown loamy sand	Chacahua	Construction fill	Moderately sorted loamy sand fill with angular grains; contains inclusions of mica, gravel, coarse sand and sherds; likely analogous to F16 in unit 10F, corresponding to the first major construction phase in area of Op F; sandier and more loosely packed than F16; see Figure 5.9
F16	10F	10 YR 4/3; brown loam	Chacahua	Construction fill	Poorly sorted loamy fill with subangular grains; contains inclusions of gravel, mica, coarse sand and sherds; very hard packed (harder packed than F15 in unit 12H and F3 in unit 10F); fewer inclusions than F3 (particularly sherds); likely analogous to F15 in unit 12H; see Figure 5.8

Stratum	Units	Sed. Desc.& Munsell	Probable Date	Formation Process	Comments
F53	20I	2.5 Y 4/4; olive brown loamy sand	Terminal Formative?	Construction fill	Poorly sorted loamy sand fill with angular grains and inclusions of sherds and small rocks; covers F53 up to the upper most level of the stone foundation as well as the area to the south and east; much lower density of artifacts and sandier than F24-s1; sediment is softly packed; see Figure 5.6
F59	20I	No Munsell; granite stone	Possible Minizundo	Possible stone building foundation	Possible stone foundation located at the base of 20I in the northwest corner of the unit; excavations did not penetrate below this level; foundation oriented to the cardinal directions; see Figure 5.6
N1	36J, 42K	No Munsell; grüs	Natural	Natural bedrock/grüs	Naturally occurring grüs and pulverized bedrock; detected only in the eastern area of Op F/Complex B; upper surface of bedrock is 2.162 m above upper surface of earliest stratum in western area of Complex B, indicating the original terrain in the area of Op F sloped relatively steeply downhill toward the west; see Figures 5.4 and 5.5

Occupational History

The natural terrain of the hill in the area of Op F likely sloped steeply downward toward the north and west, making it necessary to deposit several layers of fill over many construction episodes to eventually create Terrace 12. In the easternmost unit of 42K (Figure 5.4), natural bedrock (N1) was detected at an elevation of 161.0 m a.s.l. and just over 7 m to the west in unit 36J (Figure 5.5), at 159.8 m a.s.l. Despite relatively deep excavations in the western area of Op F (see below), no other unit reached bedrock.

Op F revealed a construction history in the northern area of the ceremonial center that most likely began in the Minizundo phase. Located in the center of the western patio of Complex B, unit 20I penetrated to the deepest and oldest cultural level, revealing a granite stone foundation (F59) oriented to the cardinal directions (Figure 5.6 and 5.7). F59 is situated at an upper elevation of 157.7 m a.s.l.

Though F59 was not removed and no diagnostic ceramics were recovered from excavated lots associated with it, it is probable that the foundation dates to the Minizundo phase based on similarly oriented Late Formative building foundations recorded by Joyce (1991) at Cerro de la Cruz and Rio Viejo. It is unclear how long the building foundation was occupied, what its overall size was, or whether a perishable superstructure was built on its surface.

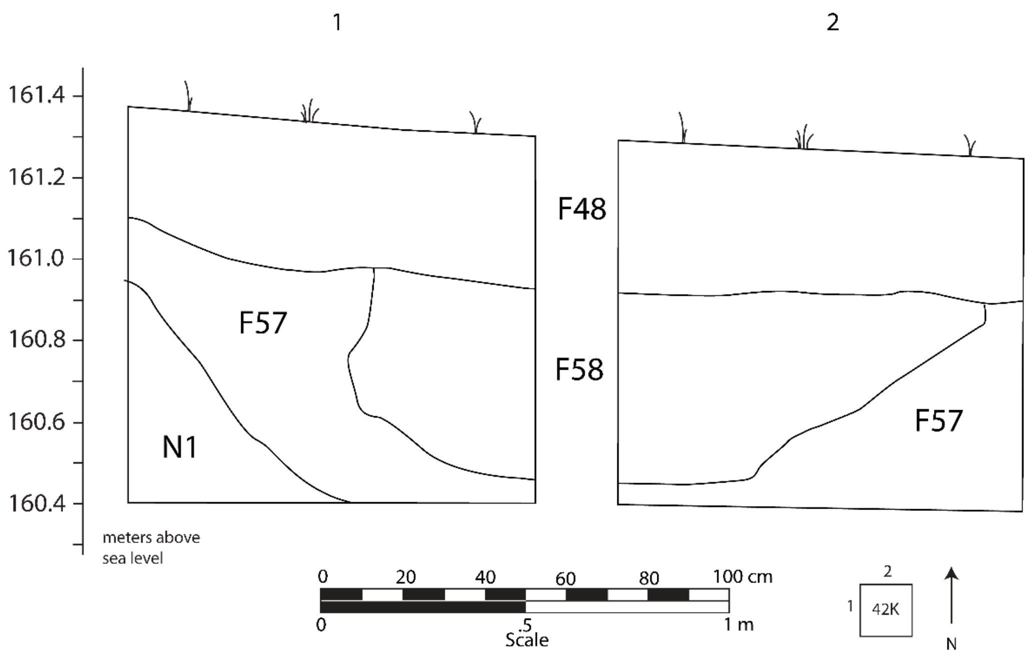


Figure 5.4: Stratigraphic profile of unit 42K.

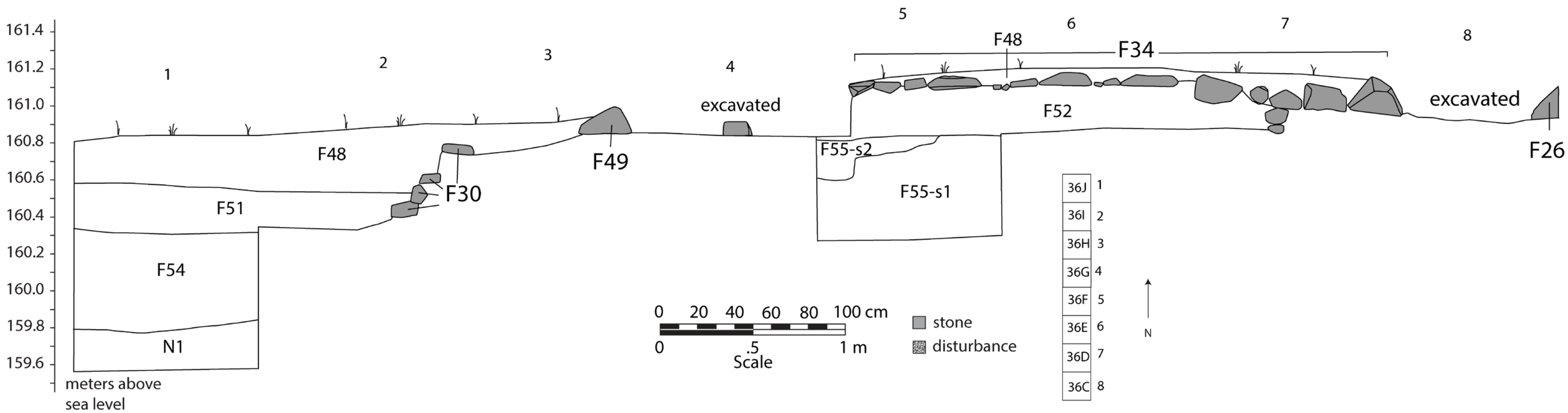


Figure 5.5: Stratigraphic profile of units 36C - 36J.

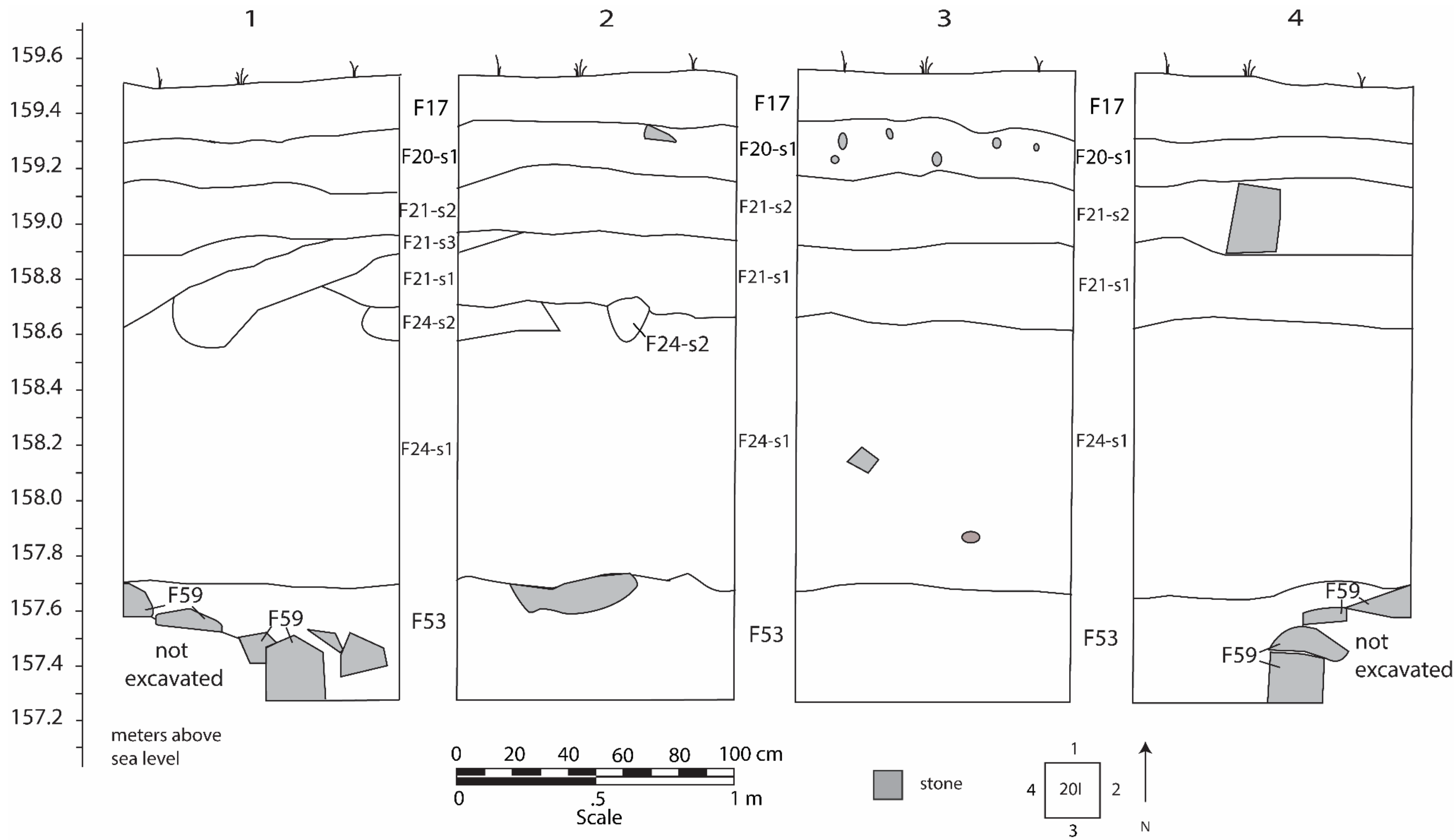


Figure 5.6: Stratigraphic profile of unit 20I.

Figure 5.7: Photograph of possible Minizundo phase building foundation (F59) in unit 20I.

Near the end of the Miniyua phase or early in the Chacahua phase, construction resumed in the area of Op F concurrently with other areas of the ceremonial center, including Structure 1 and Complex A (see Chapter 4). At this time, residents covered F59 with F53, a layer of loamy sand construction fill that elevated the occupational surface to approximately 157.8 m a.s.l. To the west, the deposition of several layers of fill formed a surface for building the ballcourt and Terrace 12. These early fill layers included F16 (exposed in unit 10F; Figure 5.8) and F15 (exposed in unit 12H; Figure 5.9). F16 consists of at least 50 – 55 cm of hard-packed loamy fill, which slopes upward toward the east to an elevation of 158.3 m a.s.l. The rise may represent an elevated surface on which the Terrace 12 retaining wall (eastern wall of ballcourt; F12 [see figure 5.8]) was built or may indicate erosion occurred within the playing field during or after its use (see below). In the area of unit 12H, builders deposited at least 60 cm of loamy sand fill (F15) at the same time or just after finishing F16, bringing the ground level up to an elevation of 158.5 m a.s.l. Excavations in units 10F and 12H did not reach bedrock, so it is possible that F15 and F16 are thicker or cover earlier deposits. After finishing F15, inhabitants of Cerro de la Virgen excavated a broad (approximately 1.5 m in diameter), deep (65 cm in depth) pit that was later filled with dark loamy sand sediment (F14) with a wide variety of inclusions, including mica, gravel, coarse sand, sherds, crushed rock, burned rock, daub, ash, charcoal, and unidentified faunal bone. Given the variety of debris present in F14, people may have used the pit to deposit refuse that resulted from activities carried out in the area of Complex B. F15 and F14 were covered with two thin layers of poorly sorted sandy loam fill (F13-s1 and F13-s2).

Builders then began an extensive phase of construction during the Chacahua phase that created Terrace 12 and the ballcourt, raising the ground surface to the east of the ballcourt by as much as 50 – 60 cm. To create Terrace 12 and the ballcourt playing alley, builders constructed F12. F12 is a retaining wall of four to five courses of faced granite stones that retained fill layers F11, F10, F9, and F7 to the east (Figure 5.8 and 5.9). Due to the weight of the retained fill and post-depositional movement, the F12 retaining wall in its present-day form leans to the west at an angle of approximately 20° (Figure 5.10). The wall would have maintained a straight vertical angle during its main period of use. F12 is 1.1 m in height, similar in size to the retaining wall used to construct Structure 1-sub 1 (see Chapter 4), and the upper course of the wall can be seen on the modern-day surface. Although the stones used to build F12 all appeared to be faced, the sizes and shapes of the stones were not standardized. Presumably, builders also constructed the western ballcourt wall (retaining wall of Terrace 13) at this time, which would have bounded the playing alley on the western side. The PRV13 did not excavate Terrace 13, nor the western ballcourt wall.

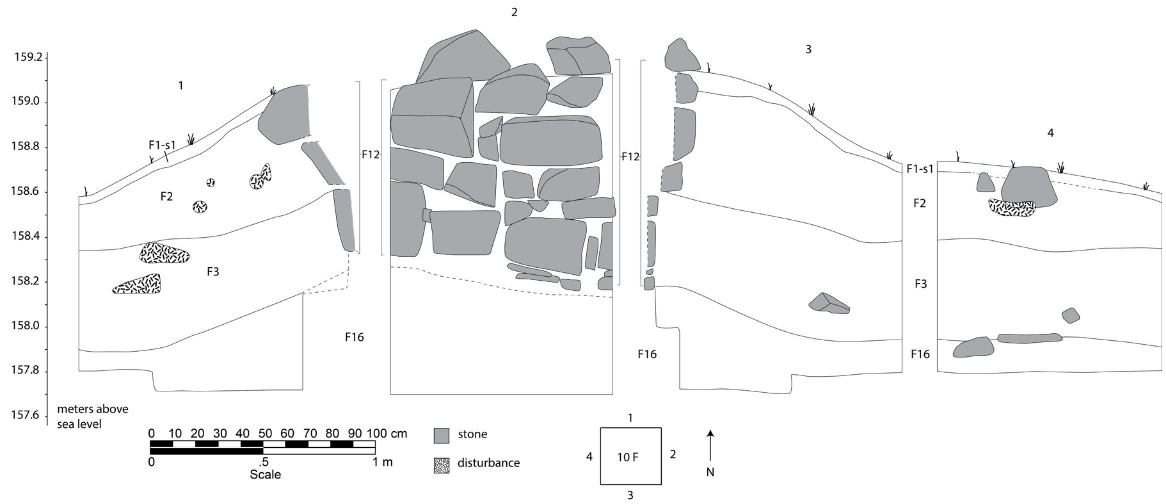


Figure 5.8: Stratigraphic profile of unit 10F.

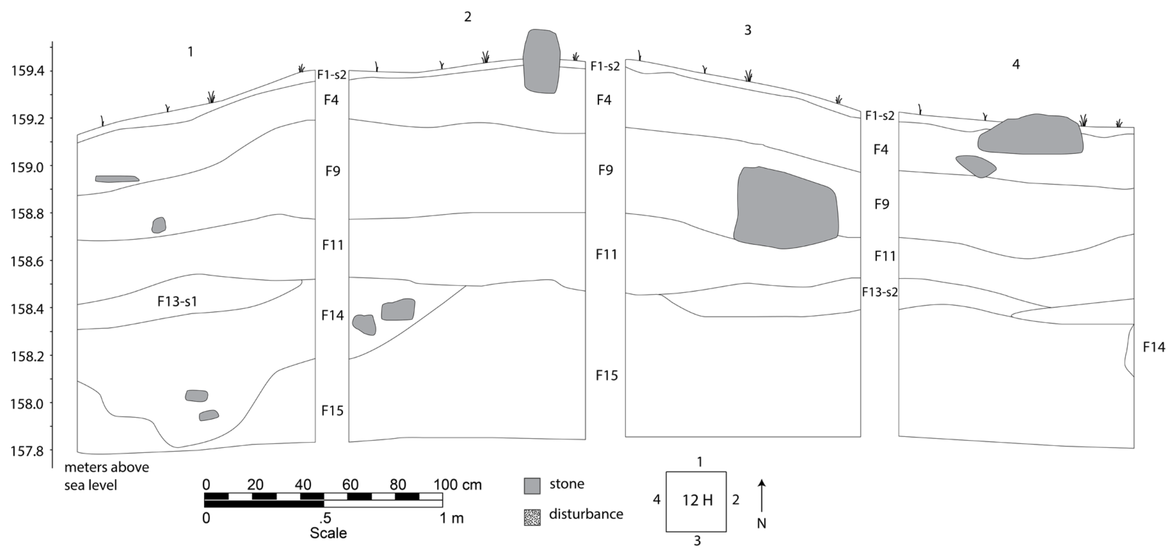


Figure 5.9: Stratigraphic profile of unit 12H.

Figure 5.10: Photograph of retaining wall (F12) in east profile of unit 10F.

A large construction fill episode (F24) followed the construction of F12, during which builders raised the level of Terrace 12 by over 1 m in height. F24-s1 constitutes the majority of sediment deposited during this period, consisting of sandy clay loam that was very densely packed and contained more clay than was recorded in the sediment matrices of surrounding strata (Figure 5.11). Near the beginning of the deposition of F24-s1, residents interred B2-I2, a burial of a young-to-middle-age adult (18-43) within the fill (Figure 5.12). No distinct burial pit was detected in profile nor in plan, suggesting the remains were placed concurrently during the construction of the fill layer. B2-I2 was placed in a flexed position facing east along the Terminal Formative period site orientation of 25˚-205˚, with the skull positioned to the south. No burial goods or offerings were found to be associated with the burial. The individual exhibited severe dental attrition, two carious lesions, and hypercementosis. The pelvis was not preserved, so no determination of sex could be made (see Appendix E for detailed osteological analyses).

Three sub-strata of F24 were detected near the surface of F24-s1, all of which contained large amounts of reddish, burned daub inclusions. In unit 20I, F24-s2 consisted of clayey sand filled with chunks of disintegrated burned daub or adobe material and very few sherds. In unit 18J, F24-s3 contained sandy clay loam with disintegrated burned daub and small amounts of charcoal in a densely packed matrix. F24-s4 is located adjacent to F24-s3 and is identical but more softly packed. While it is unclear exactly what F24-s2, F24-s3, and F24-s4 represent, it is possible that each contain small amounts of debris from a burned superstructure that may have originally been situated on the occupational surface formed by F24-s1. Alternatively, these sub-features may represent pits that were filled with occupational debris, though the absence of much cultural material from F24-s2 does not suggest it was pit fill. In unit 12 H, F13, F14, and F15 were covered by F11, a layer of sandy loam construction fill that brought the occupational surface up to the same elevation as F24 at approximately 158.7 m a.s.l.

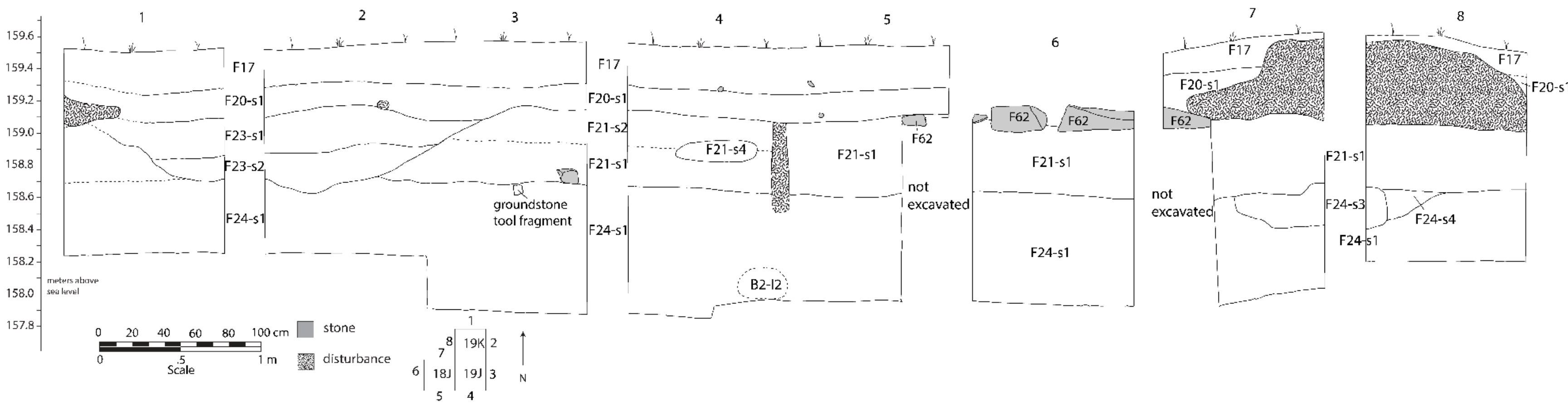


Figure 5.11: Stratigraphic profile of units 18J, 19J, and 19K.

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Figure 5.12: Burial 2-Individual 2, plan drawing (left); photograph (right).

The deposition of F24, F11, and presumably analogous fill layers to the east created a relatively flat terrace surface on which occupation and further construction could occur. Though the surface rose to the east to meet the natural bedrock, the angle of the slope was probably barely noticeable. For example, the angle of the rise from the upper surface of F11 in unit 12H to the upper surface of bedrock (N1) in unit 36J would have been approximately 2.4˚. It is on this occupational surface in the eastern area of Terrace 12 that a unique set of activities began to be carried out in conjunction with additional construction efforts. Evidence from unit 36J indicates that Terrace 12 was used as a workshop for the manufacture of faced stones to be used in masonry building foundations and terrace walls and possibly thin slabs made for the numerous offerings at the site (Figure 5.13). Excavations in 36J revealed F54, a stratum of sandy loam with inclusions of large stones with angular breaks and flat faces, as well as sherds and occasionally ash and charcoal. Several broken hammer stones were also recovered from the fill layer. F54 was 55 cm in thickness, suggesting that workshop activities continued over a significant amount of time while Terrace 12 continued to be raised and used for other ritual activities. It is not clear whether a structure was present on the occupational surface at this time.

To the west, construction of the terrace continued in conjunction with the workshop activities associated with F54. In the western area Terrace 12 (units 14F, 14G, 15G, 18J, 19J, 19K, and 20I), builders deposited F21, a layer of sandy loam that had variable levels of inclusions among four distinct sub-strata. Within F21-s1 in unit 14G, residents interred B3-I3, a secondary burial consisting of the redeposited remains of an individual of unknown age and sex. No clearly delineated burial pit was identified, making it unclear whether B3-I3 was deposited during the F21-s1 fill episode or in a shallow pit after it was complete (Figure 5.14). Osteological remains only included the long bones of the lower limbs, which precluded aging and sexing the skeleton (see Appendix xxx). No burial goods were found to be associated with B3-I3.

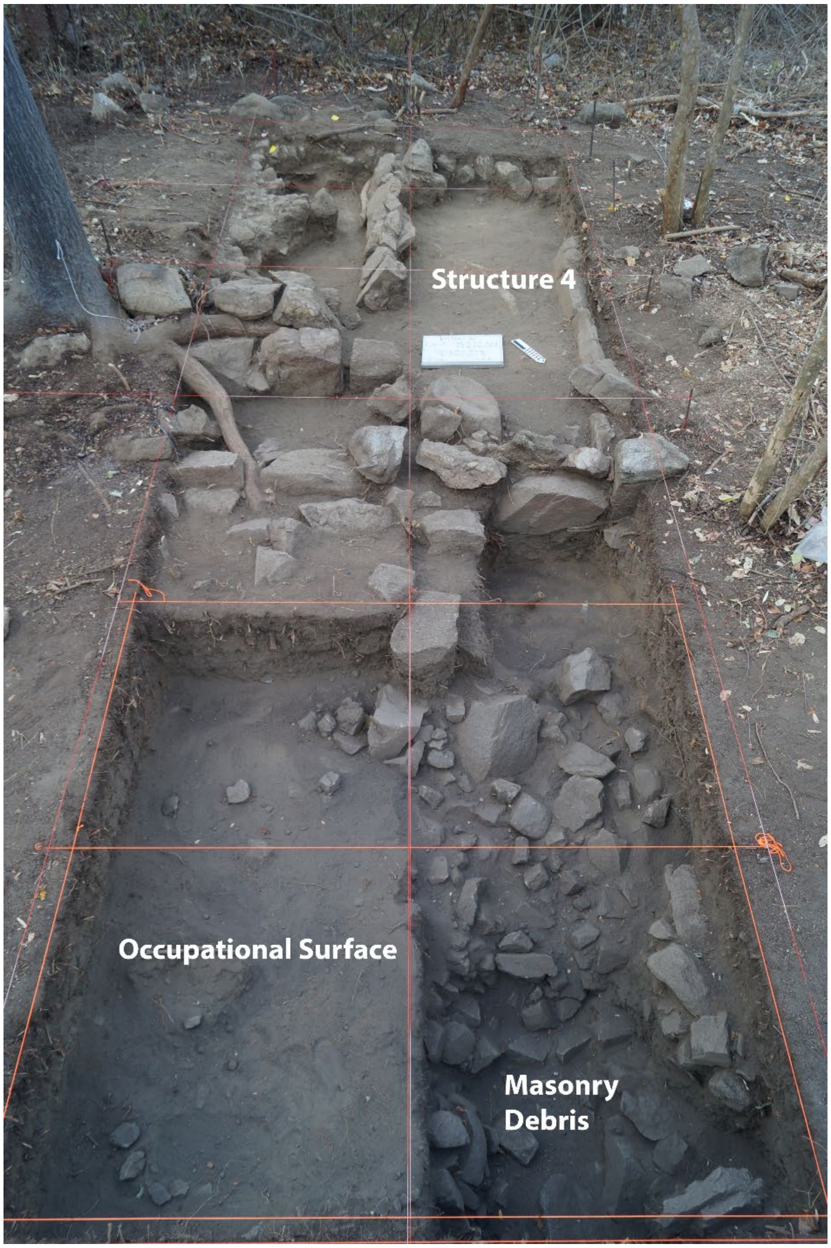

Figure 5.13: Masonry debris in context with Structure 4 and occupational surface in interior patio of Complex B; Unit 36J located at the bottom right of photo.

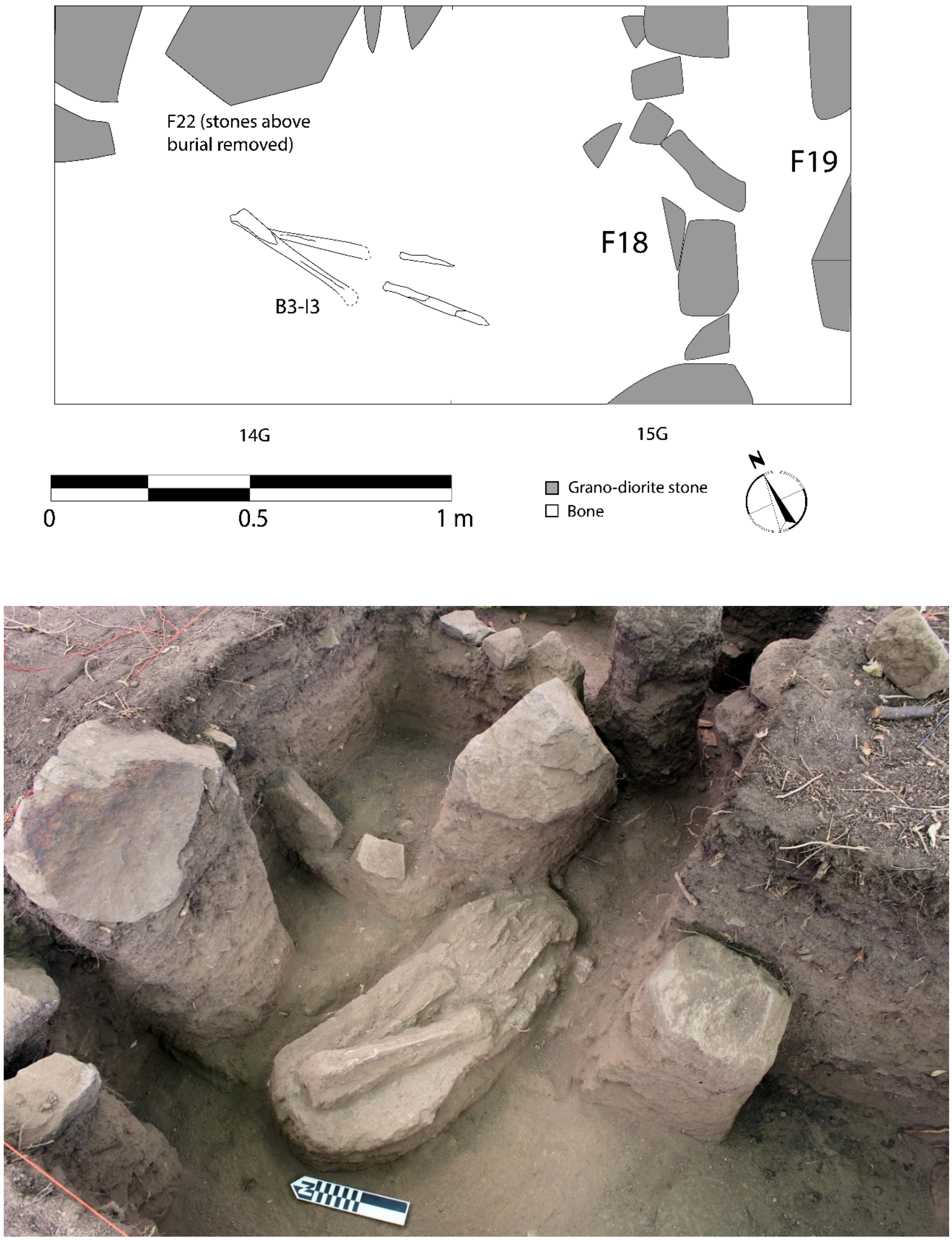

Figure 5.14: Burial 3-Individual 3, plan drawing (top), photograph (bottom).

In the southwest area of Op F, F9 (unit 12H; Figure 5.9) and F10 (units 12D and 13D; Figure 5.16) were deposited during the same general construction episode as F21. At the beginning of the F9 construction episode, inhabitants of Cerro de la Virgen placed two small cylindrical offering vessels (F8) in the fill prior to completing the construction phase (Figure 5.15). The eastern offering vessel (F8-Ob1) exhibited a small hole punched in the upper vessel wall, which may have aided in mending the vessel prior to its placement or perhaps designed to "kill" the vessel. The western vessel (F8-Ob2) was accompanied by a lid, which sat adjacent to the offering vessels. F9, which slopes downward to the east as it approaches F12, brought the ground surface in the area of unit 12H up to an elevation of 159.2 m a.s.l.

Figure 5.15: Photograph of offering vessels (F8) in unit 12H

Following the deposition of F54, F21, F9, and F10, a break in construction may have occurred. At this time, a 50 cm-deep pit (F23) was dug down from the top of F21-s2, and later filled with black loam

(F23-s2) and later dark loamy sand (F23-s1). A small line of stones (F62) was placed on the surface of F21-s1 in unit 18J, but this wall did not appear to articulate with any other architecture that was excavated in Op F. Presently, the function of F62 is unknown.

Later in the Chacahua phase, masonry construction resumed to transform Terrace 12 into a formal architectural complex (Complex B). The first of several major changes included construction of a low platform (Structure 5; Figures 5.3, 5.16-5.22) that ran parallel to the terrace retaining wall (F12). The low platform is oriented slightly to the east of the general site orientation along its north-south axis at 31˚-211˚. Structure 5 is composed of two levels, the lower of which (Structure 5-sub) was formed by F5 and F19 and the upper (Structure 5) formed by F22 and F18. F5 runs west-east, retaining fill layer F7 to the north, and F18 runs north-south, retaining fill layers F4 and F7 to the west. The corner of the lower level of Structure 5-sub, presumably formed by the articulation of retaining walls F5 and F19, was not exposed by excavations. To the east of F19, the occupational surface stepped down approximately 20-30 cm.

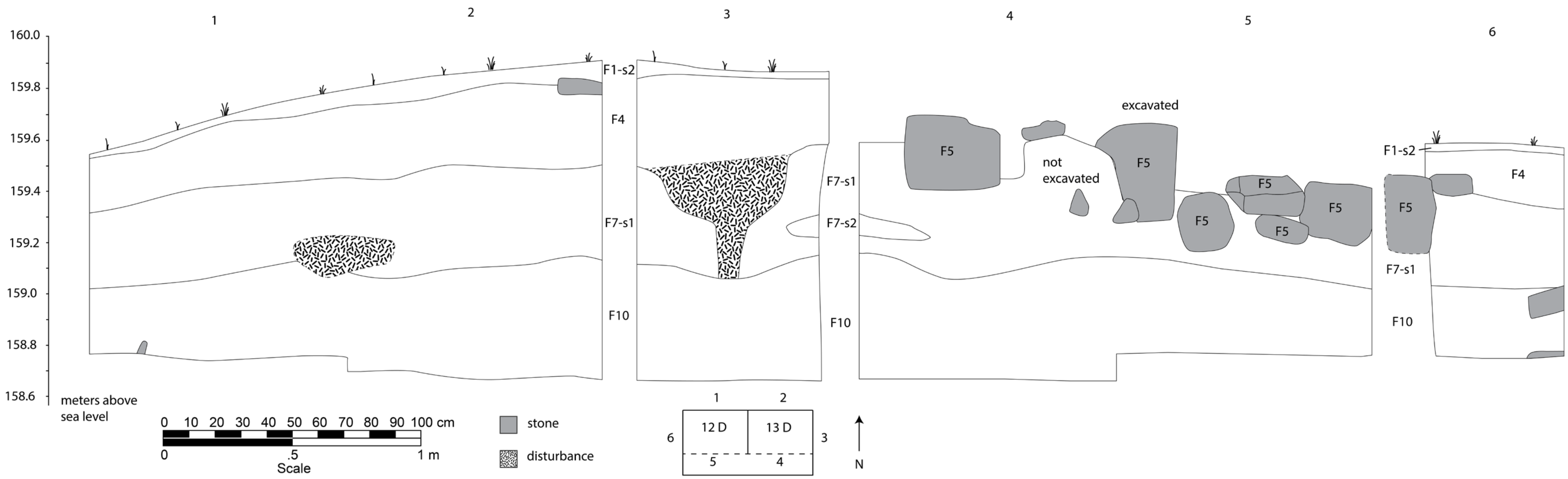

Figure 5.16: Stratigraphic profile of units 12D and 13D.

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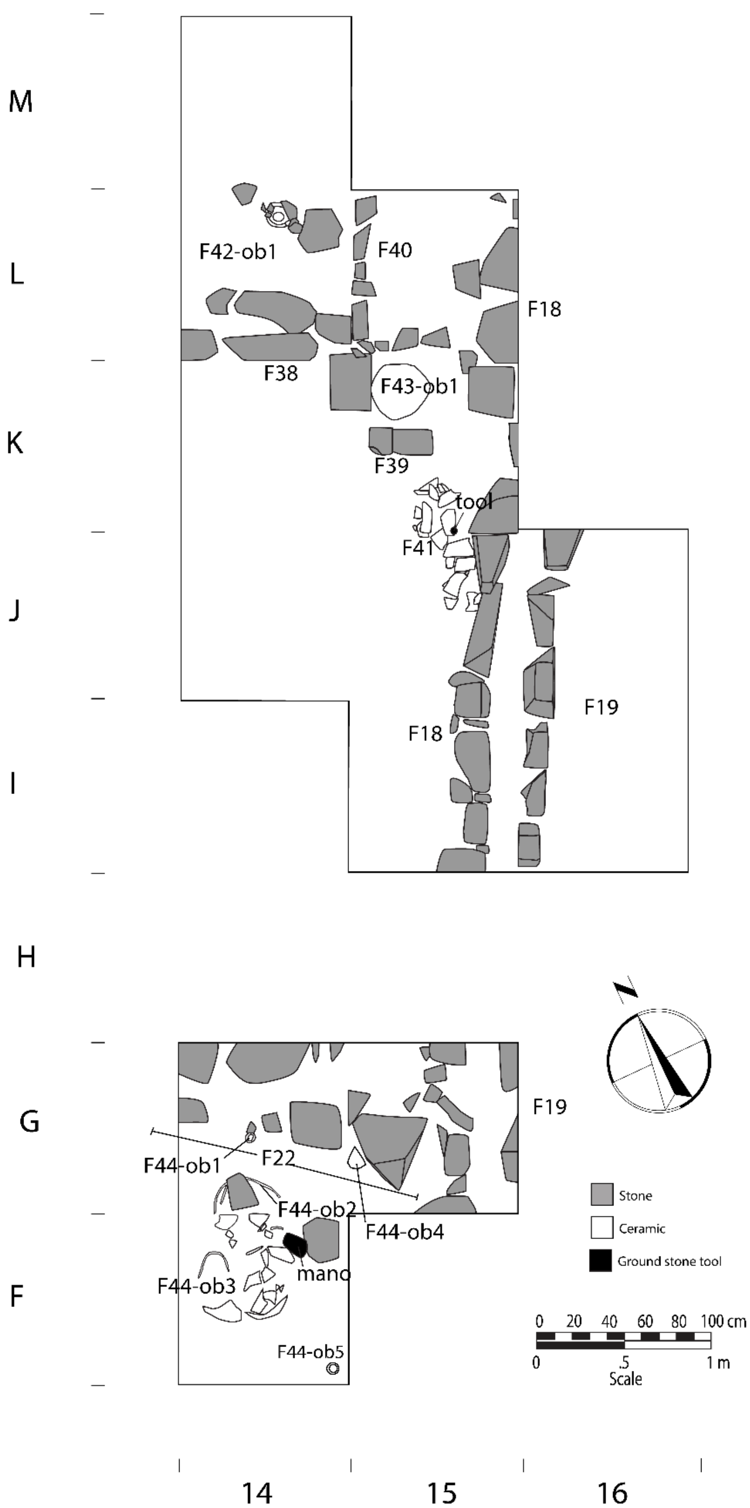

Figure 5.17: Structure 5 plan diagram

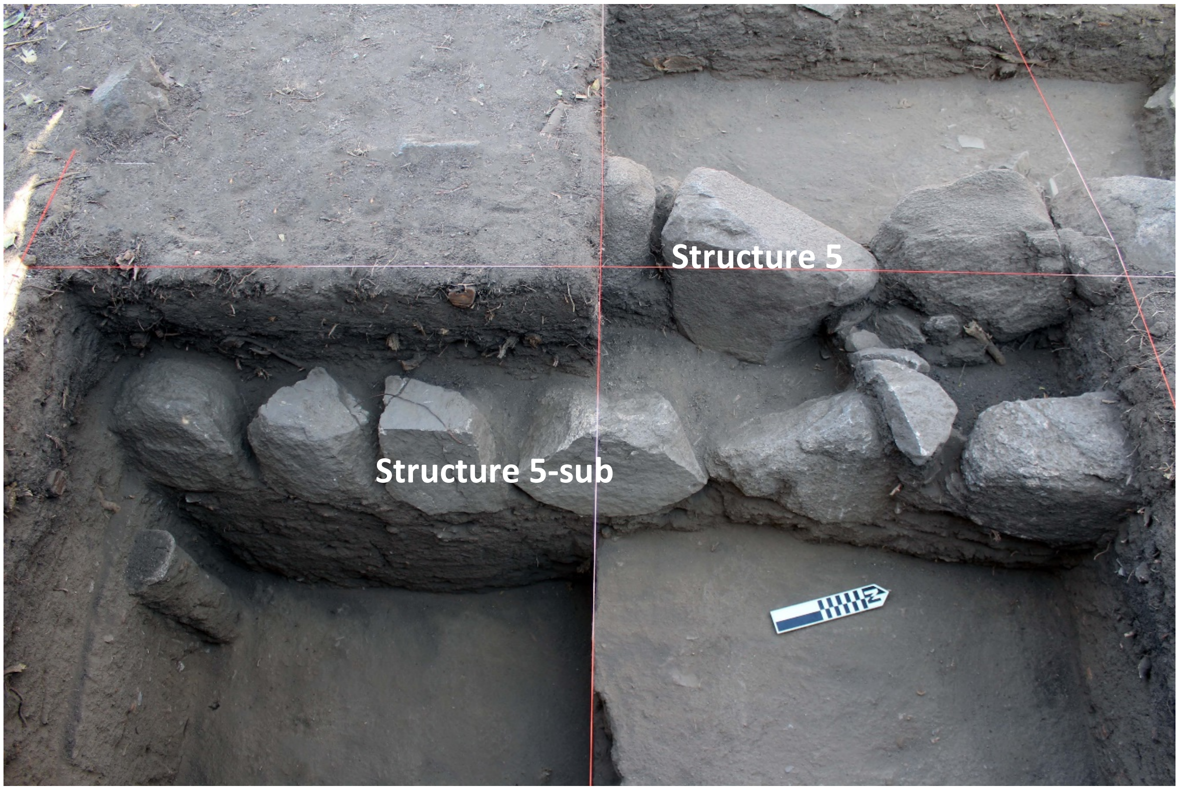

Figure 5.18: Photograph of retaining walls F18 and F19 looking west.

The period following the construction of Structure 5-sub witnessed a variety of activities identified archaeologically, including the placement of ceramic vessel offerings, the interment of a burial, and possibly cooking. In units 15J and 15K, several broken vessels (F41) were deposited within F4/F7 (Figures 5.17 and 5.19). Unlike the small and eroded pottery typically seen in fill layers at Cerro de la Virgen, sherds in F41 were large, well preserved, and flat-lying, with a majority refitting with other sherds in the deposit. F41 contained a variety of vessel forms and paste types, including coarse brown ware bowls and jars, gray ware bowls and jars, and fine brown ware bowls (see Appendix A). Given the absence of other materials such as faunal bone, ash, and charcoal, it is unlikely that F41 was a midden. The Miniyua phase fine brown ware bowls may have been heirlooms placed as a termination deposit to close Structure 5-sub prior to the construction of Structure 5 later in time. Alternatively, the fine brown wares may have been heirlooms.

Figure 5.19: Photograph of F41 and other features behind St. 5 retaining walls (looking east).

Figure 5.20: Photo of F41 up close with F18 in background.

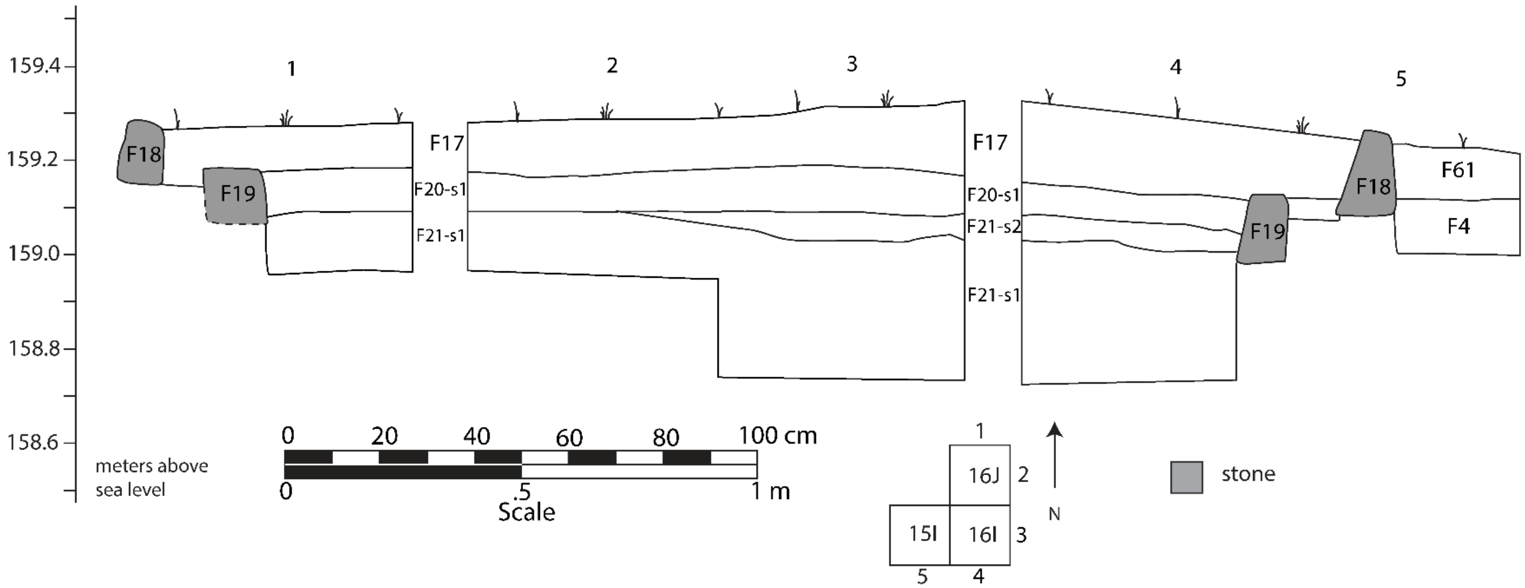

Figure 5.21: Stratigraphic profile of units 15I, 16I and 16J.

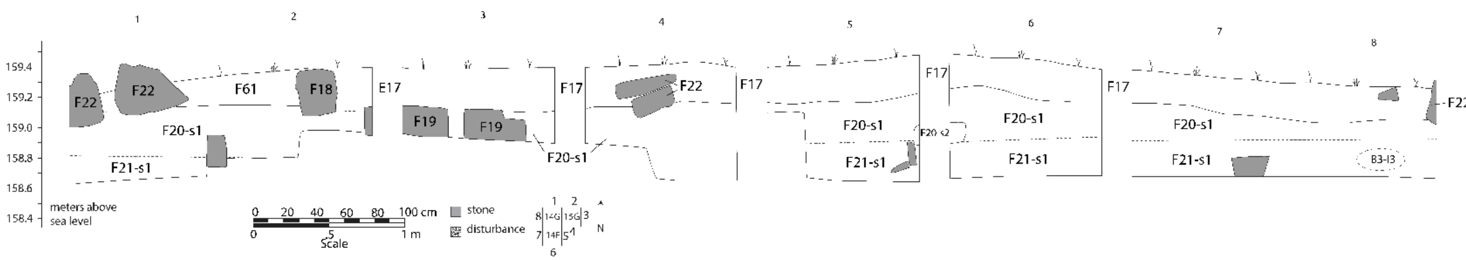

Figure 5.22: Stratigraphic profile of units 14F, 14G and 15G.

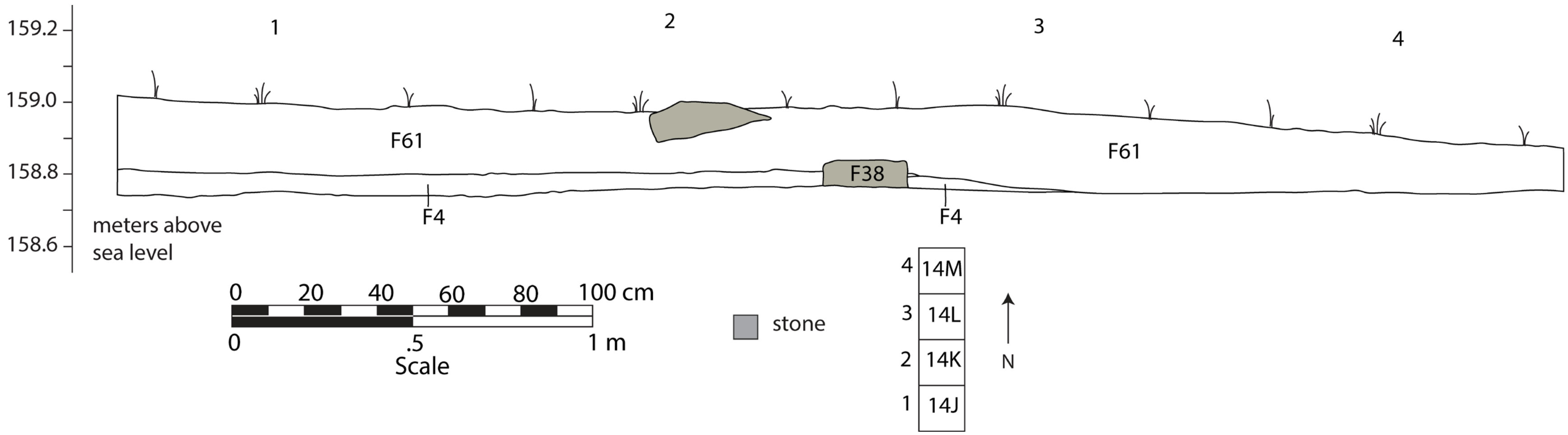

Figure 5.23: Stratigraphic profile of units 14J, 14K, 14L and 14M.

To the south in units 12D and 13D, residents interred B1-I1 within a shallow burial pit (F6) excavated into F7-s1 beneath the surface of the Structure 5 platform (Figures 5.24 - 5.26). B1-I1 was most likely redeposited given its extremely poor preservation. The burial was oriented east to west at an alignment estimated to be slightly off of the site orientation at 104˚-284˚, with the head positioned to the east. Less than 10% of the skeleton was present, which precluded determining age, sex, and pathology of the individual. The delineation of the burial pit (F6) into which B1-I1 was placed was also unclear. The limits of F6 were approximated according to differences in sediment composition. For example, loamy sand (F6) surrounding B1-I1 was much softer than the surrounding fill (F7-s1), which may represent fill deposited to cover the burial. No offerings were associated with the burial.

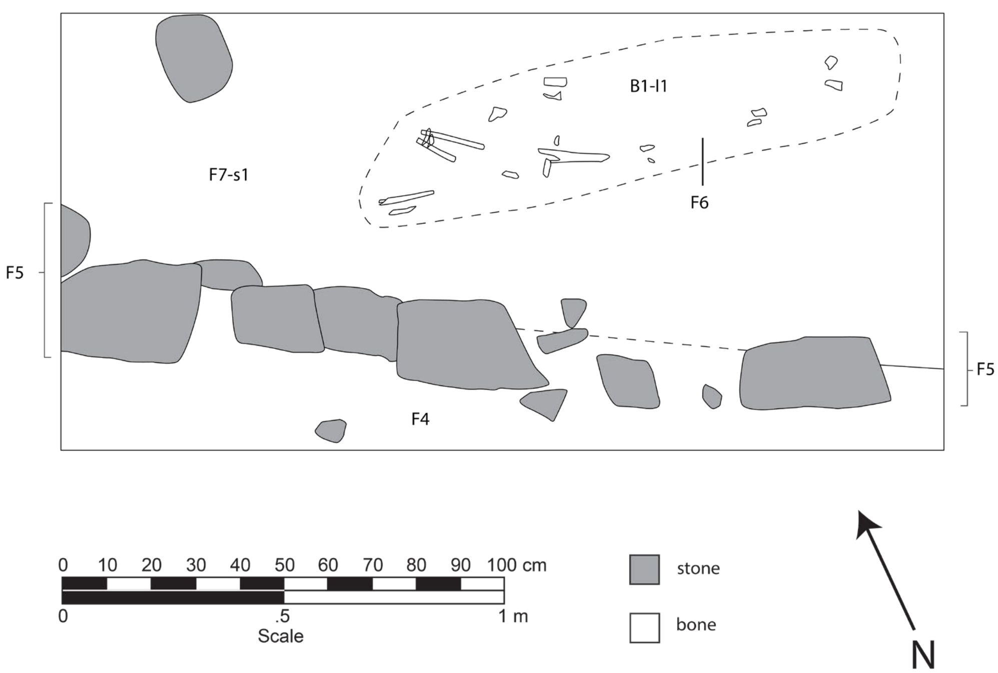

Figure 5.24: Plan map of B1-I1 in units 12D and 13D.


Figure 5.25: Photograph of B1-I1 in units 12D and 13D.

Figure 5.26: Photograph of B1-I1 below F5 retaining wall.

As construction on Structure 5 was being completed, or perhaps immediately following its completion, residents deposited an offering of at least 42 ceramic vessels (F60-s1) accompanied by thin stone slabs (F60-s2) into fill layer F21 and covered it with fill layer F20 (Figures 5.27-5.33). The deposition of F20 raised the occupational surface by 20 cm, to approximately 159.5-159.6 m a.s.l., covering the eastern retaining wall of Structure 5-sub (F19). A total of 16 m^2 of F60 was exposed in units 16-21M, 18-21N, 20-21O, 21P, 21Q, 18J, 19K, and 20-21R. The depositional pattern of F20, F21, and F60 was similar to those examined in Complex A and Structure 1 (see Chapter 4); however, unlike the Complex A offering, Op F-F60 did not contain stone compartments and did not exhibit evidence of vessels stacked atop other vessels. Stone slabs (F60-s2) were situated in groups adjacent to certain vessels in a pattern similar to Complex E (Chapter 6). Therefore, it is equally possible that F60-s1 vessels were placed simultaneously as one large ritual deposit or that they were placed sequentially over time. If placed sequentially, it is likely that F20 was deposited soon after some of the first vessels were placed, given the level of preservation of the vessels. Two vessels were rectangular in shape (Figure 5.33) and resembled similar vessels found at Yugue (Barber 2005) and San Francisco de Arriba (Workinger 2002).

The concentration of offering vessels dissipates to the west of unit 17M, to the south of the "M-line" of excavations, and to the north of the "R-line" of excavations. Given the high concentration of vessels in units 21N, 21O, 21Q, and 21P, it is likely that the offering extended to the east for at least another meter. Given the lack of offerings in unit 19K just one meter to the south of this excavation group, I estimate that the offering likely covered an area of 25-35 m^2. However, it is unclear whether the unexcavated units contained a higher concentration of vessels, so an estimate of vessels for the entire offering is not attempted here. Immediately south of and below retaining wall F22 in units 14F and 14G, excavations revealed five ceramic vessels and a ground stone mano (F44) deposited as an offering. Currently, it is not clear whether this deposit can be qualified as a dedication or termination offering.

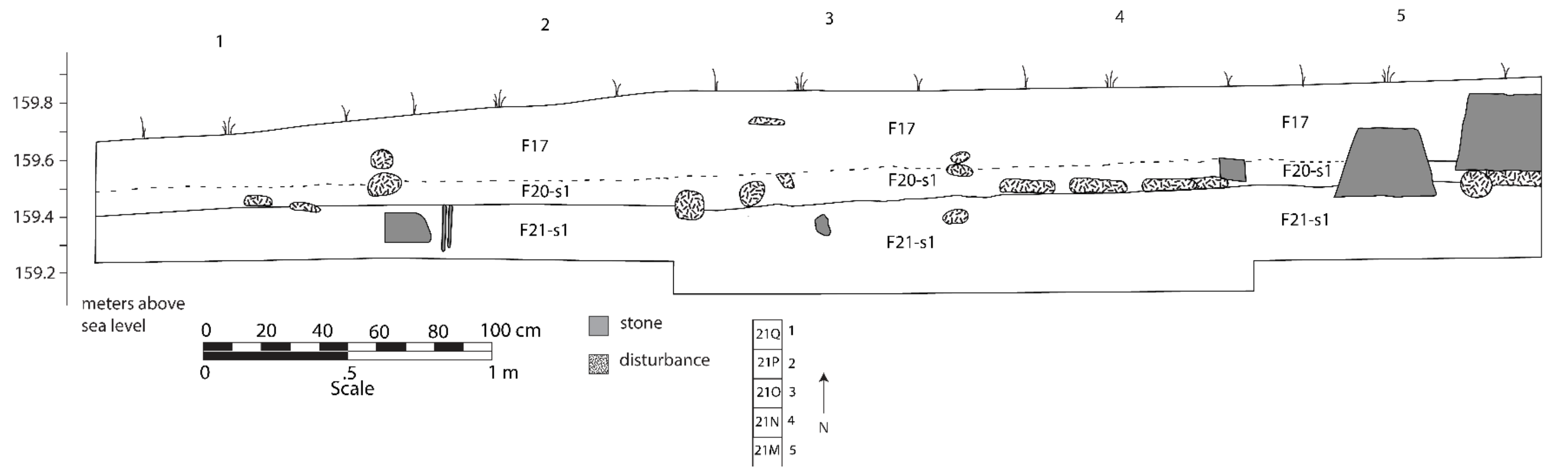

Figure 5.27: Stratigraphic profile of units 21M-21Q (east walls).

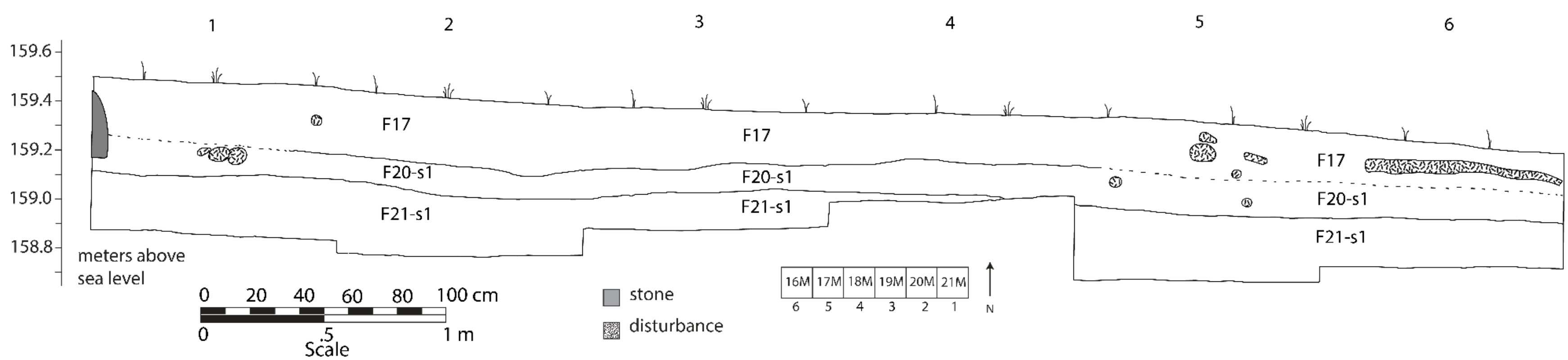

Figure 5.28: Stratigraphic profile of units 16M-21M

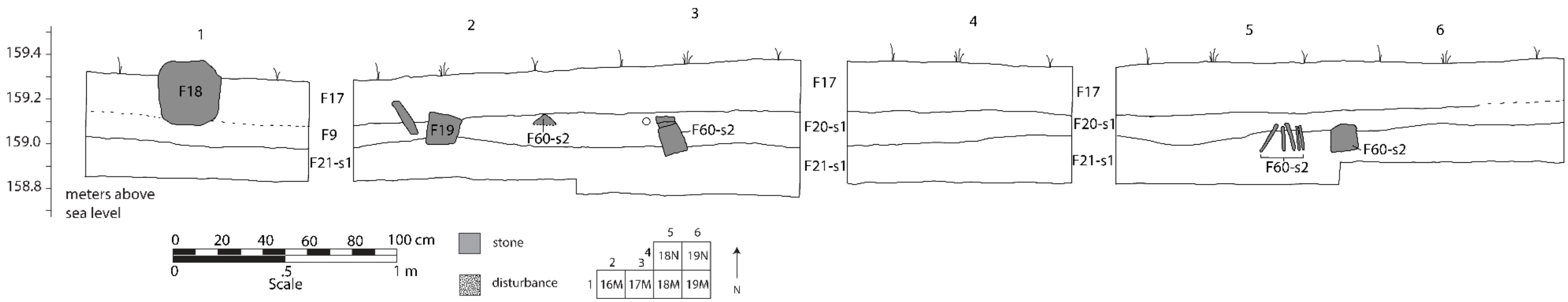

Figure 5.29: Stratigraphic profile of units 16M, 17M, 18N, and 19N.

Figure 5.30: Plan drawing of F60 offering.

Figure 5.31: Photograph of F60 in units 19N and 20N.

Figure 5.32: Photograph of offering F60 in unit 20O.

Figure 5.33: Photograph of offering F60 in unit 21N.

In the eastern half of Terrace 12, an additional layer of fill (F51) was deposited in the area of units 37-42K, 37H-J, and 36I-J. F51 raised the level of the eastern area of Terrace 12 by about 25 cm to an elevation of 160.6 m a.s.l., which maintained the slightly down angle of the terrace slope present during previous occupational periods, likely to channel rainwater off the terrace to the southwest. F51 also constituted the surface on which Structure 4 would later be built. In the area of unit 34K, residents deposited a small offering of two ceramic vessels (F37-s1) and thin stone slabs (F37-s2) into F51 (Figures 5.34, 5.39). Both vessels were short-necked grayware jars, but it is unclear whether they date to the Miniyua or Chacahua phases, suggesting the feature may have been transitional Miniyua-Chacahua or early Chacahua in date.

Figure 5.34: Photographs of Offering F37, F37-s1-ob1 (above), F37-s1-ob2 (below)

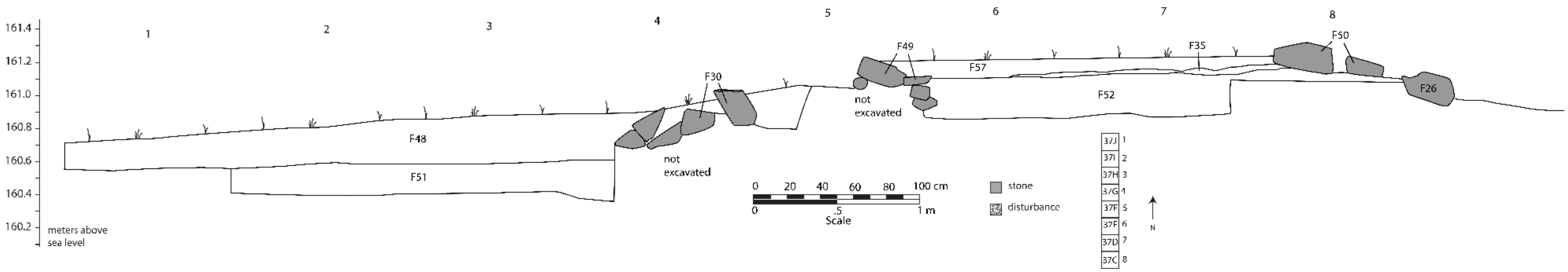

Figure 5.35: Stratigraphic profile of units 37C-37J (east wall).

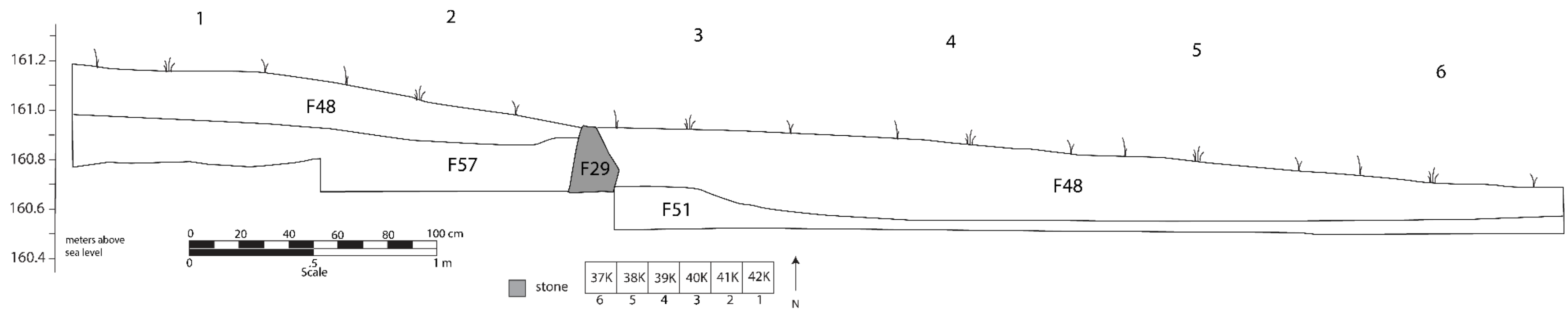

Figure 5.36: Stratigraphic profile of units 37K-42K (south wall).

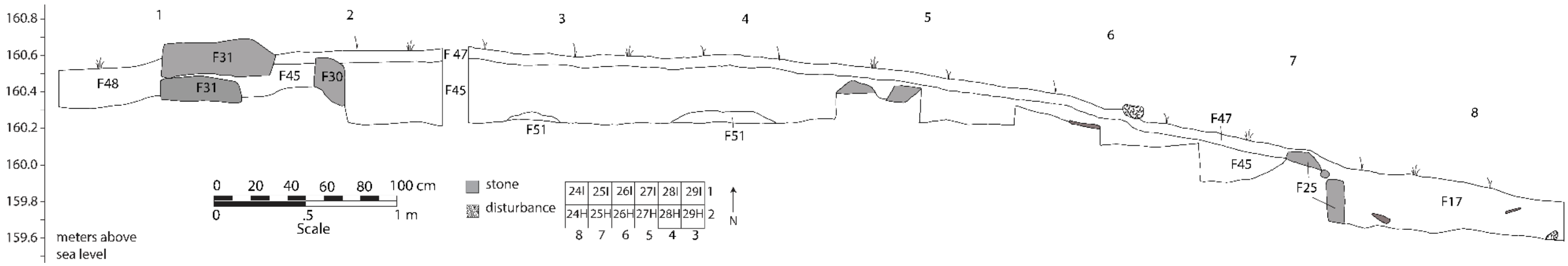

Figure 5.37: Stratigraphic profile of units 24H-29H and 29I.

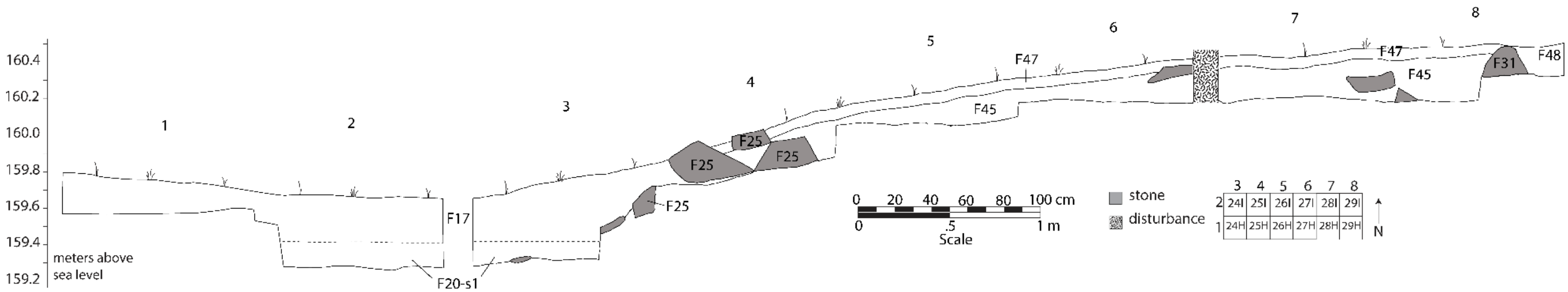

Figure 5.38: Stratigraphic profile of units 24I-29I and 24H.

The next major building phase on Terrace 12 was focused on the second level of the low platform adjacent to the ballcourt (Structure 5) as well as the construction of Structure 4, an L-shaped masonry platform situated in the eastern half of Terrace 12 (Figures 5.3, 5.17, 5.35-5.39). Structure 5 was built on the surface of F4, F7, and F20. As with Structure 5-sub, only the south (F22) and east (F18) walls were exposed in excavations. F22 and F18 retain fill layer F61 to the north and west, respectively. While I suspect that the F60 offering deposit, and the F20 fill layer that covered it, was placed prior to the construction of Structure 5, it is also possible that they were built and deposited concurrently. Therefore, it is possible that F60 was placed as a dedicatory offering associated with the opening of Structure 5. During the deposition of F61, several lines of stone (F38, F39, and F40) were placed just beneath the surface of St. 5-sub 1 in the area of units 14K, 14L, 15K, and 15L. F38 runs west-east, articulating with F18 and intersecting F40 at a perpendicular angle (see Figure 5.17). F39 runs parallel to F38, but it is unclear whether it extends to the edge of F18. Within the space created by the three lines of stone, residents placed F43-ob1, a large coarse brown ware jar recovered in fragments. Though the deposit lacked an intact rim or base, the form of the vessel recovered in situ indicates it was placed with the opening facing up. Several sherds exhibited burning on the exterior, suggesting it was used for cooking. Flotation samples were taken from inside the vessel, the results of which are pending.

Immediately to the north of F38 and west of F40, residents placed another discrete ceramic vessel offering (F42-ob1) just beneath the occupational surface of Structure 5 (Figure 5.17). F42-ob1 is a small gray ware jar with incised triple line decorations on its exterior that indicate the vessel dates to the Chacahua phase. It was placed with the opening facing down and was likely smashed before it was covered with sediment from F61, though the rim and neck remained intact. Alternatively, F42-ob1 may have simply been a broken vessel left on the surface of Structure 5-sub (F4).

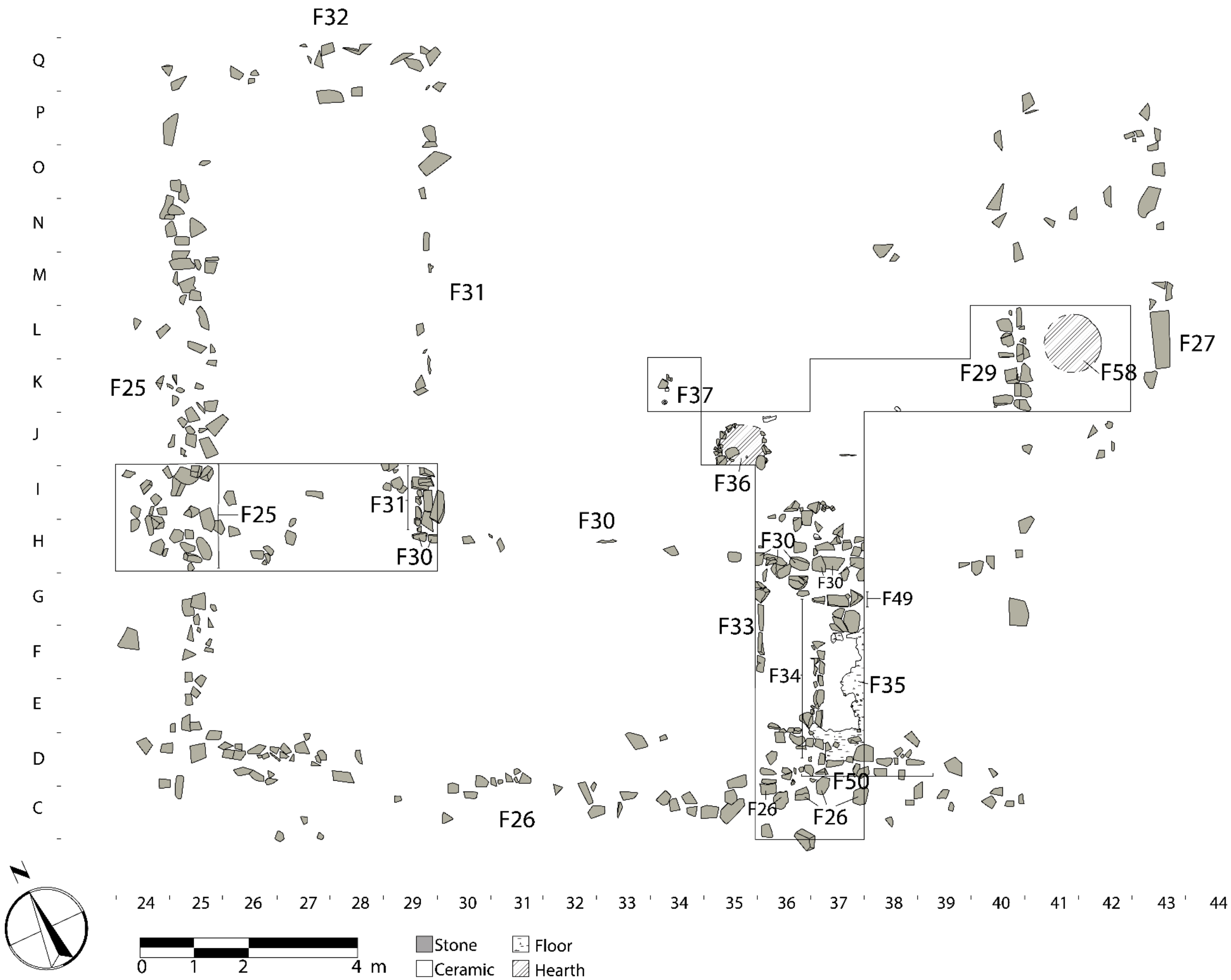

Figure 5.39: Plan drawing of Structure 4 and associated features.

Though the timing is unclear, at some point during the construction of Structure 5, construction also began on Structure 4, an L-shaped masonry foundation located in the eastern half of Terrace 12. The building foundation opens to the northeast, forming an interior patio in a manner similar to Structures 2 and 3 in Complex A, though the latter opens to the northwest. The western "arm" of Structure 4 is formed by three stone retaining walls, two running north-south (F25 and F31) and one running west-east (F32) connecting them, built atop F20. In the southern "arm", retaining walls F26 and F30 were built atop F51 and run parallel to each other from east to west, but neither surface survey nor excavations exposed a wall running north-south that connected F26 and F30. Excavations in units 29H and 29I confirm that the western and southern "arms" articulated at a right angle, forming one continuous structure. The longest sides of Structure 4, F25 and F26, measured approximately 13.5 m and 16 m, respectively. The measurement of F26 is a rough estimate, but the presence of a granodiorite outcrop in what would have been unit 43D suggests that the maximum length of the southern "arm" of St. 4 could have been 18 m, but was more likely slightly shorter than that. Based on the estimated length of F26, I estimate F30 to have been 11 m in length. F31 was 9.4 m in length.

The interior fill of Structure 4 was composed of dark brown loamy sand (F52; Figure 5.35) in the southern arm and dark brown sandy loam (F45; Figure 5.37-5.38) in the western arm. F45 was recorded in the western group of excavation units (25-29H and 25-29I) and F52 was recorded in the southern group of units (36C-G and 37C-G). Given the similarity between sedimentary matrices it is possible that F45 and F52 were sub-strata of the same fill deposit, but the distance between them precludes making this designation with certainty. While few cultural features of note were found in the western excavation area of St. 4, evidence from the southern group of excavation units indicates that additional masonry architectural features were included within the foundation walls. In the area of units 36F and 36G, builders placed a line of stones that may have been a foundation for a standing wall of a superstructure, possibly made of wattle and daub. This feature was not explored to the west, so it is unclear whether it articulates with another wall running west-east. Immediately to the southeast in the area of units 37E, 37F, and 37G, three additional lines of stone (F34, F49, and F50) form a possible foundation for a small superstructure (Structure 4-super 1). F34 runs north-south and connects F49 to F50, all of which retain F35, a floor composed of silty clay with sand inclusions. F35 was probably made from mud plaster, formed by pre-mixing the sediment with water to be dried and hardened in the sun (Figures 5.39, 5.42, and 5.43). Similar mud plaster floors have been found at the Rio Viejo acropolis (Joyce and Levine 2008). The remains of F35 eroded in the western edge of St. 4-super 1, but preserved in units 37D, 37E, and 37F. Sherds recovered from F35 date to the Chacahua phase, but no *de facto* ceramic refuse was found. However, among the artifacts that were associated with the occupational surface within St. 4 and in the interior patio to the north of the building (Figure 5.40) were several ground stone tools, including chisels, hammerstones, a ground stone edge sharpener, smoothers, and axes. The ground stone objects, though not found together in a single cache, represent a toolkit employed to create the large, faced stones that comprise the site's many terrace retaining walls (Figure 5.41). Similar terraces are found at other sites, but no single public building in the lower Verde has contained a similar collection of tools. For a more detailed description of the ground stone tools recovered in Op F, see Appendix B.

Figure 5.40: Green fine-grained basalt chisel in situ within Structure 4 (above); Groundstone smoother in situ *on occupational surface south of Structure 4 on the interior patio (below).*

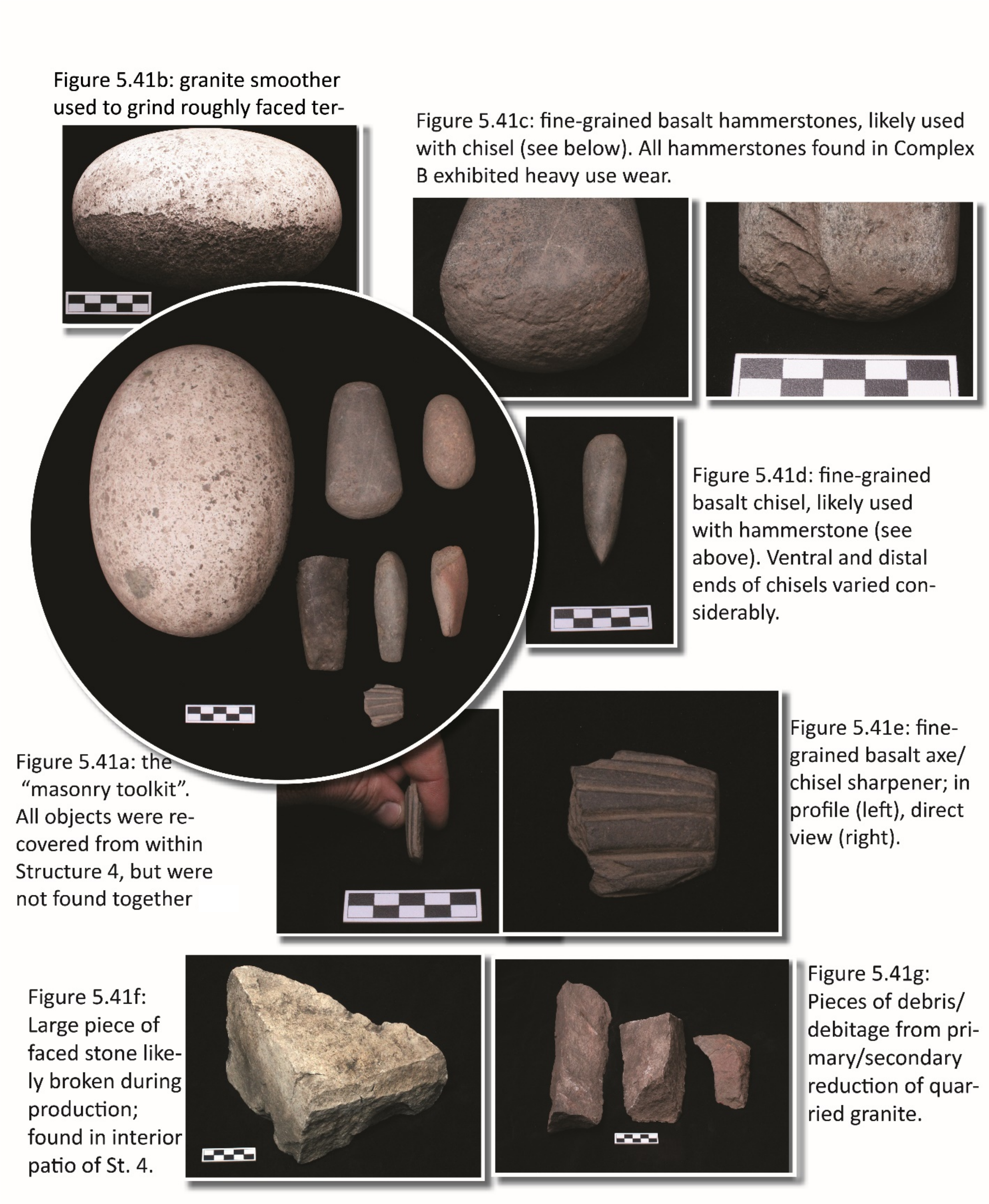

Figure 5.41: The "masonry tool kit" associated with St. 4 and patio to the north.

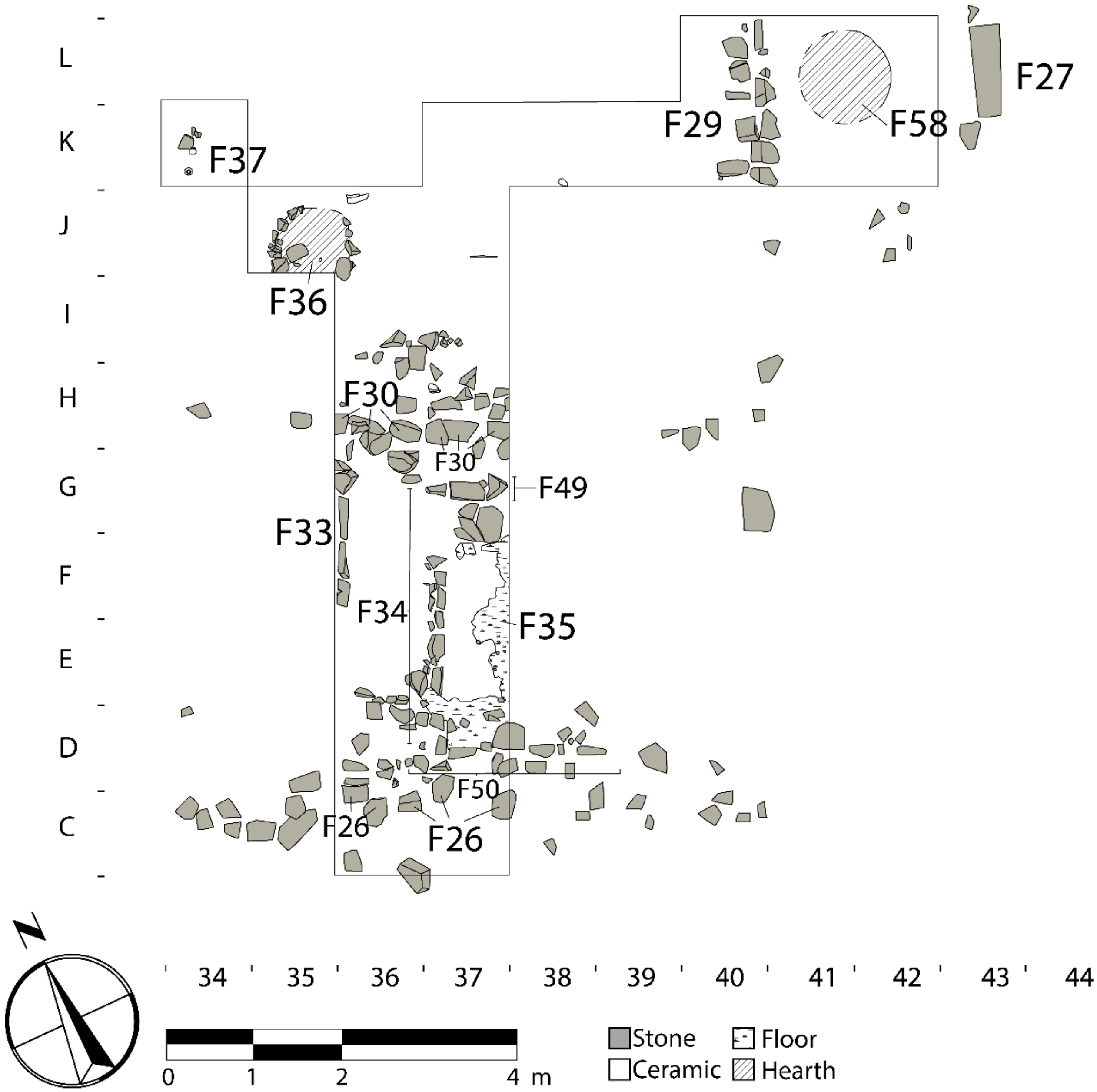

Figure 5.42: Plan of eastern block of units in St. 4.

Figure 5.43: Photograph of possible superstructure in Structure 4.

To the northeast of St. 4 at the eastern extent of Terrace 12, builders constructed two smaller terraces to create more flat occupational space at the eastern edge. The lower terrace was formed by F29, a stone wall that retained F57, a layer of sandy loam with large inclusions of sherds that was deposited directly atop bedrock (N1). F57 formed the occupational surface of the lower terrace. Excavations in unit 42K exposed the refuse of a small hearth (F58) composed of dark, organic, ashy loam with inclusions of small to medium sized stones, charcoal, burned faunal bone, and sherds. F58 cuts down from the top of F57 by about 50 cm and covers an estimated area of 0.94 m^2. Excavations did not expose the upper terrace, presumably formed by retaining wall F27.

Another hearth (F36) was found in the interior patio of Structure 4 in the area of units 35J and 36J (Figure 5.44). F36 cut down from the occupational surface formed by F51. Sediment samples were taken but the feature was not removed, making its depth unclear. The hearth was lined with granite stones of various sizes, surrounding refuse that was composed of dark loamy sand with inclusions of ash, charcoal, burned organic material, faunal bone, and sherds. F36 covered an estimated 0.72 m^2, making it nearly identical in size to F58 to the east.

Figure 5.44: Photograph of hearth (F36).

Evidence from the western side of Complex B indicates that Terrace 12 may have fallen out of use during the Coyuche phase. Excavations in unit 10F to the west of F12 in the ballcourt playing lane revealed a 35-40 cm thick layer of loamy sand (F3) consisted of dark loamy sand that contained inclusions of large, nicely preserved sherds occurring at a higher frequency than earlier fill episodes, small figurine fragments, burned daub, gravel, rocks, and small flecks of carbon. The fill did not appear to contain animal bone or large amounts of carbon. Based on its contents and stratigraphic position, F3 represents a fill episode that included trash and occupational debris that may have been designed to ceremonially close or "terminate" the ballcourt. F3 was covered by a layer of colluvium (F2) that may have included sediment from F4 that seeped through the F12 retaining wall. After the site was abandoned, a modern topsoil (F1) formed in the upper fill strata (F4 and F6). Colluvium also covered earlier deposits, including St. 5 and the western patio (F17) and St. 4 and the interior patio (F48).

TERRACE 2 AND THE PLAZA

PRV13 - Operation E

PRV13-Operation E consisted of a single 1 m x 1 m test unit placed in the center of a small, open patio in Complex C (Figure 5.45). Complex C is located at the southern edge of Terrace 2 and consists of three buildings—Structures 6, 7, and 8—and a patio that opens to the north and west. Structure 6 is an L-shaped building with a stone foundation situated directly to the north of Structures 7 and 8, both of which are rectangular buildings that have been looted extensively. At present, it is unclear whether the stones delineating Structures 6, 7, and 8 represent separate substructural platforms or the foundations of superstructures, as the PRV13 did not investigate any of the buildings. Instead, a single test unit was placed in the patio approximately 18 m to the northwest of the interior corner of the stone foundation wall of Structure 4. The test unit in Op E had the following goals:

1. Identify the construction techniques and materials used to build the patio in Complex C

2. Identify activities carried out in the Complex C patio
3. Penetrate to bedrock to investigate the earliest occupation and construction episodes of the area.

Evidence from Op E indicates that construction of the interior patio of Complex C began during the Chacahua phase. Inhabitants of Cerro de la Virgen participated in cooking activities that may have been associated with feasting in the plaza to the east. Unit 10J exposed a possible early hearth (F4) dating to the Chacahua phase as well as a larger earth oven (F2) that was used following the final construction episode in the Complex C patio. The larger size of the earth oven may be associated with the intensification of ritual feasting activities that were being carried out in the site core (e.g., Complex A; see Chapter 4).

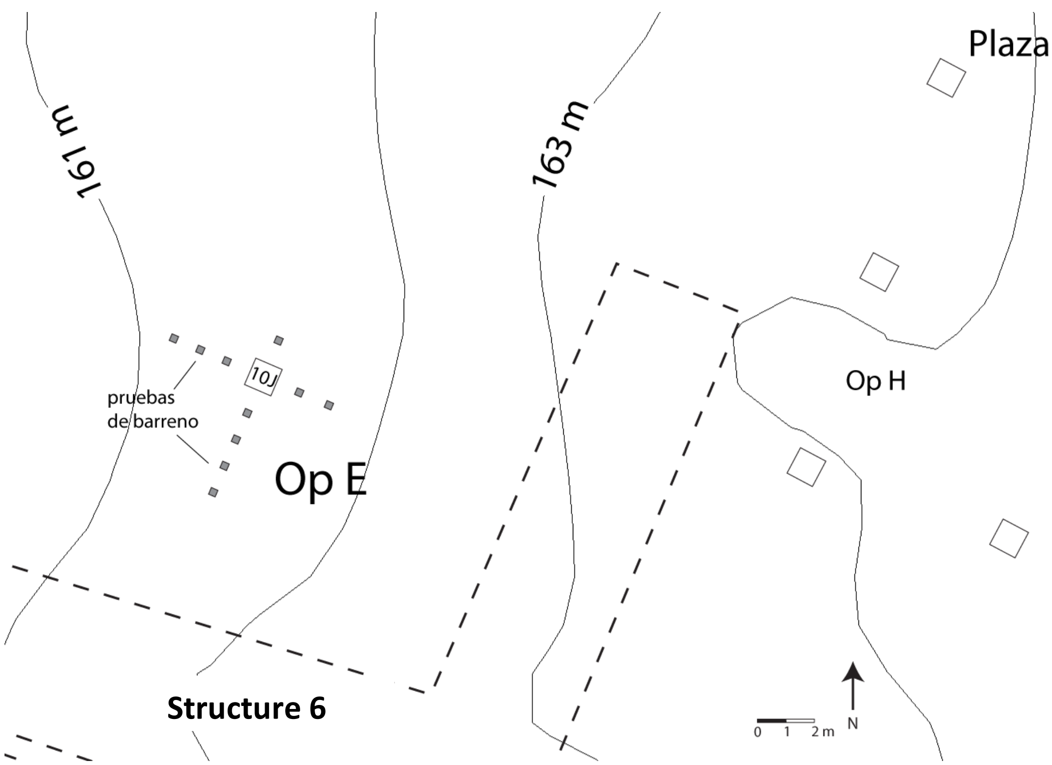

Figure 5.45: Plan map of excavated area in Operation E in patio of Structure 6; bucket auger tests are highlighted in gray; Structures 7 and 8 located directly to the south.

Figure 5.46: Photograph of excavated areas of Operation E

To facilitate future excavations in the area of Complex C, the test unit was labeled unit "10J" to provide space for additional excavation units to the south and east within the Complex C patio. Excavations penetrated to bedrock in unit 10J. To estimate the size and volume of the earthen oven (F2), 20 cm x 20 cm tests were completed using a bucket auger at intervals of 1 m in all directions until the bottom limit of the earthen oven could no longer be detected (Figure 5.46). The upper surface of the earthen oven was unclear due to mixing with overlying colluvium, so these measurements were estimated from the stratigraphic break between F1 and F2. Table 5.45 provides a detailed list of stratigraphic levels in Operation E.

Table 5.2: List of stratigraphic levels in Operation E

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F1	10J	10 YR 3/1; very dark gray loamy sand	Modern	Modern soil	Moderately sorted loamy sand with organic and plant material; soil formed in colluvial fill; sediment includes inclusions of coarse sand, sherds, gravel, and organic material; highly disturbed (animal burrows and roots); see Figure 5.47
F2-s2	10J	10 YR 2/1; black loamy sand	Chacahua	Earth oven refuse	Sediment is identical to F2-s1; dotted line delineating F2-s1 (oven) and F2-s2 (refuse) likely also follows the original surface (F3) into which F2-s1 was excavated; F2-s2 was detected in all auger tests (see Figure 5.46), indicating the refuse spread over a presumably circular area at least 5.5 m in diameter; see Figure 5.47
F2-s1	10J	10 YR 2/1; black loamy sand	Chacahua	Earth oven	Moderately sorted loamy sand fill with angular grains; contains inclusions of burned organic material, high concentration of ash, coarse sand, gravel, fragmented rocks, fire-cracked rocks and small, eroded sherds; sherds did not appear to be burned; rock inclusions are 4-5 cm in diameter or smaller (smaller, on average, than rock inclusions in F2); hearth likely cuts down from the surface of F3 fill layer; Upper surface of F4 may have eroded away and later covered by F1; see Figure 5.47
F3	10J	10 YR 4/4; dark yellowish brown sand	Chacahua	Construction fill	Moderately sorted loamy sand fill layer with sub angular grains; contains inclusions of gravel, coarse sand, mica, eroded sherds, and small rocks; fill layer is cut into by F2; see Figure 5.47

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F4	10J	10 YR 3/2; very dark grayish brown loamy sand	Miniyua or Chacahua	Pit fill	Poorly sorted, loosely packed loamy sand with inclusions of coarse gravel, ash, rocks, and sherds; rocks do not appear to be burned; no significant carbon samples detected; sediment is darker in color and less compacted than F3 and F5; pit cuts down from the top of F5 (25cm in depth at deepest point) but does not reach bedrock underlying F5; ceramic date tentative, as one Miniyua phase diagnostic sherd was found in this context; see Figure 5.47
F5	10J	10 YR 4/3; brown sand	Miniyua or Chacahua	Construction fill	Moderately sorted coarse sand with angular grains; contains inclusions of particulate mica, angular gravel, rocks and small, eroded sherds; fill layer deposited directly atop bedrock (bedrock detected in final excavated lot in 10J); sediment is more densely packed than F3 and F4; ceramic date tentative, as one Miniyua phase diagnostic sherd was found in this context; see Figure 5.47
N1	10J	No Munsell; bedrock	N/A	Natural bedrock	Bedrock; see Figure 5.47

Excavations in Op E revealed two episodes of construction (F5 and F3) in the patio of Structure 4 in Complex C, each of which was followed by a period of use and occupation. The initial building phase dates to the Chacahua phase, when builders deposited F5, a layer of sandy construction fill with coarse inclusions of gravel, rocks, and sherds (Figure 5.47). F5 was deposited directly atop the relatively level bedrock (N1) at an elevation of 158.9 m a.s.l., raising the ground surface by 45 – 50 cm to a level of 159.4 m a.s.l. Following the deposition of F5, construction ceased in the area of Complex C. The area likely was a location for various types of activities, although details of these activities are not clear from the Op E excavations. Inhabitants of Cerro de la Virgen excavated a broad, shallow pit (F4) down from the surface of F5 and later filled the pit with rocks, gravel, ash and sherds. It is possible that people used the pit filled by F4 as a hearth at some point, perhaps as a precursor to the later earth oven (see below). The presence of ash in the loamy sand matrix suggests it was used for cooking, but no significant carbon samples were detected.

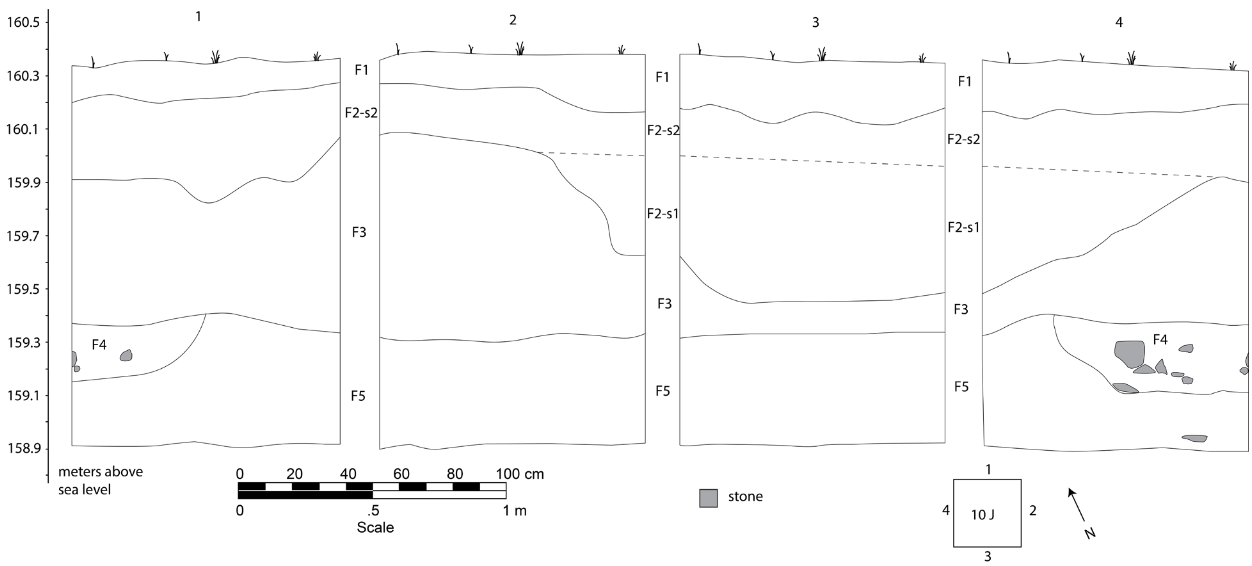

Figure 5.47: Stratigraphic profile of unit 10J

After the pit was filled with F4, builders began a period of construction (F3) that created a new occupational surface in the area of Complex C. The deposition of F3, a very sandy layer of fill with fewer inclusions than F5, raised the ground surface by as much as 1 m to an elevation of 160.3 m a.s.l., just below the modern-day surface. Ceramics recovered from the fill lot contained a mixture of Miniyua and Chacahua phase sherds, suggesting the fill was deposited during the Chacahua phase. The L-shaped Structure 4 and rectangular Structures 5 and 6 were probably constructed on the surface created by the deposition of F3 or another analogous fill layer. However, PRV13 excavations did not explore these buildings, so this hypothesis remains tentative.

At some point after the placement of F3, people at Cerro de la Virgen constructed a large hearth or earth oven (F2) in the area exposed by unit 10J. F2 was only exposed in unit 10J, so the size of the feature remains tentative. People likely excavated a pit down from the top of F3 at an elevation of approximately 160.1 m a.s.l., creating the oven in the vacated space (F2-s1). F2-s1 was filled with ashy, organic refuse in a loamy sand matrix with inclusions of small, eroded sherds (not burned), fragmented rocks, and fire-cracked rocks that probably served as heating elements (Figure 5.48). Over time, refuse from the oven (F2-s2) covered the area in a layer of ashy fill identical to F2-s1. Bucket auger tests were carried out to the north, south, east and west of unit 10J at 1 m intervals to estimate the dimensions of the F2 refuse, which measured approximately 5.5 m in diameter. The center of the refuse was estimated to be located approximately 65 cm to the southwest of the southwest corner of unit 10J, in what would have been unit 9I had it been opened. Further excavations of F2 will be necessary to determine its size, shape, and contents with better certainty. A similar, but much larger earthen oven (Op A-F42) was detected during the 2012 field season excavations on the acropolis at Río Viejo (Brzezinski and Joyce 2012). The ashy sediment in Op E-F2 at Cerro de la Virgen was very similar to that from the Op A-F42 oven at Río Viejo, but instead of using granite stone as heating elements, people at Río Viejo used discarded sherds from various types of utilitarian ceramic vessels. Excavators took several 5-liter flotation samples of sediment from F2 at Cerro de la Virgen for phytolith and pollen analysis, the analyses of which will be completed at a later date. After F2 fell out of use, likely during the Chacahua phase or possibly later, a layer of loamy sand topsoil formed in colluvium that washed down from Structure 4 and the surrounding plaza (F1).

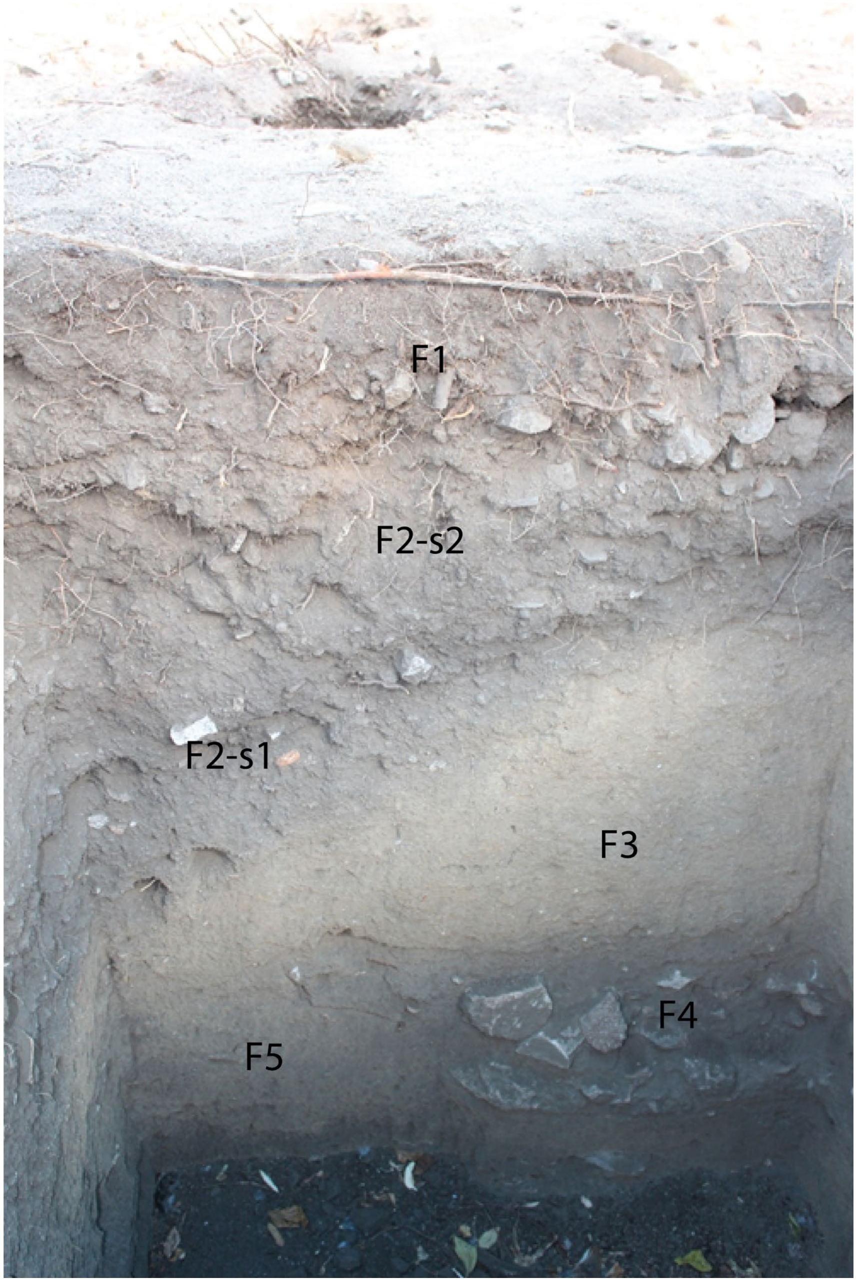

Figure 5.48: Photo of earthen oven (F2) in west profile of unit 10J

PRV13 - Operation G

PRV13-Operation G consisted of two 1 m x 1 m test units (15T and 23T) and one 1 m x 2 m test unit (units 14L and 15L) situated in a flat, open area near the southwest corner of Cerro de la Virgen's ceremonial core (Figure 5.49). The area was selected for testing to explore the activities and construction episodes carried out just outside the central site core, and in particular to determine if inhabitants of Cerro de la Virgen used the area for mortuary activities. Numbering of excavation units began at "14" and lettering began at "L" to provide space to excavate future units on the same Cartesian grid to the south and west. Excavations were placed in the area of Op G to sample a wide area with relatively few test units. Operation G had the following three objectives:

1. Identify the activities carried out in the outer part of the ceremonial core of the site, particularly whether the area was used for mortuary purposes.
2. Identify the construction techniques and materials used for building purposes in the area.
3. Penetrate to deeply buried deposits to date the earliest occupation in the southwest area of the site core.

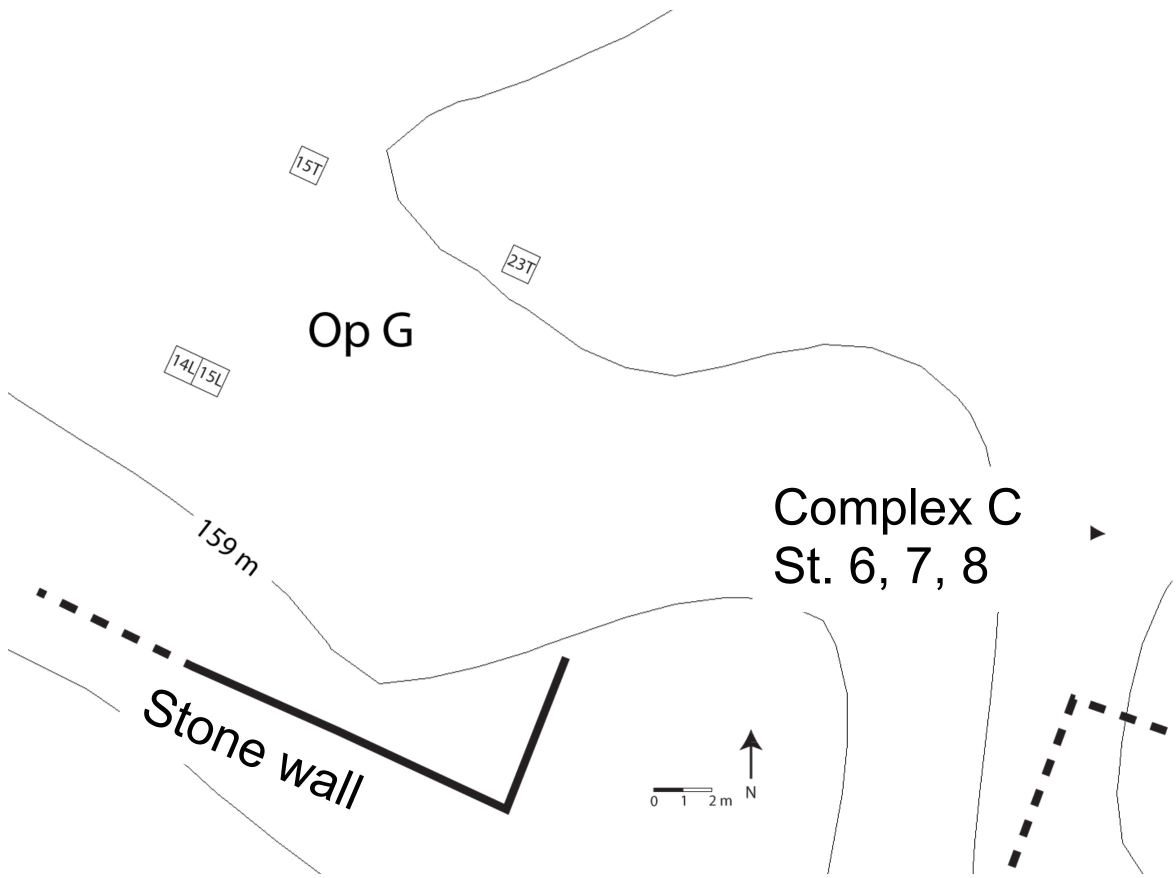

Figure 5.49: Map of excavations in Operation G (contour = 1 m)

Excavations in Op G did not detect evidence of a cemetery or burials of any kind. However, the limited area tested (4 m^2) precludes ruling out the area as a locus of mortuary activity. Surface survey and excavations in units 14L and 15L indicate that residences may have been located in the vicinity of Op G. Two large metate fragments were located on the surface near unit 15T, suggesting at the very least that cooking preparations involving food grinding may have been conducted in this area. Further, large pieces of disarticulated daub building material were detected in units 14L and 15L, which may represent the remains of a nearby burned building. A possible foundation wall was detected on the modern surface to the south of the Op G excavations, but this feature was not investigated further. Table 5.3 provides a detailed list of stratigraphic levels recorded in PRV13-Op G.

Table 5.3: List of stratigraphic levels in Operation G

Stratum	**Units**	**Sed. Desc. & Munsell**	**Probable Date**	**Formation Process**	**Comments**
F1	14L, 15L, 15T, 23T	10 YR 3/2; very dark grayish brown sandy loam	Modern	Soil formed in fill (F2-s1)	Poorly sorted sandy loam humus; contains inclusions of gravel, organic/plant material, sherds, and small rocks; highly disturbed; see Figures 5.50 – 5.52
F2-s1	14L, 15L, 15T, 23T	10 YR 3/3; dark brown sandy loam	Post-formative	Colluvium	Poorly sorted sandy loam colluvium with subrounded grains; contains inclusions of mica, eroded sherds, coarse sand, and gravel; F2-s1 and F2-s2 are very disturbed (rodent burrows and roots); see Figures 5.50 – 5.52
F2-s2	15L	10 YR 2/2; very dark brown loam	Post-formative	Colluvium	Poorly sorted loamy fill with subangular grains; contains inclusions of mica, gravel and eroded sherds; possible large disturbance—may account for intrusive Classic period pottery in lots associated with F4; see Figure 5.52
F3	23T	10 YR 3/4; dark yellowish brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with subangular grains; contains inclusions of mica, gravel and sherds; more loosely packed than F5; see Figure 5.50
F8	14L, 15L	5 YR 6/4; light reddish brown clayey silt loam	Chacahua	Wattle and daub wall panel	Sections of preserved wattle and daub wall panels placed atop F4; Some parts were burned or oxidized; Preserved cane impressions ranged in size from 6.3 mm to 12.4 mm in diameter
F4	14L, 15L	10 YR 4/3; brown loamy sand	Chacahua	Construction fill	Moderately sorted loamy sand fill with subangular grains; contains inclusions of mica, gravel, and large amounts of daub with cane impressions (possible redeposited daub wall panel); daub associated with upper levels; top surface of F4 may have been occupied; see Figure 5.52

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F5	23T	10 YR 4/3; brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with subangular grains; contains inclusions of mica, coarse sand, gravel, and eroded sherds; sherd inclusions are larger in size than underlying fill stratum (F7-s1) and overlying fill stratum (F3); likely analogous to F6; fill contains Chacahua phase pottery as well as redeposited Miniyua and Minizundo phase sherds; see Figure 5.50
F6	15T	10 YR 4/2; dark grayish brown silt loam	Chacahua	Construction fill	Well sorted silty loam fill with subrounded grains; contains inclusions of mica, gravel and eroded sherds; harder packed than F2-s1 and F5; possibly deposited concurrently with F5; fill contains Chacahua phase pottery and redeposited Minizundo phase sherds; see Figure 5.51
F7-s1	23T	10 YR 6/4; light yellowish brown loamy sand	Chacahua	Construction fill	Moderately sorted loamy sand fill with traces of clay; contains inclusions of gravel, mica, coarse sand, and eroded sherds; very hard packed (harder packed than F5); contains more gravel than F5; fill contains Chacahua phase pottery as well as redeposited Minizundo phase sherds; see Figure 5.50
F7-s2	23T	10 YR 5/3; brown sand	Chacahua	Construction fill	Thin lens of poorly sorted sandy fill with gravel and coarse sand; see Figure 5.50

Excavations in Op G revealed two major episodes of occupation to the southwest of Complex C, both likely dating to the Chacahua phase. The earliest level of construction fill, F7, was exposed at the base of unit 23T (Figure 5.50). Excavations in unit 23T did not reach bedrock, so it is possible that F7 is thicker and/or that earlier deposits are present beneath F7. F7-s1 consists of very hard packed loamy sand fill with inclusions of eroded sherds. A thin lens of sand (F7-s2) was also deposited before F7-s1 was completed. Ceramic evidence indicates builders deposited F7-s1 and F7-s2 during the Chacahua phase by mining local sediments, including some Minizundo phase deposits. A relatively large proportion of Minizundo phase sherds were recorded in the deepest lots excavated in 23T. Ceramics recovered from F7 contexts were quite fragmented and eroded, suggesting they were probably redoposited in the fill. The F7 construction episode raised the ground surface up to an elevation of 158.2 m a.s.l.

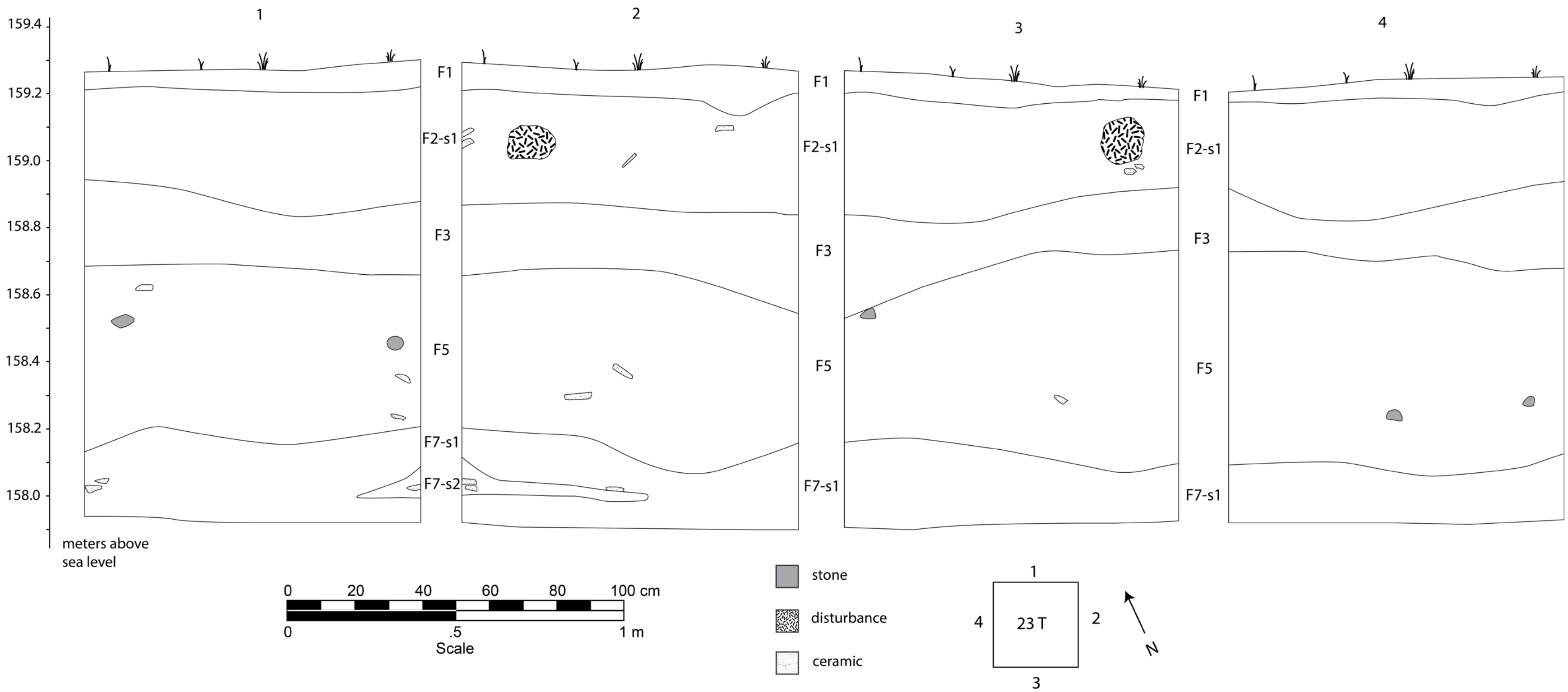

Figure 5.50: Stratigraphic profile of unit 23T

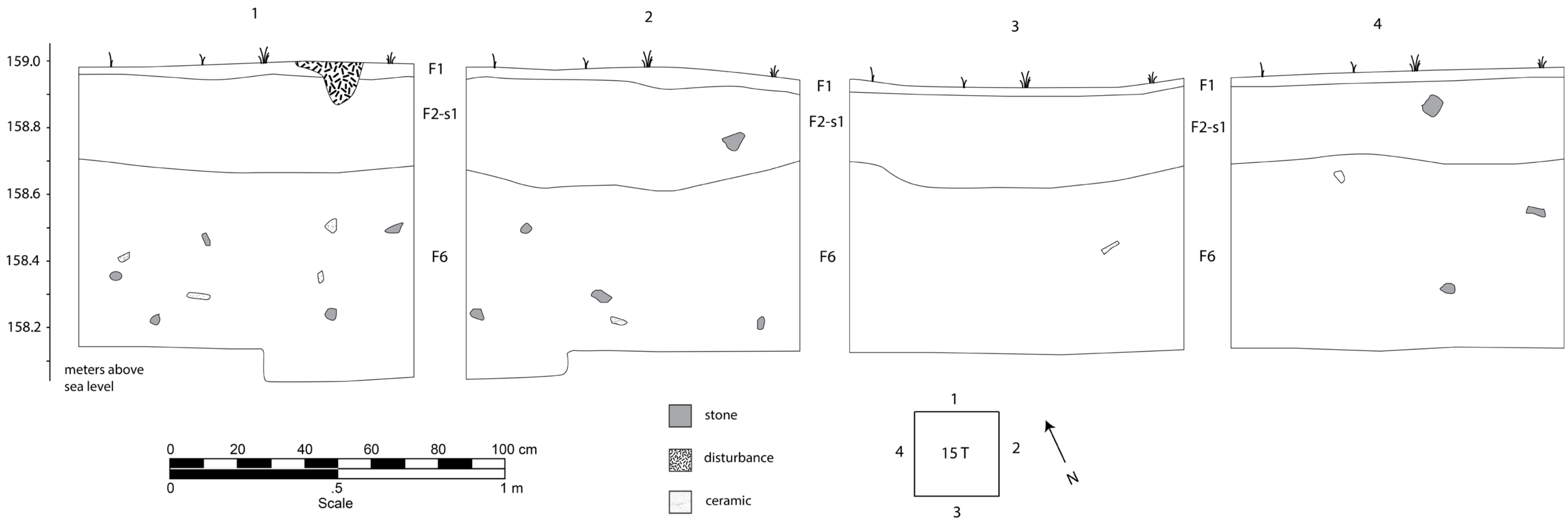

Figure 5.51: Stratigraphic profile of unit 15T

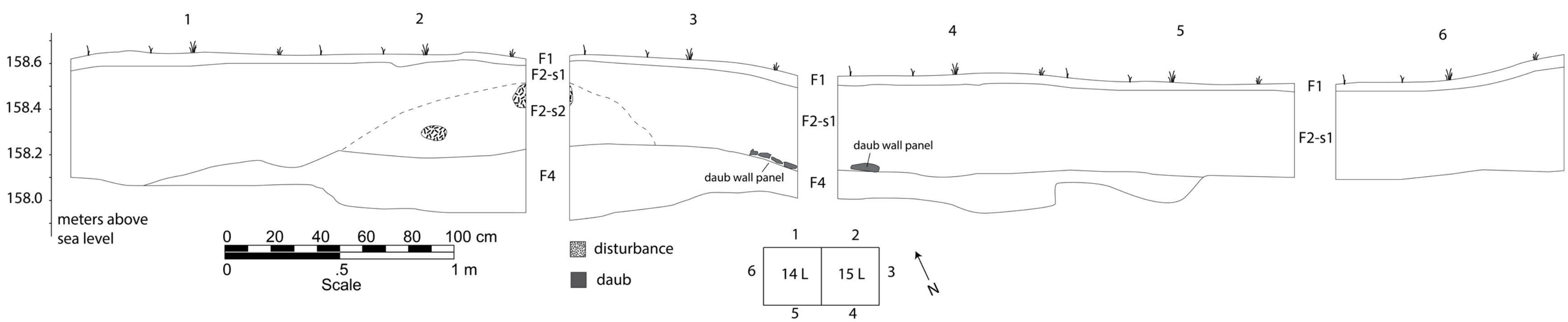

Figure 5.52: Stratigraphic profile of units 14L and 15L

The next period of occupation and construction in the area of Op G also dates to the Chacahua phase, beginning with the deposition of fill layers F6 and F5. Builders deposited F6 in the area of unit 15T (Figure 5.51) and F5 in the area of unit 23T (Figure 5.50), covering the underlying fill of F7.   F6 consisted of silt loam sediment with inclusions of mica, gravel and eroded Minizundo phase sherds. The deposition of F6 raised the ground surface in the area of unit 15T to an elevation of 158.7 m a.s.l. At around the same time, builders also deposited F5, a thick layer of sandy loam fill that raised the ground surface in the area of unit 23T to an elevation of approximately 158.7 m a.s.l. Builders also deposited a layer of loamy sand fill (F4) dating to the Chacahua phase in the southwestern area of Op G, which raised the ground surface to an elevation of 158.2 m a.s.l. It is likely that F4, F5, and F6 were deposited at around the same time and may represent the same general fill episode.

Figure 5.53: Redeposited wattle and daub wall fragment in construction fill (F4)

If F4, F5 and F6 were deposited contemporaneously, then an occupational surface that rose toward the east at an angle of 4 – 5° would have been exposed for a period. While evidence for Chacahua phase activity on the surface of F6 and F5 is sparse, excavations in units 14L and 15L revealed the remains of a large, burned wattle and daub building panel with preserved cane impressions and surfaces near the top of F4 (Figures 5.52, 5.53, and 5.54). Excavations in units 14L and 15L demonstrate that a wattle and daub superstructure may have been built and later burned in the area of Op G, suggesting the upper surface of F4 was occupied. Excavators collected 5.1 kg of daub (F8) from lots associated with the top of F4 in units 14L and 15L. Cane impressions preserved in the daub varied from small, densely packed impressions between 6.3 and 8.1 mm in diameter to larger, slightly wider spaced impressions averaging between 9.8 and 12.4 mm in diameter. The temper of the daub was typically coarse and sandy, but examples of fiber temper were also found. While only small fragments of wall surfaces were detected, evidence did not appear to suggest the presence of debris from multiple buildings. Given the amount and size of the pieces collected at the top of F4, it is likely that the daub resulted from the destruction and clearing of a perishable wattle and daub structure in the vicinity of units 14L and 15L. Alternatively, the daub may have been redeposited from another part of the site, but the original daub panel would have been quite heavy and fragile, making the likelihood it was redeposited slim. Further examination to the north of this area is needed to determine if the area supported Chacahua phase domestic areas.

Figure 5.54: Redeposited wattle and daub wall fragment in construction fill (F8)

Following the activities carried out at the top of F4, F3 was deposited as a resurfacing event atop F5 in the area of unit 23T. The deposition of F3 raised the ground surface by 20-25 cm up to an elevation of 90 cm below datum. After the F3 resurfacing, the area fell out of use and was covered by a thick layer of colluvium (F2-s1 and F2-s2) that washed down from the plaza over time. In the area of units 14L and 15L, which were at a considerably lower elevation than the ground surface in units 15T and 23T at the end of the Chacahua phase, as much as 40-45 cm of colluvial fill covered F4. Finally, a layer of modern soil (F1) formed in the colluvium.

PRV13 - Operation H

Operation H consisted of five test excavations located in the plaza of the civic-ceremonial center of the site. The plaza is a flat, unrestricted area situated to the southwest of Complex A and east of Complex C (Figure 5.55 and 5.56). Four 1 x 1 m test units were situated in a transect aligned to the site orientation (25°-205°) and an additional 1 x 1 m test unit was placed directly east of the southernmost unit. The area was selected for testing to determine the construction techniques used to build the plaza, as well as to explore the types of activities the inhabitants of the site carried out in this area. Operation H had the following three objectives:

1. Identify the construction techniques and materials used for building the plaza.
2. Identify the activities carried out in the plaza.
3. Penetrate to deeply buried deposits to date the earliest occupation or construction phase associated with the plaza.

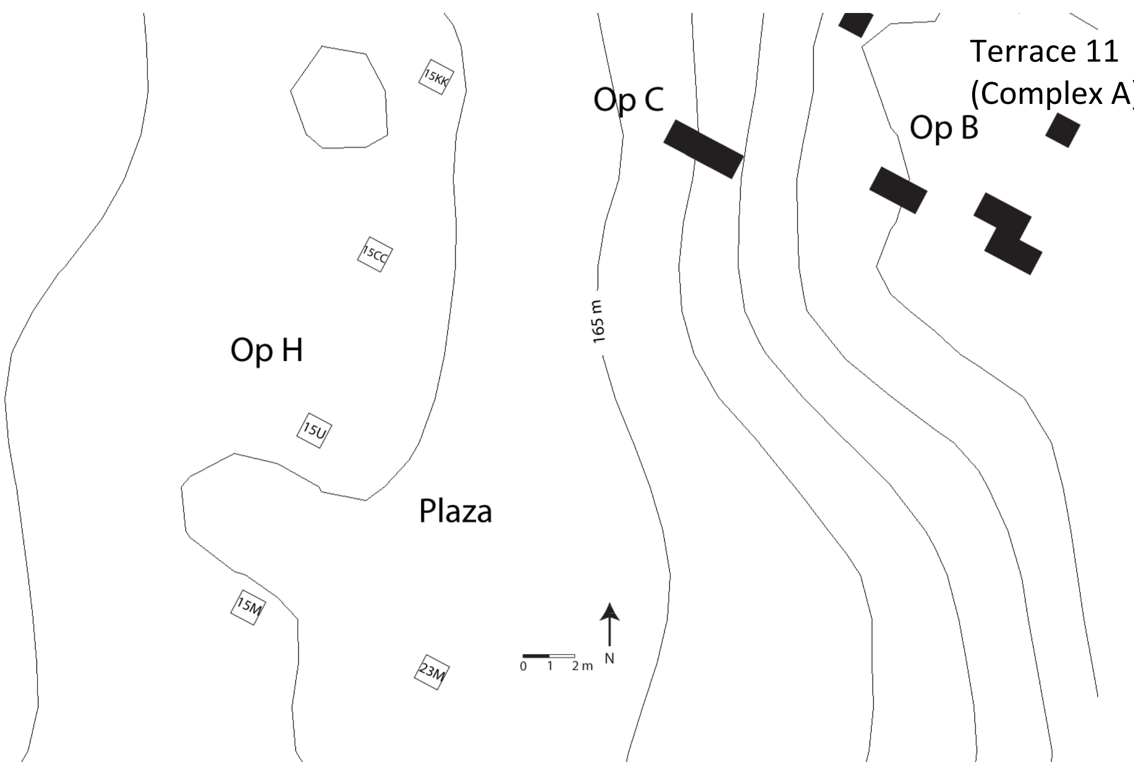

Figure 5.55: Plan map of excavations in Operation H; excavations units not included in Op H are displayed in black.

Figure 5.56: Photo of excavation units in Op H.

Evidence from Op H demonstrates that construction of the plaza began in the Terminal Formative period, perhaps by as early as the late Miniyua phase. A small stone wall (F14) with a possible pavement (F15) was built early in the development of the plaza, but the use of this feature is unclear. F14 and F15 may have represented the edge of a ceremonial flagstone patio, perhaps similar to a Late Formative flagstone patio that articulated with Structure 1 at Cerro de la Cruz (Joyce 1991a:188). People also placed several deposits of thin stone slabs in the area of the plaza. The vertical orientation of the slabs is similar to those constituting the offering compartments in Complex A, but the slab deposits in Operation H did not contain offering vessels. It is possible that the plaza area may have also been used as a storage location for the stone slabs prior to their use in more complex offerings or that the slabs were associated with perishable offerings. Table 5.55 provides a detailed list of the stratigraphic levels in PRV13-Op H.

Table 5.4: List of stratigraphic levels in Operation H

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F1	All units	10 YR 2/2; very dark brown loam	Modern	Soil formed in colluvium (F11)	Topsoil consisting of poorly sorted loam with subrounded grains containing plant material, coarse sand, mica, and sherds; highly disturbed; soil formed in colluvial fill (top of F2); see Figures 5.57 – 5.59, 5.61 - 5.62
F2	All units	10 YR 3/3; dark brown sandy loam	Post-formative to Modern	Colluvium	Poorly sorted sandy loam fill with subangular grains and inclusions of gravel, coarse sand, mica, sherds, rocks, stones, and occasionally faunal bone; sediment is loosely packed; significant number of disturbances); see Figures 5.57 – 5.59, 5.61 - 5.62
F3	15KK	10 YR 3/3; dark brown sandy loam	Late Chacahua or Coyuche	Construction fill	Poorly sorted sandy loam fill with angular grains and inclusions of mica, coarse sand, small rocks, and sherds; fill is lightly packed and likely deposited as construction fill; alternatively, may be colluvium; see Figure 5.57
F4	15M	No Munsell; thin granite slabs	Probable Chacahua	Possible offering compartment	Collection of stones sitting atop and possibly slightly recessed into the top of F8 in unit 15M; stones form a circular feature similar to hearths in Op A, but no charcoal or ash was detected; vertical or slightly angled slabs appear to demarcate the edges of the feature, situated around several slabs placed horizontally; use unclear; may be related to underlying feature of stone slabs (F11), but correlation is unclear; see Figure 5.62

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F5	15U	No Munsell; thin granite slabs	Chacahua	Possible offering compartment	Thin granite slabs cut from local bedrock placed lying flat (horizontally) at top of F6 fill layer; lower elevation of slabs just above upper elevation of vertical slabs in 15T (F9); covered in some places by F6; deposited just before end of F6; may be part of F9,however F5 and F9 separated by 10-25 cm of fill (F6) and orientation of stones differs between features (placed horizontally instead of vertically); see Figure 5.58
F6	15U	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with subrounded grains and inclusions of mica, gravel, small rocks and sherds; more similar to F8 than F7; not as gritty as F7 (contains less coarse sand); moderately packed; contains fewer inclusions than underlying fill stratum (F16); more densely packed than overlying colluvium (F2); see Figure 5.58
F7	23M	10 YR 3/4; dark yellowish brown loamy sand	Chacahua	Construction fill	Moderately sorted loamy sand fill with angular grains and inclusions of mica, coarse sand, sherds, and small rocks; contains more mica inclusions than F6 and F8; may be analogous to F6 and F8; see Figure 5.61
F8	15M	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted loamy sand with subrounded grains and inclusions of mica, coarse sand, gravel, sherds, and small rocks; moderately packed (harder packed than F2); covers thin stone slabs (F11) in unit 15M; very similar to F6 and F7, but unclear if they are identical; see Figure 5.62
F9	15U	No Munsell; thin granite slabs	Chacahua	Possible offering compartment	Thin granite slabs cut from local bedrock oriented vertically in rows following site orientation (25°-205° azimuth); covered by F8; not visible in profile
F10	23M	No Munsell; thin granite slabs	Chacahua	Possible offering compartment	Thin granite slabs cut from local bedrock arranged in form of a possible box or container; slabs oriented vertically; covered by F7; see Figure 5.61

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F11	15M	No Munsell; thin granite slabs	Chacahua	Possible offering compartment	Thin granite slabs cut from local bedrock oriented vertically in rows following orientation approximately perpendicular to site orientation (123°-303° azimuth); covered by F8; see Figure 5.62
F12	15CC	10 YR 3/2; very dark grayish brown loam	Chacahua	Construction fill	Layer of poorly sorted loamy fill with angular grains and inclusions of possible ash and burned material as well as sherds and small rocks; covers possible step (F14) and pavement (F15) in unit 15CC; sediment more loosely packed and contains a higher concentration of sherd inclusions than F2; darker in color than F2; sherds are better preserved than in other fill strata in Op H; see Figure 5.59
F13	15KK	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam fill with angular grains containing inclusions of mica, gravel, small rocks and a high concentration of sherds; sherds likely thrown into fill in form of a ceramic dump; does not appear to be midden-like (no ash, carbon, faunal bone detected in sediment); covers bedrock (N1); see Figure 5.57
F14	15CC	No Munsell; granite stone	Chacahua	Possible step or low retaining wall	Upper level of stones at base of unit 15CC; stones oriented northeast-southwest (38° - 218° azimuth); stones are faced on side facing the northwest; possible step or retaining wall to south of F15; if a retaining wall, F14 would have retained an unidentified layer of fill toward the south/southeast; detected in unit 15CC only; see Figure 5.59
F15	15CC	No Munsell; granite stone	Chacahua	Possible stone pavement	Flat-lying stones at base of unit 15CC; possible stone pavement below step (F14); detected in unit 15CC only; see Figure 5.59

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F16	15U	10 YR 4/3; brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand fill with subangular grains and inclusions of gravel, mica, sherds, small rocks, larger stones and occasionally carbon and burned daub; sediment is hard-packed and appears to have a higher organic content and darker color than F6; also contains relatively higher concentration of sherd inclusions than F6, but most are non-diagnostic; fill stratum covers collection of stones (F17) at base of unit 15U; see Figure 5.58
F17	15U	No Munsell; granite stone	Chacahua	Possible construction fill or rock fall	Collection of stones exposed at base of unit 15U; localized to NW corner of unit; shape and function of stones unclear, but likely deposited as construction fill; see Figure 5.58
F18	15KK	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Moderately sorted sandy loam fill with angular grains and inclusions of mica, coarse sand, gravel, and eroded sherds; covers bedrock (N1) in unit 15KK; see Figure 5.57
N1	All units	No Munsell; naturally occurring bedrock (grüs)	N/A	Natural bedrock	Upper stratum of bedrock in area of the Terrace 2 plaza); see Figures 5.57 – 5.59, 5.61 - 5.62

Excavations in Op H demonstrate that the construction of the Terrace 2 plaza dates to the Chacahua phase, during which activities in the civic-ceremonial core of the site intensified. Builders elevated the ground surface by as much as 1 m and carried out ritual caching practices that involved thin stone slabs similar to those found in Complex A (Terrace 11; see Section 7.2) and Structure 1 (Terrace 10; see Section 7.5). However, compartments containing ceramic vessels were not found in the plaza, suggesting the area was used for different types of cached offerings than those found on Terraces 10 and 11.

The earliest stratigraphic layer (F18) was exposed in unit 15KK at an elevation of 163.0 m a.s.l., near the base of Terrace 11 (Figure 5.57). F18 consists of sandy loam that created a level occupational surface on top of bedrock (N1). Ceramics recovered from F18 were small and eroded, with diagnostic sherds dating to the Minizundo and Chacahua phases. At present, it is unclear whether F18 was deposited as fill or as colluvium that washed down from Terrace 11. Given that the earliest episode of construction and use of Terrace 11 began during the transitional period between the Miniyua and Chacahua phases, the latter is certainly possible. After F18, a collection of stones (F17) was deposited in an area to the south exposed by unit 15U (Figure 5.58). Excavators did not penetrate below F17, so it is difficult to interpret this stratum. The stones did not appear to be stacked, faced on a particular side, or oriented in any discernable pattern, which suggests they were deposited as rubble fill. Alternatively, F17 may represent rock fall from higher elevations.

Builders later covered F17 with F16, a 0.40-0.45 m-thick layer of poorly sorted, hard packed loamy sand that contained burned daub, charcoal, rocks of various size, sherds and gravel. F16 was deposited as construction fill, which elevated the ground surface to 162.9 m a.s.l. The sediment was mottled and included more organic material than overlying layers. Ceramics recovered from F16 were small and eroded; only three were diagnostic, two dating to the Minizundo phase and one to the Miniyua phase. Given the Chacahua phase date of F18 and the likelihood that sherds included in F16 were redeposited, it is probable that F16 also dates to the Chacahua phase. While we cannot determine the horizontal extent of F16, its stratigraphic position may represent one of the first major construction phases in the plaza.

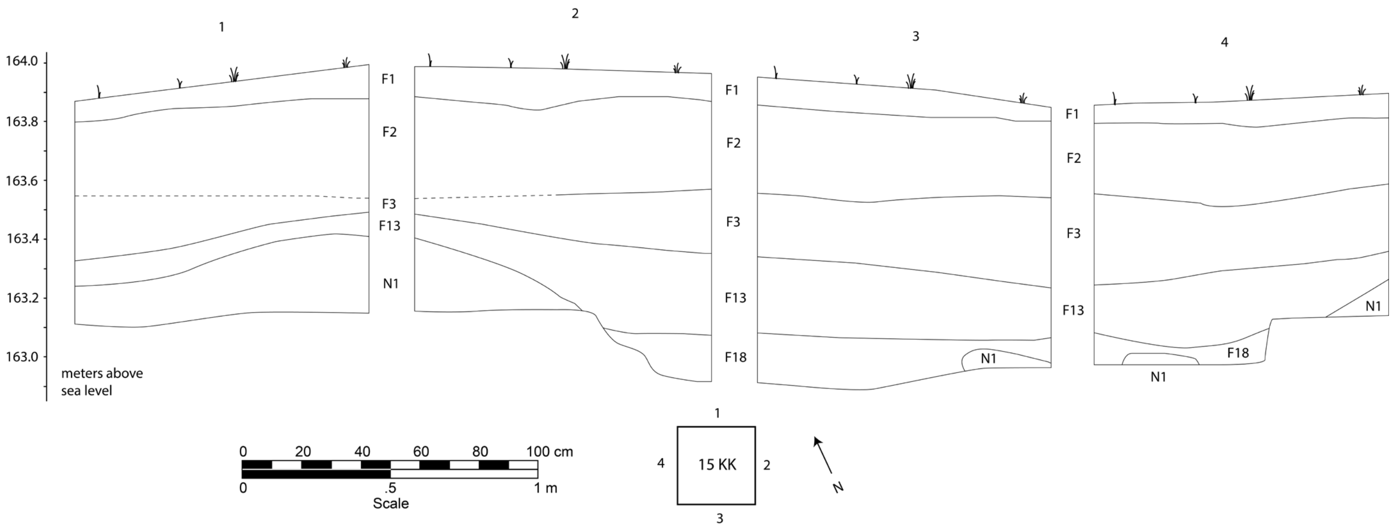

Figure 5.57: Stratigraphic profiles of unit 15 KK

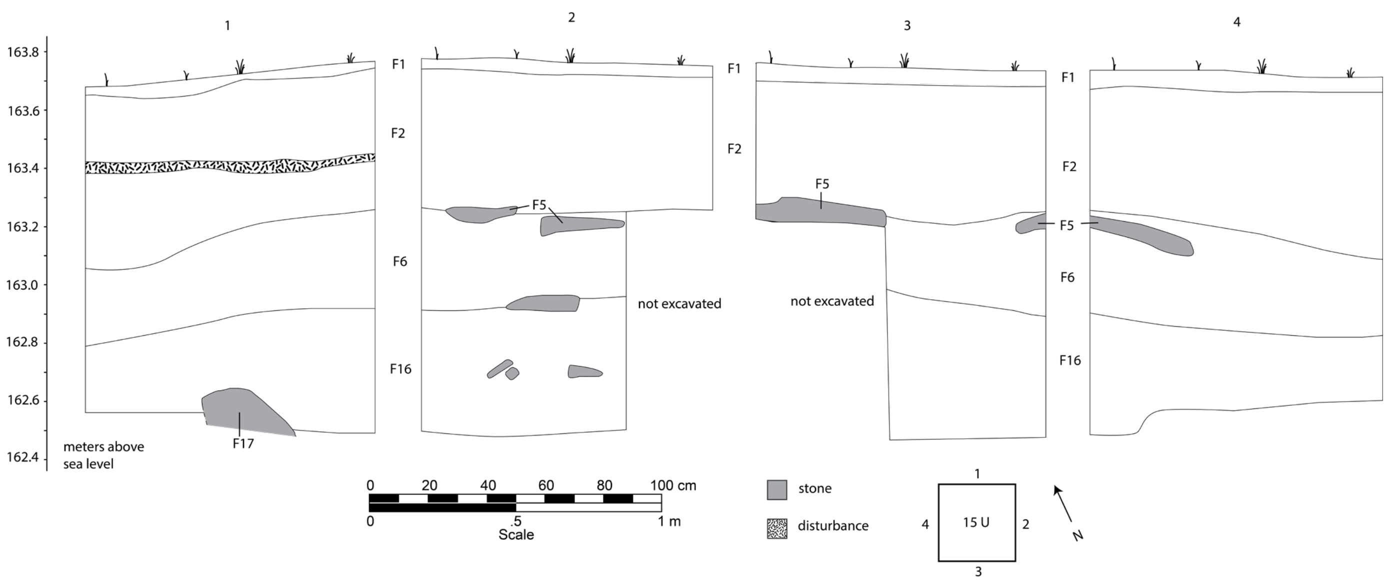

Figure 5.58: Stratigraphic profiles of unit 15 U

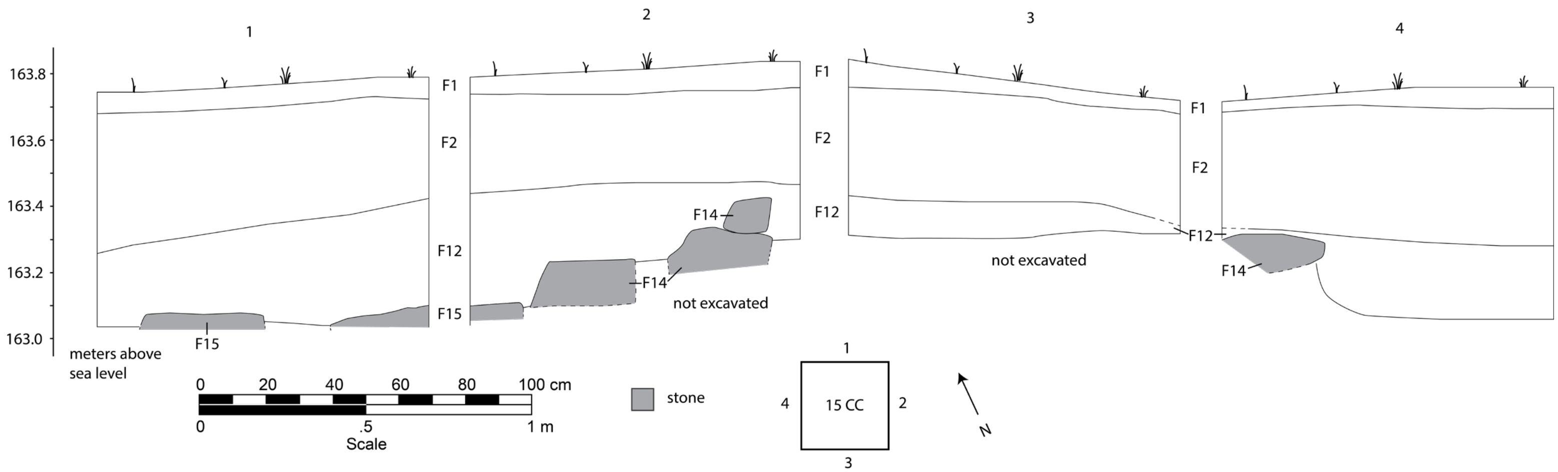

Figure 5.59: Stratigraphic profile of unit 15 CC

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Following F16, builders deposited a series of stones (F15 and F14) in the area exposed by unit 15CC that may have been part of a larger masonry building foundation (Figures 5.59 and 5.60). The first group of stones deposited is F15, which may represent a pavement leading to low stone wall (F14). Excavations did not penetrate below F14/F15, so the date and composition of the stratigraphic layer on which they sit is unknown. However, given its stratigraphic position and elevation (163.6 m a.s.l.), F14 may represent the retaining wall of a low substructural platform that sat on top F16 or an analogous layer. Excavations found no evidence of a superstructure on F14, but this may have been due to the small area exposed or perhaps erosion. Stratigraphic evidence indicates F14 and F15 date to the Chacahua phase, but further testing in this area of the plaza is needed to confirm this date and determine the size and shape of the retaining wall and possible platform.

Figure 5.60: Photograph of possible wall or step (F9) and pavement (F10) in unit 15CC.

Later in the Chacahua phase, builders deposited F13 atop F18 and N1 in the northern area of the plaza (unit 15KK). F13 consists of poorly sorted sandy loam fill with a high concentration of sherd inclusions. The fill does not contain ash, carbon or faunal bone, indicating it was probably not deposited as a midden; however, the pottery recovered in F13 was better preserved than nearly all other fill contexts exposed in the PRV13 excavations. Further laboratory analysis of pottery from F13 is needed to determine the types of vessels people discarded in this area, which may shed light on the activities in which they were used. Residents of Cerro de la Virgen also covered the possible pavement, retaining wall and platform (F15 and F14) with a 20-25 cm-thick layer of loamy construction fill (F12). F12 raised the ground surface in the area of unit 15CC to an elevation 163.4 m a.s.l., sloping slightly downward to the northwest toward Complex B. F12 may have served to close and seal the possible platform.

Next, builders initiated a series of fill layers (F6 [unit 15U; Figure 5.58], F7 [unit 23M; Figure 5.61], and F8 [unit 15M; Figure 5.62]) that contained possible offering compartments made of thin stone slabs cut from local bedrock (F9 [unit 15U; Figure 5.63], F10 [unit 23M; Figure 5.64], and F11 [unit 15M; Figure 5.65]). F6, F7, and F8 raised the ground surface by 0.30–0.40 m to a level of 163.25 m a.s.l. in unit 15U, 163.15 m a.s.l. in unit 15M, and 163.70 m a.s.l. in unit 23M. The surface elevation of each fill layer was roughly equivalent, suggesting they may have been part of a much larger layer of fill that covered a massive area of the plaza. However, the distance between excavations units in Op H prevents identifying the layers as an identical fill episode with certainty. The higher elevation of F7 in unit 23M may indicate that the terrain in the plaza sloped downward gradually from east to west toward Complex C. Ceramic evidence from F6, F7, and F8 indicates the fill layers date to the Chacahua phase.

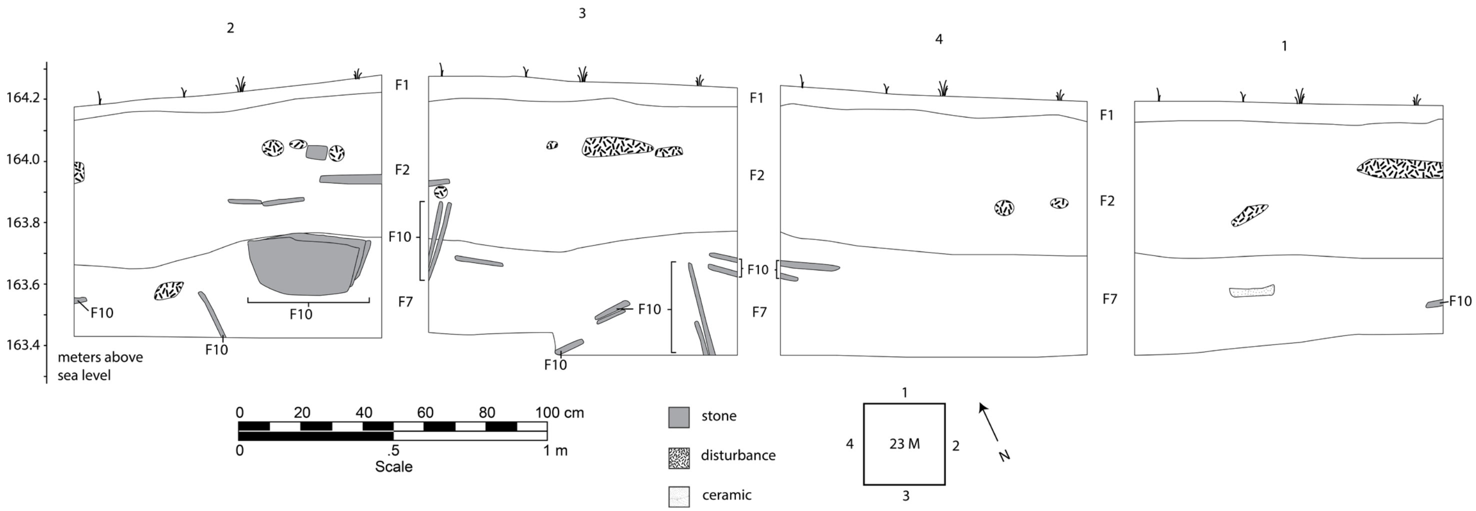

Figure 5.61: Stratigraphic profile of unit 23M

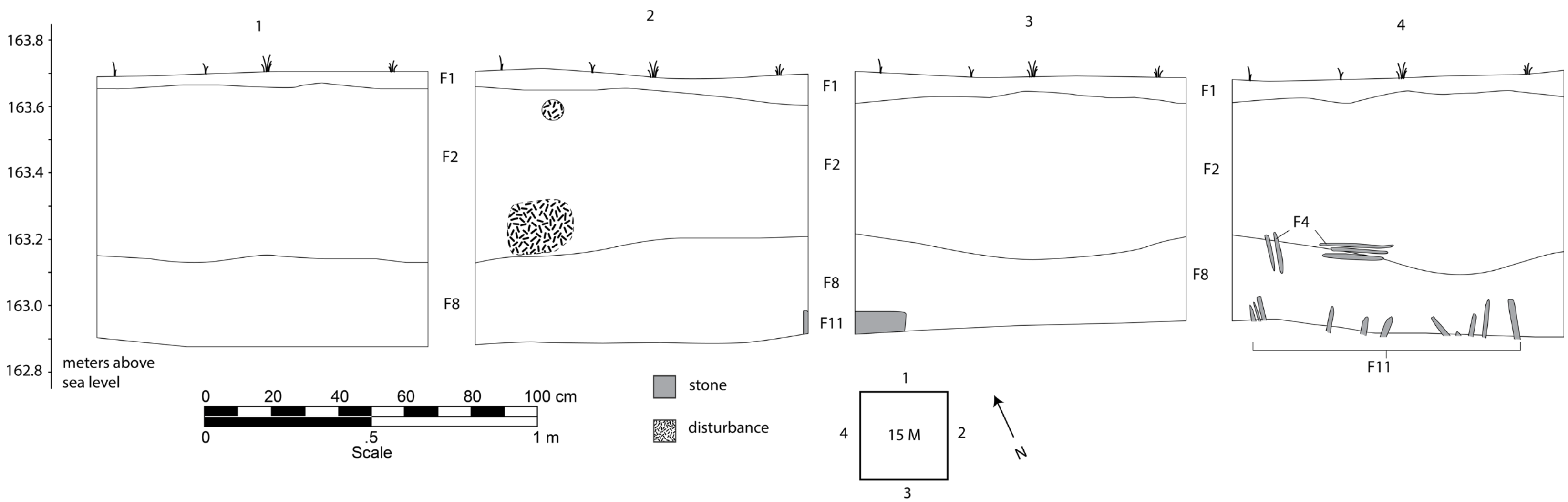

Figure 5.62: Stratigraphic profile of unit 15 M

After F6, F7, and F8 were deposited, inhabitants of Cerro de la Virgen emplaced several collections of thin stone slabs (F9, F10, and F11) within the fill. The offerings were probably deposited in pits that cut into the surface of F6, F7, and F8; however, delineations of those pits were not detected during excavations. Generally, the slabs were similar in size and thickness to slabs found in the large offering in Complex A (Op A-F18-s2) and in a termination offering at the base of Structure 1 (Op D-F17-s2). However, excavators did not find any ceramic vessels associated with the slabs on the plaza. A dense cache of at least 50 slabs (F9) was placed within F6 in the area of unit 15U, oriented at an angle of 35°-215°, which deviated slightly from the overall architectural orientation of the site (25°-205°). No other offerings appear to have been emplaced with the slabs, but it is possible that perishable offerings of organics such as food or liquid were included in the cache. In the area of unit 23M, at least 24 stone slabs (F10) were placed within F7 in a rectangular grouping "bounded" by slabs oriented east-west at an angle of 97°-277°. Within these "bounding slabs" were more slabs oriented perpendicularly at an angle of 173°-341°. In the area of unit 15M, residents placed a cache of at least 39 stone slabs (F11) of varying size and thickness within F8 in rows oriented east-west at an angle of 123°-303°, roughly perpendicular to the site orientation (25°-205°). Unlike F10, the F11 slabs were oriented at roughly the same horizontal angle and appeared to exhibit more diversity in size and shape. The pattern and orientation of F9, F10, and F11 differed from one another, suggesting they may have been independent offerings (if they indeed were offerings). Alternatively, if F6, F7, and F8 were analogous layers of fill, and F9, F10, and F11 were deposited in pits at the same time, it is possible that the features were part of one large offering.

Figure 5.63: Photograph of stone slabs or possible offering compartment (F9) in unit 15U

Figure 5.64: Photograph of stone slabs or possible offering compartment (F10) in unit 23M

Figure 5.65: Photograph of stone slabs or possible offering compartment (F11) in unit 15M

Following the initial caching activities in the plaza, two additional collections of stone slabs were placed at the surface of F6 and F8. In the area of unit 15M, residents placed a collection of slabs (F4) in a flat, circular pile with vertical slabs rounding the outside at the top of F8. The size of F4 was similar to the size of several hearths in Complex A that were associated with the offering in the north patio; however, no charcoal, ash or carbonized remains were found with F4. At the top of F6 in unit 15U, residents placed an additional set of stone slabs (F5) in a flat pile at the surface of F6. No ceramic vessels were found with the collections of stones, which suggests F4 and F5 were used in a manner similar to F9, F10, and F11. Finally, in the northern area of the plaza (unit 15KK), builders deposited a layer of sandy loam (F3) on top of F8. The plaza was abandoned at the end of the Chacahua phase and over time was covered with 0.15–0.25 m of colluvium (F2) that washed down from Terraces 10 and 11. F2 was detected in all units excavated in Op H and tended to be deeper toward the southwest in the area of units 15M, 15M, and 23M. Finally, a thin soil (F1) formed in the colluvium.

PTRV16 - Operation G

Introduction

PTRV16-Operation G explored the northwestern section of the ceremonial center's plaza through of a transect of test excavations that ran west to east, perpendicular to the transect of test units excavated in PRV13-Operation H. The transect covered a total of 18 m, beginning with unit 5D at the western side and ending with unit 23D to the east (Figure 1). The main goals of the Op G excavations were as follows:

1. Date the initial construction of the northern area of the plaza.

2. Investigate the methods used to construct the plaza.

3. Examine the types of communal activities that took place in this public area.

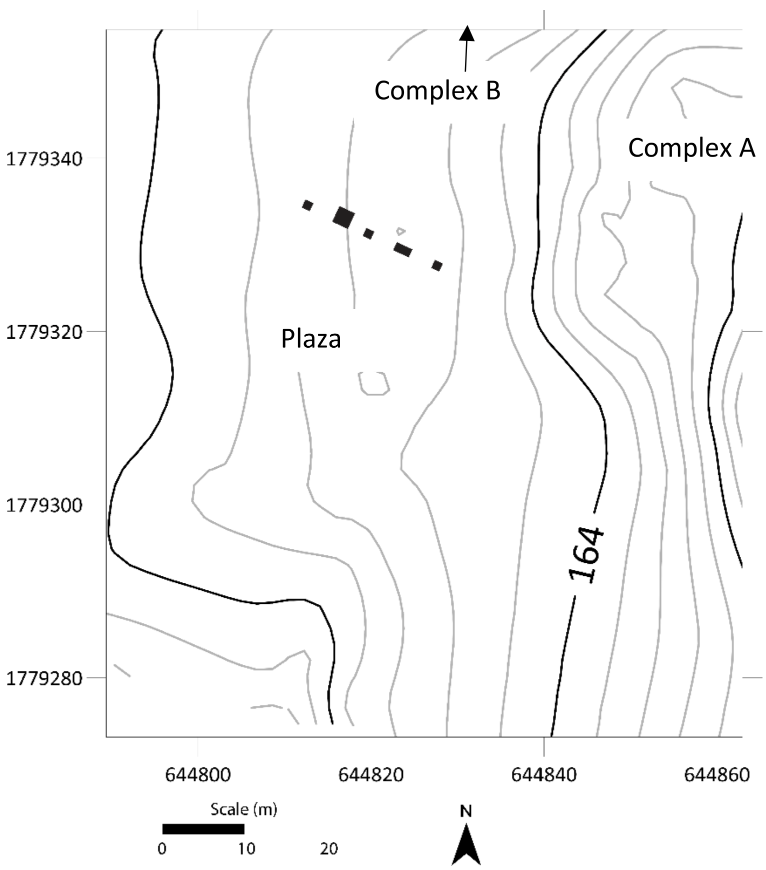

Figure 5.66: Excavation locations for PTRV16-Op G.

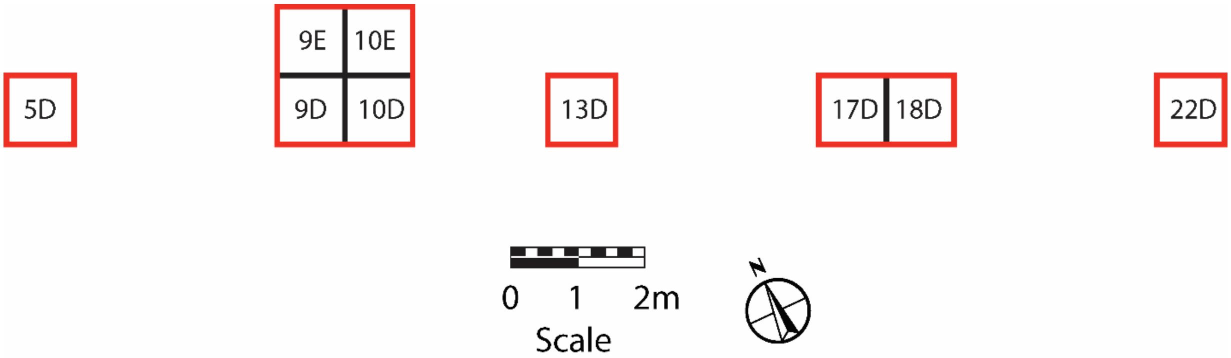

Figure 5.67: Plan map of Op G with drawn profiles outlined in red.

Evidence from Op G indicates that construction on the northwest section of the plaza began during the transitional period between the Miniyua and Chacahua phases, with the bulk of construction occurring in the latter period. Like the more formal public buildings at the Cerro de la Virgen, the plaza was a vital locale for practices associated with place-making and communal ritual. Residents placed a dedicatory offering of an effigy vessel, likely broken intentionally upon its interment, immediately before the earliest fill episode. As the plaza was elevated further, additional "feeding" offerings of cylindrical ceramic vessels were placed within certain layers of construction fill. Ceramic evidence indicates that construction of the northwest section of the plaza ceased at the end of the Terminal Formative. Table 5.5 provides a detailed list of stratigraphic levels in Op G.

Table 5.5: List of stratigraphic levels in Operation G.

Prov Strat	Units	Munsell and Sediment Description	Probable Date	Formation Process	Comments
F1-s1	All units	10 YR 2/2 very dark brown sandy loam	Chacahua	Colluvial fill	Poorly sorted sandy loam with rounded grains and inclusions of sherds, gravel, and root disturbances; frequency of sherds and other inclusions is lower than other layers of colluvium at the site; sediment is moderately packed
F1-s2	22D	10 YR 3/2; very dark grayish brown sandy loam	Chacahua	Colluvial fill	Poorly sorted sandy loam with rounded grains and inclusions of sherds, gravel, and small stones; softer than F5 but harder than F1-s1
F2	9D, 9E, 10D, 10E, 13D	10 YR 3/2; very dark grayish brown sand	Chacahua	Construction fill	Poorly sorted sand with subrounded grains and inclusions of sherds, gravel, and small stones; sediment is softly packed and has fewer inclusions than F1-s1 and F6
F3	18D	No Munsell; ceramic vessels	Chacahua	Offering vessels	Offering of five ceramic vessels (four cylindrical vessels and one globular jar) of varying size deposited into F6; no pit detected in plan or profile
F4	18D	No Munsell; granite stone	Chacahua	Possible retaining wall	One course of stones placed at the surface of F5 in units 18D running north to south at an orientation of 15°-195°; likely retains upper portion of F6 to the east; may have been placed to prevent toward the west; offering F3 placed just below and to the west of wall, suggesting it may have also marked location of offering
F5	22D	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with rounded grains and inclusions of sherds, stones and gravel; more inclusions and harder packed than F1-s3; similar in composition to F6
F6	9D, 9E, 10D, 10E, 13D, 17D, 18D	10 YR 3/2; very dark grayish brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with inclusions of sherds, gravel, and small stones; generally more inclusions than F1-s1 and F2; sediment is very hard packed; surface of fill layer probably formed an occupational surface; contains highest frequency of inclusions in entire site; similar in composition to F5 but contains more inclusions
F7	5D	10 YR 2/2; very dark brown loamy sand	Chacahua	Construction fill	Poorly sorted sandy loam with angular grains and inclusions of sherds, gravel and small stones; sherds are very eroded; sediment is very softly packed; contains more inclusions than F1-s1

Prov Strat	Units	Munsell and Sediment Description	Probable Date	Formation Process	Comments
F9	MU A (9D, 9E, 10D, 10E)	No Munsell; ceramic vessel	Chacahua	Offering vessel	Offering of a small effigy vessel of a human foot (F9-ob1) deposited at the base of F6; likely deposited at the onset of the F6 fill episode; Vessel was only partially complete
F8	13D	10 YR 4/6; dark yellowish brown sand	Probable early Chacahua	Possible pit fill	Possible pit cuts down from the top of F11 (total depth undetermined); filled with poorly sorted sand with rounded grains and inclusions of rocks and sherds; sediment is very soft packed and coarse (almost entirely gravel); fewer inclusions and sherds than overlying strata
F10	5D	10 YR 4/4; dark yellowish brown sand	Probable early Chacahua	Construction fill	Poorly sorted sand with angular grains and inclusions of sherds, mica, gravel, and small stones; sediment is very hard packed and similar in composition to F6 but contains fewer inclusions and is lighter in color; lighter in color but probably analogous to F11
F11	13D	10 YR 3/4; dark yellowish brown sandy clay loam	Late Miniyua or Early Chacahua	Construction fill	Poorly sorted sandy loam with angular grains and inclusions of rocks and sherds; low frequency of sherds; sediment is finer than F6 and contains generally fewer inclusions; hard packed and lighter in color than F6; darker than F8
N1	22D	No Munsell	n/a	Natural bedrock	Naturally occurring grüs/bedrock

Occupational History

The earliest evidence of occupation in the area of Op G comes from F11, a layer of hard-packed, unconsolidated sandy loam with very few inclusions that raised the level of the occupational surface in this area of the site by at least 20 cm to an elevation of 159.1 m a.s.l. (Figure 5.69) Excavations did not reach the base of F11, nor did they reach bedrock in the sole unit in which F11 was detected (unit 13D). While the frequency of sherds recovered from F11 was quite low, the limited number of diagnostic sherds suggests that the construction episode dates to the Chacahua phase. The construction most likely occurred contemporaneously with construction identified in PRV13-Op H (located to the southeast) and may have immediately followed the earliest construction efforts and communal ceremonies that took place in the ceremonial center, including the initial construction of Structure 1 and Complex A as well as the earliest offerings associated with these public buildings. To the west, the earliest fill layer detected in unit 5D was F10, a layer of hard packed sand with inclusions of sherds dating to the Miniyua and Chacahua phases (Figure 5.70). The surface of F10 was recorded at an elevation of approximately 159.0 m a.s.l., suggesting that it was likely analogous to F11.

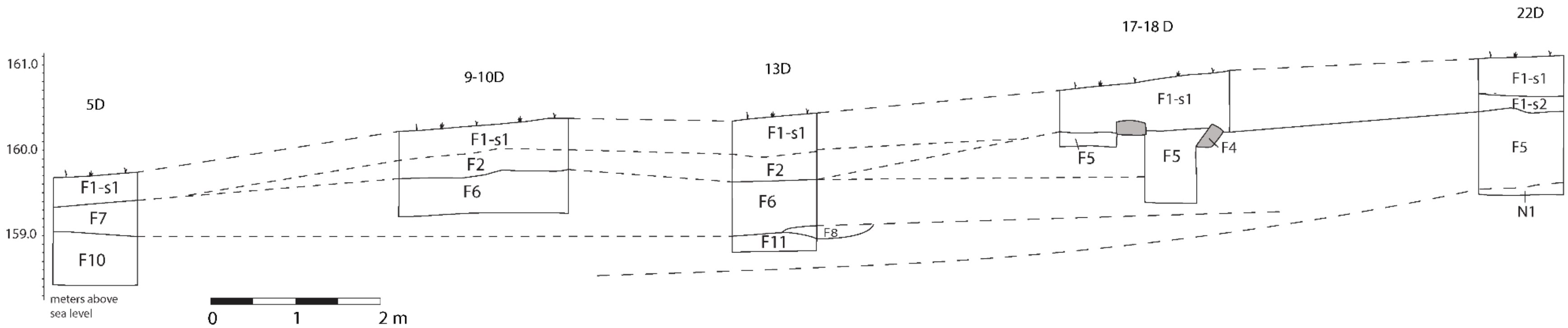

Figure 5.68: Stratigraphic profile of north walls of excavations in Op G.

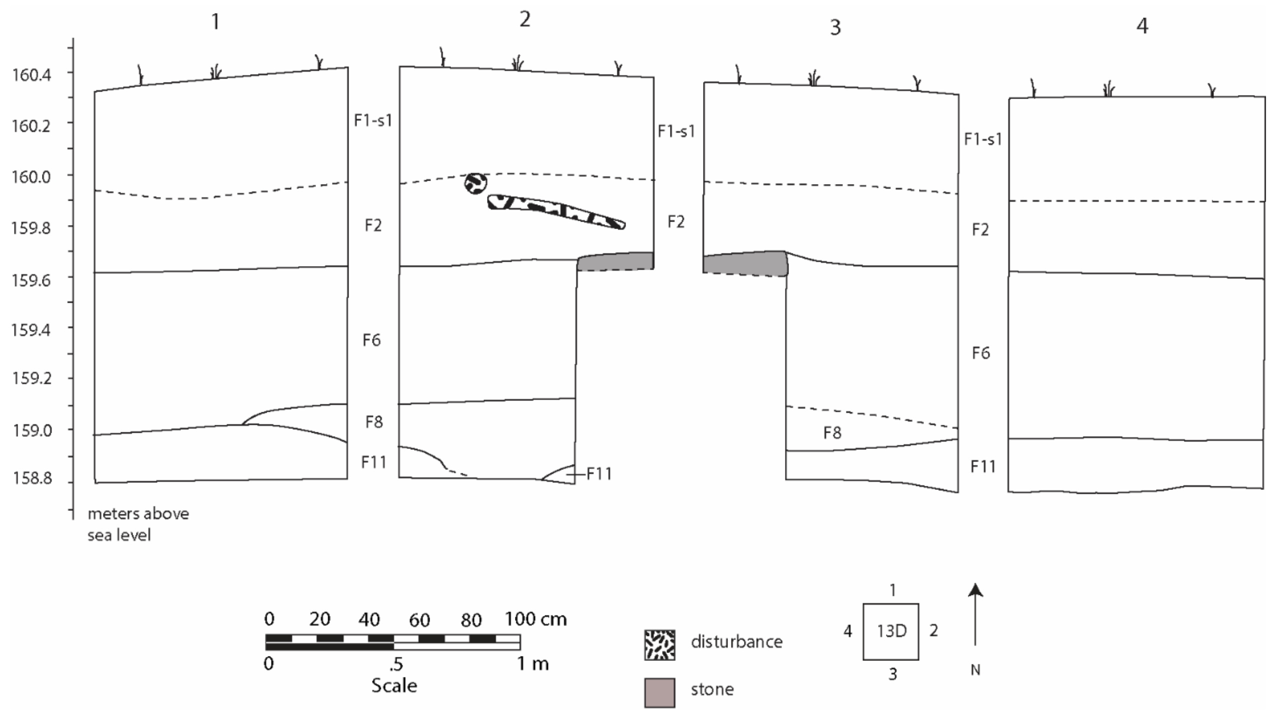

Figure 5.69: Stratigraphic profile of unit 13D.

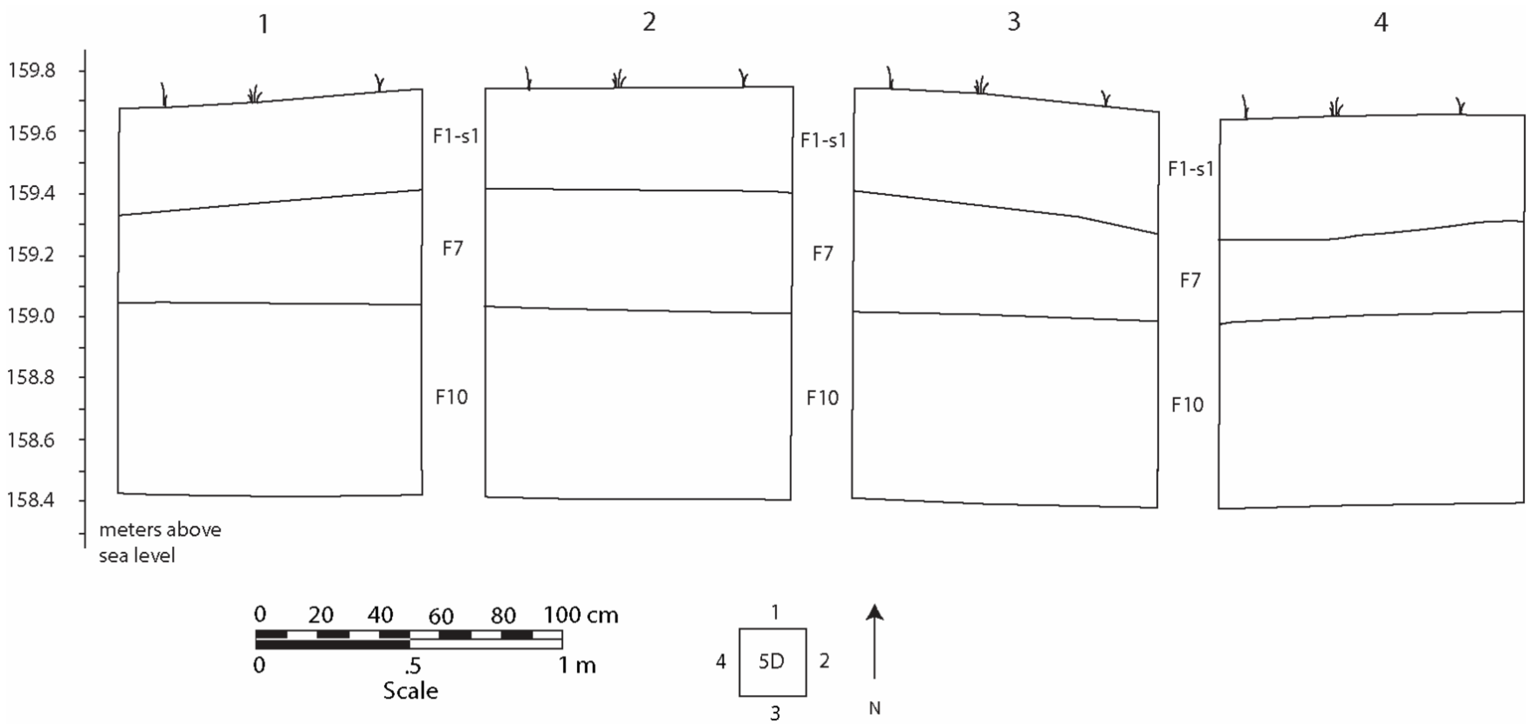

Figure 5.70: Stratigraphic profile of PTRV16-OpG-Unit 5D

Directly atop F11 in unit 13D was a layer of softly packed sand (F8) that likely represents sediment that filled in a pit that was excavated down from the top of F11. The possible pit was shallower than other pits from the site, measuring no more than 20 cm in depth. Like F11, F8 contained very few artifacts, particularly when compared to overlying strata, but diagnostic sherds from the layer also suggested it dated to the transitional period between the Miniyua and Chacahua phases. F8 did not exhibit evidence of cooking and or occupational refuse, making the interpretation of the feature difficult.

The remaining features identified in Op G were likely deposited over a short duration during the Chacahua phase. Though the plaza contained far fewer cultural features than other public buildings in the ceremonial center, some of the same types of dedicatory, feeding, and termination rituals centered on public architecture were practiced in this open space. In the area explored by units 9D, 9E, 10D, and 10E, collectively excavated as “Multi-unit A” (Figure 5.71), residents of the site deposited a small offering of a ceramic effigy vessel of a human foot (F9-ob1), likely as a dedicatory offering prior to the next major building phase in the area (Figures 5.72-5.73). The vessel was found in several pieces, of which only ten refit, though it is unclear whether the vessel was smashed intentionally upon its interment or broke apart due to post-depositional movement. Given its placement at the base of a layer of construction fill and its resemblance to offering PRV13-OpD-F24, the collection of stone objects that were broken intentionally and likely placed within a cloth bundle at the base of Structure 1 (see Chapter 4; also see Brzezinski et al. 2017), I suspect that F9-ob1 was also broken intentionally as it was placed.

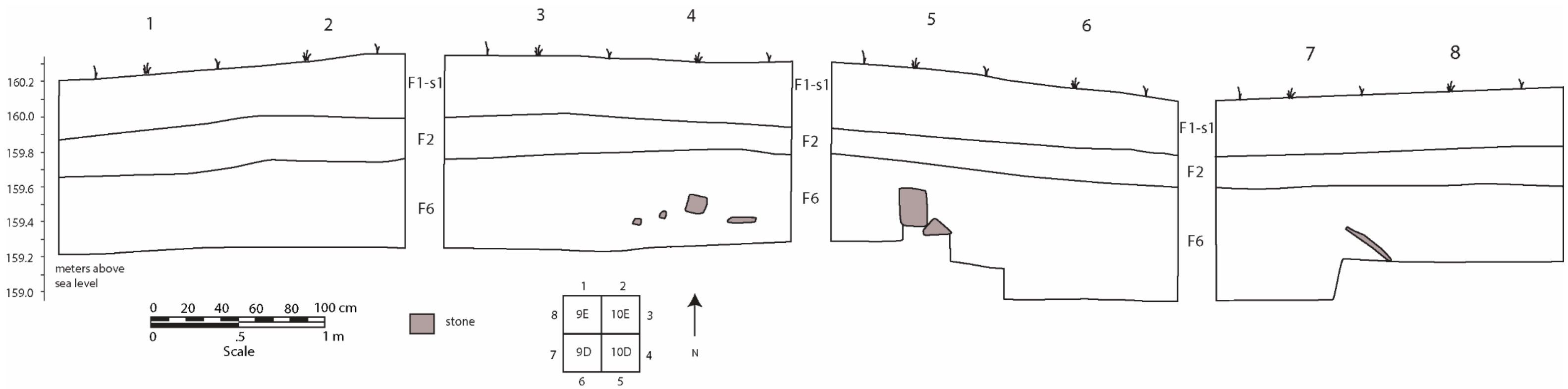

Figure 5.71: Stratigraphic profile of PTRV16-OpG-Unit 9D, 9E, 10D, and 10E

Figure 5.72: Plan drawing (left) and photograph (right) of offering F11 in situ.

Figure 5.73: Offering F9-ob1 with base of effigy vessel reconstructed.

Immediately after the placement of F9, a layer of poorly sorted, extremely hard-packed sandy loam (F6) with a significant amount of gravel, stone, and sherd inclusions was deposited across the northwest area of the plaza (Figures 7-10). This major construction episode raised the occupational surface of the plaza by about 80 cm to an elevation of approximately 159.8 m a.s.l. To the far west of Op G in unit 5D, a layer of softly packed loamy sand (F7) was detected at about the same elevation. It is unclear whether F6 and F7 date to the same construction phase. Given that the fill layers differed significantly, it is possible that the edge of F6 dropped off between units 5D and 9D, possibly making F7 stratigraphically younger. To the east, builders raised the level of the plaza an additional 50 cm to an elevation of about 160.3 m a.s.l. by depositing F5, a layer of hard-packed sandy loam (Figure 5.74-5.75). F5 and F6 were nearly identical in composition, suggesting they were mined from the same source and deposited in succession. The deposition of F5 may have given the plaza more of a three-dimensional character by stepping down to the west.

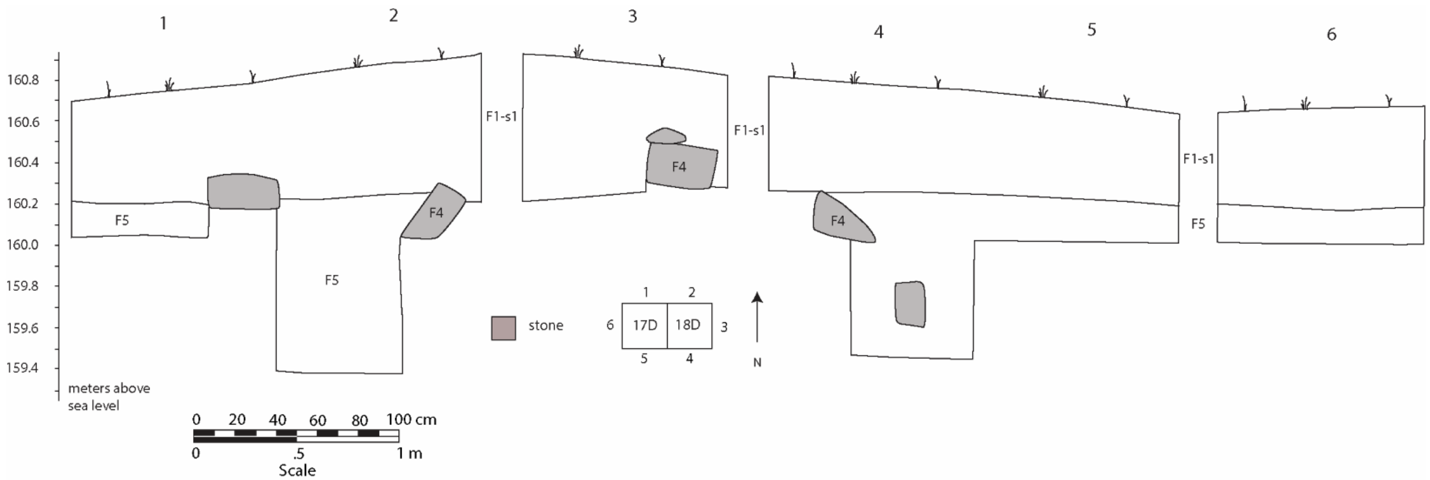

Figure 5.74: Stratigraphic profile of units 17D and 18D.

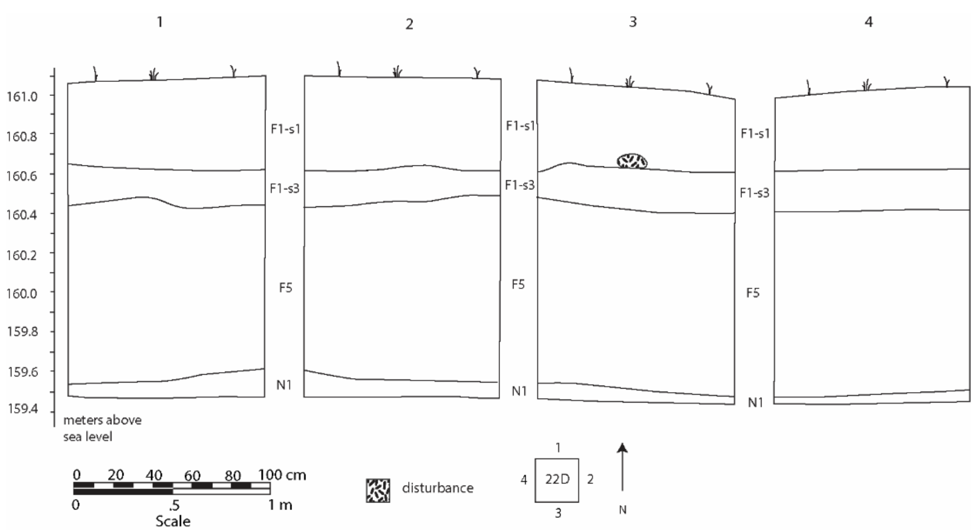

Figure 5.75: Stratigraphic profile of unit 22D.

At the end of the F5 fill episode, residents deposited two features in the area explored by units 17D and 18D--a line of stones (F4) running north-south and an offering of at least five ceramic vessels (F3). It is unclear whether the offering of vessels was placed during the F5 construction episode or immediately following it. F3 consisted of four coarse brown ware cylindrical vessels of varying sizes and one coarse brown ware globular jar that were placed just below the surface of F5 (Figure 5.76-5.77). Of particular note was F3-ob2, an extremely large cylinder similar in size to PRV13-OpD-F17-Ob8 in Structure 1. The rim of F3-ob2 was broken, so the height of the vessel is unknown. No pit was detected into which F3 was deposited. F4 was also deposited at the end of the F5 construction episode, but it is unclear how it functioned. The line of stones was likely not a retaining wall or a standing wall as it was not particularly structurally sound. Excavations did not explore the stratigraphy below the wall, but probes with ice picks did not detect a second, lower course. It is possible that F4 prevented erosion of the plaza surface down and to the west or may have marked the location of the F3 offering.

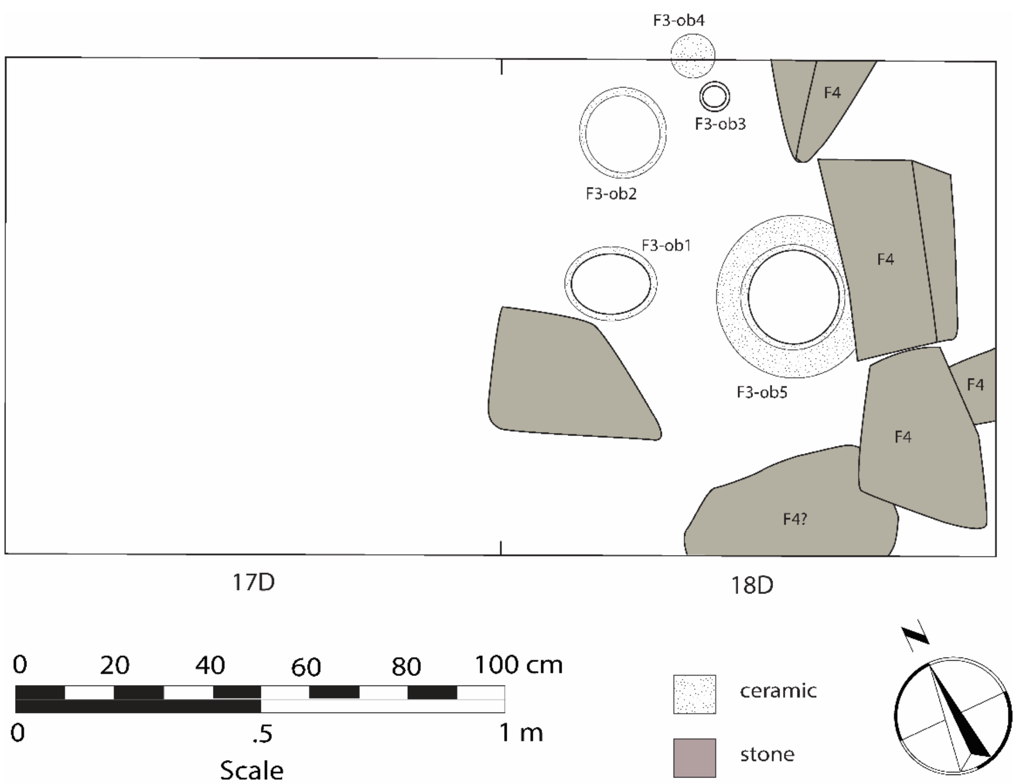

Figure 5.76: Plan drawing of offering F3 and possible wall (F4).

Figure 5.77: Photograph of offering F3 and line of stones, F4 (left); Photograph of F3 objects 2, 3, and 4 (right).

The final construction event in the area explored by Op G was F2, a layer of softly packed, poorly sorted sand. Ceramics from F2 indicate the fill layer, which elevated the occupational surface in the western area of Op G to approximately the same elevation as F5, indicate the stratum dates to the Chacahua phase. The surface marked by F2 and F5 was the final occupational episode of the northwest area of the plaza. A layer of colluvial fill (F1) covered F2 and F5 after the site was abandoned.

SUMMARY

Archaeological research carried out in Terrace 2, the ballcourt, and Complex B demonstrates that a wider range of collective practices were carried out in the broadly accessible base of the ceremonial center at Cerro de la Virgen, compared to the more restricted public buildings located up the hill and to the east. The PRV13 (Operations E, F, G, and G) and PTRV16 (Operations F and G) revealed evidence that people participated in communal rituals such as large-scale feasts, the burial of the dead, the placement of ceremonial objects as offerings in public buildings and spaces, and rituals related to the Mesoamerican ballgame. In addition, Complex B was also the setting for economic production involving multiple community members. Excavations uncovered thick deposits of stone rubble that formed as debris from the reduction of large pieces of granite into shaped stone blocks to be used in constructing the site's many impressive terraces. At present, there is little evidence to suggest that Complex B was the residence of an attached craft worker; rather, the presence of a suite of ritual deposits suggests that masonry production was just one of many practices that integrated the residents of Cerro de la Virgen. While similar terraces are found at other sites in the lower Verde, no single public building in the region has been identified as containing a similar collection of ground stone tools.

Ceramic dates from multiple areas in Terrace 2, including Complex B, the plaza, and the ballcourt, show that the area was constructed during the Chacahua phase, perhaps as the scope of ritual practices that were first carried out in Complex A and Structure 1 intensified later in time. A cache of ceramic vessels uncovered in the northern part of the plaza indicates that the placement of ceremonial offerings was not restricted to high status ritual specialists. Further, open public spaces likely necessitated the same times of dedication and termination rituals as ceremonial buildings, exemplified by the placement of an effigy vessel at the onset of the earliest fill episode identified in the plaza. There was also greater variability in the contents of ceremonial caches in the plaza. For example, three test units in the transect of PRV13-Op H revealed dense deposits of thin stone slabs that lacked associated offering vessels, although it is possible that the collections of slabs represented storage features.

The best evidence for mortuary ceremonialism also comes from Complex B. Three of the four burials excavated at Cerro de la Virgen to date were deposited in layers of fill immediately to the east of the ballcourt. It is probable that the burials constituted offerings that conveyed ontological meanings that were similar to vessel caching displayed above (Joyce and Barber 2015a; also see Chapter 8). B2-I2 was a primary interment, whereas B1-I1 and B3-I3 were secondary. All were discrete interments, unlike the late Terminal Formative cemetery at Yugue in which members of varying levels of status in the community were buried together.

VI. CONSTITUTING COMMUNITY OUTSIDE OF THE CEREMONIAL CENTER: EXCAVATIONS OF COMPLEX E

INTRODUCTION

This chapter presents the results of excavations at Complex E, a three-tiered terrace complex located approximately 125 m to the north of the ceremonial center at Cerro de la Virgen. Complex E is supported by Terrace 15, which was comprised of four smaller terraces (15a, 15b, 15c, and 15d) in its final form and covered a total area of approximately 2,120 m^2 (Figures 6.1 and 6.2). As described in Chapter 3, Complex E was selected for excavation because it was spatially separated from the activities carried out in the ceremonial center, was generally well-preserved, and had surface evidence suggestive of domestic activities (e.g., mano and metate fragments). These characteristics made excavating Complex E instrumental in documenting the chronological development of the site, comparing the ceremonial and domestic activities that took place within and outside of the site's ceremonial center, and examining the degree to which the site was integrated internally. The addition of an archaeological assemblage from an architectural complex separated from the ceremonial center also makes the overall site assemblage from Cerro de la Virgen increasingly robust for comparison to similar assemblages from other Terminal Formative sites in the region (see Chapter 8).

Investigations at Complex E were separated into four operations--A, B, C, and D. Operation A consisted of block excavations located on Terraces 15a and the southern area of Terrace 15c, covering a total area of 110 m^2. Operation B consisted of limited block excavations on Terrace 15d to the northwest, covering an area of 30 m^2. The goals of Ops A and B were to date the construction and use of Complex E and to examine the construction methods and activities carried out there. Operations C and D consisted of 1 x 1 m test units placed below and to the south of Terrace 15. The goal of Ops C and D was to uncover a midden that shed greater light on the day-to-day activities carried out on the terrace.

However, neither operation was successful in finding a midden. The findings of excavations at Complex E are detailed below.

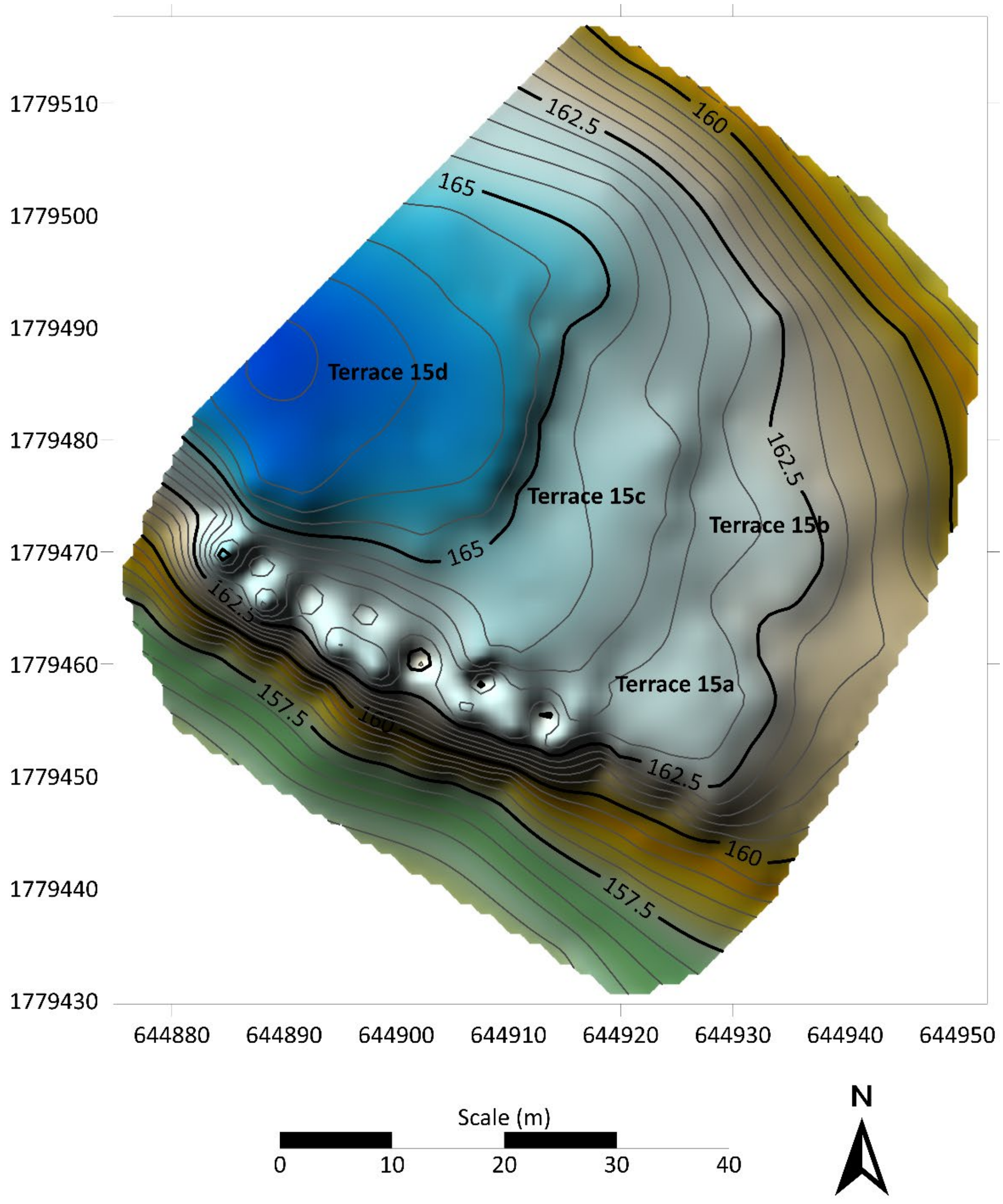

Figure 6.1: Topographic/colored relief map of Complex E with terraces labeled.

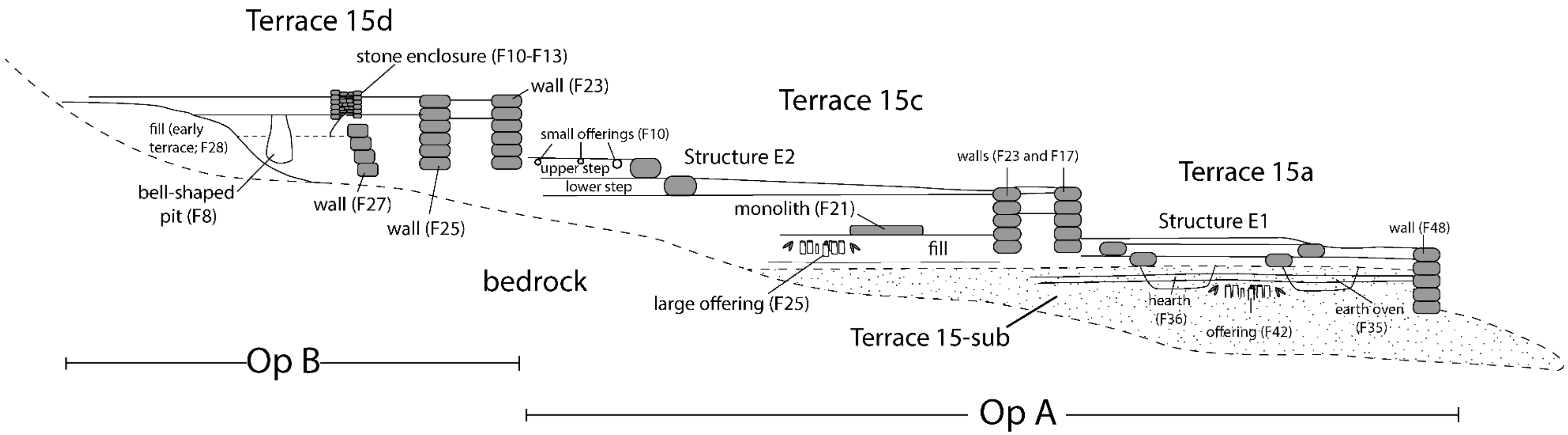

Figure 6.2: Idealized cross-section of Complex E with selected features labeled (not to scale)

PTRV16 - Operation A

PTRV 16-Operation A comprised a series of block excavations measuring a total area of 110 m^2 in the southern and central areas of Complex E (Figure 6.3). Topographically, the excavations were centered on Terraces 15a and 15c. The main objectives of Op A were to date the construction and occupation of the southern end of the complex and to examine evidence of the ceremonial and domestic activities carried out there. The majority of excavated units in Op A were opened to remove the uppermost stratum of colluvial fill to expose lines of masonry architecture just below the surface. All units that were excavated to a depth of greater than 25 cm below the modern surface were drawn in profile (Figure 6.4).

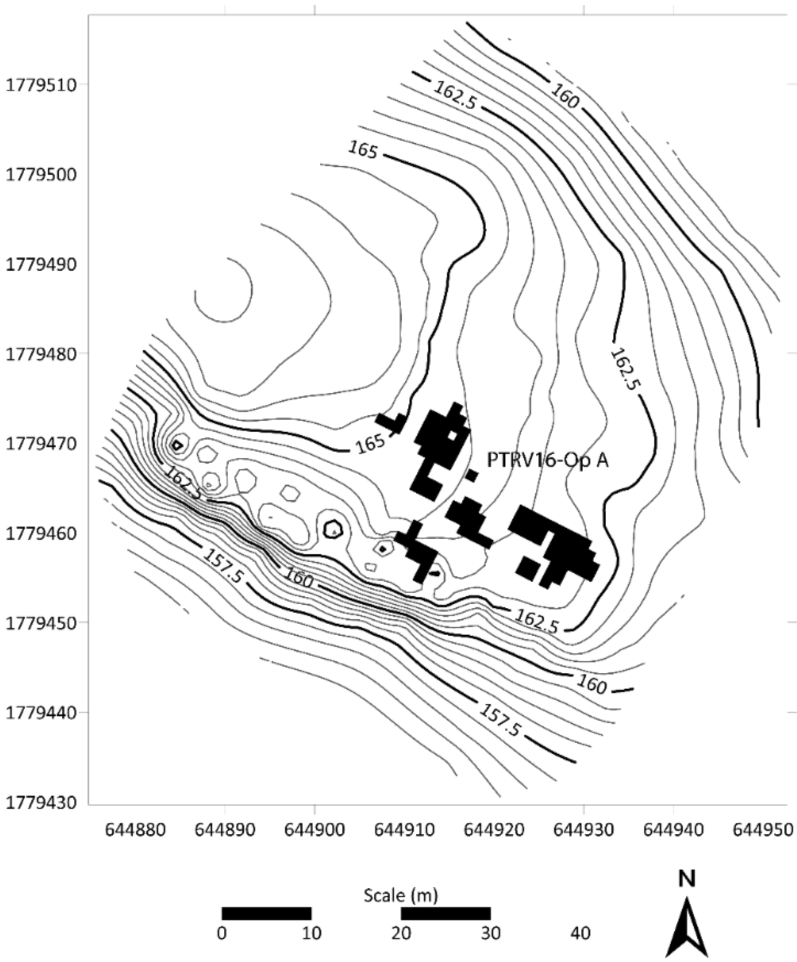

Figure 6.3:Topographic map of Complex E with excavation units marked in black.

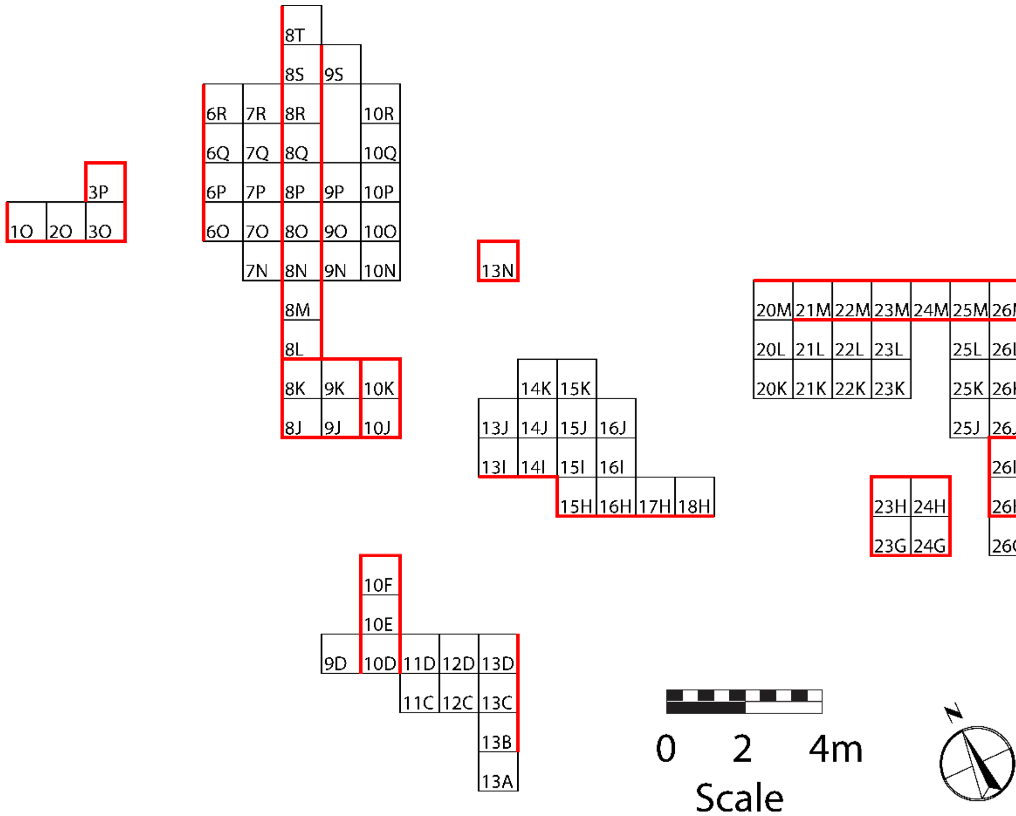

Figure 6.4: Plan of excavation units in Operation A, drawn profiles outlined in red.

Construction and occupation of Complex E began during the transitional period between the Miniyua and Chacahua phases and ended in the Coyuche phase. In its original form, the complex consisted of one broad terrace (Terrace 15-sub) on which perishable superstructures were likely built (Figure 6.2). Early evidence of day-to-day activities on Terrace 15-sub come from two cooking features--a hearth and an earth oven--located in the southeastern corner of the terrace, as well as a primary deposit of ceramic vessels consistent with domestic settings at the site (see Barber 2005:Appendix G) that included storage, cooking, and serving wares. Offerings of ceramic vessels and stone slabs were placed beneath the occupational surface associated with the cooking features. Op A also exposed a large, dense offering of ceramic vessels and stone slabs in the south-central area of Terrace 15-sub that contained 82 coarse brown ware vessels in an area measuring just 4 m^2. Based on its stratigraphic location just above bedrock, it is likely that the deposit of vessels constituted a dedicatory offering marking the first major construction episode of the terrace. A large grinding stone was found on the occupational surface just above the offering, suggesting the construction episode coincided with larger communal gatherings as the complex developed.

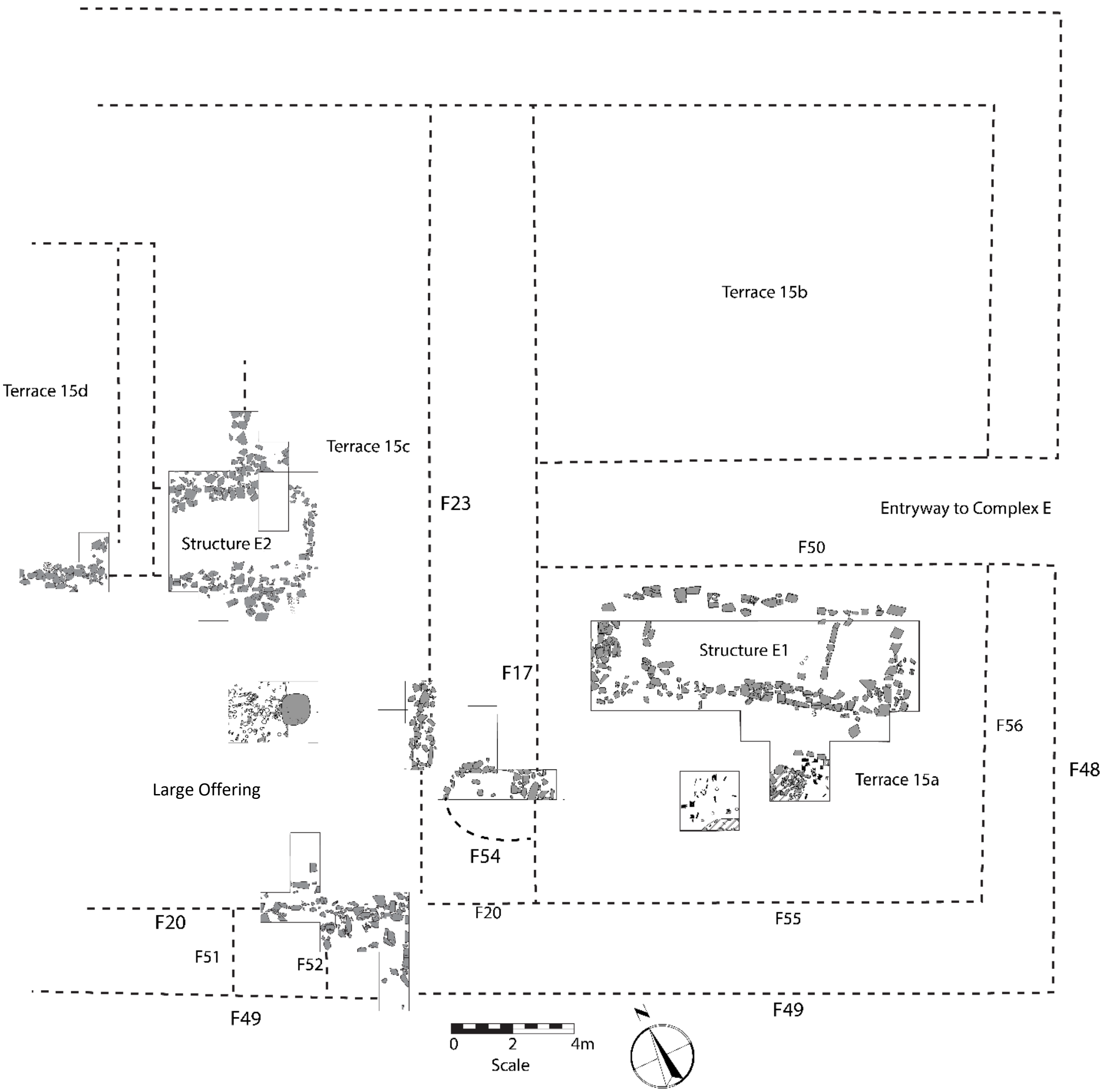

Figure 6.5: Plan drawing of Complex E with terraces labeled (dotted lines indicate lines of stone not drawn in detailed plan).

Later in the Chacahua phase, residents transformed Terrace 15 into a multi-tiered architectural complex with three levels and four distinct terraces (Figure 6.5). The lower level consisted of Terraces 15a and 15b, which were separated by a narrow corridor that served as the entry way to Complex E. Access to the complex would have been difficult from the south and north, as the terrain slopes downward steeply on each side (though access from the west would have also been possible). Some archaeological evidence suggests that Terrace 15a may have supported a residence. Excavations explored Structure E1, a rectangular stone platform built early in the Chacahua phase and later expanded, which contained a markedly higher frequency of figurine fragments and storage wares. Cooking features utilized earlier in the life history of the complex continued to be used by residents. The central level extended the length of the complex from north to south and provided a broad area at each end for what may have been communal activities involving residents and perhaps broader members of the community, including ceremonial caching of ceramic vessels, stone slabs, and ground stone tools. The upper level of the complex consisted of Terrace 15d, which was explored in detail in PTRV16-Operation B (see next section).

Near the end of the Chacahua phase or early in the Coyuche phase, access to the southern end of Terrace 15c was restricted by the construction of Structure E2, a two-stepped rectangular platform that extended perpendicularly to the east from the retaining wall of Terrace 15d. Offerings found in association with Structure E2 were consistent with other late Chacahua/early Coyuche phase deposits that tended to feature miniature globular jars found near the modern surface. Currently, it is unclear whether the later offerings were meant to dedicate the construction of Structure E2 or terminate its use prior to the abandonment of the site. Table 6.1 provides a detailed list of all stratigraphic levels recorded in Operation A, beginning with the latest and ending with the earliest.

Table 6.1: List of stratigraphic levels in Operation A.

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F1	8J, 8K, 9J, 9K	10 YR 2/1; black loam	Post Formative or Modern	Deflated soil formed in colluvial fill	Less than 10 cm-thick layer of soil formed in colluvial fill (F2); sediment is very loose and contains more organic material than F2; see Figures 6.6 and 6.30
F2	8J, 8K, 9J, 9K, 13N	10 YR 2/2, very dark brown loamy sand	Post Formative or Modern	Colluvial fill	30-35 cm-thick layer of colluvium washed down from upper level of Complex E as well as higher elevations to the west; Sediment is angular and poorly sorted; harder packed than F19; see Figures 6.6, 6.9, 6.21, and 6.30-6.33
F3	23G, 23H, 24G, 24H, 26H, 26I, 27H, 27I	10 YR 2/2, very dark brown sandy loam	Post Formative or Modern	Colluvial fill	20-25-cm thick layer of sandy colluvium with inclusions of organic matter stones; highly disturbed by roots and rodent burrows; sediment is softly packed, angular and poorly sorted; likely analogous to F4, but does not appear to have significant soil development; see Figures 6.7 and 6.8
F4	21M-28M,	10 YR 3/2, very dark grayish brown sandy loam	Post Formative or Modern	Deflated soil formed in colluvial fill	25-30 cm-thick layer of soil formed in colluvium washed down from middle level of Complex E; very dark with inclusions of organic material, roots, sherds, and small stones; harder packed than F26-s1; also contains more disturbances; sediment is semi-rounded and poorly sorted; see Figures 6.10 and 6.11
F5	27J, 27K, 28J, 28K	No Munsell; ceramic	Coyuche?	Offering vessel	Single offering vessel (coarse brown ware cylinder) deposited into F6 directly south of southern retaining wall (F29) of Structure E1; not visible in profile
F6	23G, 23H, 24G, 24H	10 YR 2/1; black loamy sand	Coyuche; post abandon-ment?	Buried soil formed in construction fill	Very dark, loosely packed loamy sand with inclusions of angular stones, sherds and organic material; sediment is angular and poorly sorted; contains the highest proportion of Coyuche phase sherds from all Op A excavations (15 of 19 [79%] diagnostics in unit 27I); more loosely packed than F3 and F62; see Figures 6.7, 6.8, and 6.15

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F55	n/a	No Munsell; granite stone	Chacahua	Stone retaining wall	Terrace retaining wall; likely retains fill layer F6 to the north (not excavated); not visible in profile
F56	n/a	No Munsell; granite stone	Chacahua	Stone retaining wall	Terrace retaining wall; likely retains fill layer F6 to the west (not excavated); not visible in profile
F7	8S, 8T	No Munsell; granite stone	Late Chacahua or early Coyuche	Possible terrace step	Possible lower retaining wall running north-south in front of larger upper level retaining wall; retains to the west (retained sediment not excavated); see Figures 6.30 and 6.31
F8	6R	10 YR 3/4, dark yellowish brown sandy loam	Late Chacahua or early Coyuche	Construction fill	Probable occupational surface at the top of fill layer; Sediment is angular and poorly sorted; retained by F9; see Figures 6.30 and 6.32
F9	6R, 7R, 8R, 10R	No Munsell; granite stone	Late Chacahua or early Coyuche	Stone retaining wall	North retaining wall of platform exposed in middle level of Complex E; retains sediment (F8) to the north; wall has largely slumped and collapsed, but several small chinking stones visible; see Figures 6.30-6.32
F10	3P, 6O, 6P, 8Q	No Munsell; ceramic	Late Chacahua or early Coyuche	Offering vessels	Offering of five vessels deposited into F11, the occupational surface within the platform extension in the middle level of Complex E; four small/miniature globular jars and one miniature cylinder; not visible in profile
F59	10O	10 YR 3/2, very dark brown sandy loam	Late Chacahua or early Coyuche	Possible post hole	Possible post hole cast located in the southeastern corner of the addition to the middle level of Complex E; upper part of possible post hole detected at surface of F11; approximately 13 cm in diameter; sediment sample preserved; no other post holes found on this surface; not visible in profile
F11	6Q, 8P, 8Q	10 YR 3/4, dark yellowish brown sandy loam	Late Chacahua or early Coyuche	Construction fill	Probable occupational surface at the top of fill layer; Sediment is angular and poorly sorted; offering of five vessels (F10) deposited within this layer; see Figures 6.30-6.33

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F12	10O, 10P, 10Q, 10R	No Munsell; granite stone	Late Chacahua or early Coyuche	Stone retaining wall	East wall of mid-level platform in Complex E; retains sediment (F11) to the west; excavations did not expose a profile that displayed stratigraphy below this wall
F58	6O	No Munsell; Ceramic vessel	Late Chacahua or early Coyuche	Offering vessel	Offering of one miniature gray ware vessel placed atop one of the stones in F13; possibly placed as a termination offering prior to abandonment; not visible in profile
F13	8N, 8O	No Munsell; granite stone	Late Chacahua or early Coyuche	Stone retaining wall	Southern platform wall for addition to the middle level; retains sediment (F11) to the north in Structure E2; see Figures 6.30-6.33
F14	8N	10 YR 2/1, black loamy sand	Late Chacahua or early Coyuche	Construction fill	Sediment is angular and poorly sorted; similar in composition to F19; Structure E2; see Figure 6.30
F15	8N	No Munsell; granite stone	Late Chacahua or early Coyuche	Possible stone "step" or retaining wall	Wall sits atop F19/F16 and retains sediment (F14) to the north, creating a step down to a lower level to the south of Structure E2; see Figures 6.30 and 6.31
F16	8P	10 YR 3/3, dark brown sandy loam	Late Chacahua or early Coyuche	Construction fill	Probably deposited to level out the undulating surface of F19 to create the platform of Structure E2; see Figures 6.30 and 6.31
F57	9S	No Munsell; ceramic	Late Chacahua or early Coyuche	Offering vessel	Offering of one miniature vessel located just north of F9 and just east of F7; deposited into F19; not visible in profile
F18	10N	No Munsell; ceramic	Late Chacahua or early Coyuche	Offering vessel	Offering of one smashed coarse brown ware vessel (F18-ob1) located directly to the south of corner of F13 and F12; deposited within F19; not visible in profile
F19	8J, 8K, 9J, 9K, 13N	10 YR 2/2, very dark brown loamy sand	Late Chacahua or Early Coyuche	Buried soil formed in construction fill	Very soft loam with inclusions of organic matter and sherds; sediment is finer and more loosely packed than F2 and F24; semi-rounded and poorly sorted; see Figures 6.6, 6.9, 6.21, 6.30 and 6.31
F51	n/a	No Munsell; granite stone	Late Chacahua or Early Coyuche	Stone retaining wall	North to south wall between F20 and F49; not visible in profile
F52	n/a	No Munsell; granite stone	Late Chacahua or Early Coyuche	Stone retaining wall	North to south wall between F20 and F49; not visible in profile

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F53	13A, 13B, 13C, 13D	No Munsell; granite stone	Late Chacahua or Early Coyuche	Stone retaining wall	North to south wall between F20 and F49; likely an extension of F23 that articulates with F49; not visible in profile
F23	14I, 14J, 14K, 13N	No Munsell; granite stone	Late Chacahua or Early Coyuche	Stone retaining wall	Terrace retaining wall running north-south along the eastern edge of the middle level of Complex E; retains F19 and/or analogous strata to the west; likely raised higher in phases as subsequent construction fill episodes were carried out in the interior of the middle level; original base of wall may have retained F45-s1 (see base of 13N, east wall), but not clear in profile; see Figures 6.21 and 6.22
F60		10 YR 4/3; brown loamy sand	Late Chacahua or Early Coyuche	Construction fill	Poorly sorted sediment with inclusions of sherds and small stones; slightly finer than F61; retained by F23; likely deposited after F54 is put in place; see Figure 6.21
F54		No Munsell; granite stone	Late Chacahua or Early Coyuche	Stone retaining wall	Circular line of stones near the southeastern corner of Terrace 15c; articulates with F17 but not with F23; function of feature unclear; see Figure 6.21
F61		10 YR 3/3; dark brown loamy sand	Late Chacahua or Early Coyuche	Construction fill	Poorly sorted sediment with inclusions of sherds and small stones; sediment is slightly coarser than F60; retained by F17 and F23 ; see Figure 6.21
F17		No Munsell; granite stone	Late Chacahua or Early Coyuche	Stone retaining wall	Terrace retaining wall running north-south parallel to F23; original base of wall likely built atop F45-s1 (see base of 13N, east wall), but not clear in profile; see Figure 6.21
F20	10D	No Munsell; granite stone	Late Chacahua or Early Coyuche	Stone retaining wall	Retaining wall running west-east located on the southern end of Terrace 15c; sits atop F45-s1 and retains F19 to the north in the area of Terrace 15c; articulates with F23 and F17, forming southeastern edge of Terrace 15c; see Figure 6.22

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F21	9J, 9K, 10J, 10K	No Munsell; granite stone	Chacahua	Large granite monolith/possible grinding stone	Large granite monolith placed on the surface of F24, overlying the large offering of ceramic vessels (F22-s1 and F25-s1) and granite slabs (F22-s2 and F25-s2); could be analogous to Late Classic offerings on the Rio Viejo acropolis; see Figure 6.6
F22-s1	9J	No Munsell; ceramic vessels	Chacahua	Offering vessel	Offering of one ceramic vessel deposited into upper offering stratum (F24); placed approximately 5 cm west of the southwest corner of large monolith/grinding stone (F21); located stratigraphically below the monolith; not visible in profile
F22-s2	8J, 8K, 9J, 9K	No Munsell; granite stone	Chacahua	Granite slabs	Small pieces of carved or naturally exfoliated stone slabs ranging from 1 cm - 3 cm in thickness; Most slabs deposited in vertical orientation, some forming compartments similar to those found in PRV 13 Op A (F18-s2); Also contains bulkier stones that do not appear to be formed in the same manner as the slabs; all granite material deposited into the upper level of F24; see Figure 6.6
F24	8J, 8K, 9J, 9K, 13N	10 YR 3/3, dark brown sandy loam	Chacahua	Unconsolidated construction fill	15-25 cm-thick layer of sandy loam construction fill with inclusions of sherds and small rocks; sediment is semi-rounded and poorly sorted; Very level upper surface; likely an occupational surface; sediment is very similar to F45-s1, but more loosely packed, slightly finer, and contains fewer sherds and other inclusions; excavations in 8J, 8K, 9J, and 9K exposed only one offering vessel (F22-s1-ob1) in this stratum; see Figures 6.6, 6.9, 6.21, 6.30, and 6.31
F25-s1	8J, 8K, 9J, 9K	No Munsell; ceramic vessels	Chacahua	Offering vessels	Offering of 81 ceramic vessels deposited into F45-s1; some are protected by offering markers (slabs; F25-s2), but most were deposited without them; greatest density of vessels/m^2 of any offering excavated at the site (20.25 vessels/ m^2); not visible in profile

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F25-s2	8J, 8K, 9J, 9K	No Munsell; granite stone	Chacahua	Offering markers or compartments	Carved or naturally exfoliated granite slabs ranging from 2 - 12 cm in thickness placed in vertical position within construction fill (F45-s1); slabs appear to be thicker and less abundant in number in this offering than any other one found so far; deposited either during the deposition of xF5 or after the construction episode was finished; groupings or "stacks" of slabs are similar to those found in the north patio of Complex A; see Figure 6.6 and 6.30
F26-s1	21M-27M	10 YR 4/3, brown sandy loam	Chacahua	Construction fill (sheet fill?)	20-30cm-thick layer of sandy clay loam construction fill deposited atop F44 and F41; Retained by F39 (on west) and F40 (on east); contains inclusions of gravel, sherds, coarse sand, and granite stones; sediment is coarser than F44; more loosely packed than F4 and F13; sediment is similar to structured adobe layers on the acropolis at Rio Viejo, containing dark layers of organic material abutting them, but is significantly coarser in composition; see Figures 6.10 and 6.11
F26-s2	21M, 22M	10 YR 2/1; black sandy loam	Chacahua	Construction fill (sheet fill?)	Dark lenses of sandy loam interspersed with F26-s1 on the western side of Structure E1; contains coarse grained inclusions but no sherds; sediment is semi rounded and poorly sorted; see Figure 6.10
F27	20M, 21M	No Munsell; granite stone	Chacahua	Stone retaining wall	West retaining wall of Structure E1 running north-south; retains F16-s1; at least 2 courses visible in profile; see Figure 6.10
F28	30K, 30L, 30M, 30N	No Munsell; granite stone	Chacahua	Stone retaining wall	East retaining wall of Structure E1 running north-south; retains F16-s1; only one course of stones visible in profile; upper course of stones may have washed further down the terrace to the east or was removed post-abandonment; see Figure 6.10
F29	21K-30K, 29J	No Munsell; granite stone	Chacahua	Stone retaining wall	South retaining wall of Structure E1 running west-east; retains F16-s1; see Figure 6.15

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F30	20N, 21N, 21O, 22N, 22O, 23N-30N, 27M, 28M	No Munsell; granite stone	Chacahua	Stone retaining wall	North retaining wall of Structure E1 running west-east; retains F16-s1; not visible in profile
F31	21M	10 YR 3/2, very dark grayish brown sandy loam	Chacahua	Possible pit feature	Possible pit feature cutting down about 25 cm into F32; contains very dark loamy material with some ash, small stones, sherds, and flecks of charcoal; sherds within stratum are small and eroded; see Figure 6.10
F32	21M	10 YR 3/3, dark brown sandy loam	Chacahua	Construction fill	Layer of construction fill directly to the west of retaining wall F39; contains inclusions of small stones and sherds; lighter than F31, but darker than all other strata associated with Structure E1; sediment is semi-rounded and poorly sorted; see Figure 6.10 and 6.11
F33	21M	10 YR 3/3; dark brown sandy loam	Chacahua	Construction fill?	Mottled sediment that is slightly coarser than F38; may represent cavity left when stone was removed from east retaining wall (F39) of Structure E1-sub; likely contains mixture of F26-s1 and F38; see Figure 6.11
F34	27J	n/a	Chacahua	Ceramic sherd deposit, possible pit	Deposit of Chacahua phase pottery within F62 directly south of F29; includes 6 coarse brown ware bowls, 17 gray ware serving bowls, 8 coarse brown ware jars, 4 gray ware jars, and 1 *comal* (not burned); may have been deposited in pit, but delineation of any cut down through F62 is not clear; likely a household refuse deposit; not visible in profile
F35-s1	26H, 26I, 27H	10 YR 2/2, very dark brown loamy sand	Chacahua	Earth oven	55 cm-deep earth oven cuts down through F62 and F43-s1; layer pertains to upper substratum of earth oven; sediment is very ash and organic, containing inclusions of burned sherds, charcoal, fire-cracked rock, organic material, burned bone, and disintegrated chunks of grano-diorite; sediment is angular and poorly sorted; contains several disturbances; see Figure 6.8

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F35-s2	26H, 26I, 27H	10 YR 2/1, black loamy sand	Chacahua	Earth oven	55 cm-deep earth oven cuts down through F62 and F43-s1; layer pertains to lower substratum of earth oven; sediment is very ash and organic, containing inclusions of burned sherds, charcoal, fire-cracked rock, organic material, burned bone, and disintegrated chunks of grano-diorite; sediment is angular and poorly sorted; contains several disturbances; see Figure 6.8
F36-s1	23G, 24G	10 YR 2/2, very dark brown loamy sand	Chacahua	Hearth	45 cm-deep hearth cuts down through F62 and F43-s1; this layer pertains to the upper substratum of ashy sediment that contains inclusions of stones (not burned), sherds and organic material; sediment is angular and poorly sorted; see Figure 6.7
F36-s2	23G, 24G	10 YR 2/1; black loamy sand	Chacahua	Hearth	45 cm-deep hearth cuts down through F13-2 and F43-s1; Lower level of hearth; sediment is semi-rounded and poorly sorted; darker and more organic than F36-s1; see Figure 6.7
F37	27L	No Munsell; ceramic	Chacahua	Offering vessels	Offering of two coarse brown ware cylinders deposited into F38; both were broken and laying on their sides; not visible in profile
F62	23G, 23H, 24G, 24H	10 YR 3/2, very dark grayish brown sandy loam	Chacahua	Construction fill	Similar to F38, but articulation unclear; likely represents construction that fills in area to the south up to the surface of E1-sub; darker in color than F38, but deposited at the same depth to the same elevation as F38; likely retained by F56 to the east, F50 to the north, and F55 to the south; see Figures 6.7, 6.8, and 6.15
F38	21M-28M	10 YR 4/4, dark yellowish brown sandy clay loam	Chacahua	Construction fill	20-30cm-thick layer of sandy clay loam construction fill deposited atop F44 and F41; Retained by F39 (on west) and F40 (on east); contains inclusions of gravel, sherds, coarse sand, and granite stones; sediment is coarser than F44; harder packed than F26-s1; represents the fill of Structure E1-sub; see Figures 6.10 and 6.11

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F39	21L, 21M, 22M	No Munsell; granite stone	Chacahua	Building foundation wall	West foundation wall of earliest version of building excavated on the lower level of Complex E--Structure E1-sub; associated with Terrace 15-sub; orientation of wall is north-south at 32˚-212˚; unclear where wall articulates with north and south wall (beneath F30 and F29, respectively) of F1-sub; wall retains F13 to the east; south profile of unit 21M indicates that stone from F39 may have been removed prior to the deposition of F26-s1 and filled with mottled sediment (F33); see Figure 6.10
F40	27K, 27L, 27M, 28M	No Munsell; granite stone	Chacahua	Building foundation wall	East foundation wall of earliest version of building excavated on the lower level of Complex E--Structure E1-sub; orientation of wall is north-south at 32˚-212˚; unclear where wall articulates with north and south wall (beneath F30 and F29, respectively) of F1-sub; wall retains F13 to the west; see Figure 6.10
F46	n/a	No Munsell; granite stone	Chacahua	Building foundation wall	Hypothetical northern retaining wall of E1-sub, running east-west; not excavated or recorded in profile
F47	n/a	No Munsell; granite stone	Chacahua	Building foundation wall	Hypothetical southern retaining wall of E1-sub, running east-west; not excavated or recorded in profile
F50	n/a	No Munsell; granite stone	Chacahua	Terrace retaining wall	Northern retaining wall of Terrace 15a; likely retains F62 to the west, but not excavated or recorded in profile

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F41	MU A (25M and 26M)	n/a	Late Miniyua or Early Chacahua	Ceramic sherd deposit	Occupational debris or refuse deposited prior to the construction of Structure E1-sub; includes sherds from 3 coarse brown ware bowls, 1 fine brown ware bowl, 12 gray ware serving bowls, two burned comales, and 10 coarse brown ware jars; fine brown ware sherd dates to Miniyua phase, but is small and eroded and likely redeposited; appears to be slightly beneath or on the surface of F44, but stratigraphic break is unclear; alternatively, could be a termination deposit similar to those found at the end of the Chacahua phase on the Rio Viejo acropolis; see Figure 6.10
F42-s1	23G, 23H, 24G, 24H, 27I	n/a	Late Miniyua or Early Chacahua	Offering vessels	Offering of seven ceramic vessels deposited into F43-s1 (or concurrently with its deposition); vessels include globular jars and cylinders of various sizes; forms are identical to those found in offerings of Complex A, Complex B, and Structure 1; not visible in profile
F42-s2	23G, 23H, 24G, 24H, 27I, 27H	No Munsell; granite stone	Late Miniyua or Early Chacahua	Offering markers or compartments	Carved or naturally exfoliated granite slabs ranging from 2 - 6 cm in thickness placed in vertical position within construction fill (F43-s1); one example of a square compartment found in unit 27I; deposited either during the deposition of F27 or placed within F27 after the construction episode was finished; groupings or “stacks” of slabs are similar to those found in the north patio of Complex A; see Figure 6.7
F42-s3	23G	No Munsell; gound stone	Late Miniyua or Early Chacahua	Offering, ground stone	Offering of a ground stone axe associated with stone slabs and vessels in F42; not visible in profile
F43-s1	23G, 23H, 24G, 24H, 26H, 26I, 27I, 27H,	10 YR 4/3, brown sandy loam	Late Miniyua or Early Chacahua	Unconsolidated construction fill	Oldest construction fill episode detected in the lower level of Complex E; 20-25 cm thick layer of sandy loam with inclusions of sherds and small stones; Sediment is angular and poorly sorted; see Figures 6.7 and 6.8

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F43-s2	23G	10 YR 2/2, very dark brown loamy sand	Late Miniyua or Early Chacahua	Unconsolidated construction fill	Lens of dark loamy sank within F43-s1 containing inclusions of sherds and small angular rocks; sediment is semi-rounded and poorly sorted; darker than F43-s1; may constitute a bucket load of fill from a different source than F43-s1; see Figure 6.7
F44	21M, 22M, 23M, 24M, 25M	10 YR 4/4, dark yellowish brown sandy loam	Late Miniyua or Early Chacahua	Unconsolidated construction fill	Deepest fill stratum detected in area of Structure E1; dark sandy loam sediment is angular and poorly sorted, containing inclusions of sherds and small stones; darker in color than F13 and harder packed than F13 and F26-s1 Probable occupational surface at the top of the fill layer; see Figure 6.10 and 6.11
F45-s1	8J, 8K, 9J, 9K, 10D, 10E, 10F, 13N	10 YR 4/4, dark yellowish brown sandy loam	Late Miniyua or Early Chacahua	Unconsolidated construction fill	65-80 cm-thick layer of densely packed sandy loam deposited directly atop bedrock in the middle level of Complex E; first major episode of construction in the middle level of Complex E; contains inclusions of coarse sand, gravel, and sherds; Offering of ceramic vessels (F22-s1) and granite stones/slabs (F22-s2) deposited near the end of the construction phase; no evidence of disturbance from later offerings; sediment is semi-rounded and poorly sorted; see Figures 6.6, 6.9, and 6.30
F45-s2	8J	5 YR 4/6, yellowish red sandy loam	Late Miniyua or Early Chacahua	Unconsolidated construction fill	Patch of possible burned daub in a coarse sandy loam matrix with inclusions of coarse sand, gravel, particulate mica, and flecks of charcoal; sediment is rounded and poorly sorted; burned daub inclusions appear to be disintegrated; no sherds visible in profile; see Figures 6.6 and 6.30

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F48	n/a	No Munsell; stone	Terminal Formative through Early Classic	Terrace retaining wall	Eastern retaining wall of Terrace 15-sub (and eventually Terrace 15a); articulates with wall F50 later in time, separating Terrace 15a from 15b and forming "entrance corridor"; elevation of wall was increased near the southeastern corner of Complex B as occupational surface was elevated; not excavated or recorded in profile
F49	n/a	No Munsell; grano-diorite stone	Terminal Formative through Early Classic	Terrace retaining wall	Southern retaining wall of Terrace 15-sub (and eventually Terrace 15a and 15c); drops off steeply to the south; elevation of wall was increased as occupational surface was elevated; likely retained F43 and F38 in the southeastern area of Terrace 15-sub and F45 in the central area; not exposed in profile
N1	8J	10 YR 4/6, dark yellowish brown sand	N/A	Natural bedrock	Naturally occurring bedrock; no artifacts; very course sandy sediment is rounded and well sorted; see Figures 6.6 and 6.30

Occupational History

The earliest evidence of occupation in the south-southeastern area of Complex E comes from several early construction fill episodes, including F43 and F44 in the eastern area of Op A and F45 in the western area (Figures 6.6-6.11). The precise sequence of the layers of sandy, loamy construction fill is unclear, but it is likely that they were deposited concurrently during the Chacahua phase to create a relatively level surface that was retained to the east by stone wall F48 and to the south by F49 (see Figure 6.5). However, excavations did not articulate F48/F49 with F43, F44, or F45, so this stratigraphic association is presumptive. Evidence from unit 8J indicates that the natural bedrock (N1) of the hill in this area slopes downward to the southeast at an angle of 12°, with the upper surface reaching average elevation of 162.75 m a.s.l. (Figure 6.6). F45, a 65-80 cm-thick layer of sandy loam was deposited directly atop N1, forming a surface in the western area of Op A at an elevation of 163.9 m a.s.l. that was probably retained by F49 as well. Collectively, these construction features formed Terrace 15-sub, upon which later architectural features were built.

Near the eastern edge of Terrace 15-sub, residents deposited F43 and F44, raising the occupational surface to 163.0 m and 162.8 m a.s.l., respectively. F43 and F44 were possibly retained by stone walls F48 and F49, which formed the eastern and southern edges of Terrace 15A, respectively. The Op A excavations did not explore the construction of F48 and F49, so these stratigraphic associations are tentative. Though excavations did not reach bedrock in the eastern area of Terrace 15-sub, it is likely that F43 and F44 were also deposited directly atop bedrock as the initial construction episodes in the area. Based on their sedimentary matrices, it is probable that F43 and F44 were the same layer of fill, but excavations did not connect the two stratigraphically (Figures 6.7, 6.8, 6.10, and 6.11).

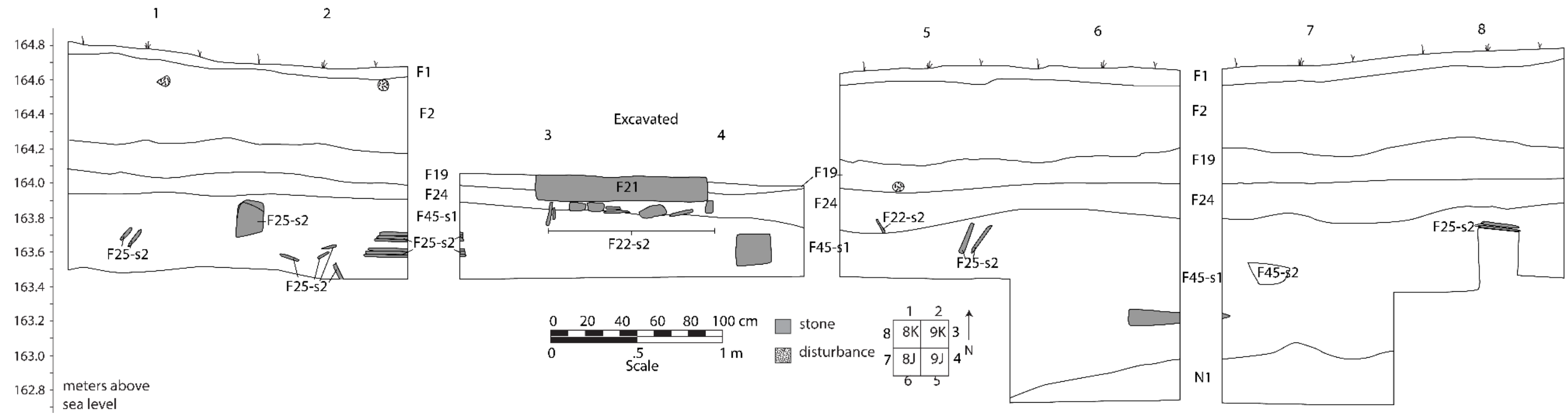

Figure 6.6: Stratigraphic profile of units 8J, 8K, 9J, and 9K in PTRV16-Op A.

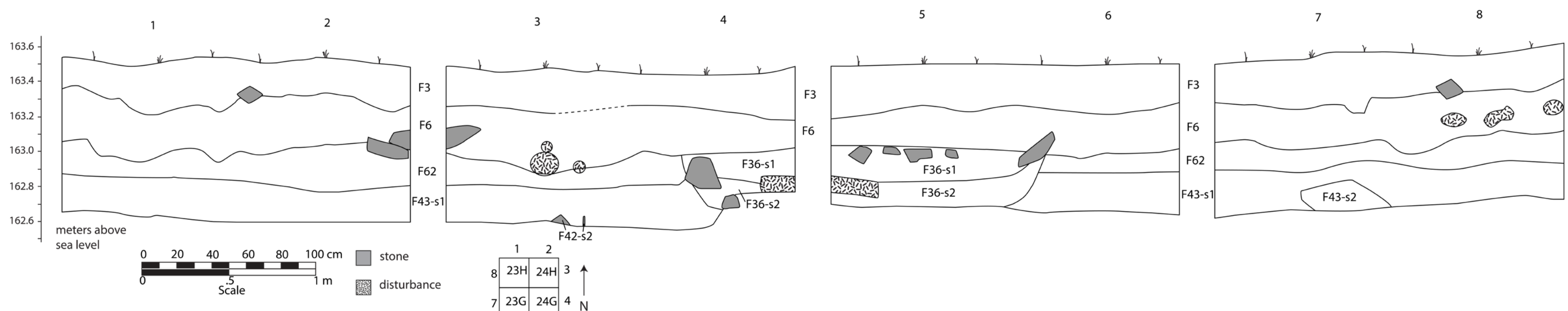

Figure 6.7: Stratigraphic profile of units 23G, 23H, 24G, and 24H in PTRV16-Op A.

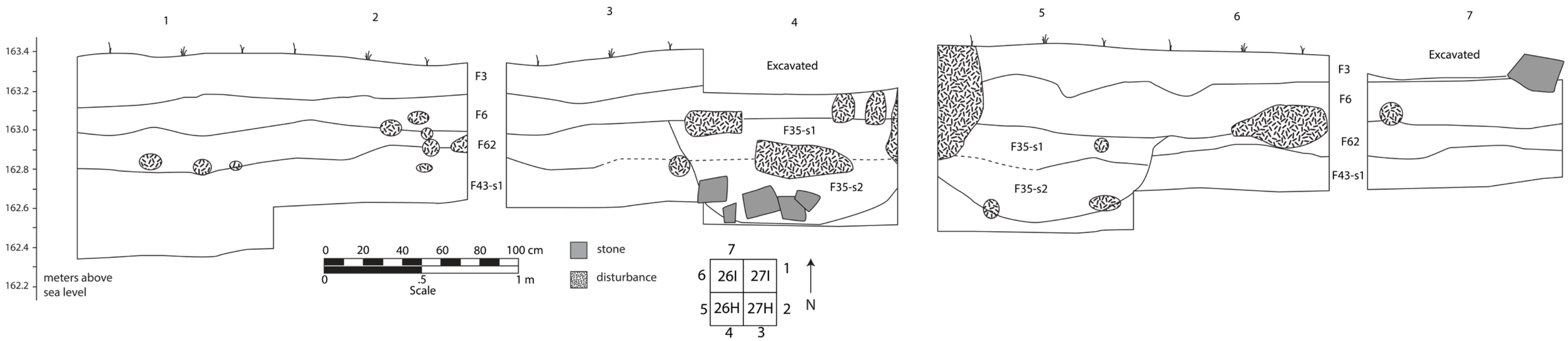

Figure 6.8: Stratigraphic profile of units 26H, 26I, 27H, and 27I in PTRV16-Op A.

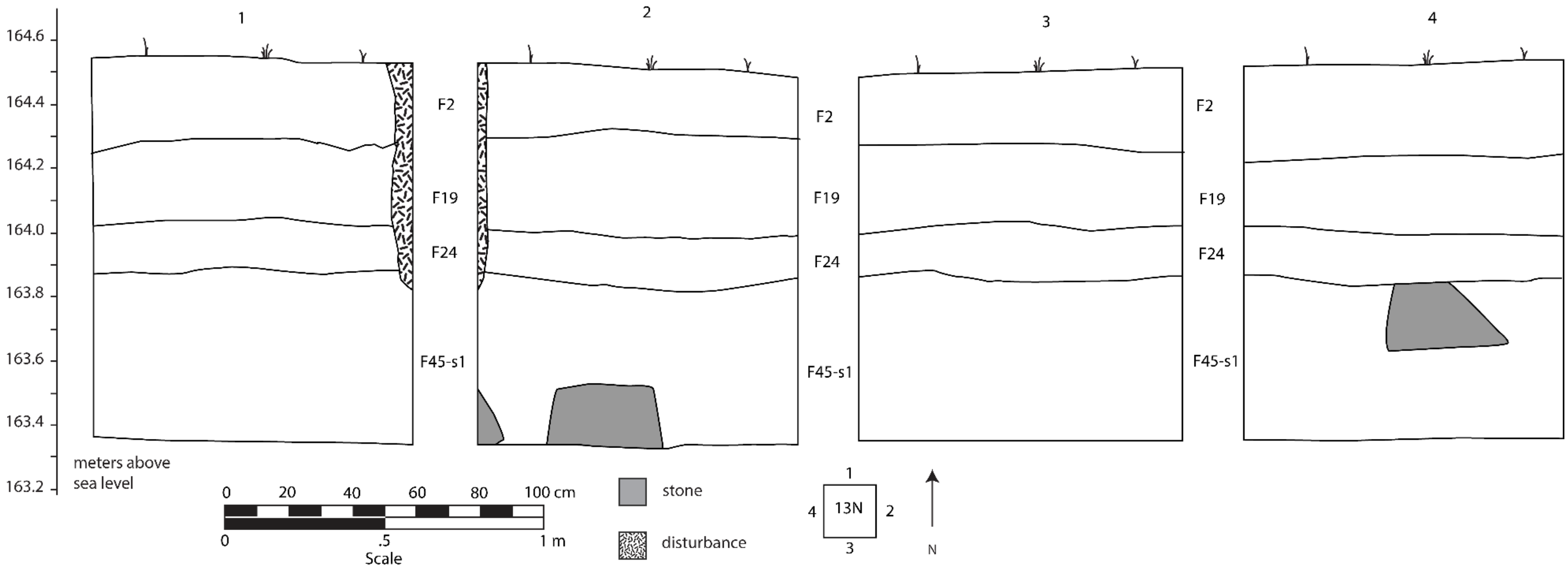

Figure 6.9: Stratigraphic profile of unit 13N in PTRV16-Op A

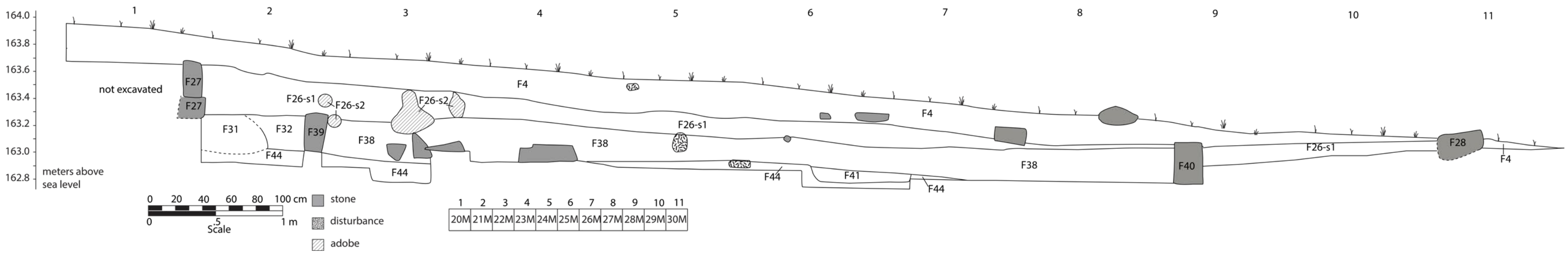

Figure 6.10: Stratigraphic profile of north walls of units 20M-30M in PTRV16-Op A.

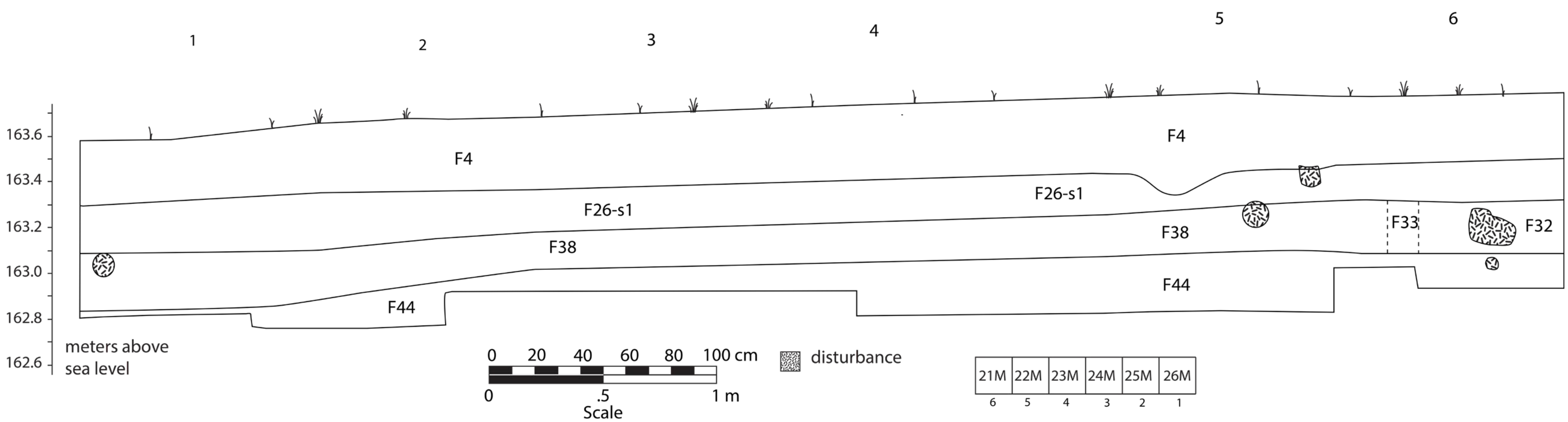

Figure 6.11: Stratigraphic profile of south wall of units 21M-26M in PTRV16-Op A.

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A dense refuse deposit of ceramics (F41) was recovered just below the occupational surface of F44 in units 25M and 26M (Figure 6.10 and 6.12). Sherds recovered in F41, excavated as “Multi-Unit A”, were large, moderately preserved, and found predominantly lying flat. Though the outlines of a pit were not detected stratigraphically, it is likely that a 20-25 cm deep pit was excavated down from the surface of F44 and filled with ceramic debris over a short period of time. Diagnostic sherds from F41 represent a range of utilitarian wares, including three coarse brown ware bowls, one fine brown ware bowl, twelve gray ware serving bowls, two burned coarse brown ware *comales*, and ten coarse brown ware storage jars. The fine brown ware bowl dates to the Miniyua phase, while all gray wares in the deposit date to the Chacahua phase, suggesting a late Miniyua phase or early Chacahua phase date for the deposit and underlying strata. Alternatively, the deposit may have dated exclusively to the Chacahua phase, wherein the Miniyua phase ceramics were redeposited. While F41 did not contain characteristics indicative of a typical residential midden (e.g., ash, charcoal, faunal bone, etc.), the presence of cooking wares, serving bowls, and storage jars in a primary feature such as F41 suggests that this area of Terrace 15-sub was used for day-to-day practices including cooking and food storage.

Figure 6.12: Photograph of ceramic deposit F41 in situ.

Following the deposition of F43 and F44, residents built Structure E1-sub, a low (estimated at 35 cm in height) rectangular platform measuring 6.5 m x 2.5 m that was formed by stone retaining walls F39, F40, F46, and F47. To promote the structural integrity of the overlying architecture of Structure E1, excavations were only able to expose the retaining walls running north-south (F39 and F40) in profile (Figure 6.13). The platform walls of Structure E1-sub were oriented 7˚ to the east of the general site orientation, with the long axis (east-west) situated at 122˚-295˚ and the short axis (north-south) situated at 32˚-212˚. Residents filled the interior of the platform with F38, a 20-30 cm-thick layer of sandy clay loam construction fill that raised the occupational surface of the platform to an elevation of 163.25 m a.s.l. A small offering of two coarse brown ware cylindrical vessels (F37) were placed just below the surface of F38, likely as a dedicatory offering (Figure 6.14). Given the types of domestic ceramic vessels present in F41 and the modest offerings in F37, it is likely that E1-sub was a residence.

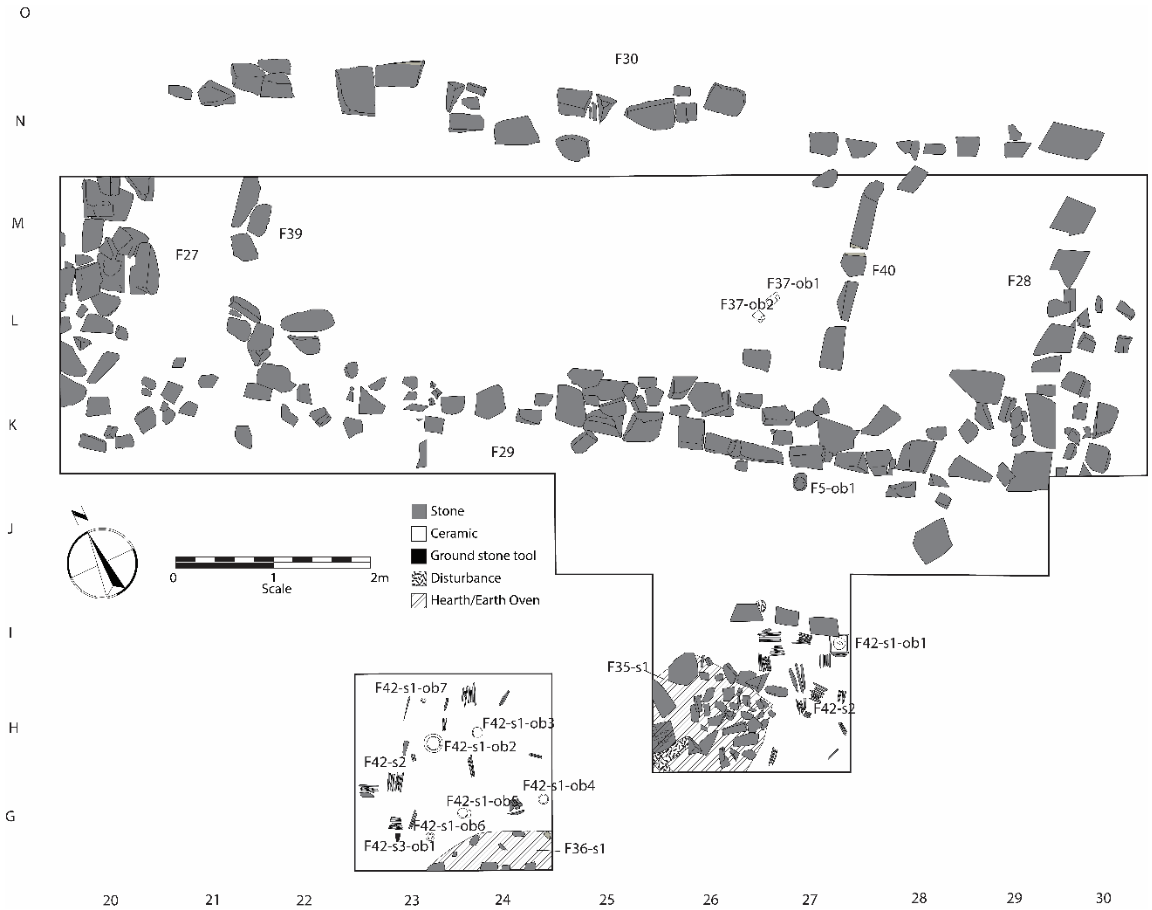


Figure 6.13: Plan drawing of Structure E1 (and E1-sub) and units excavated to the south.

Figure 6.14: Photograph of offering F39 in situ.

To the south in the area of units 23G, 23H, 24G, 24H, and, 27I, residents placed an offering of seven ceramic vessels (F42-s1) beneath the occupational surface formed by F43-s1, including coarse brown ware globular jars and cylinders of various sizes (Figures 6.13, 6.16-6.18). The style and form of the vessels are similar to those found in offerings from Complex A, Complex B, Structure 1, and the Plaza. Accompanying the offering were several collections of small granodiorite/granite slabs (F42-s2) placed vertically alongside the vessels. The pattern of the slabs found in this offering more closely matched the one documented in Complex B, as opposed to the use of the thin slabs as compartments as seen in Complex A. Because it is difficult to detect the presence of a pit into which the offering vessels would have been placed, it is not clear whether they were placed after F43 was laid down or concurrently during its deposition. Following the placement of F42, a layer of construction fill (F62) was deposited to raise the occupational surface of the central area of Terrace 15A to the surface of E1-sub at an elevation of 163.0 m a.s.l. (Figure 6.15). F62 was similar in composition to F38, likely originating from the same source.

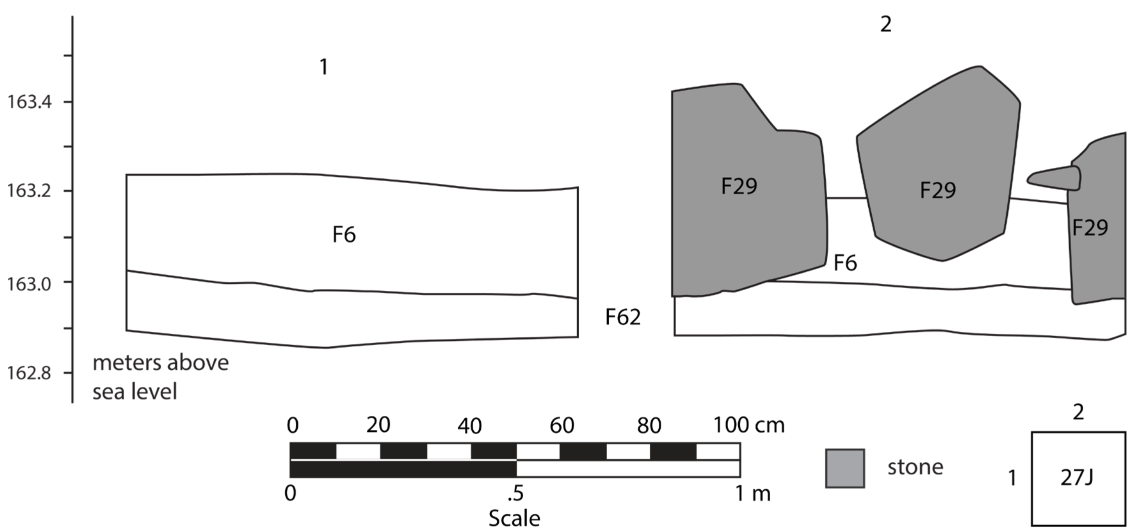


Figure 6.15: Stratigraphic profile of unit 27J.

Figure 6.16: Photograph of offering (F42) and hearth (F36, top left) in units 23G-H and 24G-H.

Figure 6.17: Photograph of F42-s1-ob1 surrounded by thin stone slabs (F42-s2) in situ in unit 27I.

The period following the deposition of F62 was marked by features indicative of public ritual activities in the southern area of Terrace 15-sub, which suggests the scope of the activities carried out there shifted to those that involved larger numbers of people. Though no significant wattle and daub remains were found in the area of E1-sub, it is likely that a perishable structure was built on top of the low platform. Just to the south of Structure E1-sub in the area of units 26H, 26I, 27H, and 27I, residents excavated a 55 cm-deep pit down from the top of F62 that was later utilized as an earth oven (F35). F35 measured about 1.2 m in diameter. Refuse that filled the earth oven included very ashy and organic loamy sand with significant inclusions, including burned sherds, charcoal, fire-cracked rock, burned bone, and disintegrated chunks of granodiorite rock (Figure 6.18). The fire-cracked rock and stone inclusions were likely used as heating elements, similar to the large earth oven found on the Rio Viejo acropolis just to the southwest of Structure 2.

Immediately to the southwest of the earth oven in units 23G, 23H, 24G, and 24G, residents utilized a hearth (F36) with an estimated diameter of 1.95 m for cooking activities, resulting in an organic, ashy matrix filled with sherds and small stones (Figure 6.16). Stones found in F36 were not burned. Given the differences in composition of refuse between F35 and F36, it is probable that the features were used for separate cooking purposes, with F36 likely utilized for ancillary cooking. While it is possible that day-to-day cooking was carried out in F35 and F36, the features were larger in size than typical domestic cooking features in the region (Joyce 1991). Further, F35 and F36 were used contemporaneously and would have exceeded the need for small-scale domestic cooking. Evidence of extensive cooking and possibly storage comes from a deposit of sherds (F34) placed in a possible pit in unit 27J. The possible pit was dug into F62 and filled with six coarse brown ware bowls, 17 gray ware serving bowls, eight coarse brown ware jars, four gray ware jars, and one *comal* (Figure 6.19). Given its proximity to cooking features, F34 may have been a small feasting midden and may have marked the termination of Structure E1-sub.

Figure 6.18: Photograph of base of earth oven (F35, top left) adjacent to thin stone slabs (F42-s2) in units 26H-I and 27H-I.

Figure 6.19: Photograph of ceramic deposit (F34) in situ in unit 27J.

Construction in Complex E increased toward the end of the Chacahua phase as residents built a number of smaller terraces atop Terrace 15-sub that transformed the area into multi-tiered architectural complex. During this construction phase, Terraces 15a, 15b, and 15c were built. Stratigraphic evidence from the eastern area of Op A indicates that Terraces 15a and likely 15b were built first, followed by 15c (see Figure 6.2). To build Terrace 15a, residents placed an additional line of stones (F50) perpendicular to F48 that formed a terrace wall to the north of Structure E1-sub lines of stone retaining construction fill that buried Structure E1-sub and its associated archaeological features (Figure 6.20). F55 and F56 were likely also placed at this time to prevent erosion to the east and south, but PTRV-16 excavations did not explore these features. The area bounded by F50, F56, F55, and later F17 (see below) measured 17.4 x 12.8 m, or about 222.7 m^2. To the north, Terrace 15b, which measured roughly the same size (17.9 m x 13.6 m, or 243.4 m^2) was likely constructed at the same time. The PTRV-16 excavations did not explore Terrace 15b, nor the area in between the terraces, but it is likely that the narrow corridor formed between the terraces served as the main entry way into Complex B.

To the west of St. E1-sub retaining wall F39, builders deposited F32, a layer of sandy loam construction fill that brought the ground surface surrounding E1-sub to the same elevation (163.2 m a.s.l.). Builders may have removed some stones in the wall line of F39 prior to construct the next phase of the platform. Excavations did not detect F39 in the south wall of unit 21M. Instead, a lens of mottled, dark sandy loam (F33) filled the cavity left behind after a section of the wall was removed. In addition, a shallow pit (F31) was excavated down from the surface of F32 and filled with dark loamy sediment, ash, charcoal, and small, eroded sherds. The placement of F32 broadened the occupational surface to the east and matched the elevation of the occupational surface of F62 at approximately 163.2 m a.s.l. Cooking features F35 and F36 were continuously utilized throughout the Chacahua phase, as the area continued to be used perhaps for ritual feasting.

Figure 6.20: Photograph of Structure E1-sub beneath Structure E1 (with foundation walls labeled).

Next, builders laid down the retaining walls for Structure E1, a rectangular platform measuring 9 m x 4 m that rose 20-25 cm above the occupational surface to the south. The foundation was formed by four lines of faced granite stone, with F27 and F28 running north-south and F29 and F30 running east-west. The foundation retained a layer of sandy clay loam (F26) that brought the level of the platform to a maximum elevation of 136.6 m a.s.l. As much as 20 cm of F26-s1 was eroded to the east, and the uppermost course of stone wall F40 was either removed or collapsed off of the terrace to the southeast.

Several very dark lenses of sandy clay loam (F26-s2) were found interspersed with F26-s1 in the western area of Structure E1, likely the result of rodent burrows.

To create Terrace 15c, builders deposited two stone walls--F23 and F17--that ran parallel to one another along the north-south site axis (Figures 6.21 and 6.22). Between the two walls, builders deposited two layers of densely packed construction fill (F60 and F61). Very few artifacts were found within F60 and F61, suggesting the sediment was deposited and tamped down in a short period of time. The placement of the two lines of stone in parallel separated by construction fill may have provided a structural advantage against erosion and architectural collapse. To the south, builders placed stone wall F20, which articulated with F55 below and to the east. Excavations did not explore the earliest fill layers retained by F23 and F20, but it is probable that these fill layers brought the occupational surface up to the level of F45. Through time, as more fill layers were added to Terrace 15c (see below), additional courses of stone were added to F20, F23, and F17. Between F23 and F17, excavations also uncovered an ovoid-shaped line of stones (F54) that articulated with F17. The function of this line of stones is currently unclear, but may have served as a type of “niche” for storage or ceremonial purposes.

Following the initial construction of Terrace 15c, residents of Complex E placed a dense offering of ceramic vessels ceramic vessels (F25-s1) and granite stone slabs (F25-s2) in the area examined by units 8J, 8K, 9J, and 9K (Figures 6.23-6.27). F25 was deposited below the surface of F45, which was later covered with F24, a 15 cm-thick layer of sandy loam construction fill that formed a new occupational surface. An area of 4 m^2 of F25 was exposed, which yielded 83 ceramic vessels, making it the densest collection of intact ceramic vessels recovered at the site. The offering was placed sequentially, with later vessels placed atop earlier ones in a manner similar to the offerings in Complex A. F25 likely served as the main continuous offering that ritually “fed” the animate architecture in Complex E (see Chapter 8).

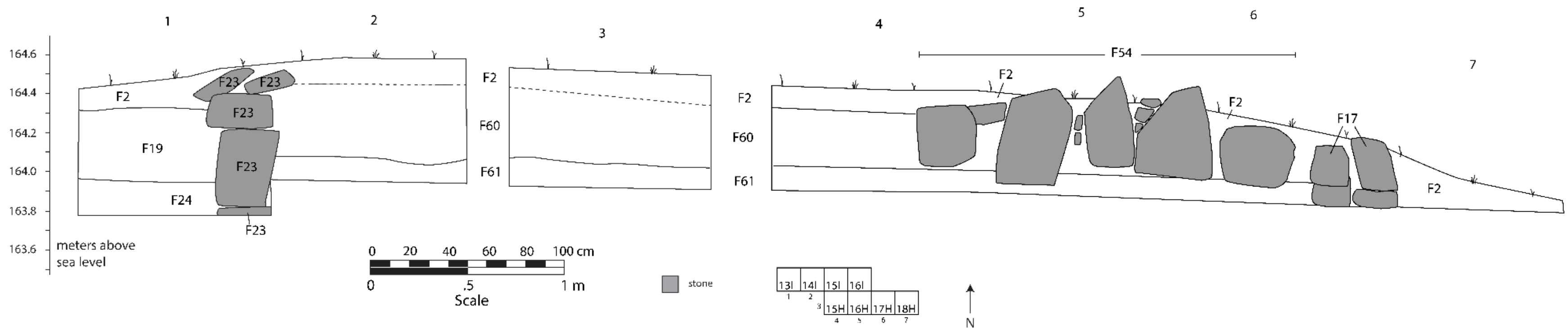
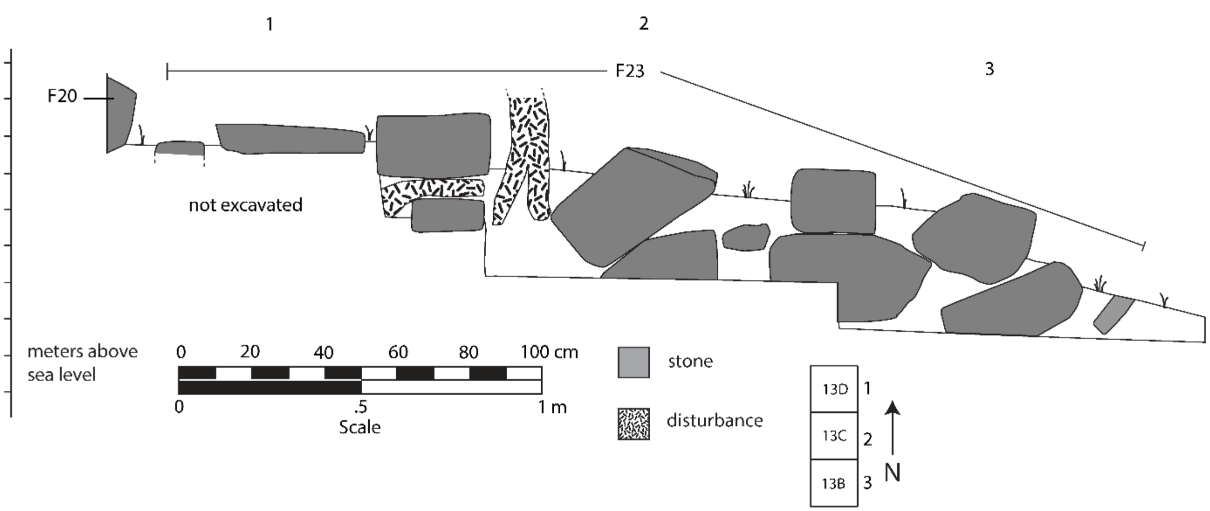


Figure 6.21: Stratigraphic profile of units 13I, 14I, 15H, 16H, 17H, and 18H in PTRV16-Op A.



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igure 6.22: Stratigraphic profile of east walls of units 13B, 13C, and 13D.

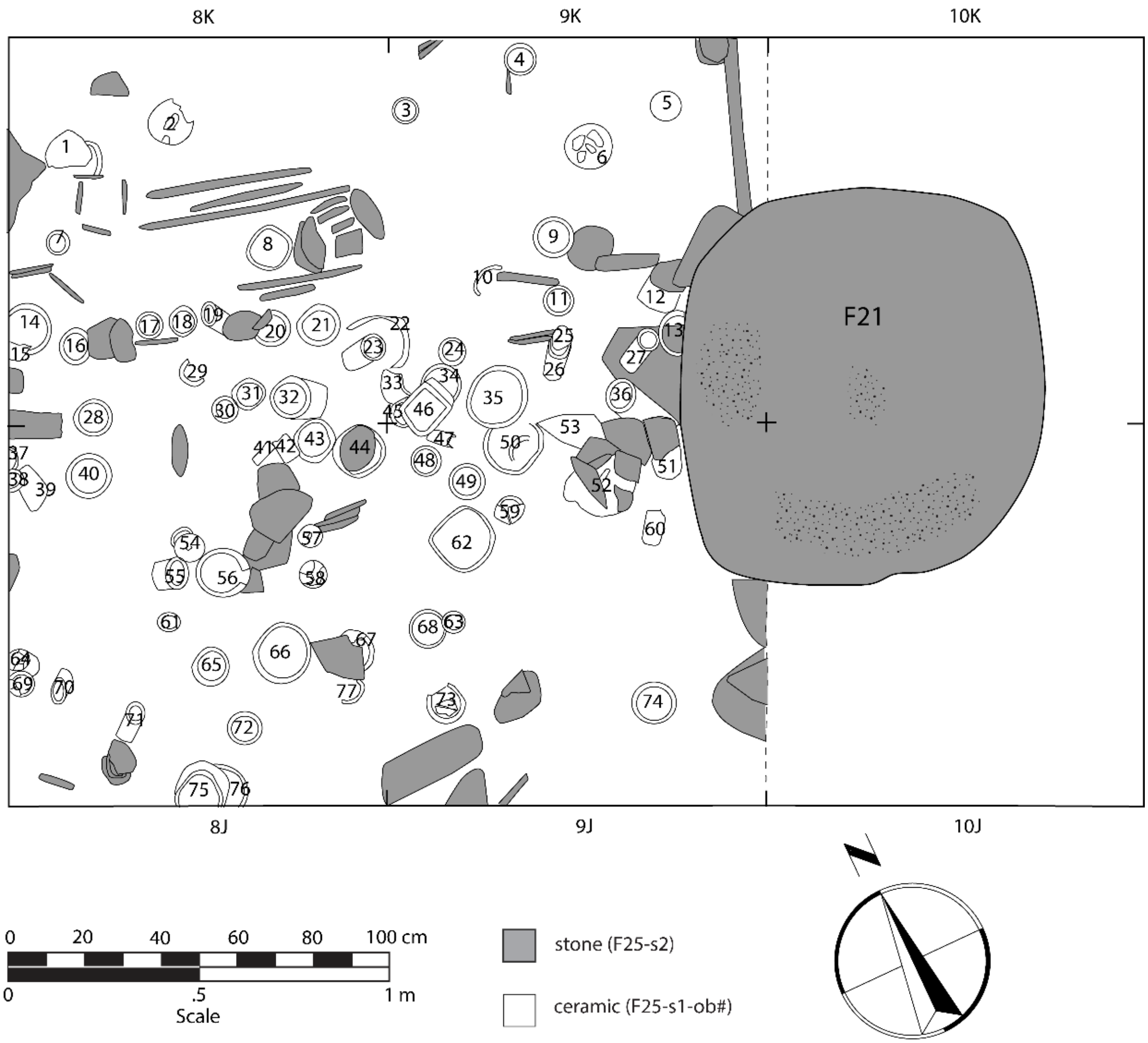

Figure 6.23: Plan drawing of offering F25 in situ in units 8J, 8K, 9J, and 9K (not pictured/obscured: F25-s1-ob- 78, 79, 80, 81).

F25 consists entirely of coarse brown ware vessels, including 75 cylindrical vessels of varying sizes, five globular jars, and one eccentric square vessel with slightly pinched walls that angled inward. Given the observation that the density of vessels in F25 did not subside in any direction, it is more than likely that the area exposed in units 8J, 8K, 9J, and 9K was only a fraction of the total breadth of the offering. Time and storage space were mitigating factors in recovering the entire deposit. Groups of granite slabs (F25-s2) ranging in thickness from two to 12 cm were found beside a number of the vessels. As with other offerings at Cerro de la Virgen, the F25-s2 stones were mined from the local granodiorite bedrock, probably carved after they had exfoliated naturally. Most slabs were placed in a vertical orientation, though some were found lying horizontally, likely the result of post-depositional movement. In contrast with other offerings at the site, including F42-s2 located just 14 m to the east, the F25-s2 stones were thicker and less abundant.

Figure 6.24: Photograph of overhead view of offering F25 (vessels already removed from unit 9J in bottom right corner).

Figure 6.25: Photograph of lateral view of offering F25, looking to the northwest.

Figure 6.26: Photograph of offering F25 looking east.


Figure 6.27: Photograph of offering F25 beneath grinding stone F21; also notice superposition of later vessels atop earlier vessels.

On the surface of F24, residents placed a large, roughly square-shaped monolith (F21) that measured 1.06 m x 1.05 m x 0.16 m (Figure 6.28). The upper surface of the stone exhibited three shallow depressions less than 1 cm in depth that were indicative of grinding, including two circular depressions in the center of the stone and one longitudinal depression on the southern edge. The variable sizes and shapes of the depressions suggests that different materials were ground separately according to need, but it is unclear what those materials were. Given the close proximity of F21 to F25, it is likely that the grinding practices associated with F21 were directly related to the placement of the offering. Excavators briefly turned the monolith over to observe the reverse side for evidence of grinding or carving, but none was found. After F24 was deposited and F21 was placed on its surface, a small offering of one ceramic vessel (F22-s1) and five granite slabs (F22-s2) were placed approximately 5 cm west of the southwest corner of F21. No other vessels were found to be placed solely in F24 (Figure 6.29). Alternatively, it is possible that the large monolith was simply associated with the offering and did not serve a quotidian use (e.g., grinding botanical materials). Evidence from a Late Classic offering and an Early Postclassic burial associated with Substructure 2 on the Rio Viejo acropolis demonstrate that large, plain monoliths were often deposited as offerings atop layers of construction fill (Joyce and Barber 2013; Joyce and Levine 2009). The Early Postclassic monolith contained ground depressions as well, suggesting that stones such as these may have been used for preparing materials for ceremonies associated with the offering or were perhaps used as an altar for some sore of ritual.

Figure 6.28: Photograph of grinding stone F21 (color adjusted to highlight smoothed areas).

Figure 6.29: Photograph of offering F22-s1-ob1 next to grinding stone (F22)

Near the end of the Chacahua phase or early in the Coyuche phase, Complex B was expanded again by the addition of Terrace 15d, which was explored in depth in PTRV-16 Operation B (see next section). As with Terrace 15c, 15d was characterized by two large granite stone walls running in parallel that retained to the west, flanked by shorter terrace walls to the north and south. The southern terrace wall was exposed in Operation A (see below). To the east, fill layers F6 and F19 were deposited in Terraces 15a and 15c, respectively, both of which elevated the occupational surface 15-25 cm (163.2 m a.s.l. in 15a and 164.3 m a.s.l. in 15c; Figure 6.30). F19 was the final fill layer in the southern area of Terrace 15c, consisting of very dark brown loamy sand in which a buried soil formed post-abandonment. Excavated lots within F19 contained a large proportion of Coyuche phase sherds (60%), indicating occupation and construction in this area extended into the Early Classic period. F6 was the final construction fill layer in Terrace 15a. F6 consisted of loamy sand and contained more Coyuche phase diagnostic sherds (79%) than any other fill layer in Complex E. Like F19, after abandonment, a soil formed in F6, which was buried by proceeding colluvial fill (see below).

In conjunction with the construction of Terrace 15d during the late Chacahua or early Coyuche phase, builders laid down a set of platforms, or “steps” extending to the east in the central area of

Terrace 15c that overlooked the area to the south, the result of which formed a small patio in the southern area of the terrace (Figures 6.30-6.35). First, F13 was placed running east-west perpendicularly to the outer wall of Terrace 15d, and F12 was placed running north-south at a right angle to F13. F13 and F12 retained F11, a layer of brown sandy loam construction fill that formed the occupational surface of the lower step. A second line of stones (F15) extended to the southwest at an angle from F13, but the function of F15 is unclear as it was only found in unit 8N. F15 retained F14, a layer of dark loamy sand that may have been redeposited from the F11 fill layer to the south. Next, another line of stones (F9) was placed atop F11 running east-west, articulating with F7, a line of stones that ran parallel to the outer Terrace 15d wall. F9 contained at least three courses of stone, the lower of which extended out to the east to articulate with F12 below. F9 and F7 retained F8, a layer of dark yellowish-brown sandy loam that formed a second occupational surface just to the east of the Terrace 15d wall (PTRV16-Op B-F23) at an elevation of approximately 164.7 m a.s.l. One deposit of a smashed coarse brown ware vessel (F18-ob 1) located directly to the south of the corner of F13 and F12 was uncovered. It is unclear whether F18 represents an offering or simply ceramic refuse; however, given the observation that most offerings at Complex E were constituted by complete vessels, it is more likely the latter.

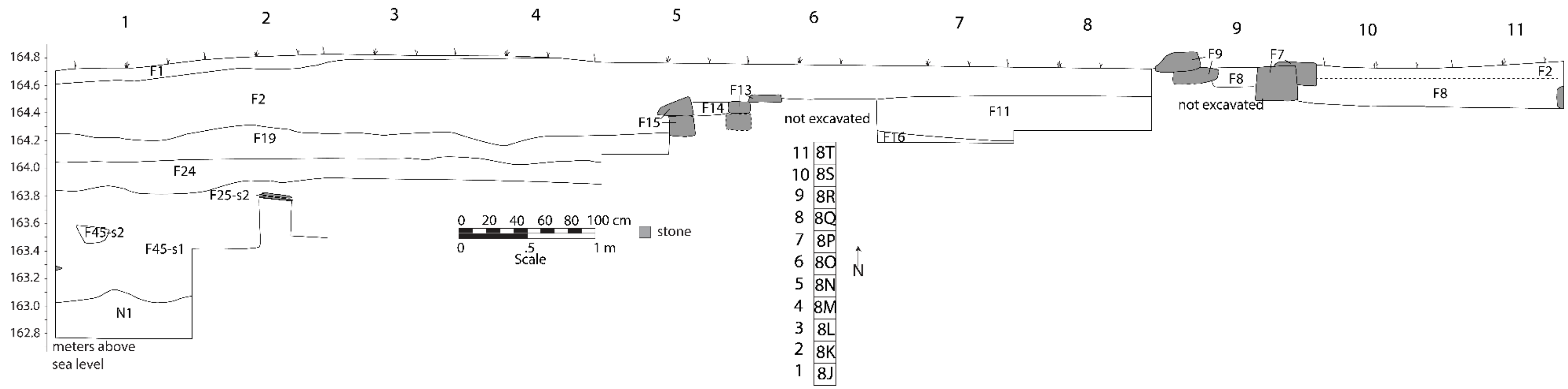

Figure 6.30: Stratigraphic profile of west walls in the "8-line" of excavation units in the western area of Op A.

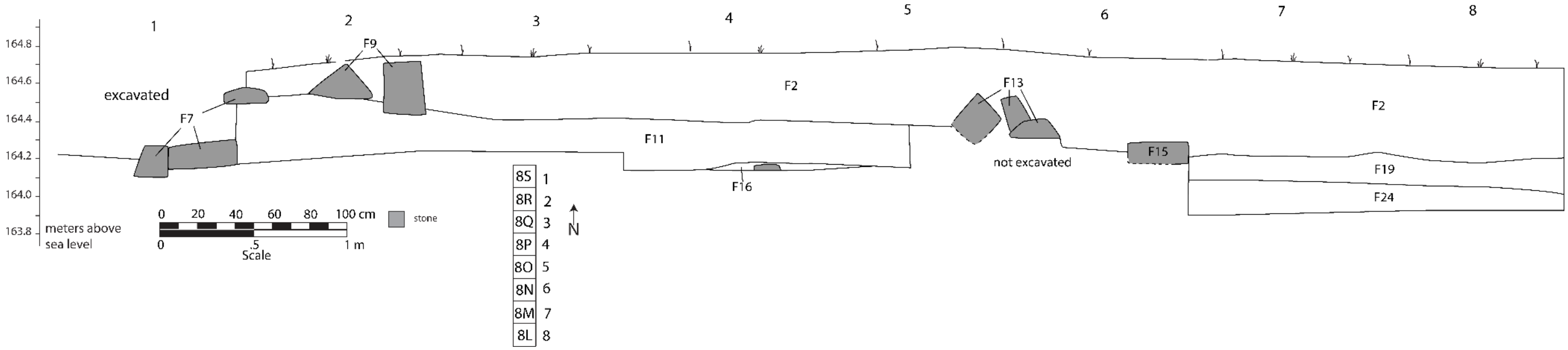

Figure 6.31: Stratigraphic profile of west walls in the "8-line" of excavations units in the western area of Op A.

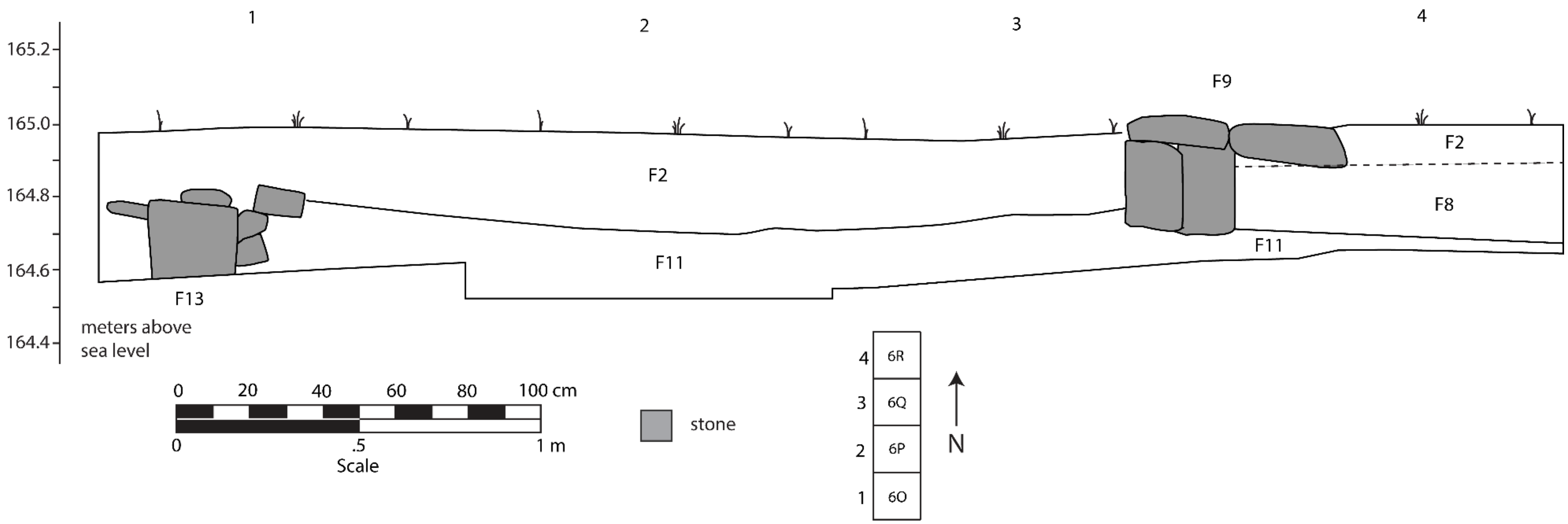

Figure 6.32: Stratigraphic profile of west wall of units 6O, 6P, 6Q, and 6R.

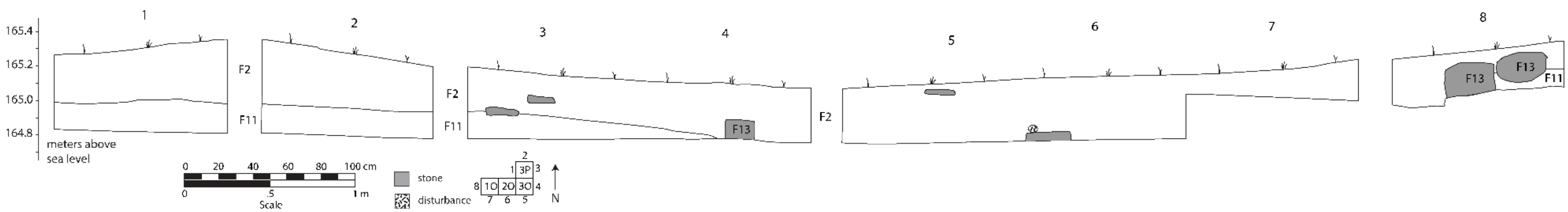

Figure 6.33: Stratigraphic profile of units 1O, 2O, 3O, and 3P in PTRV16-Op A.

Figure 6.34: Photograph of Structure E2.

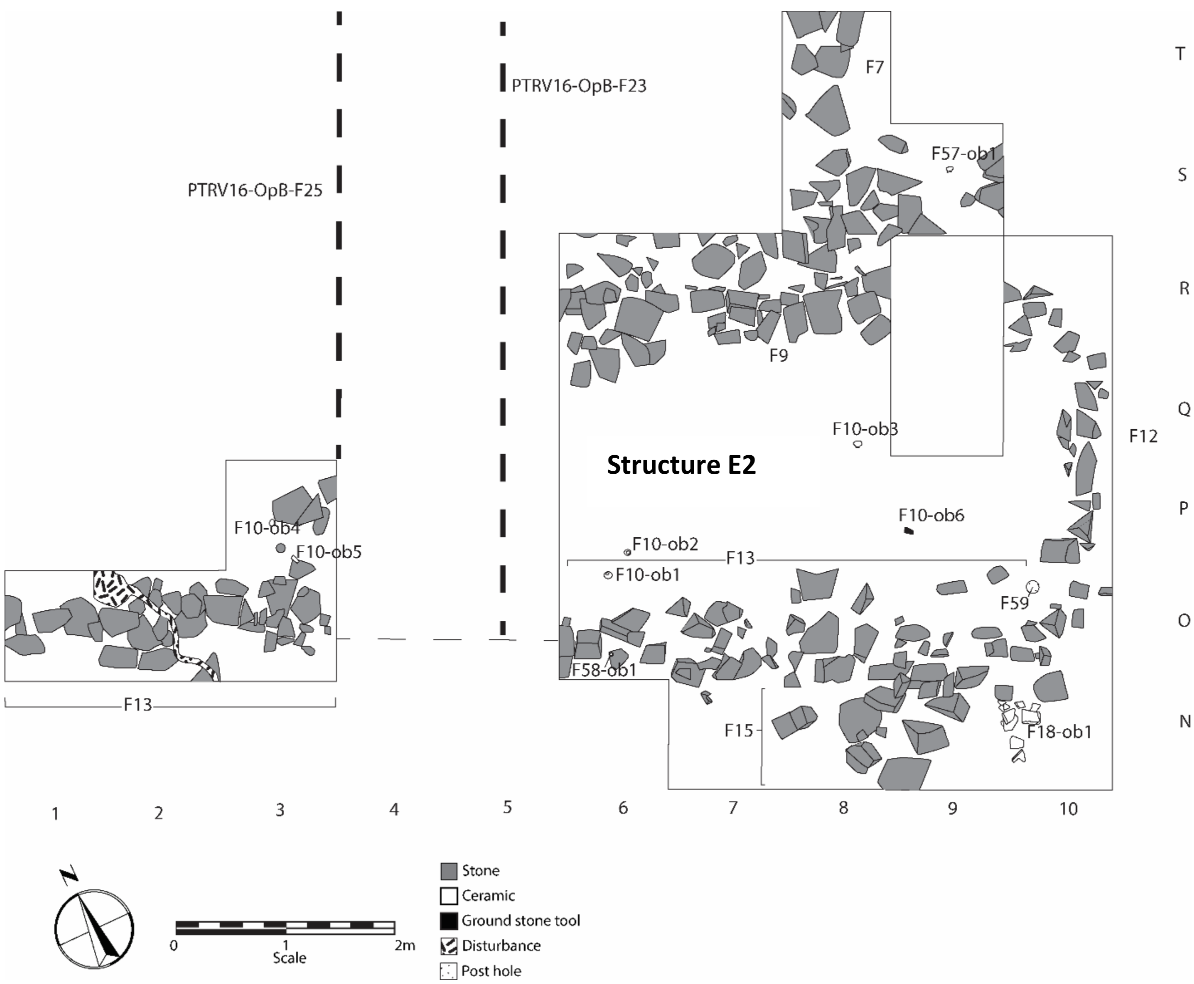

Figure 6.35: Plan drawing of Structure E2.

While the purpose of the series of steps created by F7, F8, F9, F11, F12, F13, F14, and F15 is unclear, it is possible that these architectural additions created a more restricted public space to the south. It also may have been the focus of ceremonial activities associated with Terrace 15c that took place late in the Chacahua phase or early during the Coyuche phase (Figure 6.36). Several offerings of miniature ceramic vessels (F10) were placed below the surface formed by F11. A total of five vessels were recovered during excavations, including four miniature globular jars (three coarse brown wares and one gray ware) and one miniature coarse brown cylinder. Though the F10 vessels were placed within the same stratigraphic level, it is unclear whether they were deposited at the same time or as discrete offerings.

Figure 6.36: Offering vessels associated with Structure E2; clockwise from top left: F10-ob3, F10-ob5, F10-ob4, F57-ob1, F10-ob1

Prior to the abandonment of Complex E sometime during the Coyuche phase, a single offering vessel (F5) was placed into F6 directly south of the southern retaining wall (F29) of Structure E1 on Terrace 15a. F5 was a coarse brown ware cylinder that may have constituted one of the final ceremonial activities on Complex E. Four post-abandonment layers of colluvial fill covered sections of Terraces 15a and 15c. In the area of Terrace 15a, Structure E1 was covered by F4, a 25-30 cm thick layer of colluvial sediment that washed down from Terrace 15c. To the south, the area of units 23G, 23H, 24G, 24H, 26H, 26I, 27H, and 27I were covered with F3, a 20-25 cm thick layer of sandy colluvium. A deflated soil formed in F4. F3 was highly disturbed by rodent burrows and roots, making it unclear whether a soil developed prior to the modern era. On Terrace 15c, F2 covered the majority of the area exposed in the western section of Op A. The final layer of colluvial fill identified in Op A was F1, located on the upper step to the east of F7, which appeared to have developed into a modern soil.

PTRV16 - Operation B

This section presents the results of excavations carried out during the PTRV 16 on the uppermost terrace in Complex E, Terrace 15d, the excavation of which was classified as Operation B. The goals of PTRV16-Operation B were to date the construction and use of the terrace, to examine the types of activities carried out there, and to document the construction techniques used to build the area. Initially, two transects of test units were opened, one running west to east in the center of the terrace along the "M-line" in the Cartesian grid, and another running north to south along several lines of stone visible on the modern surface in the northern area of the terrace (Figures 6.37 and 6.38). The transects were expanded in several areas in the northern part of the terrace to explore relevant features. Test units in the "M-line" were connected in a cross-section from unit 10M to 18M to aid in reconstructing the use history of the terrace.

Archaeological evidence from Op B indicates that Terrace 15d was built during the Chacahua phase and was occupied until at least the beginning of the Coyuche phase. Initial construction efforts included leveling the naturally sloping bedrock and building two large retention walls running in parallel that formed the eastern edge of the terrace, all likely occurring after Terrace 15c was built. Excavations uncovered evidence for object caching and mortuary ceremonialism, the former exemplified by several small offerings of ceramic vessels and ground stone tools, and the latter represented by a single redeposited burial. In addition, one of the primary uses of Terrace 15d was for storage. The Op B excavations revealed a bell-shaped pit, a common archaeological feature that is exceedingly rare at Cerro de la Virgen, as well as a rectangular stone enclosure that may have been a more formalized storage feature. The possible stone storage feature was built near the end of the Chacahua phase (Figure 3). Table 6.2 provides a detailed list of the stratigraphic and cultural features in Operation B, beginning with the most recent and ending with the earliest.

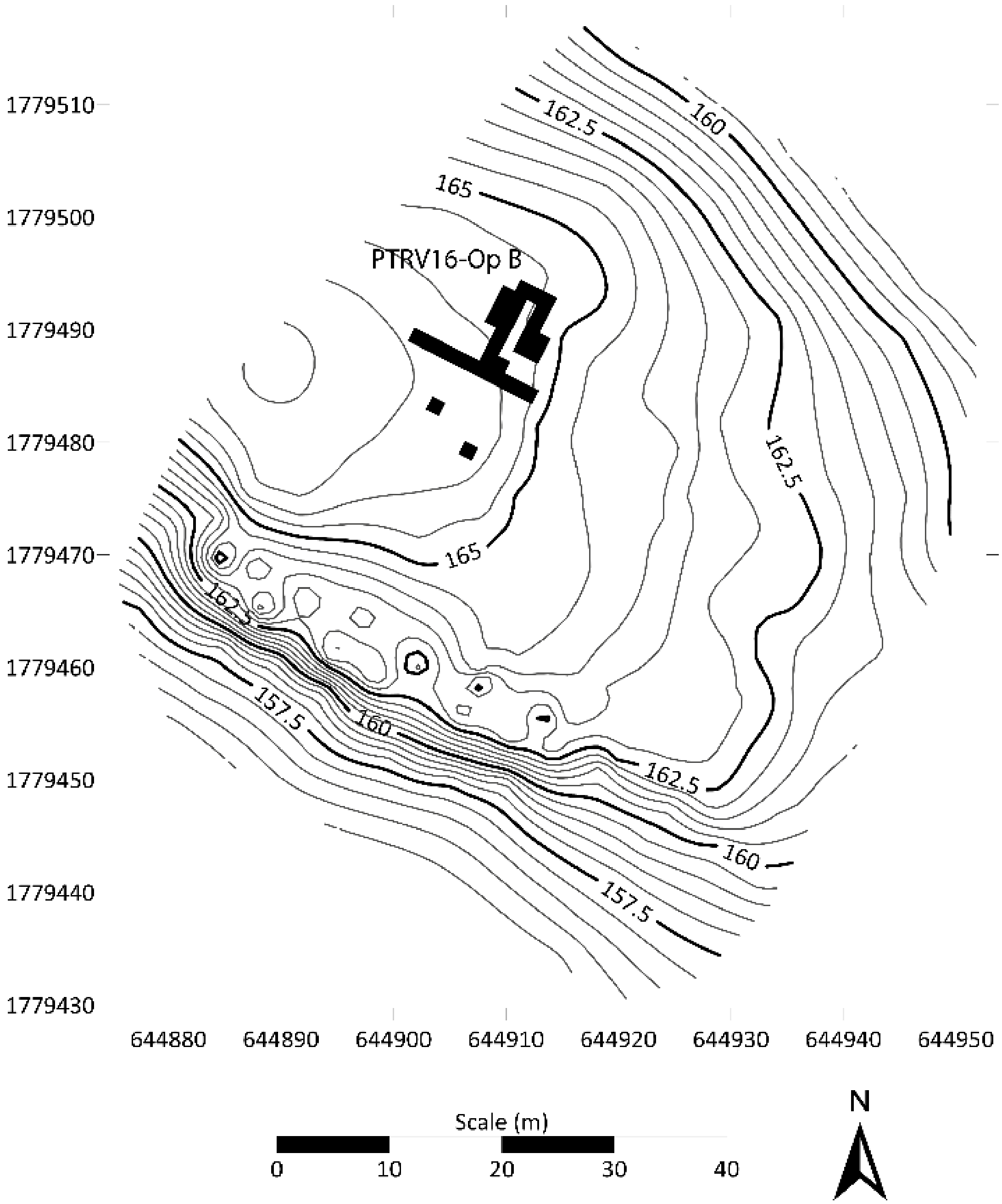

Figure 6.37: Map of location of Op B

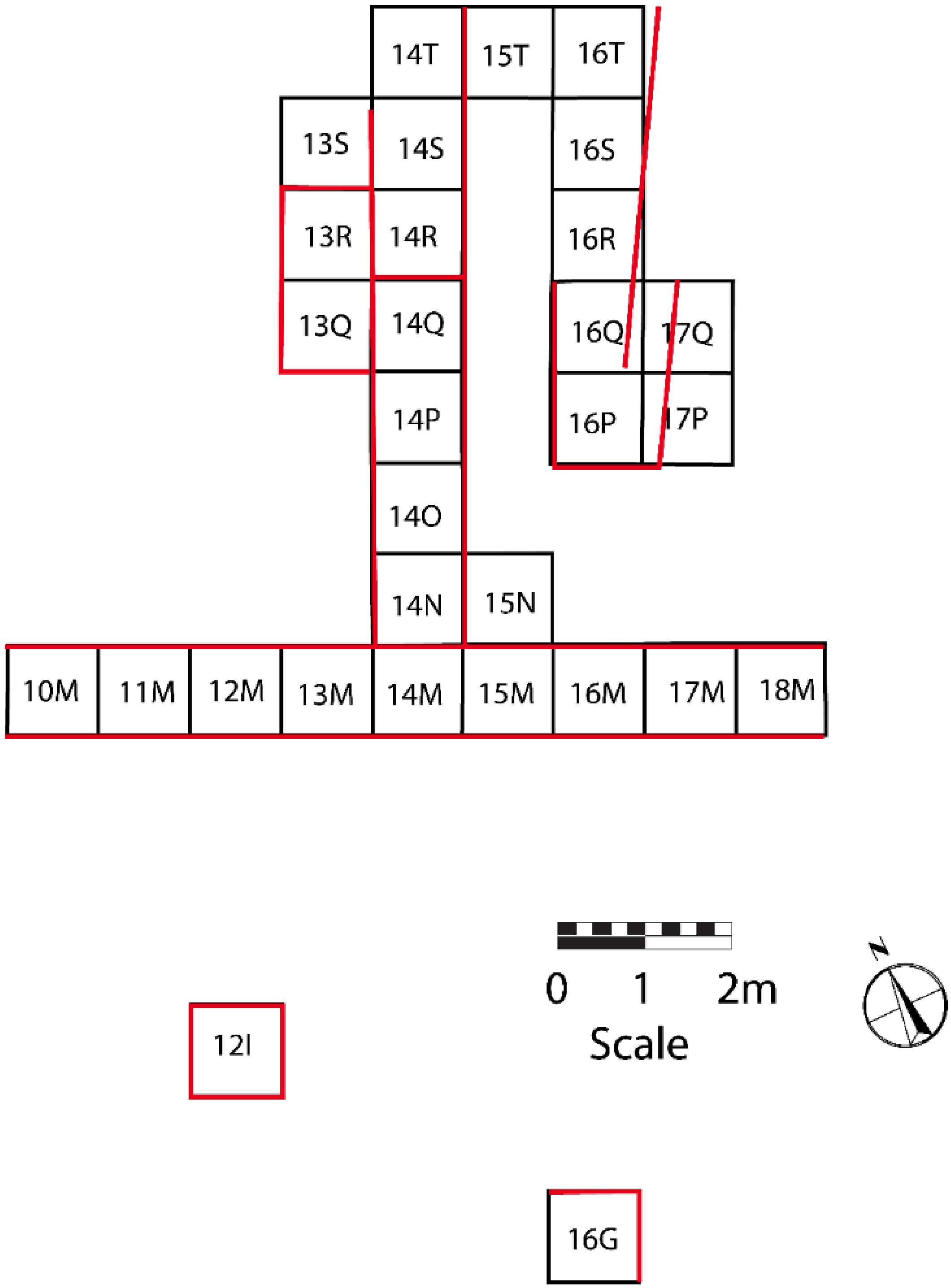

Figure 6.38: Plan map of PTRV16-Operation B with drawn profiles in red.

Figure 6.39: Plan map of Op B excavations with features labeled.

Table 6.2: List of stratigraphic levels in Operation B.

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F1	All units	10 YR 2/2; very dark brown sandy loam	Modern	Soil formed in construction fill	Stratum of organic material at the surface of the area of Op B; see Figures 6.40, 6.41, 6.45, 6.46, and 6.53-6.55
F2	17M, 18M	10 YR 3/3; dark brown sandy loam	Late Chacahua or Early Coyuche	Construction fill	Poorly sorted sandy loam with rounded grains and inclusions of sherds, small rocks, larger stones, organic material; and occasional faunal bone; frequent disturbances at the upper interface of this stratum--most rodent burrows or roots; final substantial construction fill phase associated with the eastern wall(s) of Terrace 15d; retained by F23 and F25; see Figures 6.40 and 6.41
F3	All units in main block	10 YR 3/2; very dark grayish brown sandy loam	Late Chacahua or Early Coyuche	Construction fill	Poorly sorted sandy loam with rounded grains and inclusions of sherds, small rocks, larger stones, organic material; and occasional faunal bone; frequent disturbances at the upper interface of this stratum--most rodent burrows or roots; final substantial construction fill phase in the area of Op B; several offerings of vessels deposited at the beginning of this fill episode; see Figures 6.40, 6.41, 6.45, 6.46, and 6.52-6.55
F4	14P	No Munsell; ceramic vessel	Late Chacahua or Early Coyuche	Offering	Offering of one miniature gray ware jar deposited at the beginning of F3; offering also includes a small groundstone chisel; not visible in profile
F5	14M	No Munsell; ceramic vessel	Late Chacahua or Early Coyuche	Offering	Offering of three coarse brown ware ceramic vessels, including two cylinders and one bowl, deposited into fill layer F3; stratigraphically above F6; not visible in profile
F6	13M	No Munsell; ceramic vessel	Late Chacahua or Early Coyuche	Offering	Offering of two ceramic vessels, including one gray ware short-necked jar and one coarse brown ware short-necked jar; not visible in profile
F7	16R	No Munsell; ceramic vessel	Late Chacahua or Early Coyuche	Offering	Offering of one coarse brown ware bowl deposited at the beginning of fill episode F3; not visible in profile

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F8-s1	14M, 15M	10 YR 3/3; dark brown sandy loam	Chacahua	Pit fill; possible midden	Poorly sorted sandy loam with angular grains and inclusions of sherds, small stones, small flecks of charcoal, and faunal bone; uppermost sub-stratum of fill within bell-shaped pit in patio area of southwest section of Op B; pit cuts down from the top of F19-s1 (occupational surface), through F26 and part of F28-s1; excavations were ended before reaching the bottom of the pit; lighter in color and contains much fewer sherds than F8-s2; see Figure 6.41
F8-s2	14M, 15M	10 YR 2/1; black loamy sand	Chacahua	Pit fill; possible midden	Poorly sorted loamy sand with angular grains and inclusions of large sherds, small stones, charcoal, faunal bone, burned organic material and traces of ash; sub-stratum of fill/midden deposited into bell-shaped pit in southwestern area of Op B; contains much higher frequency of sherds than F8-s1 and F8-s3; much darker in color than F8-s1 and slightly darker than F8-s3; sherds within this sub-stratum were large, well-preserved, and found lying flat/horizontally; see Figure 6.41
F8-s3	14M, 15M	10 YR 3/2; very dark grayish brown sandy loam	Chacahua	Pit fill; possible midden	Poorly sorted sandy loam with angular grains and inclusions of large sherds, small stones, charcoal, and faunal bone; lowest sub-stratum of fill/midden material deposited into bell-shaped pit in southwestern area of Op B; contains higher frequency of sherds than F8-s1, but less than F8-s2; much darker in color than F8-s1 and slightly lighter than F8-s2; sherds within this sub-stratum were large, well-preserved, and found lying flat/horizontally; see Figure 6.41
F10		No Munsell; stone wall	Chacahua	Stone retaining wall	Northern retaining wall (running east-west) of rectangular “storage unit” in northern area of Op B; composed of several courses; may have been built atop bedrock; see Figures 6.45 and 6.57
F11		No Munsell; stone wall	Chacahua	Stone retaining wall	Eastern retaining wall (running north-south) of rectangular “storage unit” in northern area of Op B; see Figures 6.45 and 6.57
F12		No Munsell; stone wall	Chacahua	Stone retaining wall	Southern retaining wall (running east-west) of rectangular “storage unit” in northern area of Op B; see Figures 6.45 and 6.57

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F13		No Munsell; stone wall	Chacahua	Stone retaining wall	Western retaining wall (running north-south) of rectangular "storage unit" in norther area of Op B; see Figure 6.57
F14		No Munsell; stone wall	Chacahua	Wall	Short wall running north-south extending perpendicularly from the meeting point of F12 and F15; may have been a short standing wall or possibly a marker for B4-I4 buried beneath; use unclear; see Figures 6.46 and 6.55
F15		No Munsell; stone wall	Chacahua	Wall	Stone wall running west from intersection of F12 and F20; use/purpose unclear; see Figure 6.55
F16	16R, 16S	No Munsell; stone wall	Chacahua	Wall	Stone wall running north-south at the northeastern extent of Op B; built atop E5 or an analogous fill layer; separated to the west from large stone wall F25 by 25-30 cm; unclear what the function of the wall serves; see Figure 6.53
F17	14T, 15T, 16T	No Munsell; stone wall	Chacahua	Wall	Stone wall running west-east at the northern extent of Op B; Wall not completely excavated--depth and underlying stratigraphy unclear; likely built atop E5 or an analogous fill layer; not visible in profile
F18-s1	13Q	No Munsell; ceramic vessels	Chacahua	Offering vessels	Offering of four course brown ware cylindrical vessels deposited into F19-s1 immediately west of B4-I4; unclear whether vessels were associated with B4-I4; not visible in profile
F18-s2	13Q	No Munsell; stone slabs	Chacahua	Granite slabs	Small, thin granite slabs placed alongside F18-s1-ob3 and F18-s1-ob 4 as part of offering; not visible in profile
B4-I4	13Q, 14Q	No Munsell; skeletal remains	Chacahua	Human skeletal remains	Burial of a probable young adult within fill layer F19-s1 immediately beneath stone wall F14; no burial pit detected; remains were very fragmented and fragile; only cranial element present was the mandible and three teeth, one of which exhibited slight dental attrition; post-cranial elements included both femora and fragments of a tibia and humerus; sex is undetermined; not visible in profile
F19-s1	13M, 14M, 15M	10 YR 3/4; dark yellowish brown sandy loam	Chacahua	Construction fill	Poorly sorted sandy loam with rounded grains and inclusions of sherds and gravel; deposited atop F26; see Figures 6.40, 6.41, 6.45, 6.46, and 6.53

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F19-s2	15M	10 YR 2/1; black loamy sand	Chacahua	Construction fill	Moderately sorted loamy sand with rounded grains and no visible inclusions; small sub-stratum of darker sediment within F19-s1; see Figure 6.40
F20	14Q, 14R	10 YR 4/4; dark yellowish brown loamy sand	Chacahua	Construction fill	Poorly sorted loamy sand with angular grains and inclusions of sherds, and coarse gravel; probably analogous to F21; see Figures 6.45 and 6.46
F21	15M, 16M	10 YR 3/4; dark yellowish brown sand	Chacahua	Construction fill	Poorly sorted sand with angular grains and inclusions of sherds, and coarse gravel; contains more sherds and is more compact than F19-s1; very similar in composition to F26; probably analogous to F20; deposited atop F26; see Figures 6.40, 6.41, and 6.52
F22	14Q	No Munsell	Chacahua	Offering vessel	Offering of a small coarse brown ware cylindrical vessel deposited during the F20 fill episode; not visible in profile
F24	18M	10 YR 4/4; dark yellowish brown sandy clay loam	Chacahua	Construction fill	Poorly sorted sandy clay loam with angular grains and inclusions of sherds, small stones, and pulverized quartz; very densely packed; contains noticeably higher clay content than most strata in Op B; see Figures 6.40 and 6.41
F23	n/a	No Munsell; granite stone	Chacahua	Stone retaining wall	Large stone retaining wall forming the eastern boundary of the upper level of Complex E; retains to the west toward F25, forming a narrow platform at the eastern edge of the upper level; built concurrently with F25; not visible in profile
F25	16M, 16P, 17M, 17P, 17Q	No Munsell; granite stone	Chacahua	Stone retaining wall	Large stone retaining wall; retains to the east, forming a narrow platform overlooking a “sunken patio” to the west; constructed concurrently with F23; not immediately built to final height--courses added and retained fill (e.g., F24) added as the upper level of Complex E was raised over time; see Figures 6.40, 6.41, 6.52, and 6.56
F29	15M	No Munsell; ground stone	Chacahua	Possible offering	Deposit of two large, ovoid-shaped ground stones placed within fill layer F26; one is a vibrant green color; unclear whether they were placed after F26 was deposited or during the deposition of F26; not visible in profile

Stratum	Units	Sed. Desc. & Munsell	Probable Date	Formation Process	Comments
F26	15M, 16M	10 YR 3/4; dark yellowish brown sand	Chacahua	Construction fill	Poorly sorted sand with angular grains and inclusions of sherds and small stones; retained by wall F27; fill has higher sherd concentration than F19-s1, but lower concentration than all other adjacent strata; sediment is also coarser and more compact than F19-s1; stratigraphic break between F26 and F21 is unclear--both likely mined from similar source; see Figures 6.40 and 6.41
F27	15M, 16M	No Munsell; granite Stone	Chacahua	Stone retaining wall	Stone retaining wall running north-south in the southern area of Op B; likely a temporary wall to prevent erosion of sediment during the construction of the upper terrace of Complex E; see Figures 6.40 and 6.41
F28-s1	10M-14M,	10 YR 5/4; yellowish brown sand	Chacahua	Construction fill	Well sorted sand with angular grains and inclusions of disintegrated bedrock (grüs), sherds, and occasionally small rocks; sherd concentration is very low and most are small and eroded; see Figures 6.40, 6.41, 6.45, 6.54, 6.55, and 6.57
F28-s2	12M, 13M	No munsell; Disintegrated bedrock; grüs	Chacahua	Construction fill	Patches of crumbling grüs thrown into F28-s1 fill; may have originally been intact granodiorite stones that disintegrated over time; see Figures 6.40, 6.41, and 6.54
N1	16M, MU B	No Munsell; bedrock	n/a	Natural	Naturally occurring bedrock; see Figures 6.40, 6.45, and 6.57

Occupational History

The earliest evidence of occupation in the area of Operation B comes from F28, a layer of construction fill containing well sorted, coarse sand (F28-s1) with patches of light-colored grüs (F28-s2; Figures 6.40 and 6.41). Very few ceramics were found within F28, and those that were recovered were heavily eroded and small. Analysis of the few diagnostic sherds from F28 indicated that the fill layer was deposited during the Chacahua phase, likely at around the same time as the construction of Terrace 15c. A transect of excavations units running east-west (units 10M-15M) exposed F28 in profile, which demonstrated that the fill layer descended steeply to the east near the eastern limit of unit 13M. The deposition of F28-s1 brought the occupational surface to an elevation of 165.9 m a.s.l. Stratigraphic evidence from units 14R, 14S, and 14T, which collectively comprised Multi-Unit B (see below), indicates that F28-s1 extended to the north as well. Excavations did not reach natural bedrock beneath F28.

There are two possible explanations for the unique stratigraphic positioning of F28. First, it is possible that F28 represents a natural layer of disintegrated bedrock that was modified and reworked, given the large inclusions of grüs within the layer; however, the presence of sherds near the base of the layer places this conclusion in doubt. The more likely interpretation is that F28 represents the earliest version of Terrace 15d (Terrace 15d-sub 2). The duration for which the surface of Terrace 15d-sub 2 was exposed is unclear. Excavations did not detect a stone terrace wall that retained 15d-sub sediment, but it is possible that the original wall was removed to expand the surface area of the terrace to the east (see below). Very little evidence of occupational features was found near the surface of F28-s1, suggesting that 15d-sub was not utilized for an extended period.

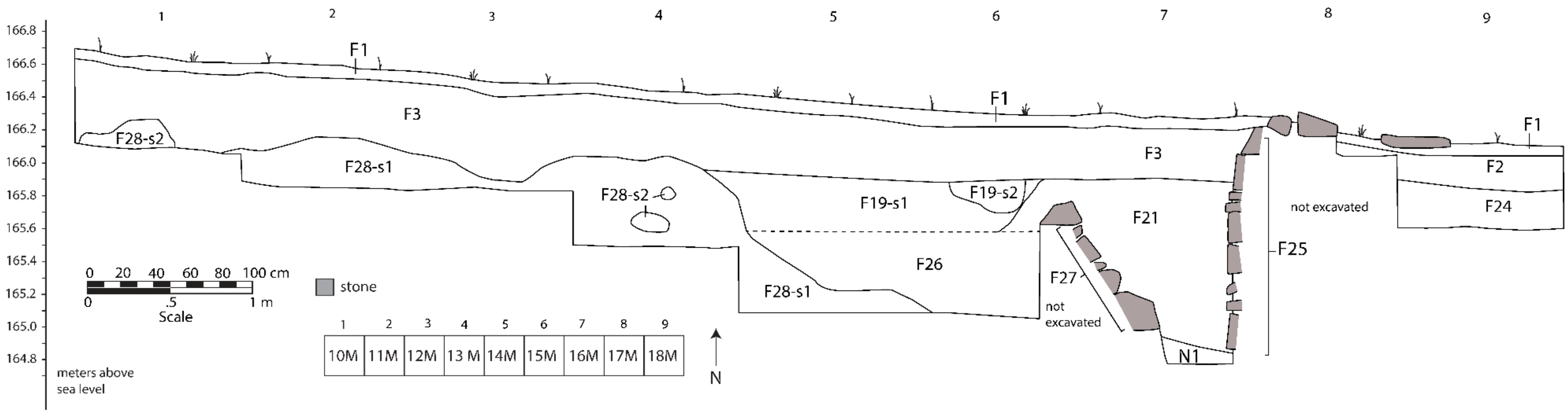

Figure 6.40: Stratigraphic profile of transect running west-east through the "M-line" units of Op B (north walls).

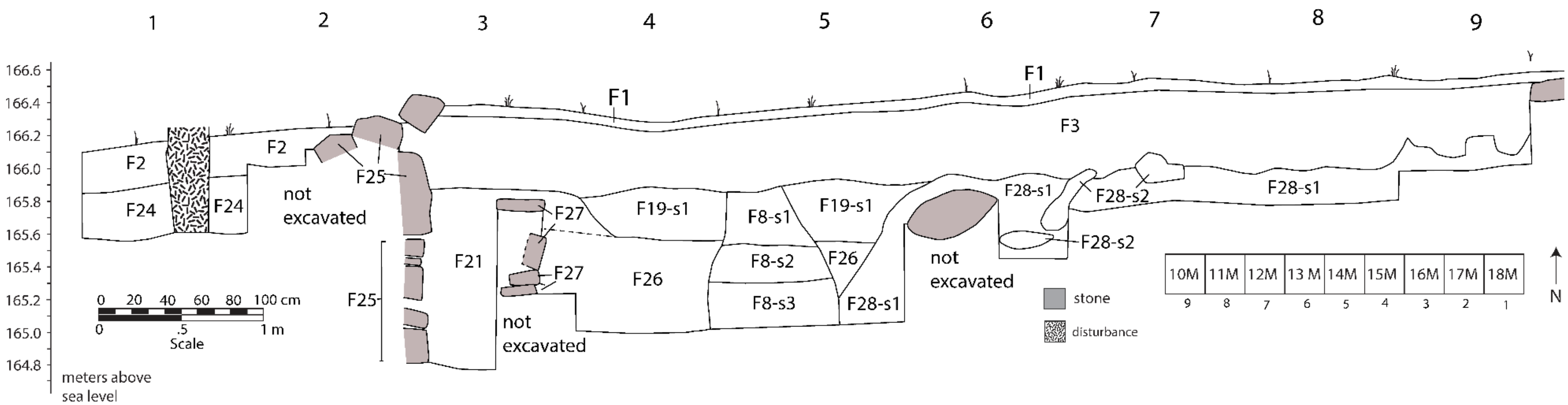

Figure 6.41: Stratigraphic profile of transect running west-east through the "M-line" units in Op B (south walls).

Next, a prolonged series of successive construction episodes in the area of Complex B was undertaken, beginning with the placement of F27, a granite stone terrace wall that retained sediment to the west. The construction of F27 provided space for the terrace surface to be extended to the east by about 2-3 meters. The base of F27 was found sitting directly on bedrock at an elevation of 165.05 m a.s.l., which indicates that the natural terrain in the upper area of Complex E sloped down to the east at a steep angle. N1 was only detected in the north profile of unit 16M. A similar pattern of bedrock sloping steeply to the east was recorded in the western area of PTRV16-Op A, beneath what would eventually become Terrace 15c. F27 presumably ran from south to north but was only found in units 15M and 16M. It is possible that stones from F27 originally retained F28 to the west, but were mined and moved to the east to broaden the terrace surface. F27 retained a layer of yellowish brown sand (F26) that was deposited atop F28-s1. The stratigraphic break between the surface of F26 and overlying fill layers was not clear, suggesting that it was not exposed for an extended period. In unit 15M, excavations uncovered a deposit of two large, ovoid-shaped ground stones (F29) just below the upper level of F26 at an elevation of approximately 165.4 m a.s.l. (Figure 6.42). The distal end of both tools exhibited moderate use wear, indicating that they were primarily used as hammerstones and possibly for smoothing or grinding as well. It is unclear whether F29 was placed after F26 was laid down or during the deposition of the fill layer. Given their upright orientation, it is likely that they were deposited as an offering.

Figure 6.42: Photograph of offering F29.

The original purpose of F27 may have been to expand the occupational surface of Terrace 15d-sub to the east. However, shortly after the placement of F27 and F26, builders initiated a massive remodeling of the area. To the east of F27, builders began construction on two stone walls (F25 and F23) that would form the eastern boundary of the second version of the upper level of Complex E--Terrace 15d. F25 and F23 run in parallel from north to south, separated by about 3.5 meters. F25, the wall to the west, retains sediment to the east and F23 likely retains to the west in a pattern similar to the outer set of walls that formed the eastern boundary of Terrace 15c. F23 was not explored by Op B excavations. As excavators exposed the western side of F25, it became clear that the platform formed by the two walls was built first, followed by additional layers of fill to the west. The western side of F25 was nicely faced and well preserved, with as many as 8-10 lines of stone of different sizes and shapes making up its structure. As the heights of F25 and F23 were increased, builders likely filled the space between with unconsolidated construction fill. However, excavations only explored the uppermost 50 cm of the fill between the two walls. The earliest of these presumed fill layers that was exposed by Op B was F24, a layer of sandy clay loam that was very densely packed and contained inclusions of sherds, small stones, and pulverized quartz. F24 contained noticeably higher concentrations of clay in its matrix, suggesting there was a structural reasoning for its use in that particular context. The gap between walls F27 and F25 also may have been left vacant for a period, forming a narrow corridor between the platform to the east and the terrace to the west (Figures 6.43 and 6.44).

Figure 6.43: Photograph of gap between walls F25 and F27 in unit 16M (facing north).

Based on stratigraphic evidence from the southern excavation trench of Op B (units 10M-18M), the occupational surface of Terrace 15d was deposited after the platform formed by F25, F23 and the intervening fill was completed. In the intervening space between F28-s1 and F25, builders deposited F21, a layer of poorly sorted sandy loam with inclusions of sherds and coarse gravel. F21 also extended

25 cm to the west of F27, just high enough to cover the earlier wall. Immediately following the placement of F21, F19 was deposited to level out the terrace surface to 166.0 m a.s.l., just below the level of the original occupational surface of Terrace 15d-sub. To the north, builders deposited F20 in the area exposed by unit 14Q, followed by F19 (Figure 6.45-6.46). F20 and F21 were nearly identical in composition, indicating they were likely analogous, if not the same layer of fill (Figure 6.45 and 6.46). An offering of a small coarse brown ware cylindrical vessel (F22) was placed into the F20 fill layer in unit 14Q. Excavations were unable to locate a pit into which F22 was placed, indicating it was likely deposited during the F20 construction episode (Figure 6.47).

Figure 6.44: Photograph of wall F25 facing east.

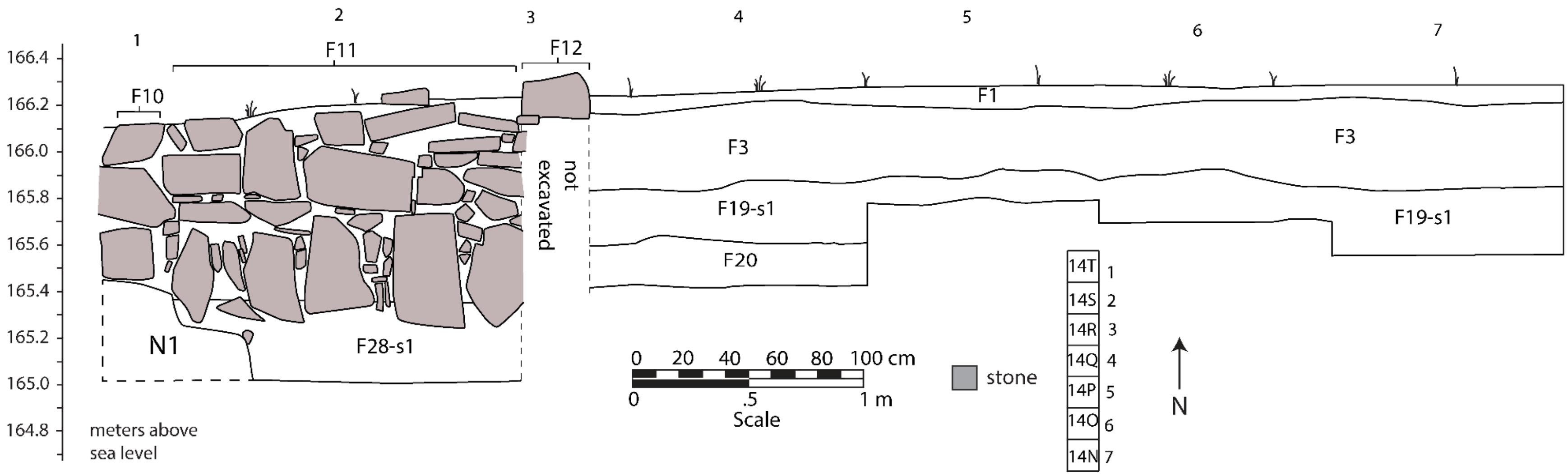

Figure 6.45: Stratigraphic profile of transect through "14-line" in Op B (east walls).

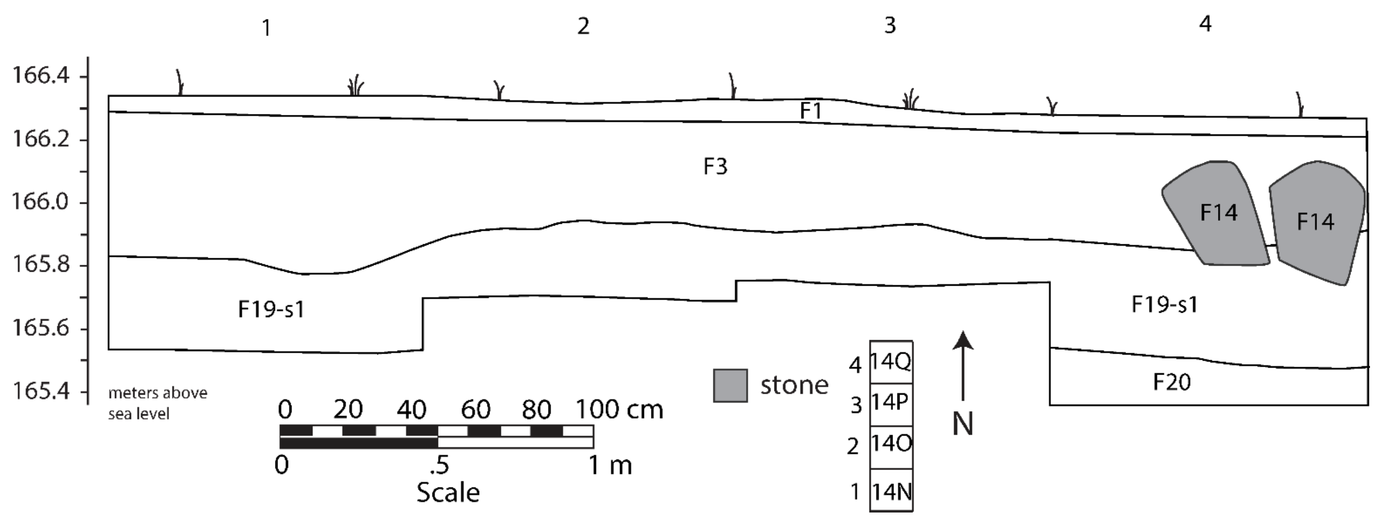

Figure 6.46: Stratigraphic profile of transect through "14-line" in Op B (west walls).

Figure 6.47: Photograph of offering F22.

During the deposition of F19-s1, several offering vessels (F18) and a burial (B4-I4) were deposited into the fill in units 13Q and 14Q (Figure 6.48). B4-I4 was a collection of human remains placed within F19-s1 in the area of unit 14Q (Figure 6.49 and 6.50). The remains were found immediately beneath stone wall F14 and consisted of a probable young adult. Small fragments of cranial material were recovered, including the mandible and three teeth, one of which exhibited slight dental attrition. Post-cranial elements included both femora and fragments of a tibia and humerus. Based on the lack of other skeletal material, it is likely that the burial was a redeposited. Osteological analysis of B4-I4 was unable to determine the sex of the individual. No burial pit was detected in profile, suggesting the remains were placed as F19-s1 was deposited. Immediately to the west, excavations revealed an offering of four coarse brown ware cylindrical vessels (F18-s1) accompanied by small, thin granite slabs (F18-s2) that were oriented vertically (Figure 6.51). The offering vessels, slabs, and human remains were all found within the same stratigraphic level at equivalent elevations. While it is possible that the offering of vessels and slabs were associated with B4-I4, they more closely follow the pattern of other offerings in Complex E, Complex B, and Complex A that were not associated with mortuary contexts. Further, given the likelihood that B4-I4 was a secondary burial, it is probable that the two contexts served as independent offerings, perhaps invoking similar religious concepts (see Chapter 8). It is also possible that the deposit of remains was simply redeposited human bone.

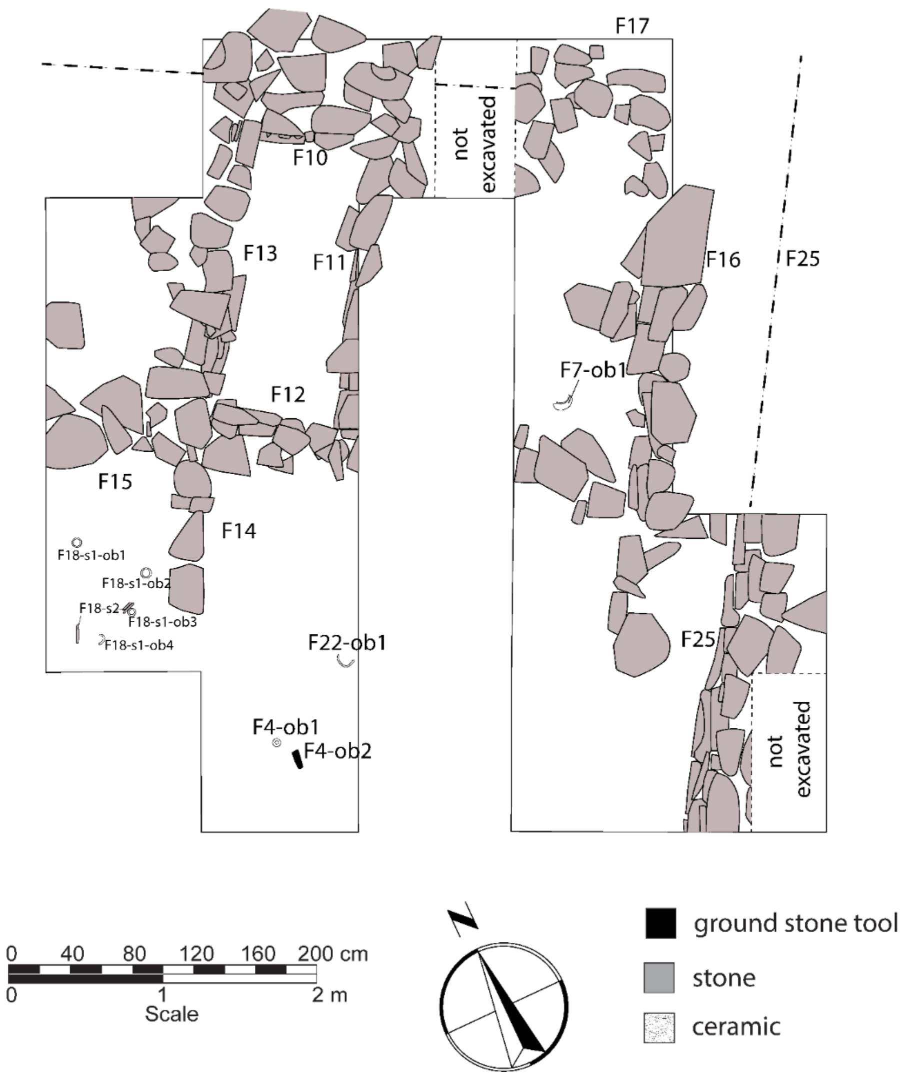

Figure 6.48: Plan of architectural and cultural features in main block of Op B.

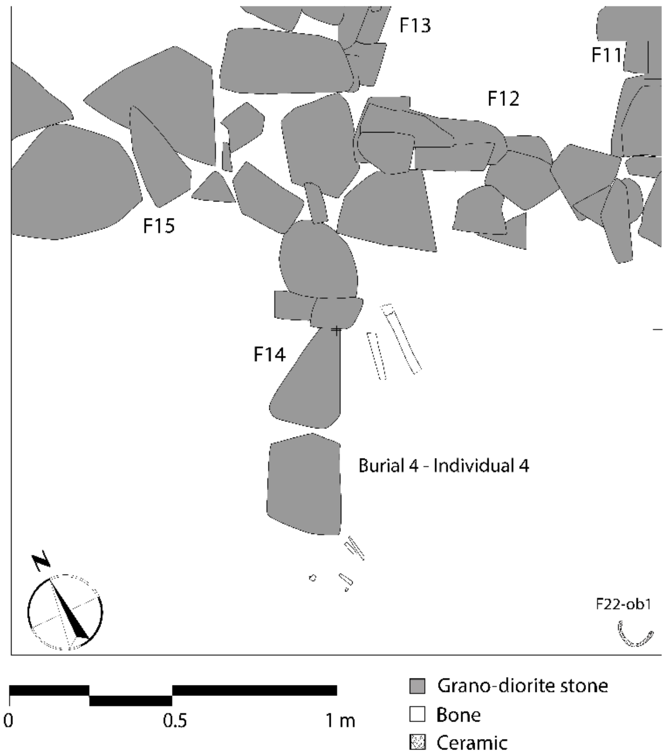

Figure 6.49: Plan drawing of Burial 4 - Individual 4

Figure 6.50: Photography of Burial 4 - Individual 4.

Figure 6.51: Photograph of Offering F18.

As the surface elevation of Terrace 15d was increased in the southern area of Op B with the deposition of F21, F20, and F19, residents of Complex E also built a series of walls in the northern area of the terrace (F10, F11, F12, F13, F14, F15, F16, and F17; Figures 6.52-6.57). The earliest of these walls to be built were F10, F11, F12, and F13, which formed a rectangular enclosure measuring approximately 0.9 m (west-east) by 1.7 m (north-south). The excavation of the enclosure formed by the four walls was completed as "Multi-unit B". The interior of the enclosure was excavated down to bedrock (N1), but to ensure the structural integrity of the stone walls, excavators left a bulk of sediment to the north of F10, to the east of F11, and to the south of F12, and to the west of F13. The interior of the enclosure exhibited nicely faced stone, indicating that each wall retained outward in each respective direction.

Based on the patterning of the stones and their stratigraphic positioning relative to fill layers outside of MU-B, it is likely that the enclosure was built in two phases. In the first phase, several similarly shaped stones, most approximately twice as tall as they were long, were placed vertically in one course with smaller “chinking” stones and large sherds placed in between. The early course of stones was placed directly on F28-s1 and had an upper elevation of approximately 165.7 m a.s.l., indicating it retained F20 and possibly F19. The upper level of stones exhibited a different pattern, with the larger stones placed horizontally instead of vertically, and was probably placed later in time (see below).

Evidence from excavations in the deepest excavated level of MU-B suggests that residents carved out portions of N1 and F28-s1 beneath the base of F10, F11, F12, and F13, perhaps to create a larger space for the enclosure (Figure 6.58). Beneath F10 on the north side of the enclosure, excavations uncovered what appeared to be small “steps” carved out of the natural bedrock. N1 in this area was similar to the upper layers of bedrock in other parts of the site--characterized by coarse, hard-packed sand and grüs that lacked any indication of artifacts. The “steps” were not large enough to be necessary for a person to physically enter the enclosure, suggesting they may have served an aesthetic purpose. Excavations penetrated through F28-s1, which was deposited earlier in the Chacahua phase (see above). Sherds recovered from the three deepest excavated lots (associated F29 and F30) dated to the Miniyua phase; however, each lot yielded only one diagnostic, making a Miniyua phase date for the fill underlying the enclosure doubtful, given the dating of F28-s1 to the Chacahua phase. Overlying F28-s1 was a layer of sandy loam (F9) that contained inclusions of sherds, bone, lithics, and gravel. A sample of charcoal was taken from this layer for AMS dating, the results of which are still pending. Osteological analysis of bone fragments from F9 indicates that they were not human. Rather, they were most likely a local species of deer. F9 was not recorded in profile.

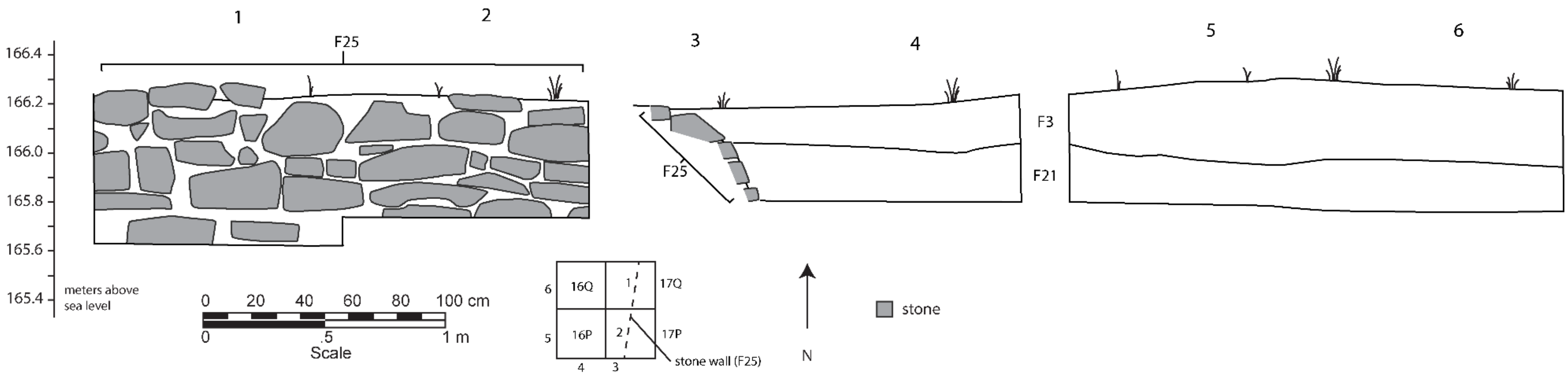

Figure 6.52: Stratigraphic profile of units 16P, 16Q, 17P, and 17Q in Op B.

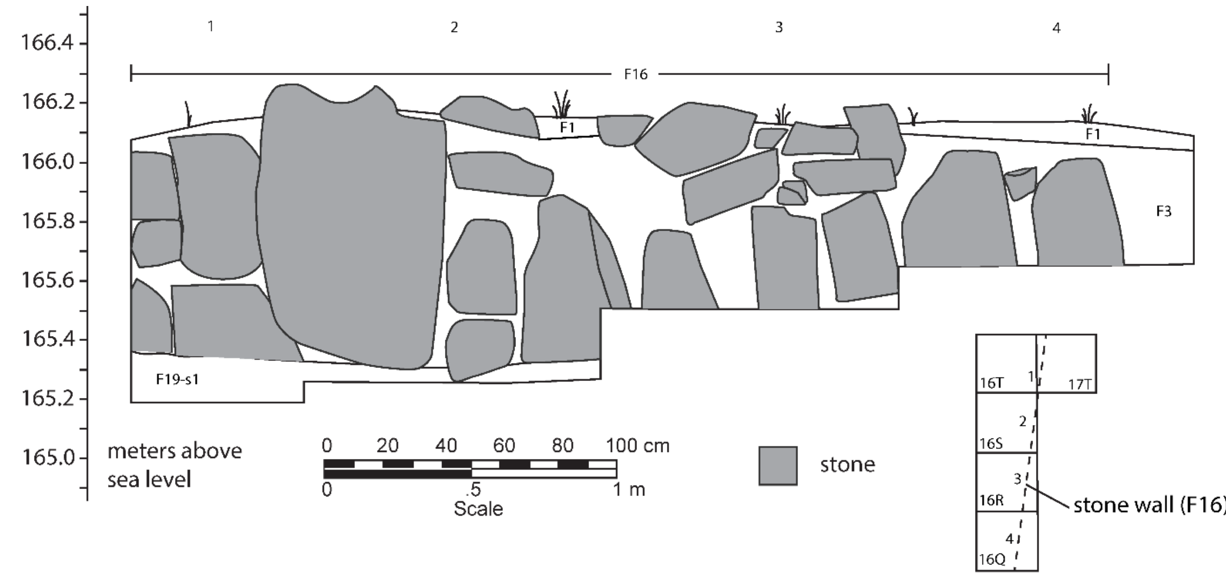

Figure 6.53: Stratigraphic profile of units 16Q, 16R, 16S, and 16T in Op B.

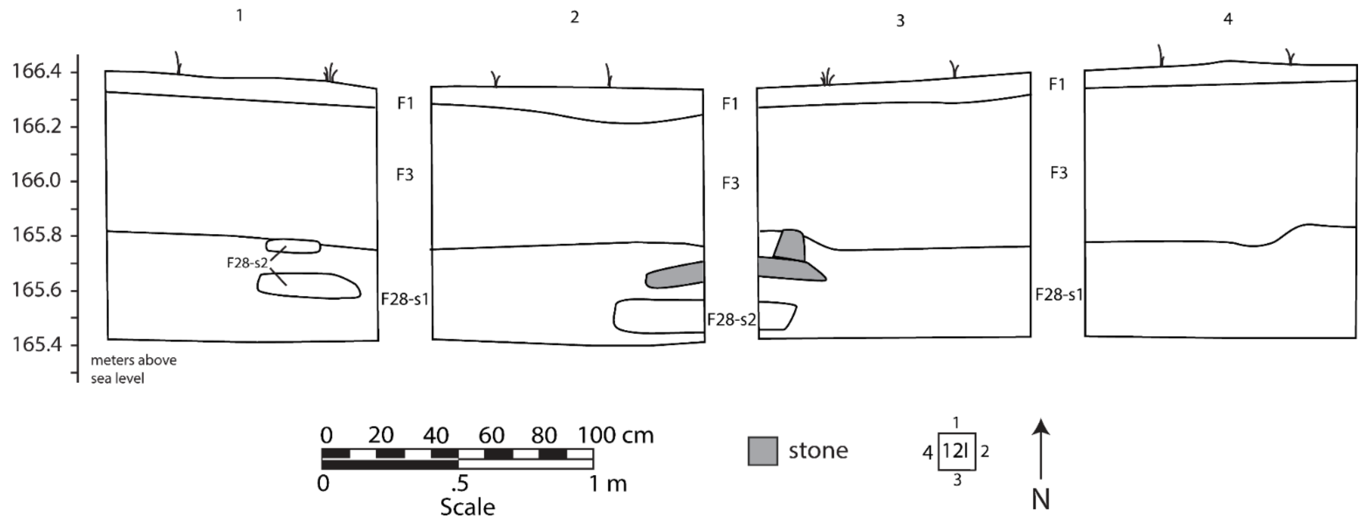

Figure 6.54: Stratigraphic profile of unit 12I.

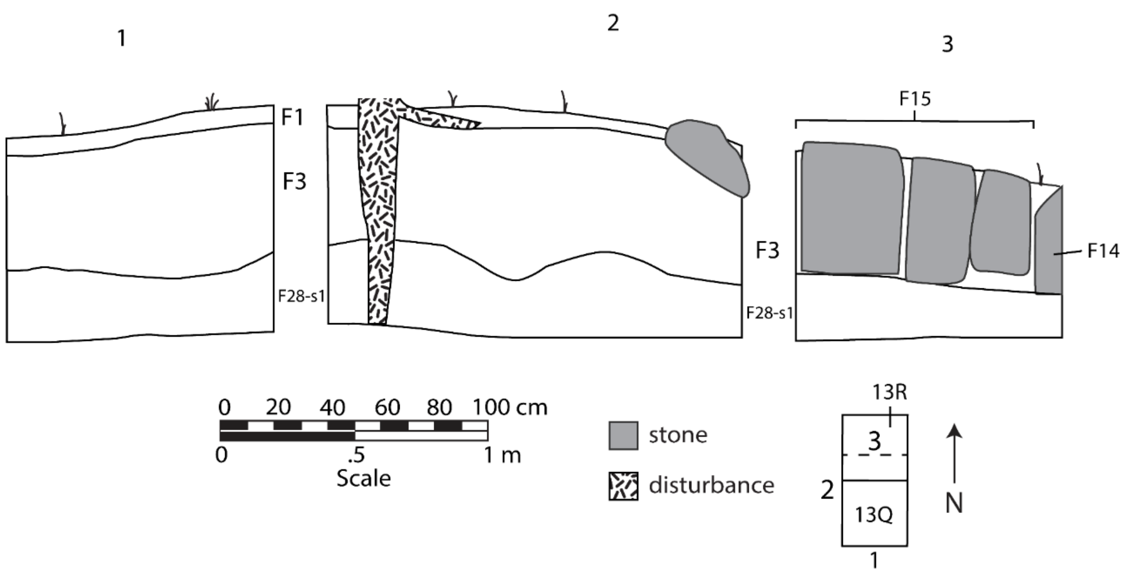

Figure 6.55: Stratigraphic profile of units 13Q and 13R.

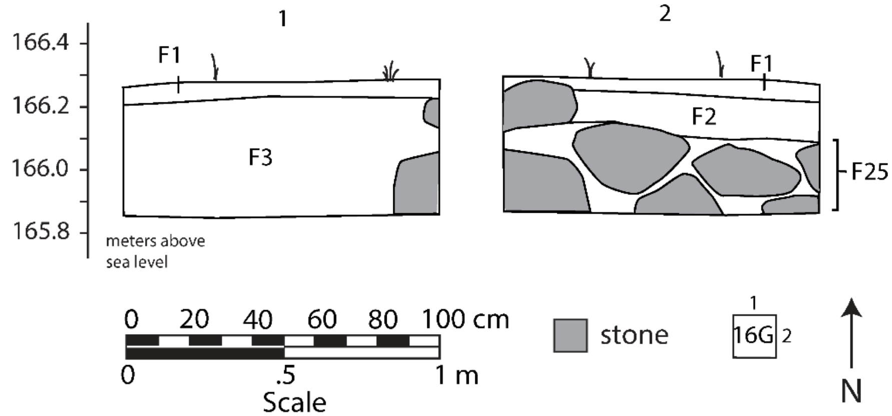

Figure 6.56: Stratigraphic profile of unit 16G.

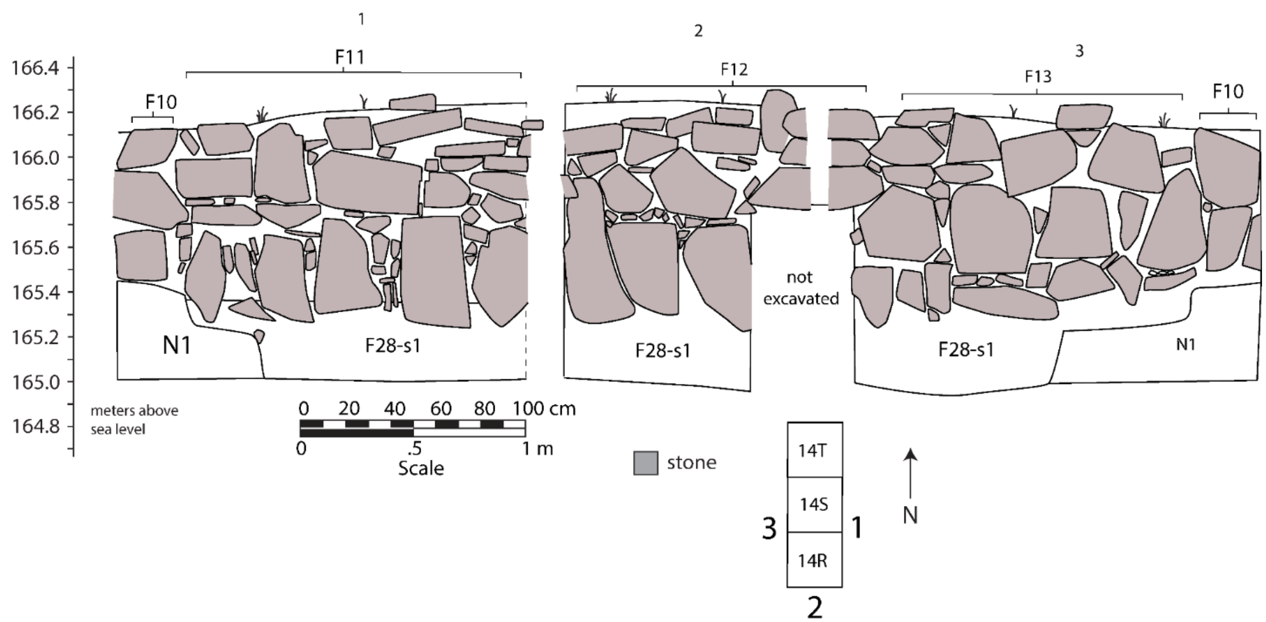

Figure 6.57: Stratigraphic profile of stone enclosure in Multi-Unit B.

Figure 6.58: Photograph of stone enclosure in Op B.

To the east and north of the enclosure, two lines of stone--F16 and F17--were built, forming a right angle at the northeastern corner of Op B. F16 was presumably built atop F28-s1, though excavations did not reach the base of this wall. Given that sections of F16 were almost 1 m in depth and contained flat-faced stones facing to the west, it is likely that the wall retained to the east. It is possible that the articulation between F17, F16, and a possible extension of F12 that ran into unit 16R may have formed a larger architectural feature--perhaps as an extension of the storage feature formed by F10, F11, F12, and F13 to the west. Further excavation in this area is needed to understand the architecture in the area. One particularly large stone was recorded in the east profile of units 16S and 16T that measured 0.55 m in length and 0.95 m in height. No carvings were recorded on the exposed side of the stone. We elected not to flip the stone to view the reverse side in order to preserve the integrity of the wall. The purpose of F16 is unclear, but it may have provided additional space to the west for the platform that was originally formed by F23 and F25. F17 was only recorded in profile, making the timing of its placement and its overall function within Terrace 15d unclear.

Construction continued on the enclosure with the placement of a second level of stones, this time oriented horizontally in a seemingly haphazard fashion, which elevated the enclosure to approximately 166.2 m a.s.l. The difference in orientation of the second level of stones may indicate that the enclosure was originally sunken. Sections of the top of walls F10, F11, F12, and F13 were visible on the modern surface. At this time, residents also placed walls F15 and F14 in the area exposed in units 13Q, 13P, and 14Q. F14 was marked by a single course of stones running north-south that extended less than a meter to the south of F2. F15 ran to the west perpendicularly from the corner formed by F12 and F14. F15 was not explored stratigraphically.

To the south, additional evidence of occupation on Terrace 15d was recorded in the area of units 14M and 15M (Figure 6.59). In this area, residents excavated a bell-shaped pit (F8) down from the surface of F19-s1 through F26 and F28-s1. The pit feature was excavated together as “Multi-unit A”. F8 measured 0.85 m in depth, but excavations did not reach the base of the feature. The pit was filled with three sub-strata of fill. The final 30 cm of the pit was filled with dark grayish brown sandy loam (F8-s3) with inclusions of sherds, charcoal and faunal bone. The second sub-stratum (F8-s2) was filled with 25 cm of black loamy sand with sherds, charcoal, faunal bone, and some traces of ash. Finally, the upper sub-stratum was filled with 35 cm of dark sandy loam (F8-s1) with fewer inclusions--likely formed by sediment washing in on top of the deposit. While the presence of ash, charcoal and faunal material in each of the sub-strata of F8 suggests the presence of a small midden, ceramic evidence suggests that the sherds present in F8 may have been redeposited. While the sherds found in the feature, particularly F8-s2 and F8-s3, were larger on average, laboratory analysis indicated that they were well weathered and eroded.

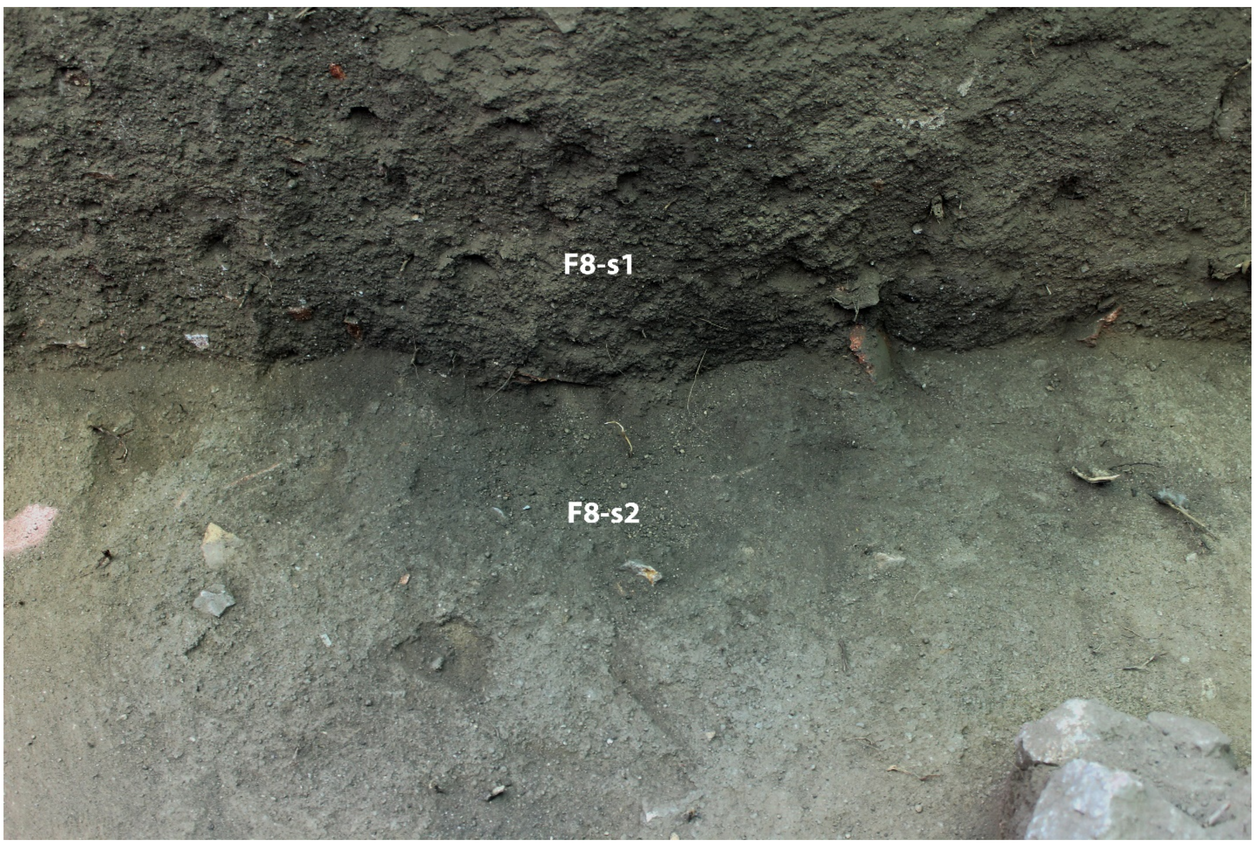

Figure 6.59: Photograph of upper level (F8-s1) and middle level (F8-s2) of bell-shaped pit in units 14M and 15M.

The final construction episode of Terrace 15d was formed by the deposition of F3, a layer of sandy loam that was found in all areas of Op B. Ceramic evidence indicates that F3 was deposited during the transitional period between the Chacahua phase and the Coyuche phase. The deposition of F3 brought the occupational surface of the terrace to the level of the series of walls in the northern area of Op B. Several offerings of ceramic vessels (F4, F5, F6, and F7) were placed in association with the F3 construction episode, each of which were found at varying elevations within the layer of fill; however, all of the vessels were found stratigraphically within F3, indicating that each was placed during the broader construction phase (Figures 6.60-6.62). F4 was an offering of one miniature gray ware jar and a small ground stone chisel placed in the area of unit 14P. To the south, F5 and F6 were placed in the area of units 14M and 13M, respectively. F5 was an offering of three coarse brown ware ceramic vessels, including two cylinders and one incurving wall bowl. F6 was an offering of one gray ware globular jar and one coarse brown ware globular jar. The coarse brown ware jar exhibited an eccentric form, containing small circular holes around the vessel walls, similar to a colander. Finally, F7 included one small coarse brown ware bowl in the area of unit 16R that was highly fragmented.

Figure 6.60: Photograph of offering F4.

Figure 6.61: Photograph of offering F5.

Figure 6.62: Photograph of offering F6.

In addition to storage, residents of Complex E likely performed some food preparation-related activities on Terrace 15d during the occupational period associated with F3. Three partial metates and several fragmented manos were recovered in excavated lots within F3 (Figures 6.63-6.65). Maize fragments were found in units 14T and 16T, and one larger metate was recorded in the wall exposed in unit 17P (F16). However, all evidence for storage and food preparation is indirect, as excavations did not recover preserved maize cobs or storage vessels in either of the presumed storage features.

Figure 6.63: Photograph of metate in unit 14T.

Figure 6.64: Photograph of metate fragment in unit 16T.

Figure 6.65: Photograph of metate *fragment in wall F16, unit 17P.*

It is probable that additional lines of stone were added to the eastern terrace walls (F23 and F25) to retain F3 as it was deposited. Between F23 and F25, an additional layer of unconsolidated fill (F2) was deposited to bring the level of the platform formed between the walls up to an elevation of approximately 166.3 m a.s.l. Following the abandonment of Complex E, likely during the Coyuche phase, a thin layer of soil (F1) formed in the uppermost layers of construction fill.

PTRV16 - Operations C, D, and E

Operations C, D, and E consisted of standalone 1 m x 1 m test units placed to the south and southeast of Terrace 15. The goal of the operations was to locate a midden deposit associated with activities carried out on the surface of Complex E. Op C was located approximately 10 m east of the southeastern corner of Terrace 15a, and Op D was located 5 m east of Op C. Op E was located 20 m directly south of Terrace 15a, at the bottom of the steep slope on which Complex E was situated. Operations C, D, and E found no evidence of a midden and very few artifacts in general.

SUMMARY

The results of excavations in Complex E consists of a three-tiered terrace (Terrace 15) occupying an area of 3,550 m^2 with stone building foundations and terrace walls visible on the modern surface. Block excavations in Terrace 15a focused on Structure E1 and the patio to the south, the results of which suggest that the area served a public ceremonial role. The earliest version of this building, Structure E1-sub, was probably a residence. The structure measured 2.5 m x 6 m and was oriented on a north-south axis of 37˚-217˚, approximately 12˚ off of the general site orientation (25˚-205˚). Later, residents of Complex E expanded Structure E1 to 3 m x 10 m and reoriented the building to match the site orientation. A high concentration of figurines and figurine fragments were recovered from the interior of the building. In the interior patio, two distinct primary deposits of sherds were found associated with the final occupation of the terrace, both of which exhibited predominantly large coarse brown ware storage vessels, suggesting that the area was used for the preparation of food for feasting. Excavations also uncovered an earth oven consisting of ashy, sandy sediment with inclusions of burned sherds, fire-cracked rock, charred seeds, and charcoal. The oven was likely the primary cooking feature for the residence. A second, smaller hearth located a few meters to the south was likely used for ancillary cooking activities. Just below the Terminal Formative period occupational surface, residents of Complex E placed a series of offerings, including coarse brown ware short-necked jars and cylinders as well as thin slabs of granite. The pattern of offerings in the patio was nearly identical to the offerings found in the western patio of Complex B.

Terrace 15c was likely the location where ritual ceremonies were carried out, perhaps involving all residents associated with Complex. Concurrently with the construction of the lower level, residents deposited a densely packed layer of sandy construction fill to raise the surface in the center of the terrace 1 m above bedrock. A 2 m x 2 m test excavation in this area exposed an extremely dense collection of 82 offering vessels deposited below the surface of this layer of fill. Stratigraphic evidence indicates the offering was placed over an extended period, evidenced by several instances where offering vessels were placed directly atop earlier deposits. Time restrictions precluded recovering the entire offering, but we can say that the depositional pattern is similar to the massive offering in the northern patio of Complex A. However, while a number of granite stones were recovered from this offering, it appears to lack discrete groupings of thin stone slabs, which were present in the interior patio of Structure E1, as well as in Complexes A and B and Structure 10 in the ceremonial center. Sitting on the upper surface of the fill into which the offerings were deposited was a large granite monolith. The stone exhibited a shallow circular depression in the center that could have been used for grinding or may have been a receptacle for liquid offerings (e.g., blood, water, etc.) associated with the offering vessels. Based on the relatively shallow depth and circular shape of the depression, it is doubtful that it was used for grinding maize, though feasting may have still been carried out in Terrace 15c. Ritual events in this area may have been witnessed by groups of people, indicated by the presence of a possible viewing platform (Structure E2) to the north, which articulated with the retaining wall of the upper level of the terrace. Several small, globular jars vessels were interred as offerings beneath the occupational surface of the low platform.

The architecture of the Terrace 15d, constructed during the Chacahua phase, is perhaps the most perplexing of Complex E. At the eastern extent of the upper level, residents built a long, narrow platform running north-south by constructing two stone walls approximately 3 m apart and filling the space between them with sandy, coarse sediment. Following the placement of the platform and step, residents raised the occupational surface of the patio almost a meter above bedrock in at least two construction phases. Excavations uncovered several offerings of ceramic vessels and ground stone tools emplaced just below the surface at this level. Later in time, the level of the patio was raised again. Following this construction phase, residents deposited additional offerings of vessels. In addition, a bell-shaped bit was excavated into the upper level of the patio, the excavation of which recovered burned ceramics, bone, and lithic fragments, suggesting that Terrace 15d was used primarily for storage for feasting activities.

To the north, excavations in the Terrace 15d also explored a set of stone walls that formed a rectangular enclosure measuring approximately 2 m x 1 m in area. The walls were built atop a fill layer analogous with the first construction fill episode to the south. The enclosure was extremely well made, with precisely cut grano-diorite stones interlocked with smaller chinking stones. A series of small steps were also carved into the naturally occurring bedrock, which was encountered at a higher elevation to the north. While it was tempting to argue that this feature may have been a tomb, which would have been the first known case for the Terminal Formative on the coast of Oaxaca, evidence does not support this association. No human remains of any kind were found in the enclosure. In fact, the only osteological remains recovered were faunal, most likely deer bone. Excavations did not recover any evidence of horizontal stones that would have sealed the enclosure from above, though this may have been accomplished with perishable materials (e.g., wood). Based on these observations, it is likely that feature was meant for storage. While no obvious macrobotanical remains were recovered (e.g., charred corn cobs), paleobotanical samples were taken for further micro-morphological studies.

VII. POLITICAL ORGANIZATION ON THE LOCAL AND REGIONAL LEVEL

INTRODUCTION

As detailed in Chapter 2, traditional scholarship on ancient Mesoamerica has often assumed that complex polities were the result of leaders' coercive strategies and the proliferation of social institutions that tightly integrated outlying communities with regional seats of power (Chase and Chase 2003; Lucero 1999; Marcus and Flannery 1996). A more nuanced reading of the archaeological record, particularly for the Formative period, tells us that in even the most stable polities, people with varying identities and positions of power struggled over competing forms of political authority (Beekman 2016b, 2016a; Blanton et al. 1996; Cowgill 1997; Inomata 2016; A. Joyce 2000; Love 1999; Pool 2008). The outcomes of these social negotiations sometimes led to institutionalized forms of regional political authority, as in the cases of Teotihuacan at the onset of the Classic Period (Murakami 2016) and Monte Alban at the end of the Formative (A. Joyce 2000, 2010:146–159). For example, the rulers of Monte Alban were able to associate their political control with forms of communal leadership that had significantly greater time-depth throughout the Valley of Oaxaca. In other scenarios, including many of the complex polities that developed in the Mixteca Alta during the later Formative, regional political authority only integrated a select number of social fields and was, as a result, tenuous and short-lived (Joyce 2010; Perez Rodriguez 2013; Pérez Rodríguez et al. 2011).

In this chapter, I discuss the nature of political authority in the lower Rio Verde Valley during the Terminal Formative period from the hinterland perspective of Cerro de la Virgen. I use archaeological data from Cerro de la Virgen and several other sites in the region to evaluate the degree to which the burgeoning "polity" centered at Rio Viejo was integrated politically. Though this chapter focuses on the sociopolitical dynamics of the Terminal Formative Period, it is imperative to acknowledge the roots of social complexity that formed during the Late Formative Period. Joyce's (1991a, 1991b, 1994) field work at Cerro de la Cruz has demonstrated that by ca. 400 BCE, Chatinos engaged in feasts and the burial of the dead in communal cemeteries. These practices created identities among the valley's residents that were predicated on shared, local histories and connections to important places within each community. Few material indications of pronounced social inequality in the form of elaborate burials or residences were found, suggesting that political authority and identity during the Late Formative were defined in terms of social relations that were "horizontal" and "communal" rather than "hierarchical" and "exclusionary" (Joyce et al. 2016:65).

Political complexity in the lower Verde reached a pinnacle at ca. 100 CE, when a tenuous regional "polity" developed in the lower Verde with its political seat located at Rio Viejo (Joyce 2008, 2010). During this time, the lower Verde witnessed a rapid increase in the occupational area of the valley from 631 hectares in the early Terminal Formative to 1,141 hectares in the late Terminal Formative (Hedgepeth Balkin et al. 2017). Concurrent with the expansion of settlements was the development of the Mound 1 acropolis, a massive monumental structure that served as the late Terminal Formative-period ceremonial center at Rio Viejo (Joyce et al. 2013). Monumental architecture was also constructed at no less than nine other sites in the region, including outlying communities like Cerro de la Virgen in the piedmont.

The expansion of regional political authority by leaders at Rio Viejo was short-lived, as the "polity" collapsed little more than a century later at 250 CE and the valley's population dispersed into scattered settlements in the foothills (Joyce et al. 2016). Research in coastal Oaxaca has shown that the Rio Viejo polity exhibits many of the fundamental characteristics of centralized and integrated "states," such as urbanism, a five-tiered settlement hierarchy, monumental architecture, and leaders' ability to mobilize labor on a regional scale (Joyce 2010). However, archaeological evidence from outlying sites like Yugue, San Francisco de Arriba, Charco Redondo, Loma don Genaro, Cerro de la Cruz, and especially Cerro de la Virgen suggest that hinterland communities had a considerable degree of autonomy over many important social fields such as religious practices, architectural techniques and styles, and some economic practices (Joyce and Barber 2015a).

Cerro de la Virgen presents an ideal case study for examining political integration "from the bottom-up" because the site persisted through the social upheaval at the end of the Formative. The analysis presented here is grounded in the idea that leaders' power in complex polities hinges on controlling a wide array of resources and social institutions on a regional scale, whether through strategies considered to be "exclusionary" or "corporate" in nature (Blanton et al. 1996; see Chapters 2 and 3). The main body of the chapter presents material evidence of social practices that involved labor, ritual, production, and exchange of resources among communities in the lower Rio Verde Valley. Within each resource category, I present and discuss the available data from sites with significant occupations dating to the later Formative, after which I present comparative archaeological data from Cerro de la Virgen. For collective labor, I examine construction techniques and spatial organization of buildings at several sites, arguing that variability in methods of construction stems from a deep connection to local places and histories that was instrumental in constituting community identity (Barber 2005, 2013, A. Joyce 2008; R. Joyce 2004; Robin 2002). Perhaps the best evidence for parity in collective practices among Terminal Formative sites comes from communal rituals, particularly involving mortuary ceremonialism, object caching, and feasting practices (Joyce and Barber 2015a; Joyce et al. 2016). Though several communities shared certain characteristics of ritual practices, evidence for regional idiosyncrasies far exceeds the regional canons that many Oaxacan scholars have argued should follow the development of centralized political authority (Flannery 1998; Redmond and Spencer 2008). Finally, to broaden the types of material correlates with which we may evaluate political integration, I compare evidence of economic practices involved in the production and/or exchange of resources as they were associated with public buildings.

The evidence presented in this chapter supports previous hypotheses of coastal Oaxacan scholars that political authority in the lower Verde was the result of negotiations among the myriad social groups that lived in the region (Barber 2005, 2013; Barber et al. 2014; Joyce and Barber 2015a; Joyce et al. 2016). Archaeological evidence indicates that leaders of Rio Viejo were able to draw people from their local communities to engage in collective labor projects and feasts focused on the Mound 1 acropolis, and may have controlled the distribution of some types of craft goods like ceramic figurines and possibly imported obsidian. However, the types of communal rituals that constituted local identities for much of the later Formative were not standardized or scaled up to the level of the "polity".

While some institutions and practices were shared to a certain extent, distinct idiosyncrasies in communal rituals appear in the archaeological record of the lower Verde hinterland, indicating that outlying communities retained a large degree of autonomy at the end of the Formative. Large-scale feasts were conducted at outlying sites, including Cerro de la Virgen, and fancy ceramic serving vessels depicting common religious themes were made by potters throughout the valley (Brzezinski 2011; Brzezinski et al. n.d.). Mortuary ceremonialism varied in form among sites, some exhibiting evidence of cemetery burial and others lacking these contexts (Barber, Joyce, et al. 2013). Variation is most profound among ceremonial offerings placed in public buildings, with those at Cerro de la Virgen exhibiting perhaps the most unique style of object caching in the valley (Joyce and Barber 2015a; Joyce et al. 2016). Evidence for the production of some valuable materials at Cerro de la Virgen, including thin stone slabs used in offerings and shaped stone blocks that formed terrace walls, were produced in public buildings for the consumption of the local community. Evidence for centralized control over valuable objects and materials exchanged throughout the valley is mixed, as ceramic figurines and possibly obsidian may have been obtained through broader exchange networks, possibly controlled by leaders at Rio Viejo.

Overall, I follow other coastal scholars in arguing that contradictions between new and preexisting forms of community and authority prevented the development of a centralized polity in the lower Verde. The tensions that formed over the growing demands of leaders at Rio Viejo and the independence of people at the outskirts of the "polity" may have perpetuated the collapse of Rio Viejo and the dispersal of populations out of the valley and into the piedmont. In Chapter 8, I offer some explanations rooted in theories of practice, power, and materiality regarding the development of the social and material entanglements that facilitated stronger local affiliations.

COLLECTIVE LABOR AND PUBLIC BUILDINGS

The most visible indications of communal practices among later Formative communities involved construction projects that culminated in the creation of monumental buildings at Rio Viejo, Cerro de la Virgen, and at least eight other sites. Collective labor in the lower Verde dates as far back as the Early Formative, evident in the construction of mounded architecture at the site of La Consentida (Hepp 2015). As a resource, labor was organized among households or small corporate groups until around 400 BCE, when the scale of public buildings in the region increased dramatically.

By the Late Formative, the elaboration of public buildings distinguished them from domestic settings, though evidence of social inequality was still muted. At Cerro de la Cruz, collective practices of the community were centered on a complex of public buildings that included Structure 1, a ceremonial structure with a flag stone patio situated adjacent to three storerooms (Structures 2, 3, and 4; Joyce 1991a). The building and its many lines of stone were situated on a generally northerly axis at an orientation of about 8˚/188˚ (A. Joyce 1991a). Though construction fill at other sites in the region has been dated to the Late Formative, there is only limited evidence of public buildings outside of Cerro de la Cruz whose construction dates specifically to this period (Workinger 2002). At Cerro de la Virgen, evidence from the deepest unit of PTRV16-Op F (unit 20I) shows that the area beneath Terrace 12 originally had a stone platform oriented at approximately 6˚/186˚, suggesting this may have been the location of a Late Formative structure. The limited exposure of the possible Minizundo phase stone foundation precludes determining whether it was the setting of public, domestic, or mixed practices (see Chapter 5).

The transition into the Terminal Formative period marked a tremendous expansion of the occupational area of the lower Verde, as well as the construction of public, monumental buildings. The first monumental building constructed at Rio Viejo was Mound 9-Structure 4, an acropolis that consisted of a rectangular platform measuring 200 m by 125 m that covered 7.4 ha (Joyce 1991a). The structure was built gradually, beginning at the end of the Late Formative when it served as a public platform. Later, it was elevated in at least three construction phases during the Terminal Formative, transforming the structure into the ceremonial center of the site (Joyce 1991a). The main construction method utilized to build Mound 9-Structure 4 was the ongoing placement of unconsolidated sediment, though excavations in 1988 and 2013 also revealed the use of rammed earth walls, blocks made from alluvial fill, and occasionally adobe blocks (Joyce 1991a; Salazar et al. 2015). The rammed earth wall was likely formed as layers of sediment were pounded down by builders to stabilize the sediment (Joyce et al. 2016). An additional wall was made of blocks of fine alluvial sediment that were solid enough to be cut from their original location by hand and transported to the site. This pattern has only been found at Mound 9-Structure 4. An adobe block was also recovered with a layer of earth plaster that demonstrated repeated episodes of maintenance, as well as the presence of red pigment and a wash of lime used for decoration. Evidence also indicates that the maintenance of Structure 4 took place over a minimum of five stages of resurfacing separated by the deposition of occupational waste material such as shell fragments, sherds, ash, and organic material.

By the late Terminal Formative, the ceremonial center of Rio Viejo moved to the Mound 1 acropolis, an even larger earthen construction covering an area of 350 m by 200m that rose at least 17 m above the flood plain in its final form (Joyce and Barber 2011; Barber and Joyce 2012; Joyce 2006;

Joyce et al. 2009, 2013). During this time, the acropolis consisted of a six-meter-tall platform that supported two large substructures (Structures 1 and 2) rising at least 16 m above the floodplain. To the south of Structures 1 and 2 was a large open plaza that was probably at the level of the floodplain, bounded to the south and west by a platform or continuous series of platforms. Joyce and colleagues (2013) place a conservative estimation of the volume of the acropolis during the Terminal Formative at 455,050 m^3, making it one of the largest structures by volume in Pre-Columbian Oaxaca.

Excavations of the fill and retaining walls of the acropolis have indicated that its construction occurred over a relatively short period (for a building of its massive size) and required a workforce that was mobilized from several communities in the lower Verde (Joyce et al. 2013; 2016.). Joyce and colleagues (2013) have identified a wide variety of strategies and building forms that were utilized in the construction of the acropolis, ranging from unconsolidated earthen fill to adobe, wattle-and-daub, and stone masonry walls. Early construction phases were marked by unconsolidated fill deposited in basket loads that were mined from the surrounding floodplain. In later stratigraphic levels, builders employed a wider range of earthen architectural techniques, including the use of adobe blocks as well as adobe layed down in a series of thin layers. Many types of structured fill likely involved the use of wooden frames or thin cells made of adobe, stone, layered fill, or tamped earth that were filled with unconsolidated sediment (Joyce et al 2013; Joyce and Levine 2009).

Joyce and colleagues (2013) have also identified variability in the construction of more formal architectural elements on the acropolis, such as standing (self-supporting) walls and retaining walls fashioned from a variety of materials, including adobe, stone, and rammed earth. Standing walls were typically made of adobe blocks and wattle-and-daub, such as those found within Structure 2-sub 2. Stone masonry walls were utilized in the northern part of the acropolis, particularly in Structures 1 and 2, in the area to the north of Structure 2, and in Structure 8-sub1, a low platform that was built between the two larger structures (Joyce and Barber 2015b; Joyce and Levine 2009; Vidal Guzman 2017). For example, in the area just west of Structure 2, a low retaining wall made of thin stone slabs was situated in front of a rectangular drain that was nearly identical in size and shape to a drain that ran beneath Structure 2 in Complex A of Cerro de la Virgen (see Chapter 4). A separate drain possibly dating to the Miniyua phase was also discovered on the acropolis. In Structure 8-sub1 of the Mound 1 acropolis, tabular stones delimited the stairs of the two-meter-tall platform, but excavations also revealed a thin plastering of earth that covered the stairs. Finally, an adobe retaining wall was also recorded in the western side of the acropolis that contained bricks made from three different clay sources stacked both horizontally and vertically (Egan and Barber 2012:367).

The diversity of building techniques on the Mound 1 acropolis far exceeds that of other sites in the region, particularly those situated on the floodplain. At the smaller (18.75 ha) site of Loma don Genaro, located in the floodplain approximately 6 km to the southeast of Rio Viejo, residents built a series of three platforms, the largest of which (Mound 3) was almost entirely built during the Chacahua phase (Joyce et al. 2015). Construction techniques dating to this time showed many similarities with those found at Rio Viejo, including puddled adobe fill, formal adobe blocks, and maybe informal structured adobe fill. In addition, several very thin layers of fill with laminations were found, which were different from any fill contexts recorded at Rio Viejo. Excavations revealed that the northern part of Mound 3 may have served as a ceremonial space during the Chacahua phase, as several small offerings were found associated with its layers of fill (see below). Several small “burning” elements and cooking features were found in the central part of the mound, suggesting that this area served a domestic purpose.

Communal labor at Yugue, also located on the floodplain, culminated in the late Terminal Formative period with the construction of a multiuse platform measuring 300 m x 150 m, a considerably large building for a small community of 10 hectares. As described by Barber (2005, 2013), construction techniques at Yugue were dominated by the placement of unconsolidated fill, though stone and adobe walls were also recorded. Similar patterns were recorded in Miniyua phase contexts at Charco Redondo. One small difference between the Yugue and Charco Redondo unconsolidated fill was the presence of "significant" amounts of human bone inclusions in the compacted loamy clay used to construct the Miniyua phase layers of Mound 2-Structure 4 at Charco Redondo. Butler (2018:242) argues that the human bone in these fill layers was redeposited or the result of taphonomic processes associated with the Miniyua phase cemetery located stratigraphically just beneath them.

Perhaps the most profound differences in building techniques among lower Verde communities were between sites in the floodplain and in the piedmont. This is not a surprise, given the tendency of communities in Pre-Columbian Mesoamerica to use raw resources for construction that were available in their immediate environmental vicinity (Abrams and Bolland 1999; R. Joyce 2004). However, the presence of alluvial sediments in some layers of unconsolidated fill at piedmont sites such as San Francisco de Arriba and Cerro de la Virgen, as well as the presence of massive quantities of granite and diorite stones in retaining walls at floodplain sites such as Rio Viejo and Yugue, indicate that stones at these sites would have been available locally. Both sites have visible bedrock outcrops, and several tall hills dot the landscape throughout the site of Río Viejo. At San Francisco de Arriba, the only indication of adobe construction comes from excavations at the top of Substructure 1-2, where Workinger (2002:281) recovered a small partial adobe from Chacahua phase fill deposits. At Cerro de la Virgen, a possible section of layered adobe fill was found in excavations of Structure E1 at Complex E; however, the matrix of the sediment was generally coarser than the extremely fine alluvial clays and silts found in layered fill on the Rio Viejo Mound 1 acropolis and other floodplain sites, likely due to its location on a hilltop. However, coarse channel sands were also available in the floodplain and have been documented in the matrices of construction fill. Several fill contexts at both sites also exhibited evidence of adobe and daub inclusions, including a layer of pit fill (PRV13-OpD-F20) at the base of Structure 1 at Cerro de la Virgen that corresponded with the termination of the first superstructure on Terrace 10. Disintegrated adobe was also found in a thick layer of construction fill (PTRV16-OpF-F24) in the western area of Terrace 12 at Cerro de la Virgen, indicating that builders repurposed some building materials, particularly daub wall panels and debris, to be used in unconsolidated fill. A well-preserved daub wall panel (PRV13-OpG-F4) with intact cane impressions was also found in the southwest area of Terrace 2 at Cerro de la Virgen. The large size of the panel indicates that it was not carried far before it was used as fill, further indicating that perishable superstructures with wattle and daub walls were present on Terrace 2.

Builders of San Francisco de Arriba and Cerro de la Virgen shared several construction techniques, including the use of unconsolidated fill and stone mined from local deposits of sediment and bedrock outcrops, respectively. The stone was used for terrace retaining walls and masonry structural foundations, among other architectural features. Barber's (2005) excavations of Residence 1, located on Terrace 1 at Cerro de la Virgen, demonstrated several architectural forms that were more elaborate than other houses in the region through time such as those that have been sampled in test excavations at Rio Viejo and Barra Quebrada (Joyce 1991a; Winter and Joyce 1986; Workinger and Joyce 1999). As described in Chapter 2, builders of Terrace 1 at Cerro de la Virgen invested considerable labor in its construction by leveling off a shallow saddle between the top of the hill and a sloping bedrock outcrop to the east and smoothing the soft, natural grüs bedrock prior to the placement of earthen fill (Barber 2013:179). Though the earliest version of the residence was not investigated in depth, excavations confirmed that the residents utilized construction fill with sloping surfaces of uncut river cobbles. The use rubble in the form of river cobbles would have been a "considerable undertaking due to the terrace's location near the summit of the hill," which suggests that its residents had the ability to command at least a small labor force (Barber 2013:179). Only limited architectural features of the earlier structure, Residence 1-sub 1, were exposed, including two single-coursed walls of faced stones set into earthen fill. Building techniques used for the later structure, Residence 1, included two-coursed foundation walls that separated Terrace 1 from Terrace 10 and Structure 1 to the north.

The most elaborate stone architectural features dating to the Formative period also come exclusively from piedmont sites. For example, Residence 1 at Cerro de la Virgen includes an L-shaped passage that led to a four-step masonry stairway at the structure's entrance, as well as an 80 cm-wide paved bench that fronted several substructures to the north. Masonry stairways are relatively common in the lower Verde and have been found at Rio Viejo (Structure 8), San Francisco de Arriba, La Soledad, and Buena Vista (Workinger 2002; Hedgepeth Balkin et al. 2017; Vidal Guzman 2017). For example, a stairway (99G-F11) built at the base of Platform 3 at San Francisco de Arriba possibly led to the surface of Substructure 3-2, which was built during the Chacahua phase. Workinger (2002:224) notes that the stairway, of which only four steps were preserved, either dated to the Miniyua phase or early in the Chacahua phase. The most prominent masonry stairway was found at Cerro de la Virgen at the eastern end of the ceremonial center. The two-meter-wide stairway, complete with ballustrades, connected Complex A with Structure 1 and the more restricted ceremonial activities carried out there.

Despite the similarities in construction methods at piedmont sites detailed above, several significant differences between architectural techniques and features at Cerro de la Virgen and San Francisco de Arriba are relevant. Perhaps the most profound difference between the two sites involves the timing of the construction and use of ballcourts within the ceremonial center of each site. Reconnaissance carried out during Barber's dissertation project in 2003 revealed an I-shaped ballcourt with a playing field situated between Terraces 12 and 13 at Cerro de la Virgen (Barber 2005). Excavations carried out during the 2013 and 2016 projects produced ceramic evidence from the fill of Terrace 12 that indicates the ballcourt was built no later than the Chacahua phase. Unfortunately, no carbon samples from primary archaeological deposits were recovered from these layers of fill.

Given the accessibility of the ballcourt, ceremonies involving the ballgame likely engaged groups of residents and visitors at Cerro de la Virgen. Excavations in Complex B also recovered the human remains of three individuals interred within layers of construction fill (see below), suggesting the area may have also served a mortuary function--a pattern seen elsewhere in Formative-period Mesoamerica (Fox et al. 1996; Hill et al. 1998). The positioning of the ballcourt on the western site of the ceremonial center may have also implicated the ballcourt and the activities carried out there with rituals involving death and the setting of the sun (Scarborough and Wilcox 1993). In contrast, Workinger's (2002:151-152) excavations on Mound 4 at San Francisco de Arriba, which composes the southwestern edge of the site's ballcourt, indicate the ballcourt dates to the Late Postclassic period, at least one millennium after the construction of the ballcourt at Cerro de la Virgen. Though the Cerro de la Virgen ballcourt is the only such architectural feature to be securely dated to the Chacahua phase, other Terminal Formative sites also had ballcourts, including La Humedad and Piedra Ancha, though the dating of these features is tentative and based only on surface collections (Hedgepeth Balkin et al. 2017).

Excavations of Complex E at Cerro de la Virgen revealed a method of terrace wall construction that was unique to the valley. As detailed in Chapter 6, Terrace 15 was built in two general phases, the first of which (Terrace 15-sub) followed the more widely observed pattern of a single line of stones with multiple courses that retained sediment. Upon the expansion of the area into a multi-level terrace with the addition of Terraces 15c and 15d, builders utilized a technique in which two lines of stone with multiple courses were built in parallel, retaining unconsolidated sediment toward each other. These "double stone and fill" walls functioned as a singular architectural feature that retained sediment (to the west, in the case of Terraces 15c and 15d). The features were easily the most meticulously constructed and maintained architectural features recorded in the 2013 and 2016 excavations at Cerro de la Virgen. For example, PTRV16-OpB-F25, the western line of stone used to retain sediment on Terrace 15d, measured 1.6 m in height in its final form and contained at least ten courses of finely cut stone. The base of the wall was situated directly atop bedrock, indicating builders planned its unique design at the onset of the construction episode.

Further evidence of unique architectural features also comes from Terrace 15d. A transect of excavations on the terrace revealed that the area was used for storage as well as occasional small, discrete offerings of ceramic vessels and ground stone objects (see Chapter 6). Storage practices are indicated by a bell-shaped pit (PTRV16-OpB-F8) that cut down from the top of an occupational surface and a rectangular stone enclosure (PTRV16-OpB-F10, -F11, -F12, and -F13) made from flat, finely shaped granite blocks that were fitted together with precision. In the latter example, builders utilized chinking stones to fill in the gaps between blocks. Both features date to the Chacahua phase. Use of chinking stones appears to be a relatively rare occurrence in stone masonry features in the lower Verde, though some instances were recorded by Workinger (2002:225) in Terminal Formative construction features on Substructure 3-2 at San Francisco de Arriba. Similar stone features dating to the Late Formative were also recorded at Cerro de la Cruz, indicating this architectural form may have some degree of time-depth in the lower Verde (Joyce 1991a:316-317, 320-321). As discussed in Chapter 6, the stratigraphic association of the Terrace 15d retaining wall and a smaller, sloped wall (PTRV16-Op B-F27) to the west leaves open the possibility that there was an open corridor between the two walls that was filled in later. The earlier wall, F27, appears to have been set at an angle of about 20-25˚ from vertical, suggesting a type of "talud-style" architecture. Similar "walls in talud" have been found at Rio Viejo, including a wall on the western side of Structure 2 on the acropolis (Meehan 2012) as well as one on Mound 9 (Joyce et al. 2000).

A final point of comparison in Terminal Formative construction techniques involves the spatial layout of architectural features among the region's communities. Joyce's (1991a) work at Rio Viejo and Cerro de la Cruz indicates that Late Formative buildings tended to be situated slightly to the east of cardinal directions, generally at a northerly azimuth of 8˚/188˚, plus or minus a few degrees in either direction. By the Terminal Formative, there was a general shift in the orientation of buildings further to the east, following a direction Kowalewski and colleagues (Kowalewski et al. 1991) have argued to represent “general Mesoamerican north”. However, there appears to have been a slight degree of variation among orientations at different sites. At Yugue, the orientation of the site and most of its structures was situated at approximately 18˚/198˚ (Barber 2005), while Terminal Formative period structures at Cerro de la Cruz were oriented to 25˚/205˚ (Joyce 1991a). The acropolis at San Francisco de Arriba was situated further toward the east at 28˚/208˚ (Workinger 2002:233).

The widest range of orientation in retaining walls and structures was present on the Rio Viejo acropolis. For example, two retaining walls on Structure 2 (PRV12-Op B-F70 and F71), which ran perpendicular to one another, had orientations of 15˚/195˚ and 105˚/285˚, respectively (Meehan 2013:157). Several Terminal Formative-period retaining walls in the northern area of the acropolis that separated Structures 1 and 2 also exhibited variable orientations, including a wall made from flat slabs (PRV12-Op F-F55) aligned at angle of 20˚/200˚ and two retaining walls (F63 and F67) angled perpendicularly at 15˚/195˚ and 105˚/285˚, respectively. During the PRV13 excavations at Rio Viejo, substructural platforms were identified in the same area, including Structures 3 and 8. Structure 3 contained at least one retaining wall at a delineation of 7˚/187˚ (Menchaca 2015). Several walls of Structure 8-sub, a masonry platform measuring 2.39 m in height with at least five masonry steps was oriented at an angle of approximately 12˚/192˚ (Vidal Guzman 2015). An expansion of the platform near the end of the Chacahua phase reoriented Structure 8 to a delineation of 23˚/203˚.

At Cerro de la Virgen, all buildings and complex orientations in the ceremonial center were oriented between 21˚/201˚ and 25˚/205˚. Greater variation was recorded at Complex B, where the foundation walls of Structure E1-sub were angled 7° further to the east of the range listed above at 32°/212°. The subsequent version of the structure was re-oriented to the more widely used orientation range. The tremendous variation in orientation of architectural features across the valley suggests that there was no overarching convention dictating the orientation of buildings, although further investigation of public buildings at additional sites in the hinterland would provide additional clarity to this question.

MATERIAL TRACES OF COMMUNAL CEREMONIES

Public buildings physically embodied the organized, collective labor of the people who built them and were the locus of an array of ceremonial practices that defined corporate groups (Joyce et al. 2013, 2016; Joyce and Barber 2015a). Communal ceremonies like object caching, feasting, and cemetery burial tied people together through a shared sense of community identity that was anchored in a public place or space. By the end of the Formative, if not before (see Hepp 2015), communal rituals became enmeshed in local ways of life to such an extent that they likely conflicted with regional forms of political authority. In this sub-section, I present the corpus of Terminal Formative-period data on communal ritual, separated by the three main categories of ritual practice--mortuary ceremonialism, feasting, and object caching. I begin each section by presenting early evidence of communal practices during the Late Formative Period, which set the stage for greater complexity and variability during the Terminal Formative. I end each section by comparing the data from Cerro de la Virgen to that from each lower Verde site mentioned.

Mortuary Ceremonialism

Archaeological evidence indicates that people interred human bodies in cemeteries within public buildings by no later than the Late Formative, and possibly by as early as the Early Formative Period (Hepp 2015). The best evidence for communal rituals in the Late Formative comes from a cemetery located beneath the floor and foundations walls of Structure 1 at Cerro de la Cruz (Joyce 1991a, 1994). The human remains of 49 individuals found in the cemetery, 86% of which were adults, represented continuous interment over the span of several decades or perhaps more than a century (Barber et al. 2013:101; Joyce 1991a). An additional nine individuals were also interred near the structure. Males and females were evenly represented in the sample, but none were accompanied by mortuary offerings. In contrast, 22 burials interred beneath the floors and foundation walls of three residences at Cerro de la Cruz exhibited two fundamental differences in relation to the public cemetery. First, juveniles and children dominated the burial assemblage (68%), though males and females were also evenly represented. Second, unlike the public contexts that lacked offerings, at least four of the individuals buried in Structure 8, a relatively elaborate residence, were interred with grave goods. For example, an adult male was buried wearing a sash of 45 notched marine shells and an adjacent child was interred with a necklace of 22 canid teeth and a vessel placed over the head. The materials buried with individuals in Structure 8 also appear to be more valuable than other domestic-setting burials. Though the homogeneous mortuary pattern of the Structure 1 cemetery alludes to relatively horizontal relationships of status among the community's members, the presence of offerings in the domestic-context burials indicates that inequality distinguished certain domestic groups from others at Cerro de la Cruz. Membership in the Structure 1 cemetery also may have been dictated by accomplishments in life, as indicated by the cemetery's restriction to adults and sub-adults (Joyce 1991).

As the valley's population and occupational area grew during the Miniyua phase, some local communities, particularly those located in the floodplain, continued the practice of cemetery burial in public buildings. However, as Barber and colleagues (2014:43; also see Barber 2005, Barber et al. 2013, Joyce 1991a; Joyce et al. 1998) argue, both age restrictions and limits on grave goods likely began to erode at this time. At Charco Redondo, Butler's (2018) excavations revealed a series of burials in the Miniyua-phase fill of Mound 2-Structure 4 that constituted a public cemetery. A total of ten individuals were recovered, all of which were adults. Unlike the Minizundo-phase cemetery at Cerro de la Cruz, the Mound 2-Structure 4 cemetery revealed some evidence of status distinctions among its members. For example, Burial 4 consisted of two adults of undetermined gender, one of which (Burial 4-Individual 6) was placed in a slab-lined grave and accompanied by one or two ceramic vessels. The other individual

(Burial 4-Individual 8) was buried with a coarse brown ware bowl on his chest that had a circular granite disk set on top. At Charco Redondo, an adult male (Burial 9-Individual 9) was buried in a slab-lined pit with an offering of a large, broken coarse brown ware cooking or storage jar, as well as a green stone bead placed in his mouth. Another adult male (Burial 20) was also buried at Rio Viejo with a greenstone bead in his mouth and possibly a perforated shell (Workinger and Joyce 1999:79). Slab-lined graves are relatively rare for the lower Verde, as only one other example of this burial type has been recovered, dating to the early Terminal Formative at Cerro de la Cruz, although they occur frequently in the Valley of Oaxaca (Martinez Lopez 2011). Given their appearance in mortuary settings at multiple sites, greenstone beads placed as offerings in the mouths of adult males may have been a salient burial pattern during the early Terminal Formative, as another adult male interred at beneath Mound 2 at Rio Viejo contained a greenstone pendant in his mouth (Joyce 1991a). At Yugue, four individuals were interred beneath Substructure 1 during the Miniyua phase, including two infants, a child, and an adult; the child and adult were interred with coarse brown ware jars (Barber 2005). Modest offerings were also present in Miniyua-phase burials at Rio Viejo and Cerro de la Cruz. A wide range of burial positions and orientations were recorded among Miniyua-phase burials. However, given the small aggregate sample size of Miniyua-phase burials (n=22), coastal researchers have not yet been able to determine whether body position and orientation of burials correlated with age, sex, or the location of a burial (Barber et al. 2013).

By the late Terminal Formative, the interment of high-status individuals, identified by their association with valuable or exotic goods, in communal cemeteries began to occur in at least some communities in the lower Verde. The sample size of burials securely dated to the Chacahua phase (n=47) is over twice as large as the preceding Miniyua phase sample, though almost all of them come from Yugue (n=42). Another burial was recorded at Campo Montealegre (Barber 2009) and four (one primary interment, three secondary interments) were recovered at Cerro de la Virgen during this project (see

Appendix E). In addition, Chacahua-phase burials have been investigated at Rio Viejo and Charco Redondo, and possibly at Cerro de la Cruz and Barra Quebrada.

At Yugue, the burials of 41 individuals were interred in a cemetery on Substructure 1 of the mixed-use platform, possibly beneath a perishable superstructure that had eroded. Given characteristics of inclusivity and heterogeneity in age, sex, and status distinctions, combined with its location within a public building, Barber (2005) identified the cemetery as a public mortuary context. The cemetery contained people of all ages and sexes, four of which were distinguished by personal adornments and/or offerings. Among the four, two female adults had pyrite incrustations in their teeth, and a child was found with a string of white and green stone beads. The most impressive individual was Burial 14-Individual 16, a sub-adult male that was buried with an iron ore mirror with plaster backing and an intricately carved bone flute. The bone flute, one of the earliest reported musical instruments of its kind in Mesoamerica, was adorned with the image of a skeletal male and other iconographic elements that situated the flute's figure, and B14-I16 with whom it was interred, within the pantheon of divine forces associated with rain, wind, and agricultural fertility (Barber and Olvera Sánchez 2012; Barber et al. 2009). Further discussion of the material and animate characteristics of the Yugue flute can be found in the next chapter.

In contrast with the populous cemeteries of Cerro de la Cruz during the Late Formative and Yugue and Charco Redondo during the Terminal Formative, the data currently available at Cerro de la Virgen does not yet indicate that the site's residents engaged in cemetery burial practices. Excavations spanning three field projects in both domestic and public spaces at Cerro de la Virgen have found the remains of only four individuals in discrete, unconnected archaeological contexts. Further, three of the burial features likely consisted of secondary, redeposited human remains, calling into question whether we may even consider them "burials". It is also possible that, despite extensive exploration of the ceremonial center and Complex E, a cemetery like those found at Yugue and Charco Redondo has yet to be located.

Few features indicative of mortuary ceremonialism at Cerro de la Virgen are available to analyze, but those available allow for the suggestion of certain patterns. Following an earlier occupation during the Minizundo phase, residents deposited several thick layers of sandy construction fill to form the base of what would eventually become Terrace 12. At least three burials were interred in the fill at various points during these construction phases, all of which date to the Chacahua phase. Two of the burials--Burial 1-Individual 1 and Burial 3-Individual 3--were most likely secondary interments, given the fragmented nature of the recovered skeletal remains. Based on fragments of long bones recovered from each interment, both individuals were probably adults, though neither individual was able to be sexed. Current evidence is unclear as to whether B1-I1 and B3-I3 were purposely moved from their original location or were haphazardly redeposited with the fill. Human remains from Burial 2-Individual 2 indicate the burial was a primary interment, likely an adult female. B2-I2 was placed in a flexed position on her side, with the head facing south and oriented to the general site orientation (25°-205°). The flexed positioning of B2-I2 was unique among Chacahua-phase burial positions at other sites in the region (see Barber et al. 2013), although I would certainly hesitate to identify a distinct burial pattern at Cerro de la Virgen based on a sample of one individual. None of the burials excavated in Complex B contained offerings of any kind, which would be unique for an aggregate burial assemblage for a site in the region. However, the small sample size of the Cerro de la Virgen burial assemblage does not allow for a rigorous evaluation of this pattern. The remains of a fourth individual, Burial 4-Individual 4, were found in a layer of Chacahua-phase construction fill in the uppermost level (Terrace 15d) of Complex E. Only four long bones and a mandible with three intact teeth were recovered in the remains, the analysis of which suggests that the individual was an adult. Sexing the skeleton was not possible with the available osteological remains. Though I identify B4-I4 as a secondary burial, it is also possible that the remains were redeposited from older fill contexts mined from somewhere else on the hill.

Feasting

Feasting in Formative Mesoamerica was a particularly potent, ritually charged communal practice through which people were brought together and new social ties were established (Blanton et al. 1996; Clark 1991; Joyce and Henderson 2008; Rosenswig 2007; Staller and Carrasco 2009). Feasting during the Late Formative is indicated by the presence of two hearths that penetrated into the flagstone patio adjacent to Structure 1 at Cerro de la Cruz that were larger than expected for the quotidian practices of a domestic setting (Joyce 1991a, 1994). Communal feasts that took place at public buildings later during the Terminal Formative would have brought together members of a community and perhaps neighboring communities as well. Evidence for feasts in the lower Verde comes from three main sources: cooking features that were larger in size than would be expected for day-to-day domestic cooking, collections of cooking and storage wares in public contexts, and midden deposits with substantial proportions of serving vessels as refuse. These types of feasting features were found at multiple sites in the lower Verde (Barber 2013; Barber and Joyce 2007; Joyce et al. 2016).

At Yugue, evidence for feasting during the Miniyua phase on Substructure 1 can be found in a deposit of three lidded cooking jars found just below an occupational surface that were filled with organic matter and displayed substantial evidence of burning, suggesting repetitive and continuous use in food preparation (Barber 2005). One of the vessels was filled with mussel shells. In addition, a Miniyua-phase midden found off the south end of Substructure 1 was filled with serving vessels, ash, and estuarine shell. By the Chacahua phase, feasting practices may have intensified on Substructure 1. Barber (2005) found two distinct midden contexts on or next to Substructure 1, both of which contained a higher than expected proportion of serving vessels than was typically observed in domestic midden contexts. Among the contents of the midden were fragments of a bone flute, unusual types of vessels not normally seen in domestic collections, and deposits of ash, estuarine shell, and fish bones. Hepp and colleagues (2014) have suggested that musical instruments like the bone flute, along with other ritual paraphernalia, were used in religious ceremonies associated with feasts.

Aside from the collective labor required to build the massive earthen structure, the best documented practice associated with the Mound 1 acropolis at Rio Viejo was communal feasting (Joyce et al. 2013, 2016). Features indicative of feasting are abundant in multiple areas of the acropolis, demonstrating that food preparation and discard of feasting-related objects like fancy ceramic serving vessels and other ritual paraphernalia were found in much larger quantities than at outlying communities (Lucido et al. 2013). For example, ten refuse deposits were explored on the south and western areas of the acropolis during the Rio Verde Project's 2012 and 2013 field seasons, nine of which were found in pits that were more than 1.5 m deep. The middens contained thick layers of estuarine mussel shell, ash, dense deposits of sherds, and dark, organic sediment. The initial deposition of these refuse deposits coincides with the intensification of construction efforts on the acropolis at beginning of the Chacahua phase (ca. 100 CE) and ended sometime around the abandonment of the acropolis at ca. 250 CE. Stratigraphic evidence indicates that five of the middens were formed over multiple, consecutive depositional events, most likely during feasts that took place with relative frequency (i.e., perhaps seasonally). The size of the middens, which were much larger than those found at outlying sites, suggests that leaders at Rio Viejo attempted to "scale up" certain communal practices that were focused on the acropolis (Joyce et al. 2016).

Additional evidence of feasting at the Mound 1 acropolis comes from excavations below and to the west of Structure 2, which uncovered an enormous earth oven (PRV12-OpA-F42; Joyce et al. 2016). Early in the Chacahua phase, occupants of the acropolis excavated a large pit into the occupational surface in which intensive cooking activities were carried out. Over time, the pit expanded in size and the surrounding area was covered with refuse from the oven, spanning an area with a diameter of at least ten meters. The refuse consisted of extremely organic sediment filled with ash, burned rock, and burned sherds. The burned rock and sherds were used as conductive elements to retain heat in the cooking feature. It is possible that additional food-related activities, perhaps ancillary food preparation connected with the large-scale cooking that took place in F42, were also carried out in a nearby area of the acropolis. Just over ten meters to the north of F42, several small pits (PRV12-OpA-F16) that exhibited signs of burning were cut into the layered adobe surface of the acropolis (PRV12-OpA-F38 and -F39). Despite the grand scale of activities represented by F16 and F42, the lack of storage features on the acropolis suggests that at least some of the attendees of feasts on the acropolis brought their own food to the communal ceremonies.

Little evidence of feasting middens like those found at Rio Viejo and Yugue were detected in the 2013 and 2016 excavations at Cerro de la Virgen. While Barber's (2005) excavations at Residence 1 found evidence of a domestic midden dating to the Chacahua phase, its deposition was more likely the result of day-to-day cooking activities rather than large-scale feasts. However, archaeological evidence from the site does show that large-scale cooking activities took place in both the ceremonial center and Complex E. In the plaza of the ceremonial center, feasts were probably held during ballgame events as well as other ceremonies such as the placement of offerings in the surrounding architectural complexes. The patio of Complex C was located about 20 m south of the ballcourt and was the locus of a large earth oven (PRV13-Op E-F2) used for cooking food. The refuse of the earth oven was spread out over a circular area measuring about 5.5 m in diameter, making it roughly half the size of the large earth oven at the Rio Viejo acropolis (Brzezinski and Joyce 2013). The refuse of F2 was filled with small stones used as heating elements, rather than burned sherds like the oven on the acropolis, likely due to the prevalence of stone debris on the hillside. Despite being smaller in size, the scale of F2 indicates that it would likely have been able to support large-scale feasts involving hundreds of people, perhaps from neighboring communities in the piedmont or nearby floodplain.

Adjacent to the plaza in Complex B, excavations revealed two small hearths (PTRV16-Op F-F58 and -F36) located in the interior patio of Structure 4. Both cooking features were relatively small (about .5 m in diameter) and may have also been used to fire treat the large quantities of stones that were cut into the form of blocks for the site's terrace walls (see below). It is not likely that the cooking features in Complex B were utilized for large-scale feasts. In Complex A, ritual activities involving cooking were perhaps more intimate in scope. Excavations revealed seven small hearths intermingled with the cache compartments in the north patio as well as two larger, deeper hearths in the south patio. This patterning demonstrates that practices in the north patio, which would not have been visible from the south patio or the plaza below, were more exclusive than the cooking activities that took place in the south patio and in the plaza below.

Additional evidence of feasting can be found in the lower level of Complex E, just to the south of Structure E1. Residents of Complex E excavated a presumably circular pit into the Chacahua-phase occupational surface in the patio to the south of the building that was used as an earth oven (PTRV16-Op A-F35). The oven, estimated to measure approximately 1.2 m in diameter, was lined with river cobbles. Like the earth oven on the Rio Viejo acropolis, sherds were used as heating elements in F35 during its use along with stones that exhibited evidence of fire cracking. A smaller hearth (PTRV16-Op A-F36) that lacked evidence of secondary heating elements like sherds or stones was found just to the southwest of F35, cutting into the same occupational surface. It is unclear whether both cooking features were used at the same time, though it is possible that F35 was "built" as construction and occupation increased at Complex E. It is possible that F35 was analogous to several "cut and burn" features present on the Rio Viejo acropolis that were used in concert with the massive earth oven near Structure 2 (Brzezinski and Joyce 2013).

Object Caching and Ceremonial Offerings

Material traces of caching practices dating to the Late Formative are relatively meager compared to the assemblage of cemetery burials from the same period. Only scant evidence of object caching was recorded at Cerro de la Cruz, though three small deposits of objects made from locally available materials were found (Joyce 1991a). One cache contained six basalt axes and a basalt adze, and another was composed of a broken coarse brown ware jar filled with ash or lime, two ground stone *manos*, a hammer stone, and 12 pieces of granite stone. By the Terminal Formative, local communities continued to be constituted through the ritual use of public spaces that were shared among residents. Archaeological evidence from Rio Viejo and outlying sites tells us that many of the ritual practices of the Late Formative continued into the Terminal Formative and, in some cases, were scaled up in terms of scope and intensity.

The most prevalent types of object deposited in caches during the Terminal Formative were locally made ceramic vessels, although variation in the types and quality of vessels was present among Terminal Formative sites. At Yugue, the first evidence of ritual caching comes from Miniyua phase deposits of offering vessels placed in the construction fill adjacent to the Miniyua-phase cemetery on Substructure 1. In these contexts, Barber (2005) found a cache of ten coarse and fine brown ware jars and cylinders, all of which were topped by fine brown ware bowls. By the Chacahua phase, larger offerings with more diverse materials were placed within public buildings at the site. For example, at Substructure 2, two discrete offerings were found with variable contents. The first included a large cooking jar filled with estuarine mussel shell that was topped with a gray ware bowl. The bowl was elaborately carved and depicted a ritual specialist wearing the mask and regalia of the rain deity. Within the same deposit was a sherd from an imported vessel from the Valley of Oaxaca, 16 ceramic earspools, and a ceramic figurine of a bird. A second smaller offering contained four small conical bowls and a rectangular “box” vessel with a flat ceramic lid.

The most profound ceramic offering at Yugue was a collection of 135 low-fired, poor quality coarse brown ware cylinders deposited into two general public areas during the Chacahua phase (Barber 2005). Fifty of the cylinders were interred across several layers of fill on Substructure 1, while an additional 85 placed within the fill of the base of the multi-use platform. Stratigraphic evidence indicates that both offerings appear to have been the result of several consecutive rituals rather than one or two larger events. Modest offerings of ceramic vessels dating to the Chacahua phase were also placed beneath some of the sandy floors in the northern area of Mound 3 at Loma Don Genaro (Joyce et al. 2015). These included an offering of one gray ware globular jar and two gray ware conical bowls (Op A-F90), one miniature gray ware jar (Op A-F89), two gray ware conical bowls (Op A-F26), and an offering of six poorly made coarse brown ware cylinders (Op A-F87). Among these caches, perhaps the one that stands out the most is F87, the vessels of which are nearly identical in shape and quality as the poorly made cylinders interred across several fill layers on Substructure 1 and in the base of the multi-use platform at Yugue. The miniature gray ware jar in F89 resembles miniature jars from Cerro de la Virgen and San Francisco de Arriba but did not contain elaborate incised decorations as found on those at the latter two sites. Scant evidence of offerings of non-ceramic objects were found at Loma Don Genaro. The lone example recovered from Terminal Formative contexts than a collection of three granite slabs (Op A-F88) buried beneath a thin sandy floor at the northern end of Mound 3. However, the discs resembled a similarly sized and shaped disc interred alongside Burial 5-Individual 8 at Cerro de la Cruz, which dates to the Miniyua phase.

Caching practices at sites in the piedmont tended to be more variable in contents and composition than those at sites in the floodplain, though it should be noted that the majority of caches in the floodplain are primarily from Yugue. At San Francisco de Arriba, only one cache dating to the

Miniyua phase was reported by Workinger (2002), which included a small coarse brown ware globular jar placed in the fill of Platform 1. By the Chacahua phase, caches were relatively ubiquitous at the site. Workinger reports two discrete offerings placed in the construction fill of an area of the acropolis that may have supported an elite residence. The first included five empty coarse brown ware cylinders, two of which were large and lacked lids while the other three were small with lids covering the vessel opening. Another offering composed of a lidded coarse brown ware cylinder and several nested coarse brown ware bowls was also found in the fill of the possible residential platform.

The most elaborate caches at San Francisco de Arriba were found within three construction episodes in the main plaza of the acropolis (Workinger 2002). The earliest offering was a relatively modest offering of five coarse brown ware cylinders, while a later offering contained 32 similar cylinders and an unidentified animal bone. Several smaller, unusually shaped and decorated vessels were found in another offering, including a rectangular "box" vessel surrounded by four conical bowls, a nubbin-footed cylindrical vessel, and a vessel with anthropomorphic appliques. The most elaborate offering at the site contained nine small gray ware jars, some of which were incised, and a diverse array of non-ceramic items that included animal bone, 356 jadeite beads and pendants, 27 rock crystal beads and pendants, 109 additional stone beads, and several thin fragments of hematite and/or pyrite.

Though some of the same types of objects were found within Terminal Formative-period offerings at Cerro de la Virgen, the organizational patterns and associated materials of many of the deposits demonstrate that ritual practices carried out at the site were unique in the valley. During Barber's (2005) fieldwork at Residence 1, excavations uncovered four modest caches of ceramic vessels that were deposited in the fill of the residence. The earliest of the residential offerings consisted of two coarse brown ware conical bowls placed within the fill of the earliest version of Residence 1. Another three discrete offerings of coarse brown ware cylinders were placed in the fill of the last version of the building, two of which were covered with lids and placed in the corners of the building.

As with the San Francisco de Arriba offerings, the more elaborate deposits of cached objects at Cerro de la Virgen were found within public buildings. Excavations in Complex A indicate inhabitants of the site engaged in extensive ritual activities in the ceremonial center, including the placement of dense caches of ceramic vessels and food preparation for communal feasting (see above). Archaeological evidence indicates that ceramic vessels were deposited as discrete offerings associated with the dedication and termination of public buildings, as well as within spatially larger contexts that were placed over extended periods of time (Joyce and Barber 2015a; Brzezinski et al. 2017; Chapter 8, this dissertation). These activities began by the early Chacahua phase and appear to have intensified throughout the end of the Formative.

The horizontal clearing in the north patio of Complex A in 2013 revealed an enormous cache (PRV13-OpA-F18-s1) of at least 260 complete offering vessels that covered an area of approximately 62 m^2. Vessels in the cache came in several forms, including slender cylindrical vessels, short-necked and neckless jars, incurving wall bowls, and several eccentric forms (see Appendix A). The cache was emplaced beneath a flat, built surface consisting of hard-packed, unconsolidated sandy sediment and was covered by softly packed sandy loam. The majority of the assemblage consisted of non-diagnostic coarse brown ware vessels. Diagnostic vessels included seven fine brown ware vessels of various forms dating to the Miniyua phase, five grayware bowls dating to the Chacahua phase, two incurving wall grayware bowls dating to a transitional period between the Miniyua and Chacahua phases, and one grayware bowl possibly dating to the transitional period between the Chacahua phase and the Early Classic Coyuche phase.

Accompanying the vessels were hundreds of thin granite slabs (PRV13-OpA-F18-s2) that either naturally exfoliated from or were chiseled out of local bedrock outcrops. Most of the slabs were stacked vertically in groups of anywhere from two to more than a dozen slabs. In several areas, the stone slabs were positioned around ceramic vessels in triangular or rectangular “compartments” that likely protected the vessels from taphonomic processes like bioturbation, or perhaps distinguished the offerings of certain groups (e.g., families) among the broader corporate body. One example of a stone compartment lacking an offering vessel was recorded, which may indicate offering vessels were removed and/or replaced at various times or that the compartments were constructed in anticipation of future offerings. Another possible scenario may have involved the filling of perishable, organic offerings of food or liquid in this compartment. An additional example of a stone "compartment" made specifically for offerings of ceramic vessels was found in Structure 5 overlooking the ballcourt on the western edge of Complex B. In this area, small lines of stone run east-west and articulate with the eastern retaining wall of Structure 5 (PTRV16-OpF-F18). The low stone "walls" surround an offering of a single coarse brown ware vessel (F43).

Another extremely dense offering of 81 ceramic vessels (PTRV16-OpA-F25-s1) was found deposited into a layer of construction fill associated with the first major expansion of Terrace 15 in Complex B. An excavation at the southern end of the middle level of the multi-tiered complex (Terrace 15c) exposed a 4 m^2 area of the offering, which contained by far the most vessels per unit of area (20.3 vessels/m^2). In comparison, the next largest ratio of vessels to area was PRV13-OpA-F18 in the northern patio of Complex A, which registered 4.2 vessels/m^2. Like the Complex A offering, PTRV16-OpA-F25 was placed over an extended period. While several granite stones were recovered from the offering that may have acted as markers or sides of compartments, it lacked the discrete groupings of thin stone slabs found in other offerings at the site; however, it is possible that the relatively small area exposed in the offering simply missed any stone slabs that may have been present in the rest of the offering. Sitting on the upper surface of the fill into which the offerings were deposited was a large granite monolith that contained shallow circular depressions on its ventral surface that may have been used for grinding or as a receptacle for liquid offerings (e.g., blood, water, etc.) associated with the offering vessels. Similar stones have been found at Rio Viejo, though these examples likely date to the Early Postclassic Period

(Joyce et al. 2001). Based on the relatively shallow depth of the depressions, it is doubtful that it was used for consistently grinding maize.

Further up the hill to the east at the top of the monumental stairway was Terrace 10, an area more restricted than the north patio of Complex A, which supported a rectangular platform (Structure 1) and a small patio. Prior to the initial construction of Terrace 10, inhabitants of Cerro de la Virgen placed an unusual offering (PRV13-OpD-F24) directly on bedrock under the center point of the building (Brzezinski et al. 2017). The cache, the contents of which were purposefully broken prior to its placement and likely bundled with cloth, consisted of a nearly complete carved stone mask of a rain deity, fragments of a second smaller, carved stone mask, two miniature stone thrones, and a carved figurine depicting what may be a deceased person, possibly an ancestor (Brzezinski et al. 2017; also see Chapter 4). The nearly complete mask was fashioned from non-local siltstone (Raymond Mueller 2013, personal communication) and exhibits several iconographic markers common to rain deities from the Gulf Coast, the highlands of Oaxaca, and the Maya area (Covarrubias 1946, 1957; Masson 2001; Sellen 2002; Taube 1996, 2000; Urcid 2009). The miniature thrones, which I link stylistically to iconography from the Soconusco and the highlands of Guatemala, suggest people at Cerro de la Virgen had access to vital trade routes, perhaps even independently from leaders at Rio Viejo (Guernsey Kappelman 2000; Kaplan 1995; Parsons 1986). At present, it is not yet clear whether the mask and the other objects in the cache were carved locally or imported in finished form. Evidence from drill holes on the smaller mask suggest that, at minimum, secondary modifications may have been carried out on these items. Surrounding the stone artifacts were several miniature ceramic vessels.

Objects with anthropomorphic characteristics may have been more closely associated with dedication rituals at Cerro de la Virgen. In addition to the D-F24 cache below Structure 1, which included masks and a small figurine with anthropomorphic characteristics, an effigy vessel of a human foot (PTRV16-Op G-F9) was found at the base of one of the earliest fill episodes explored in the plaza of the ceremonial center. Like D-F24, the vessel was probably purposefully smashed prior to its placement immediately preceding the fill layer, though no evidence of a bundle was found with G-F9. As both offerings involved smashed anthropomorphic objects, it is likely that this type of object was implicated in the most powerful rituals of dedication (see Chapter 8).

Smaller, more diffuse collections of cached vessels and other objects were found in other public spaces at Cerro de la Virgen, including the plaza of the ceremonial center, all architectural areas of Complex B, the southern patio of Complex A, the small patio to the west of Structure 1, and Complex E. In each of these settings, ceramic vessels were placed alongside small collections of thin stone slabs that were likely offerings in and of themselves, rather than simply markers or components of protective compartments. Currently, no pattern has emerged in the number of slabs or the average size of the slabs that would be linked to a deeper ritual meaning. Further, the brittle nature of the grano-diorite stone that makes up a sizeable proportion of the stone slabs precludes discerning an exact count or broader patterning in the stone sub-features.

The multiple patterns and frequency of thin stone slabs used in Terminal Formative offerings at Cerro de la Virgen form a unique set of caching practices among Terminal Formative sites in the region. Similar thin slabs of stone were occasionally used in the construction of stone drains, such as those at Complex A and the Rio Viejo acropolis (Brzezinski and Joyce 2013), placed in vertical concentrations in the uppermost Chacahua-phase levels in the north area of the acropolis (PRV12-Op F; Hill and Villanueva Ruiz 2012:424), and in slab-lined burials like those found at Charco Redondo and Cerro de la Cruz. In addition, the granite slab patio at Cerro de la Cruz contained many thin stone slabs, including vertical groupings below an upper layer of horizontally placed slabs. However, thin stone slabs were found in completely different archaeological contexts at Cerro de la Virgen. In addition to the ceramic vessel caches described above, several collections of stone slabs that lacked associated goods like ceramic vessels or ground/carved stone objects were also found buried beneath layers of Chacahua-phase fill in the plaza. Excavations carried out in 2013 (see Chapter 5) exposed three separate collections of stone slabs (PRV13-OpG-F9, -F10, and -F11) that may have constituted a separate class of cached offering (beyond the vessel compartments and associated "loaves of slabs" described above) that was unique to the region. The smallest of the three features (F10) in the plaza contained at least 24 slabs and the largest (F9) contained over 50, each oriented vertically in stacks that probably slumped to the side over time. The third feature, F11, was unique among the three in that it was bounded by additional thin slabs, forming a type of barrier or receptacle[6]. It is possible that at Cerro de la Virgen, stone slabs constituted a class of collective resource that belonged to the community, or to which the entire community had regular access. To be sure, there was no shortage of grano-diorite outcrops scattered throughout the hillside, so it is also possible that individual families or house groups removed and shaped thin stone slabs as needed. While the plaza in the ceremonial center may have simply been a convenient storage locale for stone slabs, the stratigraphic positioning of features F9, F10, and F11--buried within a layer of fill beneath an occupational surface--suggests that their placement retained a degree of permanence.

ECONOMIC PRODUCTION AND EXCHANGE

The comparison of production and exchange practices among Terminal Formative communities provides an additional line of economic evidence with which we may evaluate the degree of political integration in the Terminal Formative Rio Viejo polity. For years, Mesoamerican archaeologists have presented compelling evidence that craft production like the manufacture of stone tools, ceramic vessels and figurines, lapidary goods and bodily ornaments (Feinman and Nicholas 2000), textiles and associated tools (Hendon 2006; Meehan 2018), and certain specialty foods and beverages (e.g., *pulque*; Charlton et al. 1993), was carried out largely at the household level. Instances of craft production and

[6] The boundary slabs also resemble the margins of slab-lined burials at Charco Redondo and Cerro de la Cruz that date to the Miniyua phase.

exchange in public spaces have been documented in ancient Mesoamerica (e.g., Elson and Sherman 2007; Hirth 2009; Inomata 2001), but examples are rare in coastal Oaxaca. In the lower Rio Verde Valley, evidence for specialized production (e.g., concentrations of tools, waste products from production, etc.) is exceedingly rare.

The best evidence for craft production immediately following the Formative period comes from Structure 99A2 at San Francisco de Arriba, which may have been associated with a series of residences organized around central patios (Workinger 2002:146-147). Excavations of the structure and the surrounding area revealed a dense concentration of obsidian artifacts within a refuse pit (99A-F14) that Workinger (2002:129-133) interprets to be redeposited debris that originally formed from obsidian tool manufacturing and extensive use, presumably from a location close to the structure on Ridgeline 2. A low incidence of debris with manufacturing errors like hinge fractures and plunging terminations indicates that the person or persons responsible for the deposit are/were skilled in blade production, or that perhaps the remaining debris was deposited elsewhere. Workinger (2002:135) argues that the high frequency of blades with use wear suggests that there was also a nearby "industrial" consumption site, where obsidian tools were perhaps used for the production of perishable items made of wood, bone, gourds, basketry, leather, or feathers. The debris feature dates to the Coyuche phase and was stratigraphically one of the earliest deposits in the sequence of Structure 99A2. Though this does not necessarily mean that the feature dates to the earliest part of the Coyuche phase, if it does the it may be coeval with some of the late Chacahua- or early Coyuche-phase contexts in the ceremonial center and Complex E at Cerro de la Virgen. No primary features indicative of obsidian tool manufacturing or industrial use on the scale described by Workinger were found at Cerro de la Virgen, though evidence from obsidian tools recovered from the site suggests that people were obtaining obsidian in the form of prepared prismatic cores that were fashioned into prismatic blades and other tools on site (see Appendix B). The extensive formal and technical analyses conducted by David Williams (2012) on obsidian artifacts from a variety of sites in the lower Verde further indicate that blade production was carried out on the local level during the Terminal Formative period.

In addition to a likely scenario in which obsidian blades were produced locally at Cerro de la Virgen, intensive production of cut and shaped stone blocks used in terrace retaining walls and other masonry architecture was carried out in a public building at Cerro de la Virgen. Excavations inside and adjacent to Structure 4 in Complex B revealed that the area was used as a stone masonry workshop well into the Terminal Formative Period. Some of the earliest Terminal Formative fill layers that raised the eastern part of the terrace were comprised primarily of grano-diorite rubble with sharp edges and flat faces, suggesting the fill was the result of lithic reduction resulting in the production of stone blocks. Other evidence of intensive masonry production includes an assemblage of ground stone tools associated with the earthen floor inside the building and the occupational surface in the interior patio. The stone cutter's "toolkit" included three hammerstones and two chisels used for hard hammer and indirect percussion, respectively. A small ground stone edge sharpener was also recovered that was probably used to maintain edges on the chisels and ground stone axes, the latter of which were also found in abundance throughout the complex. The hammerstones and chisels exhibited a significant amount of use wear. Several large, ovoid-shaped stones with evidence of grinding on one side were also found. Though it is possible that these large objects could have been used to grind foods such as maize or chiles, the presence of several traditionally shaped, two-handed manos were also found associated with the building, making the former objects likely to have been used to grind down and smooth the rough exterior of the stone blocks once they were in finished form. Experimental studies likely have the ability to confirm or refute the role of these tools.

Centralized control over the distribution of raw materials and craft goods in Formative Mesoamerica has often been cited as an indication of regional political authority (e.g., Marcus and Flannery 1996:199–200; Redmond 1983:130). At present, there is no evidence for the presence of markets in the lower Verde during the Terminal Formative, suggesting that goods were distributed via a command economy managed by polity leaders, or were procured *ad hoc* by local communities. For this project, ceramic and obsidian resources were chosen as variables through which the scale of economic control in the Terminal Formative lower Verde could be modeled. The use of compositional analysis of ceramic pastes with INAA to identify exchange and interaction spheres in Pre-Columbian Oaxaca has been instrumental in examining economic and political relationships within and between several regions (Balkansky 2002; Joyce et al. 2006; Redmond 1983; Shepard 1967; Workinger 2013). For example, several studies of sherds and clay sources dating to the later Formative period (400 BC – 250 CE) demonstrated that ceramics were among the trade goods circulating between several areas of Oaxaca at that time (Joyce et al. 2006; Redmond and Harbottle 1983; Workinger 2002). Recent analysis of Mixteca-Puebla polychromes from Tututepec demonstrates the local production of these wares and their distribution through a market at the Mixtec imperial capital (Levine et al. 2016).

For this project, 85 ceramic samples were analyzed at the University of Missouri Research Reactor (MURR) using INAA, including 25 gray ware serving bowls and 30 ceramic figurines of various paste types from Cerro de la Virgen, and 30 ceramic figurines of various paste types from the Rio Viejo acropolis (see Appendix C). All specimens were recovered from primary deposits such as middens, offerings, and cooking features. The chemical composition of the ceramic artifacts was compared to all specimens within the MURR database, including previously analyzed samples from Rio Viejo, San Francisco de Arriba and Tututepec in the lower Verde (Joyce et al. 2006; Williams 2012; Workinger 2002), as well as specimens from the Manialtepec Basin submitted by (Barber and Pierce 2019).

Four compositional groups were identified among the analyzed artifacts. The first two clusters of artifacts, Groups 1 (n=5) and 2 (n=3), consisted solely of figurines recovered from Rio Viejo and Cerro de la Virgen, respectively. Though Groups 1 and 2 were few in number, their specimens suggest that at least some figurines were made, used and ultimately discarded on the local level. Alternatively, the membership of Group 3 (n=49), the largest group in the sample, indicates that some ceramic artifacts may have been made and exchanged with greater frequency at Rio Viejo. Almost one-third of artifacts in Group 3 were recovered from the Mound 1 acropolis, and the remaining two-thirds were found at Cerro de la Virgen. The chemical composition of the Group 3 ceramics, most of which were figurines, was notably similar to previously analyzed samples from Rio Viejo (Joyce et al. 2006) and likely represented a paste recipe that was unique to potters at Rio Viejo. In contrast, specimens assigned to Group 4 (n=17) consisted almost entirely of gray ware serving bowl sherds from Cerro de la Virgen and exhibited chemical compositions that were distinct for the region.

A cluster analysis of artifacts from Rio Viejo, San Francisco de Arriba, and Cerro de la Virgen (see Appendix C, fig. C.9), indicates independent production locales for ceramics, as well as markedly different paste recipes. It is not a surprise that pottery from Rio Viejo exhibited chemical signatures starkly different than those of sites like San Francisco de Arriba and Cerro de la Virgen, given the geological differences in sediments between the piedmont and the floodplain. However, paste recipes were remarkably consistent within--and substantially different between--samples from the piedmont sites, which were located on similar geological formations. While it is possible that figurine production at Rio Viejo may have been more intense than at other sites, perhaps carried out by attached specialists or certain corporate groups, additional samples of figurines must be sourced to evaluate this hypothesis. To date, however, no archaeological features dating to the Terminal Formative period on the acropolis indicate specialized production. Figurines may have also been exchanged during large-scale feasts at the acropolis. Given that the largest amount of chemical variation within the groups described above was associated with Group 3, it is also possible that people from neighboring floodplain communities around Rio Viejo, with similar but slightly different pottery recipes, brought certain figurines to Mound 1 to be exchanged or to be used in ceremonies and discarded. It is difficult to know the particular extent of involvement of leaders at Rio Viejo in the exchange of figurines. However, if leaders sponsored feasts and drew people away from their communities to engage in communal labor projects, it is feasible that the prevalence of figurine exchange may have been a social incentive that drew people there.

In addition to ceramic sourcing, obsidian sourcing using INAA and XRF has also proven to be effective in modeling economic interregional exchange because chemical characterization can identify source locations of artifacts anywhere in Mesoamerica with 99 to 100 percent accuracy (Cobean et al. 1991; Glascock et al. 1994). As detailed in Chapter 3, I would also argue that the comparison of sources between sites *within* a region tells us a great deal about the scale at which resources were obtained and exchanged. No sources of obsidian have been found within the state of Oaxaca, making XRF ideal to examine access to trade routes among communities in the lower Verde. For example, Workinger (2013) has demonstrated that comparisons of Late Formative obsidian sourcing data from various regions of Oaxaca show similarities between the lower Rio Verde and the southern Isthmus of Tehuantepec, indicating obsidian was traded south across the isthmus from Gulf coastal sources. Joyce and colleagues (1995) also demonstrated that most of the obsidian imported to the lower Verde from the Middle Formative to Late Classic periods (800 BCE - CE 900) came from the Basin of Mexico and Michoacan.

Williams's (2012; also see Joyce et al. 1995) diachronic study of obsidian sources indicates that prior to the Late Formative period, obsidian was acquired by residents of the lower Verde through two distinct trade networks--one that brought obsidian from Gulf Coast sources through the Isthmus of Tehuantepec or the Cuicatlán Cañada and a second from central Mexican sources through the Basin of Mexico. Beginning in the Late Formative, several new trends in obsidian acquisition began to manifest. First, the amount of obsidian obtained from Gulf Coast sources like Orizaba, Zaragoza, or Guadelupe Victoria dropped precipitously. Basin of Mexico sources like Paredon account for the bulk of the assemblage from the three sites from which Minizundo-phase obsidian has been sourced, including Cerro de la Cruz (n=10), Rio Viejo (n=7), and San Francisco de Arriba (n=28). Among these artifacts, 35 (77.8 %) came from Basin of Mexico sources, while nine (20%) came from Gulf Coast sources and one came from west Mexico. Further, the Minizundo phase is the first instance in which green-colored Pachuca obsidian appears in the archaeological record of the lower Verde.

Geochemical studies on obsidian recovered from Terminal Formative deposits reveal the broadest profile of sources from which lower Verde populations obtained obsidian (Joyce et al. 1995; Workinger 2002; also see Appendix B). Five sources were identified in Joyce and colleagues (1995) Miniyua phase sample from Rio Viejo (n=8), which included Otumba (n=2, 25%), Paredón (n=2, 25%), Ucareo (n=2, 25%), Guadelupe Victoria (n=1, 12.5%), and Orizaba (n=1, 12.5%). Joyce et al. (1995:9) argue that the variety of Miniyua-phase sources may have been caused by a disruption in interregional interaction between the coast and the Valley of Oaxaca, likely onset by increased conflict in the highlands. Williams (2012:116) argues that the lack of a single source in the Miniyua-phase assemblage likely reflects a scenario in which populations in the lower Verde alternated between obsidian sources as needed to meet local demands that were complicated by disruptions in trade routes to the northwest.

The late Terminal Formative Chacahua phase witnessed a similarly variable source profile for obsidian among lower Verde communities, though roughly the same suite of sources were utilized by different communities. Sourcing data from San Francisco de Arriba (Workinger 2002:424-427) indicate that no less than five sources were represented in the site's obsidian assemblage, including Paredón (n=12, 44.4%), Ucareo (n=3, 11.1%) Otumba (n=7, 25.9%), Guadalupe Victoria (n=3, 11.1%), and Pachuca (n=2, 7.4%). It should be noted, however, that much of Workinger's Terminal Formative obsidian assemblage was recovered from fill contexts, so these data should be regarded as tentative. I also limited the sample to contexts designated by Workinger as dating to the Miniyua phase, Chacahua phase, or more broadly, the "Terminal Formative." No contexts with dates that were mixed were included. Williams (2012:604-608) also submitted a sample of obsidian from late Terminal Formative contexts at Cerro de la Virgen and Yugue that were excavated by Barber. This study revealed a source profile for the two sites that included Guadalupe Victoria, Otumba, Pachuca, Ucareo, and Zaragoza (Williams 2012:90).

A total of 40 samples of obsidian from primary late Terminal Formative deposits at Cerro de la Virgen were submitted to MURR for XRF analysis in 2018. Five sources were identified, including Paredon (n=25, 62.5%), Ucareo (n=9, 22.5%), Otumba (n=3, 7.5%), Zaragoza (n=2, 5.0%), and Guadelupe Victoria (n=1, 2.5%). Pachuca is also represented with high frequency in the late Terminal Formative, comprising 39.1% of the total obsidian assemblage recovered from deposits dating to the Chacahua phase (see Appendix B) though these artifacts were simply identified by color rather than via XRF. This sampling method allowed for a larger sample of non-green obsidian artifacts to be analyzed. When the Pachuca obsidian artifacts are included in the late Terminal Formative sample, the following source profile is observed: Pachuca - 39.1%, Paredon - 38.1%, Ucareo - 13.7%, Otumba - 4.6%, Zaragoza - 3.0%, and Guadalupe Victoria - 1.5%.

Overall, there is remarkable consistency in the obsidian sources utilized by people at Cerro de la Virgen, San Francisco de Arriba, and Yugue during the late Terminal Formative. There are two possible political-economic scenarios that may account for the lack of parity. First, it is possible that the flow of obsidian into the lower Verde may have been controlled by leaders at Rio Viejo, who then distributed these materials to communities across the valley. This scenario would explain the consistency in specific source and overall number of sources from site to site. A second scenario would involve a level of autonomy in long-distance trade in which outlying communities acquired obsidian independently. Given the multiple trade routes that would have intersected in coastal Oaxaca, including those along the Pacific coast (Pye and Gutierrez Mendoza 2007) and connected to highland Oaxaca (White and Barber 2012), it is conceivable that outlying communities simply acquired obsidian as it was available, switching from source to source over time. This "opportunistic" mode of acquisition would not only explain the consistency in sources, but it would also explain why so many obsidian artifacts at Cerro de la Virgen had evidence of expedient tool maintenance and retouching. An additional complicating factor may be the issue of variable sample sizes from securely dated Chacahua phase contexts at lower Verde sites. Further sourcing studies from multiple sites in the lower Verde must be completed in the future to elaborate on these hypotheses.

DISCUSSION

The creation, operation, and reproduction of political authority in ancient Mesoamerica involved the negotiation of an array of contradictions between people of various social identities and levels of status. For much of the past 50 years, anthropologists have largely seen the hierarchical nature of centralized polities as a means of integration wherein elites regulate society for the good of the broader whole (Fried 1967; Gailey and Patterson 1987; Service 1975; Yoffee 2005). Though some scholars (e.g., Haas 1982) suggest that authority can be both coercive and integrative, focusing on the strategies that leaders must adopt to simultaneously reinforce social inequality and unanimity obscures the important role played by “subjects” in the constitution of hierarchical relationships. To varying degrees, rulers and followers influence one another, each reacting reflexively to strategies employed by the other (Ashmore et al. 2004; Blanton and Fargher 2008; Fargher et al. 2010; Joyce et al. 2001, 2016; Lohse 2007; Yaeger 2003; Yaeger and Robin 2004).

In some instances, negotiations between different collectivities of people, leaders among them, resulted in shared identities that were critical for the exercise of political authority. These negotiations extended well beyond the strategies that rulers employed to ameliorate contradictions in status and wealth in the Marxist sense. For example, Yaeger (2003) argues that in the Classic-period Maya polity of Xunantunich, Belize, the creation of a communal identity was reinforced in political and religious ceremonies and was not a “top-down process”. Rather, communal practices of the hinterland helped define membership in the broader community. In the Valley of Oaxaca, archaeological evidence suggests that rulers of the later Formative Monte Alban polity, at least for a period of time, were able to bridge contradictions between shared forms of political control and more traditional forms of leadership (Joyce 2010; Joyce and Barber 2015a).

Unlike Classic-period Xunantunich and later Formative Monte Alban, a sense of regional identity and political authority never permeated outlying communities in the lower Rio Verde Valley at the end of the Formative period (Joyce and Barber 2015a; Joyce et al. 2016). Research at Cerro de la Virgen and several other outlying sites in the lower Rio Verde hinterland has demonstrated that practices directly associated with public buildings were critical to the unfolding negotiations over regional political authority. Archaeological evidence from Cerro de la Virgen suggests that practices of religious, political, and economic affiliation did not extend much beyond local communities. Further, while there was a regionally shared set of practices and ideas involving the construction and use of public buildings, there were explicit differentiations between communities regarding the types of materials and practices through which local identities were constituted.

Though the scale of monumental construction at Rio Viejo was quite grand during the late Terminal Formative, there is only limited evidence to indicate that incipient polity leaders were able to continue drawing people to the acropolis after its construction (Joyce and Barber 2015; Joyce et al. 2016). Evidence on the acropolis of large-scale feasts in the form of an enormous earth oven, ancillary cooking pits, and large, stratified feasting middens with fancy serving wares show that some practices that were historically associated with local affiliations and community identities were "scaled up" at the regional level. Large-scale feasts were also carried out in public spaces at Cerro de la Virgen, exemplified by the presence of large earth ovens and other cooking features scattered throughout the ceremonial center of the site, as well as Complex E. It is therefore possible that elites at Cerro de la Virgen, and perhaps other secondary centers in the Rio Viejo hinterland, were at least partially able to draw people from smaller villages in their immediate vicinity. However, given Barber's (2005) calculations for the construction of Residence 1 at Cerro de la Virgen, it is unlikely that labor drawn from beyond the community was necessary for constructing the architecture of the ceremonial center.

Outside of communal labor and ritual feasting, polity leaders at Rio Viejo appear to have had minimal success in associating other social institutions to a regional framework of political authority. Polity leaders may have been unable to distinguish themselves from followers by failing to create sources of goods or specialized knowledge at Rio Viejo not available in the valley's hinterland (Joyce and Barber 2016). While leaders' lack of political, economic, and religious innovations certainly played a part, the relative autonomy of people at outlying sites reflects a powerful degree of agency through which strong community identities were maintained from the bottom-up (Joyce and Barber 2015; Joyce et al. 2016).

As noted by Joyce and colleagues (2016:77-79), the best evidence for autonomy comes from idiosyncrasies in ceremonial offerings placed in the fill of public buildings. Data from object caches at Cerro de la Virgen, Yugue, San Francisco de Arriba, Loma Don Genaro, Barra Quebrada, and Rio Viejo reflect stark differences not only in the types of materials and objects that were placed in offerings, but also in the ways that they were spatially positioned. For example, some of the most extraordinary caches of the late Terminal Formative contained valuable imported items, but the contents of these "exotic" caches varied tremendously. The cache of crystal and greenstone beads, pendants, miniature jars, and fragments of hematite, pyrite and animal bone found at San Francisco de Arriba were collectively exotic. The cache of broken stone masks, miniature thrones, a figurine, and miniature vessels found below Structure 1 at Cerro de la Virgen were also quite valuable, containing locally crafted and possibly imported objects as well. Both offerings contained stone items that were likely worn as part of a larger costume during their use life, as well as miniature ceramic vessels. However, the spatial, stratigraphic, and depositional contexts of the two caches were quite different. The San Francisco de Arriba cache was deposited in a layer of construction fill in Structure 99F3 (Workinger 2002), whereas the Cerro de la Virgen cache was deposited directly on bedrock, likely as a dedicatory offering prior to the construction of Terrace 10 and its associated architecture. Further, while both caches contained miniature vessels, comparison of the two assemblages indicates that they were quite different. The San Francisco de Arriba cache contained finely made miniature gray ware jars, some of which had elaborate plastic decorations on the exterior. In contrast, the miniature vessels associated with the Cerro de la Virgen cache were exclusively coarse and fine brown wares that lacked decoration.

Another general pattern among ceremonial caches is the placement of coarse brown ware vessels, typically in the form of cylinders and less frequently globular jars, within public buildings. Caches with multiple coarse brown ware vessels have been recorded in excavations at Cerro de la Virgen, Yugue, and San Francisco de Arriba.[7] Despite the frequent use of coarse brown ware jars in offerings, considerable variation among caches in which they are prevalent can be identified. For example, the coarse brown ware cylinders found in the dense caches in Complexes A, B, and E at Cerro de la Virgen appear to be nearly identical to cylindrical vessels from many of the San Francisco de Arriba caches, in both size and form. However, the Cerro de la Virgen vessels in nearly every offering were deposited within compartments of thin grano-diorite slabs or were placed in direct association with groups of slabs that may have acted as markers or perhaps offerings themselves. The use of stone slabs at Cerro de la Virgen is unique for the lower Rio Verde Valley, and may be unique among Formative period sites in all of Mesoamerica.

At other Terminal Formative sites like Yugue and Loma Don Genaro, coarse brown ware jars dominated the assemblages of ceremonial caches but were of inferior quality compared to those from Cerro de la Virgen and San Francisco de Arriba. At Yugue, the two largest caches associated with the

[7] Hundreds of coarse brown ware cylinders and globular jars are also housed at the Municipal Museum in the town of Tututepec. It is likely that at least some of these vessels came from the archaeological site of Tututepec, which had a significant Chacahua phase occupation. However, the lack of provenience of these specimens precludes any broader geographic or chronological associations.

site’s mixed-use platform and its associated architecture were crudely made--fired at much lower temperatures--and appear to be “amateur copies” of the better-crafted vessels from the piedmont sites. It should be noted, however, that the offerings at Loma Don Genaro were probably from a residence and were much smaller than those found on the multi-use platform at Yugue (Joyce et al. 2015). Finally, despite extensive excavations over nearly a dozen field seasons, an extensive cache of ceramic vessels has yet to be recovered from a Terminal Formative-period context at the Rio Viejo acropolis. The lack of ceramic vessels at the acropolis that were ubiquitous in offerings at other sites in the region suggests that certain ritual practices were strictly local in scope.

The burial of human remains in public buildings pervades almost all sites with significant Terminal Formative occupations. The relative scarcity of human remains at Cerro de la Virgen--four burials recovered over the course of three years of extensive excavations in public and domestic settings--suggests that mortuary ceremonialism, based on current evidence, was practiced somewhat differently than at sites like Yugue and Charco Redondo that had cemeteries with dozens of individuals. It is possible that, contrary to rituals involving cemetery burial that had significant time depth at other sites in the region, mortuary ceremonialism at Cerro de la Virgen was constituted in a different way, perhaps organized on the household level. However, if this were the case, we should expect to see at least some evidence of human burials in Barber’s excavations at Residence 1, particularly if burials involved markers of status. Additional households at the site, particularly lower-status residences outside of the ceremonial center, must be excavated to explore this question. If there was evidence of human remains at lower status households at the site, then it would be possible that the community’s prominent family at Residence 1 may have employed a corporate political strategy in which their family’s dead became possessions of the larger community, interred in a public space not yet investigated. It is also possible that residents of Cerro de la Virgen may have had a different worldview about the types of mortuary practices that were necessary to confer the dead. Archaeological evidence from Terrace 10 suggests that some human remains were converted into valuable heirlooms that may have been repurposed and used in unique ways. Prior to terminating the use of a possible wattle and daub superstructure on the terrace surface, residents excavated a shallow pit into the occupational surface of the building and deposited an offering of twelve small ceramic vessels and a human long bone (PRV13-Op D-F21). The long bone (F21-ob13) was balanced on top of an overturned miniature jar. The presence of a disarticulated long bone in an offering with other objects may indicate that an individual's human remains could be separated, and that the animate power retained by the remains could be transferred in multiple situations and/or locations (see Chapter 8 for elaboration on this concept).

We must also consider that we have not *yet* found a Terminal Formative cemetery at Cerro de la Virgen. Based on reconnaissance and mapping of the ceremonial center at Cerro de la Virgen, I estimate that the excavation projects carried out in 2003, 2013, and 2016 have collectively covered less than 15% of the total area of the ceremonial center, making it entirely possible that future excavations may still discover evidence of a Terminal Formative cemetery. In particular, future excavations should target the masonry architecture of Complexes C and D, both of which have yet to be excavated, for evidence of mortuary ceremonialism. No evidence of cremation has been found at Cerro de la Virgen or San Francisco de Arriba, though I would not completely exclude it as a possibility. A larger sample of ceramic vessels interred as offerings must be analyzed for residues to ensure that some vessels were not used as containers for cremated remains.[8]

Ceremonial practices that have significant representation at Rio Viejo--communal feasting and collective labor--allows for further exploration of the negotiations of political authority across the lower Verde. As a communal practice, feasting has tremendous time depth in the lower Rio Verde Valley, and during the Terminal Formative, all communities likely participated in ceremonial feasts in one form or

[8] Three Late Classic burials from the Rio Viejo acropolis were deposited into massive coarse brown ware ceramic vessels; however, this burial pattern has not been observed anywhere else in the lower Verde.

another (Barber 2005; Joyce 1991; Hepp 2015). Stratigraphic evidence from feasting middens at Yugue indicate multiple, consecutive events that occurred over a relatively short period, given the preservation of ceramics at the top of each stratified layer of midden refuse. However, Barber (2005) does not make an estimate of how many people may have attended. These feasts likely engaged the local community and perhaps people at small neighboring sites. The scale of feasting practices at Rio Viejo that took place on the acropolis appear to have been scaled up significantly during the Terminal Formative, likely in an effort to draw in people from multiple communities throughout the region. Large-scale feasts occurring regularly over time at the acropolis are indicated by an enormous earth oven, ancillary cooking pits, and several large, stratified midden deposits with high frequencies of serving vessels. Sherds of serving vessels deposited into middens on the acropolis exhibit a wide range of carved iconographic motifs, suggesting that people from multiple communities may have brought their serving vessels with them for feasts on the acropolis (Brzezinski 2011). The acropolis may have also been a location where certain types of ceramic figurines were distributed, though additional studies on sourcing ceramic figurines and production locales must also be done.

The prevalence and scale of cooking features at Cerro de la Virgen suggests that the site's elites likely drew in people from smaller communities located in their immediate vicinity for collective ceremonies. The accessible public plaza at the base of the ceremonial center presumably supported large gatherings of people who may have participated in ballgame-related rituals and feasts. Ceremonial caching that involved the general public likely took place in the more accessible public buildings such as Complexes A and B and the Plaza. The largest and perhaps most accessible cooking feature was the earth oven in the patio of Complex C (PRV13-Op E-F2). Though it is approximately half the size of the large earth oven at the Rio Viejo acropolis, the earth oven in Complex C would have certainly been able to support large-scale ceremonial gatherings. The presence of a smaller, but nonetheless substantial, earth oven in Complex E may shed light on the extent to which the community of Cerro de la Virgen was integrated. Like the Late Formative centers in the Mixtec highlands, which did not have a single focal public space like the Main Plaza at Monte Alban (Balkansky 1998; Balkansky et al. 2004; Joyce 2010; Pérez Rodríguez et al. 2011), Cerro de la Virgen appears to have had multiple public areas surrounded by clusters of residences that may have constituted some form of corporate-group organization consisting of families of different status levels. It is possible that the family living at Residence 1 was a foundational presence in the constitution of the community and was perhaps responsible for overseeing the ritual, political, and economic activities that took place in the ceremonial center. However, based on evidence from Complex E, it is clear that the ceremonial center associated with Terrace 2 was not the only focal point for public activities. Indeed, it may even be appropriate to cease calling the architectural complexes associated with Terrace 2 the "ceremonial center" of the site, given the evidence for highly charged ritual practices at Complex E, although the plaza gives Terrace 2 a potential for scale in terms of participants that Complex E does not have.

A massive amount of labor was mobilized as a resource at the regional level to construct the Rio Viejo acropolis, but significant labor was also mobilized by hinterland communities to build many monumental structures and spaces constructed during the Terminal Formative, including the ceremonial center at Cerro de la Virgen, the acropolis at San Francisco de Arriba, and the multi-use platform at Yugue. Variation in building orientations among sites also appears to indicate that there was no overarching, polity-wide standard for the types of landmarks, astronomical bodies, or other reference points to which any given community must orient its buildings.

CONCLUSION

Collectively, the evidence for large-scale feasting in the form of earth ovens, monumental construction on par with other moderately sized sites in the region, unusual architectural elements (e.g., the ballcourt), and impressive ceremonial caches interspersed with cooking features in accessible public buildings suggests that elites at Cerro de la Virgen may have been competing with leaders at Rio Viejo, and perhaps other communities, for followers. Archaeological evidence from Structure 1 at Cerro de la Virgen also exhibits evidence that at least some of the site's elites sponsored restricted ritual practices out of sight of the general populace, suggesting that people may have been drawn to the ceremonial center to participate in ceremonies that involved specialized religious knowledge.

The collapse of the Rio Viejo polity at around 250 CE led to a period of political fragmentation in the Early Classic Period, during which significant changes in regional settlement and sociopolitical organization took place (Butler 2018; Joyce 2008:234-240; Joyce et al. 2016:80-82). As the Mound 1 acropolis was abandoned and the site of Rio Viejo decreased in size from 200 hectares to 75 hectares, Cerro de la Virgen increased slightly in size from 60 hectares to 86 hectares (Joyce and Levine 2009). Excavations of the ceremonial center revealed little evidence of occupation during the Early Classic Coyuche phase, suggesting that the focal point of the community's ritual practices may have shifted to another location at this time. It is possible that Complex E became a focal point of rituals for at least some of the sites corporate groups, as indicated by a more substantial Coyuche phase component in that area. It may also further illustrate the political fragmentation that was occurring near the end of the Formative, perhaps spurred by the loss of trust in leaders by followers in the lower Verde.

Unlike Cerro de la Virgen and San Francisco de Arriba, many sites with monumental architecture in the valley significantly declined in size or were abandoned entirely. Evidence from the Rio Viejo acropolis suggests that people may have formally dismantled or "closed" this public space at the end of the Formative. Excavations within the ceremonial building supported by Structure 2 revealed burned floors and adobe blocks (Joyce 2006; Joyce et al. 2016). Another perishable superstructure on the south side of the acropolis was also burned prior to its destruction (Arellano Gonzalez 2012; Rivas 2012). Though violence has not been ruled out as a possible cause for the burning and eventual collapse of Rio Viejo, recent research has shown that the acropolis may have been ritually terminated over a period of time following the burning events (Joyce et al. 2016:80). Several thin deposits of broken ceramics covered the acropolis that Joyce and colleagues argue resembles the results of termination ceremonies in other areas of ancient Mesoamerica (Stanton et al. 2008; Mock 1998). Stones were also removed from masonry buildings and retaining walls, which were never repaired or rebuilt. One example of a deposit of broken sherds at Cerro de la Virgen was found in Complex B-Structure 5, but its stratigraphic position beneath a wall suggests that its placement was not related to the termination and abandonment of the area, nor the site in general. Nonetheless, we do see evidence of termination ceremonies associated with the building closure of Structure 1.

The construction and use of the acropolis during the late Terminal Formative created contradictions and tensions between the newer, more hierarchical and regional forms of political authority and identity centered at the Rio Viejo acropolis and the long-standing local and communal forms of authority and identity centered on public buildings in the lower Verde hinterland (Joyce et al. 2013, 2016). Research at Cerro de la Virgen allows us to explore the religious, political, and economic practices that helped constitute community identities at the margins of the Rio Viejo hinterland. A range of ritual and economic practices were carried out in Cerro de la Virgen's ceremonial center, exemplified nowhere better than at Complex B, where limited mortuary ceremonialism, ceramic vessel caching, the production of masonry stones, feasting, and ballcourt-related activities intersected. Data collected from outside the ceremonial center at Complex E suggest political authority within the community may have been spread between several corporate groups, perhaps families of varying statuses. Labor resources were also probably controlled on the local community level, though research at the Rio Viejo acropolis shows that polity leaders had some success in mobilizing labor for monumental construction. The scale of the Terrace 2 plaza complex and Residence 1 suggests local leaders at Cerro de la Virgen could command a labor force, but on a more modest scale. Economic resources in the form of craft production appear to have been organized at the household level, as there is very little evidence of attached specialists at any site in the lower Verde, including Cerro de la Virgen (cf. stone masonry production at

Complex B). Evidence for the exchange of valuable goods, both locally made and procured through long-distance trade, suggests that the distribution of some types of objects like figurines may have been facilitated by polity leaders at Rio Viejo, likely by way of sponsoring large-scale feasts that brought together people from other communities in the valley. However, feasting that took place away from the Rio Viejo acropolis led to stronger local political affiliations and a lesser degree of regional integration overall (Joyce and Barber 2015a; Joyce et al. 2016).

Comparisons in ritual caching practices between Cerro de la Virgen and other Terminal Formative sites in the lower Verde indicate idiosyncrasies from site to site, suggesting that strong ties to local communities via religious practices may have constrained the development of regional political authority (also see Joyce and Barber 2015a; Joyce et al. 2016). First, the ubiquity of ceramic vessel offerings at the site speaks to the foundational role these ceremonies held for the community. Between the 2013 and 2016 projects, every architectural complex examined archaeologically yielded offerings of ceramic vessels, summing to a total sample of 509 complete or partial vessels. Another caching pattern observed over the two seasons was the association of thin stone slabs with vessel offerings. Despite the slight variation among architectural complexes in relation to the use of stone slabs in offerings, this pattern of ritual caching is starkly different than those found at other sites in the region, including Rio Viejo. In addition, the intimate comingling of cooking features and ceremonial caches at Cerro de la Virgen suggests a tighter association between the two types of ritual practices that is not seen at the Rio Viejo acropolis, where feasting middens and cooking features were spatially segregated (Joyce and Barber 2013). The lack of ceremonial feasting middens in public areas at Cerro de la Virgen suggests that people may not have disposed of their fancy serving wares in a specific place, or that we simply have not located these contexts yet. In comparison, the Mound 1 acropolis at Río Viejo and the multi-use platform at Yugüe exhibit several examples of middens in which people likely broke their serving wares (typically made from gray paste), presumably at the end of large-scale feasts (Barber 2005; Joyce and Barber 2011).

Unlike the Valley of Oaxaca, where there is evidence of both communal and exclusionary political strategies, current research indicates that rulership in the lower Verde was likely vested in multiple corporate groups during the Terminal Formative (Joyce 2010:160-196). Based on the data from the 2013 and 2016 field seasons, I argue for more corporate characteristics of status and authority on the local level at Cerro de la Virgen as well. Heterogeneity and specialization in productive/ritual practices witnessed at the various complexes suggests intra-site integration within the community. There was also a continuum of visibility in ritual practices from restricted to highly accessible, which suggests slight differences in status distinctions among the people that viewed and carried them out. The most restricted public space at the site pertains to Structure 1, which overlooked Terrace 2 at the top of a monumental stairway. Ritual practices carried out in this area, including the placement of the bundled "mask cache" and other offerings of ceramic vessels, would have been intimate in scope and likely witnessed by a select few such as ritual specialists and select others. Ritual practices carried out in Complex A would have been more accessible to people congregating in the ceremonial center, as would mortuary practices and vessel caching carried out in Complex B, the plaza, and the ballcourt. Overall, the suite of communal practices revealed during excavations at Cerro de la Virgen further supports the hypothesis that the Terminal Formative polity in the lower Rio Verde Valley was tenuously integrated, which likely made it inherently vulnerable to collapse at the end of the Formative.

VIII. THE MATERIALITY OF POLITICAL ORGANIZATION IN THE LOWER RIO VERDE VALLEY

INTRODUCTION

In Chapter 7, I addressed the scope and nature of political authority in the Terminal Formative Rio Viejo polity through an exhaustive comparison of collective practices associated with public buildings at multiple sites in the lower Rio Verde Valley, including Cerro de la Virgen, Rio Viejo, and several others. Among the most relevant questions posed were: (1) 'At what level were religious, political, and economic resources controlled in the lower Verde?' and, (2) 'Did hinterland communities like Cerro de la Virgen retain autonomy over the types of collective practices that constituted community identity, or were they dictated or guided by ruling institutions emanating from Rio Viejo?' The detailed and multi-faceted dataset accumulated during the 2013 season of the Rio Verde Project and the 2016 season of the Rio Verde Hinterland Project at Cerro de la Virgen allows us to examine political authority as it manifests in rural communities. Following arguments made by other coastal Oaxacan scholars (Barber 2013; Barber and Joyce 2007; Joyce and Barber 2015a; Joyce et al. 2016), I argued that regional authority and identity never permeated the social institutions through which hinterland communities were constituted, and that the regional "polity" was loosely integrated, fragile, and short-lived.

In this chapter, I employ an explanatory paradigm rooted in theories of practice, power, materiality, and ontology to examine the integration of the Rio Viejo polity, particularly in terms of the social mechanisms that could have facilitated or constrained regional political authority. Given the lack of evidence for environmental calamity (Goman et al. 2010; Mueller et al. 2013) or conquest by a foreign power (Workinger 2013; but see Joyce 2003 on possible interactions with Teotihuacan), it is probable that the political upheaval witnessed at the end of the Formative arose from internal conditions. The regional data show that for the lower Rio Verde Valley, the interplay of religion and politics among the region's outlying communities constrained the types of societal developments that could have facilitated regional political authority (Joyce and Barber 2015a; Joyce et al. 2016). As Joyce and Barber (2015a) have argued, the unique entanglements of human bodies, ceremonial offerings, ancestors, and deities within public buildings afforded the creation of multicommunity identities and local institutions of political authority. This chapter expands on that work, particularly the interpretation that religion could alternatively enable or constrain regional political authority, an avenue of research that has only begun to be explored in Pre-Columbian archaeology.

THEORY AND THE INTERSECTION OF POLITICS AND RELIGION

Archaeological scholarship on ancient Mesoamerican religion followed similar paths as those regarding political organization that were described in detail in Chapter 2. Early treatises assumed a direct chain of continuity between contemporary indigenous groups and their Pre-Columbian ancestors and relied on ethnographic and ethnohistoric data to construct broad syntheses of past worldviews (e.g., Vaillant 1941). These works tended to assume that religion was uniform among the various social classes and primarily focused on theocratic rulers and their decrees (e.g., Willey 1956). By the 1960s, the processualists' emphasis on economy and ecology tended to neglect religion as a causal factor in social change, although there were a number of exceptions like Robert Drennan's (1976) model of complexity in which religious rituals facilitated administrative decision-making. New approaches emerged soon after as archaeologists embraced Marxist theory and the postprocessual critique, including a renewed focus on religion and ritual as a form of elite ideology meant to legitimize political authority and the interests of the nobility (Ashmore 1991; Cowgill 1997).

A shift in interest toward smaller scales of religious practice took distinct shape beginning in the 1990s, as archaeologists noted differences in the domestic ritual practices of non-elites compared to the "Great Tradition" of religion among the nobility (Gonlin and Lohse 2007; Plunket 2002; also see Janusek 2009). A growing number of scholars have gone a step further by arguing that the religious practices of people in other positions of power (e.g., commoners, leaders of small communities, intermediate elites) could dramatically affect the trajectory of complex societies (Barber and Joyce 2007; Hutson et al. 2018; Joyce et al. 2001; Yaeger 2003). The proliferation of top-down, leader-focused syntheses of ancient Mesoamerican religion stems from the accessibility of religious idioms displayed in monumental art and architecture and the decipherment of Pre-Columbian texts, both of which were the purview of the elite (Freidel and Schele 1988; Houston 1993; Martin and Grube 2008). Large-scale, potent ceremonies sponsored by leaders and conducted by high-status ritual specialists certainly generated political-economic obligations on the part of followers and increased the political influence of leaders (Clark and Blake 1994). However, much research has shown that people at all levels of power could access the divine through rituals that could vary from community to community (Barber 2013; Blackmore 2011; Robin 2002; Hutson et al. 2018). Recognition of the range of religious worldviews and practices within complex societies has resulted in a more nuanced view of the intersection of politics and religion as a locus for negotiation and possibly conflict (Carballo 2018; R. Joyce 2018; Pauketat and Alt 2003). However, as Arthur Joyce (2018:5) has noted, few studies have explored the “fault lines” along which political authority was negotiated through religious means.

One of the main reasons why the role of religion in ancient Mesoamerican politics has been neglected is due to the misconception that beliefs are less accessible than actions in the archaeological record. Archaeologists have tended to separate religious belief and ritual practices into distinct analytical categories (see discussion in Fogelin 2007)--a trend influenced by modern Western conceptions of the world that tend to purify the blurred line between lived experience and disembodied ideas (Hodder 2012; A. Joyce 2018; Keane 2005; Olsen 2010). Such Cartesian perspectives can be seen in the works of scholars like Lewis Binford (1962, 1983) who, despite recognizing religion as fundamental to his “ideotechnic” sub-system of culture, tended to discard these aspects of society as secondary or epiphenomenal to social change. Several challenges to the Western constructs imposed on Native

American religion, particularly as it is interpreted in the archaeological record, have highlighted the notion that religion was lived, experienced, and practiced in unique historical and cultural settings (Fowles 2013; Pauketat 2013; Swenson 2010). Despite these critiques, minimal attention has been given to the Native American ontology that humans and other-than-human entities were animated by the same life-giving, sacred force that has often been referenced in the anthropological literature as the "soul" (Bray 2009; Furst 1995; Joyce and Barber 2015a; Viveiros de Castro 2004; Zedeño 2009).

An extensive ethnographic record in Mesoamerica documents the relationships between humans, divinities and other animate and inanimate things, but Mesoamericanists have not fully considered the 'reciprocal' relationships between humans and other-than-human entities (Brzezinski et al. 2017; A. Joyce 2000; Joyce and Barber 2015a; Zedeño 2008, 2009; also see Brown and Emery 2008). Scholars of material culture have increasingly turned attention back to 'things' by reacting against the Western-Cartesian notion that objects only have agency through the inscription of meaning and power in them by humans (Hodder 2012; Latour 2005; Olsen 2010; Pauketat 2013; Zedeño 2009). In relational ontologies such as those of Pre-Columbian Mesoamerica, objects had the potential to possess a life force that endowed them with the ability to engage with other animate beings, to animate other entities and to manifest powerful deities or ancestors (Freidel et al. 1993; Furst 1995; Joyce and Barber 2015a; López Austin 1988; Mock 1998). Humans and their other-than-human counterparts (e.g. sacred buildings, ancestors, deities, etc.) were inextricably bundled together to form networks of relationships, or "entanglements", that played crucial roles in the formation, maintenance and transformation of complex societies (A. Joyce 2018; Joyce and Barber 2015a). By terms such as "entanglement", "network", "assemblage" and "bundle", I reference the relations between people and things that actively enabled or constrained social life (Hodder 2012; Joyce and Barber 2015a; Olsen 2010; Pauketat 2013; Fowles 2013). Rather than being mere placeholders for meaning, things co-produce society through their entanglements with people. In ancient Mesoamerica, complex societies were afforded a degree of stability through the use of--or “work” done by--many things linked to religion, such as public plazas and buildings, burials, offerings, musical instruments, costumes and ritual regalia, and blood letters (Barber and Olvera Sánchez 2012; Brzezinski et al. 2017; Inomata 2006; Joyce 2009; Joyce and Barber 2015a; Love 1999).

Teasing apart the complex entanglements of people, beliefs, and things in ancient Mesoamerica involved in the negotiation of political authority is best approached through an ontological framework. Ontology refers to a theory of reality or being, as well as the ways in which people define and categorize the phenomena that they witness around them (Alberti 2016; Descola 2013; Viveiros de Castro 2004). An ontological perspective is slightly more nuanced and inclusive than one focusing strictly on religion because it incorporates the types of ideas that inform how humans and other-than-human things and entities may act in the world (Fowles 2013). The ontologies of Pre-Columbian Mesoamericans were both animistic in nature and relational in scope. In contrast with a “naturalist” ontological perspective, defined by Descola (2013:56; also see Vivieras de Castro 2004) as incorporating a strict dichotomy between human and non-human categories, an animist ontology is predicated on the web of social relationships between humans and non-human things like plants, animals, deities, objects, and ancestors such that boundaries between categories are blurred by the idea that many types of things can be imbued with animate properties. They were also relational in that the agency and animacy attendant to social life was the outcome of networks of relations between people and things that are contingent, always in the process of becoming, and able to be transferred to other beings (Barad 2007; Hodder 2012; Olsen 2010; cf. Fowles 2013).

Entanglements of people and things can sometimes lead to innovations such as new political formations or social institutions because things have spatial and temporal properties that make them unpredictable and unstable. Such was the case in the development of the Main Plaza at Monte Alban during the Late Formative, where negotiations between new forms of hierarchical authority and traditional forms of communal leadership inhibited rulers from dominating religious and political life (A. Joyce 2000, 2010; Joyce and Barber 2015a; Urcid 2011; Urcid and Joyce 2014). In certain cases, people and things become so tightly tied together that the possibilities of social change are limited unless these relations experience a drastic unraveling (Hodder 2012:103-104). Things have a limited ability to produce themselves as humans want them, so things become dependent on humans, who then become entrapped in their dependence on the things they produce (Hodder 2012). Rather than assuming religion to be a set of institutions that inherently functions to stabilize political hierarchies, I follow other coastal Oaxacan scholars (A. Joyce 2000, 2010; Joyce and Barber 2015; Barber et al. 2014) who have proposed a more nuanced view in which religion was not necessarily a unifying force, but rather a fundamental component of complex negotiations over the reach and nature of political authority. At the end of this chapter, I discuss how the physical entrapment of ceremonial objects, deities, and the bodies of the dead, at Cerro de la Virgen and other hinterland communities facilitated local affiliations and constrained the development of a centralized authority vested in the leaders of Rio Viejo.

THE ONTOLOGY OF PUBLIC BUILDINGS, BURIALS, OFFERINGS, AND FEASTS

Critical to understanding political trajectories in complex societies is the consideration of meaningful places, including the natural landscape and monumental architecture, as arenas of ritual performance (Emerson et al. 2008; Emerson and Pauketat 2007; Inomata and Coben 2006; R. Joyce 2009; Joyce and Goman 2012; Pauketat 2013; Zedeno and Bowser 2009). As described in Chapters 2 and 7, public buildings were at the center of commensalism that forged community identities in the lower Rio Verde Valley since at least the Late Formative Period (Barber 2013; A. Joyce 2010; Joyce and Barber 2015a; Joyce et al. 1998, 2016). As the locus for collective practices like feasting, ceremonial caching, and cemetery burial, public buildings and spaces defined local corporate groups that varied in size from multiple households to entire communities (Joyce and Barber 2015a). The comparative archaeological evidence presented in Chapter 7 and elsewhere in the coastal Oaxacan literature (e.g., Barber 2013;

Barber et al. 2014; Joyce 2010:181-186; Joyce et al. 2016) suggest that political authority was not centralized, but rather diffuse--distributed among local communities who retained a level of political autonomy and relatively distinct corporate identities (Barber et al. 2014; Joyce and Barber 2015a:821). By the Terminal Formative period, communities across the valley--large and small--invested a significant amount of time, labor, and materials in both the construction and use of public buildings. It is only through a thorough examination of the ontology of the things, people, and ideas that converged on public buildings that we can fully consider *why* these spaces were so important to the constitution of local communities.

In relational ontologies such as those of indigenous Native Americans, many other-than-human entities were regarded as beings that possessed an animate life force, or "soul" (Furst 1995; Vivieras de Castro 2004). Some distinctive objects or assemblages had the ability to enhance human agency or transform the capabilities of other associated objects or places: a concept defined by Zedeño (2009: 411–13) as an "index object". Many such animate entities went through life cycles highlighted by meaningful events such as birth and death (Stross 1998). People often marked particularly important events with ritual acts, which gives archaeologists insight into the animate properties of things such as buildings and the objects interred within them. Modern ethnographies of indigenous Native American communities demonstrate that birth and death ceremonies are often performed in households as ritual acts of "ensoulment" and "termination", respectively (Brown and Emery 2008; Greenberg 1981; Stross 1998). The act of "feeding" or providing sustenance to maintain a building's animacy has also been documented ethnographically (Stross 1998). Though I focus mainly on human bodies, ceramic vessels, and other valuable objects in this discussion, it should be noted that many other types of objects and materials were implicated in the "feeding" of buildings or natural landscapes. For example, in the modern K'iche' Maya towns of Lake Atitlan, Guatemala, Allen Christenson (2008) notes the presence of food-related offerings of maize and animal meats that were left at sacred locations (e.g., crevasses in caves). The sixteenth century ethnohistoric records of Diego Durán (Durán 1971 [1581]:368, 463) describe the Aztec practice of nourishing the irrigation waters of the *chinampas* with blue maize in the form of kernels and flour and the shrines of the hunting deity, *Camaxtli*, with offerings of *xocotamalli* (sour bread) and purple maize porridge. These examples, and some of those presented in this chapter, illustrate the reciprocal relationship between indigenous groups of Mesoamerica and places in the natural and built world that were constituted through practices of "feeding" (Staller 2009:60).

Joyce and Barber (2015a) have recently argued that during the later Formative in the lower Verde, public buildings were considered animate beings and members of the community that went through life cycles like humans. At Cerro de la Virgen, public buildings are replete with evidence for ritual practices involving the ensoulment, nourishment, and termination of public buildings. The best evidence for successive rituals involving the life cycle of a building comes from Structure 1. Early in the Terminal Formative period, residents of Cerro de la Virgen placed offering D-F24--consisting of two masks, two miniature thrones, an ancestor figurine, and nine miniature ceramic vessels--directly on bedrock in the center of Terrace 10 and immediately covered it with a layer of sandy construction fill that formed the terrace surface (Brzezinski et al. 2017). The offering is consistent in context with other animating offerings in Mesoamerica--both ancient and modern (see papers in Mock 1998). After the offering and overlying construction fill were placed, a wattle-and-daub superstructure was built in the eastern end of Terrace 10. The superstructure was eventually terminated with an offering of ceramic vessels and a human long bone placed in a pit excavated into the fill overlying the "mask cache". Later in the Terminal Formative, residents built a platform mound with stone foundation walls (Structure 1-sub 2) oriented with the "mask cache" at its center point, which was then expanded (Structure 1-sub 1). Each construction phase of Structure 1 included a dedication offering of ceramic vessels placed in the fill, followed by a termination deposit of vessels marking the substructure's closure. The closure of the entire terrace might be represented by an offering ceramic vessels placed near the end of the Chacahua phase in the small patio to the west of Structure 1.

The more accessible public architectural complexes in the ceremonial center below Terrace 10 exhibited substantial evidence of caching indicative of the ritualized “feeding” of buildings. In Complex A, a massive offering of 260 ceramic vessels in the patio to the north of Structure 2 was the result of several consecutive ceremonial events. Another offering of 81 ceramic vessels exposed in a 4 m^2 area at the southern end of Complex E contains a similarly dense concentration of ceramic vessels as well as evidence that they were placed over an extended period. The superposition of some vessels atop others indicates that the offerings were placed over an extended period. The offerings of Complexes A and E are among the most extraordinary collections of cached objects found in the lower Rio Verde and more than likely represent continuous, ongoing ceremonies intended to “feed” or “sustain” the architectural complexes and their associated deities and ancestors.

The formal ceramic analysis presented in Appendix A allows us to elaborate on the ontological considerations that determine the use of vessels in the settings recorded at Cerro de la Virgen. Over the course of two field seasons, our team recovered 509 ceramic vessels that were completely or partially intact, a sample that is unmatched by any other assemblage of its type in the region. The most dominant types of vessels found in offerings were cylinders and globular jars, both of which are forms that rarely appear in household assemblages associated with cooking or storage. A small number of eccentric vessels were also found, including square-walled vessels, quatrefoil (quincunx) vessels, and an anthropomorphic effigy vessel. Overall, the ceramic assemblages produced through dedication (ensoulment), continuous/sustaining (feeding), and termination (closure) practices did not vary in a statistically significant manner, although dedication and termination assemblages did appear to be slightly more congruent in terms of the form, size, and shape of vessels. Rather, it was likely the other, non-ceramic materials that distinguished some offerings from others. Dedication offerings were represented by smaller, more spatially constrained deposits of ceramic vessels that were typically placed at the beginning of a building's construction. In termination offerings, ceramic vessels were typically accompanied by disarticulated building materials from the building that was ritually "closed", such as burned daub, ash, animal bone, and charcoal. Finally, continuous offerings were the most densely packed with ceramic vessels and tended to have stone slabs placed in various patterns within the offering (see below). Measurements of vessel diameter, height, and thickness indicate that vessels included in offerings had a relatively standardized size and shape, but there was slightly more variation in the diameter of globular jars compared to cylinders (see Appendix A). There were a wide range of sizes among cylinders, but general proportions of the vessels' form were generally standardized.

Many vessels in the assemblage were topped with lids, which suggests that the contents contained within them needed to be protected. Variability in the diameter of globular jar openings and in the overall size of cylinders also suggests that the contents of the vessels probably varied to a certain degree. However, preliminary examinations of the interior of the offering vessel assemblage have not yet clarified whether the vessels contained anything at all. For example, during the laboratory season following the 2013 excavation project, a sample of 15 vessels recovered from Structure 1 and Complex A were selected for further examination, which included the removal of sediment to examine the interior contents. No objects were found inside the vessels, and flotations of the interior sediment did not contain traces of carbonized seeds or any other evidence of macrobotanical remains. Broken lids were discovered inside of some vessels resting on their base, suggesting that these vessels may have been empty or perhaps filled with liquid or even blood. In 2017, a sample of five vessels were selected from Complexes B and E and subjected to microbotanical extractions for the purposes of identifying starch grains and phytoliths (see Appendix D). The results of the microbotanical analyses yielded negligible traces of botanical remains.

The current lack of evidence for interior contents in the offering vessels leads us to two possible explanations or scenarios. First, the vessels may have contained material(s) that we cannot detect through macrobotanical or microbotanical tests, the traces of which may include organic compounds like lipids (i.e. animal fats, waxes, resins, etc.) and proteins or an inorganic compound that would require chemical residue analyses to identify. Archaeometric analysis of residues using Fourier Transform Infrared Spectroscopy (FTIR) or Raman Spectroscopy could add additional rigor in identifying possible contents. If organic, the contents of the vessels may also be too degraded to identify compounds with certainty. A second, simpler explanation may be that the vessels did not contain anything, which would have interesting implications regarding their place in the relational ontologies surrounding public buildings at outlying sites. It is possible that the vessels were constructed to contain "spiritual contents" that we cannot detect.

The large offerings in Complexes A, B, and E also exhibit a spatial pattern in which dozens of vessels were enclosed by thin, vertically oriented slabs of granite mined from local bedrock. In Chapter 7, I demonstrated that the inclusion of stone slabs in the Complex A and E offerings, as well as in several smaller, less densely packed offerings located in Complex B, exhibited a spatial pattern that was entirely unique for the region. Here, I argue that the motivation for including thin stone slabs in offerings was not merely a stylistic choice meant to differentiate them from other ceremonial caches in the region. While there is some evidence that some slabs were used to "protect" the ceramic vessels that they surrounded, explanations based solely on function fall short, as there appears to be no structural advantage to the inclusion of stone slabs against taphonomic processes like erosion or rodent burrowing.

Rather, I argue that the placement of thin stone slabs has an ontological reasoning related to the animate properties of the surrounding piedmont landscape, particularly the hill on which the site was built. Natural hills, mountains, and volcanoes were often thought to be places of sustenance by Pre-

Columbian Mesoamericans. In Oaxaca, ethnographic and ethnohistoric accounts of indigenous Zapotec, Mixtec, and Mixe communities of the highlands (Lipp 1991; Monaghan 1995; Parsons 1932) and Zapotec and Huave groups of the Isthmus of Tehuantepec (De la Cruz 2007; Signorini 1997), indicate that mountains were home to deities responsible for unleashing the power of the skies in the form of wind, rain, and lightning. In other areas of ancient Mexico, mountains and volcanoes were thought to contain subterranean waters that played an essential role in agricultural fertility (Albores and Broda 1997; Plunket and Urunuela 2008). Architecture and natural landforms were often imbued with the same sacred, vital force that animated humans, ancestors, deities, and all other living things (Harrison-Buck 2012).

Properties of stone such as color, texture, or place of origin had the potential to make visceral the cosmovision perceived and enacted in ceremonial landscapes (Ashmore 2008). The hilly terrain of the lower Verde piedmont is dotted with grano-diorite outcrops that naturally exfoliate in thin sheets--a process that facilitated the manufacture of the hundreds and hundreds of slabs recovered during the 2013 and 2016 excavations. Though it is somewhat speculative, I propose that residents of Cerro de la Virgen identified the animate properties inherent to mountains of creation in this natural geologic process and that the placement of slabs as offerings was a strategy meant to transfer this vitality to public buildings. The presence of groups of slabs that did not appear to be protecting or marking any other object suggests that the slabs had their own animate properties. For example, a transect of test units placed in the plaza of the ceremonial center revealed several densely packed piles of stone slabs that lacked any other associated objects. Considered in the context of animate buildings and spaces, the placement of slabs in the plaza may represent a transference of power from the natural hill to a “morally charged” receptacle--the monumental space of the ceremonial center (Hendon 2000:42). It is also possible that the thin slabs were placed as markers that semiotically indexed sub-sets of ceramic vessels associated with certain corporate groups (e.g., families, household groups), but these two hypotheses need not be mutually exclusive.

In contrast to the extensive caching practices carried out at Cerro de la Virgen, there is thus far a relative lack of evidence for the types of communal mortuary ceremonialism seen at other later Formative sites. At Cerro de la Cruz, Charco Redondo, and Yugue, archaeological research has shown that the interment of human bodies in communal cemeteries spanned multiple generations and included individuals from multiple families or household groups (Barber et al. 2013; Joyce 1991a; Joyce et al. 1998). Examinations of the cemeteries show that bodies and grave goods were viewed during subsequent ceremonies, as indicated by frequent disturbances of earlier burials by later ones (Barber et al. 2013; Joyce et al. 1998). Given that we see the same type of pattern in the larger offerings of cached items at Cerro de la Virgen and other outlying sites, in which contents deposited earlier were later revisited and sometimes moved, it is likely that mortuary practices invoked similar meanings related to the transference of "souls" between different community members, including living residents, deceased ancestors, deities, public buildings and their associated contents (Joyce and Barber 2015a:824). While I cannot rule out the presence of a communal cemetery located in the ceremonial center of Cerro de la Virgen, current evidence suggests that mortuary ceremonialism may not have been a focal point of ceremonies that embodied and encapsulated the social ties constituting the community. Among the four collections of human remains recovered in 2013 and 2016 at Cerro de la Virgen, only one (B2-I2) exhibits characteristics of a primary burial. B2-I2 was deposited near the beginning of a fill episode--a pattern repeated in other caches and cemeteries in the region. The absence of primary burials in other buildings and in the elite domestic spaces of Residence 1 suggests that human remains were not a primary focus of ritual practices associated with the construction or use of neither public nor domestic spaces.

In rare cases, cached items were purposefully broken prior to, or during, their placement in offerings. In the plaza of the ceremonial center, a small offering that included an effigy vessel of a human foot was placed directly on bedrock immediately preceding an early construction episode. The vessel was smashed and arranged in a pile, but several pieces of the vessel body and rim were not among the recovered contents. In a separate example, the objects included in the “mask cache” offering beneath Structure 1 were broken and bundled together probably with cloth prior to their placement on bedrock (Brzezinski 2015; Brzezinski et al. 2017). The broken stone pieces were positioned in a circular pattern, with several large pieces located at the edges of the deposit. The ear adornments of the rain deity mask were found on opposite sides, not oriented in anatomical position, but facing each other. This distribution would be expected if the objects were broken, bundled with cloth, placed on bedrock, and covered with earth—the heavier pieces at the top of the bundle likely fell to the sides as the weight of the overlying sediment was placed on top. Excavations did not detect remains of cloth or twine in situ, a lack of preservation not unusual for the lower Río Verde Valley, but several refits were found on opposite sides of the deposit. The miniature vessels that accompanied the bundle were recovered intact, many still in an upright position, further indicating that the distribution of stone pieces did not result from post-depositional movement.

By placing the offerings atop bedrock immediately preceding a subsequent construction phase, people at Cerro de la Virgen transformed the objects into inalienable possessions of the community that ensouled the architecture within which they were placed (Barber et al. 2014). In addition to the unique objects placed at the base of the plaza and below Structure 1, offerings of ceramic vessels and stone slabs were also placed directly on bedrock in some contexts. For example, the dense offering of vessels in Complex E represented one of the earliest ceremonies that ensouled the earthen architecture of Terrace 15. Stratigraphic evidence indicates that this offering developed into one that “fed” the surrounding architecture, as some vessels were found sitting directly atop others, indicating the offering was placed over an extended period. The diversity of the types of offerings--or their contents--that could be placed on bedrock demonstrates that objects with more mundane qualities like coarse brown ware cylinders could also be index objects with animating properties.

The practice of breaking ritual objects prior to their placement also speaks to the nature of indigenous relational ontologies, namely that an animating vitality could be released through the breaking of certain objects (Freidel et al. 1998; Harrison-Buck et al. 2007; Stanton et al. 2008; Stross 1998; Zedeño 2008a). In ancient Mesoamerica, dedication and termination deposits regularly spanned multiple stratigraphic and spatial contexts within a single structure or even across an entire site (Pagliaro et al. 2003). Fragments of objects in multiple contexts also suggest that an object's life force could be dispersed to different destinations or divided and released to multiple entitities (Furst 1995). These ontological concepts may explain why some pieces of the foot effigy vessel and the carved stone masks in the Structure 1 offering were not included in their respective deposits. Given the anthropomorphic characteristics shared by the two offerings, it is also possible that objects depicting human-like characteristics were imbued with special abilities that could be animated through their ritual destruction--a pattern seen in other areas of Mesoamerica during the Formative Period (Grove and Gillespie 1984; May et al. 2018; Stanton et al. 2008:235).

In the context of materiality studies, a bundle is a set of otherwise distinct things (i.e. objects, substances, or qualities) that form nodes in larger networks where material and metaphorical associations articulate with one another (Pauketat 2013:27; also see Fowler 2013:237–238). By bringing things together, bundles combine affordant and animate properties in such a way as to mediate or articulate relationships between a variety of human and other-than-human entities (Keane 2005:187; Küchler 2002; Pauketat 2013:34). This metaphorical definition of 'bundle' may be contrasted with the specific ethnohistoric concept of 'sacred bundle', which is used frequently in the literature on Native American ontologies (Pauketat 2013). Extensive archaeological, epigraphic and iconographic evidence indicates that ancient Mesoamericans wrapped or bundled ritual objects to sacralize them through their concealment and subsequent unveiling. Through ritualized practices, sacred bundles had the ability to manifest divine forces or connect with different existential planes (Brzezinski et al. 2017; Hermann Lejarazu 2008; Joyce and Barber 2015a; Olivier 2007; Pauketat 2013).

HYBRIDITY AND THE INVOCATION OF THE SACRED COVENANT

The practices of collective interment of human bodies and other animate objects witnessed in the lower Rio Verde not only conferred animate properties to the buildings and spaces within which they were interred, but they also addressed fundamental principles of religious belief. Joyce and Barber (2015a) have argued that the later Formative communal rituals detailed in Chapter 7 were "forms of sacrifice through which people negotiated their relationships with divinities and other universal forces." These negotiations stem from a fundamental tenet of Pre-Columbian Mesoamerican belief, broadly identified as the "sacred covenant". The covenant holds that, in return for permission to practice agriculture, which causes the earth and rain/sky deities great pain, humans are required to sacrifice their bodies in death, whereby their life-giving force or soul is consumed by the deities (Hamann 2002; A. Joyce 2000; Monaghan 1990:562). Failing to provide sacrifices could result in the inability of deities to maintain the balance of the cosmos (López Austin 1988). The current world was therefore the result of a transactional relationship of debt and merit in which humans petitioned deities for agricultural fertility and prosperity in return for sacrificial offerings that maintained the cosmic order. Archaeological research in ancient Mesoamerica has tended to focus on blood sacrifices as fulfilment of the covenant, especially human and auto-sacrifice, but sacrificial practices also included other-than-human materials such ceramic vessels and sherds, copal incense, maize dough, jade, and quetzal feathers, to name a few (Freidel et al. 1993; Joyce and Barber 2015a; Joyce et al. 2016; López Luján 2005; Monaghan 1990). For example, during periods of drought in the Mixteca Alta, religious specialists presented offerings of copal incense, fine avian feathers and the blood of sacrificial victims to petition the rain deity, Dzahui, for climatic relief (Lind 2008; Sepúlveda y Herrera 1994:106).

Some of the most potent, ritually charged offerings to the deities involved the bundling of particular things whose specific combination resulted in a more powerful and profound entity (Pauketat 2013). As scholars of materiality have argued, people and objects often merge to form new ‘hybrid’ entities that had altogether different (and often more powerful) abilities than their constituent parts (Gell 1998; Latour 2005; Pauketat 2013; Zedeño 2008b). The “mask cache” in Structure 1 contained objects that invoked powerful religious and political meanings, including rain and celestial life-giving phenomena, political authority and divine ancestry (Brzezinski et al. 2017; also see Chapter 4). However, the contents of the cache were more than mere representations of religious and political concepts, they were imbued with animate, sacred properties as well. For example, masks such as those in the Structure 1 offering were essential animate objects of the *nahual,* a potent hybrid in Mesoamerican cosmology constituted by the transformation of human into animal or spirit (Gutierrez and Pye 2010; Miller and Taube 1993). *Nahualism* articulates with a wide range of ritual practices like healing and predicting the future and is closely connected with petitioning the divine for agricultural fertility (see papers in Albores and Broda 1997; Gutierrez and Pye 2010).

The rain deity mask was almost certainly worn by a ritual specialist at Cerro de la Virgen, given its physical characteristics that afforded a snug fit to the human face (Brzezinski et al. 2017:515). The resulting hybrid of costumed ritual specialist has often been referred to in the literature as a deity ‘impersonator’, a term that originated to classify phenomena that did not correspond to Cartesian dichotomies of human and divinity (Jansen 1986; Sellen 2011). Classic-period Zapotec urns and effigy vessels often depicted individuals ‘impersonating’ the rain deity Cociyo, holding in their hands maize plants at various stages of maturation and engaging in bloodletting as a sacrificial offering to ensure an abundant harvest (Sellen 2002, 2011). A similar iconographic program focused on the maize cycle has been identified on Chacahua-phase pottery from the lower Verde, which further emphasizes the importance of agricultural fertility in the worldview of the region's residents (Brzezinski 2011; Brzezinski et al. n.d.).

The variability in deity masks and costumes found on the effigy vessels of Cociyo, and the fact that the mask types are interchangeable, supports the view that they represented real-life ritual specialists in proper attire (Sellen 2002). However, categories such as 'impersonator' often fail to elucidate the complexity of Mesoamerican ontologies. Cociyo was definitely signified in Zapotec art, but as Brzezinski and colleagues (2017:523) argue, "the deity's paraphernalia, like the rain deity mask from Cerro de la Virgen, involved a more complex situation than simply the 'impersonation' of a divine figure. The mask was the physical manifestation of the deity." Houston and Stuart (1996:297–300) also use the term 'deity impersonator' to describe costuming in Classic Maya dance performance but add the caveat that this process did not involve supplanting the performer's identity for the deity's. Rather, it involved a 'concurrence' of identities in which the historical identity of the performer is made as clear as the deity into which he or she transforms (Houston 2006; Houston and Stuart 1996:297). The transformation into one's nahual allowed movement from one plane of existence to another, lending the ability to commune with the divine world by putting on an alternative 'face' (Monaghan 1995:99) or 'skin' (Galinier 1990:619) of a deity or ancestor. Sellen (2002:8) cites Durán's (1971 [1579]) account of a Mexica slave girl who was adorned with ornaments and ears of corn to assume the role of Chicomecoatl, a goddess of agriculture, as an example of how human and costume could combine to form an entity that merged with the deity. Another example involves Xipe Totec, the Aztec deity portrayed as a naked man enveloped by a covering of flayed human skin (Clendinnen 1991). While we are prone to find the deity in the individual beneath the external, dead covering, Monaghan (2000) has argued that what makes Xipe Totec a deity is the surface of enveloping skin. López Austin (1989:119) has also noted the ease with which the Nahuatl speakers used the word *ixiptlatl* with the names of deities to connote an individual who was a 'delegate' or 'representative' of the divine.

The masks from the Structure 1 cache were involved in the manifestation of a divine figure like Chicomecoatl and Xipe Totec. While it is difficult to clarify whether the more fragmented mask (D-F24-Ob5) invoked a particular deity, the iconography of the nearly complete mask identifies it as the material manifestation of the rain god. The inclusion of a chin rest, strapping holes and holes for the eyes, nose and mouth suggests that the mask was worn in rituals that allowed the wearer to engage with human and other-than-human audiences in a variety of ways such as dancing, singing and oration. Though we cannot reconstruct the broader 'costume' of a lower Verde ritual specialist, archaeological evidence from the Formative to the Postclassic in the region indicates that ritual performances involved a range of sensory engagements that included musical instruments and ornamentation (Hepp et al. 2014). For example, ceramic whistles, flutes and ocarinas were used in a variety of social settings during the Formative period, including public performances at Cerro de la Virgen (Hepp et al. 2014; Wedemeyer 2018). It is highly likely that, if religious specialists employed the mask in ritual performances at Cerro de la Virgen, other powerful objects would also have been incorporated.

In addition to the animate properties of the rain deity mask, the presence of miniature thrones in the offering references a more specific set of principles related to rulership, not only as an index of authority, but also as a physical stage for communication with the divine realm. In Pre-Columbian Mesoamerican art, thrones identified the individual who held a position of authority in a given scene (Inomata 2006; Martin and Grube 2008; Reents-Budet 1994:253–275). Thrones also highlighted the liminal places where rulers enacted royal prerogatives, spoke with the authority of the divine, and accepted offerings to be transferred over to the divine (Gillespie 1999; Kaplan 1995; Schele and Miller 1983). For the Olmec, thrones were homologous with ancestral altars, functioning as material symbols of high-status, kin-based corporate groups whose wealth and rank were associated with maintaining ties to ‘suprahuman’ ancestors (Gillespie 1999:235–243). Scenes carved in relief on Olmec table altars depicted human figures seated within a shallow niche, which David Grove (1987:430) has interpreted as a representation of the threshold separating the earth’s surface and the underworld. Miniature thrones were also surfaces on which effigies and masks were presented in ceremonies (Miller and Martin 2004). In a Late Classic carved panel from the site of Xupa in Chiapas, Mexico, a woman wearing the net collar and overskirt of the Maize God is depicted carrying a small platform or throne, perhaps presenting an offering to the deity (Miller and Martin 2004:105). The inclusion of miniature thrones in the Cerro de la Virgen offering was not only a metaphorical reference to political authority, but also references the setting in which bundled objects could become divine actors.

Bundling practices in Mesoamerica were also linked to the religious theme of ancestor veneration, exemplified in offering D-F24 by the inclusion of the ancestor figurine wrapped in a mortuary bundle. Mortuary bundles were not only containers for the remains of deceased ancestors, but also served as the physical ‘evidence’ for claims to elite status and authority (Guernsey and Reilly 2006:vii). Mixtec leaders consulted ancestral mortuary bundles prior to making an important decision and often attempted to capture and burn them in warfare to resolve competing claims to authority (Hermann Lejarazu 2008; Pohl 1994:71–82). Considered together as a sacred bundle, offering D-F24 collectively references agricultural fertility, rulership and ancestor veneration--a metaphorical invocation of the sacred covenant.

Extraordinary offerings like the “mask cache” allow for a tremendously detailed analysis of their meaning, but other comparatively “mundane” deposits can also be interpreted as an invocation of the sacred covenant. As a ritual practice, the burial of the dead was also sacrificial in nature in that it fulfilled a fundamental debt owed to the gods for the creation of the current world (Joyce and Barber 2015a). The interment of human bodies in public buildings would have also linked households and families from which the dead originated to a shared, communal space, thereby occupying a consequential node in the entanglements that integrated local communities. The inclusion of primary and secondary burials within layers of fill in public architectural complexes, coupled with the lack of evidence for burials in Residence 1, suggests that negotiations between the living and the dead were carried out through collective rituals. Further, the fact that human bones were occasionally disarticulated and included with offerings of other objects (e.g., offering D-F21 in Structure 1) follows other trends in ancient Mesoamerican ritual in which ancestors could be "partible" and "dividual" entities (Geller 2012:116). Additionally, the presence of at least one and as many as three burials in Complex B (75% of the total burial inventory; see Appendix E) suggests that mortuary ceremonialism may have been linked to ritually charged events that took place at the ballcourt, located adjacent to the complex to the west. Ceremonial landscapes such as the ballcourt and the adjacent public buildings acknowledge concepts of cosmovision through repeated ritual practices over time (Ashmore 2008). Given the powerful associations between the ballgame and ritual of sacrifice and cosmic renewal across Mesoamerica (Miller and Houston 1987; Scarborough and Wilcox 1993), it is conceivable that similar religious meanings were invoked at Cerro de la Virgen.

Alongside human bodies, analyzing the animate properties and relational qualities of ceramic vessels allows for further discussion of their ontological place as sacrificial offerings. Unlike the unique, anthropomorphic objects in the plaza and Structure 1 that were purposefully broken upon their placement, ceramic vessels were almost always found intact, in an upright position with the opening facing up, and frequently capped with a lid. Though some vessels were made from fine gray paste or had eccentric forms, the overwhelming majority of vessels were coarse brown ware cylinders and globular jars. Coarse brown wares were the predominant paste type for utilitarian cooking and storage vessels throughout the lower Verde ceramic sequence. This trend in choice of paste type entangles the public, communal ceremonies carried out in public buildings with craft production and other quotidian practices such as cooking of foods and storage of materials for human nourishment. The intimate relationship between feasting and caching at Cerro de la Virgen underscores the role of ceramic vessels as receptacles that held substances or materials as a means to transfer them to the divine world through their interment in animate buildings. Similar practices of ancestor veneration carried out through offerings of food and other items continue to be practiced in indigenous communities today, as well as in national Mestizo holidays such as Día de los Muertos (Brandes 1997).

While the placement of bodies and objects fulfills a sacred obligation on the part of humans, feasting in public spaces would have embodied the opposing end of the discourse between humans and deities. Feasts involved the commensal sharing of resources endowed by the deities in return for the sacrificial acts carried out by humans and also created social bonds and obligations that tied people together in ways that are still seen in indigenous communities of Mesoamerica today (Joyce and Barber 2015a:824; Monaghan 1995). With the exception of Structure 1 and its small patio, cooking features indicative of feasting were found at every architectural complex investigated during the two projects. Residents cooked large quantities of food in earth ovens located in multiple locations at the site, including Complex C of the ceremonial center and in the lower level of Complex E. Smaller cooking features were also interspersed with ceremonial offerings in public buildings, suggesting that feasts were carried out in tandem with ceremonies in which new items were emplaced and old items were revisited. For example, at least nine distinct hearths of various sizes were excavated into the occupational surface that overlaid the offering of 260 ceramic vessels in the northern patio of Complex A. Larger hearths were also found in the southern patio of Complex A and the interior patio of Complex B, each located within a few meters of small offerings.

Finally, one vital association that contributed to the value and animate properties of certain cached objects was the place (or places) of origin of its constituent entities, some of which were likely crafted in distant regions. Many New World societies conceptualized things from faraway places on two metaphysical axes, one situated horizontally corresponding to geographic distance and one situated vertically corresponding to cosmological distance (Helms 1993; Marcoux 2007). When geographical and cosmological distances correlate, as is the case for many indigenous groups in Mesoamerica, a horizontal movement away from the local community is also a departure into an area that is different, rare and increasingly sacred (Fash 1994:185; Helms 1993:192).

The ethnohistoric record in ancient Mesoamerica abounds with mentions of distant rarities that were valuable for more than curiosity's sake (Olivier 2007). For example, the desire of Mexica nobles to incorporate things from the edges of their world is embodied in over 90 "exotic" offerings placed at the base of the Templo Mayor at Tenochtitlan, 80% of which came from frontier provinces (Broda et al. 1987; López Luján 2005). The Templo Mayor offerings included raw goods not available in the Basin of Mexico, a pattern that contrasts with the carved masks from Cerro de la Virgen. Local artisans could have made masks from locally quarried lithic material, but the masks placed at the base of Structure 1 were made from non-local siltstone (R. Mueller pers. comm., 2013). We cannot rule out the possibility that they were manufactured or modified locally, but the iconographic similarities between the rain deity depicted in D-F24-Ob1 and depictions from highland Oaxaca suggest a non-local origin. There is also a lack of evidence for local manufacture of carved stone objects such as those in D-F24 at other Formative sites in the lower Verde, which suggests the mask was acquired through trade networks. Though not identical to Zapotec Cociyo masks from the Late Formative, the rain deity mask from Cerro de la Virgen shares a remarkable number of stylistic similarities to these objects, as well as depictions of rain deities from the Mixteca Alta (Sellen 2002; Urcid 2005b). The miniature thrones were made from locally available sandstone and granodiorite, but their value may originate from the manner in which they were iconic of powerful, geographically distant polities or people from southeastern Mesoamerica like Kaminaljuyu, Takalik Abaj, and Izapa. Though it is likely that figurine D-F24-Ob3 was also carved locally, it embodied the essence of a deceased ancestor from a cosmologically distant place. Therefore, we can see the value of the offering's constituent objects as coming, in part, from their association with a distant place, rather than solely from the rarity of their raw materials. In the case of the masks, these entanglements may have extended to other people and places as they moved from their production location to the lower Verde.

ENTRAPMENT, COMMUNITY AND STATUS AT CERRO DE LA VIRGEN

In Chapter 7, I presented the current corpus of archaeological evidence of collective practices for the Terminal Formative lower Verde and argued that the placement of burials and ceremonial objects as offerings in public buildings was fundamental in constituting community identities in the region. Further, the variability in orientation and techniques in the construction of monumental structures at outlying communities embodies the collective labor that was organized to build these animate buildings on the local level. These public areas hosted large-scale feasts. The lack of significant evidence of supra-domestic craft production (cf. Complex E) also underscores the importance of religious practices that were held in public buildings as acts that tied larger groups of people together. In this chapter, I have argued that the physical entrapment of things such as human bodies and animate objects within public buildings at hinterland communities constrained the ability of rulers at Rio Viejo to extend multi-community links and political influence in ways that elsewhere created regional polities like Early Classic-period Teotihuacan and Monte Alban in the later Formative (Joyce 2018:10; Joyce and Barber 2015a).

The construction and use of the Rio Viejo acropolis engaged people from outlying communities through participation in collective labor projects and communal rituals in the form of large-scale feasts, which Joyce and Barber (2015a:834) argue “created the potential for reorganizing and expanding the scale of entanglements that could have stabilized a politically centralized polity.” Archaeological data from this and other projects in the Rio Viejo hinterland, however, demonstrate that the permanency of the remains of ancestors and ceremonial offerings placed in public buildings at outlying sites created circumstances of entrapment that precluded their appropriation by incipient regional authorities. At

Cerro de la Virgen, the types of objects found in offerings sheds light on these entanglements on the scale of the local community. Locally mined stone slabs and ceramic vessels made from local pastes were placed in a communal repository from which they were physically difficult to reclaim, thereby tying people together. In terms of entrapment, the kinds of things that were animate and appropriate for inclusion in offerings tied residents to their local landscape as well. People were clearly reliant on the local hill for materials like stone slabs for offerings, stone blocks for terraces and building foundations, stone tools for masonry and possibly clay for the production of ceramic vessels (though we do not know whether inhabitants use a clay source on the hill). These materials were used in turn to build, ensoul, nourish, maintain, and eventually terminate the buildings. Further, the remains of ancestors buried in public buildings, in some cases disarticulated and redistributed, may have forged deep affiliations rooted in local places that were difficult to supplant on a regional scale.

The general pattern of ephemeral burial contexts and ubiquitous offerings of ceremonial objects at Cerro de la Virgen suggests horizontal access to ritual resources, but certain distinctions in status among the community's members were still made clear in the contents of offerings. Most public buildings in the lower Verde were presumably accessible to the entire community. However, there are examples of more exclusive ceremonial spaces, including Structures 1, 2, and 8 on the Río Viejo acropolis, though these buildings appear to lack ceremonial offerings (Joyce et al. 2013:142–147; Vidal Guzman 2017). In contrast to the accessible public buildings in the ceremonial center at Cerro de la Virgen, access to Structure 1 was restricted, bounded on three sides by a steeply sloping terrace wall and stairway built into the side of the hill. The intimate rituals carried out inside the series of perishable structures on the terrace would not have been visible to people congregating for ritual feasts and other large-scale ceremonies taking place in the Terrace 2 plaza below, and it is likely that only a select few ritual specialists—presumably community leaders—would have witnessed them. People living at Residence 1 likely had preferential access to Structure 1 and the intimate religious activities carried out there. In addition to proximity, the residence's entryway was positioned to allow preferential access to Structure 1 without significant changes in elevation (Barber 2013). Though there was evidence of vessel caching at Residence 1, the complex lacked offerings of valuable objects, suggesting that Terrace 10 and Structure 1 may have been the setting where potent rituals conducted by elites were set off from the rest of the community, thereby instantiating status distinctions (Barber 2005:262–269; Brzezinski et al. 2017:525-526). For example, the location of the dedication offering on bedrock below Structure 1 may implicate it in practices through which elites established their political authority by controlling access to potent religious actors such as the sacred bundle and the ceremonial space that it animated (Brzezinski et al. 2017). The placement of the sacred bundle in a public—rather than a domestic—space suggests it was an inalienable possession of the community, rather than an expression of personal wealth (Barber et al. 2014).

Ceremonies that were more accessible to larger groups of people were carried out below Structure 1 in the ceremonial center, particularly in the Plaza, the ballcourt, and the surrounding architectural complexes. As detailed in Appendix A, various statistical comparisons of the types of vessels in the site's "offering assemblage" show that offerings in the more accessible areas--Complexes A, B, and E-- were homogeneous and significantly different from those in Structure 1. Though Complex E is situated on a ridge overlooking an arroyo to the north of the ceremonial center, nothing in the architectural organization of the complex suggests that ceremonies were particularly restricted. Stratigraphic evidence also suggests that ceremonies in restricted buildings involved single, discrete events, whereas ceremonies in accessible buildings involved broader, ongoing events. Thus, it is likely that Structure 1 was the setting for ceremonies involving high status individuals, perhaps a small number of religious specialists. In contrast, Complexes A and B may have been the setting in which people of varying status distinctions participated in religious ceremonies that reflected ties to the local community. The presence of two adjacent but dissimilar ceremonial settings reflects the negotiations that took place between people of varying statuses during the Terminal Formative period in the lower Río Verde Valley.

VIII. CONCLUSIONS

INTRODUCTION

In this brief concluding chapter, I present the major findings of the dissertation and recommend some paths toward further research on the topic of political organization and integration in early complex polities, particularly those on the coast of Oaxaca. Archaeological research at Cerro de la Virgen carried out during this dissertation included excavations and laboratory research conducted during the 2013 season of the Rio Verde Project (PRV13) and the 2016 season of the Rio Verde Hinterland Project (PTRV16). These investigations aimed to model political integration during the Terminal Formative Period in the lower Rio Verde Valley (lower Verde) of Pacific coastal Oaxaca, Mexico. The lower Verde hosted a series of complex societies during its Pre-Columbian history, beginning with the emergence of a tenuous regional polity at ca. CE 100, centered at the urban site of Rio Viejo. However, the polity was short-lived, collapsing little more than a century later at ca. CE 250. The major goal of the projects was to investigate the degree of political integration in early complex societies by examining the scale at which leaders mobilized political, economic, and religious resources as sources of power over rural communities in outlying areas. As detailed in Chapter 2, archaeologists have tended to emphasize coercion over negotiation in the developmental trajectories of early states. While traditional models of regional political organization tend to focus on the strategies that leaders at political centers used to manage complex polities, far less attention has been paid to the agency of commoners and rural populations in negotiating the terms of political integration. To address the nature of the tenuous Rio Viejo polity, and perhaps why it collapsed so quickly, the dissertation focused on the social and material relations that constituted meaningful collectivities at the so-called “margins” of the valley--rural, outlying communities in the valley’s hinterland. The project tested the hypothesis that the lower Verde’s incipient polity was loosely integrated at the regional level during the Terminal Formative by examining the institutions and practices that integrated people socially, politically, and economically at the secondary community of Cerro de la Virgen.

Archaeological research involved excavations of public and domestic architecture at Cerro de la Virgen, a 92-hectare hilltop site that was occupied continuously from the beginning of the Terminal Formative to the Early Classic (150 BCE – CE 500). Cerro de la Virgen presents an ideal case study for examining political integration from the "bottom-up" because the site persisted through the social upheaval at the end of the Formative period. Previous research in the valley indicates a lack of evidence for environmental crises or a disruption caused by the intrusion of an external polity during the Terminal Formative, and evidence from the Río Viejo acropolis suggests polity leaders were able to control labor resources at the regional level. To date, we have lacked a detailed, complementary dataset that would indicate the degree to which ruling institutions permeated life in hinterland communities. The PRV13 and PTRV16 excavations targeted public architecture at Cerro de la Virgen to determine whether political, economic, and religious resources were controlled at the local or the polity level.

The PRV13 research involved an excavation program that included test pitting of the Terrace 2 Plaza and ballcourt, and block excavations of Complex A and Structure 1. The PTRV16 project broadened the excavation sample through block excavations of Complex B and additional coverage of the plaza. The PTRV16 also explored Complex E, a three-tiered terrace complex with stone building foundations located to the north of the ceremonial center. Public buildings and architectural complexes were targeted to provide detailed evidence of ritual and economic activities to compare to similar public contexts at sites throughout the lower Verde, including Rio Viejo. The laboratory program included basic analyses of ceramic and lithic artifacts, as well as archaeometric studies that investigated the control of goods made within the valley and obtained from outside the valley. Preliminary paleoethnobotanical research provided an additional layer of analysis for ritual practices.

MAJOR FINDINGS OF THE DISSERTATION

Results from the project support the general hypothesis that the lower Rio Verde Valley was loosely integrated on a regional scale during the Terminal Formative. Ritual practices at Cerro de la Virgen were different from those practiced at Rio Viejo and other sites in the lower Rio Verde Valley in a number of ways. First, the patterns observed in the placement of offerings of ceramic vessels and other valuable objects at Cerro de la Virgen were starkly different than object caches recorded at other sites in the region, particularly in relation to the use of thin stone slabs. Ceramic vessel offerings associated with public building complexes at Cerro de la Virgen were quite prevalent during the Terminal Formative, suggesting a foundational role for these ceremonial practices in the constitution of the community. Excavations carried out in 2013 uncovered a dense offering in Complex A, where several vessels were placed within triangular or rectangular stone compartments. Within the same offering, we found a number of instances of stone slabs oriented vertically in rows that did not seem to be associated with a particular vessel. This pattern was also seen in the offerings associated with Complexes B and E, although these contexts did not exhibit formal stone compartments. Despite the slight variation among architectural complexes in relation to the use of stone slabs in offerings, this pattern of ritual caching is starkly different than those found at other sites in the region, including Rio Viejo. Offerings of valuable or "exotic" objects, including the "mask cache" from Structure 1 and the foot effigy vessel found at the base of the Terrace 2 plaza, were also distinct from valuables found in offerings at other sites.

Though we need a larger sample of public architecture in the ceremonial center and the surrounding domestic terraces, preliminary mortuary data suggests that people at Cerro de la Virgen did not inter their dead in communal cemeteries like other communities. The scale of cooking features in both the ceremonial center and Complex E suggests that leaders at Cerro de la Virgen may have competed with other communities in the lower Verde, including Rio Viejo, for followers by sponsoring large-scale feasts. In addition, the lack of ceremonial feasting middens (i.e., discrete deposits) in public areas at Cerro de la Virgen may suggest that ceramic vessel caching may have been the focus of religious ceremonies at the site. In comparison, the Mound 1 acropolis at Río Viejo and the multi-use platform at Yugüe exhibit examples of feasting middens in which people likely broke their finely made serving wares (typically made from gray paste), presumably at the end of large-scale feasts.Archaeometric analyses of locally-made serving ware pottery and figurines has begun to suggest a small degree of regional control over these resources, but likely not to the extent that would have integrated the valley into a regional polity. Sourcing analysis of obsidian obtained from central Mexico and the Gulf Coast also suggests that secondary communities like Cerro de la Virgen and San Francisco de Arriba had access to multiple long-distance trade partners, though additional research on obsidian from Rio Viejo is needed to further evaluate this hypothesis.

There is also evidence for more corporate characteristics of status and authority on the local level at Cerro de la Virgen. For example, heterogeneity and specialization in productive/ritual practices witnessed at the various complexes also suggests intra-site integration within the community. Like the Late Formative centers in the Mixtec highlands, which do not seem to have had a single focal public space like the Main Plaza at Monte Alban (Balkansky 1998; Balkansky et al. 2004; Joyce 2010; Pérez Rodríguez et al. 2011), Cerro de la Virgen appears to have had multiple public areas surrounded by clusters of residences that may have constituted some form of corporate-group organization consisting of families of different status levels. It is possible that the family living at Residence 1 was a foundational presence in the constitution of the community and was perhaps responsible for overseeing the ritual, political, and economic activities that took place in the ceremonial center. However, based on evidence from Complex E, it is clear that the ceremonial center associated with Terrace 2 was not the only focal point for public activities.

Evidence from the project also suggests a continuum of visibility in ritual practices from restricted to highly accessible, which suggests slight differences in status distinctions among the people that viewed and carried them out. The most restricted public space at the site pertains to Structure 1, which overlooked Terrace 2 at the top of the ceremonial center's monumental stairway. Ritual practices carried out in this area, including the placement of the bundled "mask cache" and other offerings of ceramic vessels, would have been intimate in scope and likely witnessed by a select few ritual specialists. Ritual practices carried out in Complex A, including the placement massive 260 vessels in a cache in the north patio and cooking features indicative of feasting in the southern patio, would have been more accessible to people congregating in the ceremonial center, as would mortuary practices and vessel caching carried out in Complex B and the plaza. Though Complex E was located away from the ceremonial center, its association with presumably residential terraces to the east indicate that it may have actually provided the setting through which more people could have engaged in the ceremonial practices, but these were perhaps limited to people living in or directly around Complex E.

Buidling on the interpretive framework put forth by Joyce and Barber (2015a), I argue that the interplay of religion and politics at Cerro de la Virgen--and other outlying communities--constrained the types of societal developments that could have facilitated regional political authority. As Joyce and Barber (2015a) have argued, the unique entanglements of human bodies, ceremonial offerings, ancestors, and deities within public buildings afforded the creation of multicommunity identities and local institutions of political authority. Public buildings were not only loci of communal practices, they were also animate beings that required certain objects and ceremonies associated with rituals of dedication, spiritual feeding, and termination, all of which are represented in the archaeological sample from Cerro de la Virgen.

FUTURE RESEARCH

Future research on the issue of regional political integration in the Later-Formative lower Rio Verde Valley has the potential to further address the hypotheses raised in this project and in previous research on the topic (Barber 2013; Brzezinski et al. 2017; Joyce and Barber 2015a; Joyce et al. 2016).

First, additional excavations of ceremonial center at Cerro de la Virgen must take place to broaden the archaeological sample from this area. In particular, excavations of Complexes C and D, as well as broader horizontal excavations of the plaza, should be undertaken to examine the social, political, and ritual practices carried out in these areas. Any future project must also incorporate excavations of lower status domestic terraces to provide archaeological data that are comparable to those recorded by Barber (2005) at Residence 1, particularly as it relates to negotiations between people of varying levels of status within the community. In addition, chemical residue analysis should be carried out on a large sample of ceramic offering vessels from Cerro de la Virgen to further examine the ephemeral deposits that may have filled the vessels.

The analytical and methodological framework presented here should also be extended to the investigation of more sites in the valley with late Terminal Formative-Period occupations. Several sites recently recorded by Jessica Hedgepeth Balkin (2019) represent a continuum from small communities (in the Chacahua phase) such as La Palma (5.05 ha), Monte La Soledad (6.38), and La Humedad (10.74) to larger ones like Emiliano Zapata (33.21 ha), Piedra Ancha (44.99 ha) and La Soledad (70.60 ha) that can be investigated. Excavating a larger, more diverse sample of archaeological sites in the region will certainly add nuance to the examination of political integration at the end of the Formative.

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APPENDIX A: CERAMIC ANALYSIS

This appendix presents the methods and results of ceramic analyses completed on select assemblages of artifacts recovered during the 2013 season of the Rio Verde Project and the 2016 season of the Rio Verde Hinterland Project at Cerro de la Virgen. In the first section, I briefly describe the ceramic analysis methodology I used. Next, I present the general qualitative and quantitative characteristics of a collection of 509 complete and partial vessels recovered from a variety of primary archaeological contexts in Complexes A, B and E, Structure 1, and the Plaza. Of the total, 338 vessels were recovered during the 2013 project and 171 were recovered during the 2016 project. Ceramic analyses of the vessels were completed by myself in 2013 and by Vanessa Monson in 2016 as part of her Master's thesis data collection. Archaeological interpretations of these deposits, most of which were ceremonial offerings, can be found in Chapters 4-6. Here, I provide some basic statistical analyses related to measures of standardization on vessel types with the largest sample sizes, as well as statistical comparisons of sub-collections of the vessels grouped according to various criteria. Cylindrical bowls, conical bowls, and eccentric vessels were not included as categories in the statistical tests because their sample sizes were too small for power. Following the descriptive and quantitative analysis, I present the raw data in tabular form.

Methods

There were two phases of ceramic analysis during the PRV13 and PTRV16. The first phase included a raw count and weight of all sherds recovered from excavation. First, ceramic materials were washed and catalogued at the field laboratory. Collections of sherds were washed with soft brushes in basins of water to remove adhered sediment and air-dried on mesh screens at the field laboratory. Once dry, sherds were sorted according to paste color (e.g., coarse brown, fine brown, gray), based upon the paste categories previously identified by Joyce (1991; Joyce et al. 1998). Next, all sherds were counted, weighed, and dated according to the regional ceramic typology (Joyce 1991). After initial processing, sherds were placed in clean plastic bags and catalogued according to the excavation context from which they were recovered. Identification tags were placed on the inside and outside of the bags, which included the project year, excavation context (e.g., Operation#-Unit#-Lot#), date, excavator name, and a unique field specimen number. Sediment was not removed from the interior of intact ceramic vessels, including partial or incomplete vessels, to preserve macro- and microbotanical remains as well as organic and inorganic residues.

The second phase of ceramic analysis was a more detailed study of a smaller subset of the total ceramic assemblage. This phase focused on documenting measurements and qualitative attributes from primary deposits dating to the Terminal Formative and Early Classic periods. Measurements of rim diameters of sherds were made with a standard rim diameter chart, estimated to the nearest centimeter. As a standard procedure, all rim diameters were made from the interior of the vessel opening, though an “outer” diameter was also measured to document cases of exterior thickened or everted rims. For partial and complete vessels, rim diameters were measured with a ruler to the nearest tenth of a centimeter. The heights of vessels with an intact base and rim were also measured to the nearest tenth of a millimeter. The thickness of walls was measured with digital calipers at the widest available point on the vessel to the nearest tenth of a millimeter. Qualitative attributes and attribute states were slightly modified from previous analyses by Levine (2002) and Barber (2005).

Standardization in the size and shape of certain forms of ceramic vessels was evaluated using techniques detailed by Eerkens and Bettinger (2001), which were based on the Weber fraction--an estimation method used to describe the minimum difference that humans can perceive through unaided visual inspection. Eerkens and Bettinger use the Weber fraction to derive a constant for the coefficient of variation (CV = 1.7%) that represents the highest degree of standardization attainable through manual human production of artifacts. Through the analysis of several random datasets, they derive a second constant for the coefficient of variation that represents variation expected when production *is* random (CV = 57.7%). For example, a sample of measurements of a continuous variable, such as rim diameter in a ceramic vessel, with a CV greater than 57.7% would suggest that a potter (or potters) did not have a desired "target" size for the finished vessel. The CV constants can therefore be used to assess the degree of standardization in artifact assemblages regardless of kind. Despite Eerkens and Bettinger's caution against using measures of association (e.g., R^2 in regression analysis) to demonstrate standardization when comparing independent samples, I chose to include them here to show whether certain attributes (e.g., rim diameter, height, etc.) were strongly or weakly associated with one another.

The Offering Vessel Assemblage

The assemblage of ceramic vessels from ceremonial offerings at Cerro de la Virgen is perhaps the most visually and statistically striking of all collections of artifacts recovered during the 2013 and 2016 projects. Ceramic offerings at the site spanned the Miniyua, Chacahua, and Coyuche phases and were represented by three different paste types--coarse brown, fine brown, and gray (Figure A.1). The overwhelming majority (93.3%) of the vessels were coarse brown wares, which were typically used for cooking and storage vessels outside of ceremonial contexts. Gray wares represented 4.5% of the assemblage, composed entirely of serving bowls and globular jars, and fine brown wares (2.2%) were comprised of incurving wall bowls and small jars. There was slightly more diversity among vessel types in the offering assemblage compared to paste composition, represented by at least eight broad categories of vessels (Figure A.2). Table A.1 displays summary statistics of rim diameter, height, and thickness of all vessels separated by type. It should be noted that inconsistencies in the sample size of measurements within a single artifact category are due to the prevalence of partial or incomplete vessels in the sample that lacked certain features, such as a complete rim (e.g., rim diameter), an intact base and rim (e.g., vessel height), or an eroded exterior surface (e.g., surface decoration).

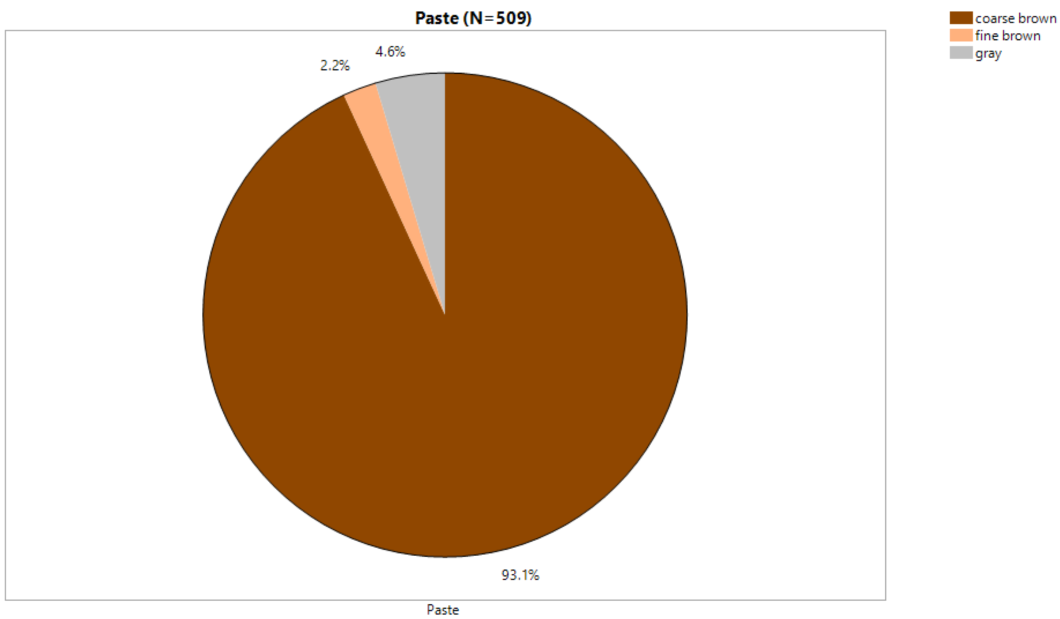


Figure A.1: Paste type of all offering vessels recorded in assemblage.

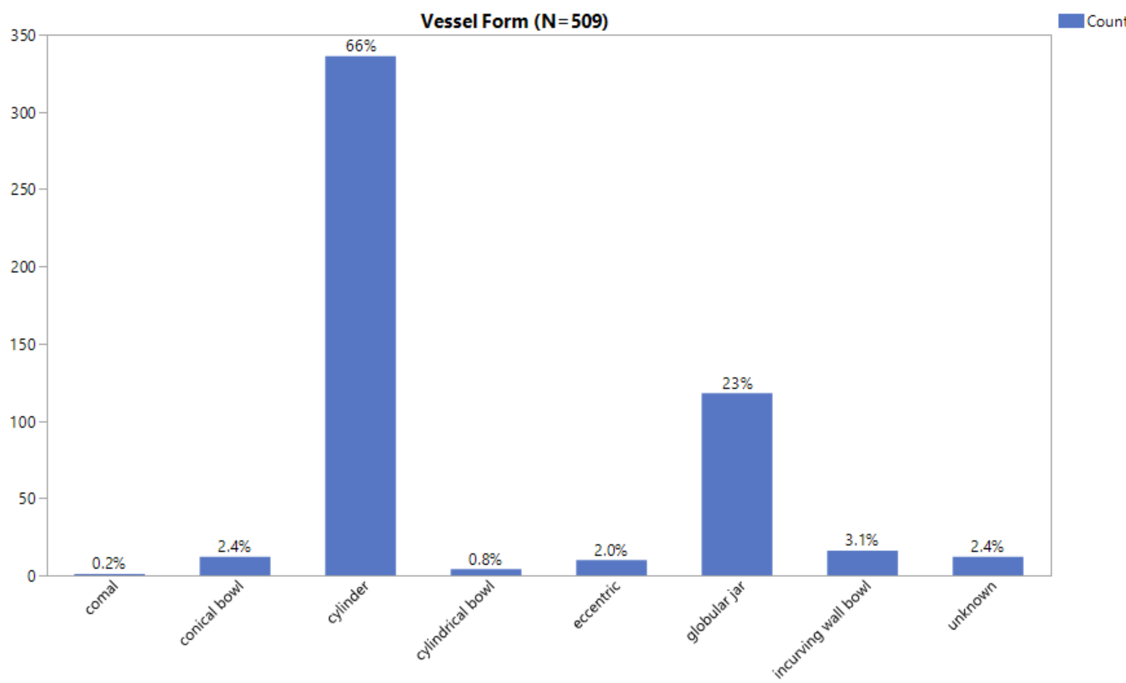


Figure A.2: Vessel form of all offering vessels recorded in assemblage.

Table A.1: Summary statistics of rim diameter, height, and thickness by vessel type.

	Rim Diameter (cm)				Height (cm)				Wall Thickness (cm)			
Vessel Type	**Mean**	**s.d.**	**Min**	**Max**	**Mean**	**s.d.**	**Min**	**Max**	**Mean**	**s.d.**	**Min**	**Max**
comal	.	.	.	.	.	.	.	.	.	.	.	.
conical bowl	16.4	5.23	11.2	22.5	5.05	2.79	1.7	10	0.75	0.18	0.5	1
cylindrical bowl	17	6.49	8	23.5	16.9	8.01	6	25	1.05	0.06	1	1.1
cylinder	8.14	3.31	2.4	22	22	7.08	5	67	1.05	0.29	0.3	2.3
eccentric	6.84	3.28	4.1	12	7.36	2.99	3.9	13.1	1.03	0.37	0.5	1.5
globular jar	6.21	4.02	0.4	27.6	7.85	2.93	3.2	16.1	0.74	0.18	0.3	1.3
incurving wall bowl	8.01	5.89	2.9	25	4.93	2.33	1.6	8.5	0.61	0.16	0.4	1.1

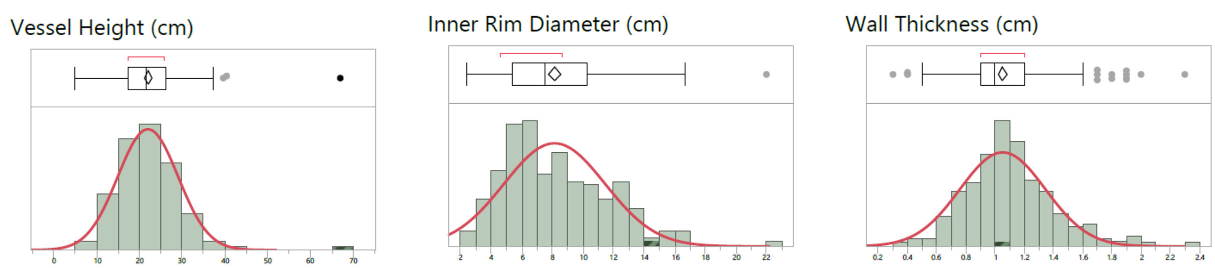
Cylinders

Over two-thirds (68.0%) of the total assemblage were “cylinders,” or “cylindrical vessels,” comprised of tall, slender, “flower vase-like” containers in a variety of sizes (Figure A.3-A.4). I define cylinders as a type of vessel that shares characteristics with both bowls and jars but is distinct from both categories. Cylinders were made primarily from coarse brown paste (98.2%), with a small proportion of gray wares (1.2%) and fine brown wares (0.6%) rounding out the sample (N=335). Like bowls, cylinders have an unrestricted opening that could have direct, outleaning, or outcurving rims. The vessel walls are almost exclusively oriented vertically like a cylindrical bowl, though a few examples of outcurving, outleaning, inleaning, and incurving-divergent walls were recorded. Bases were almost always flat, though three examples out of 313 with intact bases were rounded. The rims of the vessels were usually direct or outcurving, with rare examples of everted and outleaning rims. Most rims were exterior thickened or direct (unthickened), and one instance each of an exterior bolstered and tapered rim were recorded. Lips were generally rounded and only rarely squared. Surface treatment of the vessels generally consisted of wiping coarse grains from the exterior of the vessel, followed by smoothing in the case of coarse and fine brown wares and burnishing for gray wares. Most coarse brown ware cylinders were covered in a red slip on the main body of the vessel, on the distal end of the vessel’s rim, or both. Fine brown wares were often treated with a graphic slip that was black or dark gray in color. Many cylinders were found *in situ* with ceramic lids covering their openings, suggesting they likely had contents that needed to be protected (see Appendix C for macrobotanical analyses). Lids were typically flat or slightly concave and occasionally had pointed or ringed handles on their upper (outward-facing) surface. Occasionally, conical bowls were used as lids as well, though it is unclear whether they were made *ad hoc* with their respective cylinders or were repurposed as needed. One example of a fine brown ware conical bowl was found covering a coarse brown ware cylinder in the large offering at Complex A, which suggests that both scenarios were equally plausible.

Figure A.3: Photograph of cylinders recovered from various offerings at Cerro de la Virgen.

Figure A.4: Cylinders recovered at Cerro de la Virgen.

Like most storage jars, cylinders are typically taller than they are wide, varying in the ratio of height to diameter by a factor of 2:1 to 6:1. For vessels that contained an intact rim and base, heights varied tremendously, ranging from a minimum of 5 cm to a maximum of 67 cm. Heights of cylinders were distributed around a mean of 21.9 cm, with a standard deviation of 7.08, but were not normally distributed. Rim diameter and the thickness of the vessel walls also did not follow a normal distribution around their means of 8.14 cm and 1.05 cm, respectively. Given a coefficient of variation for each measure that was less than 57.7 %, it is likely that there was a generally preferred diameter, height, and thickness of offering cylinders among potters at Cerro de la Virgen that clustered around each mean (Figure A.5). Though regression analysis indicates that vessel height and diameter in cylinders were associated the variables appear to diverge as the height of a vessel exceeded approximately 15 cm, suggesting that, as vessel height increased, there was a wider range of shapes preferred by potters (Figure A.6). An R^2 value of 0.24 suggests a relatively weaker, but still statistically significant, association between height and diameter.



Vessel Height (cm) — Normal(21.9795,7.07787)

Summary Statistics

Mean	21.979545
Std Dev	7.0778702
Std Err Mean	0.4771899
N	220
Variance	50.096246
CV	32.202077

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.937496	<.0001*

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Inner Rim Diameter (cm) — Normal(8.13708,3.30752)

Summary Statistics

Mean	8.1370833
Std Dev	3.3075165
Std Err Mean	0.2134993
N	240
Variance	10.939665
CV	40.647445

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.955430	<.0001*

Wall Thickness (cm) — Normal(1.05195,0.29377)

Summary Statistics

Mean	1.051952
Std Dev	0.2937667
Std Err Mean	0.0160983
N	333
Variance	0.0862989
CV	27.925869

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.964291	<.0001*

Figure A.5: Summary statistics of ceramic cylinders from ceremonial offerings at Cerro de la Virgen.

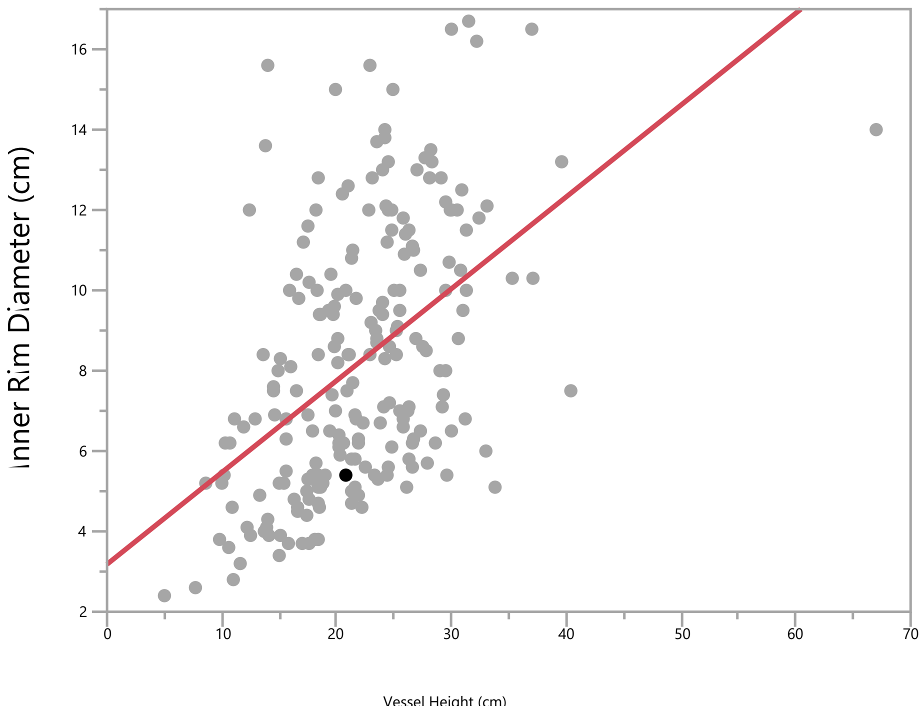


*Figure A.6: Regression analysis of rim diameter by height in cylinders; Diameter = 3.18 + 0.23*Height, $R^2 = 0.24$, ANOVA: $p < 0.0001$.*

The size and shape of cylinders were relatively standardized, but several eccentric examples were of note. Though the exterior surface of cylinders were almost always smooth and covered in a red slip, one example from the Complex A offering (F18-s1-obxx) exhibited an anthropomorphic applique on its exterior (Figure A.7). The figure's neck is elongated, arms and legs are extended with fingers and a few toes detailed, and face is depicted with two eye holes and an amorphous mouth. A larger indentation in the area of the torso is also pronounced, which is likely drawing attention to the figure's belly button. Similar examples of anthropomorphic appliques have been found at San Francisco de Arriba (Workinger 2002: xxx). Several examples of exceedingly tall, but narrow, cylinders were also recovered in the sample (A.8). One example was found in an offering within Structure 1 that measured an astonishing 67 cm in height, and another was found in the plaza that appeared to be similar in proportion but lacked an intact base, preventing a definitive height measurement.

Figure A.7: Cylinders with appliques; anthropmorphic (left), unidentified (right).

Figure A.8: Photo of eccentric cylinder in situ.

Jars

The second most prevalent vessel type represented in ceremonial offerings were jars (22.0%, N=103), which came in a variety of forms (Figure A.9-A.11). Unlike utilitarian storage jars, which tend to be greater in height than width, many globular jars are as wide as they are tall. Most jars were “globular” in shape with incurving convergent vessel walls and highly restricted openings with vertical or outcurving necks and rims. Within this category, sizes varied from miniature jars (or, *ollitas* in Spanish) to large, broad jars with wide openings. Many jars had short necks, an attribute often associated with vessels termed *tecomates* in the Mesoamerican literature (Figure A.10). I chose to be parsimonious in lumping short-necked and neckless jars together within the broader category because the gradient of neck forms from “absent” to “pronounced” was gradual and difficult to sub-divide with consistency. Further, neckless jars, short-necked jars, and “necked” globular jars appear to have the same technical purpose of restricting the outward flow of the liquid or solid material that they contained, making their placement within the same category relevant in a ceremonial setting.

Figure A.9: Photograph of jars from offerings at Cerro de la Virgen.

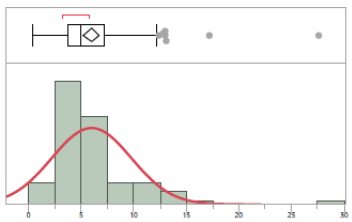
Figure A.10: Various short-necked and neckless jars.

Figure A.11: Vessel profile drawings of jars from offerings at Cerro de la Virgen

Like cylinders, the majority (84.7%) of globular jars were made of coarse brown paste, with a smaller proportion of fine brown wares (2.7%) and gray wares (12.61%) present. Jar necks could be direct, inleaning, or outcurving. Vessel walls tended to be incurving, though several examples of composite-silhouette walls with sharply changing angles also appeared in the sample. Most globular jars with necks had direct or outcurving rims, though a small number of rims were everted or inleaning. Most rims were unthickened or exterior thickened, with one example of a tapered rim recorded. Vessel lips were typically rounded and occasionally grooved or squared. Bases were relatively evenly divided between flat and rounded. The exterior surface treatment of coarse and fine brown wares was smoothed or smoothed over wiped, while gray ware globular jars were exclusively burnished after being smoothed. The surface treatment of the interior of the vessels was not recorded, as I did not remove sediment from the majority of the assemblage in order to preserve macro/microbotanical and inorganic residues for future studies. Fine brown globular jars were either unslipped or graphite slipped, and coarse brown wares were red-slipped.

The rim diameters, heights, and thickness of globular jars were not normally distributed (Figure A.12). The coefficients of variation (CV) for measurements of height and thickness were less than 57.7%, suggesting that means of 7.85 cm for the former and 0.61 cm for the latter were relatively standardized and preferred dimensions among potters that made globular jars (Figure 9.11). However, the CV for rim diameter was greater than 57.7%, indicating that potters had variable preferences for the size of the opening of jars. Given the variability in diameter, it is possible that potters had an idea of the type material(s) or object(s) that would eventually fill their jars. The continuous variables of height and diameter in jars were more closely associated ($R^2 = 0.65$) than cylinders (Figure A.13).

Inner Rim Diameter (cm)



Normal(6.00515,3.78218)

Summary Statistics

Mean	6.0051546
Std Dev	3.7821778
Std Err Mean	0.384022
N	97
Variance	14.304869
CV	62.982188

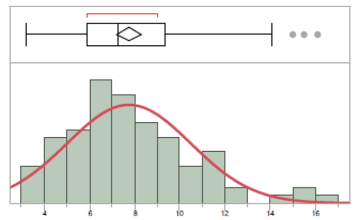
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.792917	<.0001*

Ho = The data is from the Normal distribution.
Small p-values reject Ho.

Vessel Height (cm)



Normal(7.74681,2.74256)

Summary Statistics

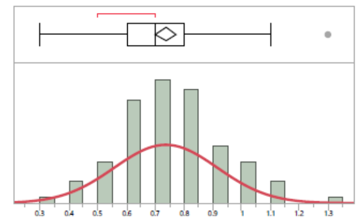
Mean	7.7468085
Std Dev	2.7425638
Std Err Mean	0.2828739
N	94
Variance	7.5216564
CV	35.402499

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.952707	0.0019*

Wall Thickness (cm)



Normal(0.73689,0.17932)

Summary Statistics

Mean	0.7368932
Std Dev	0.179318
Std Err Mean	0.0176687
N	103
Variance	0.032155
CV	24.334332

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.967266	0.0118*

Figure A.12: Summary statistics of globular jars in ceremonial offerings at Cerro de la Virgen.

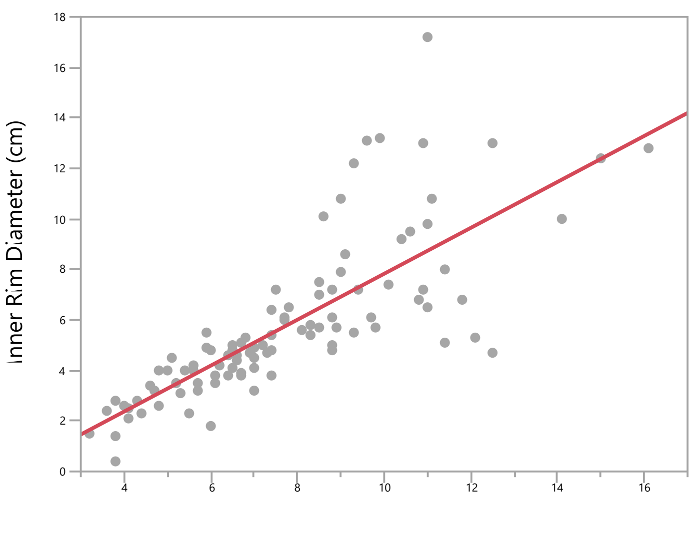


*Figure A.13: Regression analysis of rim diameter by height in jars; Diameter = -1.27 + 0.91*Height, R^2 = 0.65, ANOVA: p < 0.0001.*

Few examples of eccentric jars were recovered from the Cerro de la Virgen offerings (Figures A.14-A.15). The most unique was a red-slipped coarse brown globular jar with dozens of circular perforations along the vessel wall, taking the form of a colander. The vessel was found in a small, discrete offering in Terrace 15d (PTRV16-Op B) with a fragment of a flat coarse brown ware lid covering the opening. It is not yet clear what type of material would be placed in a "colander" that would need to be sealed with a lid. Also from Terrace 15d, excavations uncovered a gray ware jar with a banded, exterior thickened neck and rim with a flat, coarse brown lid.

Figure A.14: Coarse brown ware globular jar with circular perforations.

Figure A.15: Gray ware globular jar with exterior thickened neck and rim; lid is flat coarse brown ware.

Incurving wall bowls

Incurving wall bowls were the third most prevalent vessel type in the assemblage (3.1%, N=16; Figures A.16-A.18). Like cylinders and globular jars, incurving wall bowls were made from three different paste types, the majority of which were coarse brown wares (68.8%), followed by gray wares (18.8%) and fine brown wares (12.5%). Wall forms were typically incurving convergent and less frequently incurving divergent. Rims tended to be direct in form, though one example each of outcurving and outleaning rims were recorded. Bases were generally flat and occasionally rounded. The lips of the vessels were exclusively rounded. Gray ware incurving wall bowls were burnished, and fine brown wares and coarse brown wares were smoothed or wiped before slip was applied. Slips were black (graphite) in color for fine brown wares and red (clay) for coarse brown wares. Several gray ware incurving wall bowls had plastic decorations on their exterior walls, including single incised lines just below the exterior rim, vertical lines in groups, and paired Lazy-S designs. However, none exhibited the incised and excised decorations indicative fancy Chacahua phase gray ware serving bowls (see Brzezinski 2011), nor the less intricately decorated gray ware bowls of the preceding Miniyua phase.

Figure A.16: incurving wall bowls; grayware with flat, coarse brown lid (left), coarse brown ware with coarse brown conical bowl lid (right).

Figure A.17: Coarse brown ware incurving wall bowl.

Figure A.18: Incurving wall grayware bowl.

Measurements of the rim diameter and wall thickness of incurving wall bowls did not follow the normal distribution, but vessel heights were normally distributed, according to a Shapiro-Wilk test of continuous fit (Figure A.19). However, the low sample size makes this designation suspect. The diameter of incurving wall bowls varied considerably around the mean of 8.01 cm (s.d. = 5.89), with a CV of 75.0%, indicating that this attribute was comparatively standardized. Like globular jars, it is likely that potters had variable preferences for the sizes and shapes of incurving wall bowls to be included in offerings (Figure A.20). The variation appears to have exceeded any consideration of a standardized size and/or shape of vessel.

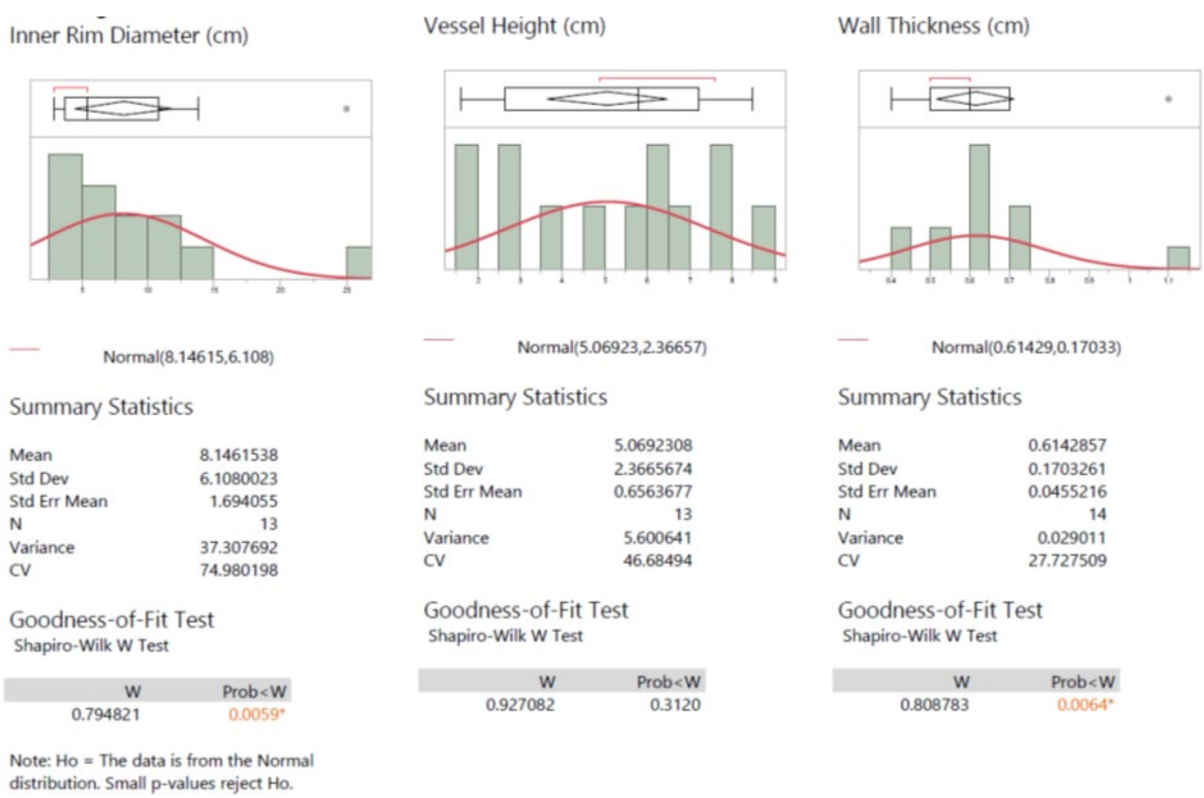


Figure A.19: Summary statistics of incurving wall bowls in offering vessel sample.

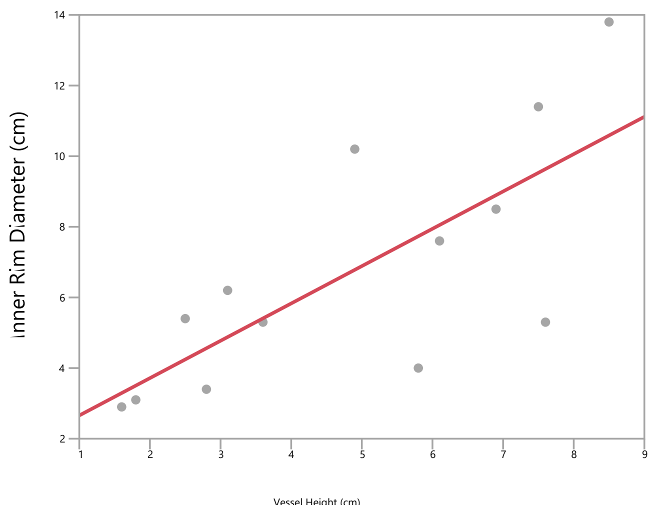


*Figure A.20: Regression analysis of rim diameter by height in incurving wall bowls; Diameter = 1.60 + 1.06*Height, R^2= 0.55, ANOVA: p < 0.0038.*

Conical and cylindrical bowls

Conical and cylindrical bowls accounted for 2.4% (N=12) and 0.8% (N=4) of the offering vessel assemblage, respectively (Figures A.21-A.22). Conical bowls were represented by all paste types in the sample and consisted of outcurving or outleaning walls with direct, everted, or outcurving rims that were typically unthickened. Grayware conical bowls were highly burnished and contained incised decorations indicating that they dated to the Chacahua phase. Fine brown ware conical bowls were slipped with graphite and dated to the Miniyua phase or perhaps the early Chacahua phase. In contrast, cylindrical bowls were exclusively made from coarse brown ware paste and exhibited vertical walls with direct or exterior thickened rims. All cylindrical bowls resembled the taller cylinders (see above) that were predominant in the assemblage, suggesting that they were simply shorter versions of the same types of vessels. None of the cylindrical bowls were diagnostic.

Figure A.21: Conical bowls from offerings.

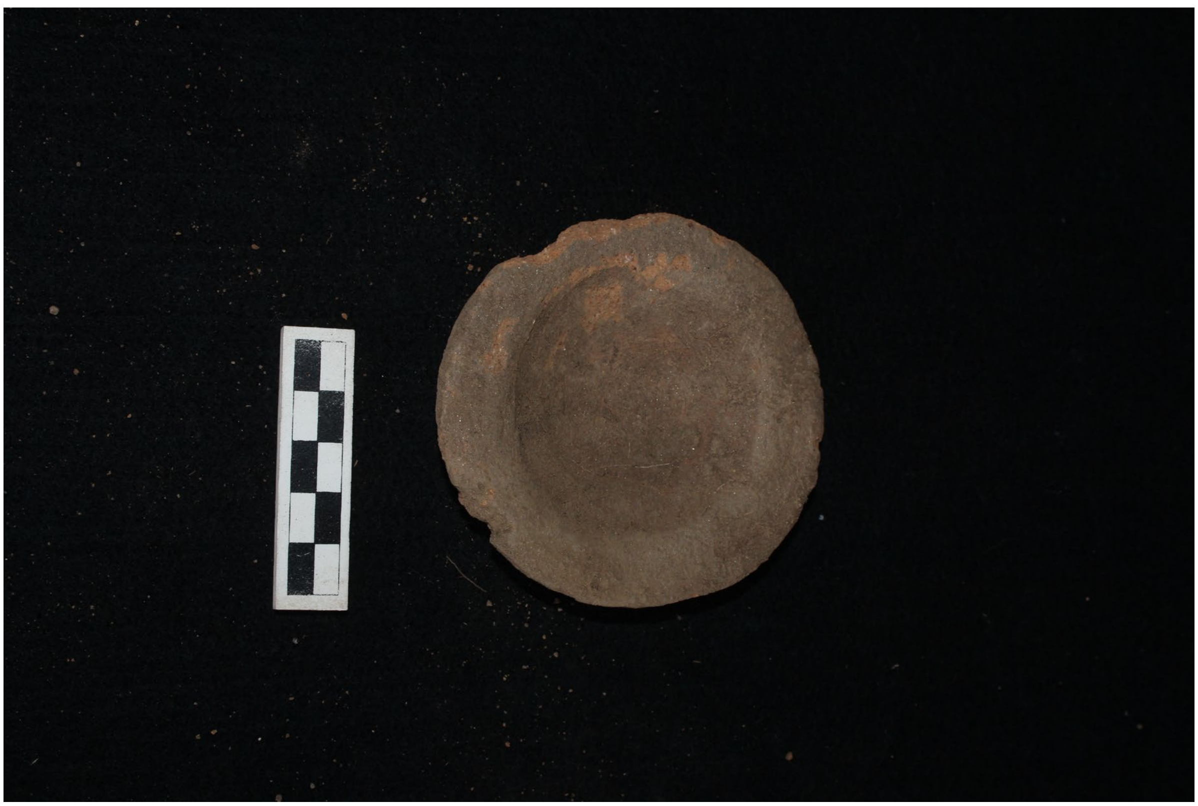


Figure A.22: Top-down view of conical bowl.

Eccentric vessels

Ten vessels did not match the general criteria of the ceramic vessel types presented above, all exhibiting unique or exaggerated characteristics that warranted a designation of “eccentric”. Two of the vessels were small, fine brown ware vessels with slightly outleaning walls and rectangular openings (Figure A.23). The remaining eight vessels were non-diagnostic coarse brown wares, including six rectangular vessels (Figures A.24-A.27), one “quatrefoil” or “quincunx” vessel with four circular nodes around a center point (Figure A.28), and an effigy vessel of a human foot (Figure A.29). Archaeological evidence indicates that the effigy vessel was purposefully smashed upon its placement.

Figure A.23: Fine brown ware vessel with rectangular opening (F18-ob146) from Complex A.

Figure A.24: Coarse brown ware rectangular eccentric vessel (F60-s1-ob16) from Complex B.

Figure A.25: Coarse brown ware rectangular eccentric vessel with lid (F18-Ob1) from Complex A.

Figure A.26: Coarse brown ware rectangular vessel (F60-s1-ob16) from Complex B.

Figure A.27: Coarse brown ware eccentric vessel with "pinched" walls (F25-s1-ob46) from Complex E.

Figure A.28: Quincunx eccentric vessel (F18-ob85) from Complex A.

Figure A.29: Effigy vessel of human foot (F9-ob1) from the plaza (PTRV16-Op G).

Comparisons of Assemblages

In this section, I compare subsets of vessels with respect to architectural complex and type of offering (e.g., dedication, termination, continuous; see Chapter 8). Comparisons of nominal variables such as vessel type were made using a one-way contingency analysis of Chi-square. Comparisons of interval/ratio data such as rim diameter and height were made with a Wilcoxon nonparametric test of means. Nonparametric tests were chosen because most datasets in the offering vessel sample were not normally distributed (see above). Wilcoxon tests were evaluated for pairwise error through a Steel-Dwass analysis of all pairs. Comparisons of offering vessel assemblages by site location, separated into architectural complexes A, B, and E, Structure 1 (including the building and patio), and the Plaza, reveal several relevant conclusions. Figure A.30 displays frequencies of each vessel type in the assemblage, and Table A.2 displays proportions, separated by site location. Though I include the Plaza sample in the initial histogram and table, I did not include it in the statistical analyses because of the small sample size.

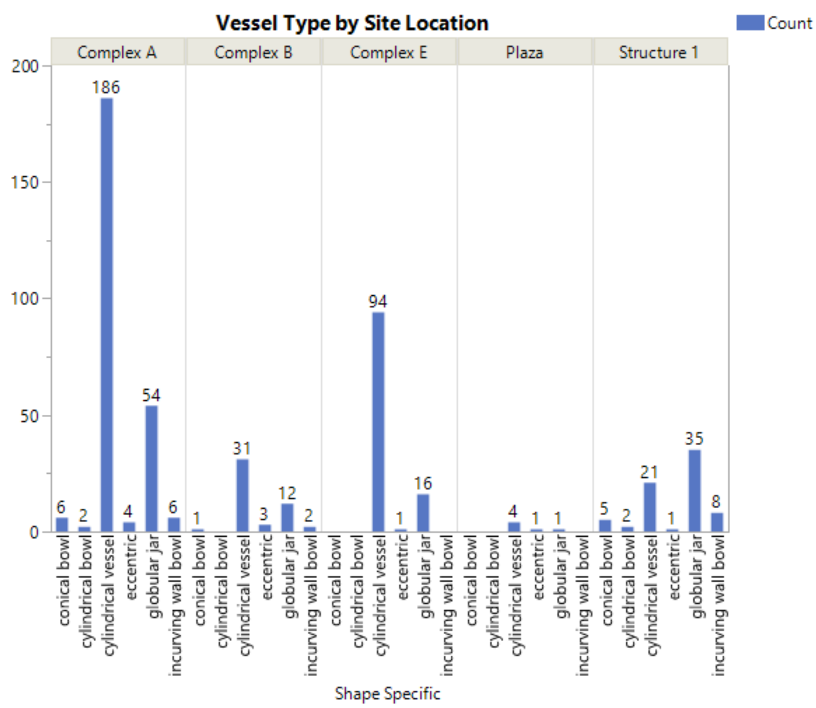


Figure A.30: Comparison of vessel type by site location (architectural complex).

Table A.2: Proportions of vessel types by site location (architectural complex).

	con bowl	cyl bowl	cylinder	eccentric	jar	inc wall
Complex A	2.3%	0.8%	72.1%	1.6%	20.9%	2.3%
Complex B	2.0%	0.0%	63.3%	6.1%	24.5%	4.1%
Complex E	0.0%	0.0%	84.7%	0.9%	14.4%	0.0%
Plaza	0.0%	0.0%	66.7%	16.7%	16.7%	0.0%
Structure 1	6.9%	2.8%	29.2%	1.4%	48.6%	11.1%

The aggregate assemblages from Complexes A, B, and E demonstrate relatively similar distributions of vessel types. The proportions of cylinders and jars--the most prevalent vessel types across all offering contexts at the site--to total artifacts in these contexts were relatively similar, falling between 63.3% and 84.7% for the former and 14.4% and 24.5% for the latter. The diversity in vessel types in Complex E compared to Complexes A and B, however, was much lower. Offerings in Complex E contained no serving wares such as conical bowls, cylindrical bowls or incurving wall bowls, suggesting that an association of offerings with feasting practices may have been weaker outside of the ceremonial center. A larger sample of vessels from other parts of Complex E would shed light on this question.

In contrast, the proportions of vessel types in the Structure 1 assemblage were much different than those found in Complexes A, B, and E. Offering vessels associated with Structure 1 were more evenly spread among the various vessel types, with conical bowls, cylindrical bowls, and incurving wall bowls all registering a relative proportion greater than 2.3%. The relative proportions of cylinders and jars found in Structure 1 offerings were nearly the opposite of those found in the larger complexes. Cylinders comprised only 29.2% of the assemblage, while jars made up almost half (48.6%). Several contingency analyses of two nominal variables, vessel type (only jars and cylinders included) and site location, were performed to quantify the degree of difference between the four assemblages (Figure A.31, Table A.3). With the Structure 1 assemblage included, a statistically significant difference among the assemblages was found ($\chi^2 = 42.97$, $p < 0.05$ ($p < 0.0001$). When the Structure 1 assemblages was eliminated from the comparison, the difference among assemblages was not statistically significant (χ^2 = 4.48, $p > 0.05$).

Vessel assemblages were also compared with respect to the type of offering in which they were interred (see Chapter 8). First, a contingency test of nominal variables (i.e., vessel type vs. offering type) was performed to quantify the difference among assemblages of the most prevalent vessel types--jars and cylinders (Figure A.32, Table A.4). Eliminating the other vessel types was a choice aimed at parsimony in that it made the threshold of quantifying differences between the assemblages more stringent. No statistically significant differences were found among offering types with respect to vessel type (χ^2 = 2.05, $p > 0.05$). Variation in continuous variables such as rim diameter and height was also tested among assemblages of specific types of vessels, across each type of offering (Figures A.33-A.36). Wilcoxon tests of nonparametric variables were completed, followed by Steel-Dwass tests to account for pairwise error between each independent variable (type of offering), none of which demonstrated a statistically significant difference ($p > 0.05$) in rim diameter or height in cylinders or jars. These results suggest that depositional context and associated materials (e.g., ash, burned daub, etc.) had a greater impact as an independent variable on distinguishing one context from another than did vessel type. Interestingly, in every Steel-Dwass test, the assemblages of termination and dedication offerings were substantially more similar to one another (statistically) than they were when compared to continuous offerings. This may indicate that there were similar ideas surrounding the types of materials needed to carry out birth and death rites for public buildings, which may be associated with an ontologically cyclical concept of time in which birth and death are closely related. Following the statistical tests, Table A.5 presents the raw data in tabular form.

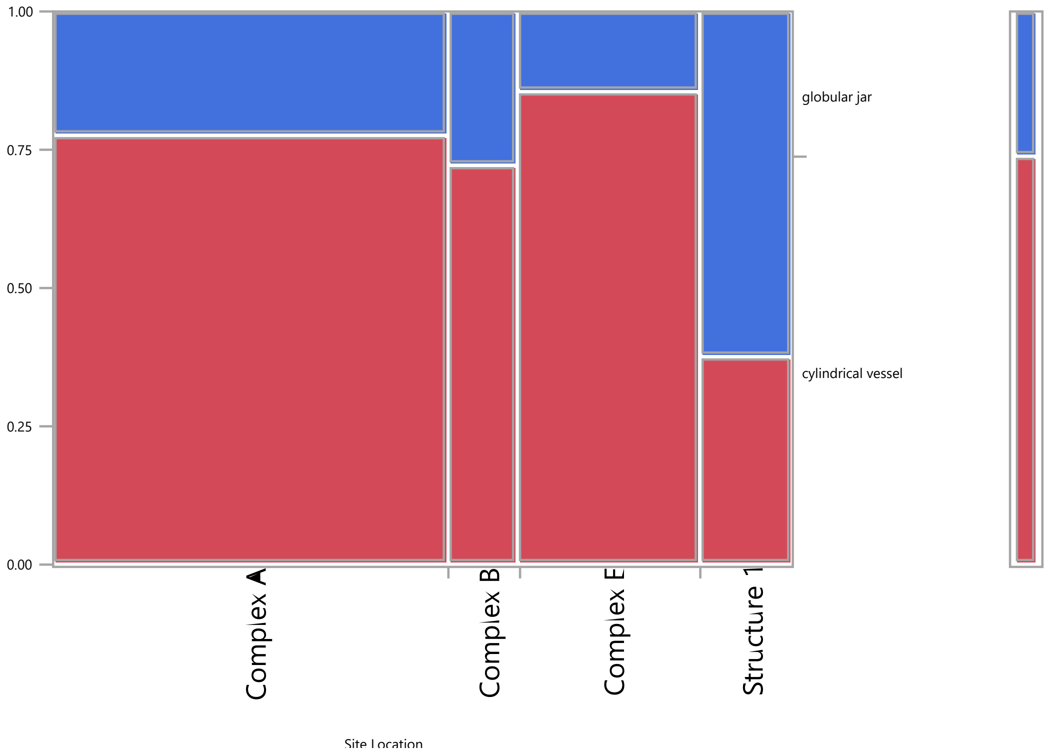


Figure A.31: Contingency analysis of vessel type by architectural complex.

Table A.3: Contingency table of vessel type by architectural complex, with counts and expected counts labeled.

Count Expected	cylindrical vessel	globular jar	Total
Complex A	186 177.461	54 62.539	240
Complex B	31 31.7951	12 11.2049	43
Complex E	94 81.3363	16 28.6637	110
Structure 1	21 41.4076	35 14.5924	56
Total	332	117	449

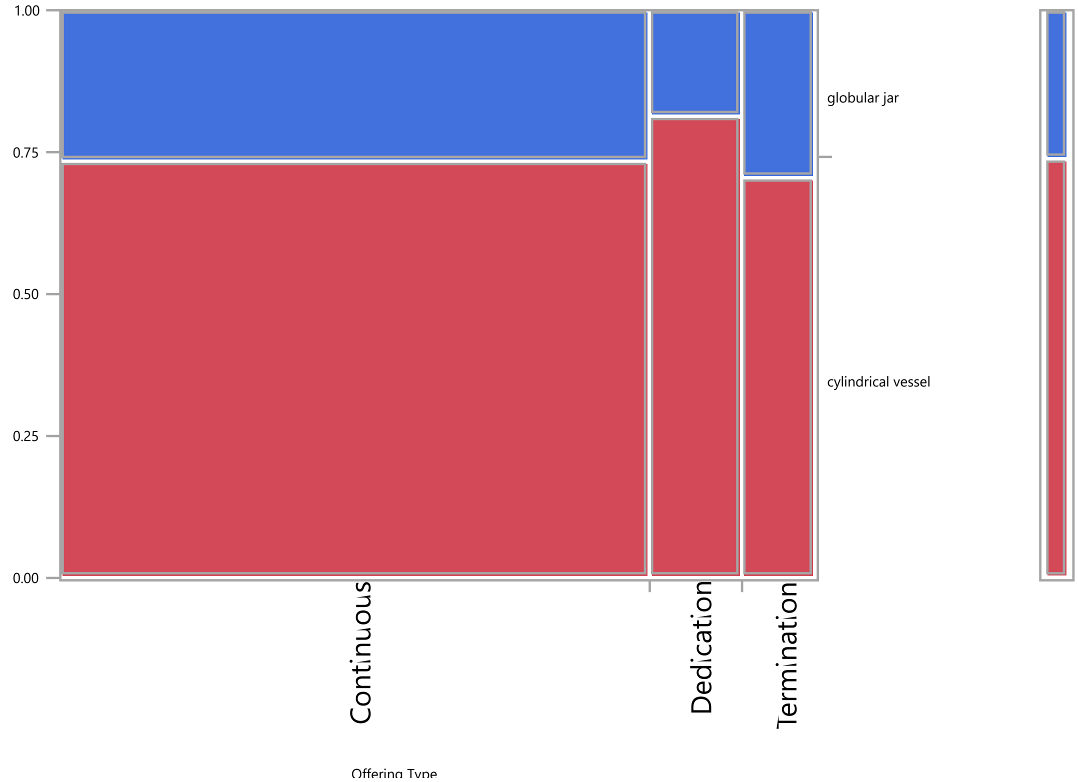
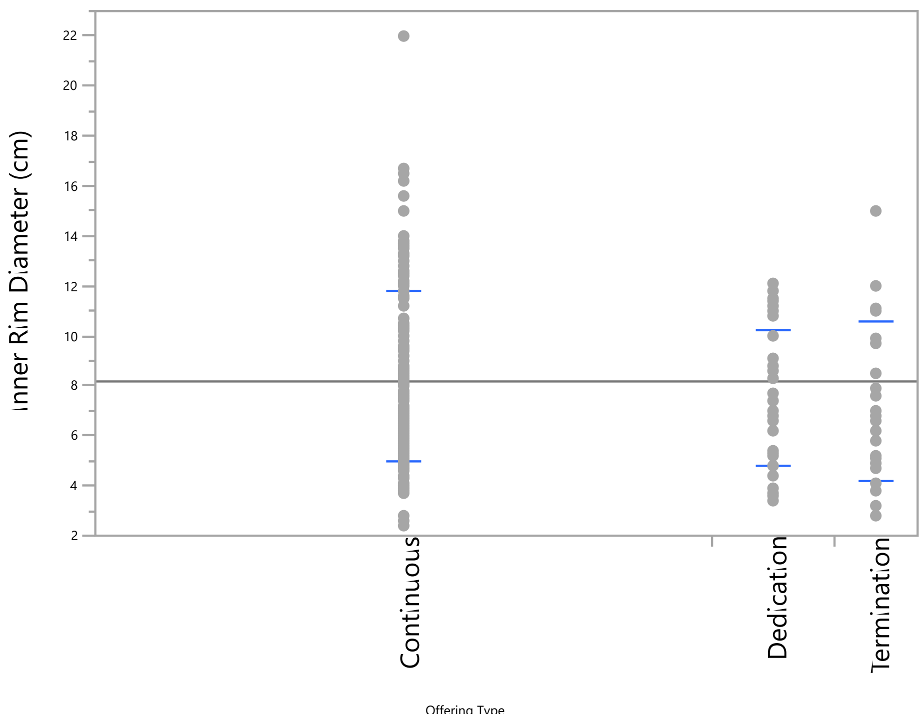


Figure A.32: Mosaic plot of vessel type by offering type.

Table A.4: Contingency table of vessel type by offering type, count and expected count labeled.

Count Expected	cylindrical vessel	globular jar	Total
Continuous	253 255.44	92 89.5598	345
Dedication	44 39.9819	10 14.0181	54
Termination	31 32.5779	13 11.4221	44
Total	328	115	443

Oneway Analysis of Rim Diameter (cm) By Offering Type (cylinders only)



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
Continuous	177	21813.5	20974.5	123.240	1.847
Dedication	35	3723.00	4147.50	106.371	-1.138
Termination	24	2429.50	2844.00	101.229	-1.306

1-Way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
3.4947	2	0.1742

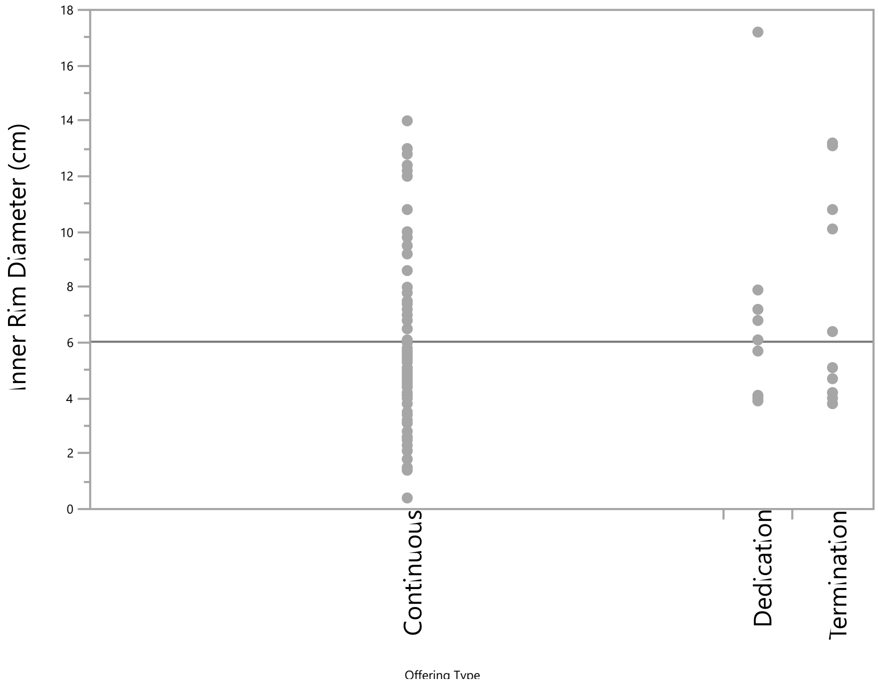
Nonparametric Comparisons For All Pairs Using Steel-Dwass Method

q*	Alpha
2.34370	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value
Termination	Dedication	-1.7560	4.54975	-0.38594	0.9212
Dedication	Continuous	-15.3824	11.34626	-1.35572	0.3644
Termination	Continuous	-18.3824	12.65106	-1.45303	0.3138

Figure A.33: Statistical tests of rim diameter in cylinders among offering types; p-values highlighted in yellow.

Oneway Analysis of Rim Diameter (cm) By Offering Type (jars only)



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
Continuous	85	4322.50	4505.00	50.8529	-1.486
Dedication	9	565.500	477.000	62.8333	1.008
Termination	11	677.000	583.000	61.5455	0.979

1-Way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
2.2280	2	0.3282

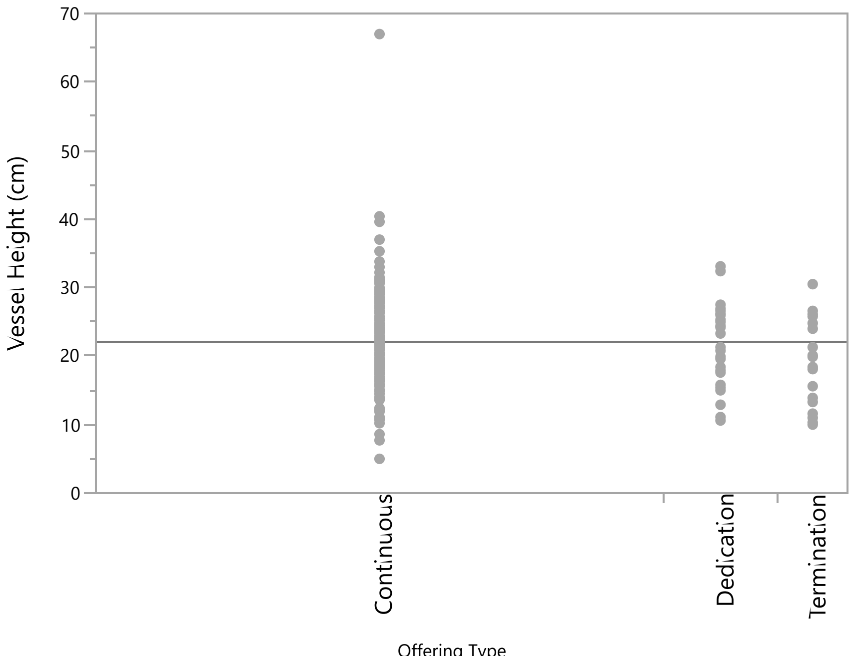
Nonparametric Comparisons For All Pairs Using Steel-Dwass Method

q*	Alpha
2.34370	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value
Dedication	Continuous	10.75163	9.559909	1.124659	0.4988
Termination	Continuous	9.65134	8.923747	1.081534	0.5255
Termination	Dedication	0.00000	2.655078	0.000000	1.0000

Figure A.34: Statistical tests of rim diameter in jars among offering types; p-values highlighted in yellow.

Oneway Analysis of Vessel Height (cm) By Offering Type (cylinders only)



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
Continuous	163	18136.0	17685.5	111.264	1.139
Dedication	33	3626.50	3580.50	109.894	0.138
Termination	20	1673.50	2170.00	83.675	-1.863

1-Way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
3.4911	2	0.1746

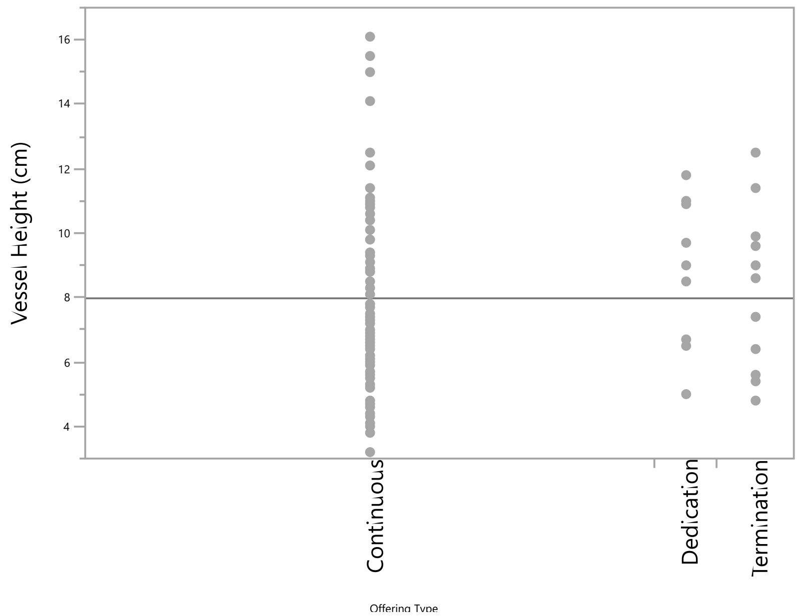
Nonparametric Comparisons For All Pairs Using Steel-Dwass Method

q*	Alpha
2.34370	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value
Dedication	Continuous	-1.3300	10.82749	-0.12283	0.9917
Termination	Dedication	-6.6250	4.37536	-1.51416	0.2842
Termination	Continuous	-23.1837	12.54987	-1.84733	0.1544

Figure A.35: Statistical tests of rim diameter in jars among offering types; p-values highlighted in yellow.

Oneway Analysis of Vessel Height (cm) By Offering Type (jars only)



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
Continuous	82	4066.50	4223.00	49.5915	-1.315
Dedication	9	569.000	463.500	63.2222	1.239
Termination	11	617.500	566.500	56.1364	0.545

1-Way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
2.0247	2	0.3634

Nonparametric Comparisons For All Pairs Using Steel-Dwass Method

q*	Alpha
2.34370	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value
Dedication	Continuous	12.0840	9.272470	1.30321	0.3933
Termination	Continuous	5.9285	8.664486	0.68423	0.7727
Termination	Dedication	-1.3131	2.658080	-0.49401	0.8742

Figure A.36: Statistical tests of height in jars among offering types; p-values highlighted in yellow.

Table A.5: Offering vessels recovered at Cerro de la Virgen during the PRV13 and PTRV16.

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob1	n/a	7.6	1.3	cb	eccentric	vertical	direct	slip
13	A	F18-Ob10	7.5	14.5	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob100	4.2	6.2	0.5	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob101	10.0	31.3	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob102	10.5	30.8	1.4	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob103	8.5	27.8	0.8	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob104	16.5	37.0	1.9	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob105	n/a	11.0 (with handle)	1.0	cb	conical bowl	outleaning	outcurving	slip
13	A	F18-Ob106	10.8	11.1	0.7	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob107	4.1	n/a	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob108	4.7	21.3	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob109	12.8	10.0	0.6	g	conical bowl	outleaning	direct	n/a
13	A	F18-Ob11	7.6	14.5	1.2	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob110	9.1	25.3	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob111	n/a	n/a	1.8	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob112	n/a	n/a	1.0	cb	cylindrical vessel	slightly incurving	n/a	slip
13	A	F18-Ob113	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
13	A	F18-Ob114	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
13	A	F18-Ob115	11.0	n/a	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob116	6.2	26.6	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob117	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob118	7.9	9.0	0.6	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob119	n/a	n/a	0.8	cb	jar	incurving convergent	n/a	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob12	4.1	6.5	1.1	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob120	10.0	25.0	0.6	g	cylindrical vessel	vertical	direct	n/a
13	A	F18-Ob121	23.5	25.0	1.1	cb	cylindrical bowl	vertical	slightly outcurving	n/a
13	A	F18-Ob122	10.0	20.8	0.7	g	cylindrical vessel	vertical	direct	n/a
13	A	F18-Ob123	12.1	33.1	1.2	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob124	17.2	11.0	1.0	cb	globular jar	incurving convergent	direct	n/a
13	A	F18-Ob125	11.5	26.3	1.2	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob126	8.8	26.9	0.7	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob127	8.6	27.5	1.2	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob128	11.8	32.4	1.4	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob129	6.8	11.8	1.0	cb	globular jar	incurving convergent	outleaning	slip
13	A	F18-Ob13	7.0	26.2	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob130	3.7	15.8	1.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob130	n/a	n/a	n/a	cb	cylindrical vessel	n/a	n/a	n/a
13	A	F18-Ob131	8.5	n/a	1.0	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob132	12.0	30.5	0.8	cb	cylindrical vessel	slightly incurving	outcurving	slip
13	A	F18-Ob133	13.8	8.5	0.4	g	incurving wall bowl	incurving convergent	direct	n/a
13	A	F18-Ob134	n/a	n/a	n/a	n/a	globular jar	n/a	n/a	n/a
13	A	F18-Ob135	n/a	n/a	n/a	n/a	globular jar	n/a	n/a	n/a
13	A	F18-Ob136	n/a	n/a	n/a	coar	globular jar	n/a	n/a	n/a
13	A	F18-Ob137	3.8	7.4	0.8	cb	globular jar	incurving convergent	direct	eroded
13	A	F18-Ob138	8.0	29.5	0.8	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob139	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
13	A	F18-Ob14	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob140	5.0	6.5	0.9	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob141	3.2	4.7	0.7	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob142	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob143	13.7	23.5	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob144	4.5	7.0	0.6	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob145	9.4	18.6	0.6	g	cylindrical vessel	vertical	direct	n/a
13	A	F18-Ob146	4.1	8.5	0.7	cb	eccentric	slightly outleaning	direct	slip
13	A	F18-Ob147	5.7	27.9	0.8	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob148	5.9	20.3	0.8	cb	cylindrical vessel	slightly inleaning	outcurving	slip
13	A	F18-Ob149	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob15	6.5	30.0	1.5	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob150	n/a	n/a	0.7	cb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob151	6.9	n/a	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob152	5.6	26.6	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob153	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob154	10.2	4.9	0.4	g	incurving wall bowl	incurving convergent	outleaning	n/a
13	A	F18-Ob155	3.2	7.0	0.6	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob156	4.0	4.8	0.7	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob157	4.0	5.4	0.6	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob158	10.8	9.0	1.0	cb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob159	9.7	24.0	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob16	12.0	24.8	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob160	5.8	21.3	1.1	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob161	7.9	n/a	1.1	cb	cylindrical vessel	vertical	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob162	3.4	15.0	0.8	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob163	6.1	9.7	1.0	cb	globular jar	semispherical	direct	slip
13	A	F18-Ob164	5.2	15.4	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob165	5.7	8.5	1.0	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob166	3.9	6.7	0.6	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob167	11.4	26.0	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob168	11.0	26.7	1.4	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob169	15.0	19.9	1.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob17	11.2	24.4	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob170	n/a	n/a	1.7	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob171	5.4	24.4	1.0	cb	cylindrical vessel	incurving divergent	direct	slip
13	A	F18-Ob172	7.7	21.4	1.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob173	8.3	24.2	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob174	7.4	19.6	0.7	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob175	7.0	19.9	0.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob176	5.3	17.9	1.4	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob177	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob178	5.4	23.3	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob179	4.8	17.6	0.8	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob18	n/a	n/a	1.5	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob180	4.6	16.6	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob181	5.6	24.5	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob182	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob183	8.6	19.8	1.0	cb	cylindrical vessel	slightly inleaning	outcurving	slip
13	A	F18-Ob184	8.5	n/a	1.3	cb	cylindrical vessel	vertical	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob185	5.0	7.2	0.9	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob186	4.6	6.6	0.7	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob187	3.8	6.7	0.9	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob188	1.4	3.8	0.4	g	globular jar	incurving convergent	direct	n/a
13	A	F18-Ob189	15.6	22.9	1.0	fb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob19	6.8	31.2	1.2	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob190	18.0	16.7	1.1	cb	cylindrical bowl	vertical	direct	slip
13	A	F18-Ob191	8.4	21.0	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob192	6.0	n/a	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob193	4.7	6.9	0.8	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob194	5.4	7.4	1.1	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob195	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob196	9.5	19.3	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob197	12.0	22.8	1.0	cb	cylindrical vessel	vertical	direct	n/a
13	A	F18-Ob198	12.8	23.1	1.3	cb	cylindrical vessel	slightly incurving	direct	slip
13	A	F18-Ob199	10.3	35.3	2.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob2	5.0	17.4	1.0	cb	cylindrical vessel	vertical	outleaning	slip
13	A	F18-Ob20	12.8	18.4	1.2	cb	cylindrical vessel	slightly inleaning	slightly outcurving	slip
13	A	F18-Ob200	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob201	13.3	27.7	1.5	cb	cylindrical vessel	vertical	direct	unclear
13	A	F18-Ob202	13.0	24.0	1.3	cb	cylindrical vessel	slightly inleaning	slightly outcurving	slip
13	A	F18-Ob204	15.0	24.9	1.2	cb	cylindrical vessel	slightly inleaning	slightly outleaning	slip
13	A	F18-Ob205	4.1	7.0	0.8	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob206	6.1	7.7	0.8	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob207	5.4	10.2	0.8	cb	cylindrical vessel	slightly inleaning	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob208	n/a	n/a	1.1	cb	cylindrical vessel	slightly inleaning	n/a	slip
13	A	F18-Ob209	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob21	6.2	20.2	1.5	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob210	n/a	n/a	0.7	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob211	13.2	9.9	0.9	cb	jar	incurving convergent	direct	slip
13	A	F18-Ob212	5.4	8.3	0.8	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob213	6.5	11.0	0.9	cb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob214	5.3	12.1	1.2	cb	jar	incurving convergent	direct	slip
13	A	F18-Ob215	13.0	10.9	0.8	cb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob216	11.5	24.8	1.3	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob217	14.0	24.2	1.1	cb	cylindrical vessel	inleaning	outcurving	slip
13	A	F18-Ob219	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob219	5.6	8.1	0.6	cb	globular jar	incurving convergent	slightly outcurving	slip
13	A	F18-Ob22	10.0	25.5	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob220	8.1	16.0	1.0	cb	cylindrical vessel	slightly inleaning	slightly outcurving	slip
13	A	F18-Ob221	3.8	6.1	0.8	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob223	n/a	n/a	n/a	cb	comal	n/a	n/a	n/a
13	A	F18-Ob224	6.9	21.6	0.7	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob225	4.9	21.9	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob226	9.6	19.8	2.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob227	6.2	10.7	0.7	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob228	n/a	n/a	1.1	cb	cylindrical vessel	slightly inleaning	n/a	slip
13	A	F18-Ob229	4.0	13.7	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob23	5.4	19.0	0.7	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob230	6.5	19.4	1.2	cb	cylindrical vessel	vertical	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob231	5.0	8.8	0.9	cb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob232	6.8	21.7	1.0	cb	cylindrical vessel	slightly incurving	direct	slip
13	A	F18-Ob233	6.7	22.3	1.0	cb	cylindrical vessel	slightly inleaning	slightly outcurving	slip
13	A	F18-Ob234	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob235	12.6	21.0	1.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob235	6.1	20.2	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob236	12.4	20.5	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob238	12.8	28.1	0.9	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob239	13.0	27.0	0.9	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob24	12.0	30.0	0.9	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob240	6.2	21.9	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob241	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob242	12.1	24.3	1.2	cb	cylindrical vessel	slightly inleaning	outcurving	slip
13	A	F18-Ob243	8.5	n/a	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob244	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob245	10.7	29.8	1.0	cb	cylindrical vessel	vertical	direct	n/a
13	A	F18-Ob246	13.2	28.3	1.1	cb	cylindrical vessel	slightly inleaning	direct	slip
13	A	F18-Ob247	6.9	17.5	0.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob248	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob249	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob25	6.3	n/a	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob250	16.2	32.2	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob251	16.7	31.5	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob252	8.4	13.6	1.0	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob253	3.1	5.3	0.7	cb	globular jar	incurving convergent	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob254	11.8	25.8	1.0	cb	cylindrical vessel	vertical	slightly outleaning	slip
13	A	F18-Ob254	9.5	10.6	0.8	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob255	9.2	10.4	1.0	cb	jar	incurving convergent	direct	slip
13	A	F18-Ob256	11.5	31.3	0.9	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob257	9.8	11.0	0.7	fb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob258	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob259	9.4	18.5	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob26	5.0	21.3	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob260	9.0	25.2	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob27	12.0	n/a	0.6	cb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob28	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob29	12.2	29.5	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob3	12.0	18.2	0.9	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob30	7.5	20.9	1.1	cb	cylindrical vessel	slightly inleaning	direct	slip
13	A	F18-Ob31	6.3	26.7	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob32	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob33	13.0	12.5	1.0	cb	globular jar	incurving convergent	direct	n/a
13	A	F18-Ob34	9.5	31.0	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob35	n/a	6.3	0.6	g	incurving wall bowl	incurving convergent	direct	n/a
13	A	F18-Ob36	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob37	8.4	22.9	1.3	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob38	12.0	n/a	0.5	fb	eccentric	lower - incurving convergent; upper - incurving divergent	direct	slip
13	A	F18-Ob39	11.4	7.5	0.7	fb	incurving wall bowl	incurving convergent	outcurving	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob4	11.6	17.5	1.5	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob40	22.5	5.1	0.5	fb	conical bowl	outleaning	everted	slip
13	A	F18-Ob41	14.1	3.4	0.8	fb	conical bowl	outleaning	outcurving	slip
13	A	F18-Ob42	25.0	n/a	0.6	fb	incurving wall bowl	incurving convergent	direct	slip
13	A	F18-Ob43	4.9	7.0	0.8	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob44	13.5	28.2	1.2	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob45	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob46	5.1	18.6	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob47	16.5	30.0	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob48	n/a	n/a	1.7	cb	cylindrical vessel	vertical	n/a	unclear
13	A	F18-Ob49	12.5	30.9	1.4	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob5	8.0	14.9	0.8	cb	cylindrical vessel	vertical	slightly outleaning	slip
13	A	F18-Ob50	4.8	6.5	0.7	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob50	12.0	29.9	1.4	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob52	8.6	9.1	0.9	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob53	9.4	19.7	1.0	cb	cylindrical vessel	slightly incurving	slightly outcurving	slip
13	A	F18-Ob54	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob55	10.3	37.1	1.6	cb	cylindrical vessel	slightly incurving divergent	direct	slip
13	A	F18-Ob56	7.8	n/a	0.8	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob57	4.0	n/a	0.9	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob58	13.2	24.5	1.3	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob59	6.8	10.8	0.7	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob6	10.4	19.5	1.1	cb	cylindrical vessel	slightly inleaning	direct	slip
13	A	F18-Ob60	n/a	n/a	0.9	cb	cylindrical vessel	incurving divergent	n/a	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob61	n/a	n/a	1.6	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob62	5.2	18.8	1.6	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob63	6.8	25.8	0.8	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob64	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob65	8.6	24.6	1.2	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob66	8.2	n/a	0.8	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob67	8.8	20.1	1.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob68	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob69	10.0	18.3	1.1	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob7	3.8	n/a	1.1	cb	cylindrical vessel	inleaning	direct	slip
13	A	F18-Ob70	8.0	29.0	1.2	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob71	7.1	29.2	1.1	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob72	9.2	23.0	0.7	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob73	8.8	23.5	0.8	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob74	9.0	23.4	0.8	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob75	14.0	n/a	0.7	cb	jar	incurving convergent	direct	slip
13	A	F18-Ob76	7.0	25.5	1.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob77	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob78	10.0	15.9	1.3	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob79	6.0	33.0	0.8	cb	cylindrical vessel	vertical	outleaning	slip
13	A	F18-Ob8	7.2	7.5	0.7	cb	globular jar	incurving convergent	outcurving	slip
13	A	F18-Ob80	5.1	33.8	1.1	cb	cylindrical vessel	slightly inleaning	direct	slip
13	A	F18-Ob80	7.7	n/a	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob82	n/a	n/a	1.0	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob83	6.3	21.9	1.4	cb	cylindrical vessel	vertical	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	A	F18-Ob84	6.0	7.7	0.9	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob85	n/a	6.7	n/a	cb	eccentric	vertical	direct	slip
13	A	F18-Ob86	n/a	n/a	0.8	cb	globular jar	incurving convergent	direct	unclear
13	A	F18-Ob88	5.8	21.6	0.8	cb	cylindrical vessel	slightly incurving	direct	slip
13	A	F18-Ob89	6.4	20.2	1.0	cb	cylindrical vessel	slightly inleaning	direct	slip
13	A	F18-Ob9	21.6	4.6	0.8	g	conical bowl	outleaning	outcurving	n/a
13	A	F18-Ob90	11.2	5.5	0.8	cb	conical bowl	outleaning	direct	n/a
13	A	F18-Ob91	10.5	27.3	1.0	cb	cylindrical vessel	slightly inleaning	direct	slip
13	A	F18-Ob92	8.8	30.6	1.1	cb	cylindrical vessel	vertical; slightly curved but this may be due to imperfection	outcurving	slip
13	A	F18-Ob93	8.3	15.1	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob94	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	unclear
13	A	F18-Ob95	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
13	A	F18-Ob96	7.5	16.5	1.2	cb	cylindrical vessel	vertical	slightly outcurving	slip
13	A	F18-Ob97	3.5	5.2	0.6	cb	globular jar	incurving convergent	direct	slip
13	A	F18-Ob98	10.0	29.5	1.0	cb	cylindrical vessel	vertical	direct	slip
13	A	F18-Ob99	4.6	10.9	0.6	cb	cylindrical vessel	outleaning	direct	slip
13	A	F18-Ob203	13.8	24.2	1.2	cb	cylindrical vessel	vertical	outcurving	slip
13	A	F18-Ob87	6.2	28.6	1.7	cb	cylindrical vessel	vertical	everted	slip
13	B	F3-s1-ob1	8.5	6.9	1.1	cb	incurving wall bowl	incurving convergent	direct	n/a
13	D	F12-Ob1	4.4	6.6	0.7	cb	globular jar	incurving convergent	direct	probable slip
13	D	F16-Ob1	12.0	24.5	1.2	cb	cylindrical vessel	vertical	slightly outcurving	unclear
13	D	F16-Ob2								
13	D	F16-Ob3	n/a	n/a	0.7	cb	cylindrical vessel	vertical	n/a	probable slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	D	F16-Ob4	n/a	n/a	0.7	cb	cylindrical vessel	incurving divergent	n/a	unclear
13	D	F16-Ob5	3.7	17.0	1.1	cb	cylindrical vessel	vertical	everted	probable slip
13	D	F17-Ob1	n/a	n/a	1.2	cb	n/a	n/a	n/a	n/a
13	D	F17-Ob10	n/a	n/a	n/a	cb	conical bowl	n/a	n/a	n/a
13	D	F17-Ob11	18.5	19.7	1.0	cb	cylindrical bowl	vertical	outcurving	n/a
13	D	F17-Ob12	5.2	15.0	0.7	cb	cylindrical vessel	slightly incurving	outcurving	slip
13	D	F17-Ob13	n/a	n/a	0.7	cb	cylindrical vessel	vertical	n/a	slip
13	D	F17-Ob2	n/a	n/a	n/a	cb	cylindrical vessel	vertical	outleaning	n/a
13	D	F17-Ob3	n/a	n/a	n/a	cb	incurving wall bowl	incurving convergent	direct	n/a
13	D	F17-Ob4	n/a	n/a	n/a	cb	conical bowl	outleaning	everted	n/a
13	D	F17-Ob5	n/a	n/a	n/a	cb	conical bowl	outleaning	n/a	n/a
13	D	F17-Ob6	n/a	n/a	n/a	cb	conical bowl	outleaning	n/a	n/a
13	D	F17-Ob7	n/a	n/a	1.9	cb	cylindrical vessel	vertical	n/a	unclear
13	D	F17-Ob8	14.0	67.0	1.0	cb	cylindrical vessel	incurving divergent	outcurving	n/a
13	D	F17-Ob9	12.0	12.4	0.8	cb	cylindrical vessel	incurving divergent	outcurving	slip
13	D	F21-Ob1	5.5	5.9	0.7	cb	globular jar	incurving convergent	outcurving	probable slip
13	D	F21-Ob10	2.9	1.6	0.5	cb	incurving wall bowl	incurving divergent	direct	slip
13	D	F21-Ob11	3.1	1.8	0.6	cb	incurving wall bowl	incurving convergent	direct	slip
13	D	F21-Ob12	5.7	8.9	0.7	cb	jar	outcurving	direct	n/a
13	D	F21-Ob2	n/a	n/a	0.8	cb	cylindrical vessel	vertical	n/a	unclear
13	D	F21-Ob3	2.3	4.4	0.7	cb	globular jar	incurving convergent	direct	probable slip
13	D	F21-Ob4	4.9	5.9	0.6	fb	globular jar	incurving convergent	outcurving	slip
13	D	F21-Ob5	5.1	6.7	0.8	cb	globular jar	incurving convergent	direct	slip
13	D	F21-Ob6	3.4	2.8	0.7	cb	incurving wall bowl	incurving convergent	direct	slip
13	D	F21-Ob7	2.6	4.8	0.6	cb	globular jar	incurving convergent	outcurving	slip
13	D	F21-Ob8	2.3	4.4	0.7	cb	globular jar	incurving convergent	outcurving	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	D	F21-Ob9	6.2	3.1	0.6	cb	incurving wall bowl	incurving divergent	n/a	n/a
13	D	F24-s2-Ob1	1.8	6.0	0.6	cb	globular jar	incurving convergent	outleaning	slip
13	D	F24-s2-Ob2	4.8	6.0	0.7	cb	globular jar	incurving convergent	direct	n/a
13	D	F24-s2-Ob3	6.0	n/a	0.6	fb	eccentric	incurving convergent	outcurving	unclear
13	D	F24-s2-Ob4	2.3	5.5	0.6	cb	jar	incurving convergent	outcurving	slip
13	D	F24-s2-Ob5	5.4	2.5	0.6	cb	incurving wall bowl	incurving divergent	direct	slip
13	D	F24-s2-Ob6	5.3	3.6	0.6	cb	incurving wall bowl	incurving convergent	direct	slip
13	D	F24-s2-Ob7	3.5	5.7	0.6	cb	jar	composite silhouette	outcurving	slip
13	D	F24-s2-Ob8	2.5	4.1	0.5	cb	globular jar	incurving convergent	direct	probable slip
13	D	F24-s2-Ob9	2.6	4.0	0.5	cb	globular jar	incurving convergent	direct	slip
13	D	F3-Ob1	7.2	9.4	0.7	cb	globular jar	incurving convergent	direct	slip
13	D	F3-Ob10	6.5	7.8	0.9	cb	globular jar	incurving convergent	direct	slip
13	D	F3-Ob11	8.0	11.4	0.7	cb	globular jar	incurving convergent	outcurving	slip
13	D	F3-Ob12	7.2	8.8	0.8	cb	globular jar	incurving convergent	direct	probable slip
13	D	F3-Ob12	7.5	8.5	0.9	cb	globular jar	incurving convergent	direct	slip
13	D	F3-Ob13	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
13	D	F3-Ob14	22.0	n/a	1.0	cb	cylindrical vessel	vertical	slightly incurving divergent	
13	D	F3-Ob15	n/a	n/a	0.6	cb	cylindrical vessel	vertical	n/a	
13	D	F3-Ob16	5.7	9.8	0.7	cb	globular jar	incurving convergent	direct	unclear
13	D	F3-Ob17	4.7	7.3	0.8	cb	globular jar	incurving convergent	direct	slip
13	D	F3-Ob18	6.1	8.8	0.7	cb	globular jar	incurving convergent	direct	slip
13	D	F3-Ob19	5.8	8.3	0.8	cb	globular jar	incurving convergent	direct	probable slip
13	D	F3-Ob2	7.0	8.5	0.7	cb	globular jar	incurving convergent	direct	probable slip
13	D	F3-Ob20	4.8	7.4	0.6	cb	globular jar	incurving convergent	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
13	D	F3-Ob21	n/a	7.0	0.7	cb	globular jar	semispherical	direct	slip
13	D	F3-Ob22	4.0	5.8	0.7	cb	incurving wall bowl	incurving divergent	direct	unclear
13	D	F3-Ob23	12.4	15.0	0.8	cb	globular jar	incurving convergent	outcurving	slip
13	D	F3-Ob3	12.8	16.1	0.8	cb	globular jar	incurving convergent	outcurving	probable slip
13	D	F3-Ob4	12.8	16.1	0.8	cb	globular jar	incurving convergent	outcurving	slip
13	D	F3-Ob5	12.4	15.0	0.8	cb	globular jar	incurving convergent	outcurving	slip
13	D	F3-Ob6	10.0	14.1	0.8	cb	globular jar	incurving convergent	outcurving	slip
13	D	F3-Ob7	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
13	D	F3-Ob8	5.5	9.3	1.0	cb	globular jar	incurving convergent	direct	slip
13	D	F3-Ob9	8.0	6.0	1.0	cb	cylindrical bowl	vertical	direct	probable slip
13	D	F9-Ob1	4.2	5.6	0.6	cb	globular jar	incurving convergent	direct	probable slip
13	D	F9-Ob2	3.8	6.4	0.5	cb	globular jar	incurving convergent	direct	unclear
13	D	F9-Ob3	3.2	11.6	0.7	cb	cylindrical vessel	vertical	direct	probable slip
13	D	F9-Ob4	4.9	13.3	0.5	cb	cylindrical vessel	outcurving	direct	slip
13	D	F9-Ob5	6.8	12.9	0.9	cb	cylindrical vessel	outleaning	outcurving	probable slip
13	D	F9-Ob6	4.0	5.0	0.6	cb	globular jar	incurving convergent	direct	probable slip
13	D	F9-Ob7	6.8	11.1	0.6	g	cylindrical vessel	vertical	outcurving	n/a
13	D	F9-Ob8	3.6	10.6	0.9	cb	cylindrical vessel	slightly outleaning	direct	unclear
13	D	F9-Ob9	3.8	9.8	0.6	cb	cylindrical vessel	vertical	direct	probable slip
13	F	F8-ob1	6.2	10.3	0.9	cb	cylindrical vessel	vertical	direct	
13	F	F8-ob2	5.2	10	0.6	cb	cylindrical vessel	vertical	direct	n/a
13	F	F8-ob3	n/a	1.7	n/a	cb	conical bowl	outcurving	everted?	
16	A	F10-ob1	0.4	3.8	0.5	g	globular jar	incurving convergent	direct	n/a
16	A	F10-ob2	2.8	3.8	0.8	g	globular jar	incurving convergent	outcurving	n/a
16	A	F10-ob3	2.1	4.1	0.7	g	globular jar	incurving convergent	direct	n/a

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
16	A	F10-ob4	2.8	4.3	0.6	cb	globular jar	incurving convergent	direct	n/a
16	A	F10-ob5	n/a	n/a	0.8	cb	cylindrical vessel	vertical	n/a	slip
16	A	F18-ob1	18.8	n/a	1	cb	n/a; see note	n/a	direct	n/a
16	A	F22-s1-ob1	4.6	6.4	0.6	cb	globular jar	incurving convergent	direct	n/a
16	A	F25-s1-ob1	8.4	21.1	1.2	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob10	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob11	6.1	24.8	1.1	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob12	9.4	24	1.4	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob13	9.8	21.7	1.4	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob14	15.6	14	1	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob15	n/a	n/a	0.8	cb	n/a	vertical	n/a	slip
16	A	F25-s1-ob16	6.7	23.8	1.2	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob17	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob18	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob19	5.3	23.6	0.7	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob2	9	n/a	1.3	cb	cylindrical vessel	vertical	slightly outcurving	n/a
16	A	F25-s1-ob20	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob21	7.4	29.3	1.9	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob22	9.8	16.7	1	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob23	4.1	n/a	1	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob24	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob25	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	n/a
16	A	F25-s1-ob26	5.8	26.3	0.9	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob27	n/a	n/a	0.6	cb	cylindrical vessel	vertical	n/a	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
16	A	F25-s1-ob28	n/a	n/a	1.4	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob29	5.6	22.5	0.8	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob3	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob30	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob31	7.1	26.3	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob32	7.6	n/a	1	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob33	4.7	12.5	0.8	cb	globular jar	incurving convergent	direct	slip
16	A	F25-s1-ob34	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob35	13.2	39.6	1.5	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob36	9.5	25.5	1.3	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob37	3.9	12.5	1.1	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob38	4.1	12.2	1.1	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob39	n/a	n/a	1.4	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob4	7.2	24.6	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob40	n/a	n/a	1.4	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob41	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob42	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob43	n/a	n/a	0.8	cb	cylindrical vessel	vertical	n/a	eroded
16	A	F25-s1-ob44	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob45	5.1	21.6	0.9	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob46	7.9	13.1	1.5	cb	eccentric	vertical	slightly outcurving	slip
16	A	F25-s1-ob47	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob48	4.4	n/a	0.8	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob49	5.4	29.6	1.4	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob5	6.5	17.9	1.4	cb	cylindrical vessel	vertical	outcurving	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
16	A	F25-s1-ob50	12.8	29.1	1.8	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob51	10.4	16.5	1.1	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob52	11.1	26.6	1.9	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob53	5.1	26.1	1.5	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob54	5.4	18.4	1	cb	cylindrical vessel	vertical	outcurving	n/a
16	A	F25-s1-ob55	5.4	20.8	0.9	cb	cylindrical vessel	vertical	outcurving	eroded
16	A	F25-s1-ob56	10.9	25.9	1.5	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob57	4.5	16.6	0.9	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob58	4.6	18.5	0.9	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob59	5.7	18.2	1.3	cb	cylindrical vessel	vertical	direct	eroded
16	A	F25-s1-ob6	n/a	n/a	0.7	cb	cylindrical vessel	vertical	n/a	eroded
16	A	F25-s1-ob60	n/a	13.8	1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob61	4.1	n/a	0.7	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob62	4.4	n/a	0.5	cb	globular jar	incurving convergent	outcurving	slip
16	A	F25-s1-ob63	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	eroded
16	A	F25-s1-ob64	4.8	16.3	1.1	cb	cylindrical vessel	vertical	direct	n/a
16	A	F25-s1-ob65	7.5	40.4	1	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob66	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob67	7.1	24.1	1.2	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob68	11.2	17.1	1.2	fb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob69	5.1	18.4	0.7	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F25-s1-ob7	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob70	4.6	22.2	1	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob71	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob72	6.6	25.8	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
16	A	F25-s1-ob73	8.4	25.2	1.1	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F25-s1-ob74	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob75	10.1	8.6	0.8	cb	globular jar	incurving convergent	outcurving	slip
16	A	F25-s1-ob76	n/a	n/a	1.2	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob77	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob78	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	eroded
16	A	F25-s1-ob79	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob8	10.2	17.6	1.4	cb	cylindrical vessel	vertical	direct	slip
16	A	F25-s1-ob80	n/a	n/a	1.3	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob81	n/a	n/a	0.8	cb	cylindrical vessel	vertical	n/a	slip
16	A	F25-s1-ob9	8.4	18.4	0.7	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F37-ob1	6.6	11.9	0.7	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F37-ob2	6.9	14.6	0.7	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F42-s1-ob1	9.5	23.7	1.5	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F42-s1-ob2	12.2	9.3	0.7	cb	globular jar	incurving convergent	outcurving	slip
16	A	F42-s1-ob3	8.2	20.1	0.9	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F42-s1-ob4	6.5	27.3	0.9	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	A	F42-s1-ob5	6.2	20.6	0.8	cb	cylindrical vessel	vertical	outcurving	slip
16	A	F42-s1-ob6	3.5	6.1	0.8	g	globular jar	incurving convergent	slightly outcurving	n/a
16	A	F42-s1-ob7	n/a	n/a	0.7	cb	cylindrical vessel	vertical	n/a	slip
16	A	F57-ob1	3.4	4.6	0.7	cb	globular jar	incurving convergent	direct	n/a
16	A	F58-ob1	2.4	5	0.6	cb	cylindrical vessel	vertical	slightly outcurving	eroded
16	A	F5-ob1				cb	cylindrical vessel	vertical	n/a	
16	A		11	21.4	1.3	cb	cylindrical vessel	vertical	slightly outcurving	eroded
16	B	F18-s1-ob1	3.9	14.1	0.7	cb	cylindrical vessel	vertical	outcurving	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
16	B	F18-s1-ob2	4.3	14	0.8	cb	cylindrical vessel	vertical	outcurving	slip
16	B	F18-s1-ob3	3.7	17.6	0.7	cb	cylindrical vessel	vertical	outcurving	slip
16	B	F18-s1-ob4	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	B	F22-ob1	n/a	n/a	0.8	cb	cylindrical vessel	vertical	n/a	slip
16	B	F4-ob1	1.5	3.2	0.3	g	globular jar	incurving convergent	direct	n/a
16	B	F4-ob3	5.3	6.8	0.4	g	globular jar	incurving convergent	outcurving	slip
16	B	F5-ob1	n/a	n/a	0.7	cb	cylindrical vessel	outleaning	n/a	n/a
16	B	F5-ob2	2.6	7.7	0.6	cb	cylindrical vessel	outleaning	outcurving	n/a
16	B	F5-ob3	n/a	n/a	0.6	cb	n/a	n/a	n/a	n/a
16	B	F6-ob1	7.2	10.9	0.7	cb	globular jar	incurving convergent	direct	slip
16	B	F6-ob2	5.1	11.4	0.7	g	globular jar	incurving convergent	outcurving	n/a
16	B	F7-ob1	6.4	7.4	0.9	g	globular jar	inleaning convergent	direct	n/a
16	F	F37-s1-ob1	3.2	5.7	0.6	g	globular jar	incurving convergent	direct	n/a
16	F	F37-s1-ob2	3.5	6.1	0.5	fb	globular jar	incurving convergent	direct	n/a
16	F	F42-ob1	7.8	n/a	0.4	g	globular jar	incurving convergent	everted	n/a
16	F	F43-ob1	n/a	n/a	0.8	cb	n/a	n/a	n/a	slip
16	F	F44-ob1	n/a	n/a	0.3	cb	cylindrical vessel	vertical	direct	n/a
16	F	F44-ob2	n/a	n/a	1	cb	n/a	n/a	n/a	n/a
16	F	F44-ob3	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	n/a
16	F	F44-ob4	n/a	n/a	n/a	cb	n/a	n/a	n/a	slip
16	F	F44-ob5	3.9	15.1	0.5	cb	cylindrical vessel	vertical	outcurving	slip
16	F	F60-s1-ob1	n/a	n/a	0.9	cb	cylindrical vessel	vertical	n/a	n/a
16	F	F60-s1-ob10	3.8	18.4	0.8	cb	cylindrical vessel	vertical	outcurving	slip
16	F	F60-s1-ob11	8.7	23.5	1	cb	cylindrical vessel	vertical	direct	n/a
16	F	F60-s1-ob12	7.6	6.1	0.6	cb	incurving wall bowl	incurving convergent	direct	slip; see note

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
16	F	F60-s1-ob13	13.6	13.8	0.9	cb	cylindrical vessel	vertical	outcurving	eroded
16	F	F60-s1-ob14	13.1	9.6	0.6	cb	globular jar	incurving convergent	direct	slip
16	F	F60-s1-ob15	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	slip
16	F	F60-s1-ob16	4.2	3.9	1	cb	eccentric	vertical	direct	slip
16	F	F60-s1-ob17	4.1	13.9	0.5	cb	cylindrical vessel	vertical	slightly outleaning	slip
16	F	F60-s1-ob18	4.7	18.4	0.8	cb	cylindrical vessel	vertical	outcurving	slip
16	F	F60-s1-ob19	5.2	18.4	0.9	cb	cylindrical vessel	vertical	direct	slip
16	F	F60-s1-ob2	2.4	3.6	0.4	g	globular jar	incurving convergent	direct	n/a
16	F	F60-s1-ob20	n/a	n/a	1.1	cb	cylindrical vessel	vertical	n/a	slip
16	F	F60-s1-ob21	5.2	8.6	0.6	cb	cylindrical vessel	outleaning	direct	n/a
16	F	F60-s1-ob22	10.8	21.3	0.9	cb	cylindrical vessel	vertical	outcurving	slip
16	F	F60-s1-ob23	5.1 x 12.3	4.8	1.4	cb	eccentric	vertical	direct	slip
16	F	F60-s1-ob24	n/a	n/a	0.8	cb	n/a	n/a	n/a	slip
16	F	F60-s1-ob25	4.4	n/a	0.6	cb	cylindrical vessel	vertical	outcurving	slip
16	F	F60-s1-ob26	6.6	n/a	0.7	cb	cylindrical vessel	vertical	slightly outcurving	n/a
16	F	F60-s1-ob27	n/a	n/a	0.8	cb	cylindrical vessel	vertical	n/a	slip
16	F	F60-s1-ob28	n/a	n/a	0.4	cb	cylindrical vessel	vertical	n/a	n/a
16	F	F60-s1-ob29	n/a	n/a	1	cb	cylindrical vessel	vertical	n/a	n/a
16	F	F60-s1-ob3	2.8	11	0.9	cb	cylindrical vessel	vertical	outleaning	n/a
16	F	F60-s1-ob30	n/a	n/a	0.8	cb	n/a	n/a	n/a	n/a
16	F	F60-s1-ob31	7	n/a	0.4	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	F	F60-s1-ob32	4.8	8.8	1	cb	globular jar	incurving convergent	direct	slip
16	F	F60-s1-ob33	3.8	18.1	1	cb	cylindrical vessel	vertical	slightly outcurving	n/a
16	F	F60-s1-ob34	n/a	n/a	1.1	cb	globular jar	incurving convergent	n/a	slip
16	F	F60-s1-ob35	9.9	20.1	1.1	cb	cylindrical vessel	vertical	direct	slip

Yr.	Op	Feature #	Diam. (cm)	Height (cm)	Wall Thick (cm)	Paste	Vessel Type	Wall Form	Rim Form	Surface Dec.
16	F	F60-s1-ob36	n/a	n/a	0.5	cb	globular jar	incurving convergent	n/a	slip
16	F	F60-s1-ob37	6.8	15.6	0.7	cb	cylindrical vessel	slightly inleaning	outcurving	slip
16	F	F60-s1-ob38	n/a	33.1	1.2	cb	cylindrical vessel	vertical	n/a	eroded
16	F	F60-s1-ob4	4.5	5.1	0.6	cb	globular jar	incurving convergent	direct	n/a
16	F	F60-s1-ob40	5.3	7.6	0.5	cb	incurving wall bowl	incurving convergent	direct	n/a
16	F	F60-s1-ob40	27.6	n/a	1.3	cb	globular jar	incurving convergent	outcurving	slip
16	F	F60-s1-ob41	4	5.6	0.6	g	globular jar	incurving convergent	everted	n/a
16	F	F60-s1-ob42	7.4	10.1	1.1	cb	globular jar	slightly incurving convergent	slightly inleaning	n/a
16	F	F60-s1-ob5	5.5	15.6	1.3	cb	cylindrical vessel	vertical	direct	eroded
16	F	F60-s1-ob6	4.4	17.4	0.4	cb	cylindrical vessel	vertical	slightly outcurving	slip
16	F	F60-s1-ob7	n/a	6.9	1.3	cb	eccentric	vertical	direct	slip
16	F	F60-s1-ob8	5.3	17.5	1.1	cb	cylindrical vessel	vertical	outcurving	slip
16	F	F60-s1-ob9	5.4	17.9	1.2	cb	cylindrical vessel	vertical	outcurving	slip
16	G	F3-ob1	n/a	~51	1.2	cb	cylindrical vessel	vertical	n/a	slip
16	G	F3-ob2	n/a	~51	1.1	cb	cylindrical vessel	vertical	n/a	slip
16	G	F3-ob3	2.8	11.1	0.9	cb	cylindrical vessel	vertical	outcurving	slip
16	G	F3-ob4	6.3	15.6	0.8	cb	cylindrical vessel	vertical	outcurving	n/a
16	G	F3-ob5	n/a	15.5	0.8	cb	globular jar	incurving convergent	n/a	slip
16	G	F9-ob1	n/a	n/a	1	cb	eccentric	n/a	n/a	slip

Primary Ceramic Deposits

Outside of offerings (see above), very few primary deposits of ceramic artifacts were found during the 2013 and 2016 field seasons at Cerro de la Virgen. In total, three discrete primary contexts of ceramic materials were identified, two of which were associated with Structure E1 on Terrace 15a in Complex E (PTRV16-Op A-F34 and Op A-MUA-1) and one associated with Structure 5 in Complex B (Op F-MUA-2). All were excavated during the 2016 field season. All vessel counts in each context were made based on diagnostic rim sherds.

PTRV16-Op A-F34

F34 was a collection of ceramic sherds likely deposited into a pit directly to the south of Structure E1 in Complex E (see Chapter 6) that dated to the Chacahua phase (Figure A.37). The scale of F34 suggests that it was not a large-scale midden used for an extended period. Rather, stratigraphic evidence suggests that it was a small-scale refuse deposit, likely stemming from cooking and serving practices carried out around Terrace 15a. Of the aggregate sample of xxx sherds weighing xxx kg, only 35 diagnostic rim sherds were recovered, 21 of which were gray wares and 14 of which were coarse brown wares. Twenty-three of the sherds were serving bowls (15 gray wares and eight coarse brown wares), including 16 conical bowls that measured an average of 31.8 cm in diameter and five incurving wall bowls that measured an average of 17.0 cm in diameter. Three sherds did not have a segment of preserved rim large enough to estimate a diameter. Conical bowls in the sample had outcurving or outleaning walls with direct, everted or outcurving rims. Incurving wall bowls had convergent and divergent walls with predominantly direct rims. Eleven were jars of various sizes, ranging in diameter from 8-34 cm, all of which had incurving convergent walls with direct, everted, or outcurving rims. The four gray ware jars in the subset were the four smallest overall, ranging in diameter from 8-18 cm. Coarse brown ware jars ranged from 21-34 cm in diameter. It is likely that the gray ware jars constituted serving wares or perhaps storage wares for liquids in lesser volumes. Finally, one small fragment of a comal was found in the deposit; the sherd did not appear to be burned on the interior or exterior.

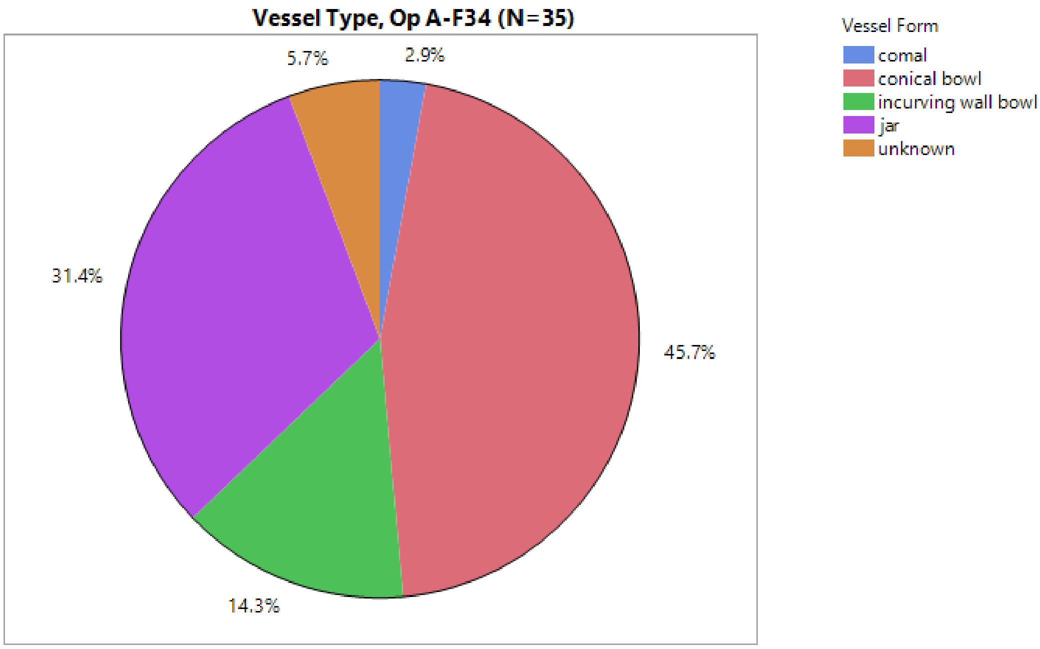


Figure A.37: Vessel types in PTRV16-Op A-F34.

PTRV16-Op A-F41

F41 was a ceramic sherd deposit similar to F34, but was shallower in depth and larger in area, spanning units 25M and 26M in Operation A. The feature was likely deposited as refuse resulting from cooking and/or feasting activities carried out prior to the construction of Structure E1-sub during the the Chacahua phase. The sample included 28 diagnostic rim sherds (Figure A.38). Fifteen sherds were coarse brown wares, 12 were gray wares, and one was made of fine brown paste. In contrast with F34, serving bowl measurements appeared to be much more similar across paste types and forms. A total of sixteen sherds were serving bowls, including 13 conical bowls measuring an average of 28.8 cm in diameter, two cylindrical bowls with an average of 18.5 cm in diameter, and one incurving wall bowl that measured 19 cm in diameter. Conical bowls typically had direct or outcurving rims that were exterior thickened or unthickened. Cylindrical bowls and incurving wall bowls had exclusively direct, unthickened rims. A total of ten jars were present in the sample, all of which were storage vessels that were, on average, smaller in diameter (mean of 17.5 cm) than the subset of coarse brown ware jars in F34. Jars typically had outcurving or direct rims and very short necks. Finally, two *comales* were recovered in the sample, both of which exhibited evidence of burning on their undersides (exteriors). The *comales* were quite large in size, averaging 45.5 cm in diameter.

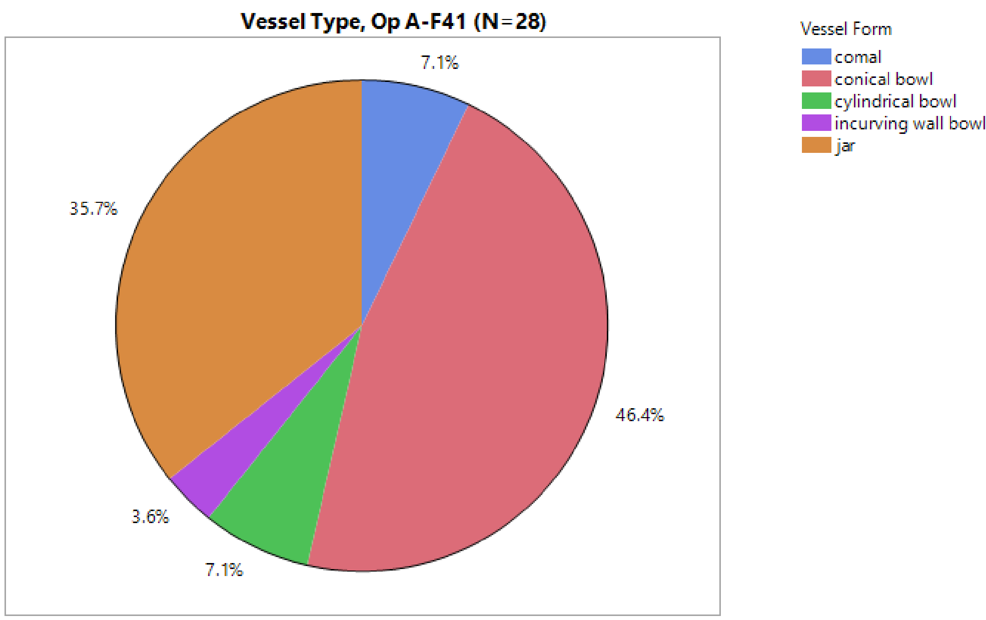


Figure A.38: Vessel types in PTRV16-Op A-F41.

PTRV16-Op F-F41

F41 was a ceramic deposit of several broken vessels placed prior to the construction of a retaining wall associated with Structure 5 in Complex B (see Chapter 5). Based on stratigraphic evidence, it is possible that F41 represented a termination offering associated with the ballcourt or Structure 5-sub, similar in scope and content as the termination deposits of sherds that were placed in pits on the Rio Viejo acropolis at the end of the Formative (Joyce et al. 2016). The ceramic sample of the feature consisted of 24 were diagnostic rims or bases (Figure A.39). Eleven sherds were coarse brown wares, nine were gray wares, and four were fine brown wares. All fine brown wares were conical bowls with outleaning, outcurving, and direct rims measuring from 13-30 cm in diameter. Coarse brown ware serving bowls included one conical bowl with a direct rim and four incurving wall bowls with direct and incurving rims. The coarse brown conical bowl was quite large, measuring 42 cm in diameter, whereas the coarse brown incurving wall bowls measured 20.8 cm in diameter, on average. Sherds classified as jars in the sample were all made from coarse brown paste but were diverse in form, consisting of a fragmented coarse brown ware cylinder, several small storage jars, and a large, 47-cm diameter jar with thick, exterior bolstered rims. It is likely that the latter was a very large cooking vessel with a slightly restricted opening. The assemblage did not contain other cooking wares such as *comales.*

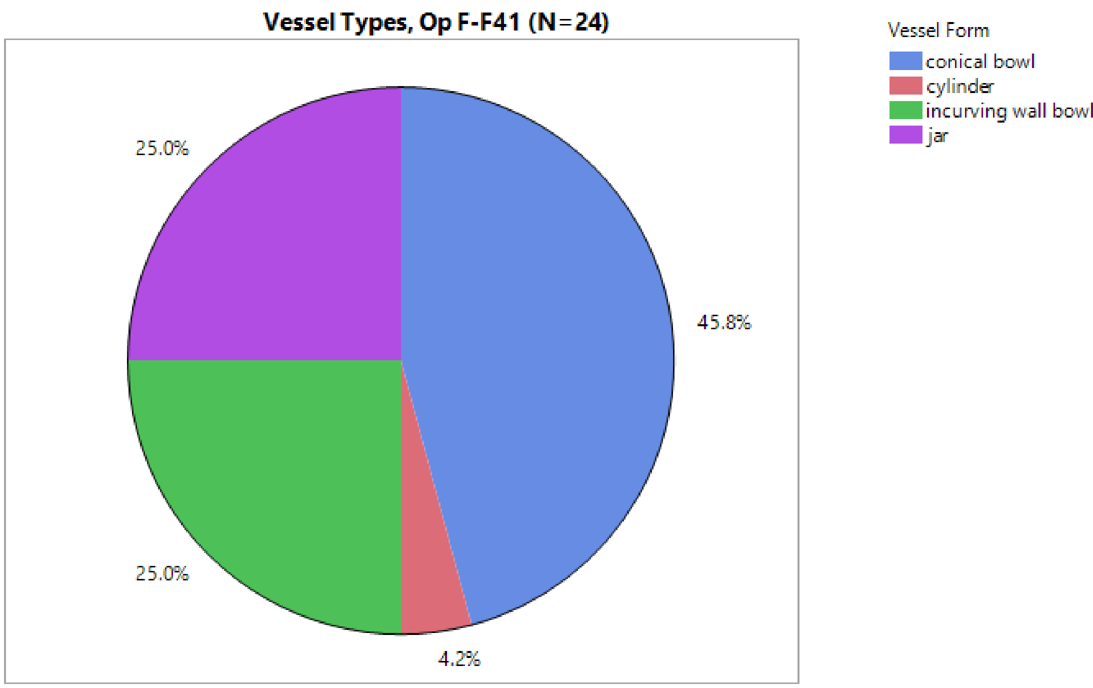


Figure A.39: Vessel types in PTRV16-Op F-F41.

APPENDIX B: LITHIC ANALYSIS

Introduction

This appendix presents typological and functional analyses of lithic artifacts recovered from excavations carried out during the 2013 and 2016 field seasons at Cerro de la Virgen. Stone tools form an essential category of objects necessary to provide details on the quotidian and ceremonial practices of the site's residents during the later Formative and Early Classic periods, as well as on patterns of interregional interaction and exchange. In the summer of 2017, I spent two weeks analyzing the obsidian and ground stone from Cerro de la Virgen assemblage at the INAH archaeological laboratory located in the Ex-Convento of Cuilapan de Guerrero, Oaxaca. I began by recording basic quantitative measurements, including maximum length, width, and thickness, using digital calipers that measured to the nearest hundredth of a centimeter. The weight of each artifact was recorded using a digital scale to the nearest hundredth of a gram. For obsidian, artifact categories were classified according to typological criteria established by David Williams (2012), who analyzed over 5,000 obsidian artifacts from the lower Verde during his master's thesis. Williams (2012:37-42) utilized a simplified version of the descriptive categories established by Clark (1988:30–33), Aoyama (2009:18), Parry (1987:33–41), Whittaker (1994), and Clark and Bryant (1997:112–128).

Following Williams' study, another measurement relevant to the analysis of prismatic blades, the cutting edge-to-mass (CE/M) ratio, was also calculated in cm/gram. The CE/M ratio is used to model the "scarcity of obsidian" in Pre-Columbian contexts, particularly as it relates to regions located far from obsidian sources, such as the lower Verde (Sheets and Muto 1972:633). Sheets and Muto (1972) hypothesized that the distance to an obsidian source is inversely proportional to the size and weight of a blade, such that consistently thinner and narrower blades should be found among populations located further from a source. The ratio was calculated by doubling the length recorded for each blade and dividing by the weight.

I also recorded the color of each obsidian artifact as a precursor to the XRF sourcing study presented Appendix 3. Each artifact was washed carefully with water and held up to natural, direct sunlight to maintain consistency in color designation. Colors were classified according to one of four categories--green, black, gray, and clear. Though scholars of some areas of Mesoamerica, such as the Maya region (e.g., Braswell et al. 2000), have had success in identifying obsidian sources through the identification of colors visually, many Mexican sources tend to varying tremendously across a gradient of black to light gray (Cobean 2002). For the lower Verde, Levine and colleagues (Levine et al. 2011) successfully identified obsidian from Pachuca and Pico de Orizaba, but the color variation among obsidian from other sources has precluded using visual inspection exclusively. My familiarity with the artifacts allowed me to identify Pachuca (green) obsidian, making it unnecessary to submit these artifacts for XRF. I did not complete microscopic use wear analyses on the obsidian artifacts, though an analysis of use wear would be useful in the future.

Ground stone artifacts were also analyzed during the summer of 2017 at the INAH archaeology facility in the Ex-Convento at Cuilapan de Guerrero, Oaxaca. Initial processing of the artifacts included washing off adhered sediment with water and a soft-bristled brush to evaluate the type of stone and to make basic observations of use wear on the surface. All materials that were less than 1 kg in mass were weighed with a digital scale to the nearest hundredth of a kilogram. All materials greater in mass than 1 kg were weighed with a mechanical scale that was on hand at the INAH laboratory. The heavier materials were weighed to the nearest tenth of a kilogram. Quantitative measurements such as length, width, and thickness were measured to the nearest hundredth of a centimeter using digital calipers. Qualitative analyses were made using typological attributes adapted from Katherine Wright's (1992) classification system for the Prehistoric Levant and Jenny Adams's (2014) work on classification and usewear in the Pre-Columbian Southwest. To date, no systematic classificatory analyses of ground stone artifacts or use-wear on materials from the lower Verde have been undertaken.

The Obsidian Assemblage

The Cerro de la Virgen obsidian assemblage consists of 313 artifacts recovered during the 2013 and 2016 excavation projects (Tables B.1 and B.2). Obsidian artifacts were recovered in every architectural complex explored during the two seasons, including Complexes A and B, Structure 1, and the Plaza in the ceremonial center and Complex E located to the north. The archaeological features from which obsidian was recovered ranged in date from the Miniyua to the Coyuche phase, with a sizeable group recovered from mixed chronological contexts that likely formed as colluvium after this chronological period. Below, I briefly describe the typological methods used to classify obsidian artifacts before summarizing the general typological and functional attributes in the assemblage. I end with some general observations for the assemblage, followed by interpretations broken down by spatial and/or chronological context(s).

The characteristics of the obsidian artifacts recovered from the site indicate that small-scale prismatic blade production and tool maintenance occurred throughout the occupation of the site. Though there was a great deal of variation in the chaine operatoire of prismatic blade production in Mesoamerica, certain fundamental processes appear across time and space (Clark and Bryant 1997). Most of the Cerro de la Virgen assemblage consisted of flakes and tools (88.5%), with the former category comprised almost entirely of tertiary (interior) flakes lacking cortex and the latter consisting primarily of prismatic blades, as well as bifaces, one possible projectile point, and scrapers. Only one secondary flake exhibited scant evidence of cortex, indicating that residents of Cerro de la Virgen almost exclusively obtained obsidian in the form of prepared cores or perhaps even finished tools (see discussion in Williams 2012:46-50). Excavations uncovered only one possible exhausted core; however, given that hundreds of prismatic blades and other flake tools can originate from a single core, the presence of only a single core should not preclude the possibility that residents of the Cerro de la Virgen consistently obtained obsidian cores through time.

Table B.1: Quantities of artifacts in the obsidian assemblage by category.

Artifact Category	N	% of Total
core	1	0.32%
debitage	35	11.18%
flake	179	57.19%
blades/tools	98	31.31%
All	313	100%

Table B.2: Summary statistics of obsidian color by artifact type.

	Black		Clear		Gray		Green	
Artifact Type	N	%	N	%	N	%	N	%
biface	1	0.32%	0	0.00%	7	2.24%	1	0.32%
core	1	0.32%	0	0.00%	0	0.00%	0	0.00%
debitage	2	0.64%	0	0.00%	18	5.75%	15	4.79%
flake	9	2.88%	3	0.96%	74	23.64%	91	29.07%
flake fragment	0	0.00%	0	0.00%	1	0.32%	1	0.32%
percussion blade	0	0.00%	0	0.00%	5	1.60%	3	0.96%
prismatic blade	2	0.64%	0	0.00%	16	5.11%	60	19.17%
projectile point	1	0.32%	0	0.00%	0	0.00%	0	0.00%
scraper	0	0.00%	0	0.00%	0	0.00%	1	0.32%
utilized flake	0	0.00%	0	0.00%	1	0.32%	0	0.00%
All	16	5.11%	3	0.96%	122	38.98%	172	54.95%

Flakes comprised 131 (41.9%) of the obsidian objects recovered at the site. Flakes in the assemblage were removed predominantly as tertiary flakes during the final stages of tool production, as platform preparation flakes that served to extend the use life and production of obsidian cores, or as thinning flakes indicative of tool sharpening (Figures B.1-B.2). Flakes were quite small and thin, measuring 1.29 cm in length, 1.15 cm in width, and 0.27 cm in thickness, on average. On occasion, some of the largest flakes were utilized for certain practices involving cutting or chopping, indicated by use wear on one or more of their edges. Only flakes ending in a sharp, feather termination were utilized as expedient tools and may have been hafted onto wood or bone handles for various purposes. The high frequency of tertiary flakes and absence of primary or secondary flakes indicates that residents of Cerro de la Virgen obtained obsidian in the form of prepared prismatic cores. Alternatively, people at the site may have completed initial reduction of the raw material in a different area.

Figure B.1: Obsidian flakes from Cerro de la Virgen.

Figure B.2: Core rejuvenation flake from Cerro de la Virgen.

Excavations also recovered a variety of obsidian tools and tool fragments, which collectively comprised 31.3% of the aggregate sample (Table B.3-B.4). Almost four out of every five (79.6%) tools were prismatic blades. Most prismatic blades were “final-series” or “third-series” blades with one or two arises on their dorsal surface, driven off a prepared prismatic core (Figure B.3). Far fewer percussion blades (8.2%) were recorded, none of which had cortex present, further indicating that the initial stages of prismatic core preparation and reduction were not often practiced by flintknappers at the site. Every prismatic blade had significant evidence of macroscopic use wear that was visible to the naked eye. A total of nine (9.2%) fragments of bifacially reduced implements (bifaces) were found, one of may have been fashioned into a projectile point (Figure B.4). However, given the exhaustive use present on all obsidian tools from the site, it is likely that projectile points were repurposed into smaller pointed tools after their initial purpose was completed.

Table B.3: Quantities of obsidian tools at Cerro de la Virgen.

Tool Type	N (%)	% of Total
biface	9	9.18%
percussion blade	8	8.16%
prismatic blade	78	79.59%
projectile point	1	1.02%
scraper	1	1.02%
utilized flake	1	1.02%
All	98	100%

Table B.4: Summary statistics of obsidian tools by type.

	Length (cm)		**Width (cm)**		**Thickness (cm)**		**Weight (g)**	
Tool Type	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
biface	1.42	0.33	1.37	0.31	0.45	0.17	0.90	0.57
percussion blade	1.76	0.54	1.16	0.33	0.32	0.04	0.72	0.42
prismatic blade	1.97	0.88	1.08	0.35	0.30	0.32	0.77	0.57
projectile point	2.67	---	1.12	---	0.51	---	1.33	---
scraper	5.09	---	4.66	---	1.12	---	38.37	---
utilized flake	2.80	---	1.64	---	0.44	---	2.32	---
All								

Figure B.3: Obsidian prismatic blades from Cerro de la Virgen.

Figure B.4: Obsidian biface fragments from Cerro de la Virgen; possible projectile point fragment on the far right.

Chronological Comparisons

The main occupation of Cerro de la Virgen spans the latter part of the Miniyua phase to the Coyuche phase, so chronological comparisons of trends in obsidian artifacts were separated into four periods--Transitional Miniyua-Chacahua, Chacahua, Transitional Chacahua-Coyuche, and Coyuche. Though excavations revealed the possibility of a potentially substantial Minizundo phase occupation in the area below Complex B, obsidian artifacts were not recovered from these contexts; therefore, the Minizundo phase was not included in chronological comparisons. It should also be noted that the majority of contexts from which obsidian was recovered were construction fill, so the chronological patterns should be taken as tentative (see Figures B.5-B.7).

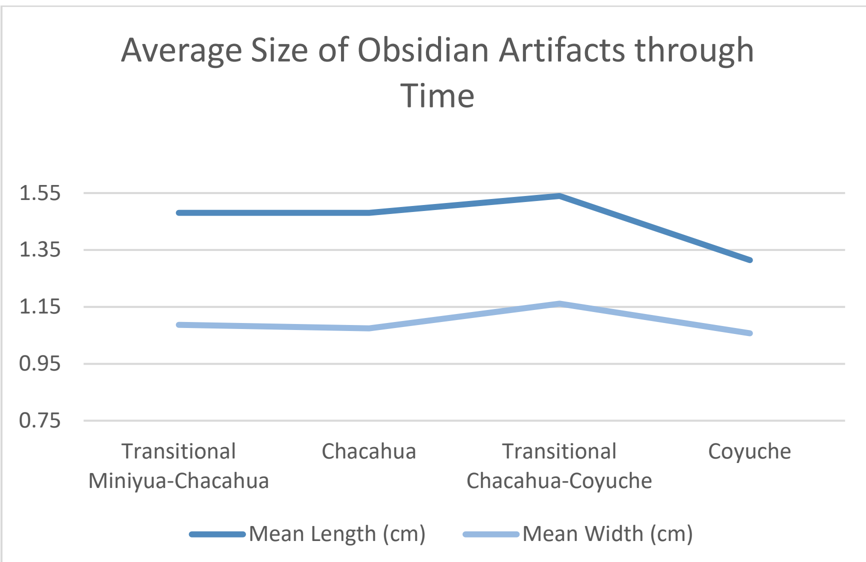


Figure B.5: Graph of average length and width in cm of obsidian artifacts in the Cerro de la Virgen sample through time.

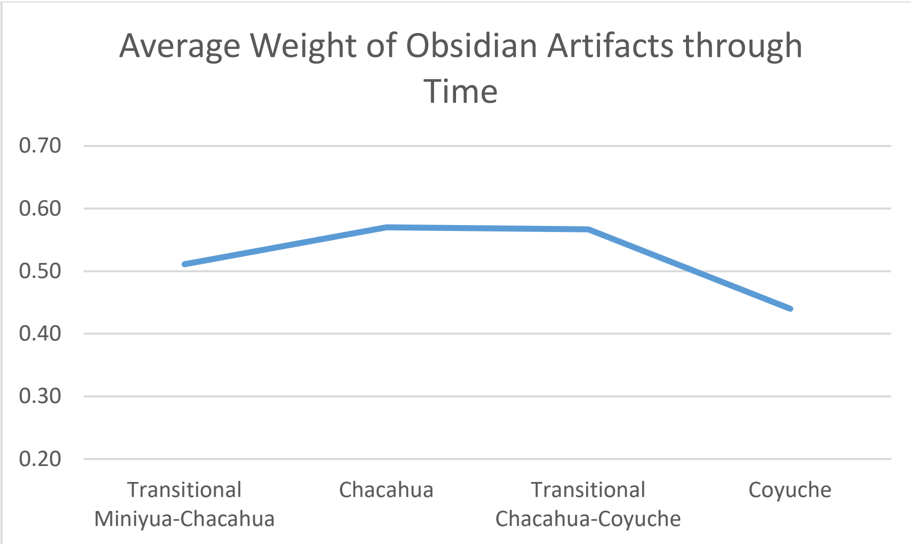


Figure B.6: Graph of the average weight of obsidian artifacts in the Cerro de la Virgen sample through time.

Generally, two patterns emerge from the chronological comparisons. First, the overall size and weight of obsidian artifacts remained relatively constant through the beginning of the Coyuche phase but dropped off rather substantially during the rest of the Coyuche phase prior to abandonment (see Table B.5 for sample size). The average length and width of obsidian artifacts during the Transitional Miniyua-Chacahua, Chacahua, and Transitional Chacahua-Coyuche phases remained within a relatively narrow range of 1.47-1.55 cm and 1.06-1.16 cm, respectively. In both measures, length and width peaked during the Transitional Chacahua-Coyuche phase. By the Coyuche phase, the average length of obsidian artifacts dropped to 1.32 cm and the average width dropped to 1.01 cm, a decline of 14.8% and 4.7%, respectively. The ratio of cutting edge to mass also generally decreased over time, but there was a significant spike (21.1%) from the Chacahua to the Transitional Chacahua-Coyuche phase. The CE/M ration dropped dramatically by the later Coyuche phase by 22.7%. One possible explanation for the decline in size and weight may be related to obsidian becoming scarcer due to disruptions to trade routes during the late Terminal Formative. However, given the evidence from San Francisco de Arriba (Workinger 2002) and Charco Redondo (Butler 2018) for increasing intensity in interactions with Teotihuacan during the Early Classic, I would have expected the amount of obsidian as exemplified by weight, length, and CE/M to increase during the Coyuche phase. It is likely that a large sample size for the Early Classic at Cerro de la Virgen will elaborate on this question.

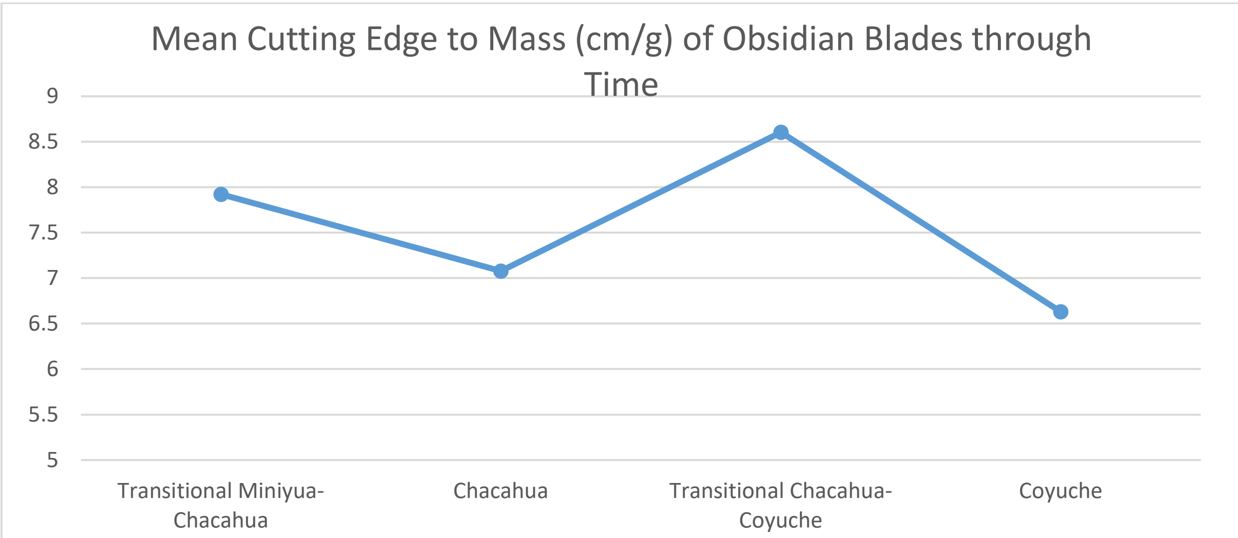


Figure B.7: Average cutting edge to mass ratio of obsidian blades through time.

There was also a significant chronological change in the color of obsidian that occurred at the end of the Formative consisting of a shift from a mix of black, gray and green obsidian during the Miniyua and early Chacahua phases to predominantly green obsidian in the late Chacahua and Coyuche phases (Table B.5). Though we cannot visually source non-green obsidian with certainty, the chronological analyses presented below highlight some basic trends in obsidian acquisition during the Terminal Formative and Early Classic Periods, namely that green obsidian from the Pachuca source becomes increasingly more prevalent at Cerro de la Virgen through time. Appendix C provides a more detailed analysis of obsidian sources utilized by residents at Cerro de la Virgen. Among archaeological contexts dating to the earlier time span, gray obsidian represented 52.9%-57.6% of each sample, and green obsidian represented 39.1%-39.4%. Black obsidian appears to have been more readily available during the early part of the Chacahua phase but drops off significantly later in time. Near the end of the Chacahua phase and into the Coyuche phase, the ratio of gray to green obsidian is nearly the inverse of the earlier period, with the former representing 21.1%-24.1% of its respective sample and the latter representing 72.2%-78.6% of its sample. By the Coyuche phase, black obsidian disappears, but this may be due to the smaller size of Coyuche phase contexts.

Table B.5: Summary statistics of obsidian color by chronological period (mixed and modern contexts excluded).

	black		**gray**		**green**		
	N	**%**	**N**	**%**	**N**	**%**	**ALL**
Trans. Miniyua-Chacahua	1	3.0%	19	57.6%	13	39.4%	33
Chacahua	11	8.0%	73	52.9%	54	39.1%	138
Trans. Chacahua-Coyuche	2	3.7%	13	24.1%	39	72.2%	54
Coyuche	0	0.0%	3	21.4%	11	78.6%	14

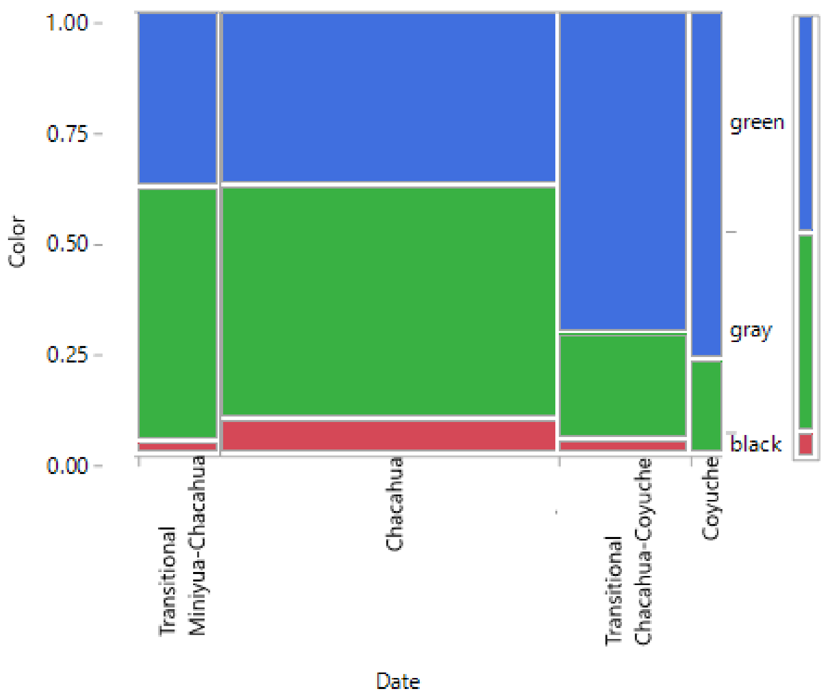


Figure B.8: Mosaic plot of obsidian color by date. Note, width of columns relative to sample size.

Table B.6: Contingency table of obsidian color by date.

Count Total %	black	gray	green	Total
Chacahua	11 4.60%	73 30.54	54 22.59	138 57.74
Coyuche	0 0.00	3 1.26	11 4.60	14 5.86
Transitional Chacahua-Coyuche	2 0.84	13 5.44	39 16.32	54 22.59

Transitional Miniyua-Chacahua	1 0.42	19 7.95	13 5.44	33 13.81
Total	14 5.86	108 45.19	117 48.95	239

Statistical tests were also used to compare assemblages broken down by the periods discussed above, as well as by a general “early” vs. “late” classification (Figures B.8-B.9; Tables B.6-B.7). The “early” category lumped together the Transitional Miniyua-Chacahua with the Chacahua data, while the “late” category combined the Transitional Chacahua-Coyuche with the Coyuche data. A chi-square test was performed that compared obsidian assemblages among the four spans of time, followed by a Yates’ correction. Yates’ correction was applied because more than 20% of expected values in the contingency table were less than five, a condition that makes chi-square suspect. The differences among the assemblages were statistically significant (Yates’ chi-square = 20.14, $p<0.05$ [$p<0.01$]). When early vs. late contexts were compared, the difference was even more statistically significant (Chi-square = 23.638, $p < 0.05$ ($p < 0.0001$). Yates’ correction was not applied to the latter test.

Table B.7: Summary statistics of "Early" and "Late" obsidian assemblages.

	black		**gray**		**green**		
	N	**%**	**N**	**%**	**N**	**%**	**ALL**
Early	12	7.0%	92	53.8%	67	39.2%	171
Late	2	2.9%	16	23.5%	50	73.5%	68

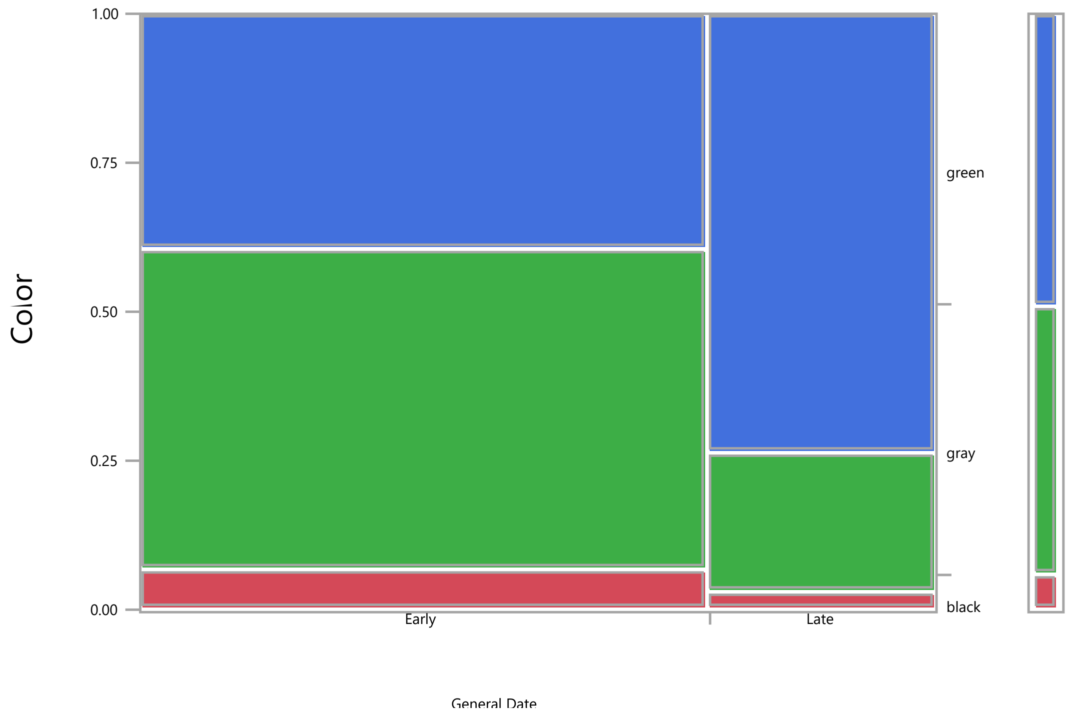


Figure B.9: Contingency table of obsidian color by general date (early vs. late).

Spatial Comparisons

Statistical comparisons of nominal variables (i.e., artifact type, color) were also made among subsets of obsidian assemblages from different architectural complexes at the site. All obsidian recovered from Complexes A, B, and E, the Plaza, and Structure 1 were included in these assemblages, regardless of time period, as there were no significant lapses in use of any architectural area from initial construction to eventual abandonment of the site. Table B.8 provides summary statistics with respect to artifact type, and Table B.9 displays obsidian color data.

Table B.8: Summary statistics for artifact type by architectural complex. Percentages refer to subsets within each architectural complex.

	core		debitage		flake		tool		
	N	%	N	%	N	%	N	%	ALL
Complex A	0	0.0%	3	7.0%	25	58.1%	15	34.9%	43
Complex B	1	1.0%	18	18.2%	52	52.5%	28	28.3%	99
Complex E	0	0.0%	9	6.6%	86	63.2%	41	30.1%	136
Plaza	0	0.0%	4	14.3%	15	53.6%	9	32.1%	28
Structure 1	0	0.0%	1	14.3%	1	14.3%	5	71.4%	7
All	1		35		179		98		313

Table B.9: Summary statistics for obsidian color by architectural complex. Percentages refer to subsets within each architectural complex.

	black		clear		gray		green		
	N	%	N	%	N	%	N	%	ALL
Complex A	1	2.3%	0	0.0%	18	41.9%	24	55.8%	43
Complex B	6	6.1%	0	0.0%	49	49.5%	44	44.4%	99
Complex E	8	5.9%	3	2.2%	31	22.8%	94	69.1%	136
Plaza	0	0.0%	0	0.0%	21	75.0%	7	25.0%	28
Structure 1	1	14.3%	0	0.0%	3	42.9%	3	42.9%	7
All	16		3		122		172		313

Several patterns emerge upon initial inspection of the artifact type data (Figures B.10-B.11; Tables B.10-B.11), though it should be noted that the majority of contexts in which obsidian was found was construction fill. Thus, these preliminary analyses should be taken with caution in advance of the discovery and analysis of a primary lithic feature at the site. First, the proportions of artifacts in the assemblages of Complexes A and B and the Plaza are nearly identical, indicating that blade production and tool maintenance occurred throughout the plaza and its most accessible architectural areas. Complex E exhibited nearly as many obsidian objects as all of the other locations combined and had a larger proportion of flakes to other objects. Despite these observations, a chi-square test demonstrated that the difference among assemblages with respect to artifact type was not statistically significant (χ^2 = 9.313, p > 0.05). Artifacts from Structure 1 were excluded from the comparison due to small sample size. However, it should be noted that the relative paucity of obsidian in Terrace 10 likely indicates that relatively few utilitarian or quotidian practices involving fine cutting or chopping occurred in this restricted space.

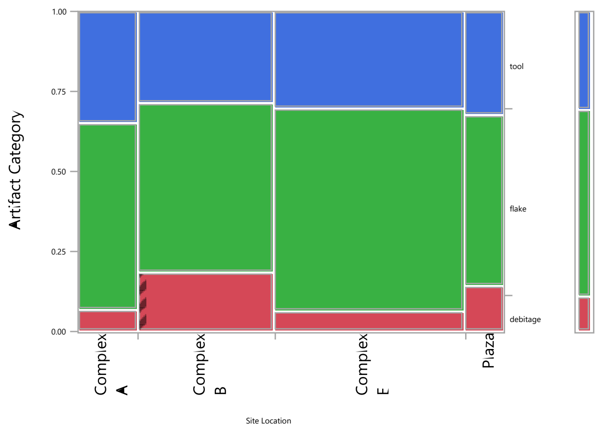


Figure B.10: Mosaic plot of obsidian artifact type by site location; assemblage from Structure 1 not incorporated.

Table B.10: Contingency table of artifact category by site location (Structure 1 excluded).

Count Expected	debitage	flake	tool	Total
Complex A	3 4.79344	25 25.0951	15 13.1115	43
Complex B	18 10.9246	52 57.1934	28 29.882	98
Complex E	9 15.1607	86 79.3705	41 41.4689	136
Plaza	4 3.12131	15 16.341	9 8.5377	28
Total	34	178	93	305

Comparisons of obsidian color by site location proved to demonstrate more significant differences among assemblages. These comparisons excluded data from Structure 1 as well as all clear-colored obsidian, which constituted just a small fraction (0.9%) of the aggregate sample. A chi-square test indicated that the differences in color by site location were statistically significant (χ^2 = 37.149, p < 0.05 [p < 0.0001]). Yates' correction was applied to the test to account for expected values in more than

20% of entries in the contingency table that were less than 5, which yielded a statistically significant difference as well (χ^2 = 31.138, $p < 0.05$ [$p < 0.0001$]).

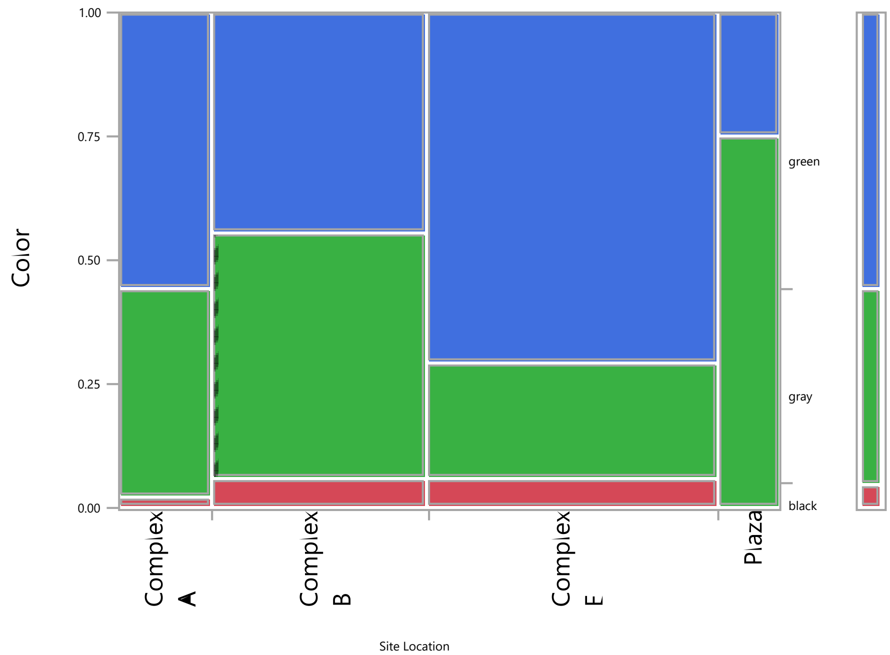


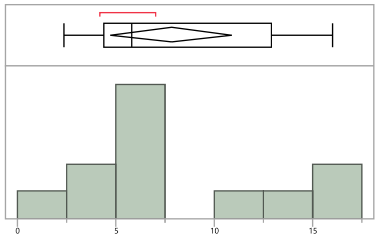
Figure B.11: Mosaic plot of obsidian color by site location.

Table B.11: Contingency table of obsidian color by site location.

Count Expected	black	gray	green	Total
Complex A	1 2.12871	18 16.8878	24 23.9835	43
Complex B	6 4.90099	49 38.8812	44 55.2178	99
Complex E	8 6.58416	31 52.2343	94 74.1815	133
Plaza	0 1.38614	21 10.9967	7 15.6172	28
Total	15	119	169	303

Finally, ratios of cutting edge to mass (CE/M) were compared among the various complexes (Figures B.12-B.13). High ratios indicate a more tenuous access to obsidian sources than low ratios. The area with the highest CE/M ratio was Structure 1, which may indicate that as obsidian tools were exhausted in utility, they were discarded or used for their final time in this location. The lowest CE/M ratio was found at Complex B. This may have been due to the repeated, day-to-day types of utilitarian practices that were happening in this location. A one-way analysis of CE/M ratio among architectural complexes was completed using a nonparametric Wilcoxon test, which indicated that the differences in CE/M among assemblages was not significant ($\chi^2 = 7.78$, $p > 0.05$). A Steel-Dwass test was performed to protect against pairwise error, which indicated that the only statistically significant difference in CE/M among assemblages was between Complexes B and E.

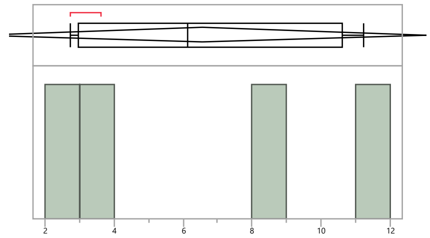
Complex A, CE/M (cm/g)



Summary Statistics

Mean	7.81
Std Dev	4.8557445
N	12

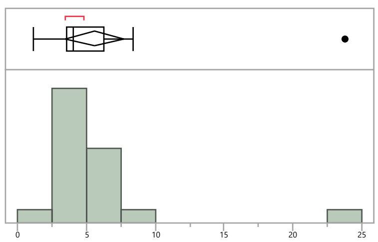
Plaza, CE/M (cm/g)



Summary Statistics

Mean	6.565
Std Dev	4.0751074
N	4

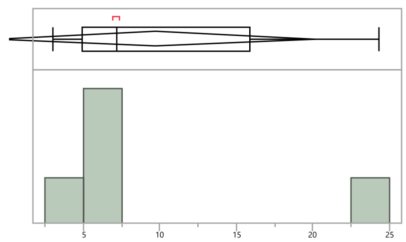
Complex B, CE/M (cm/g)



Summary Statistics

Mean	5.573
Std Dev	4.640954
N	20

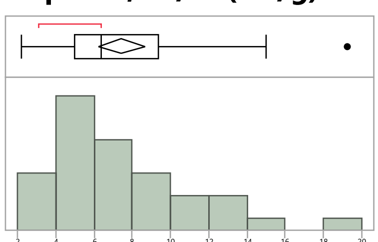
Structure 1, CE/M (cm/g)



Summary Statistics

Mean	9.734
Std Dev	8.3722297
N	5

Complex E, CE/M (cm/g)

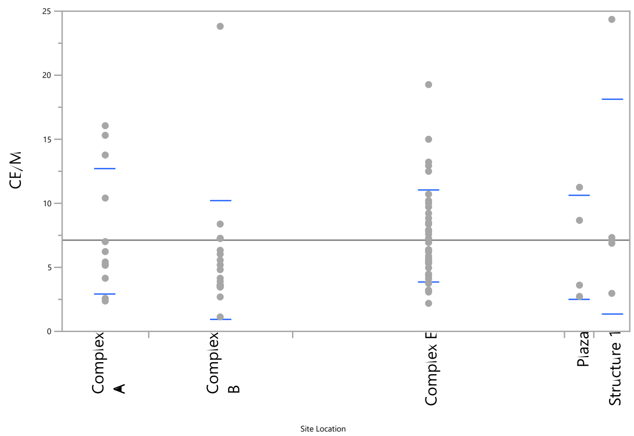


Summary Statistics

Mean	7.4371053
Std Dev	3.625865
N	38

Figure B.12: Cutting edge to mass ratios and summary statistics for Complexes A, B, and E, Structure 1, and the Plaza.

Oneway Analysis of CE/M By Site Location



Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
Complex A	12	507.500	480.000	42.2917	0.369
Complex B	20	561.500	800.000	28.0750	-2.683
Complex E	38	1704.00	1520.00	44.8421	1.801
Plaza	4	150.000	160.000	37.5000	-0.212
Structure 1	5	237.000	200.000	47.4000	0.735

1-Way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
7.7791	4	0.1000

Nonparametric Comparisons For All Pairs Using Steel-Dwass Method

q*	Alpha
2.72777	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value
Complex E	Complex B	13.1645	4.664981	2.82198	0.0384*
Structure 1	Complex B	5.3750	3.679900	1.46064	0.5882
Structure 1	Complex A	1.8417	2.687936	0.68516	0.9597
Plaza	Complex B	1.6500	3.872983	0.42603	0.9931
Structure 1	Complex E	1.4711	5.973254	0.24627	0.9992
Complex E	Complex A	0.6031	4.826937	0.12494	0.9999
Structure 1	Plaza	0.2250	1.837117	0.12247	0.9999
Plaza	Complex A	-0.8333	2.748737	-0.30317	0.9982
Plaza	Complex E	-3.1776	6.448423	-0.49278	0.9881
Complex B	Complex A	-4.9333	3.425081	-1.44036	0.6014

Figure B.13: Nonparametric comparison of CE/M by site location.

Table B.12: Obsidian data from excavations at Cerro de la Virgen.

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	A	Complex E	debitage	gray	0.52	0.41	0.14	<0.01	n/a	very small piece of shatter
PTRV16	A	Complex E	debitage	gray	1.89	0.85	0.34	0.50	n/a	piece of shatter
PTRV16	A	Complex E	debitage	green	1.64	1.14	0.24	0.44	n/a	irregular piece of debitage (looks like a flake); flake ripples going in diff directions on both sides
PTRV16	A	Complex E	debitage	green	1.24	0.50	0.33	0.19	n/a	shatter
PTRV16	A	Complex E	debitage	green	1.57	1.12	0.82	1.20	n/a	chunk of shatter with flake scars on both sides
PTRV16	A	Complex E	debitage	green	0.77	0.76	0.13	0.11	n/a	small piece of debitage; no visible platform or bulb
PTRV16	A	Complex E	debitage	green	1.39	0.59	0.33	0.39	n/a	shatter
PTRV16	A	Complex E	flake	black	1.85	1.35	0.42	1.06	n/a	secondary core reduction flake; platform and bulb present; feather termination; flake scars on dorsal
PTRV16	A	Complex E	flake	black	1.05	0.70	0.34	0.34	n/a	platform present on top; probable core reduction flake; prismatic line running down dorsal side
PTRV16	A	Complex E	flake	black	1.65	1.19	0.28	0.58	n/a	platform/bulb present; tip broken, but probably feather termination; flake scars on dorsal
PTRV16	A	Complex E	flake	black	1.16	1.16	0.28	0.33	n/a	platform and bulb present; eralliure scar on ventral side; feather termination
PTRV16	A	Complex E	flake	clear	0.74	0.97	0.11	0.13	n/a	small thinning flake; possible platform but no bulb; feather termination
PTRV16	A	Complex E	flake	gray	1.08	0.94	0.28	0.21	n/a	hinge fracture at distal end
PTRV16	A	Complex E	flake	clear	1.00	1.31	0.23	0.31	n/a	small thinning flake; dorsal flake scars; no bulb or platform

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	A	Complex E	flake	clear	1.03	0.85	0.26	0.38	n/a	flake fragment; possibly core reduction; no bulb/platform; no termination
PTRV16	A	Complex E	flake	gray	0.72	0.73	0.12	0.10	n/a	pressure flake; no plat or bulb; feather termination
PTRV16	A	Complex E	flake	gray	1.49	1.20	0.24	0.40	n/a	platform and bulb present; flake fragment, broken in medial section; flake scars on dorsal surface; unknown termination
PTRV16	A	Complex E	flake	gray	2.11	1.86	0.42	2.10	n/a	utilized flake; retouching on ventral side edge; likely driven off during core production; NEED to photograph
PTRV16	A	Complex E	flake	gray	1.02	0.52	0.12	0.10	n/a	very thin thinning flake
PTRV16	A	Complex E	flake	gray	0.98	0.92	0.19	0.24	n/a	small flake; platform/bulb present; eralliure scar; feather termination.
PTRV16	A	Complex E	flake	gray	1.07	0.80	0.31	0.16	n/a	no platform or bulb; thinning flake; flake scars on dorsal side; very thin
PTRV16	A	Complex E	flake	gray	0.99	0.83	0.09	0.08	n/a	thin flake; feather termination; no bulb/plat
PTRV16	A	Complex E	flake	gray	0.73	1.10	0.39	0.24	n/a	core prep flake; feather termination; plat but no bulb;
PTRV16	A	Complex E	flake	gray	1.68	1.02	0.30	0.53	n/a	platform present but no bulb; flake scars on dorsal side; possible usewear on edges (utilized flake?)
PTRV16	A	Complex E	flake	gray	1.12	0.65	0.13	0.14	n/a	no platform or bulb; thinning flake; flake scars on dorsal side; very thin
PTRV16	A	Complex E	flake	gray	1.69	1.09	0.39	0.58	n/a	utilized flake with use wear on edges; platform and bulb present; prismatic core reduction; feather termination
PTRV16	A	Complex E	flake	gray	1.37	2.23	0.29	0.53	n/a	
PTRV16	A	Complex E	flake	gray	1.23	1.68	0.27	0.41	n/a	platform and bulb present; smooth ventral surface; feather termination

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	A	Complex E	flake	gray	0.87	1.16	0.34	0.37	n/a	flake taken off during core reduction; prismatic lines on dorsal side; platform present but no bulb; may be step termination
PTRV16	A	Complex E	flake	gray	0.74	1.07	0.32	0.27	n/a	flake fragment; distal end; no platform or bulb; feather termination;
PTRV16	A	Complex E	flake	green	1.25	0.82	0.19	0.17	n/a	small flake; platform/bulb present; feather termination; flake scars on dorsal
PTRV16	A	Complex E	flake	green	2.35	1.56	0.43	1.21	n/a	platform/bulb present; plunging fracture; flake scars on dorsal;
PTRV16	A	Complex E	flake	green	1.93	1.82	0.38	1.19	n/a	weird flake; looks like it might be second stage prismatic core reduction; platform and bulb present with a plunging termination; looks like they were trying to knock off some imperfections to get a better platform to make prismatic blades; get a photo
PTRV16	A	Complex E	flake	green	1.50	1.33	0.40	0.83	n/a	platform and bulb present; feather termination
PTRV16	A	Complex E	flake	green	0.85	0.83	0.16	0.09	n/a	super thin thinning flake; platform and bulb present; feather termination; pressure flake
PTRV16	A	Complex E	flake	green	1.06	0.83	0.26	0.22	n/a	platform but no bulb; feather termination; flake scars on dorsal
PTRV16	A	Complex E	flake	green	2.04	0.90	0.73	0.94	n/a	platform and bulb present; kinda blocky, likely part of initial core reduction; hinge termination
PTRV16	A	Complex E	flake	green	1.49	1.61	0.46	0.84	n/a	narrow platform and bulb; flake scars on both sides; could actually be a piece of debitage
PTRV16	A	Complex E	flake	green	0.83	1.38	0.20	0.25	n/a	platform present; feather termination; flake scars on both sides
PTRV16	A	Complex E	flake	green	1.23	0.73	0.26	0.23	n/a	platform and bulb; feather termination;

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	A	Complex E	flake	green	1.41	0.82	0.20	0.19	n/a	platform/bulb present; eralliure scar; flake scars on dorsal; feather termination
PTRV16	A	Complex E	flake	green	0.92	1.49	0.20	0.29	n/a	
PTRV16	A	Complex E	flake	green	2.07	1.43	0.50	1.39	n/a	platform and bulb present; feather termination; flakes on dorsal; utilized flake with pressure flaking scars on dorsal side of edge
PTRV16	A	Complex E	flake	green	1.62	1.62	0.46	1.22	n/a	platform and bulb present; hinge fracture; flake scars on dorsal
PTRV16	A	Complex E	flake	green	1.27	1.27	0.31	0.49	n/a	no platform or bulb; feather termination; flake scars on dorsal
PTRV16	A	Complex E	flake	green	2.01	0.62	0.26	0.32	n/a	platform but no bulb; plunging termination; very narrow flake
PTRV16	A	Complex E	flake	green	1.07	0.75	0.12	0.10	n/a	small thinning flake; platform and bulb present; feather termination
PTRV16	A	Complex E	flake	green	1.66	0.95	0.66	0.63	n/a	platform and bulb present; feather termination; flake scars on dorsal side
PTRV16	A	Complex E	flake	green	2.11	1.24	0.32	0.87	n/a	platform and bulb present; eralliure scar on ventral side; feather termination
PTRV16	A	Complex E	flake	green	0.98	0.87	0.19	0.14	n/a	platform present, no bulb; thinning flake; flake scars on dorsal surface; feather termination
PTRV16	A	Complex E	flake	green	1.19	1.78	0.32	0.56	n/a	platform and bulb present; feather termination; flake scars on dorsal side
PTRV16	A	Complex E	flake	green	1.54	1.34	0.34	0.58	n/a	platform and bulb present; broken so no termination; big flake scar on dorsal side
PTRV16	A	Complex E	flake	green	0.75	1.46	0.26	0.25	n/a	platform present but no bulb; thinning flake;feather termination
PTRV16	A	Complex E	flake	green	1.31	0.86	0.22	0.20	n/a	platform and bulb present; feather termination; small scar on dorsal; may be core reduction flake

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	A	Complex E	flake	green	1.16	1.27	0.25	0.43	n/a	bulb and platform present; feather termination; flake scars on dorsal; part of edge broken off
PTRV16	A	Complex E	flake	green	1.64	0.80	0.38	0.38	n/a	bulb and platform present; eralliure scar; feather termination
PTRV16	A	Complex E	flake	green	1.81	1.52	0.25	0.66	n/a	platform/bulb present; feather termination; flake scars on dorsal;
PTRV16	A	Complex E	flake	green	1.84	1.58	0.33	1.13	n/a	flake taken off during core reduction; hinge fracture; ripples and flake scars on dorsal side; platform/bulb present
PTRV16	A	Complex E	flake	green	1.16	1.07	0.22	0.32	n/a	no bulb/platform; flake scars on dorsal; broken, so no idea on termination
PTRV16	A	Complex E	flake	green	1.48	0.72	0.18	0.14	n/a	small bulb/platform; feather termination
PTRV16	A	Complex E	flake	green	0.61	0.92	0.21	0.11	n/a	small flake; no bulb/platform; feather termination; flake scars on dorsal; pressure flake
PTRV16	A	Complex E	flake	green	0.70	0.78	0.12	0.10	n/a	small pressure flake; no plat or bulb; feather termination; flake scars on dorsal
PTRV16	A	Complex E	flake	green	1.38	1.89	0.36	0.82	n/a	bulb/platform present; flake scars on dorsal side; possible step termination
PTRV16	A	Complex E	flake	green	1.25	1.51	0.29	0.54	n/a	platform and bulb present; possible bifacial thinning flake; flake scars on dorsal surface
PTRV16	A	Complex E	flake fragment	green	1.10	1.82	0.47	0.71	n/a	platform and bulb present; several flake scars on dorsal surface; feather termination; almost twice as wide as it is long
PTRV16	A	Complex E	percussion blade	gray	1.33	1.15	0.38	0.71	3.75	percussion blade fragment (prob medial section) that was retouched on both sides, including ridge reduction and pressure flaking

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	A	Complex E	percussion blade fragment	green	0.85	0.67	0.30	0.20	8.50	
PTRV16	A	Complex E	prismatic blade	gray	1.35	1.40	0.38	0.88	3.07	prismatic blade fragment; may have broken as it was being driven off core; flake scars on ventral side but not dorsal; kinda weird
PTRV16	A	Complex E	prismatic blade	green	0.75	0.56	0.15	0.10	15.00	prismatic blade frag (small one)
PTRV16	A	Complex E	prismatic blade	green	1.06	0.68	0.10	0.11	19.27	very thin prismatic blade with use wear
PTRV16	A	Complex E	prismatic blade	green	1.57	0.93	0.23	0.58	5.41	medial section of prismatic blade; use wear present
PTRV16	A	Complex E	prismatic blade	green	2.43	1.26	0.27	1.18	4.12	medial section of prismatic blade; use wear present
PTRV16	A	Complex E	prismatic blade	green	3.19	1.04	0.25	1.00	6.38	distal section of prismatic blade; usewear on edges; tip probably broke off in use;
PTRV16	A	Complex E	prismatic blade	green	0.98	0.83	0.20	0.27	7.26	prismatic blade frag (small one); prob proximal section
PTRV16	A	Complex E	prismatic blade	green	2.61	1.78	0.40	2.38	2.19	proximal section of blade, prob broke of in use; usewear on both edges; possible platform but no bulb; may be second stage or a large third stage blade
PTRV16	A	Complex E	prismatic blade	green	0.90	1.23	0.28	0.29	6.21	small fragment of prismatic blade
PTRV16	A	Complex E	prismatic blade	green	1.54	1.15	0.24	0.58	5.31	proximal section of prismatic blade (fragment); two prismatic lines running down center; use wear present
PTRV16	A	Complex E	prismatic blade	green	2.72	0.85	0.23	0.65	8.37	distal section of prismatic blade; usewear on edges; tip probably broke off in use;
PTRV16	A	Complex E	prismatic blade	green	1.67	0.79	0.21	0.44	4.58	medial section of prismatic blade; lots of usewear on both blades

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	A	Complex E	prismatic blade	green	2.74	0.94	0.21	0.86	6.37	medial section of prismatic blade
PTRV16	A	Complex E	prismatic blade	green	3.81	1.17	0.26	1.75	4.35	proximal section of pris blade; lots of use wear
PTRV16	A	Complex E	prismatic blade	green	1.35	0.83	0.16	0.27	10.00	very thin prismatic blade frag (medial); retouching on right side
PTRV16	A	Complex E	prismatic blade	green	1.19	0.89	0.18	0.18	13.22	small medial fragment of prismatic blade; tapers in toward the presumably distal end; use wear present
PTRV16	A	Complex E	prismatic blade	green	1.14	1.25	0.25	0.46	4.96	medial section of pris blade; use wear present
PTRV16	A	Complex E	prismatic blade	green	2.83	1.32	2.90	1.76	3.22	refit two pieces; proximal section of prism blade; use wear present
PTRV16	A	Complex E	prismatic blade	green	1.66	0.73	0.25	0.31	10.71	proximal section of pris blade; some use wear
PTRV16	A	Complex E	prismatic blade	green	1.79	1.25	0.22	0.72	4.97	medial section of prismatic blade; use wear present
PTRV16	A	Complex E	prismatic blade	green	1.17	1.21	0.34	0.61	3.84	prob proximal section of pris blade frag; use wear on edges;
PTRV16	B	Complex E	biface fragment	gray	1.04	1.54	0.67	1.32	n/a	bifacial reduction on this piece, possibly a stem of a biface; pressure flaking around all edges; need to photo
PTRV16	B	Complex E	biface fragment	gray	1.32	1.26	0.33	0.62	n/a	tip of bifacially reduced tool; pressure flake scars on both ventral and dorsal sides
PTRV16	B	Complex E	debitage	gray	1.39	1.18	0.42	0.51	n/a	chunk of shatter with flake scars on both sides
PTRV16	B	Complex E	debitage	gray	1.32	1.80	0.39	0.83	n/a	chunk of shatter with flake scars on both sides
PTRV16	B	Complex E	flake	black	2.00	1.46	0.24	0.62	n/a	bulb and platform present; feather termination; flake scars on dorsal

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	B	Complex E	flake	gray	0.94	1.11	0.14	0.19	n/a	flake fragment; platform and bulb present; possible usewear; interesting bluish gray color; may want to consider for
PTRV16	B	Complex E	flake	gray	1.00	0.78	0.27	0.13	n/a	thinning flake; flake scars on dorsal side; bulb and platform present
PTRV16	B	Complex E	flake	gray	0.65	1.21	0.17	0.08	n/a	small flake with platform but no bulb; feather termination
PTRV16	B	Complex E	flake	gray	0.87	1.29	0.26	0.24	n/a	thin flake; feather termination; no bulb/plat
PTRV16	B	Complex E	flake	gray	0.90	0.85	0.16	0.11	n/a	platform and bulb present; feather termination;
PTRV16	B	Complex E	flake	green	1.16	0.91	0.12	0.18	n/a	thinning flake; possible platform but no bulb; feather termination; flake scars on dorsal
PTRV16	B	Complex E	flake	green	1.50	1.10	0.34	0.45	n/a	
PTRV16	B	Complex E	flake	green	2.23	1.60	0.38	1.27	n/a	platform and bulb present; feather termination; flakes on dorsal;
PTRV16	B	Complex E	flake	green	1.08	0.70	0.12	0.14	n/a	small percussion flake; plat but no bulb; feather termination; no flake scars
PTRV16	B	Complex E	flake	green	0.93	1.52	0.23	0.34	n/a	platform and bulb present; ealliure scar on ventral side; feather termination
PTRV16	B	Complex E	flake	green	2.03	1.33	0.51	0.90	n/a	another platform reduction flake; prismatic lines on dorsal; platform and bulb present; feather termination
PTRV16	B	Complex E	flake	green	0.95	0.65	0.22	0.17	n/a	small flake; tiny platform and maybe a bulb; feather termination
PTRV16	B	Complex E	flake	green	1.16	0.80	0.23	0.22	n/a	no platform but maybe a bulb present; feather termination; flake scars on dorsal side; ventral side has some imperfections too

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	B	Complex E	flake	green	0.83	1.42	0.18	0.21	n/a	flake fragment; no platform or bulb; may have been a reutilized flake; retouching/usewear on edge
PTRV16	B	Complex E	flake	green	1.15	1.35	0.19	0.28	n/a	thinning flake; platform and bulb; feather termination; flake scars on dorsal surface
PTRV16	B	Complex E	flake	green	0.91	1.94	0.48	0.47	n/a	core preparation flake; flake scars on dorsal side
PTRV16	B	Complex E	flake	green	1.62	0.92	0.27	0.24	n/a	platform and bulb present; feather termination; flake scars on dorsal side
PTRV16	B	Complex E	flake	green	1.15	0.69	0.14	0.11	n/a	small flake; platform and bulb present; feather termination
PTRV16	B	Complex E	flake	green	1.11	1.25	0.22	0.17	n/a	small thinning flake; platform and bulb present; feather termination
PTRV16	B	Complex E	flake	green	1.11	1.83	0.77	1.56	n/a	flake driven off during secondary/tertiary core reduction or while trying to drive off prismatic blades (mistake?); flake scars on dorsal side; nice platform and bulb with feather termination
PTRV16	B	Complex E	flake	green	2.14	1.37	0.43	0.92	n/a	prominent platform and bulb; feather termination; possible utilized flake with retouching on both sides;
PTRV16	B	Complex E	flake	green	1.50	0.96	0.15	0.27	n/a	platform/bulb present; feather termination; flake scars on dorsal;
PTRV16	B	Complex E	percussion blade	green	2.11	1.30	0.32	0.78	5.41	blade driven off during preparation of polyhedral core; could have been done to correct a hinge fracture coming from the opposite direction on core
PTRV16	B	Complex E	prismatic blade	black	1.70	0.88	0.23	0.35	9.71	proximal section of blade
PTRV16	B	Complex E	prismatic blade	green	1.70	0.95	0.20	0.49	6.94	medial prismatic blade fragment with fine usewear on both blades

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	B	Complex E	prismatic blade	green	2.52	0.95	0.15	0.57	8.84	very thin prismatic blade frag (proximal)
PTRV16	B	Complex E	prismatic blade	green	1.43	0.82	0.18	0.28	10.21	medial prismatic blade frag
PTRV16	B	Complex E	prismatic blade	green	1.35	0.74	0.18	0.28	n/a	medial pris blade frag; use wear present
PTRV16	B	Complex E	prismatic blade	green	3.19	1.10	0.31	1.12	5.70	proximal/medial sections of blade
PTRV16	B	Complex E	prismatic blade	green	1.95	1.11	0.25	0.87	4.48	medial frag of pris blade with use wear on both sides
PTRV16	B	Complex E	prismatic blade	green	2.34	0.80	0.24	0.60	7.80	proximal section of prismatic blade (fragment); cross section is more triangular; use wear on edges
PTRV16	B	Complex E	prismatic blade	green	2.50	0.68	0.23	0.40	12.50	very similar to other blade in this lot, but more triangular in cross section (not a refit); use wear on edges
PTRV16	B	Complex E	prismatic blade	green	1.06	0.86	0.21	0.23	9.22	
PTRV16	B	Complex E	prismatic blade	green	2.07	0.89	0.15	0.32	12.94	medial section of prismatic blade
PTRV16	B	Complex E	prismatic blade	green	2.48	1.15	0.24	0.89	5.57	proximal section of prismatic blade; use wear present
PTRV16	B	Complex E	prismatic blade	green	0.99	0.95	0.23	0.25	7.92	small medial fragment of prismatic blade
PTRV16	B	Complex E	prismatic blade	green	0.88	0.89	0.24	0.30	5.87	small medial fragment of prismatic blade
PTRV16	B	Complex E	prismatic blade	green	2.50	1.17	0.26	0.92	5.43	proximal segment of prismatic blade; lots of use weare, including one big semicircular chunk;
PTRV16	C	Complex E	flake	gray	0.80	0.63	0.13	0.10	n/a	small flake fragment
PTRV16	F	Complex B	biface fragment	black	1.58	1.90	0.44	1.51	n/a	distal end of a bifacially reduced tool; prob a point, but unclear if it is a projectile point; pressure flake scars on both sides

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	F	Complex B	biface fragment	gray	1.98	1.55	0.76	2.00	n/a	possible biface preform; flakes on both sides; may have broken during production
PTRV16	F	Complex B	biface fragment	gray	1.19	1.09	0.32	0.51	n/a	small flake with scars on both surfaces; may have been a preform for a biface
PTRV16	F	Complex B	biface fragment	gray	1.28	1.59	0.37	0.66	n/a	fragment of a bifacially reduced possible tool; one edge has retouching on both sides; looks like relatively fresh breaks on the other sides;
PTRV16	F	Complex B	debitage	black	1.77	1.57	0.90	2.60	n/a	platform present at top; flake scars on both sides
PTRV16	F	Complex B	debitage	black	1.31	1.08	0.47	0.75	n/a	angular piece of shatter with flake scars going in diff directions
PTRV16	F	Complex B	debitage	gray	1.08	0.39	0.23	0.11	n/a	small piece of debitage
PTRV16	F	Complex B	debitage	gray	1.94	0.79	0.48	0.54	n/a	small piece of debitage; small flake scar on one side; angular breaks
PTRV16	F	Complex B	debitage	gray	1.80	0.57	0.41	0.60	n/a	long, angular piece of debitage
PTRV16	F	Complex B	debitage	gray	1.24	0.82	0.37	0.40	n/a	chunk of shatter with flake scars on both sides
PTRV16	F	Complex B	debitage	gray	0.61	0.78	0.20	0.13	n/a	shatter
PTRV16	F	Complex B	debitage	gray	1.02	0.61	0.27	0.22	n/a	small piece of shatter
PTRV16	F	Complex B	debitage	gray	0.89	0.99	0.24	0.18	n/a	small piece of debitage w/ flake scars on both sides
PTRV16	F	Complex B	debitage	gray	1.11	1.09	0.44	0.61	n/a	chunk of shatter with flake scars on dorsal side
PTRV16	F	Complex B	debitage	green	0.60	0.37	0.21	0.14	n/a	small piece of debitage
PTRV16	F	Complex B	debitage	green	1.08	0.70	0.25	0.19	n/a	piece of shatter

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	F	Complex B	debitage	green	1.61	0.86	0.61	0.68	n/a	shatter
PTRV16	F	Complex B	debitage	green	0.85	0.65	0.30	0.16	n/a	shatter
PTRV16	F	Complex B	debitage	green	0.88	0.45	0.24	0.08	n/a	shatter
PTRV16	F	Complex B	debitage	green	1.43	1.97	0.33	1.01	n/a	irregular piece of debitage (looks kinda like a flake); flake ripples going in diff directions on both sides
PTRV16	F	Complex B	debitage	green	1.10	0.57	0.35	0.26	n/a	shatter with several faces
PTRV16	F	Complex B	flake	black	1.62	1.45	0.37	0.64	n/a	flake has a hinge fracture (distal)
PTRV16	F	Complex B	flake	gray	0.72	0.81	0.13	0.09	n/a	small thinning flake
PTRV16	F	Complex B	flake	gray	1.23	1.04	0.37	0.39	n/a	really small unknown flake type; flake scars on both sides; if it was larger, I'd suspect it was a core, but it is so small that I can't imagine there being much use to the flakes being driven off of it
PTRV16	F	Complex B	flake	gray	1.48	0.87	0.19	0.25	n/a	no platform or bulb; flake scars on dorsal side; probable feather termination
PTRV16	F	Complex B	flake	gray	0.93	0.64	0.11	0.11	n/a	very thin pressure flake; no bulb/platform; prob feather termination
PTRV16	F	Complex B	flake	gray	0.91	1.19	0.22	0.29	n/a	no bulb or platform; flake scars on dorsal; feather termination
PTRV16	F	Complex B	flake	gray	1.31	0.70	0.17	0.17	n/a	very thin thinning flake; feather termination; no bulb or plat
PTRV16	F	Complex B	flake	gray	1.13	1.60	0.14	0.19	n/a	no plat or bulb; distal end broken but prob a feather termination
PTRV16	F	Complex B	flake	gray	0.85	0.80	0.20	0.15	n/a	platform but no bulb; feather termination; flake scars on dorsal

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	F	Complex B	flake	gray	1.79	1.45	0.31	0.75	n/a	platform and bulb present; small bit of cortex present; feather termination
PTRV16	F	Complex B	flake	gray	0.81	0.99	0.26	0.23	n/a	small flake; platform and bulb present; feather termination
PTRV16	F	Complex B	flake	gray	0.79	1.42	0.43	0.36	n/a	core prep flake; flake scars on dorsal; possible platform but no bulb or ripples
PTRV16	F	Complex B	flake	gray	1.88	1.15	0.53	0.71	n/a	utilized flake; use wear on edges; platform present but no bulb; feather termination
PTRV16	F	Complex B	flake	gray	1.16	0.85	0.26	0.28	n/a	possible platform preparation flake; platform but no bulb present; feather termination; flake scars on dorsal and ventral sides
PTRV16	F	Complex B	flake	gray	1.01	1.36	0.19	0.27	n/a	no platform or bulb; hinge fracture; flake scars on dorsal
PTRV16	F	Complex B	flake	gray	2.17	0.87	0.35	0.54	n/a	core prep flake; bulb/platform present; feather termination; flake scars on dorsal
PTRV16	F	Complex B	flake	gray	0.68	0.57	0.16	0.08	n/a	small flake; platform but no bulb; feather termination
PTRV16	F	Complex B	flake	gray	1.26	1.52	0.26	0.47	n/a	small platform and bulb present; hinge fracture; flake scars on dorsal side
PTRV16	F	Complex B	flake	gray	0.98	1.33	0.21	0.34	n/a	no bulb, but possible platform; feather termination;
PTRV16	F	Complex B	flake	gray	0.93	1.50	0.15	0.26	n/a	platform present but no bulb; flake is curved along the long axis; feather termination;
PTRV16	F	Complex B	flake	gray	1.49	1.41	0.21	0.32	n/a	no bulb/platform; feather termination; flake scars on one side
PTRV16	F	Complex B	flake	gray	1.57	1.21	0.35	0.55	n/a	platform/bulb present; feather termination; flake scars on dorsal;
PTRV16	F	Complex B	flake	green	1.06	1.18	0.31	0.36	n/a	platform but no bulb; feather termination; flake scars on dorsal

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	F	Complex B	flake	green	1.54	1.56	0.18	0.38	n/a	platform and bulb present; super thin; feather termination; triangular shaped flake scar on dorsal side
PTRV16	F	Complex B	flake	green	1.17	1.22	0.31	0.35	n/a	platform and bulb present; no flake scars on either side; prob thinning flake; feather termination
PTRV16	F	Complex B	flake	green	1.42	1.12	0.43	0.61	n/a	platform and bulb present; flake scars on dorsal side; feather termination
PTRV16	F	Complex B	flake	green	0.70	0.64	0.22	0.10	n/a	tiny platform and bulb present; super small; feather termination
PTRV16	F	Complex B	flake	green	1.98	1.08	0.40	0.73	n/a	platform and bulb present; utilized flake with use wear; feather termination; may even be a blade fragment
PTRV16	F	Complex B	flake	green	1.56	1.41	0.26	0.40	n/a	platform and bulb present; prob part of flake tool reduction; feather termination; flake scars on dorsal
PTRV16	F	Complex B	flake	green	1.65	1.50	0.35	0.70	n/a	platform and bulb present; feather termination; flake scars on dorsal
PTRV16	F	Complex B	flake	green	0.67	0.86	0.07	0.04	n/a	thin flake; feather termination; no bulb/plat
PTRV16	F	Complex B	flake	green	0.81	0.65	0.13	0.11	n/a	thin flake; feather termination; no bulb/plat
PTRV16	F	Complex B	flake	green	2.85	2.35	0.39	1.55	n/a	nice big flake; platform and bulb present; step fracture; flake scars on dorsal and ventral (may have tried to make into utilized flake); tiny bit of use wear; need to photo
PTRV16	F	Complex B	flake	green	1.31	1.30	0.27	0.43	n/a	platform and bulb present; feather termination; flake scars on dorsal
PTRV16	F	Complex B	flake	green	0.60	0.58	0.15	0.40	n/a	small pressure flake; no plat or bulb; feather termination; flake scars on dorsal

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	F	Complex B	flake	green	1.54	1.02	0.23	0.26	n/a	possible platform but no visible bulb; eralliure scar present on ventral side; flake scars on dorsal side
PTRV16	F	Complex B	flake	green	0.84	0.90	0.12	0.10	n/a	small thinning flake
PTRV16	F	Complex B	flake	green	1.18	0.98	0.19	0.27	n/a	small flake fragment; flake scars on presumably dorsal side; no bulb or platform
PTRV16	F	Complex B	flake	green	1.63	1.07	0.32	0.54	n/a	platform, bulb and emoillment scar present; usewear present on edges; possible retouching flake scars on dorsal side
PTRV16	F	Complex B	flake	green	1.30	1.83	0.37	0.64	n/a	platform and bulb present; plunging termination; dorsal scars
PTRV16	F	Complex B	flake	green	1.92	0.85	0.35	0.53	n/a	platform and bulb present; flake scares on dorsal side; feather termination
PTRV16	F	Complex B	flake	green	1.35	1.58	0.50	1.09	n/a	core reduction flake; prominent bulb and platform; may have broken after being driven off; flake scars on dorsal; no idea on termination
PTRV16	F	Complex B	flake	green	1.16	0.92	0.25	0.23	n/a	platform and bulb present; feather termination; flake scars on dorsal
PTRV16	F	Complex B	flake	green	0.98	0.78	0.26	0.17	n/a	platform and bulb present; feather termination; flake scars on dorsal
PTRV16	F	Complex B	flake	green	1.08	0.78	0.29	0.38	n/a	no plat or bulb; distal end broken; flake fragment
PTRV16	F	Complex B	flake	green	2.18	1.54	0.50	1.32	n/a	utilized flake; retouching on ventral side edge; likely driven off during core production; NEED to photograph
PTRV16	F	Complex B	flake	green	1.39	1.06	0.33	0.40	n/a	platform present but no bulb; feather termination; flake scars on dorsal
PTRV16	F	Complex B	flake fragment	gray	1.31	1.29	0.44	0.82	n/a	

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	F	Complex B	percussion blade	gray	2.17	1.78	0.36	1.64	n/a	medial section of percussion blade (second stage); usewear present; flake scar in middle of dorsal surface;
PTRV16	F	Complex B	percussion blade	gray	1.81	1.28	0.25	0.60	6.03	percussion blade fragment (proximal section); platform and bulb present with prominent ripples on ventral side; eralliure scar present; ends in a hinge fracture; some good use wear on one edge
PTRV16	F	Complex B	percussion blade	gray	1.36	1.18	0.31	0.51	n/a	possible percussion blade fragment that broke along the vertical axis (only one edge present, so no CE/M ratio); use wear on present edge
PTRV16	F	Complex B	percussion blade	gray	2.00	0.82	0.33	0.55	7.27	stretching the definition of a blade here, but there is use wear on one edge
PTRV16	F	Complex B	percussion blade	green	2.47	1.11	0.27	0.78	6.33	blade driven off during secondary core reduction (NEED PHOTO); use wear on edges; blade tapers toward distal end
PTRV16	F	Complex B	prismatic blade	gray	0.78	0.32	0.08	0.40	3.90	super small, thin fragment of prismatic blade
PTRV16	F	Complex B	prismatic blade	gray	1.51	2.77	0.57	2.67	1.13	medial fragment of a LARGE, THICK prismatic blade; use wear present; def get photos
PTRV16	F	Complex B	prismatic blade	gray	1.31	0.58	0.19	0.11	23.82	distal end of prismatic blade, with a slightly curved tip; use wear on both sides;
PTRV16	F	Complex B	prismatic blade	gray	1.37	1.42	0.29	0.79	3.47	medial section of pris blade; use wear present
PTRV16	F	Complex B	prismatic blade	gray	3.06	0.80	0.60	0.73	8.38	long prismatic blade; lines down length of blade are curvy
PTRV16	F	Complex B	prismatic blade	green	2.73	1.40	0.30	1.58	3.46	proximal section of prismatic blade; bulb and platform prominent; use wear present

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	F	Complex B	prismatic blade	green	2.05	1.14	0.28	1.15	3.57	prismatic blade fragment (proximal segment); distal end may have broken in transit (two small pieces also in bag that are refits);
PTRV16	F	Complex B	prismatic blade	green	1.73	1.51	0.34	0.99	3.49	small proximal frag of prismatic blade; looks pretty chewed up
PTRV16	F	Complex B	prismatic blade	green	1.62	1.13	0.35	0.89	3.64	medial prismatic blade fragment with lots of usewear;
PTRV16	F	Complex B	prismatic blade	green	1.64	1.19	0.36	0.89	3.69	lots of use wear on this prismatic blade as well as some rejuvenation flake scars on the ventral side; probably second stage;
PTRV16	F	Complex B	prismatic blade	green	2.01	1.31	0.26	1.11	3.62	medial section of prismatic blade; two lines down center; definite use wear
PTRV16	F	Complex B	prismatic blade	green	5.10	1.29	0.31	2.46	4.15	proximal prismatic blade frag; lots of use wear on both edges; definitely need to photo this one;
PTRV16	F	Complex B	prismatic blade	green	2.72	1.48	0.34	2.02	2.69	proximal segment of prismatic blade; lots of use wear
PTRV16	F	Complex B	prismatic blade	green	1.88	1.31	0.26	0.78	4.82	medial section of pris blade; use wear present; weird flake scar on dorsal side
PTRV16	F	Complex B	prismatic blade	green	2.67	1.30	0.17	0.96	5.56	distal section of prismatic blade; usewear on edges; tip probably broke off in use; some sharpening on ventral side
PTRV16	F	Complex B	projectile point	black	2.67	1.12	0.51	1.33	n/a	projectile point fragment; looks like it started as a flake (ventral side has distinct ripples) but was then fashioned into a small point; notch on right side made with pressure flaking; dorsal side has retouching scars
PTRV16	F	Complex B	flake	gray	1.07	1.04	0.24	0.26	n/a	small flake; platform but no bulb; feather termination
PTRV16	G	Plaza	debitage	gray	1.08	0.40	0.20	0.12	n/a	small piece of shatter

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	G	Plaza	debitage	green	1.28	0.93	0.42	0.54	n/a	small piece of shatter; primary or secondary core reduction
PTRV16	G	Plaza	flake	gray	1.17	1.46	0.21	0.29	n/a	
PTRV16	G	Plaza	flake	gray	1.86	1.09	0.26	0.44	n/a	slight hint of a platform; more indication of a bulb; flake scars on both sides; color is gray with several dark striations
PTRV16	G	Plaza	flake	gray	0.99	0.97	0.13	0.16	n/a	small thinning flake; feather termination; no plat or bulb
PTRV16	G	Plaza	flake	gray	1.50	1.14	0.35	0.47	n/a	no distinct bulb but possible platform; broken near distal end but its probably a feather termination; previous blow may have exposed imperfection
PTRV16	G	Plaza	flake	green	0.57	0.52	0.11	0.06	n/a	thinning flake
PTRV16	G	Plaza	prismatic blade	green	1.03	1.06	0.38	0.57	3.61	small fragment of prismatic blade
PTRV16	G	Plaza	prismatic blade	green	0.91	0.84	0.18	0.21	8.67	medial section of prismatic blade
PTRV16	Surface	Plaza	scraper	green	5.09	4.66	1.12	38.37	n/a	surface find; scraper has pressure flaking showing sharpening as well as a large flake taken out of the reverse side that fits the thumb well; need to photograph
PTRV16	G	Plaza	flake	green	1.10	0.86	0.20	0.20	n/a	tertiary flake; platform but no bulb; feather termination; flake scars on dorsal
PTRV16	G	Plaza	flake tool	gray	2.80	1.64	0.44	2.32	n/a	flake with intact bulb and platform; erraliure scar present; flake scars on dorsal side (ripples running toward distal end as well); distal end crush, suggesting it may have been driven off while on an anvil; evidence of use and retouching on one edge

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PTRV16	G	Plaza	flake	gray	1.81	0.63	0.21	0.27	n/a	flake that looks like it was taken off during the preparation of a prismatic core; platform but no bulb; unclear termination;
PTRV16	G	Plaza	prismatic blade frag	gray	1.10	1.60	0.27	0.39	n/a	fragment of prismatic blade; no CE/M ratio taken because the frag is broken at an angle
PTRV16	B	Complex E	flake	green	1.33	2.23	0.38	0.94	n/a	secondary reduction flake; platform and bulb present; feather termination; possibly a utilized flake; flake scars on dorsal side
PTRV16	B	Complex E	flake	gray	1.01	0.86	0.16	0.12	n/a	tertiary flake; platform but no bulb; feather termination; flake scars on dorsal
PTRV16	B	Complex E	flake	black	2.61	1.90	0.41	1.11	n/a	secondary flake; platform and bulb present; plunging termination; flake scars on dorsal
PTRV16	B	Complex E	flake	black	1.22	1.00	0.27	0.33	n/a	tertiary flake; platform but no bulb; feather termination; no flake scars on dorsal side
PRV13	A	Complex A	debitage	gray	1.04	1.17	0.31	0.43	n/a	piece of shatter
PRV13	A	Complex A	debitage	gray	1.23	1.18	0.40	0.60	n/a	shatter; flake scars on both sides and no distinct platform/bulb
PRV13	A	Complex A	flake	gray	1.54	1.18	0.58	0.91	n/a	probable core repair flake; crushed platform; flake scars going down vertically
PRV13	A	Complex A	flake	gray	1.53	0.82	0.21	0.25	n/a	thin flake that may have been driven off during prismatic blade production; feather termination; flake scars on dorsal side
PRV13	A	Complex A	flake	gray	1.42	1.68	0.46	1.10	n/a	platform but no bulb; feather termination; use wear on one side, so probable utlized flake

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PRV13	A	Complex A	flake	gray	0.71	0.92	0.09	0.10	n/a	thinning flake with hinge fracture; small platform but no bulb;
PRV13	A	Complex A	flake	gray	0.59	0.85	0.14	0.09	n/a	thinning flake; feather termination; small platform but no bulb
PRV13	A	Complex A	flake	gray	0.94	0.98	0.19	0.18	n/a	thinning flake with platform but no bulb; feather termination; flake scars on dorsal
PRV13	A	Complex A	prismatic blade	gray	2.46	1.62	0.28	0.92	n/a	utilized flake; driven off in secondary prismatic core reduction; uniform use wear on two edges
PRV13	A	Complex A	flake	gray	1.44	0.98	0.13	0.19	n/a	thinning flake; feather termination; no platform or bulb present
PRV13	A	Complex A	flake	gray	1.04	1.12	0.27	0.31	n/a	prismatic core reduction flake, prob second stage; flake scars on dorsal; no platform or bulb; feather termination
PRV13	A	Complex A	flake	gray	0.82	1.21	0.24	0.27	n/a	flake frag; flake scars on dorsal; platform but no blade; unclear on termination
PRV13	A	Complex A	flake	gray	1.52	0.60	0.20	0.21	n/a	platform and bulb present; feather termination; flakes on dorsal; likely driven off during secondary core reduction
PRV13	A	Complex A	flake	gray	0.58	1.00	0.16	0.10	n/a	small, thin platform production flake; flake scars on dorsal; feather termination
PRV13	A	Complex A	flake	gray	1.56	0.99	0.22	0.34	n/a	no platform or bulb; thin flake; feather termination; flake scars on dorsal side
PRV13	A	Complex A	biface fragment	green	1.90	1.00	0.46	0.49	n/a	sharpening flake scars on both sides of one edge; probably broken during use
PRV13	A	Complex A	flake	green	1.36	0.89	0.40	0.25	n/a	platform but no bulb; feather termination; dorsal side is blocky, indicating early lithic reduction sequence of a tool

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PRV13	A	Complex A	flake	green	2.28	1.14	0.55	1.13	n/a	platform and bulb present; hinge fracture; probably driven off during secondary core/tool reduction; flake scars on dorsal
PRV13	A	Complex A	flake	green	1.44	2.07	0.62	1.41	n/a	platform and bulb present; eralliure scar on ventral side; feather termination; flake scars on dorsal; likely a core prep flake
PRV13	A	Complex A	flake	green	1.71	2.15	0.19	0.55	n/a	very thin flake; feather termination; bulb and platform present; two flake scars (also look thin) on dorsal side
PRV13	A	Complex A	flake	green	1.46	0.93	0.24	0.26	n/a	platform and bulb present; plunging termination; flake scars on dorsal; either from preparing a core or a tool
PRV13	A	Complex A	flake	green	1.47	0.79	0.25	0.28	n/a	small flake taken off during prismatic core reduction; platform present but no bulb; probably taken off during platform preparation, possibly to repair a flaking error (e.g., step fracture)
PRV13	A	Complex A	flake	green	1.22	0.67	0.65	0.46	n/a	platform but no bulb; feather termination; flake scars on dorsal side
PRV13	A	Complex A	flake	green	2.47	2.20	0.45	1.57	n/a	platform and bulb present; core reduction flake; feather termination; dorsal flake scar
PRV13	A	Complex A	flake	green	1.31	2.48	0.33	0.85	n/a	platform and bulb present; step fracture; flake scars on dorsal side; secondary reduction
PRV13	A	Complex A	prismatic blade	green	2.18	1.07	0.29	0.83	5.25	proximal section of pris blade with a lot of use wear
PRV13	A	Complex A	prismatic blade	green	2.81	0.77	0.13	0.35	16.06	distal section of prismatic blad frag; use wear on edges; tapers toward distal end; tip broken off
PRV13	A	Complex A	prismatic blade	green	3.27	1.00	0.27	1.05	6.23	full blade with broken tip; plunging termination; use wear on both edges

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PRV13	A	Complex A	prismatic blade	green	1.25	1.50	0.37	0.97	2.58	medial section of prismatic blade; broken on both ends; one edge rejuvenation flake scar on dorsal side; use wear on both edges
PRV13	A	Complex A	prismatic blade	green	4.93	1.09	0.30	1.91	5.16	proximal section of pris blade; usewear on both sides; bulb and platform present
PRV13	A	Complex A	prismatic blade	green	3.01	1.21	0.60	1.45	4.15	proximal end of prismatic blade w/ use wear on both sides
PRV13	B	Complex A	flake	black	1.30	0.94	0.22	0.28	n/a	platform and bulb present; hinge fracture; one flake scar on dorsal
PRV13	B	Complex A	biface fragment	gray	1.17	1.01	0.27	0.36	n/a	weird piece; flaked on both sides but super thin; not sure how this would have been used as a tool
PRV13	B	Complex A	flake	gray	1.43	1.67	0.33	0.54	n/a	platform and bulb present; feather termination; flake scars on dorsal
PRV13	B	Complex A	prismatic blade	gray	1.66	1.32	0.49	1.40	2.37	medial section of prismatic blade; use wear on both sides
PRV13	B	Complex A	debitage	green	0.58	0.69	0.15	0.10	n/a	small, thin piece of shatter with flake scars on both sides
PRV13	B	Complex A	flake	green	1.55	1.00	0.60	0.58	n/a	core reduction flake; plunging termination; flake scars on dorsal; possibly a utilized flake (use wear on edges); platform but no bulb
PRV13	B	Complex A	flake	green	1.01	0.98	0.16	0.08	n/a	thinning flake with platform and bulb present; feather termination; no flake scars (final stage of tool production?)
PRV13	B	Complex A	prismatic blade	green	1.99	0.70	0.15	0.26	15.31	distal section of prismatic blad frag; use wear on edges; tapers toward distal end
PRV13	B	Complex A	prismatic blade	green	1.51	0.75	0.19	0.29	10.41	very thin prismatic blade; possible hafting scar at one end; medial fragment
PRV13	B	Complex A	prismatic blade	green	2.35	0.99	0.23	0.67	7.01	proximal end of prismatic blade w/ use wear on both sides

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PRV13	B	Complex A	prismatic blade	green	1.03	0.91	0.28	0.38	5.42	proximal section of prismatic blade; use wear on both sides
PRV13	C	Complex A	prismatic blade	green	2.41	0.73	0.15	0.35	13.77	proximal section of prismatic blade; use wear on both sides
PRV13	D	Structure 1	prismatic blade	black	3.19	0.95	0.19	0.87	7.33	medial section of pris blade; very little use wear, if any (there is a circular scar on one edge that may have been from use, but the remaining edges are prestine)
PRV13	D	Structure 1	flake	gray	1.14	0.93	0.23	0.22	n/a	no platform or bulb; thin flake; feather termination; flake scars on dorsal side
PRV13	D	Structure 1	prismatic blade	gray	1.78	1.57	0.33	1.20	2.97	proximal section of pris blade with a lot of use wear; also some rejuvenation flake scars on dorsal side
PRV13	D	Structure 1	prismatic blade	gray	1.34	0.72	0.12	0.11	24.36	very thin prismatic blade, close to distal end; use wear on both sides
PRV13	D	Structure 1	debitage	green	0.98	0.87	0.25	0.24	n/a	shatter; flake scars on both sides and no distinct platform/bulb
PRV13	D	Structure 1	prismatic blade	green	2.58	0.98	0.20	0.75	6.88	proximal section of prismatic blade; use wear on both sides
PRV13	D	Structure 1	prismatic blade	green	2.21	0.98	0.20	0.62	7.13	medial section of prismatic blade; broken on both ends; use wear on both sides
PRV13	F	Complex B	core	black	1.07	1.15	0.97	1.37	n/a	very small possible exhuasted core; flakes driven off in same direction, prepared platform; plunging termination on one flake likely knocked off the rest of the distal end; need to photo
PRV13	F	Complex B	debitage	gray	1.33	0.77	0.43	0.40	n/a	shatter; flake scars on both sides and no distinct platform/bulb
PRV13	F	Complex B	flake	gray	1.24	2.34	0.33	0.80	n/a	platform and bulb present; feather termination; flake scars on dorsal side; tool production flake

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PRV13	F	Complex B	flake	gray	0.41	0.86	0.31	0.14	n/a	flake fragment; distal end of flake;
PRV13	F	Complex B	flake	gray	1.39	1.52	0.26	0.65	n/a	step fracture; no bulb/platform; flake scars on dorsal side
PRV13	F	Complex B	prismatic blade	gray	0.92	0.82	0.22	0.22	n/a	fragment of prismatic blade; one edge not present, so no CE/M ratio taken; use wear present on available edge
PRV13	F	Complex B	prismatic blade/tool	gray	1.85	0.74	0.34	0.51	7.25	distal end of prismatic blade that was then touched up and used as a tool, perhaps as a drill
PRV13	F	Complex B	prismatic blade	green	2.31	1.07	0.28	0.89	5.19	platform and bulb present; proximal section of prism blade; use wear on both sides
PRV13	G	Plaza	biface fragment	gray	1.36	1.37	0.39	0.60	n/a	small fragment of possible bifacially reduced tool; probably the tip of a bifacial blade?;
PRV13	G	Plaza	flake	gray	1.07	1.01	0.20	0.18	n/a	small platform and bulb; feather termination; flake scars on dorsal; small secondary reduction flake
PRV13	G	Plaza	flake	gray	1.69	0.95	0.25	0.27	n/a	platform and bulb present; eralliure scar on ventral side; feather termination; flake scars on dorsal; likely a core prep flake
PRV13	G	Plaza	flake	green	1.61	1.81	0.54	1.36	n/a	flake frag; originally ended in a hinge fracture and may have had the platform/bulb break off; its chunky, so may have been part of secondary core production
PRV13	H	Plaza	debitage	gray	1.18	0.58	0.39	0.36	n/a	shatter
PRV13	H	Plaza	debitage	gray	1.04	1.03	0.36	0.42	n/a	shatter
PRV13	H	Plaza	flake	gray	1.05	1.16	0.36	0.40	n/a	flake frage; petina bult up on distal end where the flake broke; unknown fracture; flake scars on dorsal; platform and bulb present

Project	Op	Site Location	Artifact Type	Color	Max length (cm)	Max width (cm)	Max thickness (cm)	Weight (g)	CE/M ratio (cm/g)	NOTES
PRV13	H	Plaza	flake	gray	2.49	1.50	0.35	1.01	n/a	flake driven off trying to make a prismatic blade; flake scars on dorsal; no bulb or platform;
PRV13	H	Plaza	flake	gray	2.09	1.37	0.32	1.09	n/a	core reduction flake; feather termination; no bulb or platform; two long flakes on dorsal side
PRV13	H	Plaza	flake	gray	0.93	1.21	0.24	0.31	n/a	core reduction flake; hinge fracture; no bulb or platform; flakes on dorsal
PRV13	H	Plaza	flake	gray	0.75	0.96	0.28	0.17	n/a	core reduction flake; feather termination; no bulb/plat
PRV13	H	Plaza	prismatic blade	gray	1.35	1.20	0.20	0.24	11.25	distal end (tip) of prismatic blade; use wear on both sides
PRV13	H	Plaza	prismatic blade	gray	0.87	1.05	0.37	0.33	n/a	blade fragment does not have enough edge to do CE/M ratio; small medial fragment
PRV13	H	Plaza	prismatic blade/biface	gray	2.32	1.74	0.45	1.70	2.73	prismatic blade fragment that was bifacially flaked to try to rejuvenate an edge after the blade was broken; use wear on both long sides

The Ground Stone Assemblage

In this section, I present quantitative and qualitative descriptions of an assemblage of 140 ground stone artifacts recovered from the 2013 and 2016 projects at Cerro de la Virgen. Though I briefly described use-wear and surface treatment, a lack of time and general expertise in this area of lithic analysis precluded an in-depth technological study of ground stone. Future studies in the lower Verde should explore this often overlooked category of artifacts for both diachronic and synchronic studies.

Excavations at Cerro de la Virgen recovered a wide range of ground stone tools (Figures B.14-B.15). Quantitative measurements of all categories of artifacts can be found in Table B.13. The most frequent artifacts included hammerstones (28.6%) with significant use wear on the distal and/or proximal ends of the longitudinal axis indicative of hard hammer percussion, and *manos* (22.9%) with grooved lines perpendicular to the longitudinal axis indicative of grinding food or other materials. Several smaller stones had evidence of grinding on the distal end, suggesting they were pestles (2.1%) used to grind smaller, more delicate materials such as chiles or other dried spices. Additional tools with evidence of grinding were much larger and more ovoid in shape than a traditional mano, suggesting that they were used to smooth the rough exterior surfaces of the terrace stones that were manufactured on-site (see below). Chopping and cutting implements included axes (8.6%), chisels (2.9%), drills (1.4%), scrapers (3.6%), and percussion debris fashioned into expedient tools such as utilized flakes and blades (4.3%). Several tools exhibited evidence of having more than one general use (i.e., grinding and hammering); these tools were classified as having “multiple” uses.

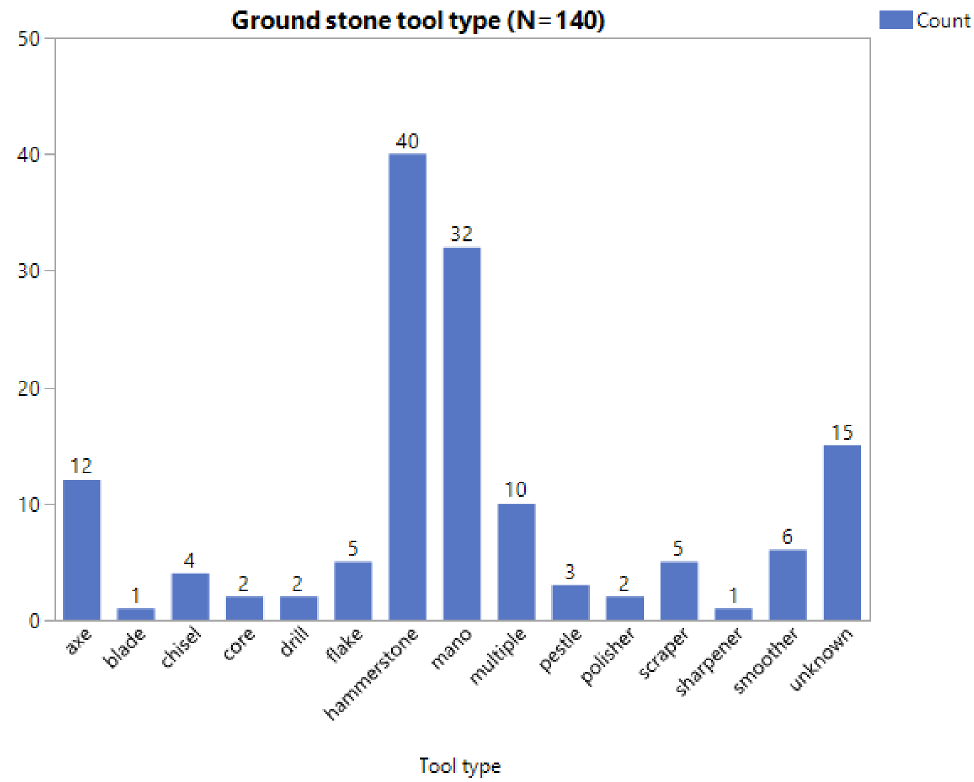


Figure B.14: Total sample of ground stone artifacts from Cerro de la Virgen.

Table B.13: Summary statistics of complete ground stone tools.

		Weight (g)		Length (cm)		Width (cm)		Thickness (cm)	
Tool type	**N**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
axe	7	310.43	301.42	10.26	3.06	5.23	0.98	2.80	0.77
chisel	4	143.16	70.11	8.95	1.87	3.28	0.65	2.46	0.33
core	2	250.65	270.90	6.59	3.88	5.12	2.51	4.24	1.49
drill	2	8.31	6.48	4.02	0.80	1.15	0.33	1.10	0.31
flake	4	57.08	82.84	3.90	0.71	4.70	2.45	1.97	1.14
hammerstone	14	439.74	330.04	9.41	1.78	6.18	1.64	4.13	0.97
mano	8	1853.75	835.24	17.34	5.24	9.51	1.25	6.44	1.30
multiple	10	882.03	1710.56	10.08	6.56	5.10	4.39	4.01	3.44
pestle	1	63.83		7.58		3.01		2.23	
polisher	1	25.90		5.05		2.67		1.16	
scraper	4	109.44	71.40	6.45	2.02	6.32	1.04	2.10	0.87
smoother	6	55.14	45.59	5.14	1.45	3.32	0.57	1.84	0.61
unknown	2	25.95	15.01	4.94	0.43	2.47	0.32	1.56	0.49
All	65	526.29	920.73	9.15	5.06	5.39	2.84	3.44	2.13

Over half of the ground stone artifacts were made from local porous basalt (51.4%), which residents of the site predominantly fashioned into hammer stones and *manos*. Granite (20%) was used primarily for hammer stones as well as drills and scrapers. The second most frequently used material for ground stone was green stone (22.9%), a fine-grained basalt that cools quickly under higher pressure. Green stone appears to have been the material of choice for axes and chisels, though several hammer stones were also made from the material. Residents also used a darker form of fine-grained basalt (2.1%). Collectively, diorite, quartzite, siltstone, and an unidentified white stone (4.3%) accounted for the remaining artifacts in the assemblage.

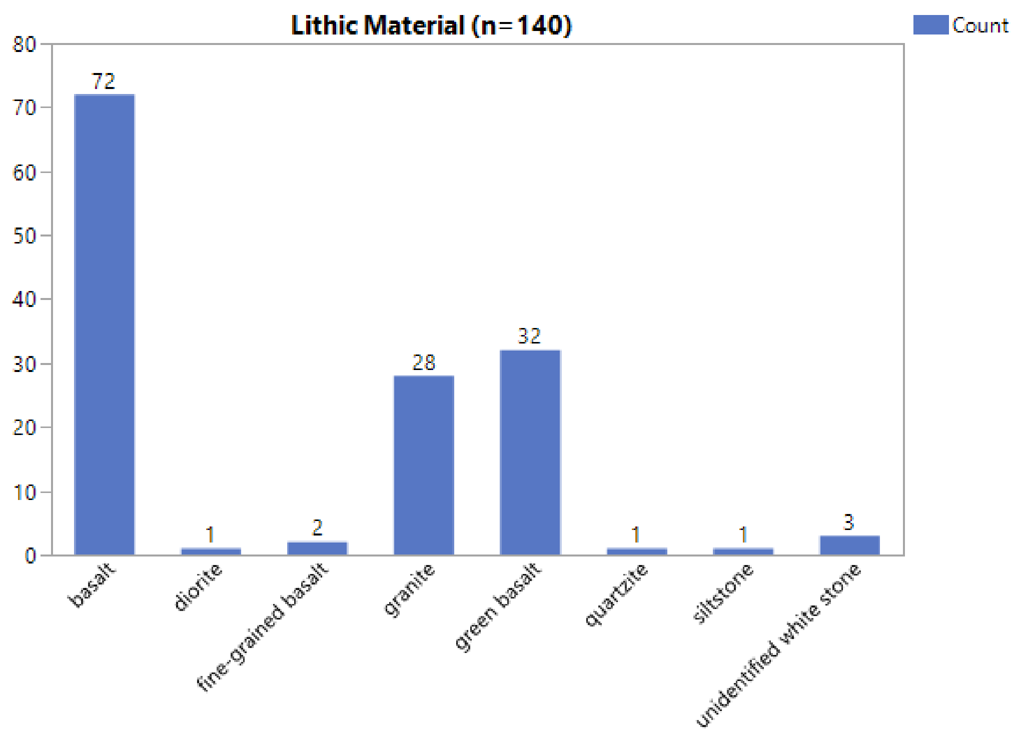


Figure B.15: Quantities of ground stone by lithic material.

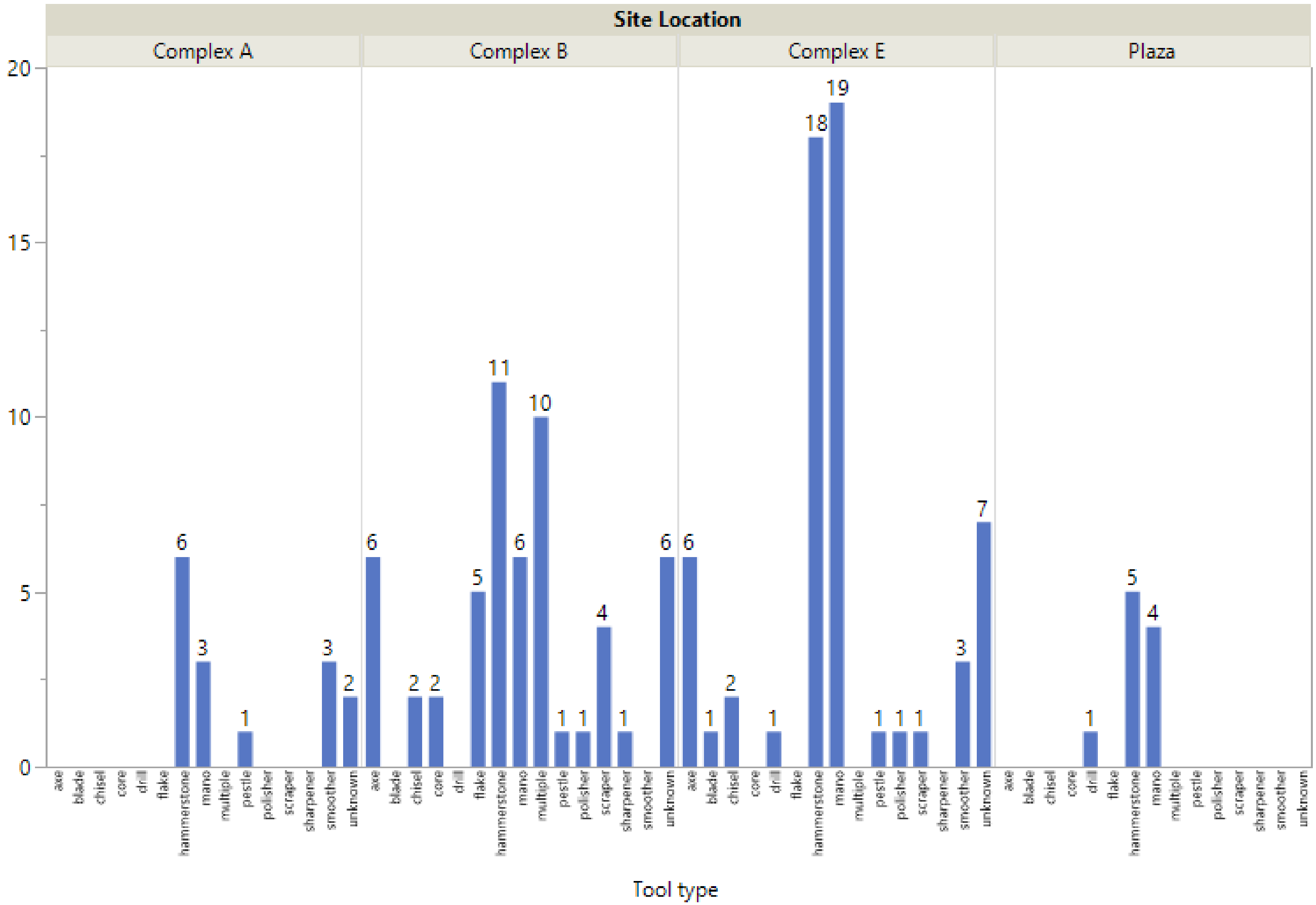


Figure B.16: Ground stone assemblages by Site Location.

Table B.14: Ground stone tools from Cerro de la Virgen.

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	G	2050	214.2	93.3	62.65	basalt	mano (two-handed)	n/a	repecking	two handed mano (good sized)
PTRV16	G	201.88	92.82	49.51	30.19	basalt	hammerstone	n/a	no	small mano
PTRV16	G	133.79	58.4	45.99	35.43	fine grained basalt	one-handed mano?	n/a	no	fragment of tool with a platform that appears to show grinding marks; this is a small cobble fragment; has lots of pyrite or mica inclusions in the matrix
PTRV16	G	154.97	63.96	43.15	34.71	green basalt	possible hammerstone	n/a	no	fragment of possible hammerstone broken on what is likely the longitudinal axis;
PTRV16	G	227.31	78.28	64.36	31.53	basalt	mano fragment	n/a	no	one end of a mano
PTRV16	G	142.98	67.76	49.65	32.05	green basalt	possible hammerstone	n/a	no	probably the distal end of a hammerstone
PTRV16	G	12.89	45.81	13.9	13.25	granite	possible drill	n/a	no	pointed tool with four/five faces; possible large drill bit
PTRV16	A	209.81	89.85	36.76	36.75	granite	hammerstone	n/a	none	hammerstone has a flat platform (possibly for indirect percussion) and a worn distal end from hammering
PTRV16	A	3.73	34.5	9.17	8.81	granite	drill	n/a	none	drill bit has four faces with indicative of flakes driven off of each; flat surface at the top
PTRV16	A	264.8	96.34	56.9	30.54	green basalt	axe	n/a	none	axe with heavy amound of use wear on distal end; likely hafted onto a handle
PTRV16	A	960	164.3	68.76	40.01	basalt	axe	n/a	none	probably hand axe; much longer than the normal axes we see at Virgen; edge does not appear to have very much use wear (possibly ceremonial?)
PTRV16	A	1150	147.26	82.76	51.74	basalt	mano	n/a	repecking	mano with repecking scars; one face is worn down more than others; has evidence of burning, probably because it was found on the surface
PTRV16	A	131.44	93.99	42.6	18.78	green basalt	axe	n/a	edge reduction	axe with some edge reduction at distal end, but not much use wear
PTRV16	A	184.8	86.28	49.48	29.01	basalt	hammerstone	n/a	none	hammerstone with lots of use wear on distal end; proximal end looks like it was broken and worn down

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	A	527.81	102.91	74.04	43.3	basalt	hammerstone	n/a	none	possible hammerstone; use wear on what is likely the distal end (but it is a pretty uniform shape, so there could have been alternative percussion ends)
PTRV16	A	268.72	87.52	67.31	51.6	granite	mano fragment	n/a	none	mano frag
PTRV16	A	3250	204.2	107.33	94.8	basalt	mano	n/a	repecking	very large mano frag; uniformly worn down on underside; evidence of repecking
PTRV16	A	4.07	36.52	18.13	4.68	basalt	possible blade	fire treatment	none	possible blade that was fire treated; likely the distal end
PTRV16	A	215.09	71.12	57.1	37.83	basalt	mano fragment	n/a	none	mano frag
PTRV16	A	215.47	76.57	57.72	40.09	basalt	mano fragment	n/a	none	mano frag
PTRV16	A	314.09	80.03	81.17	33.28	basalt	mano fragment	n/a	none	mano frag
PTRV16	A	429.54	77.97	73.06	45.29	basalt	hammerstone	n/a	none	hammerstone with use wear
PTRV16	A	433.61	85.09	77.31	44.91	basalt	hammerstone	n/a	none	hammerstone with use wear on two surfaces
PTRV16	A	25.9	50.5	26.67	11.63	basalt	polisher	n/a	none	possible ceramic polisher
PTRV16	A	50.25	30.57	34.18	24.74	basalt	mano fragment	n/a	none	mano frag
PTRV16	A	28.76	51.6	37.93	14.36	basalt	mano fragment	n/a	none	mano frag
PTRV16	A	39.3	56.82	26.57	15.83	basalt	possible pestle	n/a	none	possible pestle frag
PTRV16	A	107.86	75.04	46.81	21.75	green basalt	axe	polished	none	proximal end of an axe with heavy use on the distal end that probably caused it to break
PTRV16	A	56.76	48.34	35.34	19.8	green basalt	hammerstone	polished	none	proximal end of a hammerstone; small fragment
PTRV16	A	127.76	88.94	38.67	27.88	basalt	hammerstone	n/a	none	proximal end of hammerstone that broke along longitudinal axis
PTRV16	A	43.66	46.44	45.15	16.46	basalt	mano fragment	n/a	possible repecking	small mano fragment
PTRV16	B	236.9	117.38	35.61	28.81	green basalt	chisel	polished	resharpening on edge	long, narrow chisel with use wear on edge and some evidence of resharpening; also has an impact platform at proximal end

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	B	105.27	58.15	47.26	22.61	fine-grained basalt	axe	none		distal fragment of an axe
PTRV16	B	128.1	51.27	49.2	27.44	basalt	hammerstone	n/a		distal frag of a hammerstone
PTRV16	B	95.57	77.88	29.52	24.47	green basalt	chisel	n/a	resharpening on edge	chisel
PTRV16	B	1480	138.1	89.65	67	green basalt	hammerstone	n/a	n/a	green basalt hammer with evidence of impact marks on both ends
PTRV16	B	2050	181.5	92.89	76.96	basalt	mano	n/a	repecking	mano with evidence of repecking
PTRV16	B	392.6	99.08	61.84	40.06	basalt	hammerstone	n/a		hammerstone with evidence of hammering marks
PTRV16	B	325.6	96.66	76.09	39.3	basalt	mano	n/a	repecking	fragment of mano (probably a large one)
PTRV16	B	222.91	76.9	52.14	35.13	green basalt	unknown	n/a	n/a	fragment of a possible tool (maybe a hammerstone)
PTRV16	B	800	113.17	72.55	52.98	basalt	mano	n/a	repecking	one handed mano; has a weird cross-section in shape with four grinding surfaces
PTRV16	B	22.9	57.46	37.97	17.19	green basalt	unknown	n/a	none	one surface is nice and smooth; may have been a hammerstone fragment
PTRV16	B	351.43	88.81	73.78	47.45	basalt	mano			
PTRV16	B	119.08	54.2	47.98	24.39	basalt	axe fragment	n/a	n/a	distal end of an axe that looks like it was used and essentially exhuasted; no evidence of resharpening or edge reduction
PTRV16	B	10.59	32.52	30.7	7.92	green basalt	smoother	polishing	n/a	small circular polished stone; probably ceramic smoother
PTRV16	B	88.35	41.26	47.39	34.8	basalt	hammerstone?	n/a	n/a	medial fragment of what is probably a hammerstone
PTRV16	B	380.71	105.87	59.28	41.79	basalt	hammerstone	n/a	n/a	smaller hammerstone with one end with evidence of hammer blows/marks
PTRV16	B	3460	205.5	113.24	89.36	basalt	mano	n/a	repecking	two handed mano with some girth to it; evidence of repecking; one side is a bit smoother than the other
PTRV16	B	247.35	73.23	51.81	38.47	basalt	hammerston	n/a	none	smaller hammerstone; two ends with hammer marks
PTRV16	B	167.18	55.58	55.61	42.43	basalt	unknown	n/a	n/a	fragment of unknown tool with one smooth face; it is cube shaped and angular, so could this have possibly been a core? Has four faces with rough texture

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	B	184.46	78.51	54.48	30.79	granite	scraper	n/a	n/a	possible scraper; has a good edge with what looks like use wear; proper size for a scraper
PTRV16	B	900	88.3	94.83	52.09	basalt	mano	n/a	possible repecking	weird circular shaped mano with more grinding use wear on the narrower edges
PTRV16	B	2050	171.2	111.84	54.60	basalt	mano	n/a	repecking	either a small two handed mano or a large one handed mano; lots of evidence of repecking
PTRV16	B	481.45	110.4	62.1	45.98	basalt	hammerstone	n/a	n/a	hammerstone broken along longitudinal axis
PTRV16	B	1020	126.29	77.27	57.89	basalt	mano	n/a	n/a	really crumbly material--seems to be similar to the lajas; probably really crappy basalt
PTRV16	B	522.2	75.65	58.48	58.48	basalt	unknown	n/a	n/a	may have been a hammerstone; unclear, but broke along the transverse axis
PTRV16	B	20.77	45.84	37.78	11.87	green basalt	unknown	n/a	n/a	fragment of possible tool with a smooth, curved surface on one face
PTRV16	B	15.99	44.14	40.78	11.77	green basalt	unknown	n/a	n/a	unknown tool frag
PTRV16	B	328.83	98.64	59.42	30.61	basalt	hammerstone	n/a	n/a	tabular shaped hammerstone (thin in width) with hammering marks on both ends
PTRV16	B	139.55	58.18	41.58	29.1	green basalt	hammerstone	n/a	n/a	narrow hammerstone (distal end)
PTRV16	B	62.98	60.58	35.58	22.72	basalt	smoother	n/a	n/a	probably a smoother, given the size of it; may have also been used for some percussion/hammering
PTRV16	B	1820	117.97	92.21	93.11	basalt	mano	n/a	n/a	large mano fragment that may have been broken before its uselife ended; there is some girth to this one
PTRV16	B	26.62	54.39	29.08	16.5	green basalt	unknown	n/a	n/a	fragment of tool, unknown type
PTRV16	B	53.51	62.26	44.05	17.43	granite	mano	n/a	n/a	mano frag
PTRV16	B	38.39	49.16	34.27	17.07	Unidentified white stone?	smoother	n/a	n/a	smoother made of a white colored stone that may be something like alabaster (not sure what it is)
PTRV16	B	88.65	73.75	31.09	21.12	green basalt	hammerstone or mano	n/a	n/a	green basalt tool with ground surface which may be evidence of grinding or hammering or both
PTRV16	B	19.97	21.53	40.95	15.65	green basalt	probable hammerstone	n/a	n/a	probably the distal end of a hammerstone

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	F	83.82	80	25.7	24.4	green basalt	chisel	polished	none	Chisel does not appear to have much use wear on the distal end; may have been hit a few times on the proximal end, but was certainly not used
PTRV16	F	156.36	82.68	40.45	20.73	basalt	chisel	n/a	none	chisel has lots of use wear on distal end and pronounced platform on proximal end
PTRV16	F	9.24	30.86	30.93	7.45	green basalt	edge sharpener	n/a	none	sharpener has four grooved lines that run the length of the artifact; probably a utilized flake that was turned into a tool; used for rejuvenating edges of ground stone (though the edge of whatever tool was being sharpened would have had to have retouch flaking done first)
PTRV16	F	49.28	65.9	27.48	20.91	siltstone	chisel/pestle	fire treatment	repecking	tool was likely a pestle, but could have been used for chiseling as well; angled platform shows pounding marks; fire treated on ground down sides; distal end shows a few repecking marks as well as a longitudnal crack, which may have been the result of use in indirect percussion
PTRV16	F	424.13	126.17	59.18	37.7	basalt	axe	n/a	repecking	axe likely used for coarse chopping and possibly also hammering; broke during use (flake removed from both sides); repecking present on distal end
PTRV16	F	168.97	82.38	35.32	34.94	basalt	hammerstone/pestle	n/a	repecking	hammerstone/pestle was likely used for both grinding and hammering for hard percussion;
PTRV16	F	138.56	91.11	38.77	26.14	green basalt	axe	slightly polished	none	use wear on the edge of this axe (but none on proximal end--likely hafted onto a handle);
PTRV16	F	149.17	78.55	54.35	21.79	green basalt	axe	polished	edge rejuvenation (resharpening)	nice little trapezoidal axe with use wear (visible with naked eye) going in transverse and longitudnal axes; little use wear on proximal end; probably hafted onto handle
PTRV16	F	385.59	118.46	53.79	35.38	green basalt	axe	polished	edge rejuvenation (resharpening)	longer axe (possibly a hand axe); use wear present on edge

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	F	505.48	104.28	59.36	44.62	green basalt	hammerstone	n/a	repecking	trapezoidal hammerstone; used one both sides with evidence of hammering marks
PTRV16	F	128.7	74.26	30.35	30.59	basalt	hammerstone	n/a	possible repecking	small hammerstone that might have been used for some grinding; one side is a bit flatter than the other (long side);
PTRV16	F	5230	260	148.5	117	basalt	smoother/possible mano	n/a	repecking	Huge smoothing/grinding stone, likely for smoothing out the sides of faced terrace/wall stones; seems to be weirdly shaped to be strictly a mano (more circular than long), but it could have been used for that; one side is a lot smoother, and was probably the side that was used the most; definite evidence of repecking on the smooth side; other side may have been intentionally left rough as a grip
PTRV16	F	2150	253	95	66.97	basalt	mano	n/a	repecking	good sized mano with heavy use on one side; lots of repecking
PTRV16	F	1090	110.81	85.81	65.5	basalt	mano fragment	n/a	repecking	mano fragment; this also may have been a big piece of debitage that was fashioned into a grinding stone (dorsal side does not appear to have been used much)
PTRV16	F	54.48	61.56	31.62	19.72	basalt	axe	n/a	edge rejuvenation	small axe with broken proximal end (also could have been a chisel that was broken by a blow); probable edge rejuvenation on the distal end
PTRV16	F	257.66	49.93	56.08	55.06	granite	hammerstone	n/a	none	fragment of hammerstone that broke at proximal end along transverse axis but was used afterward; multiple faces of impact
PTRV16	F	143.44	75.25	51.22	23.45	green basalt	axe	polished	probable edge rejuvenation	small axe with use wear on edge; seems thinner than most axes in this context
PTRV16	F	37.88	48.16	68.25	10.48	granite	scraper	n/a	ridge reduction; edge rejuvenation	flake of granite that was fashioned into a scraper; evidence for ridge reduction at distal end and possibly sharpening

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	F	155.34	85.18	75.36	24.58	green basalt	scraper	n/a	edge rejuvenation	flake of what may habe been formerly a mano that was refashioned into a scraper; use wear on distal edge; platform was probably the sides of the mano
PTRV16	F	349.65	53.22	80.28	45.94	granite	mano fragment	n/a	repecking	end of a mano; evidence of repecking; may have been broken and used for some hammering
PTRV16	F	209.71	39.55	73.07	34.29	granite	hammerstone fragment	n/a	possible repecking	end of a hammerstone that may have also been used for some grinding; may have a small flake taken out of it near the platform
PTRV16	F	181.07	46.51	72.83	36.37	green basalt	platform preparation flake	n/a	n/a	preserved platform but no bulb of percussion; may have been driven off to create a core or to remove crappy vasicular stuff from the nodule
PTRV16	F	251.84	79.81	59.54	33.9	granite	hammerstone	n/a	possible repecking	small hammerstone, may have been used for some grinding; use wear on distal end
PTRV16	F	38.63	63.6	30.03	18.5	basalt	hammerstone	n/a	n/a	small, thinner hammerstone; has a platform used for hammering; may have had a segment or flake driven off of the side
PTRV16	F	442.2	93.34	68.96	52.92	granite	core	n/a	n/a	this is a river cobble that has at least three flakes driven off of it; one has a very nice flake scar on which you can see the bulb of percussion; not sure why they discarded it after driving off three flakes…
PTRV16	F	214.99	123.44	31.85	30.15	granite	hammerstone/chisel	n/a	n/a	long, thin hammerstone possibly used for more delicate primary/secondary flaking
PTRV16	F	60.06	46.17	54.67	18.18	granite	possible scraper	fire treatment	none	fire treated on outside; primary flake that may have been used as a scraper; some usewear present on one or two edges
PTRV16	F	60.3	40.79	46.1	29.14	diorite	possible mano	n/a	none	possible fragment of a mano; poor quality diorite; probably broke during use; one side is very smooth while the other faces are coarse and brittle
PTRV16	F	151.51	100.28	39.73	20.31	basalt	probable hammerstone	n/a	n/a	small, thin hammerstone that was likely split down the middle during use; may have had another flake driven off the dorsal side, also during use

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	F	11.91	23.63	17.5	17.44	Unidentified white stone	possible polisher	n/a	n/a	very small possible ceramic smoother; off white in color, could be something like alabaster or even a fine grained siltstone; need to check
PTRV16	F	59.09	38.5	33.4	31.8	quartzite	core?	n/a	repecking	spherical chunk of quartzite with evidence of pecking and at least three flakes driven off various parts of the exterior; not sure what this would have been used for
PTRV16	F	28.38	37.73	33.6	14.6	granite	unknown	n/a	n/a	fragment of possible hammerstone
PTRV16	F	17.03	38.07	27.08	11.82	granite	unknown	n/a	n/a	fragment of possible hammerstone
PTRV16	F	129.54	67.66	42.04	32.51	green basalt	probable hammerstone	polishing	n/a	fragment of probable hammerstone; surface is polished; one face seems to be flatter than the others but doesn't have evidence of hammering scars/fractures
PTRV16	F	14.7	39.69	16.88	13.7	basalt	pestle/possible polisher	n/a	n/a	small possible ceramic polisher; may have also been used as a pestle
PTRV16	F	24.5	57.12	18.2	14	basalt	pestle/possible polisher	n/a	n/a	possible pestle; very smooth appears to be siltstone;
PTRV16	F	2550	152.27	103.52	86.74	basalt	mano/hammerstone	n/a	repecking	this is either a smaller but rounder mano or a large hammerstone (or both); evidence for use wear on ends as well as longitudnal surfaces; repecking evident too
PTRV16	F	20.5	41.5	58.82	10.55	green basalt	platform preparation flake	n/a	n/a	platform preparation flake; platform present but no bulb; feather term; flake scar on dorsal side
PTRV16	F	27.94	38.44	42.74	12.65	green basalt	possible scraper	n/a	ridge reduction	flake or possible fragment of broken tool that was likely fashioned into a scraper; ridge reduction present on one side
PTRV16	F	397.9	96.92	72.49	34.29	granite	hammerstone /smoother	n/a	repecking	river cobble that was used as a hammerstone and maybe a smoother
PTRV16	F	7.44	23.22	18.43	17.14	basalt	unknown	n/a	n/a	unknown tool fragment
PTRV16	F	8	29.7	16.28	17	granite	core preparation flake	n/a	n/a	core preparation flake; platform present but no bulb; feather termination; dorsal side has nice smooth surface; may have been made in reduction of a river cobble to smaller core
PTRV16	F	18.75	38.11	40.05	14.82	granite	possible core prep flake	n/a	n/a	plunging termination; platform present but no bulb; flake scars and some pecking present on dorsal side

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PTRV16	F	11.55	34.53	27.96	9.35	granite	possible core prep flake	n/a	n/a	core prep flake with imperfections on dorsal side; no platform or bulb; unknown termination
PTRV16	F	19.27	49.29	34	10.96	granite	unknown	n/a	n/a	unknown tool fragment
PTRV16	F	15.33	46.37	22.4	12.13	granite	unknown	n/a	n/a	flake with platform but no bulb;
PTRV16	F	14.81	37.69	18.01	16.03	basalt	unknown	n/a	n/a	unknown tool fragment
PTRV16	F	44.17	46.65	25.44	22.29	granite	possible pestle	n/a	n/a	possible pestle frag
PTRV16	F	22.23	50.03	20.7	15.22	granite	possible polisher/pestle	n/a	n/a	possible polisher/pestle
PRV13	A	385.47	79.44	62.37	57.7	basalt	possible hammerstone	none	none	broken hammerstone
PRV13	A	103.59	45.76	71.69	26.74	basalt	unknown	none	none	unknown stone tool frag
PRV13	A	572.99	112.59	67.18	46.5	basalt	hammerstone	n/a	none	hammerstone that may have also been used briefly as a one-handed mano
PRV13	A	141.7	74.41	42.1	25.33	basalt	smoother	n/a	none	small hammerstone-shaped tool with smooth surfaces on the sides and rough ones on the edges; may habe been used for smoothing ceramics and later (or also) for some hammering
PRV13	A	146.43	56.31	68.56	29.47	basalt	probable mano	n/a	none	probable mano fragment
PRV13	A	279.35	93.77	51.11	39.93	green basalt	probable hammerstone	n/a	none	prbable hammerstone fragment (distal end)
PRV13	A	105.28	56.4	45.1	30.3	granite	probable hammerstone	n/a	none	probable hammerstone distal end
PRV13	A	35.17	48.53	24.77	16.76	basalt	possible smoother	n/a	none	possible smoother
PRV13	A	42.02	43.38	31.9	20.75	basalt	possible smoother	n/a	none	possible smoother
PRV13	A	7.87	40.6	22.88	10.71	quartzite	possible projectile point	fire treatment	none	crudely made possible projectile point
PRV13	A	36.56	52.46	26.91	18.99	Unidentified white stone	unknown	polished?	none	weird piece of milky white stone in the shape of a small pestle; not much use wear on the presumably distal end, so it may have been a smoother

Proj.	Op	Wt. (g)	Max L (mm)	Max W (mm)	Max Th (mm)	Material	Tool type	Finish-ing	Modifi-cation	Notes
PRV13	A	21.12	39.79	40.52	12.99	basalt	probable mano	n/a	none	mano frag
PRV13	A	474.89	87.85	78.04	45.29	granite	hammerstone	n/a	none	
PRV13	B		131.39	101.9	89.77	basalt	mano	none	none	very large mano fragment
PRV13	B	63.83	75.82	30.14	22.29	basalt	possible pestle	none	none	possible pestle; four pieces refit to make this artifact
PRV13	B	99.45	35.15	55.4	35.34	basalt	hammerstone	none	none	distal end of hammerstone
PRV13	F	410.85	98.66	78.16	36.8	basalt	possible hammerston	fire treatment	n/a	possible hammerstone
PRV13	F		130.72	86.8	52.43	granite	mano	fire treatment	n/a	very brittle matrix; definitely a mano, though
PRV13	F	112.34	71.4	39.22	32.59	green basalt	hammerstone	polishing	n/a	distal end of a hammerstone with hammer marks on end
PRV13	F		71.63	115.3	63.18	basalt	mano	none	repecking	end of a mano, probably a large one; surfaces are smooth but with some examples of repecking
PRV13	F	199.77	69.46	54.07	31.06	basalt	hammerstone	none	n/a	distal end of a hammerstone with hammer marks on end
PRV13	F	147.74	80.64	34.94	34.24	basalt	hammerstone /pestle	none	n/a	small for a hammerstone but right size for a pestle
PRV13	H	46.68	58.02	48.46	23.22	basalt	probable mano	none	none	end fragment of a possible mano
PRV13	H	63.58	50.43	45.97	15.26	granite	probable hammerstone			distal end of possible hammerstone
PRV13	G	251.28	83.69	57.7	35.69	basalt	hammerstone	n/a	none	hammerstone fragment

APPENDIX C: ARCHAEOMETRIC ANALYSES OF CERAMIC AND OBSIDIAN ARTIFACTS

Analyses prepared by Daniel Pierce and Michael Glascock

This appendix describes the preparation, analysis, and interpretation of 85 archaeological pottery samples from the sites of Cerro de la Virgen and Rio Viejo and 40 archaeological obsidian samples from Cerro de la Virgen. The studies were completed in the spring of 2018 by Dr. Michael Glascock and Dr. Daniel Pierce of the Missouri University Research Reactor (MURR). Research funds for the study were provided by a National Science Foundation Doctoral Dissertation Research Improvement grant as well as an Undergraduate Research Opportunities Program grant awarded to Rachael Wedemeyer from the University of Colorado Boulder. Wedemeyer's honor's thesis research involved the quantitative and qualitative study of Terminal Formative-period figurines from Rio Viejo and Cerro de la Virgen. As described in Chapter 3, the primary goal of these analyses was to address the variability in source material of obsidian and pottery among sites in the region.

Neutron Activation Analysis (NAA) of Pottery

In this section, I summarize the results of the NAA conducted on 85 archaeological pottery samples from Rio Viejo and Cerro de la Virgen. The sample submitted to MURR includes 25 gray ware pottery sherds, all from serving bowls, as well as 60 ceramic figurines dating to the Terminal Formative period. Among the figurine sub-sample, 30 were excavated at Cerro de la Virgen during the 2013 and 2016 projects, and 30 were excavated from Rio Viejo during the 2012 and 2013 projects (see Wedemeyer 2018). The specimens were assigned six-digit identification numbers unique to MURR, ranging from OAX715-OAX799).

The samples were tested for their elemental composition and compared to contemporaneous reference samples from Rio Viejo and San Francisco de Arriba (Joyce et al. 2006), as well as non-contemporaneous samples from the late Postclassic site of Tututepec (Levine 2000) and from the Manialtepec Basin (Barber and Pierce 2019). While the sample size of 85 specimens is relatively small, the reference data available for comparison at MURR is extensive, with over a thousand samples from Oaxaca alone. This study not only benefits from this large reference collection, but also further augments its scope. The primary goal of the NAA was to address compositional variability within the sample and to better understand the consumption and production patterns as they relate to the degree of political integration and the nature of political authority in the lower Verde during the Terminal Formative period. This study not only explores the sites of Rio Viejo and Cerro de la Virgen, but also has broader implications for exploring general Lower Rio Verde Valley social dynamics and socioeconomic relationships during the Terminal Formative. Below, I briefly summarize the procedures used in sample preparation and data collection. I then review in detail the compositional group assignments and possible matches with other ceramic and clay samples previously submitted which are recorded in the MURR database to identify possible geographic origin of compositional groups.

Sample Preparation and Group Assignment

Pottery and clay samples were prepared for NAA using procedures standard at MURR. Fragments of about 1 cm^2 were removed from each sample, abraded with a silicon carbide burr to remove contaminants, and washed with deionized water. After drying, the fragments were ground to powder to make the samples homogeneous and archival samples were retained for future research. Two analytical samples were prepared from each source specimen, consisting of approximately 150 mg of powder weighed into clean high-density polyethylene vials used for short irradiations at MURR. An additional 200 mg of each sample was weighed into clean high-purity quartz vials used for long irradiations. Along with the unknown samples, standards made from National Institute of Standards and Technology (NIST) certified standard reference materials of SRM-1633a (coal fly ash) and SRM-688 (basalt rock) were similarly prepared, as were quality control samples (e.g., standards treated as unknowns) of SRM-278 (obsidian rock) and Ohio Red Clay (a standard developed for in-house applications at MURR).

The application of NAA at MURR consists of two irradiations and a total of three gamma-ray counts (see Glascock 1992; Neff 1992, 2000). A short irratdiation is carried out through a pneumatic tube irradiation system in which samples in polyethylene vials were irradiated for five seconds by a neutron flux of 9 x 10^{13} n cm^{-2} s^{-1}. The resulting 720-second gamma-ray count (first of three counts) yields peaks for nine short-lived elements, including aluminum (Al), barium (Ba), calcium (Ca), dysprosium (Dy), potassium (K), manganese (Mn), sodium (Na), titanium (Ti), and vanadium (V). The samples in quartz vials were subjected to a 24-hour irradiation by a neutron flux of 5 x 10^{13} n cm^{-2} s^{-1}, were allowed to decay for seven days, and then were counted for 1,800 seconds (second count) to determine the yields of seven medium half-life elements, including namely arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). After an additional three- or four-week decay, a final count of 8,500 seconds is carried out on each sample. The latter measurement yields the following 17 long half-life elements: cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), strontium (Sr), tantalum (Ta), terbium (Tb), thorium (Th), zinc (Zn), and zirconium (Zr). The element concentration data from the three measurements were tabulated in parts per million. For this study, Arsenic (As) and Nickel (Ni) were removed from all NAA statistical techniques due to the high frequency of missing values within the dataset.

Typically, the approach used to interpret chemical data for pottery involves hierarchical cluster analysis (CA) and principal component analysis (PCA) to establish initial groupings within the sample. To further chemically characterize the sample, PCA are also useful in identifying which elements are the most significant in explaining multidimensional variation within the sample. After constructing base compositional groups through CA and PCA, bivariate elemental plots were used to refine groups. Next, Mahalanobis distance-based probabilities were calculated to affirm or modify these initial groupings. Archived data from samples collected elsewhere were then integrated to assess similarities between the proposed groups and any previously analyzed data. Finally, the groups were further compared to relevant previously analyzed samples from the MURR database using Euclidian distance (Figure C.1).

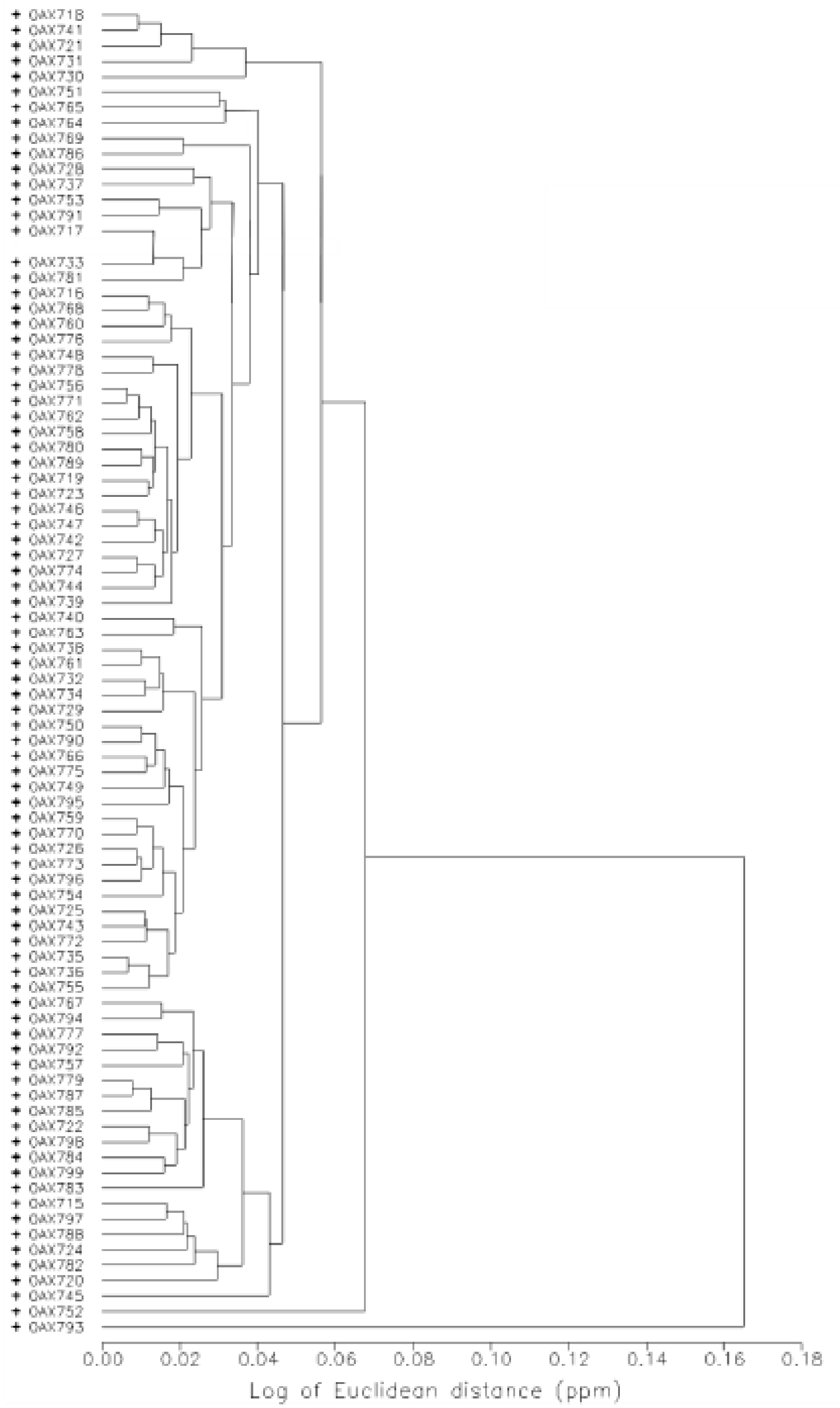


Figure C.1: Results of Hierarchical Cluster Analysis

As an initial step toward interpreting the pottery sample, the dataset was considered in isolation to identify important variables for group formation. A PCA was conducted without As, and Ni (Table C.1). The results of this analysis are presented in Figure 3 through an R-Q mode biplot of the first two principal components (Figure C.2). Though not a typical strategy, a second PCA was also conducted for better differentiating compositional groups within the assemblage. In the first PCA as well as the cluster analysis, it was revealed that specimen OAX793, a conical bowl, is an extreme outlier compositionally and has significantly affected the results of principal component analyses. For this reason, though the initial PCA is useful for characterizing the general structure of the dataset in aggregate, for subsequent analyses we have conducted a second PCA with the outlier removed for the purposes of better differentiating compositional groups within the assemblage.

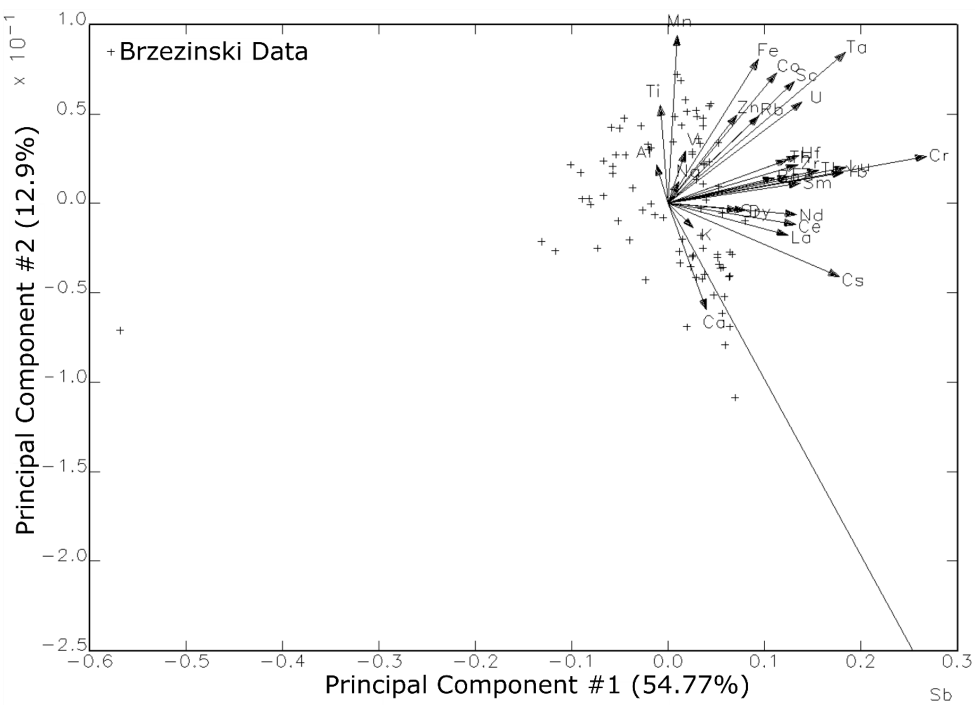


Figure C.2: R-Q Mode biplot of sample on Pricipal Component 1 and Principal Component 2. Elemental vector magnitudes set at 1.0.

Table C.1: Elemental Loadings for study sample on Principal Component Axes 1 through 5.[9]

Variable	Average	PC1	PC2	PC3	PC4	PC5
Al	113961.604	**-0.016**	0.061	0.021	-0.141	0.014
Ba	789.991	0.150	0.041	0.163	0.053	-0.082
Ca	15519.358	0.055	*-0.167*	-0.008	**0.481**	0.149
Ce	55.733	0.180	-0.033	0.114	-0.122	-0.023
Co	20.712	0.153	0.204	-0.136	-0.053	-0.083
Cr	59.664	**0.365**	0.074	**-0.391**	0.022	**0.346**
Cs	4.133	*0.242*	*-0.114*	*-0.338*	0.165	**-0.509**
Dy	4.413	0.110	-0.011	-0.079	-0.047	**0.301**
Eu	1.427	0.171	0.042	0.052	-0.160	-0.023
Fe	58807.538	0.127	*0.226*	0.005	-0.052	-0.136
Hf	3.932	0.184	0.075	**0.379**	0.268	-0.081
K	19632.056	0.036	-0.039	-0.112	*0.333*	-0.102
La	26.928	0.170	-0.050	0.130	-0.153	-0.042
Lu	0.316	*0.252*	0.056	0.031	-0.002	0.118
Mn	726.488	*0.014*	*0.264*	-0.180	*0.411*	*0.230*
Na	9244.364	*0.015*	0.034	*0.257*	0.220	0.051
Nd	26.349	0.182	-0.017	0.111	-0.154	-0.006
Rb	99.890	0.129	0.137	-0.131	0.170	**-0.499**
Sb	0.249	**0.372**	**-0.754**	-0.071	-0.040	0.019
Sc	18.422	0.179	0.191	-0.053	-0.070	-0.042
Sm	6.029	0.186	0.031	0.072	-0.119	0.013
Sr	235.613	0.099	-0.010	**0.442**	0.031	0.011
Ta	0.807	*0.250*	*0.236*	-0.065	0.135	0.138
Tb	0.772	*0.213*	0.052	0.025	-0.100	0.084
Th	7.321	0.169	0.068	0.132	-0.056	-0.043
Ti	6612.995	**-0.010**	0.154	-0.091	-0.111	-0.005
U	2.796	0.189	0.159	0.085	-0.081	0.111
V	161.616	0.025	0.082	-0.223	**-0.204**	-0.019
Yb	2.116	*0.247*	0.049	0.023	-0.034	0.150
Zn	170.148	0.097	0.138	0.033	**-0.196**	*-0.254*
Zr	117.664	0.183	0.060	*0.256*	0.203	-0.092
Eigenvalues:		0.541	0.127	0.106	0.050	0.038
% of variation explained:		54.75%	12.87%	10.69%	5.09%	3.88%

Base compositional groups were identified using the cluster analysis shown by Figure C.2 and Table C.1. These groups were then projected on bivariate plots using principal component loadings to examine the greatest amount of internal variation, which aided in defining groups (Figure x.2). Elements

[9] Values in bold explain the greatest amount of variation within each component. Those in italics explain a significant portion of the variation, but less than those in bold.

identified as most significant through PCA were examined on bivariate plots were also examined (Figures C.3-C.6). The groups formed through PCA were then confirmed using Mahalanobis distance calculations.

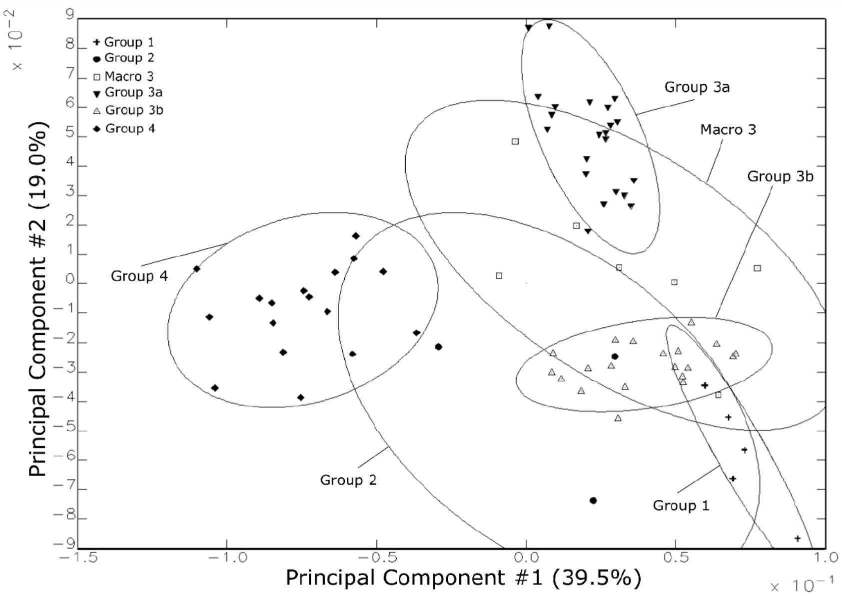


Figure C.3: Results of PCA including compositional group assignment (PC1 and PC2).

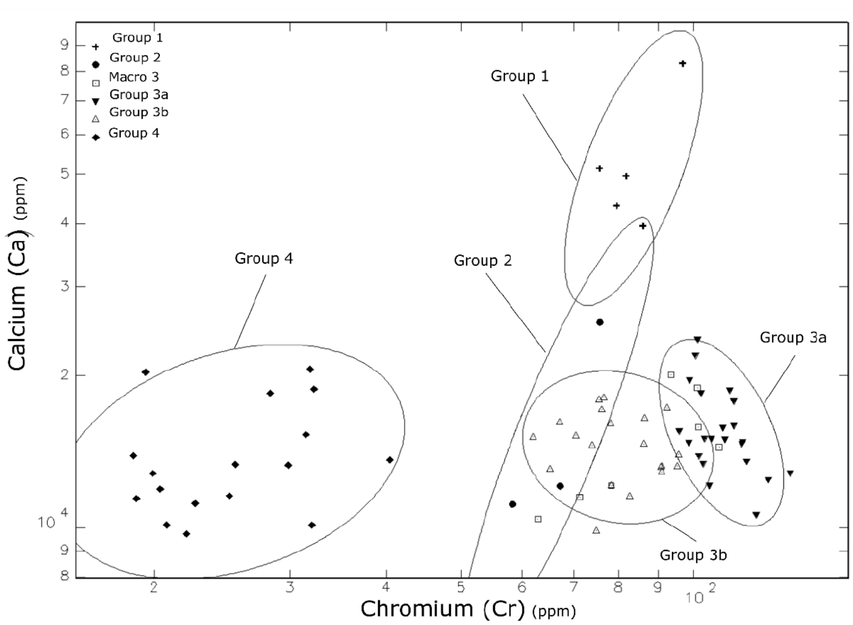


Figure C.4: Bi-variate plote of sample with chemical composition on axes of Cr and Ca.

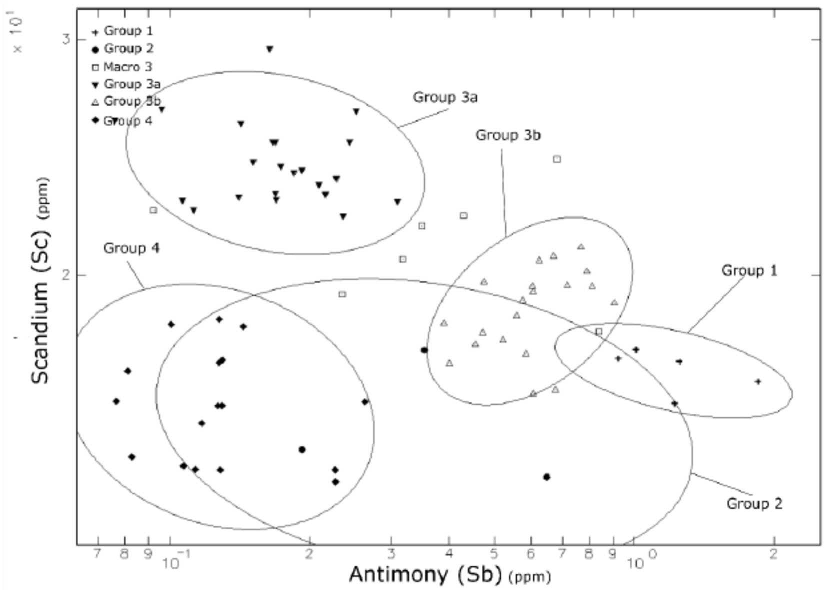


Figure C.5: Bi-variate plot of sample with chemical composition on axes of Sb and Sc.

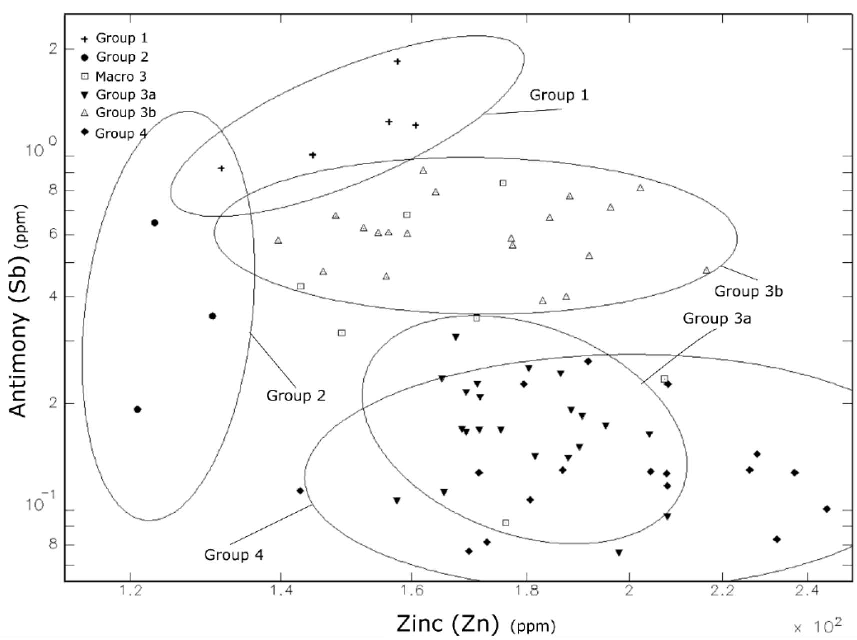


Figure C.6: Bi-variate plot of sample with chemical composition on axes of Zn and Sb.

From the multiple analyses described above, compositional groups were assigned by number, in no particular order, one through four. Group 3 can be further subdivided into two distinct subgroups (3a and 3b). However, a number of samples are clearly within the Macrogroup 3, but it is unclear how they fit within one or the other subgroup. These specimens have been labelled as “Macro 3”. After defining chemical groups, a canonical Discriminant Analysis (CDA) was conducted using the identified groups to maximize inter-group variation by maximizing internal homogeneity and external heterogeneity between groups. Specimens included in the Macro 3 group were not included in these calculations, as they would obfuscate the differentiation between distinct groups by treating unassigned specimens as a cohesive distinct group in and of itself. For this reason, only Groups 1, 2, 3a, 3b, 3b, and 4 were included. It should also be noted that Group 2 shows overlap with Group 3b in the Discriminant Analysis plot (Figure C.7); however, distinction between Group 2 and 3a/3b specimens can be seen in other ways, justifying the distinction between them. As demonstrated in Figure x.8, there is little overlap between groups when considering discriminant functions, though overlap does occur when considering any combination of individual elements. Conversely, the Group 2 vs. 3a/3b distinction is lost when discriminant functions are considered. The likelihood of each specimen being a member of each compositional group was calculated by comparing each specimen to each group with that specimen removed, which confirmed cohesive group assignments. Here, the value given for each group is the equivalent of the percentage likelihood of that particular specimen being a member of that group. For this reason, the “Best Group” may contradict the group assignment. For example, Artifact OAX770 has a “best group” of Group 1, despite being grouped with 3B in the final results. In this case, Group 1 is a best group due to the 42.5% likelihood of membership, but there remains a 41.8% likelihood of membership in Group 3B. Thus, membership of the specimen in Group 3B cannot be completely ruled out.

Table C.2: Canonical Discriminant Analysis of distinct compositional groups.

Variable	CD1	CD2	CD3	CD4
Ce	0.52957	-1.23330	-1.64069	-0.10934
Sc	0.99281	-0.20887	0.60767	-0.96679
La	-0.48636	-0.21101	1.21093	-0.58367
Eu	-0.06396	-0.14772	0.86849	0.87244
Dy	0.58103	0.82997	0.15003	-0.49055
Fe	0.28007	-0.44694	0.48903	0.86314
Yb	-0.11783	0.20908	-1.04282	-0.32797
Sm	0.37664	0.74173	0.44063	0.59480
Th	-0.40049	0.86126	0.08049	0.23173
Cr	0.85195	-0.30519	-0.13808	0.21112
Ti	-0.36899	-0.80948	0.03219	0.24891
V	-0.63254	-0.44150	-0.50340	0.00345
Ca	0.58698	0.43423	0.52792	-0.07496
Rb	0.34306	-0.58781	-0.29663	-0.37981
Zn	0.41629	0.69775	0.03845	0.06508
Lu	-0.24300	0.09918	0.60004	0.26305
Ta	-0.43956	-0.43284	-0.29442	-0.06897
Nd	0.51310	-0.12960	-0.38178	0.06408
Al	0.46326	0.43233	0.01158	0.12608
Cs	0.03915	0.24508	0.41794	0.29973
Co	-0.31228	-0.10367	0.09223	-0.36837
Hf	0.08721	-0.31787	0.01153	0.15770
Ba	-0.04979	-0.18234	-0.27170	-0.01163
Tb	0.09193	0.22204	0.22473	-0.00255
U	-0.11064	-0.21915	-0.09321	0.03012
Na	-0.05959	0.12441	-0.18558	-0.10779
Sr	-0.20256	-0.12729	-0.05422	-0.01926
Sb	-0.03359	0.14231	-0.18685	-0.02920
K	0.07048	-0.10283	0.07927	0.12495
Zr	-0.15367	-0.01244	0.10578	0.01465
Mn	-0.00200	-0.00114	-0.10872	-0.04661
Total Variance explained:	54.80%	35.09%	7.41%	2.70%
		Wilk's lambda:		1.428E-05
		Approx. F:		16.273264
		p-value:		9.614E-45

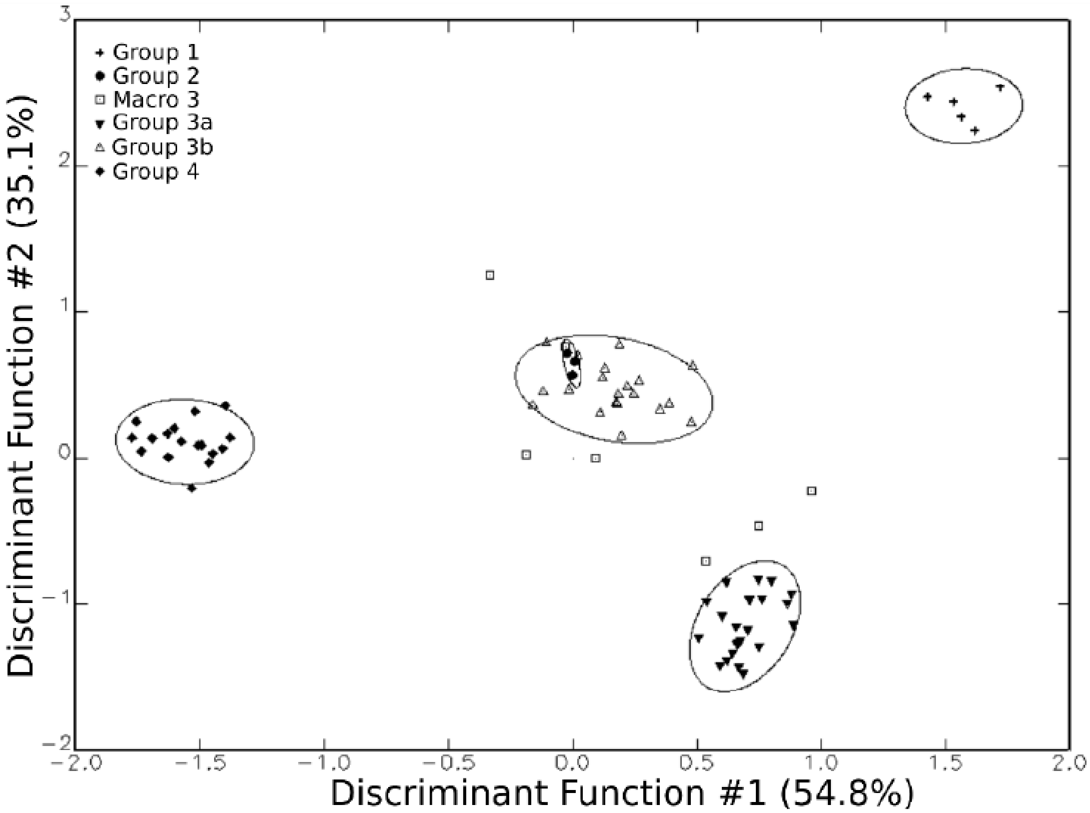


Figure C.7: Bi-variate plot of sample on axes of Discriminant Functions 1 and 2.

Despite overlap that may occur among groups based upon individual elements or analyses, the following groups remain cohesive and were created to maximize internal homogeneity as well as distinction between them. There are two major macrogroups (Group 3 and Group 4), one of which has been subdivided into subgroups based on subtle differences (Group 3a and Group 3b). Two smaller minor groups (Group 1 and 2) were also identified that contained few specimens which feature some homogeneity but are distinct from the larger groups (Group 3 and 4). When considering only the major groups, the general range of variation within Group 3 has caused it to appear to be less cohesive with certain elements having larger standard deviations (Table C.3). However, by separating these two groups into two more specific subgroups, Group 3a and Group 3b then become more statistically cohesive. Nonetheless, the subgroup variation is slight and may not indicate separate production locale, but rather variation in paste recipe resulting in elevated or depleted levels of particular elements.

Table C.3: Individual compositional (major) group statistics.

Element	Group 3			Group 4		
	Mean	StDev	% StDev	Mean	StDev	% StDev
La	29.3324	4.9709	16.95%	23.9585	2.9374	12.26%
Lu	0.3876	0.0511	13.17%	0.2277	0.0494	21.71%
Nd	29.1693	4.6777	16.04%	22.7869	2.8669	12.58%
Sm	6.7692	0.7698	11.37%	5.0525	0.5971	11.82%
U	3.3168	0.9928	29.93%	2.4552	0.8105	33.01%
Yb	2.5931	0.3101	11.96%	1.4796	0.2885	19.50%
Ce	61.7134	9.3490	15.15%	47.5178	5.6337	11.86%
Co	24.5917	4.4758	18.20%	18.2547	3.2976	18.06%
Cr	94.3238	17.4151	18.46%	25.8565	6.2989	24.36%
Cs	5.4574	1.2763	23.39%	2.9760	0.7411	24.90%
Eu	1.5940	0.1685	10.57%	1.2494	0.0688	5.51%
Fe	65076.8	9860.4	15.15%	60160.4	7525.4	12.51%
Hf	4.2058	0.9212	21.90%	4.7500	2.0285	42.71%
Rb	114.7910	28.7927	25.08%	103.17	18.68	18.10%
Sb	0.3821	0.2506	65.59%	0.1209	0.0700	57.91%
Sc	21.6599	3.0435	14.05%	16.0312	1.5536	9.69%
Sr	236.016	93.701	39.70%	285.59	83.83	29.35%
Ta	1.0717	0.2523	23.55%	0.5341	0.1427	26.72%
Tb	0.9102	0.1054	11.58%	0.6050	0.1673	27.66%
Th	8.0392	1.1460	14.25%	6.5533	0.9264	14.14%
Zn	175.224	18.419	10.51%	199.54	28.38	14.22%
Zr	127.841	33.485	26.19%	117.48	49.48	42.12%
Al	113607.1	9561.0	8.42%	122894.5	9300.2	7.57%
Ba	864.55	197.61	22.86%	722.99	100.58	13.91%
Ca	15115.5	2905.9	19.22%	13904.5	3566.1	25.65%
Dy	5.1125	0.5716	11.18%	3.1448	0.5123	16.29%
K	21137.4	4582.9	21.68%	17688.9	2209.2	12.49%
Mn	815.24	307.54	37.72%	740.38	262.70	35.48%
Na	9224.5	1833.1	19.87%	10733.0	3518.1	32.78%
Ti	6941.2	843.2	12.15%	6897.5	546.1	7.92%
V	179.64	31.93	17.77%	149.89	40.29	26.88%

Group 3 (n=49 [3a: n= 21, 3b: n= 20, unidentified to subgroup level: n=8]): Subgroup 3a and Subgroup 3b can be differentiated from each other at multiple levels. But despite the differences, they nonetheless retain enough relatedness between them that they can be considered part of a larger macrogroup. Notably, there is clear distinction with PC2 scores (see Figure C.3 above) between the subgroups. However, many individual elements differ as well. For example, Subgroup 3a is higher in Ta,

Tl, Rb, Fe, Mn, Sc, Ca, and Cr while lower in Sb, La, Ce, and Nd as compared to Subgroup 3b (Figure C.8). Beyond chemistry, however, there does not appear to be any significant difference between the two subgroups. Both contain approximately one third Rio Viejo and two thirds Cerro de la Virgen ceramics. The majority of both subsamples are figurines, while only four pottery sherds are found in each of the two subgroups (almost exclusively conical bowls). This distribution in regards to ceramic form is in stark contrast with Group 4. Eight specimens were assigned to the Macrogroup level but either share affinity to both subgroups or differ in some way from each.

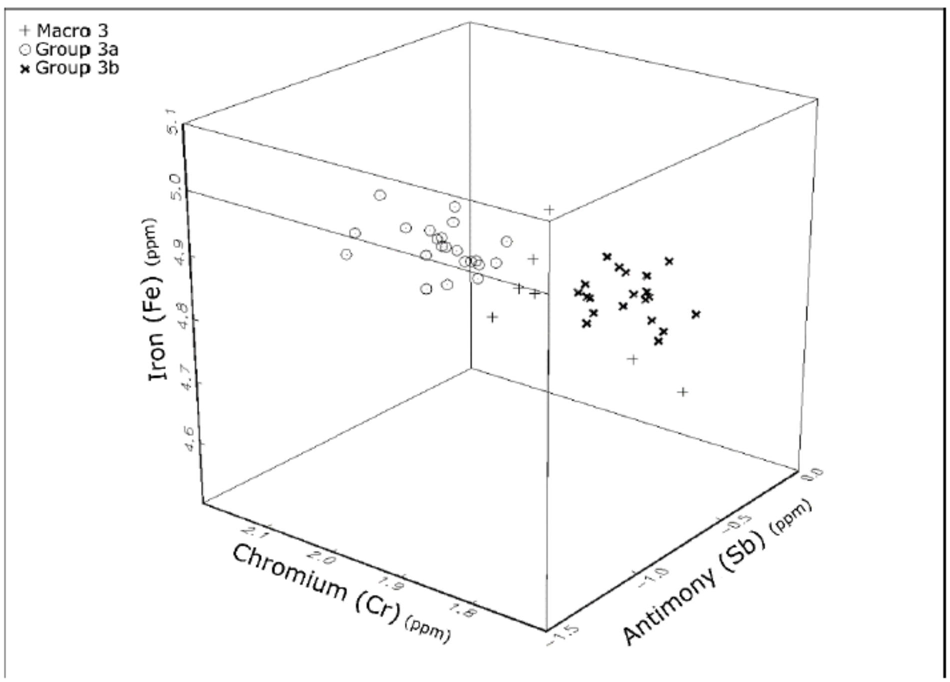


Figure C.8: Distinction of Group 3 subgroups based upon Sb, Cr, and Fe.

Group 4 *(n=17):* Group 4 contains a much larger percentage of Cerro de la Virgen ceramics (n >80%). However, there is a more profound distinction. In the assemblage as a whole, all Rio Viejo ceramics were in the form of figurines. But pottery makes up slightly less than half of the Cerro de la Virgen sample. Group 4, despite only containing 17 members (20% of the total assemblage), contains greater than 50% of all of the Cerro de la Virgen pot sherds and only a single Cerro de la Virgen figurine fragment. In other words, it appears that this group may represent a local paste recipe for pottery production at Cerro de la Virgen, as dictated with the Criterion of Abundance (Bishop et al. 1982).

Group 1 *(n = 5):* This group is small but distinct. All five members of this Group are figurines from Rio Viejo. While there are many other Rio Viejo figurines in Group 3, Group 1 is clearly distinct compositionally. In particular, levels of Ca, Sb are noticeably higher; while levels of poor metals such as Ti and Al being much lower. Despite being distinct from the major groups, this particular group is not as tightly clustered chemically and includes a fair amount of internal variation. Nonetheless, the five members of this group are assuredly not compositionally the same as either major group. Rather, they may represent a separate paste recipe using similar materials, perhaps even produced at Rio Viejo.

Group 2 (n=3): This group, though only containing three members, stands out in a few ways. There is a fair amount of diversity with many elements. But in other cases, the proportions of elements such as Sm, Nd, Tb, Zn, Al, and Ce are very homogenous, despite overlapping with portions of other groups. Overall, levels of Zn, Fe, Al, and Na are largely distinct from most other specimens in this assemblage regardless of compositional group. All three members of this small group are figurine fragments from Cerro de la Virgen.

Eleven specimens were left unassigned. These specimens are primarily figurines but are from both Rio Viejo and Cerro de la Virgen sites. These specimens have been left unassigned due to the inability to securely assign them to any group, some specimens do not clearly fit within any single group, though some specimens statistically may fit in multiple groups concurrently. In nearly every case, their true inclusion or exclusion in a compositional group cannot be ruled out, as the full range of variation within each compositional group is unknown. It is thus possible that the unassigned specimens may be peripheral but on the margins of the range of variation of a particular compositional group. Therefore, it cannot be ruled out that these unassigned specimens were created using the same raw materials as other ceramics within the total assemblage of which subgroups have been assigned. Mahalanobis distance calculations do indicate a non-negligible probability of inclusion of some of these unassigned specimens into the compositional groups. But when considering alternative analyses, each specimen has been withheld from assignment to its most likely group to ensure conservative and replicable conclusions, due to various analytical discrepancies. However, one specimen in particular, OAX793, is most certainly different from all of the others and clearly contains a very different paste recipe - and potentially exotic production locale. This conical bowl collected from Cerro de la Virgen is unlike all other specimens in this assemblage chemically and clearly does not share a compositional signature, and may in fact be an import.

Comparison with the MURR Database

After identifying and characterizing compositional groups, the groups were compared to the MURR NAA database to identify any similarities with external locales to assess the potential for trade. First, Euclidian Distance Searches using GAUSS software were utilized to identify the most similar "known" specimens in the database. The Rio Viejo and Cerro de la Virgen samples were compared to all specimens within the MURR database from the sites of Rio Viejo, San Francisco de Arriba and Tututepec in the lower Verde, as well as a sample of sherds from the Manialtepec Basin submitted recently by Sarah Barber. Overall, the sample was compared to 226 specimens total from the local vicinity and beyond. Within this reference dataset, the current assemblage was also included as "knowns". This inclusion can allow for the determination of uniqueness of the current sample. Though often less than definitive in the conclusions which can responsibly be drawn from the results of a Euclidian distance search alone, this analysis can yet give assistance in hypothesizing a locality of origin samples.

As with branch lengths in hierarchical cluster analysis, low values indicate close chemical similarities while high values indicate dissimilarity. The ten closest "matches" were examined for each specimen in the sample. However, it is important to note that the "known" samples were matched based on provenience not provenance. Thus, a "Tututepec" sherd is a specimen that was collected from Tututepec, not necessarily one that was produced there, for example. But given the likelihood of largely local production at most sites (Bishop et al. 1982), a strong argument can still be made in this regard when a majority of specimens found at the same site are highly similar and few from other sites are found to be similar to the sherd in question.

Most of the Group 3 specimens analyzed returned matches from either the current sample (and more specifically Group 3), or to samples previously collected from Rio Viejo. On the contrary, Group 4 samples show little similarity with neither Group 3 samples nor the previously sampled Rio Viejo sherds. Rather, they are most similar to other Group 4 specimens and show some similarity to later sherds from Tututepec. But, because the Group 4 sample and all identified Tututepec compositional groups show distinct differences in elemental biplots and statistical analyses, the similarity between them does not indicate common recipe usage. However, raw materials may have been shared (keeping in mind the temporal differences between assemblages). This similarity is rather likely due to the proximity of the sites and the possible common use of some raw materials despite a lack of temporal continuity between assemblages. The small Group 2 shows some affinity to sherds form the Manialtepec Basin through this Euclidian distance. But based upon individual elements, these three specimens are beyond the range of variation of the Manialtepec Basin sample (n=67). These three sherds are also dissimilar to previously analyzed Rio Viejo samples as well as Group 4 sherds (presumably a local paste recipe to Cerro de la Virgen). Therefore, the origin of this group is currently unknown. Group 1 is similarly unique. This group contains five Rio Viejo figurine fragments, but is far less similar to Rio Viejo sherds than Group 3. It also shows some similarity to samples from San Francisco de Arriba, but does differ in elements such as Ca, Cs, and Ti. Thus, the San Francisco de Arriba assemblage and Group 3 do not appear to share a common paste recipe.

Based upon the Euclidian Distance Analyses as well as visual inspection of bivariate elemental plots informed by previous results, it appears that Group 3 may reflect a paste recipe(s) local to Rio Viejo, particularly to produce figurines. Group 4, on the other hand, contains primarily Cerro de la Virgen ceramics and may represent a localized pottery production there. This is further substantiated in considering only gray ware pottery. Using compositional groups created by Joyce et al. (2006) as reference, the Rio Verde Valley features a generalized compositional group known as Gris 2. This reference group is largely made up of Rio Viejo sherds and is similar to the gray wares from Group 3 in the current sample. In contrast, Group 4 sherds are distinct from Group 3, as well as Gris 2 sherds. This further suggests that Group 4 is a product of unique production, likely at or near Cerro de la Virgen. Finally, conducting a new Cluster analysis including only Gray Ware pottery indicates distinction between Rio Viejo, Cerro de la Virgen (Group 4) and San Francisco de Arriba pottery. The clustering of specimens is therefore informed by the provenience postulate, and therefore indicate unique recipes likely tied to separate production locales (Fig 10). Group 3 sherds from the current study are very similar to samples previously collected at Rio Viejo and therefore likely represent a local recipe as well. In other words, it appears as though we can detect separate paste recipes for not only Cerro de la Virgen and Rio Viejo, but also for San Francisco de Arriba, perhaps having further implications for pottery production throughout the Lower Rio Verde Valley.

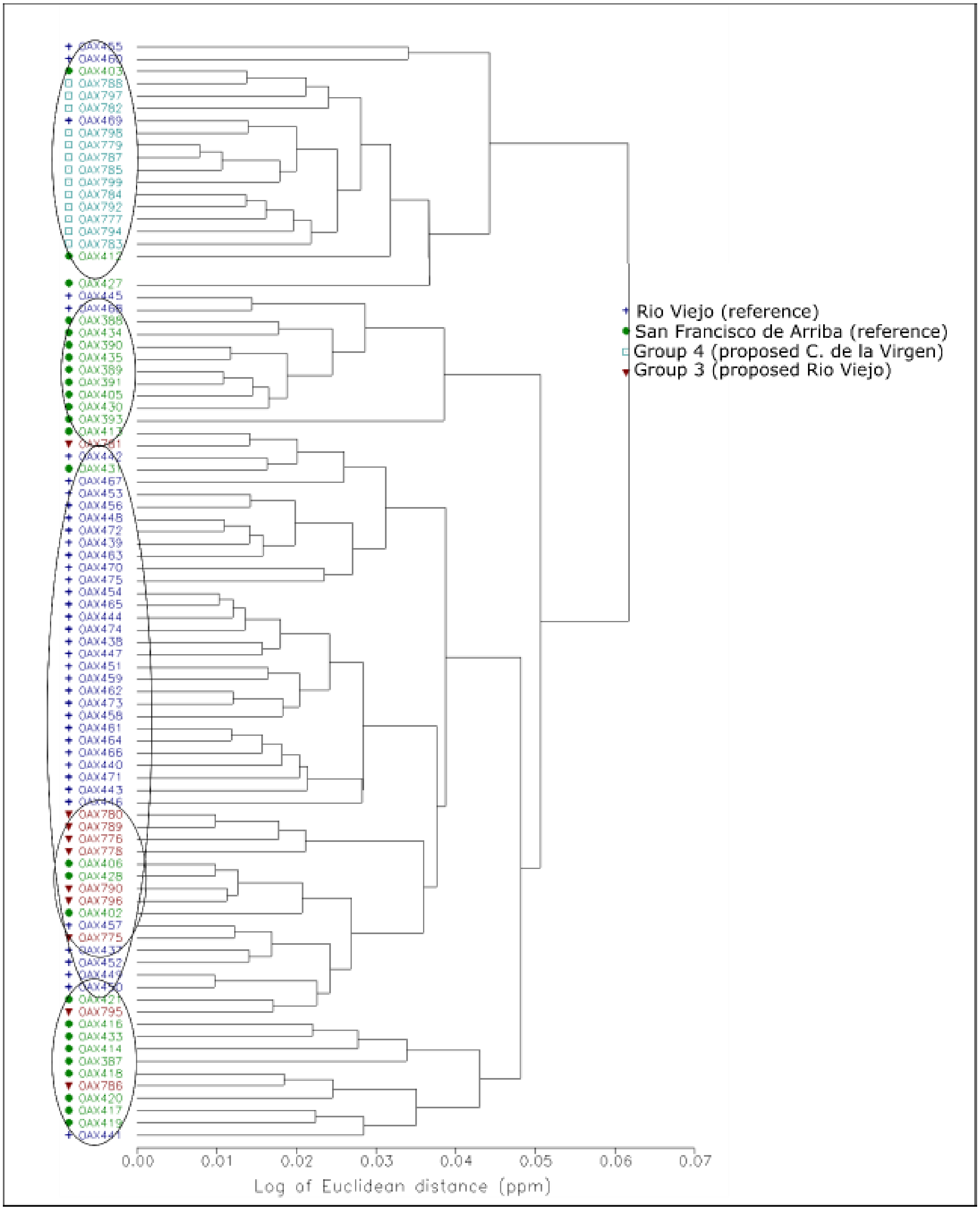


Figure C.9: Cluster analysis including gray wares and reference samples. Based upon all elements, excluding Ni and As.

The above discussions regarding the NAA of the ceramic sample from the Lower Rio Verde Valley has revealed the likely local production for most, if not all, specimens, due to a lack of affinity to non-local samples; including Manialtepec Basin and central Oaxaca. However, despite the fact that the assemblage may be mostly local in origin, specific compositional groups can be differentiated based upon a number of factors. In doing so, different paste recipes have been identified which are likely associated with different production locals. While figurines are almost always members of Group 3, Group 4 is comprised of primarily Cerro de la Virgen grayware pottery. Thus, we propose the possibility that Group 4 represents pottery production at Cerro de la Virgen, while Group 3 represents production of pots (and figurines) at Rio Viejo. Further, Rio Viejo may have been the main producer of figurines and may have had a greater diversity in paste recipes, as indicated by the subdivision of Group 3 into subgroups.

Table C.4: Final compositional group assignment for lower Verde sample.

ANID	Site Name	Material	Compositional Group
OAX715	Rio Viejo	Figurine	Group 4
OAX716	Rio Viejo	Figurine	Group 3A
OAX717	Rio Viejo	Figurine	unassigned
OAX718	Rio Viejo	Figurine	Group 1
OAX719	Rio Viejo	Figurine	Group 3A
OAX720	Rio Viejo	Figurine	unassigned
OAX721	Rio Viejo	Figurine	Group 1
OAX722	Rio Viejo	Figurine	Group 4
OAX723	Rio Viejo	Figurine	Group 3A
OAX724	Rio Viejo	Figurine	Group 4
OAX725	Rio Viejo	Figurine	Group 3B
OAX726	Rio Viejo	Figurine	Group 3B
OAX727	Rio Viejo	Figurine	Group 3A
OAX728	Rio Viejo	Figurine	unassigned
OAX729	Rio Viejo	Figurine	Macro 3
OAX730	Rio Viejo	Figurine	Group 1
OAX731	Rio Viejo	Figurine	Group 1
OAX732	Rio Viejo	Figurine	Group 3B
OAX733	Rio Viejo	Figurine	unassigned
OAX734	Rio Viejo	Figurine	Group 3B
OAX735	Rio Viejo	Figurine	Group 3B
OAX736	Rio Viejo	Figurine	Group 3B
OAX737	Rio Viejo	Figurine	Macro 3
OAX738	Rio Viejo	Figurine	Group 3B
OAX739	Rio Viejo	Figurine	Macro 3

OAX740	Rio Viejo	Figurine	Group 3A
OAX741	Rio Viejo	Figurine	Group 1
OAX742	Rio Viejo	Figurine	Group 3A
OAX743	Rio Viejo	Figurine	Macro 3
OAX744	Rio Viejo	Figurine	Group 3A
OAX745	C. Virgen	Figurine	unassigned
OAX746	C. Virgen	Figurine	Group 3A
OAX747	C. Virgen	Figurine	Group 3A
OAX748	C. Virgen	Figurine	Group 3A
OAX749	C. Virgen	Figurine	Group 3B
OAX750	C. Virgen	Figurine	Group 3B
OAX751	C. Virgen	Figurine	Group 2
OAX752	C. Virgen	Figurine	unassigned
OAX753	C. Virgen	Figurine	unassigned
OAX754	C. Virgen	Figurine	Group 3B
OAX755	C. Virgen	Figurine	Group 3B
OAX756	C. Virgen	Figurine	Group 3A
OAX757	C. Virgen	Figurine	unassigned
OAX758	C. Virgen	Figurine	Group 3A
OAX759	C. Virgen	Figurine	Group 3B
OAX760	C. Virgen	Figurine	Group 3A
OAX761	C. Virgen	Figurine	Group 3B
OAX762	C. Virgen	Figurine	Group 3A
OAX763	C. Virgen	Figurine	Macro 3
OAX764	C. Virgen	Figurine	Group 2
OAX765	C. Virgen	Figurine	Group 2
OAX766	C. Virgen	Figurine	Group 3B
OAX767	C. Virgen	Figurine	Group 4
OAX768	C. Virgen	Figurine	Group 3A
OAX769	C. Virgen	Figurine	unassigned
OAX770	C. Virgen	Figurine	Group 3B
OAX771	C. Virgen	Figurine	Group 3A
OAX772	C. Virgen	Figurine	Macro 3
OAX773	C. Virgen	Figurine	Group 3B
OAX774	C. Virgen	Figurine	Group 3A
OAX775	C. Virgen	Pottery	Group 3B
OAX776	C. Virgen	Pottery	Group 3A
OAX777	C. Virgen	Pottery	Group 4
OAX778	C. Virgen	Pottery	Group 3A
OAX779	C. Virgen	Pottery	Group 4
OAX780	C. Virgen	Pottery	Group 3A
OAX781	C. Virgen	Pottery	Macro 3
OAX782	C. Virgen	Pottery	Group 4
OAX783	C. Virgen	Pottery	Group 4

OAX784	C. Virgen	Pottery	Group 4
OAX785	C. Virgen	Pottery	Group 4
OAX786	C. Virgen	Pottery	Macro 3
OAX787	C. Virgen	Pottery	Group 4
OAX788	C. Virgen	Pottery	Group 4
OAX789	C. Virgen	Pottery	Group 3A
OAX790	C. Virgen	Pottery	Group 3B
OAX791	C. Virgen	Pottery	unassigned
OAX792	C. Virgen	Pottery	Group 4
OAX793	C. Virgen	Pottery	unassigned
OAX794	C. Virgen	Pottery	Group 4
OAX795	C. Virgen	Pottery	Group 3B
OAX796	C. Virgen	Pottery	Group 3B
OAX797	C. Virgen	Pottery	Group 4
OAX798	C. Virgen	Pottery	Group 4
OAX799	C. Virgen	Pottery	Group 4

Table C.5: Membership probabilities (%) for samples in Group 1

ANID	Group 1	Group 3a	Group 3b	Group 4	Best Group
OAX718	7.966	0.011	0.134	0.002	Group 1
OAX721	17.657	0.003	0.006	0.001	Group 1
OAX730	29.145	0.000	0.000	0.000	Group 1
OAX731	79.794	0.160	43.595	0.011	Group 1
OAX741	92.454	0.028	2.508	0.004	Group 1

Table C.6: Membership probabilities (%) for samples in Group 2.

ANID	Group 1	Group 3a	Group 3b	Group 4	Best Group
OAX751	6.469	0.059	1.555	0.177	Group 1
OAX764	3.603	0.000	0.008	0.014	Group 1
OAX765	1.699	0.000	0.089	13.582	Group 4

Table C.7: Membership probabilities (%) for samples in Macro Group 3.

ANID	Group 3a	Group 3b	Group 4	Best Group
OAX729	0.028	7.191	0.006	Group 3b
OAX737	2.123	0.004	0.243	Group 3a
OAX739	0.301	0.000	0.030	Group 3a
OAX743	15.232	0.142	0.273	Group 3a
OAX763	0.050	0.176	0.009	Group 3b
OAX772	8.190	0.357	0.072	Group 3a
OAX781	0.013	0.053	2.846	Group 4
OAX786	0.161	0.000	0.814	Group 4

Table C.8: Membership probabilities (%) for samples in Group 3a.

ANID	Group 1	Group 3a	Group 3b	Group 4	Best Group
OAX716	10.483	88.130	0.000	0.129	Group 3a
OAX719	17.174	68.744	0.000	0.190	Group 3a
OAX723	8.542	26.485	0.001	0.128	Group 3a
OAX727	5.754	82.870	0.000	0.086	Group 3a
OAX740	7.085	81.259	0.000	0.081	Group 3a
OAX742	4.891	64.011	0.000	0.141	Group 3a
OAX744	7.843	52.686	0.000	0.146	Group 3a
OAX746	3.984	32.054	0.000	0.173	Group 3a
OAX747	4.473	41.316	0.000	0.111	Group 3a
OAX748	3.186	15.184	0.000	0.019	Group 3a
OAX756	11.225	74.780	0.000	0.189	Group 3a
OAX758	5.900	76.720	0.000	0.176	Group 3a
OAX760	18.858	24.447	0.000	0.152	Group 3a
OAX762	15.386	11.708	0.003	0.554	Group 1
OAX768	9.878	29.498	0.000	0.074	Group 3a
OAX771	17.825	59.401	0.000	0.325	Group 3a
OAX774	5.378	88.801	0.000	0.066	Group 3a
OAX776	7.503	27.920	0.000	0.052	Group 3a
OAX778	2.766	19.198	0.000	0.014	Group 3a
OAX780	10.533	88.076	0.000	0.135	Group 3a
OAX789	14.851	65.386	0.000	0.342	Group 3a

Table C.9: Membership probabilities (%) for samples in Group 3b.

ANID	Group 1	Group 3a	Group 3b	Group 4	Best Group
OAX725	29.999	1.153	58.459	0.121	Group 3b
OAX726	69.818	0.934	86.879	0.034	Group 3b
OAX732	25.221	0.066	46.709	0.007	Group 3b
OAX734	22.196	0.056	44.173	0.007	Group 3b
OAX735	13.324	0.168	88.902	0.138	Group 3b
OAX736	15.195	0.107	63.434	0.072	Group 3b
OAX738	16.722	0.423	23.603	0.025	Group 3b
OAX749	7.324	0.031	14.003	0.310	Group 3b
OAX750	6.524	0.012	51.905	0.235	Group 3b
OAX754	21.408	0.491	15.813	0.026	Group 1
OAX755	13.293	0.483	46.129	0.154	Group 3b
OAX759	58.769	0.465	93.971	0.028	Group 3b
OAX761	12.454	0.153	20.875	0.030	Group 3b
OAX766	5.393	0.009	27.136	0.375	Group 3b
OAX770	42.501	0.435	41.830	0.015	Group 1
OAX773	78.122	0.441	87.305	0.021	Group 3b
OAX775	6.189	0.016	24.282	0.893	Group 3b
OAX790	9.461	0.022	5.131	0.053	Group 1
OAX795	5.311	0.007	47.649	0.647	Group 3b
OAX796	55.605	0.387	61.041	0.021	Group 3b

Table C.10: Membership probabilities (%) for samples in Group 4.

ANID	Group 1	Group3 a	Group 3b	Group 4	Best Group
OAX715	0.656	0.000	0.000	32.624	Group 4
OAX722	1.034	0.000	0.096	48.330	Group 4
OAX724	0.823	0.000	0.001	35.331	Group 4
OAX767	0.773	0.000	0.000	67.897	Group 4
OAX777	0.717	0.000	0.000	41.288	Group 4
OAX779	1.706	0.000	0.001	53.768	Group 4
OAX782	0.564	0.000	0.000	51.124	Group 4
OAX783	0.491	0.000	0.003	13.863	Group 4
OAX784	0.728	0.000	0.009	76.983	Group 4
OAX785	1.452	0.000	0.000	65.867	Group 4
OAX787	1.600	0.000	0.000	33.855	Group 4
OAX788	0.678	0.000	0.011	11.786	Group 4
OAX792	1.002	0.000	0.001	71.059	Group 4
OAX794	1.231	0.000	0.000	81.955	Group 4
OAX797	0.551	0.000	0.000	7.767	Group 4

OAX798	1.715	0.000	0.305	17.780	Group 4
OAX799	0.969	0.000	0.001	99.361	Group 4

Table C.11: Membership probabilities (%) for "unassigned" samples.

ANID	Group 1	Group 3a	Group 3b	Group 4	Best Group
OAX717	1.423	0.000	0.018	3.636	Group 4
OAX720	0.429	0.000	0.000	13.785	Group 4
OAX728	1.881	0.000	0.001	15.299	Group 4
OAX733	2.018	0.000	0.392	0.900	Group 1
OAX745	0.940	0.000	0.000	38.129	Group 4
OAX752	0.230	0.000	0.000	0.073	Group 1
OAX753	3.091	0.001	0.000	9.740	Group 4
OAX757	0.881	0.000	0.001	79.222	Group 4
OAX769	4.334	0.001	0.000	1.618	Group 1
OAX791	2.613	0.000	0.000	26.450	Group 4
OAX793	0.044	0.000	0.000	0.000	Group 1

X-ray Fluroescence of Obsidian

This section briefly summarizes the analysis and source determinations made on 40 obsidian artifacts recovered from the 2013 and 2016 excavations at Cerro de la Virgen. The artifacts were analyzed in the Archaeometry Lab at the University of Missouri Research Reactor (MURR) by non-destructive, energy dispersive X-ray fluorescence (ED-XRF). Source assignments involved comparisons between compositional data for the artifacts and the MURR obsidian database for known obsidian sources in Mexico and Guatemala. The XRF data was compiled by Dr. Michael Glascock, senior scientist at MURR, and sent to me in a report (Glascock 2018). Measurements were made using a ThermoScientific ARL Quantx energy-dispersive XRF spectrometer. The instrument has a rhodium-based X-ray tube and thermoelectrically-cooled silicon-drift detector (SDD) with a Pd filter that provided readings of mid-Z elements. Samples were analyzed for two minutes each to facilitate measurements for the following elements: Mn, Fe, Zn, Rb, Sr, Y, Zr, Nb, and Th. Calibration of the XRF was accomplished by measuring a set of 40 obsidian source samples previously analyzed by NAA, inductively coupled plasmamass spectrometry (ICP-MS), and XRF. The sources employed for calibration had a wide range of concentrations for the elements measureable by XRF (Glascock and Ferguson 2012).

After the samples are measured, a scatterplot of elemental concentrations is typically made to analyze clusters of samples from similar sources. In the case of this sample, which is smaller than the typical sample completed by XRF, a scatterplot of ratios of elements is easier to interpret than plots of the elements themselves. The scatterplot below (Figure C.10) shows ratios of Sr/Rb versus Rb/Zr. All of the artifacts are assigned to known sources as follows: Paredon (n=25), Ucareo (n=9), Otumba (n=3), Zaragoza (n=2), and Guadelupe Victoria (n=1). It may be immediately apparent to the reader that the Sierra de Pachuca source in Hidalgo, known for its green obsidian, is conspicuously missing from this list. While over half of the total sample from Cerro de la Virgen is green in color, none of these artifacts were submitted for XRF at MURR. The general consensus among Mesoamerican archaeologists is that green obsidian can be visually identified with reliable accuracy to the Pachuca source. Some green obsidian has been identified in Jalisco, but this is usually of a much poorer quality and is rarely found in archaeological contexts (see discussion in Williams 2012). See Chapter 7 for a comparative analysis of obsidian source profiles between the sites of Cerro de la Virgen, San Francisco de Arriba, and Yugue.

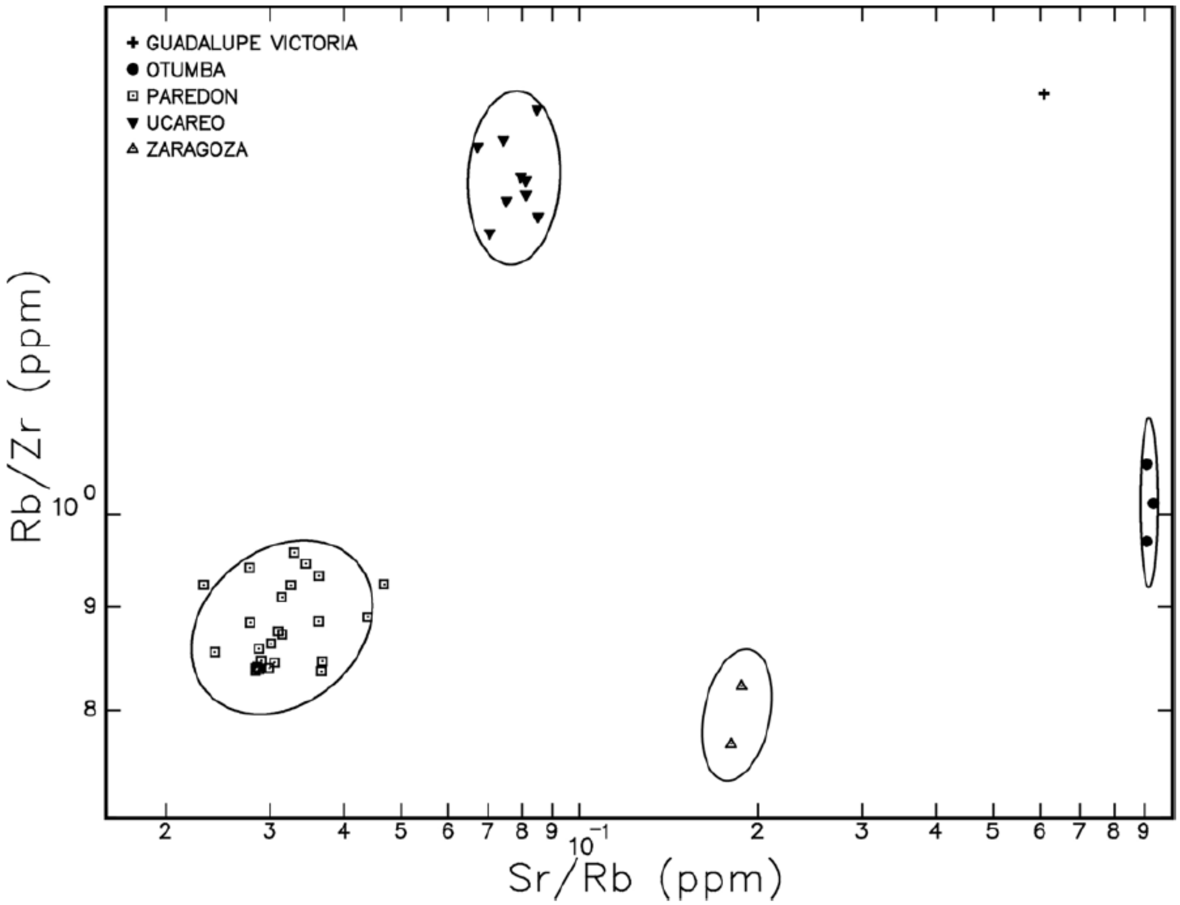


Figure C.10: Scatterplot of Sr/RB versus Rb/Zr for obsidian artifacts from Cerro de la Virgen. Source ellipses are shown at the 90% confidence interval.

APPENDIX D: MICROBOTANICAL ANALYSIS

Analysis prepared by Eloi Berube

This appendix presents the results of a microbotanical analysis of residues obtained from five ceramic offering vessels recovered from Cerro de la Virgen. The goal of the exploratory analysis was to identify possible botanical remains that could have been left as offerings in the vessels in advance of more intensive chemical and botanical analyses in the future. Residue extractions were completed by Eloi Berube, an expert in paleoethnobotany from McMaster University in Ontario, Canada, in the summer of 2017 at the INAH laboratory at the Ex-Convento of Cuilapan de Guerrero, Oaxaca. A total of 15 samples were exported from Mexico to Canada for microbotanical analyses, which took place from December 2017 - January 2018 at the McMaster Paleoethnobotanical Research Facility (MPERF). Microbotanical analyses included the identifaction of phytoliths and starch grains. Nearly all the identified microbotanical remains come from grasses of the *Poaceae* family, while a single phytolith was tentatively identified as coming from *Arecaceae*, the palm tree family. A few starch grains were found, many of them showing a high degree of damage, potentially showing signs of heating.

Methods

Five ceramic vessels were selected at random from materials recovered during the PTRV-16.[10] The sample included two gray ware globular jars and two coarse brown cylinders from Complex E, and one coarse brown cylinder from Complex B (Table D.1; Figure D.1). Globular jars and cylinders represent the majority of offering vessels recovered from the site (see Appendix A). The vessels were assigned "Microbotanical" sample numbers (MS #) from 1-5.

[10] INAH permissions for microbotanical analyses only pertained to the 2016 project

Table D.1: Offering vessels analyzed in microbotanical analysis.

MS #	Op	Unit	Lot	Ob #	Location	Offering Type	Description	FS #
1	A	23G	4	F42-s1-ob6	Complex E	Dedication	Globular jar	16-1393
2	B	13M	1	F6-ob2	Complex E	Undetermined	Globular jar	16-1296
3	A	8J	5	F25-s1-ob57	Complex E	Continuous	Cylindrical vessel	16-0778
4	A	9K	5	F25-s1-ob5	Complex E	Continuous	Cylindrical vessel	16-0773
5	F	19N	3	F60-s1-ob10	Complex B	Continuous	Cylindrical vessel	16-0276

Figure D.1: Analyzed vessels, from left to right. (top) OpA-F42-s1-ob6 (MS 1), OpB-F6-ob2 (MS 2); (bottom) OpA-F25-s1-ob57 (MS 3), OpA-F25-s1-ob5 (MS 4), OpF-F60-s1-ob10 (MS 5).

The first step in the microbotanical extraction was the excavation of all sediments from the vessels in the laboratory (Figure D.2). During this process, Berube wore powder free nitrile exam gloves that were changed before moving on to the next artifact. The vessels were first wrapped in a clean plastic bag and surrounded by multiple layers of masking tape that ensured the structural integrity of the vessel. Next, a clean dental tool was used to slowly excavate the vessels. Sediment excavated from the vessels was bagged and preserved for possible future analyses.

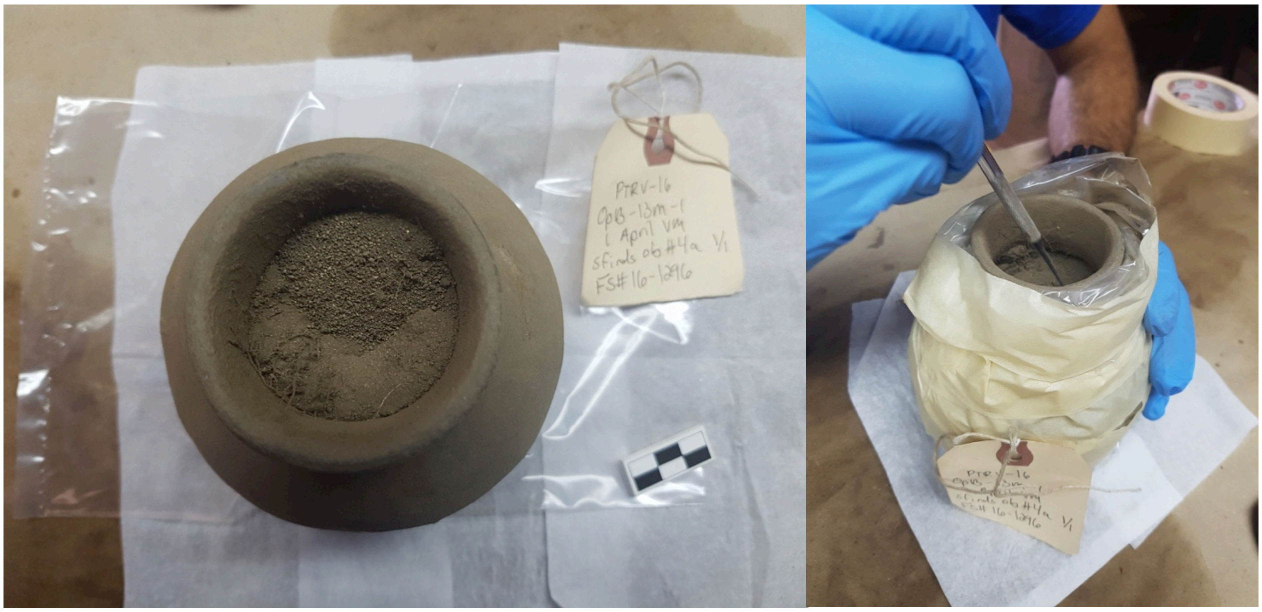


Figure D.2: Excavation of sediments from offering vessels.

After the removal of all loose sediment, microbotanical extractions were made following procedures elaborated by Shanti Morell-Hart (2015; also see Berube 2017:88-93). Extractions for each vessel consisted three “washes,” or removals of artifacts and ecofacts, including a dry wash, a wet wash, and a sonicated wash (see below). Between each wash, the laboratory work space was covered in a new layer of paper towels to avoid contamination. Petri dishes were used to retain an aqueous solution extracted from each wash.

First, the dry wash allows collecting microbotanical remains from the sediment adhering to the artifact, which can be useful to understand the environment in which it was preserved and assess plants growing and discarded in the vicinity of the artifact (Bérubé 2017:88; Mickleburgh and Pagán-Jiménez 2012:2471; Morell-Hart 2015; Morell-Hart et al. 2014:72–73; Pearsall et al. 2004:427). The process consists of gently rubbing the targeted surface of an artifact, in this case the interior of the vessel, to detach adhered sediment and associated microbotanical materials (Figure D.3). A gloved index finger was rubbed across each vessel's interior until all surfaces were smooth to the touch. In the case of the globular jars, which had narrow, restricted openings, a plastic implement covered in an exam glove was used to complete the task. Once no visible material was coming off the artifacts, the sediment that fell into the Petri dish was suspended in an aqueous solution with distilled water and moved to a labeled centrifuge tube using a clean pipette. Upon completing the dry wash, the exterior surface of the vessel was also cleaned to avoid contamination in the next two phases of the extraction.

Figure D.3: Dry wash phase of the microbotanical extraction.

The second phase of the extraction, the wet wash, was completed in the same manner as the dry wash but with the interior of the vessel filled with water (Figure D.4). The wet wash facilitates a link between the composition of the surrounding matrices (i.e., the sediment into which the vessel was placed) and the use of the object itself (Bérubé 2017:88; Logan et al. 2012:240; Mickleburgh and Pagán-Jiménez 2012:2471; Morell-Hart 2015; Morell-Hart et al. 2014:72-7; Pearsall et al. 2004:427:3). By extracting sediment from the crevices of the artifact, the results obtained are more likely to be associated with the use of the artifact but may also contain some material from the surrounding matrices. During this process, the vessel is placed in a large petri dish, and distilled water is poured into its interior, which is rubbed with a gloved finder to extract the sediment and associated microbotanical materials still adhered to the pores of the vessel. Using a new pipette, Berube collected the sediment and water solution and transferred it to a new centrifuge tube. After finishing, the same cleaning protocol was followed as for the dry wash. The wet wash, by extracting the dirt from the crevices of the artifacts, means the results obtained are more likely associated with the use of the artifact, but also contain some material from the surrounding matrices. This wash allows for an association to be made between surrounding matrices and artifact use (Bérubé 2017:88; Logan et al. 20122:240; Mickleburgh and Pagán-Jiménez 2012:2471; Morell-Hart 2015; Morell-Hart et al. 2014:72-7; Pearsall et al. 2004:427:3).

Figure D.4: Wet wash phase of microbotanical extraction.

The final extraction phase is the sonicated wash, which utilizes water and sound waves to dislodge sediment and associated microbotanical materials from the deepest crevices of the artifact, providing results usually believed to be associated primarily with the use of the artifact (Bérubé 2017:88; Mickleburgh and Pagán-Jiménez 2012:2471; Morell-Hart 2015; Morell-Hart et al. 2014:72–73; Pearsall et al. 2004:427). During this wash, the vessel was rinsed and filled with distilled water and a sonicating device was placed within the aqueous solution (Figure D.5). For this study, a *Labelle* hand-held sonicator vibrating at 30 kHz was used. The device was activated for five minutes, after which all materials in the vessel were transferred to a centrifuge tube with a clean pipette. It should be noted that during the wet and sonicated washes of the cylinders (16–0778, 16–0773, 16–0276), each vessels' temper was extremely soft and began to disintegrate, suggesting that some of the phytoliths recovered from these washes might come from the temper and the clay, and not from the content of the ceramics. However, the starches recovered in these washes are certainly from the botanical contents of the artifacts, as the extreme heat of the firing process would have destroyed them while making the vessel. After completing the sonicated wash, the vessel was left to air dry.

Figure D.5: Sonicated wash phase of microbotanical extraction.

After extraction, samples were viewed under a microscope at the MPERF at McMaster University. Each sample was placed in a centrifuge for five minutes at 3000 rpm to concentrate the microbotanical remains at the bottom of the tubes. Using a pipette, an aqueous solution was placed on a clean glass slide. The remaining water was discarded. Once mounted on the slides, the samples were analyzed using a ZEISS polarizing transmitting light microscope at 400x magnification. Photographs were taken using the ZEISS software.

Berube identified phytoliths and starch grains using reference materials (Ball et al. 1999; Duncan et al. 2009; Pearsall and Piperno 1993; Piperno 2006; Piperno and Holst 1998; Torrence and Barton 2006), the MPERF reference collection, and online resources (Pearsall et al. 2006; PhytCore 2018). Berube also collected plant specimens linked with traditional Mixtec foodways (squash, maize, amaranth, etc.) from markets located in Toronto, Ontario, and studied them under the microscope. Added together, these references contain around 500 species found all around the world. However, it is estimated that there are currently over 9000 in Oaxaca (García-Mendoza and Meave del Castillo 2011), some of them producing different types of phytoliths. The identification of diagnostic phytoliths and starch grains is getting better worldwide (Pearsall 2015:253), but many phytoliths remain unknown or non-diagnostic as of now, thus explaining the presence of unidentified microbotanical remains still present in many paleoethnobotanical studies, including this one.

Results

The following section presents the results of the microbotanical analyses. Table E.xxx presents identifications of remains to the family level. What follows is a sample-by-sample analysis of all starch grains and phytoliths, including unidentified examples, detected under the microscope. All identifications were made by Eloi Berube. Table D.2 presents a summary of all specimens, both known and unknown, that were identified during the analysis.

Table D.2: Identification of microbotanical remains.

	Arecaceae	Poaceae	Damaged starch	UNK Phyto 1	UNK Phyto 2	UNK Phyto 3	UNK Sil 1	UNK Sil 2
MS1 - DW		(1)		1				
MS1 - WW		(3) 2	1					
MS1 - SW		(4) 1						
MS2 - DW		4						
MS2 - WW		(1) 2						
MS2 - SW		(2) 1						
MS3 - DW		(1) 5			1	2		
MS3 - WW							1	
MS3 - SW		4						
MS4 - DW		15						
MS4 - WW		3						
MS4 - SW		(1) 2	2					
MS5 - DW	(1)	8	1			1		
MS5 - WW		1						1
MS5 - SW		4						

DW: Dry wash; WW: Wet wash; SW: Sonicated wash; UNK Phyto: Unknown phytolith; UNK Sil: Unknown siliceous tissue
Numbers in parentheses represent tentative identification (cf).

The first artifact analyzed (F42-s1-ob6) led to the identification of 11 Poaceae rondel phytoliths. An unknown phytolith (UNK Phyto 001) found in the dry wash and a damaged starch grain in the wet wash (Figure D.6) were also detected. The unknown phytolith was rectangular with round edges. It was compressed by the cover slide, creating a flat 3D shape, making it impossible to obtain an alternative view for identification. The damaged starch grain was missing more than half of its original size, leaving any identification impossible.

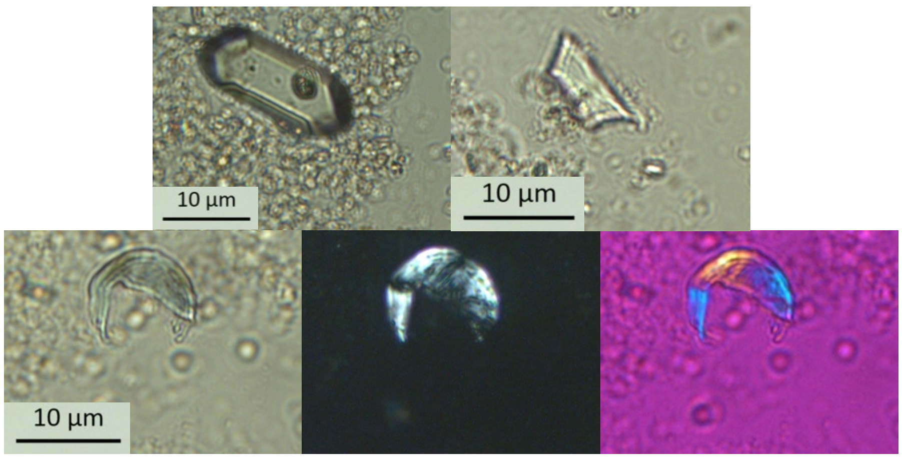


Figure D.6: Microbotanical remains found in MS 1 (F42-s1-ob6); top row (left to right): UNK Phyto 001 (dry wash), Poaceae *rondel phytolith (wet wash); bottom row: damaged starch grain (wet wash)*

The *Poaceae* family is large, composed of 1,187 known species of herbs and cereals in Mexico alone (Ibarra-Manríquez 2015:248). Included in *Poaceae* are several genera of grasses, most notably the *Zea* genus that includes maize and teosinte. Plants of the *Poaceae* family produce different microbotanical remains associated with different parts of the plant, which allows paleoethnobotanists to identify the particular part of the plant from which the remains originated. For example, maize leaves produce cross-shaped and bilobate phytoliths, cupules produce rondel phytoliths, and kernels produce starch grains. Tables D.3 and D.4 present the different types of microbotanical remains identified to the Poaceae family, as well as the few bilobate phytoliths that have been identified to the subfamily level.

Table D.3: Types of microbotanical remains identified to the Poaceae family.

	Bilobate phyto	Chloridoid phyto	Elongated phyto	Rondel phyto	Starch grain
MS 1-DW				(1)	
MS 1-WW				(3) 2	
MS 1-SW			(1)	(3) 1	
MS 2-DW	3			1	
MS 2-WW	2			(1)	
MS 2-SW				(2) 1	
MS 3-DW	2		2	(1) 1	
MS 3-WW					
MS 3-SW				4	
MS 4-DW	15				
MS 4-WW				3	
MS 4-SW	1			1	(1)
MS 5-DW	2	3		3	
MS 5-WW		1			
MS 5-SW	2			2	

Table D.4: Poaceae microbotanical remains and identification to the subfamily level.

	Poaceae	*Panicoideae*	*Bambusoideae*	*Panicoideae/Aritsoideae*
MS 1-DW	(1)			
MS 1-WW	(3) 2			
MS 1-SW	(4) 1			
MS 2-DW	3	1		
MS 2-WW	(1) 1			1
MS 2-SW	(2) 1			
MS 3-DW	(1) 4	1		
MS 3-WW				
MS 3-SW	4			
MS 4-DW	10	1	2	2
MS 4-WW	3			
MS 4-SW	(1) 2			
MS 5-DW	8			
MS 5-WW	1			
MS 5-SW	2	2		

The second artifact (F6-ob2), led to the identification of ten microbotanical remains, all coming from *Poaceae*. Five were rondel phytoliths and five were bilobate phytoliths (Figure D.7). One bilobate phytolith from the dry wash came from the *Panicoideae* subfamily, and another from the wet wash was either from the *Panicoideae* or the *Aristoideae* subfamily.

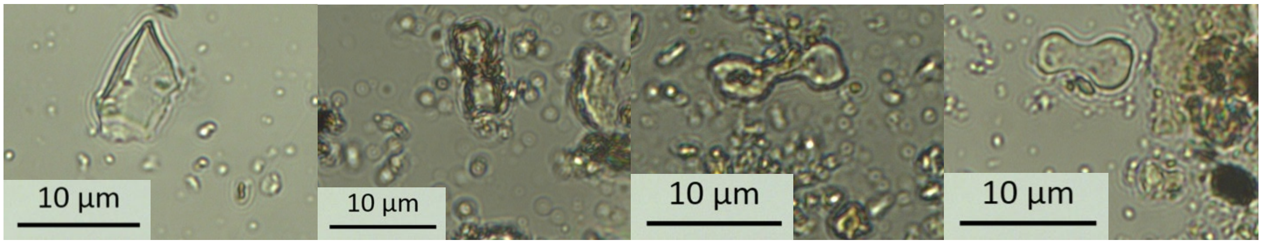


Figure D.7: Microbotanical remains found in F6-ob2 (MS #2); from left to right: rondel phytolith (DW), Panicoideae bilobate (DW), Panicoideae/Aristoideae bilobate (WW), Bilobate (WW)

The analysis of the third artifact, F25-s1-ob57, led to the identification of ten *Poaceae* microbotanical remains, with the addition of three unknown phytoliths and one unknown siliceous tissue (Figure D.8). The ten *Poaceae* phytoliths are composed of six rondel phytoliths, two elongated phytoliths, and two bilobate phytoliths. One of the bilobate phytoliths comes from the *Panicoideae* subfamily. UNK Phyto 002 is cylindrical, while UNK Phyto 003 is a big, hat-shaped phytolith. Finally, the unknown siliceous tissue is of great proportions and might come from the xylem tissue (Morell-Hart, personal communications 2018), although it is impossible to say with certainty.

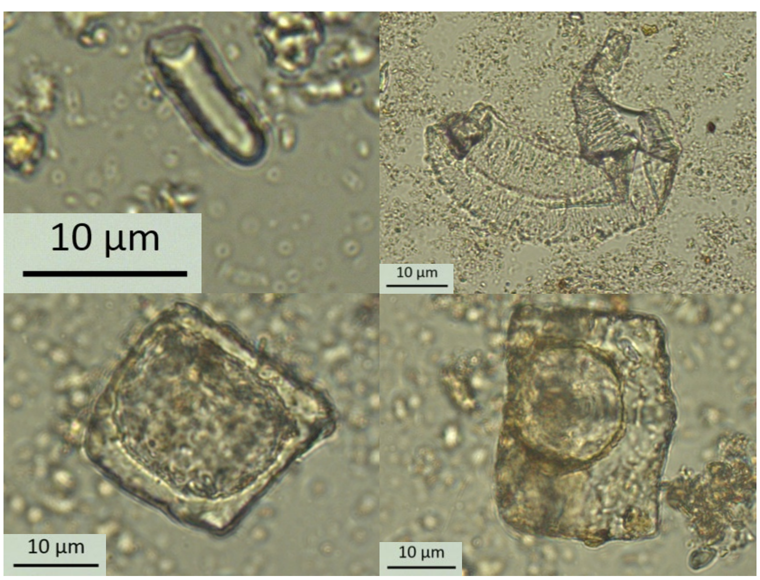


Figure D.8: Microbotanical remains of F25-s1-ob57; from left to right. Top row: UNK Phyto 2 (DW), UNK Sil 001 (WW).

The fourth artifact (F25-s1-ob5) produced the most microbotanical remains of the study. Twenty-one specimens came from the *Poaceae* family, along with two damaged starch grains (Figure D.9). The majority of the *Poaceae* microbotanical remains came in the form of bilobate phytoliths (76.2%), followed by four rondels (19.0%) and one starch grain (4.8%). One rondel comes from the subfamily *Panicoideae*, two from the *Bambusoideae*, and two come from either the *Panicoideae* or the *Aristoideae* subfamilies. The two damaged starch grains show signs consistent with heating damage (Henry et al. 2009).

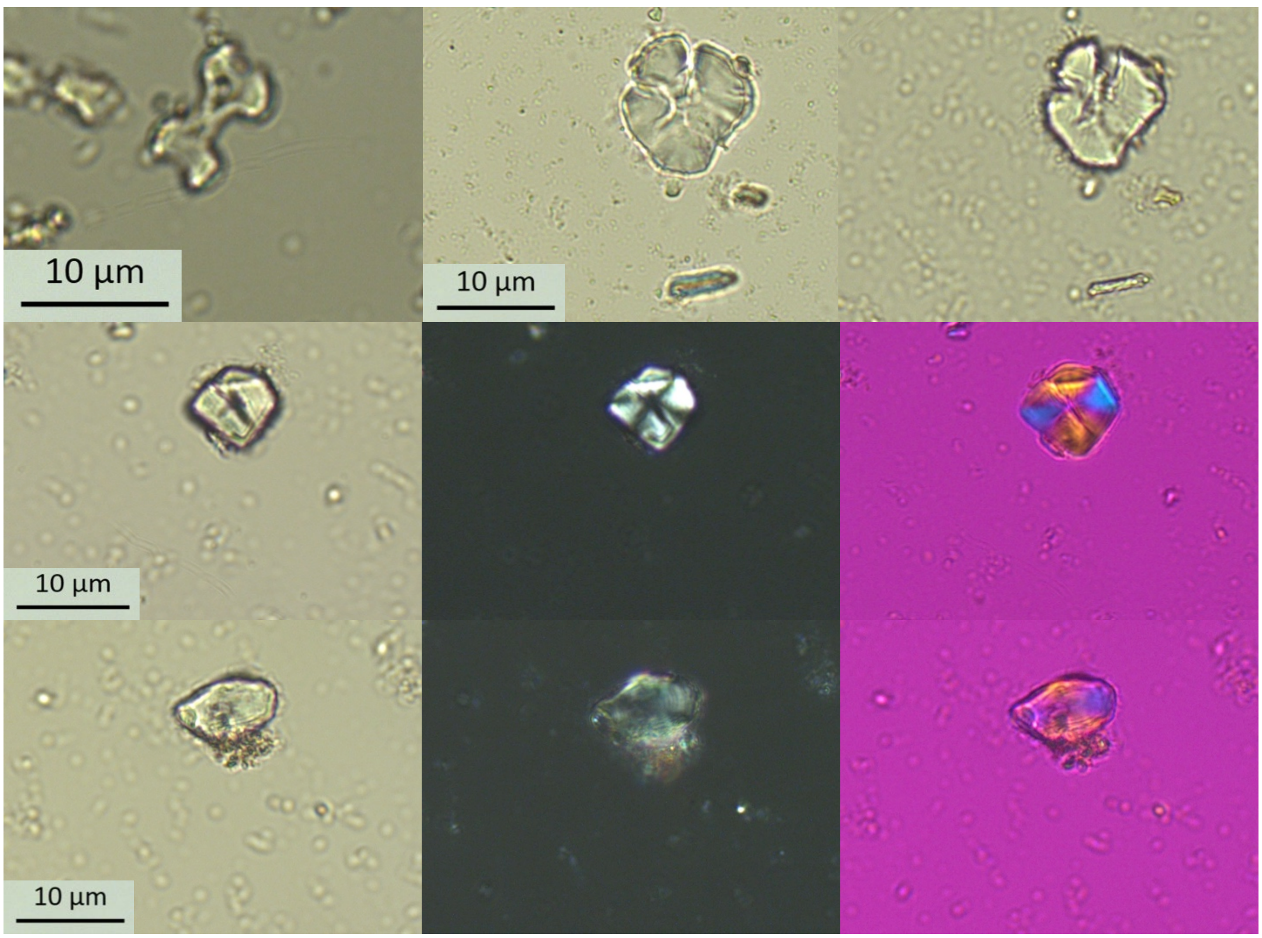


Figure D.9: Microbotanical remains found in F25-s1-ob5; From left to right. Top row: Bambusoideae bilobate (DW), Damaged starch grain (SW).

The final artifact (F60-s1-ob10) led to the tentative identification of a plant from the palm family, *Arecaceae* (Figure D.10). This is the only microbotanical remain of this study identified to a different family than Poaceae. With the addition of thirteen microbotanical remains coming from the grass family (two of them coming from the *Panicoideae* subfamily), the analysis of this sample led to the identification of a damaged starch grain, of one specimen of UNK Phyto 003 and of an unknown siliceous tissue (UNK Sil 002).

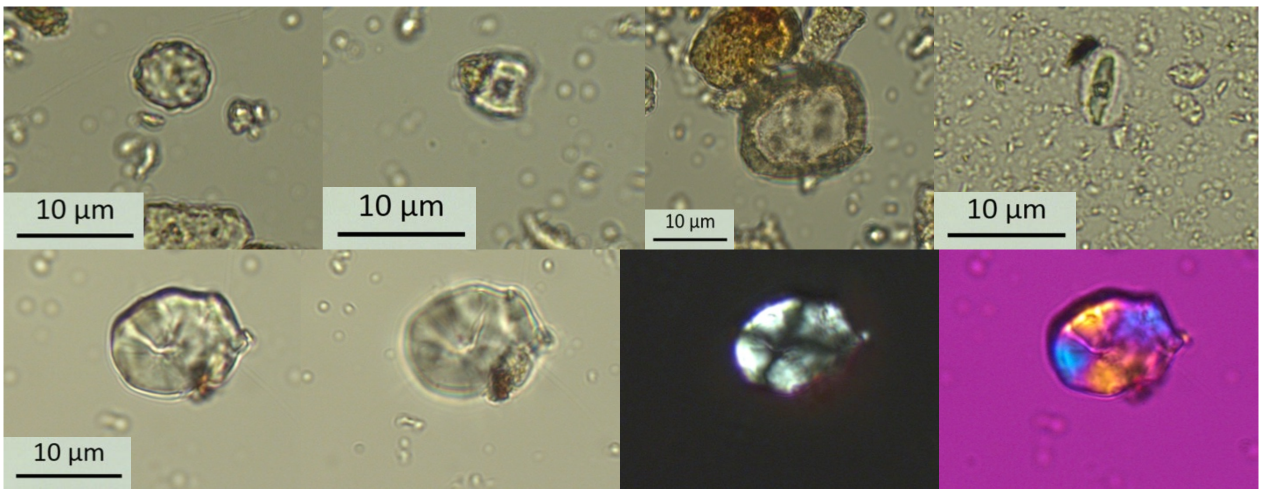


Figure D.10: Microbotanical Remains Found in F60-s1-ob10; From left to right. Top row: cf Arecaceae (DW), Poaceae chloridoid phytolith (DW), UNK Phyto 003 (DW), UNK Sili 002 (WW); Bottom row: damaged starch grain (DW).

Summary

The main goal of this study was to extract and identify adhered botanical residues to better understand what botanical materials may have been held in offering vessels at Cerro de la Virgen. The majority of the microbotanical remains identified in this research come from grasses (*Poaceae*). While no edible plant remains were encountered during this study, the results obtained still provide information about the possible uses of these vessels.

The *Poaceae* microbotanical remains could come from different sources. It is highly plausible that there were grasses in the vicinity of these vessels when they were crafted and eventually deposited in their respective ritual context. In contact with those grasses, some phytoliths may have found their way into the vessels. The temper could also explain the presence of *Poaceae* phytoliths, as the vessels, particularly the coarse brown cylinders, were composed of a very soft temper that mixed with the remaining sediment when exposed to water during the wet and sonicated washes. Thus, the phytoliths retrieved could come from the temper and the clay. Finally, there is also the possibility that the vessels were filled with grass at a certain point.

The presence of two starch grains likely exposed to heat in F25-s1-ob5 provides interesting information. Two scenarios could explain the presence of these starches. The first would be that this jar, while containing plant remains, got exposed to heat. The other possible scenario would be that this jar contained at a certain point already cooked plant remains. In both scenarios, the plants were either removed before being placed there or the plants did not preserve archaeologically, leaving only these two starches behind.

Berube did not find any microbotanical remains associated with edible plants, and I did not encounter any carbonized seeds in the dirt I excavated from these vessels. This tends to support the idea that these jars were not holding botanical materials immediately prior to their placement. The jars could have been holding other perishable items, such as meat or liquids. While it is a possibility that the vessels were placed in their respective offerings empty, chemical analyses must be completed to evaluate whether meats or liquids, or other inorganic materials, were placed in the vessels.

APPENDIX E: ANALYSIS OF HUMAN REMAINS

Analysis prepared by Aaron Young and Arion Mayes

Burial 1, Individual 1
Adult, possible male

Present is the incomplete skeleton of an adult individual, possible males. Age and sex are undetermined, although there is a slight pre-auricular sulcus likely a result of weight bearing. All of the skeletal elements are fully developed, the joints that are present show slight to moderate degeneration, with prominent muscle attachments on the leg and arm bones present. The pronator ridge on the radius is robust while the insertion point for the inferior supinator is raised with changes due to micro-tears (enthesopathies). Despite missing epiphyses on the left femur, a robust linea aspera, gluteal line, iliacus and the spiral line (muscle attachments on the anterior and posterior surfaces) can be observed. On the left innominate a portion of the acetabulum is present with slight lipping along the rim. What remains of the pubis, ischium, and ilium are crushed. A small portion of the area inferior to the auricular surface, with a small pre-auricular sulcus, is present. The hand bones have the greatest preservation (right carpals: captitate, trapezium; left carpals: hamate, lunate, trapezium, navicular), protected by their placement across the pelvic girdle and under the body, which was placed face-down (as determined by the femur *in situ*). All of the hand bones (carpals, metacarpals, phalanges) have slight lipping on joint surfaces that are present, with prominent ridges on the palmer surface of present phalanges indicating robust build-up and use of hands.

Burial 2, Individual 2 (PTRV16-OpF MUC-1)
Adult, probable female

Burial 2, Individual 2 is the most complete individual excavated during this field season (Figure E.1-E.4). Portions of the skull are present, which aided in the estimation of age and sex. A total of fourteen teeth are present, some of which provided pathological information. The pelvis is absent, and therefore unavailable for age and sex estimation. The majority of the right side of the cranium is present. Some key morphological and skeletal features are visible such as suture lines, nuchal crest, and the supra-orbital margin. Fourteen total teeth are identified. The majority of the teeth are all fragmented and show extreme wear. Over half of the teeth recovered show signs of significant wear such as: worn enamel, dentin exposure, and crown loss. The left humerus is present with only the distal epiphysis missing. The right and left radii are present but are missing both the proximal and distal epiphyses. A portion of the right clavicle is present as well as the body of the left scapula. Five ribs are identified but side and order is indeterminate. Five phalanges were found next to the right femur, which could indicate that they are from the right hand. The distal ends of both femora are identified as well as the proximal ends of the tibiae, representing the right and left knee joint.

Figure E.1: Remains of Burial 2-Individual 2 in anatomical position.

Age and sex for this individual was determined using the skull fragments (Figure x.x). Based on the morphology of the nuchal crest, which displayed minimal expression with no boney projections, and the subra-orbital margin, which displayed slight to medium thickness, sex was estimated as probable female. Based on cranial suture closure, the estimated age of this individual is a young to middle adult from 18-43 years of age at death. Two premolars display dental caries (Figure x.x). Both carious lesions are located on the root, inferior to the cemento-enamel junction (CEJ). The dental caries on the root are a result of the root surface being exposed due to alveolar restoration and/or periodontal disease. Dental caries can develop from a multitude of sources such as: environmental factors, diet, hygiene, and bacteria. The dentition also displays hypercementosis, which is abundantly clear on the maxillary premolar with the carious lesion as well as on various other teeth. Hypercementosis is an over-production of the cementum often common in individuals who display extensive dental wear, which is evident in this individual.

Figure E.2: Posterior view of cranium, B2-I2.

Figure E.3: Dentition of B2-I2.

Figure E.4: Right femur, B2-I2.

Burial 3, Individual 3 (PTRV16-OPF-14G-Lot7)
Adult, unknown sex

Burial 3, Individual 3 is extremely fragmented and fragile. Numerous elements were missing and only long bone fragments were identified (Figure E.5). Neither the skull nor the pelvic girdle are present. And, due to taphonomic processes, the epiphyseal end of the long bones are also absent, thus age and sex estimation were not possible beyond adult. A total of five elements are present, representing the leg. Only the diaphyses are present with the proximal and distal epiphyses missing or damaged. The diaphyses of both the left and right femora are present. Portions of both tibiae are present, as well as the diaphysis of a fibula. The tibiae and the fibula diaphyses are all un-sideable due to taphonomic damage. No analysis beyond osteological identification is possible due to lack of material present. However, the individual is a probable adult due to the size of the long bones. No pathology or trauma was evident on the available skeletal elements.

Figure E.5: Right femur, B3-I3

Burial 4, Individual 4 (PTRV16-Op B)

Probable young adult, unknown sex

Burial 4, Individual 4 is remarkably fragile with minimal elements present. Four long bone fragments were found as well as a fragment of the mandible. The mandible fragment includes a portion of the body from the mental protuberance to the root of the gonial angle. Three teeth are also present, which aided in age estimation. The only cranial element present is the mandible. The mandible fragment is a left and appears to be fully developed. A total of three teeth are present, with only one complete. The complete tooth is a left maxillary premolar with slight dental attrition. The remaining dentition are a premolar and a molar with only the crowns present. Post-cranial elements that are present include both femora as well as fragments of a tibia and humerus. Both the tibia and humerus fragments are un-sidable due to only portions of their diaphysis being recovered and a lack of identifiable features from taphonomic processes. Both the right and left femora are missing the proximal and distal epiphyses. However, the femora diahpyses display diagnostic features, aiding in siding and identification.

Minimal analyses could be completed from this burial due to the lack of skeletal material present and condition of the remains. With no significant morphological features present, sex was undetermined for this individual. A minimum age of 15 years of age at death is given to this individual based on the apex closure of the maxillary premolar. The individual is most likely older than the minimum age of 15 based on the dental wear on all three teeth present. The dental wear is moderate, and not severe enough to expose the dentin (Figure E.6). There are no carries or linear enamel hypoplasias present. This suggests that this individual was generally healthy prior to death and did not experience stressors during growth and development that would disrupt enamel development.

Figure E.6: Maxillary premolar, B4-I4.

OpD-15M-7 (Offering)
Adult, sex unknown.

Found in association with several vessel fragments and one piece of stone is a human femur diaphysis. The bone is crushed and delicate and can fall a part at the touch. The chalky consistency of the bone is consistent with a secondary burial-this piece is obviously not a primary burial as it is the only skeletal element present and is placed with the other items. The femur itself is not large, cortical bone of average thickness. No outstanding or identifiable features (epiphysis are missing or severely damaged).