The 2023 Season of the Belize Estates Archaeological Survey Team

EDITED BY

Brett A. Houk

Papers of the Chan Chich Archaeological Project, Number 16
Texas Tech University • Lubbock, Texas
2023

Belize Estates Archaeological Survey Team
BEAST
Orange Walk District, Belize, Central America

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EDITED BY

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WITH CONTRIBUTIONS BY

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Bridgette Degnan
Mara De Gregori
Anna DesHotels
Tomás Gallareta Cervera
Brett A. Houk
Marie Ical
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Briana Smith
Tera Stocking
Amy E. Thompson
J. Ray Wallace
Mark Willis
and
Bo Zhao

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Chan Chich Archaeological Project
CCAP
Chan Chich, Belize - Central America

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Department of Sociology, Anthropology, and Social Work
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Cover art: Simple Red Relief Image Map of the Main Plaza at Ayiin Winik.

Acknowledgments

"These are the days of lasers in the jungle. Lasers in the jungle somewhere."

— Paul Simon (1986)

This report closes the books on the 2023 season of the Belize Estates Archaeological Survey Team (BEAST). While 2023 brought its own challenges, it also brought a host of possibilities, because we live in a world with lidar data now. "You see, it's all very clear to me now. The whole thing. It's wonderful" (Hyams 1984). Lidar dominated our thoughts and research design in 2023, and it is easy to make grandiose plans when it looks like you can drive right up to a previously unknown site and then scamper gleefully among the ruins. But, it's still a jungle out there, to paraphrase Randy Newman (2017). The jungle has its own plans and does not care about your fancy lidar data.

As is the case each year, we have many people to thank for making the 2023 season successful. First and foremost is the Institute of Archaeology (IA) in Belize, the agency which issues a permit for our research. We would like to thank Dr. Melissa Badillo, the Director of Research, for approving our permit application and being so supportive of our research. The other staff members at the IA provided assistance throughout the summer season, including Rumari Ku, Josue Ramos, and Paul Smith. We thank the Public Utilities Commission and Department of Civil Aviation for issuing a drone permit to Mark Willis.

Malcolm Robinson, the general manager of Gallon Jug Estate, granted us permission to excavate at Chan Chich and Gallon Jug in 2023, and Dr. Elma Kay, the Managing Director of Belize Maya Forest Trust (BMFT), allowed us to work at multiple sites on BMFT land, assisted us with finding someone to clear the Hillbank road, and sent two of her rangers to help us clear the road to Ayiin Winik in April. We would also like to thank Lindon Mai at BMFT for securing bids for the Hillbank road clearing and the two rangers, José and Alvin, who chain sawed their way toward Ayiin Winik.

Michael Bowen and Bowen & Bowen, Inc. once again let us use Chan Chich Lodge as our field camp. The management staff at Chan Chich Lodge—Anabella De La Rosa, Esmerelda De La Rosa, Elijio Coh, and Teresita Cerda—went out of their way to make our stay productive. We will miss Anabella but wish her well as she begins married life in England! We would like to thank all the staff at the lodge and in Gallon Jug for being kind and helpful to our group, but especially Emil Flota and Jonathan Garcia for keeping us hydrated.

The Alphawood Foundation generously funded the fieldwork in 2023 through two separate grants, one old and one new. We would like to thank Melissa Terrell (Office & Grants Manager), Chirag Badlani (Executive Director), and the board of directors at Alphawood for funding the project. Although she technically no longer works for Alphawood, Kristin Hettich coordinated the grant proposal and award process. She has always been a huge supporter of our research. A subaward through Howard University from the National Science Foundation (Award Number 2051377) funded

the marketplace study lab work in 2023. We would like to thank Dr. Eleanor King (Howard University) for asking us to participate in this collaboration and for wrangling, as best she could, the Howard University grants office. We acknowledge Kenyon College for supporting Dr. Claire Novotny and Dr. Tomás Gallareta Cervera and The University of Texas at Austin for supporting Dr. Amy Thompson's research with startup funds. We would also like to thank the Big XII faculty fellowship program for funding Dr. Thompson's trips to Lubbock in 2022 and 2023 to work on the lidar data.

The project field staff for the season included Bridgette Degnan, Mara De Gregori, Anna DesHotels, Dr. Tomás Gallareta Cervera, Marie Ical, Dr. Victoria Ingalls, Kaitlin Murphy, Dr. Claire Novotny, Kristina Priotto, Heather Richards-Rissetto, Briana Smith, Tera Stocking, Dr. Amy E. Thompson, J. Ray Wallace, and Mark Willis. Team Beach included Dr. Timothy Beach, Dr. Sheryl Luzzadder-Beach, and Chris Ploetz. We enjoyed sharing camp with them for a week! Brooke Bonorden, Dr. Anna C. Novotny, and Dr. Bo Zhao contributed post-field analyses to this report. We would like to thank Lori Phillips for her willingness to look at our faunal material, which, unfortunately, never made it to her. May the bones of the deceased rodents forever haunt the US Postal Service. Dr. Fred Valdez, Jr. and Dr. Lauren Sullivan analyzed ceramics from the 2022 field

The BEAST 2023 summer staff (Part 1), from left to right: Tomás Gallareta Cervera, Claire Novotny, Oscar, Brett A. Houk, Kristina Priotto, Kaitlin Murphy, Tera Stocking, Bridgette Degnan, Amy E. Thompson, Chris Ploetz, Timothy Beach, Sheryl Luzzader-Beach, and Heather Richards-Rissetto.

season for us this summer, and we thank them for their time and expertise.

In 2023, grumpy 3-year-old Oscar replaced happy 2-year-old Oscar in a sort of invasion of the body snatchers way, and we thank Janely Serminia for serving as Oscar's nanny all season. We also thank Jerry Serminia and the rest of his family for hosting Oscar each day at their home and on walks to the river.

Scholars that contributed to this report through informal consultation include Dr. Christina Halperin, who looked at images of a ceramic figurine fragment from Ayiin Winik, and Dr. Mary Kate Kelly, who gave us possible site names for BE-33 in both Yucatecan and Cholan Mayan. She is now our favorite epigrapher. We waded into new research areas in 2023, particularly in terms of learning how to identify tree species from ancient charcoal. We would like to Dr. Nicholas Brokaw (University of Puerto Rico) and Dr. Sheila Ward for sharing multiple publications on trees in the Three Rivers region. Dr. Elisabeth Wheeler (Professor Emerita at North Carolina State University) and Dr. Lydie Dussol (Université Côte d'Azur) graciously consulted with Kaitlin Murphy on her charcoal study; the final chapter based on that study is much improved thanks to their input. Dr. Bo Zhao was a tremendous help in the Microscopy Lab at Texas Tech University (TTU), and we thank her for being willing to

The BEAST 2023 summer staff (Part 2), from left to right: Anna DesHotels, Brett A. Houk, Tomás Gallareta Cervera, Bridgette Degnan, Victoria Ingalls, Kaitlin Murphy, Kristina Priotto, Tera Stocking, Claire Novotny, Oscar, Mara De Gregori, and Mark Willis.

The BEAST 2023 summer staff (Part 2) on Hawaiian Shirt Wednesday, from left to right: Mara De Gregori, Kaitlin Murphy, Kristina Priotto, Anna DesHotels, Bridgette Degnan, Tera Stocking, Brett A. Houk, Victoria Ingalls, Claire Novotny, Oscar, and Tomás Gallareta Cervera.

scan charcoal on short notice! We also thank Dr. Callum Hetherington (TTU) for introducing us to Dr. Zhao and facilitating our collaboration. Dr. Brendan Culleton and his team at Penn State analyzed three radiocarbon samples for us in 2023.

The Virginia Tech Univerity jaguar research team shared shapefiles on roads and trails and collaborated on opening the road to Hillbank. We would like to thank Dr. Marcella Kelly and her field directors, Darby McPhail and David Lugo, for their assistance.

We would also like to thank the key members of our lidar working group. Dr. Marcello Canuto and Dr. Francisco Estrada-Belli at Tulane University have had a team of graduate students digitizing tens of thousands of mounds and features for us for nearly a year now. Dr. Timothy Beach, Dr. Sheryl Luzzadder-Beach, Dr. Kat Brown, and Dr. Jason Yaeger are the other members of the group collaborating on the analysis of the BEAST data and an adjacent block of data south of our permit boundary.

As always, we could not have accomplished anything in the summer without the assistance of our field and lab assistants. This summer, those were Gricela Alvarado, Lorena Alvarado, Mauricio Alvarado, Joe Aquiño, Porfilio Bolaños, Osem Briceño, Elijio Coh, Emanuel Cordova, Lohanny Cordova, Emil Flota, Nahaman Gutierrez, Petrona Ical, Vidal Ku,

"The right combination of guilt and machismo has sent many a fool out into the jungle when he should have stayed home."

— Jimmy Buffett (1989)

Shaliny Moh, Hori Monroy, Lusbin Monroy, Christopher Quetzal, Gary Romero, Luis Romero, Jr., Jeremias Serminia, Jermi Diylin Serminia, Jerviany Serminia, Manuel Sho, Aloria Tush, Wayne Tush, Julian Velasquez, Miguel Velasquez, Alejandra Villamil, and Jacinto Villamil.

Lastly, several individuals helped us with vehicles and solutions to vehicle problems. We would like to thank Abe Rempel of Blue Creek for renting us trucks and replacing broken trucks, Porfirio Bolaños at Gallon Jug for almost fixing Dr. Thompson's brake problems, and Pancho and Lisa Friesen of Spanish Lookout for finally fixing Dr. Thompson's brake problems. Porfi also fixed a power steering leak on our green Tacoma. Stephen Ferguson at the airport in Belize City helped us shuttle vehicles on our arrival and departure days. Thank you to AQ Car Rental in Belize City for providing a truck that never broke down the entire month.

Finally, the authors of the chapters in this report deserve thanks for all their hard and thankless work. Good work, everyone!

Brett A. Houk, December 28, 2023

Snake guard sweat at Gallon Jug.

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An Introduction to the 2023 Season of the Belize Estates Archaeological Survey Team

Brett A. Houk

This report presents the preliminary results of the 2023 season of the Belize Estates Archaeological Survey Team (BEAST). Assessing discoveries in our lidar data dominated our field investigations, and completing the analysis of artifacts from the 2022 Chan Chich North Plaza excavations kept our lab busy in 2023. As described below, we conducted a short reconnaissance trip in April to record one of the sites revealed in the lidar and we returned to Belize for a 29 day field and lab season in June and July. This chapter includes details on dates, staff, permits, funding, and so on; examines the difficulties we faced in the field; and presents short summaries of the 2023 investigations.

RESEARCH AREA

In May 2023, we renegotiated our permit area with the Institute of Archaeology (IA) to square off the research area's southeastern edge and reduce the previously established buffer around the site of Chan Chich. The new BEAST permit area covers approximately 560 km^2 in northwestern Belize (Figure 1.1). The research area includes Gallon Jug Ranch and portions of the Belize Maya Forest Trust (BMFT), which was established in 2021. BEAST conducted archaeological work at Chan Chich, Gallon Jug, Wamil, Sierra de Agua, Laguna Seca, and the newly recorded sites of Ayiin Winik and Tiho'witz in 2023.

PROJECT TIMELINE, STAFF, AND CONSULTANTS

The reconnaissance trip in the spring took place between April 10 and 19 and included Dr. Victoria Ingalls, Briana Smith, Ray Wallace, and me. The fieldwork phase of the summer session began on June 13, with the arrival of the project staff (Table 1.1) and ended on July 11. Various members of the team arrived and departed throughout the summer session depending on their whims, travel difficulties, and other commitments. During the first two week of the summer, Dr. Timothy Beach, Dr. Sheryl Luzzadder-Beach, and Chris Ploetz, all from The University of Texas at Austin (UT) and collectively referred to as "Team Beach," shared camp with us, while they conducted geomorphological work near Wamil. Dr. Amy Thompson (UT) and Dr. Heather Richards-Rissetto (University of Nebraska-Lincoln [UNL]) joined the project for the first two weeks, departing on June 27. Texas Tech University (TTU) incoming graduate student Mara De Gregori arrived on June 20. Ingalls and former TTU student/current Texas Parks and Wildlife Department (TPWD) archaeologist Anna DesHotels replaced Thompson and Richards-Rissetto for the final two weeks of the project, arriving on June 27 and June 28, respectively. Finally, Mark Willis brought his lidar drone down from June 30 to July 4. All other project personnel arrived on June 13 and departed July 11. Brooke Bonorden, a former

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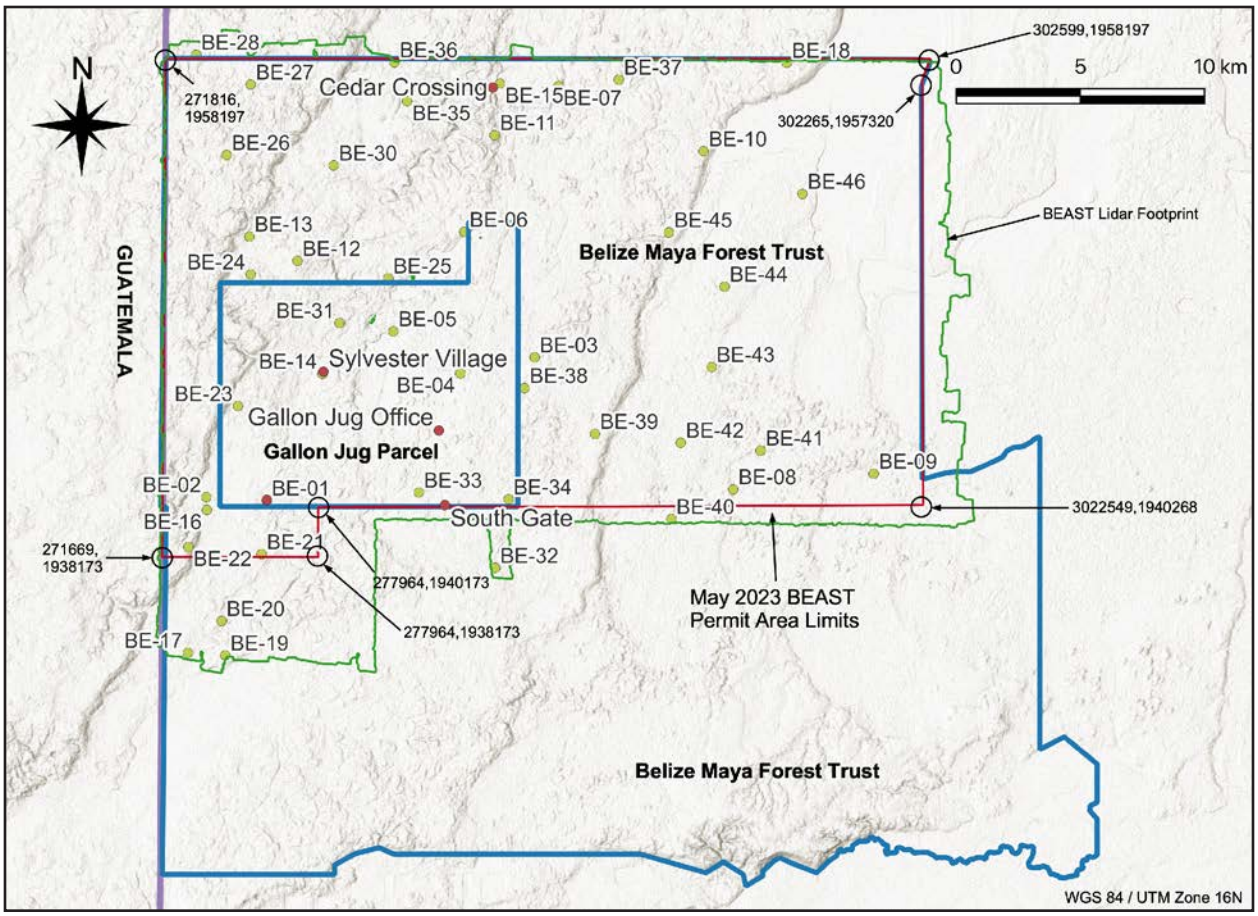

Figure 1.1. Map of the BEAST permit area as established in May 2023.

TTU graduate student, consulted on historic artifact identifications. Dr. Anna Novotny (TTU) examined a human tooth from the North Plaza in her lab at TTU. Dr. Fred Valdez, Jr. (UT) and Dr. Lauren Sullivan (University of Massachusetts Boston [UMass Boston]) analyzed ceramics from the 2022 season for us at the Programme for Belize Archaeological Project's field lab. Sullivan is the ceramicist for the Marketplace Study, and Valdez looked at the 2022 material from Gallon Jug and Chan Chich.

PROJECT FUNDING AND PERMITTING

Two separate grants from Alphawood Foundation of Chicago supported the April reconnaissance trip and the summer field season. Additionally, BEAST is part of a multi-disciplinary team investigating Maya marketplaces at sites across northwestern Belize. That work is funded by a grant from the National Science Foundation (NSF, Award Number 2051377) to Dr. Eleanor King of Howard University. The NSF grant funded the lab work and radiocarbon analysis conducted in 2023 on the marketplace artifacts and samples collected in 2022.

The IA, part of the Belizean National Institute of Culture and History, issued Permit No. IA/H/2/1/23(06) to Houk for the field investigations. At the time the permit was issued, Dr. Melissa Badillo served as the Director of the IA. Malcolm Robinson, the General Manager of Gallon Jug Estate, and Dr. Elma Kay, the Managing Director of Belize Maya Forest Trust, gave us permission to conduct the research on their properties.

Table 1.1. List of 2023 Project Staff

Name	Role	Affiliation
Dr. Brett A. Houk	Project Director	TTU
Bridgette Degnan	Operation Director	UC Santa Barbara
Mara De Gregori	Field Assistant	TTU
Anna DesHotels	Field Assistant	TPWD
Dr. Tomás Gallareta Cervera	Operation Director	Kenyon College
Marie Ical	Field Assistant	University of Belize
Dr. Victoria Ingalls	Operation Director	Acacia Heritage Consulting
Kaitlin Murphy	Lab Assistant	TTU
Dr. Anna Novotny	Project Bioarchaeologist	TTU
Dr. Claire Novotny	Associate Project Director	Kenyon College
Kristina Priotto	Field Assistant	UT
Dr. Heather Richards-Rissetto	Operation Director	UNL
Briana Smith	Field Assistant	TTU
Tera Stocking	Lab Director	University of Kentucky
Dr. Lauren Sullivan	Ceramicist	UMass Boston
Dr. Amy Thompson	Operation Director	UT
Dr. Fred Valdez, Jr.	Ceramicist	UT
Ray Wallace	GIS Technician, Field Assistant	TTU
Mark Willis	Drone Operator	Flinders University

CHALLENGES IN 2023

We faced a litany of challenges in 2023, which we can break into the following areas: tree falls, growing pains, labor, transportation, and Covid. We learned on our first day in the field in April that Hurricane Lisa, which hit Belize on November 2, 2022, dropped many trees in our permit area, across roads and on top of sites (Figure 1.2). Many of our pre-field plans assumed good road access, because the Virginia Tech University jaguar research team had opened multiple logging roads and trails the previous year. As Houk and colleagues (Chapter 3, this volume) describe, this assumption made asses out of everyone near it (Figure 1.3). Clearing roads and cutting trails cost us both time and money—opening the road from Gallon Jug to Sierra de Agua cost several thousand dollars—and hindered our overly ambitious plans to visit multiple unrecorded sites.

In 2023 we added some new project members to the BEAST team, collaborated with Team Beach from UT, and worked at more sites than ever before in one field season. All of this resulted in growing pains. We discovered a structural problem with our FileMaker database—basically, you must have a site name to create a lab code before you submit any artifacts to the lab—and had to bring new people up to speed on our project's methods and routines. As the new people learned, while there may be other ways of doing things, the BEAST way is the right way!

As I described in the introduction to last year's report, the pandemic exacerbated our endemic labor issues (Houk 2022). All the problems we faced in 2022 worsened in 2023. You can read about them in Houk (2022:3–4), but the issues boil down to the fact that there are not enough folks with archaeological field experience living in the area for us to hire.

Figure 1.2. Trucks and field crews wait while Gallon Jug Ranch personnel clear a fallen tree blocking the road to Chan Chich on June 28 at the end of the field day. Months after Hurricane Lisa, damaged trees continued to fall in the permit area.

Yet again, we faced transportation challenges in 2023. Here is a quick rundown. The right front wheel assembly on a rented Nissan Frontier failed after week one of the summer season just a few miles from the Gallon Jug property line in an area with no cell coverage. The right front quarter of the truck dropped to the ground (Figure 1.4a), and the 50-m long gouge in the marl road is probably still visible. The replacement truck, aka the Banana Truck (Figure 1.4b), miraculously made it through the rest of the season. Dr. Thompson's field vehicle, purchased from our trusted contact in Blue Creek, spent about 2 weeks at the mechanic's shop in Gallon Jug with brake problems. Although we thought these problems were fixed in time for Thompson to depart on June 27, we found out deep in the Yalbac Hills, close to where the van died in 2022 (see Houk 2022:4), that all was not well. We had to abandon the truck there, and I had to abandon Dr. Thompson in Spanish Lookout to get to the airport in time to pick up one of two scheduled arrivals—the other was rescheduled for the following day, super conveniently. The road to Ayiin Winik became nearly impassible toward the end of the summer field season, and a branch punched a fist-sized hole in the windshield of the red Tacoma (Figure 1.4c), while Ingalls slogged through a particularly muddy stretch of road one day (Figure 1.4d). We now know where to buy a windshield in Spanish Lookout. We also know now where it gets super muddy on the road to Spanish

Figure 1.3. Jermi Serminia clears a tree fall on the logging road leading toward Ayiin Winik (BE-30) on April 14. Large trees covered in vines and lianas that fall across the road create dense walls of vegetation that require lots of machete work before the chain saw can be used.

Lookout in the Mennonite fields south of BMFT land. Dr. Gallareta Cervera, who was driving Dr. Novotny to the clinic in Spanish Lookout because she was having an allergic reaction to multiple bee stings, managed to get the green Tacoma stuck there a few hours after Houk and Ingalls reported on the road conditions. Houk and Ingalls mounted a rescue party, and Dr. Novotny, thankfully, survived.

Finally, Covid presented a challenge. No, we did not have another Oscar-inspired outbreak like in 2022 (see Houk 2022), but a rolling outbreak at the Programme for Belize Archaeological Project's field camp, prevented us from bringing our two ceramicists down to analyze pottery in 2023. As a result, we are lacking important chronological information in this season's report.

ACCOMPLISHMENTS IN 2023

Lidar

As I reported last year (Houk 2022), the National Center for Airborne Laser Mapping (NCALM) at the University of Houston collected lidar data on approximately 650 km^2 of mostly forested land for us in May 2022 (Figure 1.5). This covers the BEAST permit area and some extra areas to the south and east. The eastern extension includes land owned by the Programme for Belize in the Booth's River Depression and is part of a collaboration

Figure 1.4. a) The Nissan Frontier with a failed right front wheel assembly on road through BMFT; b) Kaitlin Murphy next to the Banana Truck at Chan Chich; c) duct tape holding together the windshield of the red Tacoma after a branch smashed it; and d) the road to Ayiin Winik on the last day working at Tomb 1.

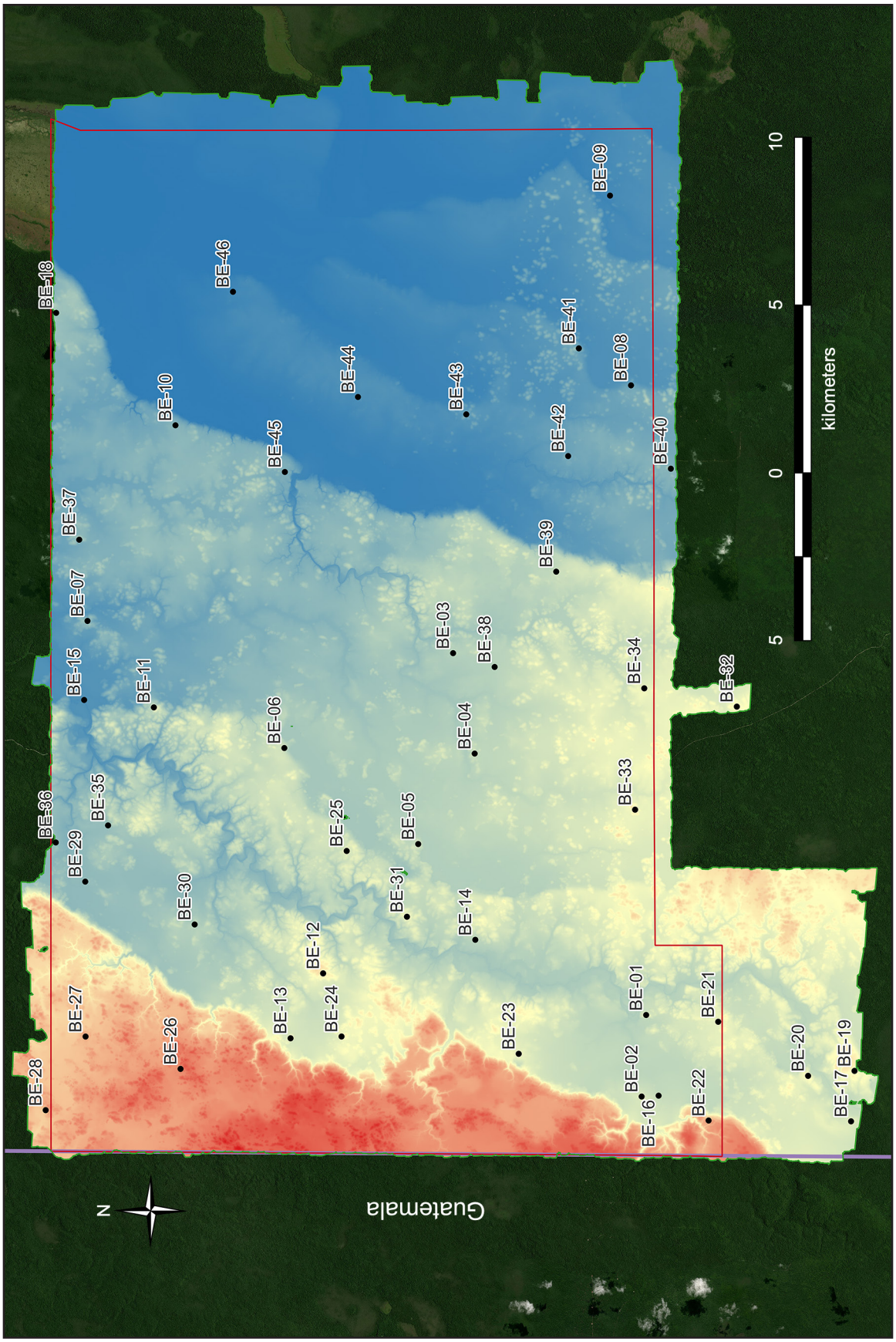

Figure 1.5. Locations of recorded sites in the BEAST lidar data. The BEAST permit boundary is shown in red.

between BEAST and Tim Beach and Sheryl Luzzadder-Beach who have an interest in the wetland agricultural fields near Sierra de Agua.

We began working with our lidar data during the fall 2022 semester, and in December 2022 Thompson, Richards-Rissetto, Ray Wallace, and I met in Lubbock for a 4-day lidar workshop, funded in part by a Big XII Faculty Fellowship grant to Thompson (Figure 1.6). During that meeting, we systematically viewed the lidar data and assigned Belize Estates (BE) numbers to previously unrecorded sites. Our inventory of BE sites jumped from 18 to 46 over the course of a couple of days (see Figure 1.5; see Houk, Project Lists, this volume). Some of these sites are so remote that the project may never be able to visit them.

In spring 2023 we formalized our agreement with the Middle American Research Institute (MARI) at Tulane University to collaborate on publications related to the BEAST dataset. In exchange, MARI students, supervised by Dr. Marcello Canuto and Dr. Francisco Estrada-Belli, digitized archaeological features in the data. By December 2023, MARI had nearly completed the work, documenting over 28,000 ancient Maya structures (Houk et al. 2023). We are scheduled to meet at MARI in January 2024 to go over the results and plan a collaborative journal article to debut the data to the world. To date, other than the chapters in this report, our lidar research output includes conference presentations at the International Union for Quaternary Research in Rome (Thompson et al. 2023) and the South-Central Conference on Mesoamerica in San Antonio (Houk et al. 2023; Ingalls et al. 2023).

Field Assessments

As noted above, we dedicated our fieldwork in 2023 to assessing our lidar data through survey, mapping, and chronological test pitting. Other

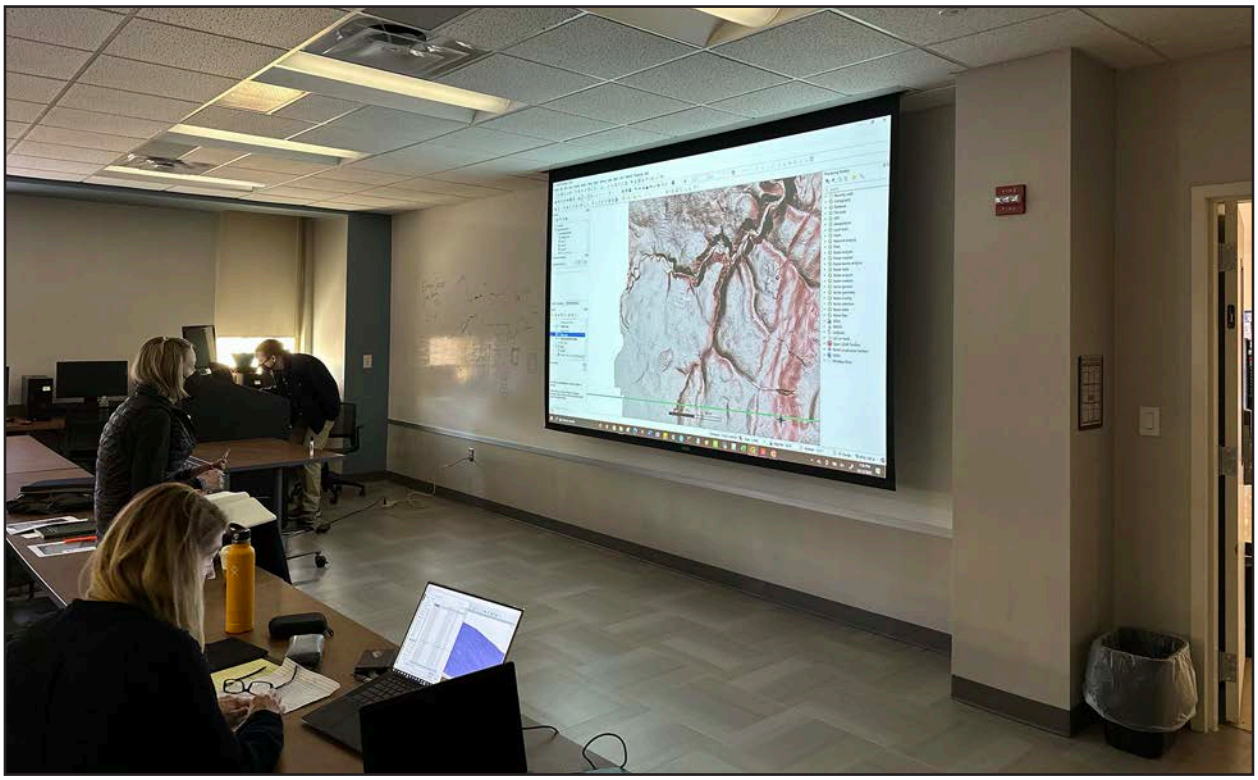

Figure 1.6. The BEAST lidar team reviews potential BE sites on December 12. From front to back are Richards-Rissetto, Thompson, and Wallace.

than our salvage excavations of a looted tomb at Ayiin Winik (see Ingalls et al., this volume), all our fieldwork related directly to investigating sites and features revealed in the lidar data.

Recording Ayiin Winik (BE-30)

As Houk and colleagues (this volume) discuss in detail, a small BEAST team traveled to Belize in April to assess several newly recorded BE sites north of Sylvester Village. We know from previous seasons that the logging road passing through this part of the permit area becomes a mud pit during the summer. We originally proposed to visit BE-30, BE-24, and BE-31, but numerous tree falls impeded our progress (Figure 1.7). The team did, however, manage to reach BE-30, now named Ayiin Winik, and document stone monuments and looters' trenches over approximately 12 hours at the site. Ayiin Winik is a beautiful site, with

Figure 1.7. Briana Smith works to clear vines from a fallen tree on the road to Ayiin Winik on April 13, while Jermi Serminia (left) and Manuel Sho observe.

minimal looting, several once carved stone monuments, the only double ball court in the permit area, and a large, parapet-lined *sacbe*.

New Features at Chan Chich (BE-01)

Tomás Gallareta Cervera directed field assessment of two areas at Chan Chich (Gallareta Cervera et al., this volume). The lidar data greatly expands our understanding of the spatial extent of Chan Chich and required us to assign new group designations to areas beyond the limits of our previous mapping (Figure 1.8). Gallareta Cervera's team investigated a hilltop courtyard with a possible monumental ramp in Group E and documented the first E Group to be recorded in the BEAST permit area, although others are visible in the lidar data.

New Features at Gallon Jug (BE-04)

Claire Novotny led a team to visit and test newly revealed groups at Gallon Jug (Novotny et al., this volume). Already an enigmatic site, Gallon Jug only gets weirder when you add the new groups and features to its map. Novonty's team recorded a previously unknown altar at Courtyard C-1, west of the Main Plaza, documented a previously unknown parapet-lined *sacbe* connecting the Main Plaza to Courtyard B-1, investigated Plaza D-1 and its small ball court, and assessed courtyards across the Blue Creek road in the newly designated Group E.

New Features at Laguna Seca (BE-06)

Of all the previously recorded sites, the lidar data revealed the most surprises at Laguna Seca. Amy Thompson (this volume) led a small team there to document a previously unmapped group of architecture about 800 m west of the plaza originally recorded by Thomas Guderjan's team over three decades ago (Guderjan et al. 1991). This new group, Group B, includes two large hilltop platforms and a ball court. The lidar data also revealed a wide, parapet-lined *sacbe* connecting Group A to Group B.

Documenting Sierra de Agua (BE-09)

Documenting "Sierra de Agua proper," as Tim Beach calls it, proved to be a pain in the ass. Clearing the road, a bill shared by BEAST, the Virginia Tech University jaguar research team, and Team Beach, cost $4,000 US. Driving to the trailhead to get to Sierra de Agua took over an hour each day. But, the site, which had been recorded in the 1970s, proved to be bigger than suspected. Thompson and Richards-Rissetto led a team that mapped it, recorded looters' trenches, excavated test units, and documented historic artifact scatters presumably associated with the Belize Estate and Produce Company camp of the same name (Thompson et al., this volume).

Documenting Wamil (BE-08)

Richards-Rissetto directed mapping and testing at Wamil, a settlement area west of Sierra de Agua (Thompson et al., this volume). The small hilltop courtyards on both sides of the Hillbank-Gallon Jug road overlook apparent raised fields to the east, most apparent in the lidar data at the base of a low escarpment. Team Beach conducted a geomorphological test excavation in one of these fields as part of their survey of possible wetland agricultural modification in the general area of Sierra de Agua.

Recording Tiho'witz (BE-33)

In addition to investigating groups at Chan Chich, Gallareta Cervera's team (this volume) mapped and tested BE-33, a really cool site near the Gallon Jug south gate. The site's small plaza is nestled between five hills, four of which have architecture on them. The site's new name, Tiho'witz, is an homage to those five hills and to Gallareta Cervera's hometown of Mérida, the ancient Maya site of Ti'ho. The site has a large ball court, a parapet-lined

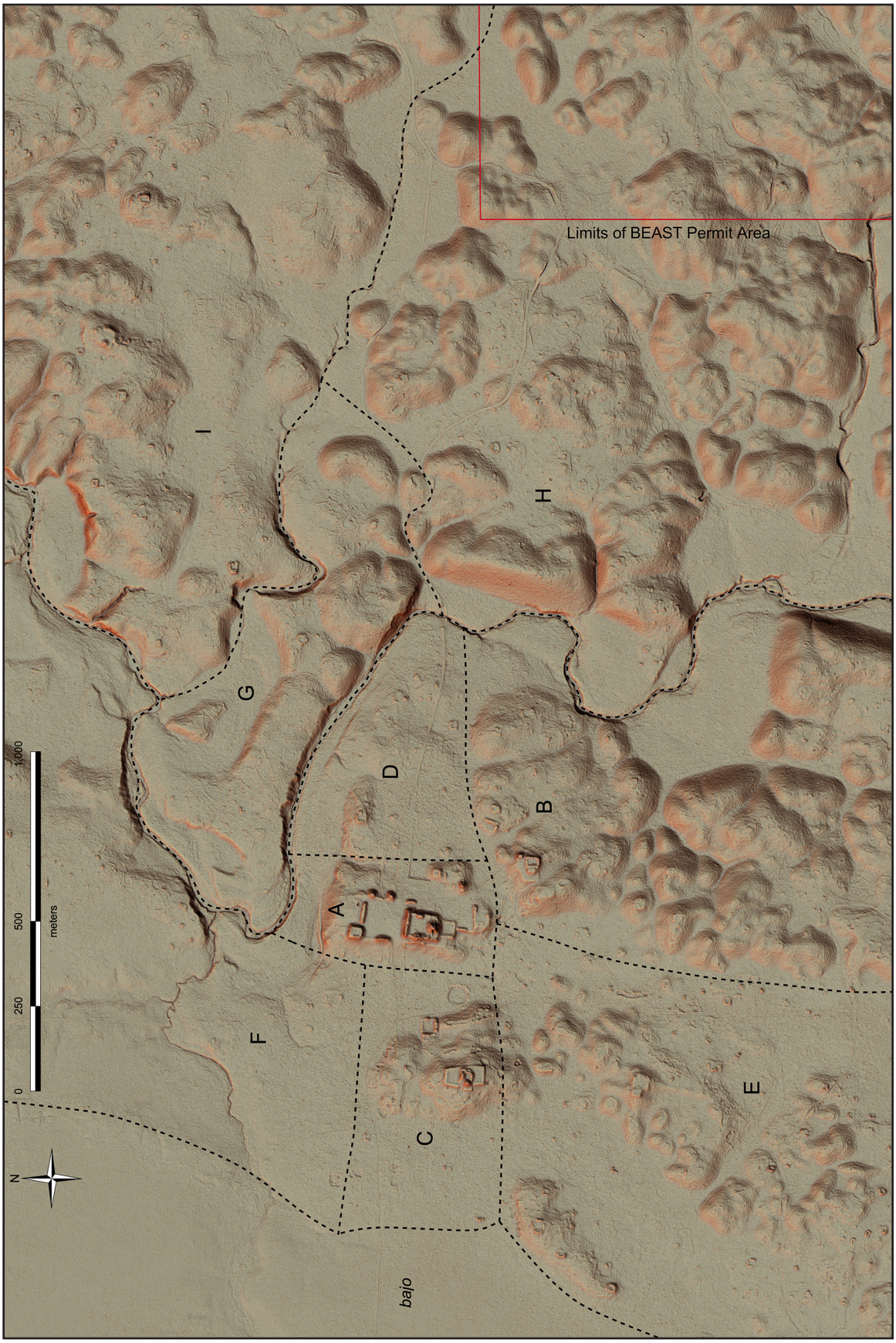

Figure 1.8. Lidar visualization of Chan Chich showing the boundaries between designated groups of structures at the site.

sacbe extending to the south/southwest, and a ramp or stairway connecting the plaza to the architectural group on the northern hill.

Drone Lidar

Mark Willis (this volume) graciously donated his time and expertise to map parts of Chan Chich and Gallon Jug with a drone outfitted with a lidar sensor (Figure 1.9). This work is part of a planned comparison between airborne lidar like that collected by NCALM and drone lidar. Did I mention that Willis' rented truck ran out of gas on the way to Chan Chich? Add that to the list of transportation woes.

North Plaza Marketplace Study

A significant component of the 2023 field season was the analysis of the thousands of artifacts Degnan and colleagues (2022) collected from the North Plaza at Chan Chich in 2022 (Figure 1.10). This work is part of a collaborative project funded by NSF Award Number 2051377. Degnan and colleagues (this volume) report on the analysis of debitage, obsidian, and other materials recovered from strip trenches, shovel tests, and chronological test pits. The NSF Marketplace Study is ongoing, and we are still awaiting the results of ceramic analyses from Sullivan.

Charcoal Study

Kaitlin Murphy conducted a study of charcoal, mostly from burial contexts at Chan Chich, to identify the types of wood used by the ancient Maya in funerary rituals. With help from Dr. Bo Zhao at the TTU Microscopy Lab, Murphy examined Scanning Electron Microscope images from 13 charcoal samples.

Figure 1.9. Mark Willis launches the lidar drone in the Main Plaza at Chan Chich on June 30. Chan Chich Lodge's restaurant is visible in the background.

Figure 1.10. Petrona Ical (left) and Lohanny Cordova sort chert flakes in the Chan Chich bar on June 25.

Murphy and colleagues (this volume) report on the preliminary results of the project, which we plan to incorporate into a larger study of mortuary patterns at Chan Chich.

Salvaging Tomb 1 at Ayiin Winik

Houk and colleagues (this volume) documented an L-shaped trench/tunnel into Structure B-1 in the Southern Acropolis at Ayiin Winik in April. The tunnel appeared to have clipped part of the vault of a tomb, and the looters seem to have filled the tomb's chamber with back dirt as they continued the tunnel deeper into the mound. The weather proved dry enough during the first part of the summer to allow us to drive down the logging road and to return to Ayiin Winik in the final two weeks of the season. Ingalls directed the salvage excavations of Tomb 1 before the road became unpassable. Ingalls and colleagues (this volume) confirmed our suspicions that the looters had plundered the tomb, but they did recover several human teeth, which will allow us to date the tomb next year, and some jade beads the looters had overlooked.

ORGANIZATION OF THIS VOLUME

In Chapter 2, Degnan and colleagues report on the lab work phase of the NSF Marketplace Study. In Chapter 3, Houk and colleagues discuss the April reconnaissance trip to Ayiin Winik, and Ingalls, Houk, and De Gregori describe the salvage excavations of Tomb 1 at the site in Chapter 4. Gallareta Cervera and his co-authors summarize the work at Chan Chich and Tiho'witz in Chapter 5. Claire Novotny and colleagues present the results of

the Gallon Jug field assessment and testing in Chapter 6. Project newbies Thompson and Richards-Rissetto report on the work at Sierra de Agua and Wamil in Chapter 7. In Chapter 8, Thompson describes her team's documentation of Sierra de Agua. Three special studies follow, beginning with Willis' lidar drone mapping in Chapter 9, Stocking's report on changes to the lab procedures necessitated by the scaling up of field teams in Chapter 10, and Murphy's SEM examination of charcoal in Chapter 11. Finally, Chapter 12 presents the updated, but streamlined, project lists through 2023.

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The Chan Chich North Plaza Marketplace Study: Results of the 2023 Lab Analysis

Bridgette Degnan, Brett A. Houk, Kaitlin Murphy, and Anna C. Novotny

In 2022, the Belize Estates Archaeological Survey Team (BEAST) continued excavations in the North Plaza at Chan Chich to test the hypothesis that the space functioned as a marketplace in the Late Classic period (Degnan et al. 2022). The team, led by Bridgette Degnan, conducted a systematic shovel-test survey to supplement strategically placed strip trench and test pit excavations. The team also began artifact analysis on obsidian artifacts, ground stone, and special finds. In 2023, we returned to wrap up artifact analysis and look the amassed lithic materials in the eye. This chapter summarizes our 2023 lab work and presents it alongside results from the 2022 excavations. Both this and last year's work are part of a regional collaboration, funded by the National Science Foundation, investigating marketplaces at several sites in the eastern Three Rivers adaptive region (TRR).

The 2023 lab season took place from June 13 to July 12, 2023. Bridgette Degnan directed laboratory analysis with support from staff member Kaitlin Murphy and lab assistant Lohanny Cordova. The team also received support from Tera Stocking, the BEAST lab director. The project director, Brett A. Houk, assisted with artifact identification, and the project bioarchaeologist, Anna C. Novotny, working in her lab at Texas Tech University analyzed a human tooth recovered during the excavations.

BACKGROUND AND PREVIOUS INVESTIGATIONS

The North Plaza is one of two publicly accessible plazas in Chan Chich's epicenter (Figure 2.1). In the initial survey of the site, researchers noted the presence of lithic debris near the northeastern corner of the Main Plaza, before this space was recognized as the North Plaza (Guderjan 1991; Houk 1998). At 8,400 m^2 it is second in size to the Main Plaza, which measures 12,490 m^2. Structure A-5, a range building, runs most of the length between the two plazas, and Structure A-4 sits in the southwestern corner of the North Plaza, bordering the Main Plaza. The northern edge of the North Plaza drops steeply to an *aguada* 26 m below. The western and eastern edges are not as steep, but drop 17 m and 4 m respectively, forming well defined limits to the plaza's space. Two causeways lead into the Main Plaza from the east and west. Once in the Main Plaza, people could access the North Plaza along either side of Structure A-5. A set of stairs also descends into the plaza from Structure A-5 (Herndon et al. 2013).

The 2023 season marks the fourth year of investigations at the North Plaza. The first was in 2017, when the first author directed excavations on Structure A-6 and the adjacent debitage deposit as Operation (Op) CC-18 (Degnan et al. 2017). Excavations on Structure A-6 investigated the architectural form and

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2023 The Chan Chich North Plaza Marketplace Study: Results of the 2023 Lab Analysis. In *The 2023 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 15–40. Papers of the Chan Chich Archaeological Project, Number 16. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

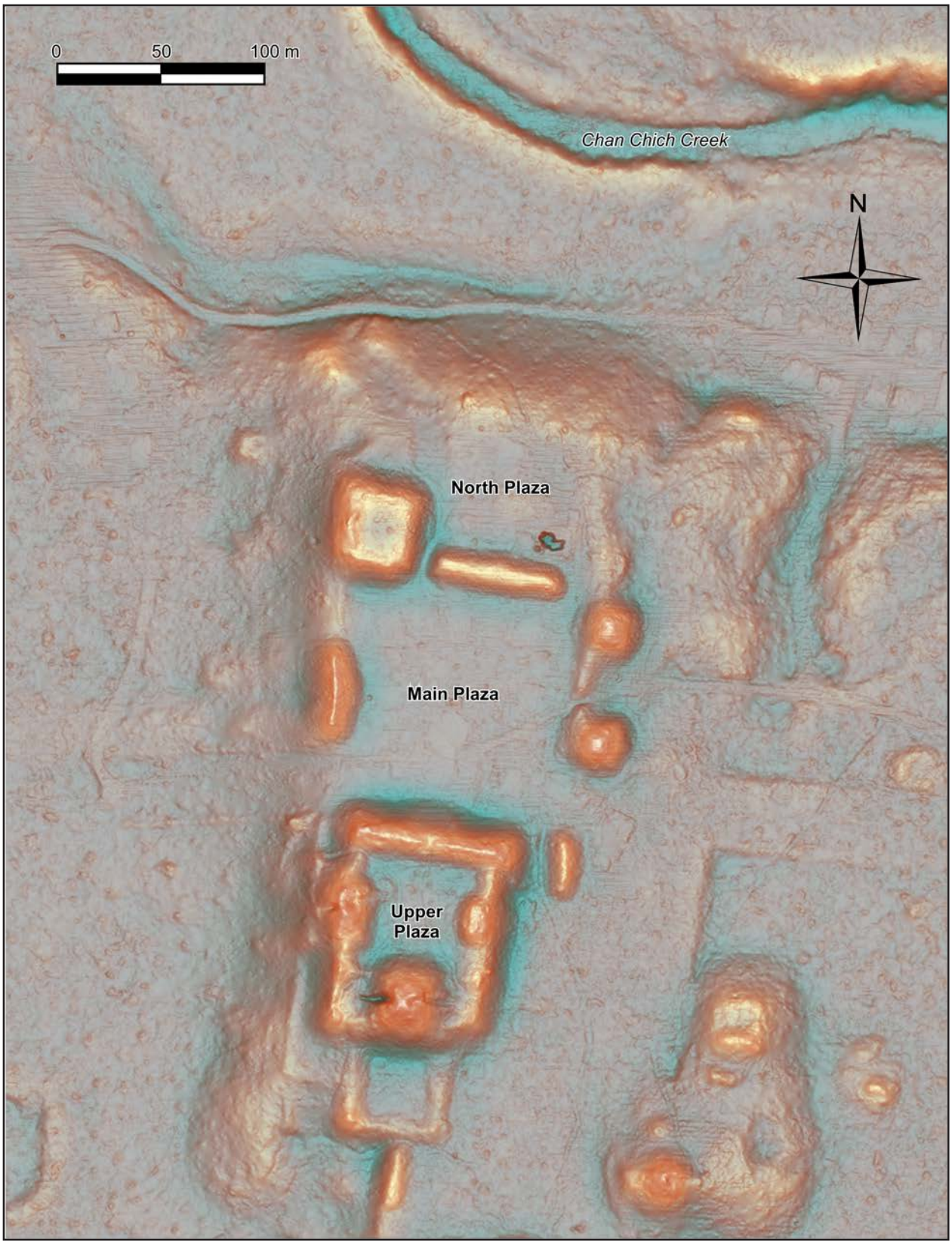

Figure 2.1. Simple Red Relief Image Map of Chan Chich site core based on 2022 lidar data.

function of the structure. The first construction occurred in the Late Preclassic period. In its final form during the Late and Terminal Classic periods, it was a low platform with no masonry superstructure. There were at least two resurfacing events during the Late Classic period, both associated with an abundance of lithic production debris including broken bifaces, production tools, and ample debitage. The Late Preclassic construction phase did not contain a similar concentration of lithic artifacts indicating that the structure originally served another purpose (Degnan et al. 2017). The investigations into the debitage deposit spilling off the back of Structure A-6 and the eastern edge of the North Plaza estimated that the deposit was minimally 585 m^2 and 30–50 cm thick and that the materials were deposited during the Late and Terminal Classic periods. In 2018, Degnan returned for a day to test the presence of lithic debris extending beyond Structure A-6 and onto the plaza floor as a continuation of Op CC-18. Two shallow test pits, each 2 x 2 m, confirmed that lithic production materials extended onto the terminal plaza floor (Degnan and Houk 2019).

Following a Covid-induced hiatus, BEAST returned to the North Plaza in 2022. This phase of our work is associated with a regional collaboration investigating marketplaces in the eastern TRR. This initiative, hereafter referred to as the NSF Marketplace Study, is led by Eleanor King and funded by NSF Award Number 2051377. It combines efforts of eight research projects investigating possible marketplaces at Blue Creek, Bolsa Verde, Chan Chich, Chawak But'o'ob, Dos Hombres, Gran Cacao, Hun Tun, La Milpa, Ma'ax Na, N950 (a small site between Dos Hombres and Gran Cacao), Say Kah, and Ixno'ha (see King et al. 2020; Figure 2.2). Chan Chich's North Plaza was chosen as a candidate for marketplace investigations due to consistencies with other presumed marketplaces, in particular its spatial configurations (including its layout, access points, and access to water) and epicentral lithic production (King et al. 2020).

To test our hypothesis, we implemented a systematic shovel test survey and targeted excavations to determine the plaza's terminal form, including both architectural features and activity/discard areas on the plaza, as well as its construction sequence and chronology under Op CC-22 (Figure 2.3). A full description of our 2022 excavations can be found in the previous season's interim report (Degnan et al. 2022). We conducted some artifact analysis on the recovered materials in 2022, but most analysis occurred during the 2023 field season.

RESEARCH DESIGN AND LABORATORY METHODS

For more detail on the research design of the excavations, refer to the 2022 interim report chapter (Degnan et al. 2022). This section refers to our research design for artifact analysis. To fully characterize the spatial distribution of terminal activity in the plaza, we sought to quantify all artifact types recovered during the 2022 excavations. To gain insight on longer-term patterns of activity in the plaza, we also quantified microartifacts (artifacts measuring less than 1/4-inch). In the case of a marketplace, microartifacts can be deposited by activities like repeated trampling through which microartifacts may be pressed into the plaza floor and not easily swept off during plaza maintenance (Cap 2015).

Our team analyzed ceramics, lithic tools, shell, and special finds from all lots under Op CC-22. We analyzed a subset of debitage from the shovel test surveys and a sample of debitage from Suboperation (Subop) CC-22-C. Due to time constraints we did not analyze debitage from every shovel test from the 2022 field season.

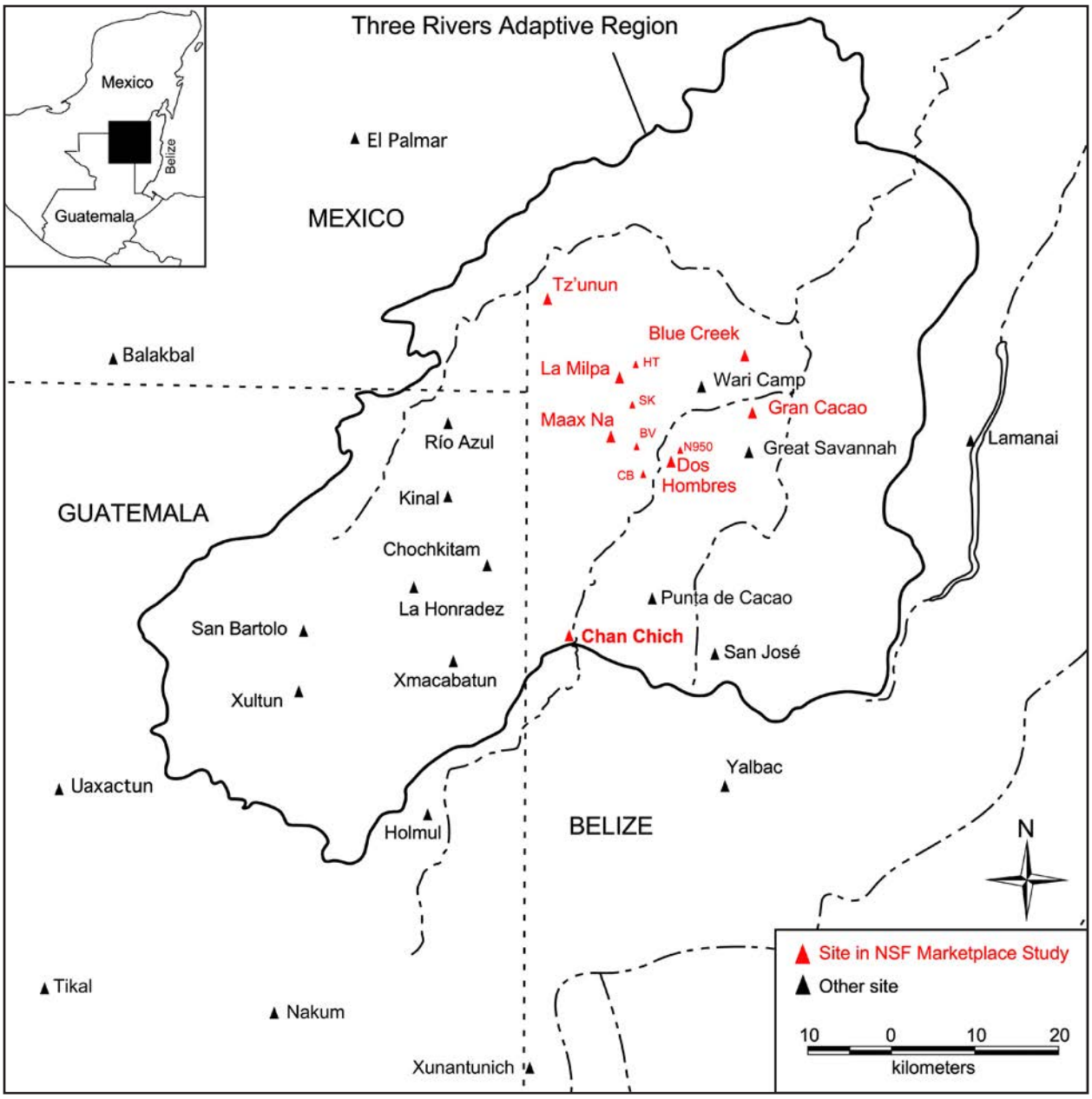

Figure 2.2. Map of sites in the Three Rivers adaptive region. Sites under study by the NSF Marketplace Study are highlighted in red: Blue Creek, Bolsa Verde (BV), Chan Chich, Chawak But'o'ob (CB), Dos Hombres, Gran Cacao, Hun Tun (HT), La Milpa, Ma'ax Na, N950, Say Kah (SK), and Tz'unun.

For details on typologies and methods for analyzing lithic tools, ground stone, and shell materials, refer to the 2022 and 2023 lab manuals updated by Tera Stocking (2022, this volume). All exceptions and special methods for artifact analysis are outlined below.

Ceramic Artifacts

We did initial sorting of ceramic sherds to prepare them for the NSF Marketplace Study's ceramic analyst, Dr. Lauren Sullivan. For each lot, we separated rim, body, base, and shotgun sherds and recorded counts and the total weight. Sullivan and Dr. Fred Valdez, Jr.

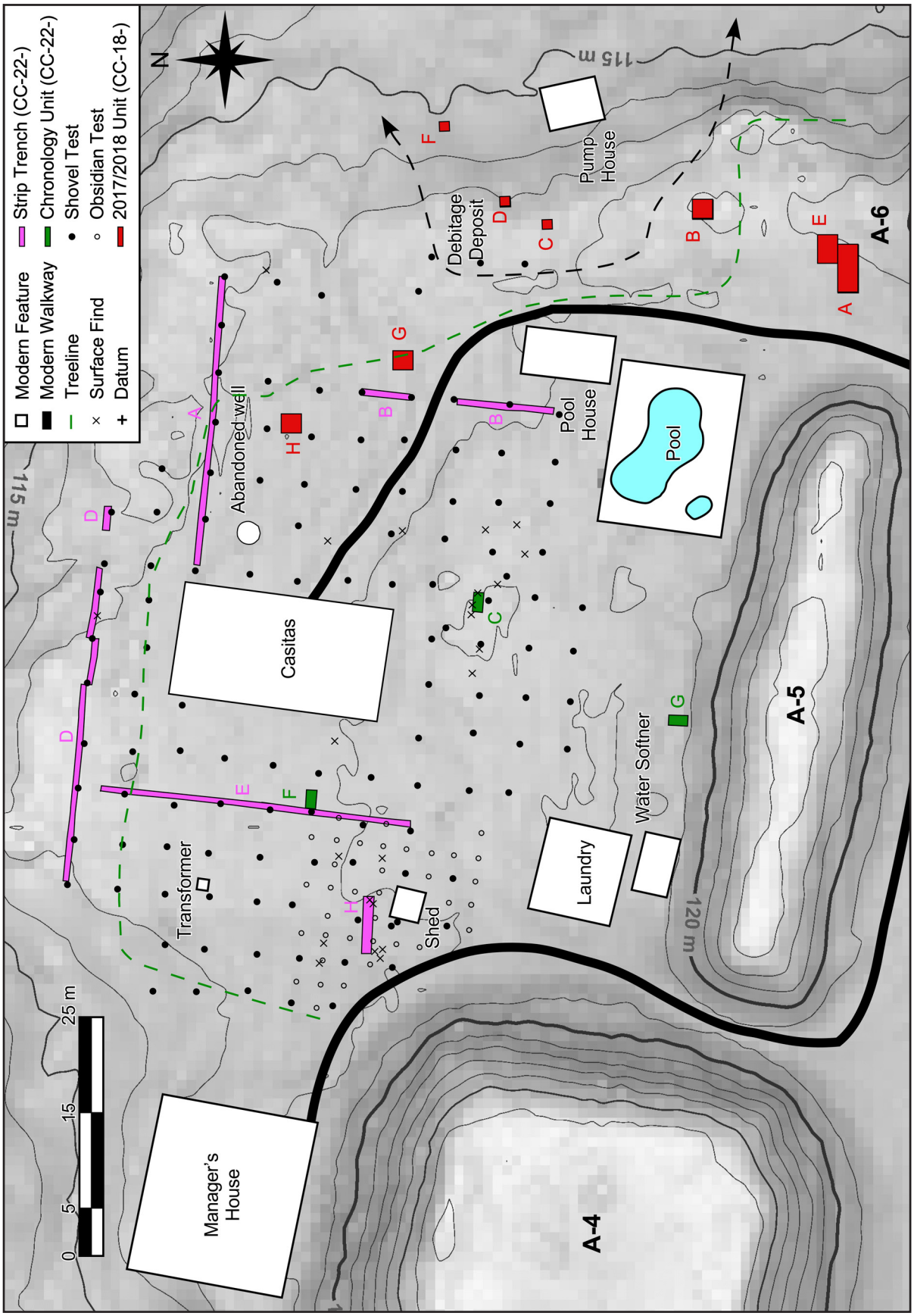

Figure 2.3. Lidar-derived shaded contour map of the North Plaza, modern features, and Ops CC-18 and -22 excavations.

conducted chronology assessments for each lot. In addition, Sullivan pulled 26 sherds as possible specimens for INAA analysis as part of the NSF Marketplace Study. The results of that analysis are still pending.

Debitage

We analyzed lithic debitage from June 21 to July 7, 2023, following the methods outlined by Degnan and colleagues (2017) for their study on Op CC-18 debitage. Consistent with the 2017 methodology, we sorted each flake into one of four size categories: 0.01–2 cm, 2.01–4 cm, 4.01–6 cm, and 6.01 cm and larger. We then separated flakes into those that have a striking platform and those that do not. If they have a platform, we further divided them into two groups based on the percentage of visible dorsal cortex: 0–25 percent and 25.01–100 percent. We also recorded the raw material type. Our only divergence from the 2017 methodology was to combine the raw material categories for chert and chalcedony into one ("Chert/Chalcedony").

Shovel Test Sampling

Our original goal was to analyze all debitage from the 111 shovel tests excavated as Subop CC-22-ST lots. However, after completing the analysis on the first 13 lots in Subop CC-22-ST (Lots CC-22-ST-01–13), we reevaluated the time demands and developed a sampling strategy to ensure our analysis covered the entire plaza. To do this, we analyzed odd lot numbers, starting at CC-22-ST-27 and counting up, and selected additional lots to strategically fill gaps in coverage. In total, we analyzed debitage from 66 out of 111 shovel tests.

Excavation Assemblage Sampling

We analyzed debitage from Lots CC-22-C-03 and -04. These lots were part of a chronology unit placed roughly in the center of the plaza, atop a slightly raised and rocky surface that we interpret as an unfinished or informal platform (Degnan et al. 2022). This suboperation had a high density of lithic production activity, and Lots CC-22-C-03 and -04 both contained dense debitage deposits. We included debitage from these contexts to be able to compare the activity that generated these deposits with that of the shovel tests and Structure A-6's debitage deposit (Degnan et al. 2017).

Due to the sheer quantity of debitage in these contexts, we analyzed a 10-percent sample (by weight) of the full assemblage (Table 2.1). To take the sample, we first separated the total assemblage into the four size categories described above, then weighed each category in full. We then removed 10-percent of each size category (based on the weight). This methodology produced a 10-percent sample with a stable distribution of flake sizes for Lots CC-22-C-03 and -04.

Daub

During the 2022 field season, we identified possible daub fragments while cataloging water-screened materials from shovel tests (for more detail on shovel test collection and processing, see Degnan et al. 2022). Daub in northwestern Belize is a light tan color that can be difficult to distinguish from eroded limestone plaster floor. In an exercise of caution and in the interest of time, we did not refine our possible categorization of daub any further in our 2023 lab season. We present counts and

Table 2.1. Sampling Weights of Lots CC-22-C-03 and -04

Lot	Total weight of sample (g)	Goal sample weight (g)	Observed sample weight (g)
CC-22-C-03	34,529	3,453	3,414
CC-22-C-04	38,626	3,863	3,877

weights of cataloged "possible daub" artifacts in Appendix A, which is available online at https://doi.org/10.18738/T8/R3NFDJ.

Microartifacts

Our 2022 excavation team collected microartifacts during shovel test processing by screening all material that passed through standard 1/4-inch screen again through 1/16-inch window screen. All artifact types identified as microartifacts were cataloged separately from their macroartifact counterparts. All material types were counted and weighed and not analyzed further.

RESULTS

This section presents a summary of artifacts recovered from the three types of excavations: chronology units, shallow trench units, and shovel test surveys. For a full exploration of excavation results, consult the 2022 report on excavations in the North Plaza (Degnan et al. 2022). Table 2.2 summarizes the dimensions, types, and purpose of the 11 suboperations excavated in 2022. Table 2.3 summarizes artifacts recovered from the chronology excavation units. For a summary of artifacts recovered from the remaining excavations units, consult Appendix A.

Bone

Faunal

The marketplace excavations recovered 55 small faunal bone fragments, weighing less than 30 g combined, from primarily shallowly buried contexts in shovel tests and strip trenches (Table 2.4). Most of the bones appear to be from small rodents, and many may be modern. We mailed all the faunal material from the Texas Tech campus mail room to Lori Phillips for analysis, but the shipment was lost in transit. All attempts to locate it failed.

Table 2.2. Summary of Op CC-22 Suboperations

Subop	Dimensions (m)	Type	Purpose
CC-22-A	0.5 x 30	Strip trench	To capture architectural features in the plaza and debris from clearing/sweeping refuse out of main plaza area.
CC-22-B	15 x 0.5	Strip trench	To capture any architectural features in the plaza and near the assocaited debitage deposit.
CC-22-C	1 x 2	Chronology	To understand chronology of the plaza.
CC-22-D	0.5 x 35	Strip trench	To capture architectural features in the plaza and debris from clearing/sweeping refuse out of main plaza area.
CC-22-E	30 x 0.5	Strip trench	To capture architectural features in the plaza and debris from clearing/sweeping refuse out of main plaza area.
CC-22-F	1 x 2	Chronology	To understand chronology of the plaza.
CC-22-G	2 x 1	Chronology	To understand chronology of the plaza.
CC-22-H	1 x 6	Wide shallow trench	To capture any architectural features in the obsidian artifact zone and collect obsidian artifacts for geochemical sourcing.
CC-22-OB	0.175 x 0.175 (each lot)	35 shovel tests	To define boundaries and relative intensity of obsidian artifact zone.
CC-22-SF	--	Surface finds	To document surface finds.
CC-22-ST	0.3 x 0.3 (each lot)	111 shovel tests	To systematically capture artifact distribution across the plaza.

Table 2.3. Artifact Summary of Chronology Suboperations (Subops CC-22-C, -F, and -G)

Subop	Lot	Artifact Category	Catalog Number	Count	Weight (g)	Description
CC-22-C	01	Ceramic Sherds	4340	31	99	Unanalyzed
CC-22-C	01	Debitage	4342	613	2,075	Unanalyzed
CC-22-C	01	Lithic Tools	4341	4	958	Unknown biface (2), general utility biface (1), core (1)
CC-22-C	01	Obsidian	4339	1	0	Unanalyzed due to size
CC-22-C	02	Ceramic Sherds	4516	213	723	Achote Black, Tinaja Red, Belize Red, Zibal Unslipped, eroded Red Slipped
CC-22-C	02	Debitage	4513	3,691	8,300	Unanalyzed
CC-22-C	02	Lithic Tools	4515	3	471	General utility biface (1), scraper (1), core (1)
CC-22-C	02	Obsidian	4530	2	1	Blade fragment (2)
CC-22-C	02	Charcoal sample	4729	1	1	Sample CC-22-S01
CC-22-C	03	Ceramic Sherds	4518	234	1,137	Garbutt Creek Red (more orange), Achote Black, Cayo Unslipped, Belize Red, Tres Mujeras Mottled, Unslipped jar handle
CC-22-C	03	Debitage	4517	21,139	34,962	10% sample analyzed
CC-22-C	03	Lithic Tools	4519	26	4,862	Oval biface (3), unknown biface (5), core (8), hammerstone (1), scraper (4), unknown uniface (3), utilized flake (2)
CC-22-C	03	Obsidian	4529	2	1	Unanalyzed due to size
CC-22-C	04	Ceramic Sherds	4573	115	844	Cayo Unslipped, Achote Black, Tinaja Red, Subin Red, Striated, Meditation Black, eroded Tunich Red-on-orange
CC-22-C	04	Debitage	4572	25,663	38,640	10% sample analyzed
CC-22-C	04	Lithic Tools	4574	7	1,535	Oval biface (3), unknown biface (2), scraper (1), core (1)
CC-22-C	04	Obsidian	4575	2	2	Debitage chunk (1), unanalyzed (1)
CC-22-C	06	Ceramic Sherds	4678	266	1323	Eroded plate rim with possible ash temper - Palmar Orange plate form, Garbutt Creek Red, Achote Black, Belize Red, Red and Black Mottled with ash temper
CC-22-C	06	Debitage	4700	12,424	16,438	Unanalyzed
CC-22-C	06	Lithic Tools	4701	19	1,856	Oval biface (4), unknown biface (4), narrow biface (2), scraper (1), core (8)
CC-22-C	06	Obsidian	4698	3	2.3	Blade fragment (1), unanalyzed (2)
CC-22-C	06	Sample	4819	1	0.1	Sample CC-22-S03

Table 2.3. Artifact Summary of Chronology Suboperations (continued)

Subop	Lot	Artifact Category	Catalog Number	Count	Weight (g)	Description
CC-22-C	07	Ceramic Sherds	4837	491	1,755	Cayo Unslipped, eroded Belize Red, ash tempered jar rim - Zibal Unslipped form, Black Slipped with ash temper, Subin Red, gunshot
CC-22-C	07	Debitage	4836	2,955	8,308	Unanalyzed
CC-22-C	07	Lithic Tools	4838	9	1,319	Narrow biface (1), unknown biface (2), scraper (2), core (4)
CC-22-C	07	Obsidian	4839	3	0.7	Unanalyzed
CC-22-C	07	Obsidian	4860	4	1.7	Tertiary flake (1), unanalyzed (3)
CC-22-C	07	Sample	4817	1	0.1	Sample CC-22-S02; submitted for AMS dating
CC-22-C	07	Shell	5113	1	0.2	Unworked marine shell (1)
CC-22-F	01	Ceramic Sherds	4748	396	1113	Subin Red, Cayo Unslipped, eroded Belize Red
CC-22-F	01	Debitage	4749	445	264	Unanalyzed
CC-22-F	01	Obsidian	4681	5	2.3	Blade fragment (3), secondary flake (1), debitage chunk (1)
CC-22-F	02	Ceramic Sherds	4753	627	1836	Unanalyzed
CC-22-F	02	Debitage	4752	964	3,978	Unanalyzed
CC-22-F	02	Lithic Tools	4750	5	1,301	Unknown biface (3), utilized flake (1), core (1)
CC-22-F	02	Obsidian	4694	1	0.3	Unanalyzed
CC-22-G	01	Ceramic Sherds	4835	188	1,015	Subin Red, Cayo Unslipped
CC-22-G	01	Debitage	4834	215	3,302	Unanalyzed
CC-22-G	01	Lithic Tools	4833	7	2,891	Narrow biface (1), unknown biface (1), utilized flake (1), core (4)
CC-22-G	01	Obsidian	4767	1	0.3	Unanalyzed
CC-22-G	02	Ceramic Sherds	5003	464	2,114	Unanalyzed
CC-22-G	02	Debitage	5004	366	5604.4	Unanalyzed
CC-22-G	02	Lithic Tools	5005	9	3,157.3	Scraper (2), unknown uniface (1), core (6)
CC-22-G	02	Obsidian	4848	3	2.1	Blade fragment (2), unanalyzed (1)
CC-22-G	03	Ceramic Sherds	5093	362	1,556	Achote Black, Cayo Unslipped, Tinaja Red, eroded Belize Red, eroded body sherds
CC-22-G	03	Debitage	5094	298	1613	Unanalyzed
CC-22-G	03	Ground Stone	5095	2	1,560	Ovate granite mano (1), square granite mano (1)
CC-22-G	03	Lithic Tools	5092	5	1,094	Thin contracting stem biface (1), unknown biface (1), core (3)

Table 2.3. Artifact Summary of Chronology Suboperations (continued)

Subop	Lot	Artifact Category	Catalog Number	Count	Weight (g)	Description
CC-22-G	03	Obsidian	4961	8	8	Blade fragment (3), tertiary flake (2), unanalyzed (3)
CC-22-G	04	Faunal Bone	5106	6	3.6	Unanalyzed
CC-22-G	04	Ceramic Sherds	5007	218	714	Tinaja Red, Striated, gunshot, eroded Achote Black, Garbutt Creek Red, eroded ash tempered sherds
CC-22-G	04	Debitage	5006	154	565	Unanalyzed
CC-22-G	04	Lithic Tools	5009	1	13	Scraper (1)
CC-22-G	04	Obsidian	4959	2	6	Blade fragment (1), tertiary flake (1)
CC-22-G	04	Shell	5008	2	4.8	*Jute* (1), Other riverine shell (1)
CC-22-G	05	Faunal Bone	5107	1	0.5	Unanalyzed
CC-22-G	05	Ceramic Sherds	5010	252	719.3	Garbutt Creek Red, Cubeta Incised, Striated, Cayo Unslipped, Belize Red, Tres Mujeres Mottled, gunshot
CC-22-G	05	Debitage	5012	687	2948.6	Unanalyzed
CC-22-G	05	Lithic Tools	6560	2	15.8	Scraper (1), utilized flake (1)
CC-22-G	05	Obsidian	4962	23	8.9	Blade fragment (2), tertiary flake (2), secondary flake (1), polyhedral blade core rejuvination fragment (1), unanalyzed (17)
CC-22-G	05	Ground Stone	5111	1	4.5	Spindle whorl (1)
CC-22-G	05	Shell	5011	1	0.4	Riverine shell (1)
CC-22-G	06	Ceramic Sherds	5016	106	487.7	Cubeta Incised, Red Slipped, gunshot
CC-22-G	06	Debitage	5015	135	937.7	Unanalyzed
CC-22-G	06	Lithic Tools	6575	1	4.7	Scraper (1)
CC-22-G	06	Obsidian	4960	2	1.1	Blade fragment (1), unanalyzed (1)
CC-22-G	08	Ceramic Sherds	5098	153	815	Gunshot, Tinaja Red, Belize Red, eroded polychome with ash temper bowl, Sierra Red, possible Aguila Orange
CC-22-G	08	Debitage	5099	85	1001	Unanalyzed
CC-22-G	08	Lithic Tools	5100	8	4,637	Unknown biface (2), core (6)
CC-22-G	08	Obsidian	4964	2	1.6	Blade fragment (2)
CC-22-G	08	Shell	5112	2	4.8	*Jute* (2)
CC-22-G	09	Ceramic Sherds	5096	1	2	Unanalyzed
CC-22-G	09	Lithic Tools	5097	1	148	Unknown biface (1)

Note: Lots CC-22-C-05 and CC-22-G-07 are both architectural features (floor) from which we did not collect any artifacts.

Table 2.4. Summary of Faunal Material Recovered from Op CC-22

Subop	Lot	Description	Count	Weight (g)
CC-22-A	08	Faunal bone fragment	1	1.8
CC-22-D	03	Faunal bone fragments	20	4.7
CC-22-D	03	Faunal bone fragments	12	6.4
CC-22-D	04	Faunal bone fragments	3	0.1
CC-22-D	05	Faunal tooth	1	>0.1
CC-22-G	04	Faunal bone fragments	6	3.6
CC-22-G	05	Faunal bone fragment	1	0.5
CC-22-H	03	Faunal teeth	2	0.2
CC-22-H	04	Faunal tooth	1	0.3
CC-22-ST	17	Faunal bone fragment	1	1.2
CC-22-ST	36	Faunal bone fragment	1	1.8
CC-22-ST	48	Faunal tooth	1	0.2
CC-22-ST	52	Faunal tooth	1	0.2
CC-22-ST	66	Faunal tooth	1	0.7
CC-22-ST	70	Faunal bone fragments	2	4.5
CC-22-ST	82	Faunal tooth	1	0.5

Human Remains

We recovered one human incisor from Lot CC-22-H-01. The tooth was broken mesiodistally, only the lingual aspect is present, and about one-quarter of the tooth root is missing. By comparing the shape and size of the pulp cavity and the morphology of the lingual aspect of the crown, BEAST bioarchaeologist Anna C. Novotny determined the tooth to be a maxillary, central incisor, possibly from the right side. There is an oblong, shallow wear facet along the mesial interproximal surface. There is a possible B-4 (Romero 1951) modification to the distal edge of the tooth. The edges of the modification are smooth and rounded suggesting that the tooth was in occlusion for some time after the modification was made. The tooth itself shows no pathological changes such as caries or dental calculus. The tooth returned a radiocarbon age of 1270 BP ± 20 (BEAST Sample CC-22-S04; PSUAMS # 14754, XAD amino acids). This corresponds to a 2-sigma range of cal AD 670 to 798, during the Late Classic period.

Ceramic Analysis

The earliest construction in the Op CC-22 excavations is the buried feature in Subop CC-22-G, three faced stones, which we hypothesized were part of a wall or platform (Lot CC-22-G-10; see Degnan et al. 2022:Figure 3.16). The construction fill surrounding the buried structure contained Late Classic, Motmot 2 complex (AD 700–800) sherds with a Late Preclassic Jacamar complex (400 BC–AD 150) trace (Table 2.5, Lot CC-22-G-08). We only excavated 10 cm below the depth of the faced stones (Lot CC-22-G-09), but we did not recover ceramics to date this deeper context. The faced stones and construction fill, however, are consistent with other Late Preclassic construction at Chan Chich (Degnan et al. 2022). All subsequent activity—at least two floor plastering events—date to the Tepeu 2 sphere as evidenced by Motmot 2 complex sherds.

Most ceramic sherds from the terminal plaza floor date to the Tepeu 2 ceramic sphere. There are trace amounts of Chicanel sherds

Table 2.5. Summary of Chronology Suboperations and Lots

Subop	Lot	Lot Description	Ceramics Sphere	Chan Chich Complex
CC-22-C	01	Topsoil	-	-
CC-22-C	02	Construction Fill	Tepeu 1-2	Motmot 1-2
CC-22-C	03	Construction Fill	Tepeu 2	Motmot 2
CC-22-C	04	Construction Fill	Tepeu 2	Motmot 2
CC-22-C	05	Floor	-	-
CC-22-C	06	Construction Fill	Tepeu 2	Motmot 2
CC-22-C	07	Construction Fill	Tepeu 1-2	Motmot 1-2
CC-22-F	01	Topsoil	Tepeu 2	Motmot 2
CC-22-F	02	Construction Fill	-	-
CC-22-G	01	Topsoil	Tepeu 2	Motmot 2
CC-22-G	02	Topsoil/Collapse Debris	-	-
CC-22-G	03	Collapse Debris	Tepeu 2	Motmot 2
CC-22-G	04	Floor	Tepeu 2	Motmot 2
CC-22-G	05	Construction Fill	Tepeu 2	Motmot 2
CC-22-G	06	Construction Fill	Tepeu 2	Motmot 2
CC-22-G	07	Floor	-	-
CC-22-G	08	Construction Fill	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-G	09	Construction Fill	-	-

(the Jacamar complex at Chan Chich) running along the very northern edge of the plaza, found in various lots in Subop CC-22-D, a nearby shovel test (Lot CC-22-ST-34), and on the easternmost edge of Subop CC-22-A (Lot CC-22-A-01; Tables 2.6 and 2.7). There are also traces of ceramics from the Tepeu 3 sphere, Chich Chich's Paraque ceramic complex (AD 800–900). The Tepeu 3 sphere sherds are located both on the southern half of the plaza (Lots CC-22-ST-01, -12, -14, -90) and along the edges of the plaza (Lots CC-22-ST-47, -106, -109, -120, and -E-10). Finally, there are a low number of contexts that contained a mix of Tepeu 1 sphere sherds from the Motmot 1 complex (AD 600–700; Lots CC-22-B-06 and -D-03).

Table 2.6. Summary of Trench Suboperations and Lots*

Subop	Lot	Lot Description	Ceramics Sphere	Chan Chich Complex
CC-22-A	01	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-A	04	Topsoil	Tepeu 2	Motmot 2
CC-22-A	06	Topsoil	Tepeu 2	Motmot 2
CC-22-A	07	Topsoil	Tepeu 2	Motmot 2
CC-22-A	08	Topsoil	Tepeu 2	Motmot 2
CC-22-A	11	Topsoil	Tepeu 2	Motmot 2
CC-22-B	03	Topsoil	Tepeu 2	Motmot 2
CC-22-B	04	Topsoil	Tepeu 2	Motmot 2
CC-22-B	06	Topsoil	Tepeu 1-2	Motmot 1-2

Table 2.6. Summary of Trench Suboperations and Lots (continued)

Subop	Lot	Lot Description	Ceramics Sphere	Chan Chich Complex
CC-22-D	01	Topsoil	Tepeu 2	Motmot 2
CC-22-D	02	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-D	03	Topsoil	Chicanel and Tepeu 1 mix	Jacamar - Motmot 1 mix
CC-22-D	04	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-D	05	Topsoil	Tepeu 2	Motmot 2
CC-22-D	06	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-D	07	Topsoil	Tepeu 2	Motmot 2
CC-22-D	08	Topsoil	Tepeu 2	Motmot 2
CC-22-D	09	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-D	11	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-D	12	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-D	13	Topsoil	Tepeu 2	Motmot 2
CC-22-D	14	Topsoil	Tepeu 2	Motmot 2
CC-22-E	02	Topsoil	Tepeu 2	Motmot 2
CC-22-E	04	Topsoil	Tepeu 2	Motmot 2
CC-22-E	05	Topsoil	Tepeu 2	Motmot 2
CC-22-E	08	Topsoil	Tepeu 2	Motmot 2
CC-22-E	09	Topsoil	Tepeu 2	Motmot 2
CC-22-E	10	Topsoil	Tepeu 2-3	Motmot 2 - Pauraque
CC-22-E	11	Topsoil	Tepeu 2	Motmot 2
CC-22-E	12	Topsoil	Tepeu 2	Motmot 2
CC-22-H	02	Topsoil	Tepeu 2	Motmot 2
CC-22-H	03	Topsoil	Tepeu 2	Motmot 2

*Only includes lots with analyzed ceramics

Charcoal

Two charcoal samples, both from Subop CC-22-C (see Table 2.3), were submitted for AMS radiocarbon dating. Excavators collected Sample CC-22-S01 from Lot CC-22-C-02, the remains of the eroded final occupation surface of the North Plaza. Unfortunately, the sample returned a radiocarbon age of 25 ± 15 (PSUAMS# 14586; wood charcoal). This corresponds to a 2-sigma range of cal AD 1705–1909. Sample CC-22-S03 came from Lot CC-22-C-06, a debitage deposit 50–60 cm below surface and beneath an eroded plaster floor surface. Despite its presumed context, this sample proved to be laden with bomb carbon and returned a radiocarbon age of -3070 ± 15 (PSUAMS# 14587; wood charcoal). This corresponds to a 2-sigma range of cal AD 1962–1973. Both samples come from charcoal related to burning events that occurred long after the Maya abandoned Chan Chich.

Chipped Stone

Debitage

We analyzed debitage from 66 shovel tests in Subop CC-22-ST (see Appendix B for a full report of the analyzed debitage; https://doi.org/10.18738/T8/R3NFDJ). Figure 2.4 shows the distribution of large and small fraction chert/chalcedony debitage for each shovel test under Subop CC-22-ST. The count and weight

Table 2.7. Summary of Shovel Test Suboperations and Lots*

Subop	Lot	Lot Description	Ceramics Sphere	Chan Chich Complex
CC-22-OB	14	Topsoil	Tepeu 2	Motmot 2
CC-22-OB	18	Topsoil	Tepeu 2	Motmot 2
CC-22-OB	22	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	01	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?
CC-22-ST	10	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	12	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?
CC-22-ST	14	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?
CC-22-ST	15	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	24	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	34	Topsoil	Tepeu 2 with Chicanel trace	Motmot 2 with Jacamar trace
CC-22-ST	36	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	40	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	44	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	47	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?
CC-22-ST	57	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	61	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	66	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	75	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	80	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	84	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	85	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	86	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	90	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?
CC-22-ST	105	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	106	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?
CC-22-ST	107	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	109	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?
CC-22-ST	113	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	119	Topsoil	Tepeu 2	Motmot 2
CC-22-ST	120	Topsoil	Tepeu 2-3?	Motmot 2 - Pauraque?

*Only includes lots with analyzed ceramics

of large fraction and small fraction debitage are displayed in Panels a, b, c, and d in Figure 2.4. Panels e and f in Figure 2.4 display the ratio of weight to count for each fraction type.

Considered together, these panels show distinct patterns of activity in the western and eastern halves of the plaza. Chert and chalcedony micro- and macrodebitage are concentrated on the eastern side of the plaza both in the raw count of artifacts as well as the total weight of the assemblages. There are also elevated levels of small fraction microdebitage in the southwestern area of the plaza. Panel e indicates that the large fraction flakes on the western side of the plaza are, on average, larger than those on the eastern side (Panel f shows more evenly distributed ratios, though this is likely due to

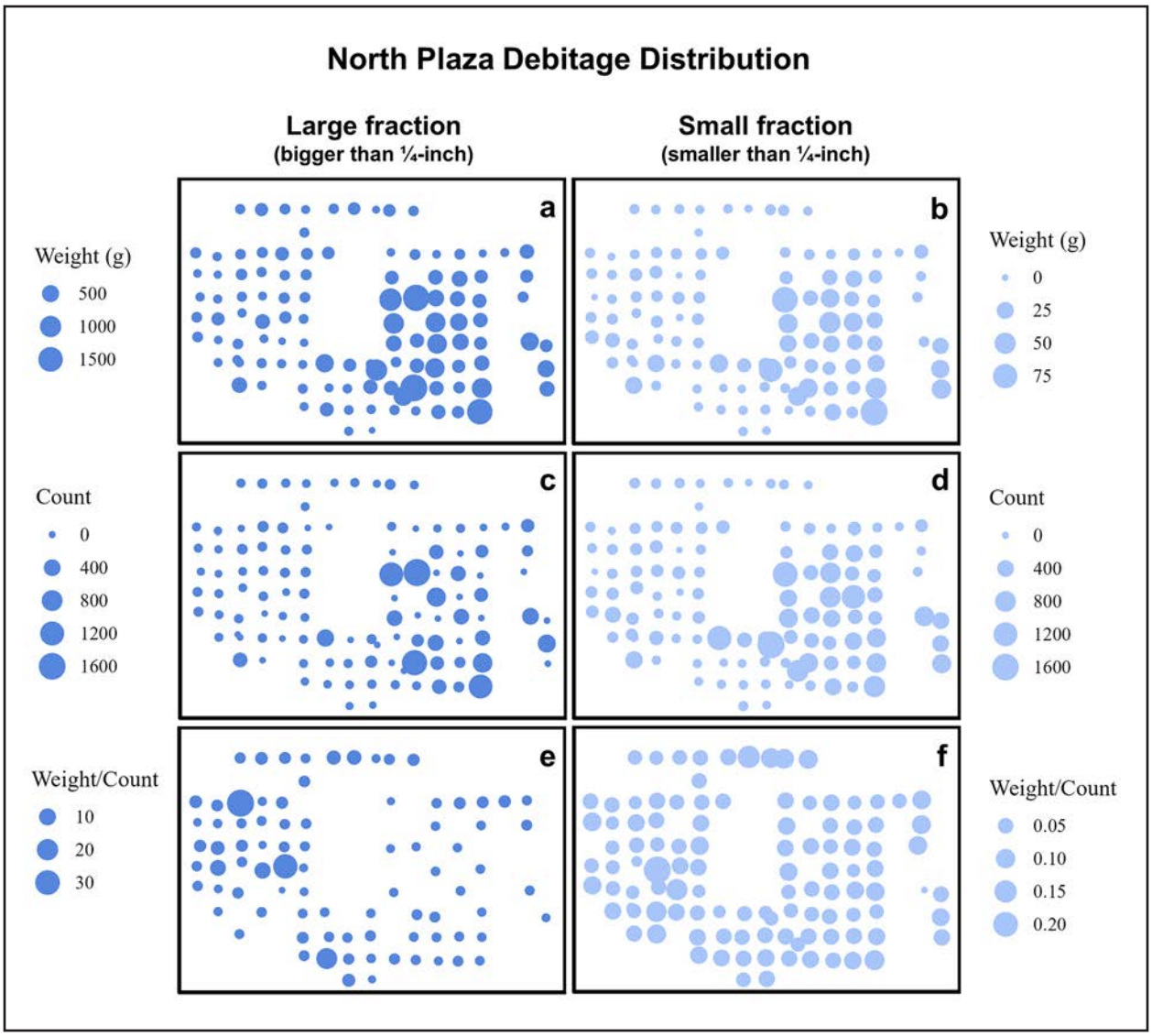

Figure 2.4. Count, weight (in grams), and ratio of weight to count of analyzed debitage in Subop CC-22-ST shovel tests. Each point represents one shovel test, sized proportional to the weight, count, or ratio as indicated in the accompanying legend. To see how the shovel tests are oriented in the North Plaza, refer to Figure 2.3, 2.5, or 2.6.

the lack of size variation for already small microartifacts). This compositional difference is also clear in patterns of flakes with striking platforms. Figure 2.5 shows the percentage of flakes with and without a striking platform for each shovel test. Assemblages on the eastern side of the plaza are dominated by flakes with striking platforms, while those on the western side contain more flakes that are missing the striking platform. Combined with spatial patterns in the lithic tool assemblage, this suggests that craft specialists conducted initial tool reduction and shaping in the northwestern part of the plaza and later-stage reduction in the eastern portion (Figure 2.6, Panels a and b).

Lithic Tools

Excluding obsidian, we recovered 217 tools from Op CC-22 excavations: 65 chert and chalcedony bifaces; 74 cores made of chalcedony, chert, and quartzite; one

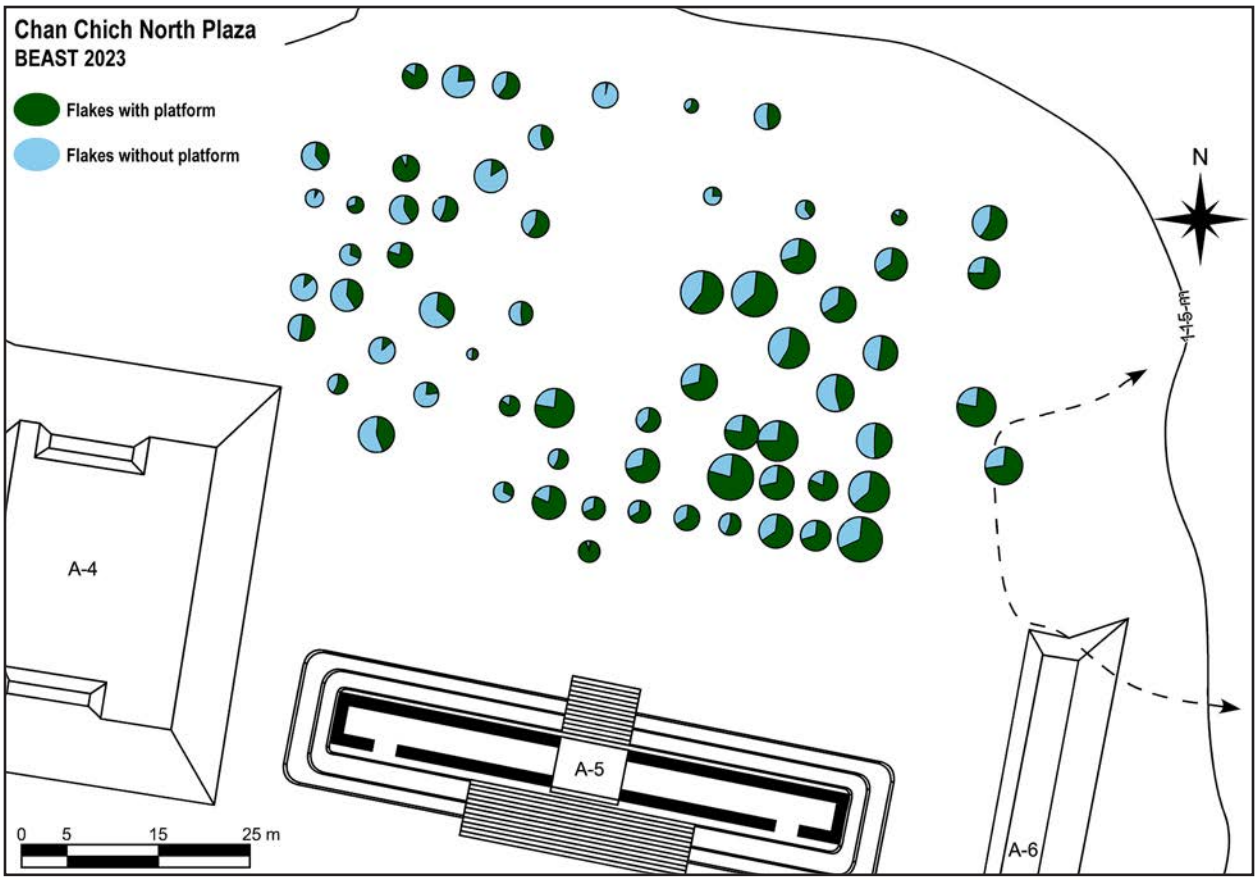

Figure 2.5. Share of flakes with and without striking platforms, by shovel test. Individual pie charts are sized proportional to the total weight of debitage from that shovel test.

hammerstone; two granite manos; two granite metates; and 73 chert and chalcedony unifaces.

Table 2.8 summarizes the quantities of the tool forms and their raw material types. Most tools in the North Plaza are made from chalcedony and chert. Although we did not conduct a formal geochemical analysis on the materials, with input from Houk we identified both local and non-local chert material. Roughly 30-percent of chalcedony tools are fine-grained chalcedony, and the remaining 70-percent are coarse and very coarse-grained chalcedony. Chert tools have a slightly higher composition of fine-grained tools (40-percent), but the majority are coarse and very coarse-grained (60-percent). All quartzite and granite tools are very coarse-grained.

Cores

Of the 74 cores, there are 56 chert, 14 chalcedony, and four quartzite cores. Seventy cores are multidirectional (95-percent), three unidirectional (4-percent), and one bifacial (~1-percent). The cores range in size from small, exhausted cores weighing less than 30 g to large stones, weighing 2 kg or more, with only a few flakes removed. We recovered 28 cores from terminal phase contexts on and around the eastern portion of the plaza, especially on the raised platform in the center of the plaza where Subop CC-22-C was located (and an additional 13 cores from non-terminal phase contexts in Subop CC-22-C). We found three additional cores nearby in the northeast corner. Finally, we recovered 12 cores from terminal phase contexts in the northwest corner of the plaza. These spatial concentrations are

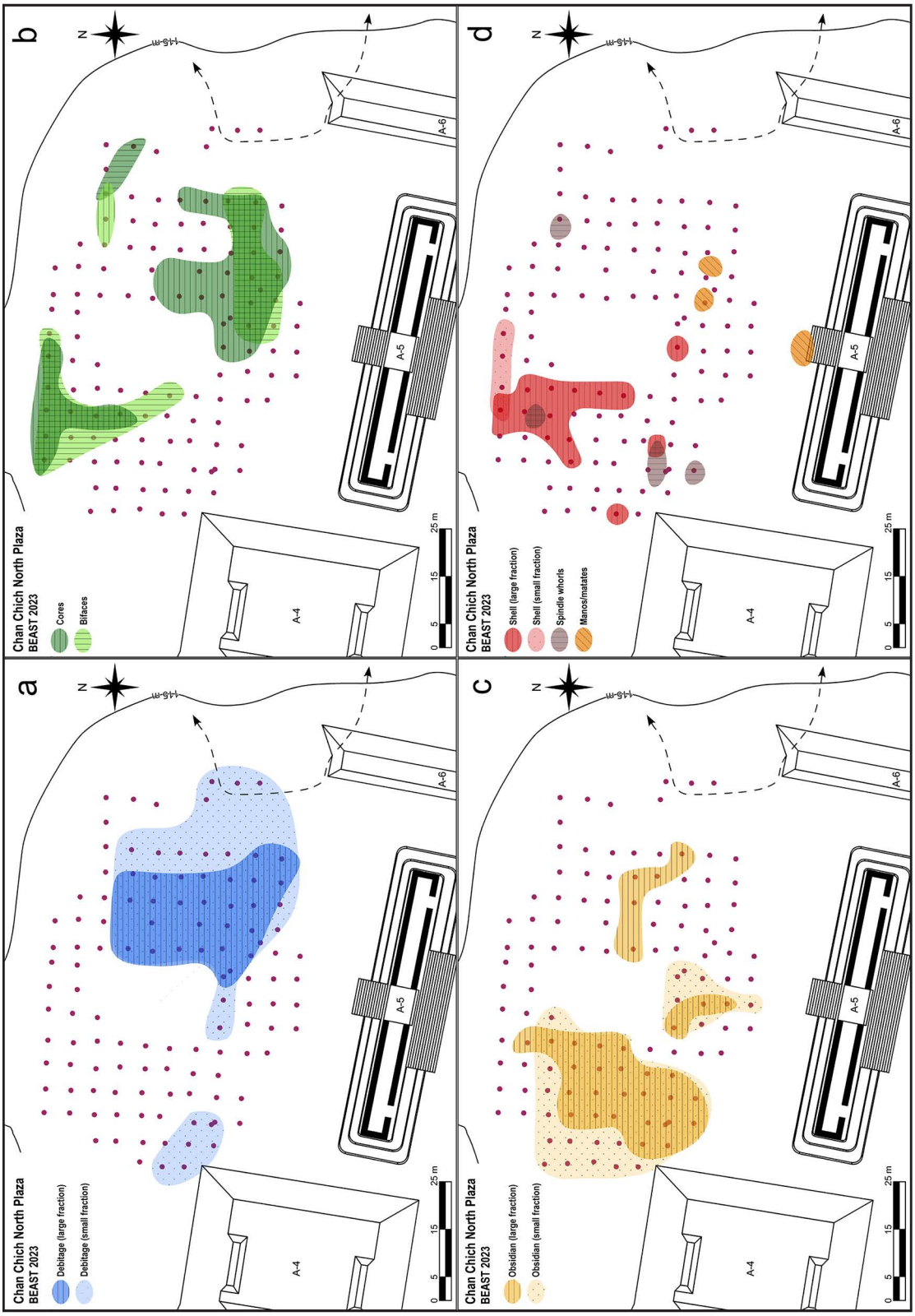

Figure 2.6. Summary of artifact concentrations in the North Plaza: a) summary of debitage concentration from shovel test survey; b) summary of lithic cores and bifaces from all terminal-phase excavations; c) summary of obsidian artifact concentration from shovel test survey; d) summary of shell, spindle whorls, manos, and metate artifacts from all terminal-phase excavations.

Table 2.8. Op CC-22 Lithic Tool Forms and Raw Material

Form	Chalcedony	Chert	Granite	Quartzite	Total
Biface	10	55			65
Core	14	56		4	74
Mano			2		2
Metate			2		2
Other		1			1
Uniface	19	54			73
Total	43	166	4	4	217

summarized in Panel b of Figure 2.6 as dark green shaded areas with horizontal stripes.

Bifaces

We recovered 65 bifaces representing five known subforms and two categories of unknown subforms. Of the known subforms, we recovered 18 oval bifaces, five general utility bifaces (GUBs), five narrow bifaces, two thin contracting stem bifaces, and one stemmed macroblade (Table 2.9). We categorized 31 tools as unknown bifaces and an additional three tools as unknown thin subforms. Roughly half of the bifaces are finished tools (51 percent), while the other half are split into early-stage and late-stage preforms (18 and 31 percent, respectively). We recovered 25 bifaces from terminal contexts on the eastern side of the plaza, again concentrated on the unfinished platform in the center of the plaza (another 18 were in non-terminal phase contexts in Subop CC-22-C). We recovered an additional three bifaces near the cores in the northeast corner. Finally, we recovered nine bifaces from terminal phase contexts in the northwest corner of the plaza. These spatial concentrations are summarized in Panel b of Figure 2.6 as light green shaded areas with vertical stripes.

The most identified subform in this assemblage is the oval biface, a common agricultural tool in the Maya lowlands that was used from the Preclassic period through to the Terminal Classic period (Hyde 2003; Shafer and Hester 1983). Oval bifaces, as well as GUBs, narrow bifaces, and thin bifaces, are well documented at Chan Chich (Meadows and Hartnett 2000). However, this is the first documentation of a stemmed macroblade at Chan Chich. Figure 2.7 displays examples of the known subforms found in Op CC-22.

Table 2. Biface Subforms and Production Stage

Biface Subform	Early-stage Preform	Late-stage Preform	Finished Tool	Total	Complete
General Utility (GUB)	1		4	5	0
Narrow		2	3	5	0
Oval	2	7	9	18	0
Stemmed macroblade			1	1	0
Thin Contracting Stem			2	2	0
Unknown	9	11	11	31	12
Unknown Thin			3	3	0
Total	12	20	33	65	12

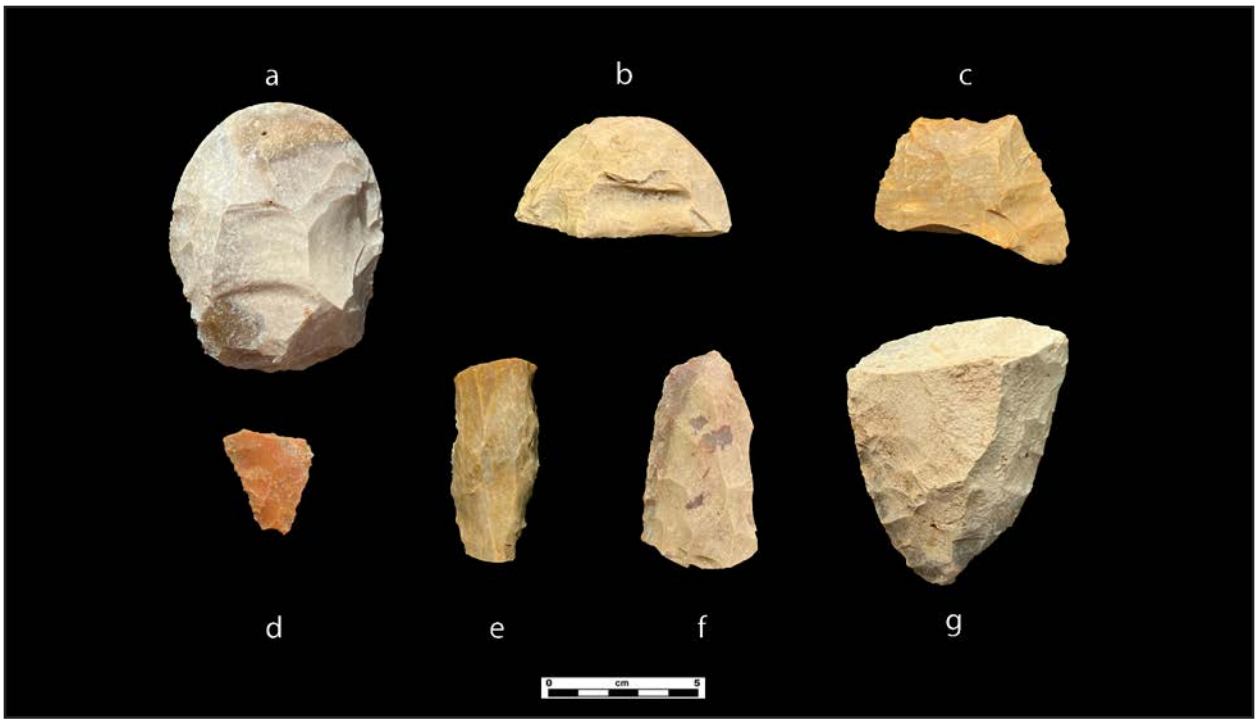

Figure 2.7. Biface subforms from Op CC-22: a) Hammerstone that was previously a ground bit general utility biface (Spec. # CC4519-03); b) oval biface (Spec. # CC4701-07); c) Unknown thin biface (Spec. # CC4758-01); d) Thin contracting stem biface (Spec. # CC4552-01); e) Stemmed macroblade (Spec. # CC4531-02); f) Narrow biface (Spec. # CC4701-02); g) GUB (Spec. # CC4515-01).

Unifaces

We recovered 73 unifaces: 38 utilized flakes, 23 scrapers, 11 unknown unifaces, and one graver. Most of these tools are made of chert (74 percent), and the remaining subset are of chalcedony (26 percent). The assemblage is roughly divided between fine or very fine-grained material (56 percent) and coarse or very coarse material (44 percent). The prevalence of utilized flakes is consistent with the high number of utilized flakes noted throughout the Op CC-18 excavations on and around Structure A-6 (Degnan et al. 2017). Over a third of the utilized flakes are from Subop CC-22-B, which is located among the Op CC-18 excavations (see Figure 2.3).

Obsidian

Our team recovered obsidian from every suboperation in Op CC-22. At the end of the 2022 field season, Houk and Gabi Blowers analyzed the obsidian artifacts that were large enough to include in an ongoing study on the geochemical sourcing of obsidian artifacts at Chan Chich. The same summer, Degnan analyzed the Op CC-22 obsidian using a portable X-ray fluorescence spectrometer, hereafter referred to as pXRF (Degnan and Houk 2022). In total, Houk and Blowers analyzed 176 obsidian artifacts, 172 of which were included in the pXRF study. Most of the obsidian is from terminal-phase contexts (164), while the remaining 12 specimen are from earlier construction phases in Subops CC-22-C and -G.

Table 2.10 shows the results of the attributional and geochemical analyses for Op CC-22 obsidian artifacts. Over 70 percent of the obsidian specimens are blades, 26 percent are debitage, and the remaining three percent are

Table 2.10. Obsidian Form, Subform, and Source According to Degnan et al. (2022)

Form	Subform	El Chayal	Ixtepeque	SMJ	Total
Blade	Blade	112	7	3	122
Core	Core Rejuvenation Fragment	6			6
Debitage	Chunk	9			9
Debitage	Secondary Flake	3			3
Debitage	Shatter/Chip	2			2
Debitage	Tertiary Flake	30			30
Total		162	7	3	172*

*Excludes four artifacts that were analyzed in the lab but did not undergo pXRF analysis: two blades, one piece of shatter, and one tertiary flake.

fragments of polyhedral blade cores, which were likely broken off from the full core during blade production (Crabtree 1968). Most of the specimen are from El Chayal (94.1 percent), which was the dominant volcanic source in the eastern TRR during the Classic period (Beckwith 2011). There are some blades from Ixtepeque and San Martín Jilotepeque (SMJ), but notably all debitage and core rejuvination fragments are from El Chayal.

Figure 2.8 displays the distribution of large and small fraction obsidian artifacts from each shovel test under Subop CC-22-ST. The count and weight of large fraction and small fraction debitage are displayed in Panels a, b, c, and d in Figure 2.8. Panels e and f in Figure 2.8 display the ratio of weight to count for each fraction type. These figures indicate that obsidian is concentrated on the western side of the plaza, distinct from the chert and chalcedony debitage pattern discussed above. The obsidian is most concentrated on the southern boundary of the shovel test survey. The survey did not continue farther to the south and west because of modern impact including the laundry house, a shed, and a stone path (see Degnan et al. 2022 for more detail). This is also the same zone where Subops CC-22-H and -OB are located. While the large fraction obsidian specimens are mainly—though not exclusively—confined to this zone, micro traces of obsidian are present throughout the entire plaza. This is evident in Panels b, d, and f in Figure 2.8, though Panel f highlights just how minuscule the small fraction obsidian specimens are in the southwest corner; despite an overall higher count and weight, each specimen is, on average, much smaller than the small fraction found throughout the plaza.

Most of the debitage and core rejuvination fragments were located in the obsidian activity zone; only eight of 27 obsidian debitage specimen were found on the eastern side of the plaza, and all core rejuvination fragments (except one found under the terminal-phase floor of Subop CC-22-G) were found on the western side. This, combined with the density of small fraction obsidian material and its relative smaller size, indicates that this zone was an obsidian blade workshop. Additionally, Degnan's sourcing study reveals that all obsidian debitage and core rejuvination fragments were from the El Chayal source, while the 10 Ixtepeque and SMJ artifacts were all blade fragments.

Ground Stone

We recovered 12 ground stone artifacts: two manos, two metates, six spindle whorls, and two small, unidentified fragments of ground stone. The identified materials are discussed in further detail below.

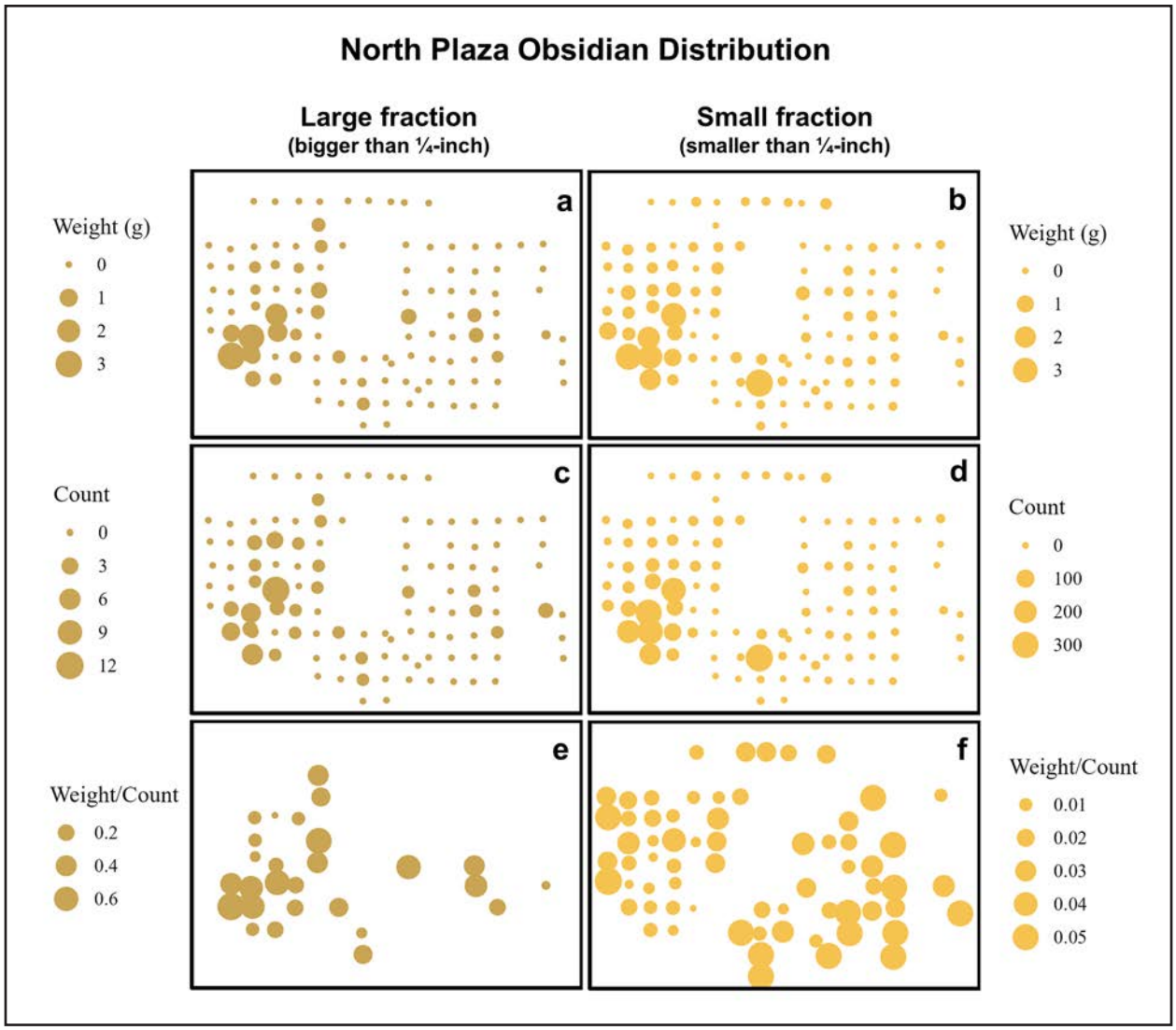

Figure 2.8. Metric Data for Analyzed Obsidian in Subop CC-22-ST Shovel Tests. Each point represents one shovel test, sized proportional to the weight (in grams), count, or ratio of weight to count as indicated in the accompanying legend. To see how the shovel tests are oriented in the North Plaza, refer to Figure 2.3, 2.5, or 2.6.

Manos and Metates

We recovered two mano fragments and two metate fragments, all from terminal phase contexts in the southern end of the plaza (Figure 2.6, Panel d). The manos were both found in the collapse debris at the base of Structure A-5 (Lot CC-22-G-03), atop the final phase floor of the North Plaza. One is ovate and the other square shaped. The metate fragments were both collected as surface finds (Subop CC-22-SF) about 20 m north of the mano fragments. During the 2013 investigations of Structure A-5, Herndon and colleagues (2013) collected fragments from two other metates scattered across the structure.

Spindle Whorls

We recovered six incomplete spindle whorls, all domed whorls made of ground stone (Figure 2.9). Four spindle whorls were found on the western side of the plaza, overlapping with the high-density obsidian zone (Lots CC-22-E-11, -H-01, -H-03, and -ST-115). All four

Figure 2.9. Types of spindle whorls from Op CC-22: Spec. # CC4923-01 (a) plan view and (e) profile; Spec. # CC4915-01 (b) plan view and (f) profile; Spec. # CC4484-01 (c) plan view and (g) profile; Spec. # CC5111-01 (d) plan view and (h) profile.

are undecorated, gray granite (Figure 2.9a/e and b/f). Due to the size of the fragments, we can only measure the center diameter on two of the four whorls: both measure between 6.3 and 6.4 mm across. The other two spindle whorls have incised designs. The first (Figure 2.9c/g) was found along the northern edge of the North Plaza in Lot CC-22-A-07 and has two carved bands running horizontally around sides of the whorl. The other (Figure 2.9d/h) is the only spindle whorl from a non-terminal phase context. It was found in Lot CC-22-G-05, under the terminal phase floor. The whorl is made of fine-grained, pink granite and is designed with carved bands framing incised triangular designs. These two incised spindle whorls (Figure 2.9c/g and d/h) have diameters between 5.2 and 5.4 mm.

Shell

We recovered riverine, marine, and freshwater shell artifacts. Of the 29 shell artifacts, there are 18 *jute*, six marine mussel, two freshwater mussel, two tentatively identified as pomacea shell (apple snails), and one shell bead. Most of the shell artifacts were located on the western side of the plaza (see Figure 2.6, Panel d). This includes the shell bead from Lot CC-22-H-01, found within the obsidian investigation zone.

DISCUSSION

Our 2022 excavations provided insight into the chronology, architecture, and activity areas of the North Plaza. Ops CC-18 and -22 indicate activity in the North Plaza at least as early as the Late Preclassic period in the southeastern portion of the plaza, first at Structure A-6 (Lot CC-18-A-14) and likely also at the base of Structure A-5 (Lots CC-22-G-08–10), though we lack definitive ceramic evidence to support architectural evidence. Activity in the chronology units venturing farther north from Structure A-5, Subops CC-22-C and -F, was confined to the Classic period. Subop CC-22-C was placed on a raised, unfinished platform with large cobbles and lithic debris scattered across the modern-day surface. Excavations here revealed multiple construction sequences

all concerned with chert and chalcedony tool production, including two levels of dense debitage deposits (Lots CC-22-C-03 and -04). The third chronology unit, Subop CC-22-F, roughly 15 m north and 20 m west of Subop CC-22-C, did not contain any trace of a plastered floor or previous construction phases, though it did have cultural material throughout. Similarly, the strip trench excavations did not reveal any formal architectural features (Subops CC-22-A, -B, -D, and -E). Subop CC-22-H did encounter a north-south alignment of medium rocks, similar to a north-south alignment of stones also running through Structure A-6, but neither are fully intact enough to speculate on their regularity and function.

Taken together with the topography of the plaza, it appears that formal architecture was concentrated on the southern end of the plaza, flush with the northern boundary of Structure A-5. This area contains a significant number of modern features (including Chan Chich Lodge's pool, laundry house, and buried utilities) that inhibit investigations in this area (including the placement of Op CC-22's strip trenches and shovel test surveys, which avoided areas of modern disturbance).

The strip trench excavations and shovel test surveys recovered robust assemblages that provide insight into activity during the terminal life phase of the North Plaza. Significantly, we observe two distinct activity spheres distinguishing the eastern and western sides of the plaza. Macrodebitage, microdebitage, and patterns in striking platforms indicate that initial tool reduction and shaping occurred in the northwest corner of the plaza, while later-stage tool production occurred in the eastern half of the plaza (see Figures 2.4 and 2.5). Obsidian blade production and other craft activities occurred on the western side of the plaza, as evidenced by the high density of obsidian blades, obsidian production debris, the four undecorated spindle whorls, and one shell bead (see Figures 2.6 and 2.8). In addition, shell, manos, and metates point to the presence of food-related activities, another correlate of marketplaces both in ethnographic studies and iconography argued to depict Classic Maya marketplaces (Cap 2015; Carrasco Vargas et al. 2009). Finally, the strip trenches on the northern boundary—Subops CC-22-A and -D—contain an assortment of artifact types and various ceramic that are consistent with expectations for discard zones (Cap 2015).

Finally, artifact analysis of chert, chalcedony, and obsidian tools reveals information on the procurement of raw material, long distance trade, and on-site tool production. While most of the chert material appears locally sourced, we identified some fine-grained, non-local chert tools and flakes that speak to the exchange of raw material as well as technological forms from the Colha area. The stemmed macroblade, for example, is an intriguing addition to Chan Chich's lithic tool assemblage that places Chan Chich within Colha's peripheral consumer area, the zone containing sites importing ceremonial tools great distances from the production source (Santone 1997). We have evidence that obsidian specialists working in the North Plaza at Chan Chich worked exclusively with material from El Chayal, though blades from other volcanic sources were in circulation. The dominance of El Chayal obsidian in production debris is consistent with obsidian production at the marketplace identified at Buenavista del Cayo (Cap 2022) as well as patterns observed at Tikal (Moholy-Nagy 2022).

CONCLUSION

Our objectives for the 2022 and 2023 investigations at the North Plaza were to investigate the configurational and distribution evidence that it functioned as a marketplace in the Late Classic period. We are also interested in its integration into a regional

network of marketplaces across the TRR. The answer to this question will become more evident through ongoing research into the geochemical sourcing of ceramic artifacts from the marketplaces within the NSF Marketplace Study, led by Sullivan, and further research into obsidian trade networks in the region. As we await those results, we refrain from making definitive statements about whether the North Plaza was a Late Classic marketplace in this chapter. However, our work clearly shows that the Maya engaged in chert tool production and obsidian blade production in the plaza and that these activities took place in different locations. The diversity of other types of artifacts—spindle whorls, unifaces, shell, and ceramics, for example—lend tentative support to a marketplace interpretation. These investigations also open questions regarding chronology and urban planning at Chan Chich. What was the function of the North Plaza during the Late Preclassic and ensuing Early Classic periods? As the North Plaza transitioned into a space for craft production and exchange, what else was happening in the site core and surrounding settlements? The North Plaza is adjacent to the Main Plaza, the site's only other epicentral public plaza, and one of the biggest in the TRR. It is also within sight of the Upper Plaza, which calls into question its association with political power at Chan Chich. Building on work by Inomata (2006) and Hutson (2016), Houk and Booher (2020) propose that significant site planning decisions—the size of the Main Plaza, the construction of two causeways, the placement of the ball court, and so forth—reflect a desire by Chan Chich's rulers to create a stage for ritual processions and public spectacles. Hosting such events created "centripetal forces" that drew rural farmers to the city and fostered a sense of community. Marketplaces functioned along the same lines (Hutson 2016) to attract people to site. Setting the marketplace in the heart of the city would have added to the experience for rural farmers because "monumental architecture is undeniably salient" (Hutson 2016:185).

DATA AVAILABILITY

Appendix A and Appendix B are available online at https://doi.org/10.18738/T8/R3NFDJ.

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The Newly Recorded Major Ceremonial Center of Ayiin Winik (BE-30)

Brett A. Houk, Victoria Ingalls, J. Ray Wallace, and Briana Smith

One of the largest previously unrecorded sites revealed in the 2022 lidar data is BE-30, a major ceremonial center in the Rio Bravo terrace lowlands. The site is in the northwestern corner of Belize Maya Forest Trust lands, 4.7 km north of the Gallon Jug parcel, 1.8 m northwest of a prominent bend in the Rio Bravo, and 700 m north of an unnamed drainage, which runs from southwest to northeast, meeting the Rio Bravo at the bend (Figure 3.1). Like other major sites in the region, BE-30 has a large rectangular plaza flanked by monumental architecture, however the site's unusual double ball court and large parapet-lined *sacbe* prompted our field inspection. This chapter documents our short reconnaissance to BE-30, which we named Ayiin Winik (Crocodile Person) after a ceramic figurine fragment, discussed below.

PROJECT TIMELINE

The only "easy" access to the site is to drive along a logging road that branches off the road from Sylvester Village to the escarpment, 700 m northwest of the Rio Bravo, and arcs to the north and then east. The workers with us from Chan Chich Lodge referred to this road as the "Cabaret" road, named after an old logging camp (see Houk, Project Lists, this volume). East of BE-30, the Cabaret road forks with one branch continuing north and one running east, ultimately passing by Laguna Seca (BE-06) before connecting to the Blue Creek road. In 2022, the Virginia Tech jaguar team kept the logging road open, using it as a transect for camera traps. Near where the logging road begins its turn to the east, it passes approximately 1.3 km south of BE-30. Our pre-field planning assumed that we could drive 7 km to that point and then cut a new trail to the site. Another old road extends from the Cabaret road to BE-30, but it is entirely overgrown.

Because the Cabaret road is unimproved, we chose to visit the site in April, during the dry season; the road becomes impassible, even for four-wheel-drive vehicles, once the rainy season begins. In addition to BE-30, we planned to visit and record BE-24, a small ceremonial center with a ball court, *sacbe*, and dense settlement at the base of the La Lucha Escarpment, and BE-31, a possible *atalaya* (watch tower) near Laguna Verde, which Francisco Estrada Belli flagged in our lidar data.

Houk, Ingalls, and Wallace flew to Belize on April 10 (Smith missed her flight), retrieved a rental truck from the airport, and managed to locate alternative lodging in Belmopan after finding the Bullfrog Inn unexpectedly closed. On April 11, Houk and Ingalls met with Dr. Melissa Badillo, the Director of Research at the Institute of Archaeology, and secured our "Permit to Search for, Explore and Excavate" for the 2023 field seasons. We then bought a chainsaw in Belmopan, picked Smith up at the airport, and traveled to Chan Chich Lodge, which served as our field camp for the April reconnaissance trip.

Houk, Brett A., Victoria Ingalls, J. Ray Wallace, and Briana Smith
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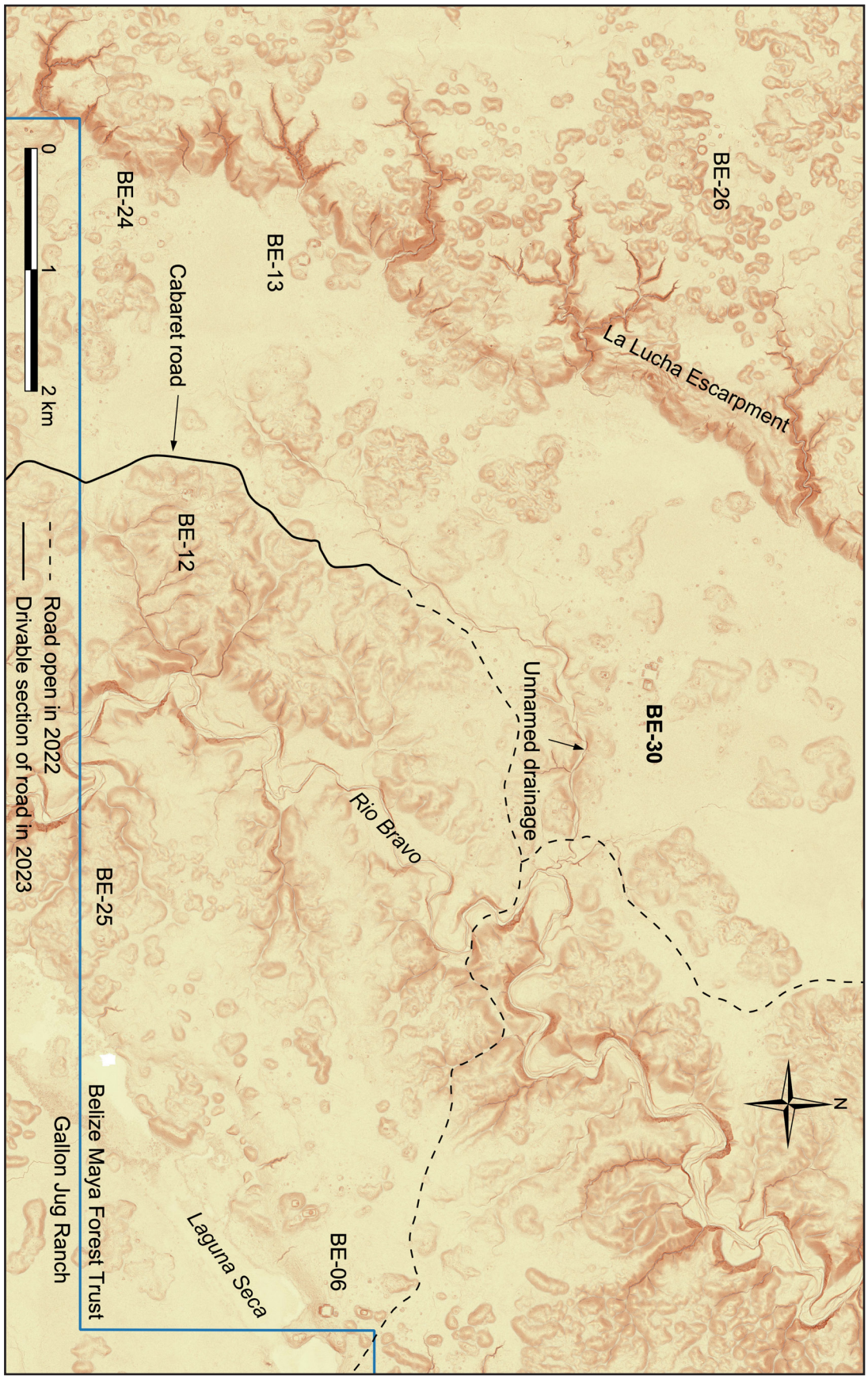

Figure 3.1. Location of Ayiin Winik (BE-30) in relation to features described in the text.

On April 12, the crew, joined by Manuel Sho, set off from the lodge and found that the logging road, which had been drivable for its entire length in 2022, was only open for about 0.4 km. At that point, we encountered intermittent fallen trees, victims of Hurricane Lisa, which made landfall in Belize on November 2, 2022. Using the chain saw and machetes, we managed to clear the road to about 1.72 km north of the junction with the escarpment road. On April 13, a massive tree, which took all morning to cut, slowed our progress (Figure 3.2). However, on April 14, Dr. Elma Kay sent two rangers from Belize Maya Forest Trust to help clear the road. By the end of the day, we could drive 4 km down the road. Smith, Wallace, and Sho managed to reach the site a little after 1:00 PM but had to turn around after a short visit to hike 4 km back to the truck.

On April 15, Wallace, Sho, and Emil Flota cut a trail to visit Kaxil Uinic, in preparation for planned, but later scrapped, summer work. Houk, Ingalls, and Smith, along with four workers from Sylvester Village (Wayne Tush, Vidal Ku, Miguel Velasquez, and Joe Aquiño) and a worker from Chan Chich Lodge (Jermi Serminia) cut a walking trail from the 4-km point to the site. Much of our trail follows the other old road that runs all the way to the site—with a great deal of effort, that road could be cleared and used to access the site. We reached BE-30 by 10:15 AM on April 15 and spent a few hours exploring the large plaza and attached groups.

Figure 3.2. Photograph of Victoria Ingalls, foreground, and Ray Wallace working on a large, fallen tree across the Cabaret road.

On April 16, Aquiño and Tush continued to clear the road while the rest of the crew—Houk, Ingalls, Smith, Wallace, Sho, Serminia, and Ku—explored the site, look for monuments, and inspect looters' trenches. By the end of the day, the road was opened to about 5.6 km, 1.4 km short of our pre-field goal. Our last and longest field day at BE-30 was Monday, April 17. Our crew that day included Sho and two workers from Chan Chich Lodge, Jerry Serminia and Emanuel Cordova.

The time lost to road clearing precluded our visiting BE-24 and BE-31, however we managed to cut a trail to a previously unknown E Group at Chan Chich on April 18 (see Gallareta et al., this volume). The crew returned to the United States on April 19, ending the short spring reconnaissance.

METHODS

Prefield Preparations

Houk visually examined simple Red Relief Image Maps (sRRIM), hillshades, and other visualizations of BE-30 and plotted the locations of suspected looters' trenches. Prior to departing for the field, Wallace created a series of maps and visualizations in QGIS of BE-30 and the overall permit area. We loaded these maps as TIFFs onto an iPad Pro and as Geo-referenced PDFs on iPhones running Avenza for navigation purposes.

Exploration and Recording

Because we only spent approximately 12 hours at the site, we had little time to explore the ruins outside of the site core. Our work began with an inspection of the ball court plaza and attached groups and expanded to three of the hilltop groups nearby. Our efforts included only minimal vegetation clearing to create trails between groups. To accomplish as much as we could in a short time frame, we divided the crew into tasks: Houk crawled over the main groups to record the architecture, Ingalls and Smith documented stone monuments, and Wallace inspected looters' trenches. In the case of one particularly challenging trench, Ingalls and Houk both made notes and sketches, as discussed below. Additionally, this chapter includes some observations made by Houk and Ingalls during our summer 2023 return to the site.

Mapping

Starting with the Main Plaza and its attached groups, Houk sketched Malerized structures on various visualizations of site. Through trial and error, he discovered that sRRIM made poor base maps for interpreting low mounds; a basic hillshade exported from QGIS proved to be the most effective base map. He supplemented the iPad drawings with sketches in his field notebook and then drew a rectified map in Canvas X Draw back in the United States. All structure orientations described below are based on UTM grid north and measured from lidar visualizations of the site.

Monument Documentation

For each suspected stone monument, Ingalls and Smith cleared the area around the monument with a rake, brushed dirt and leaves off the surface of the monument, and carefully inspected it for evidence of carving. They recorded basic metric data (length, width, and thickness) and made notes on the monument's condition and composition. After recording the monument's location in Avenza, they photographed the monument, in some cases taking numerous photos for Structure from Motion modeling, and then scanned the monument on an iPhone using Scaniverse. Following the standard project convention, monuments are numbered in order of discovery

by type (i.e., Altar 1, Altar 2, Altar 3, Stela 1, and Stela 2).

Looters' Trench Documentation

Guided by Houk's pre-field plotting of suspected looters' trenches, Wallace assessed marked locations in and around the main architectural group and recorded any trenches not visible in the lidar data. As discussed below, most trenches at Ayiin Winik are small and collapsed, so Wallace could retrieve little architectural information from his inspections. He photographed each trench and recorded notes on its size and location. Ingalls documented two trenches in other courtyards in the summer.

Test Excavations and Surface Collections

Although we had proposed to excavate one or more 1-x-2-m test excavations to assess the depth of deposits and establish a chronology for the site's construction, we did not have enough time to open any test pits. However, while cleaning around a stela, we collected a small number of ceramics from the surface. We therefore created Op AW-01 and Subop AW-01-SF, following the project's procedures for assigning provenience information to surface finds (see Bonorden and Smith 2015). Lot AW-01-SF-01 encompasses the context discussed below from which we collected artifacts near a stela.

RESULTS

Site Plan, Architecture, and Groups

Houk created a Malerized map of the central 1.5 km^2 of Ayiin Winik's site core (Figure 3.3), an area comparable to the mapped limits of the monumental core at Chan Chich. Following project convention, he divided the architecture into groups. Group A comprises the Main Plaza, the Eastern Palace, the Western Acropolis, Courtyard A-10, the *sacbe*, and 16 other, scattered mounds. Group B comprises the Southern Acropolis and a few other structures on and around a prominent hill south of the Main Plaza. Group C includes structures and courtyards west of the Southern Acropolis and south of the *sacbe*. Scattered courtyards and structures east of Groups A and B form Group D. The mapped portion of Group E comprises one large hilltop group, a few small courtyards, and scattered isolated structures north of Groups A and D. Group F includes a smattering of structures west of Group E, separated from Groups A and C by a small bajo. Groups A, B, and C, which the crew visited in April 2023, are discussed in more detail below.

Group A

The central feature at Ayiin Winik is the Main Plaza, which measures 135 m north-south by 90 m east-west and is oriented approximately 14° east of UTM grid north (Figure 3.4). The southern end of the plaza contains three parallel, 4-m tall mounds forming a double-ball court, the only one known in the eastern Three Rivers region. A low platform face marks the southern edge of the plaza, and an unimposing, 4-m tall range building marks the northern edge. Structure A-1, a 14-m tall range building, forms the eastern side of the plaza and fronts the Eastern Palace, a complex containing two rectangular courtyards bounded by range buildings. The Western Acropolis, a complex of private courtyards, range buildings, and a small temple-pyramid rises above the Main Plaza's western side. The 8-m tall Structure A-6 and the 4-m tall Structure A-4 stretch a combined 90 m on the eastern face of the acropolis.

A 28-m wide *sacbe* connects to the southwestern corner of the Main Plaza, running across mostly level terrain roughly 175 m to the west (varying from 270° to 263°), where its edge-defining parapets end. The *sacbe*'s western terminus is not associated with any structures. The *sacbe* is

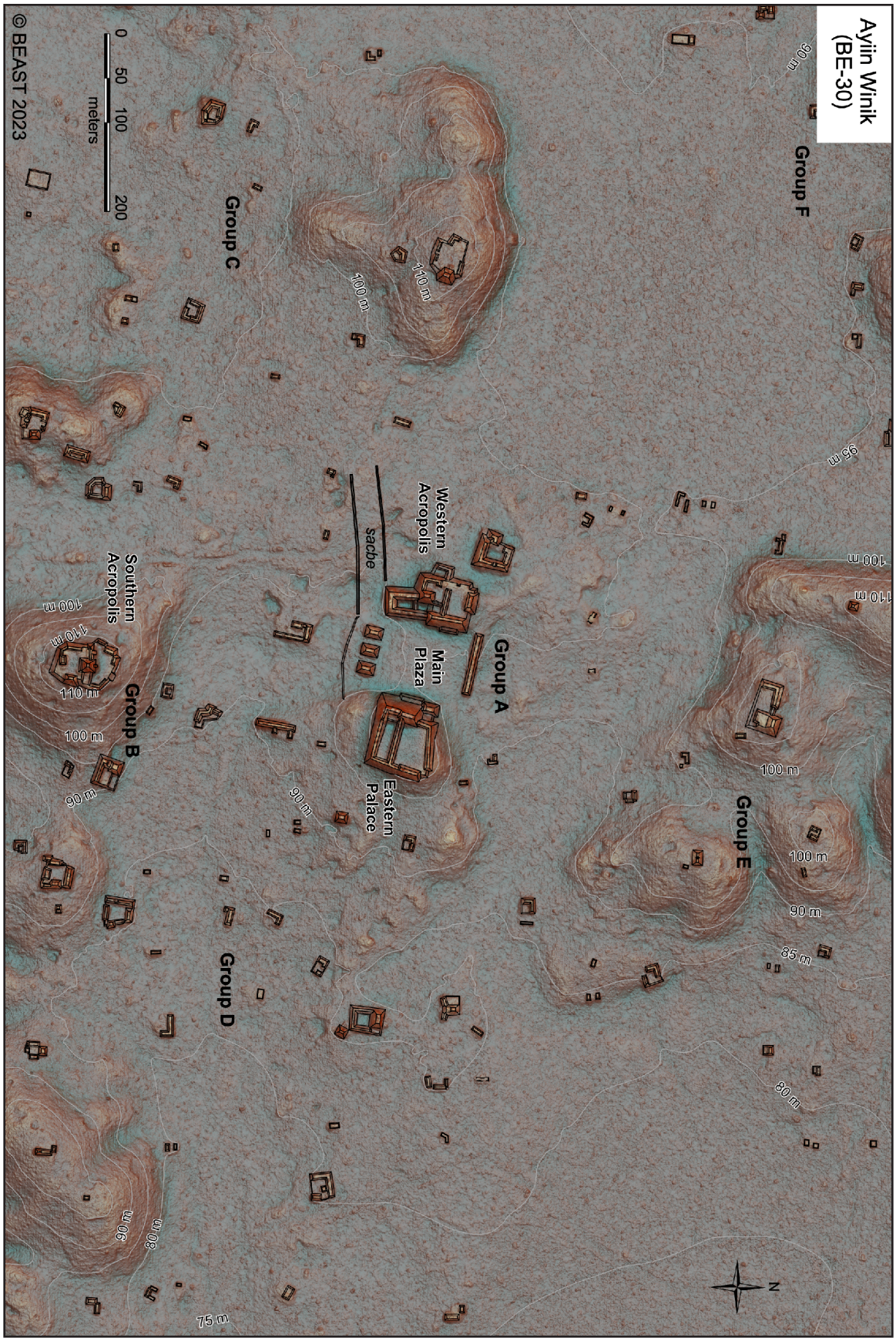

Figure 3.3. Malerized map of Ayiin Winik overlain on a simple Red Relief Image Map.

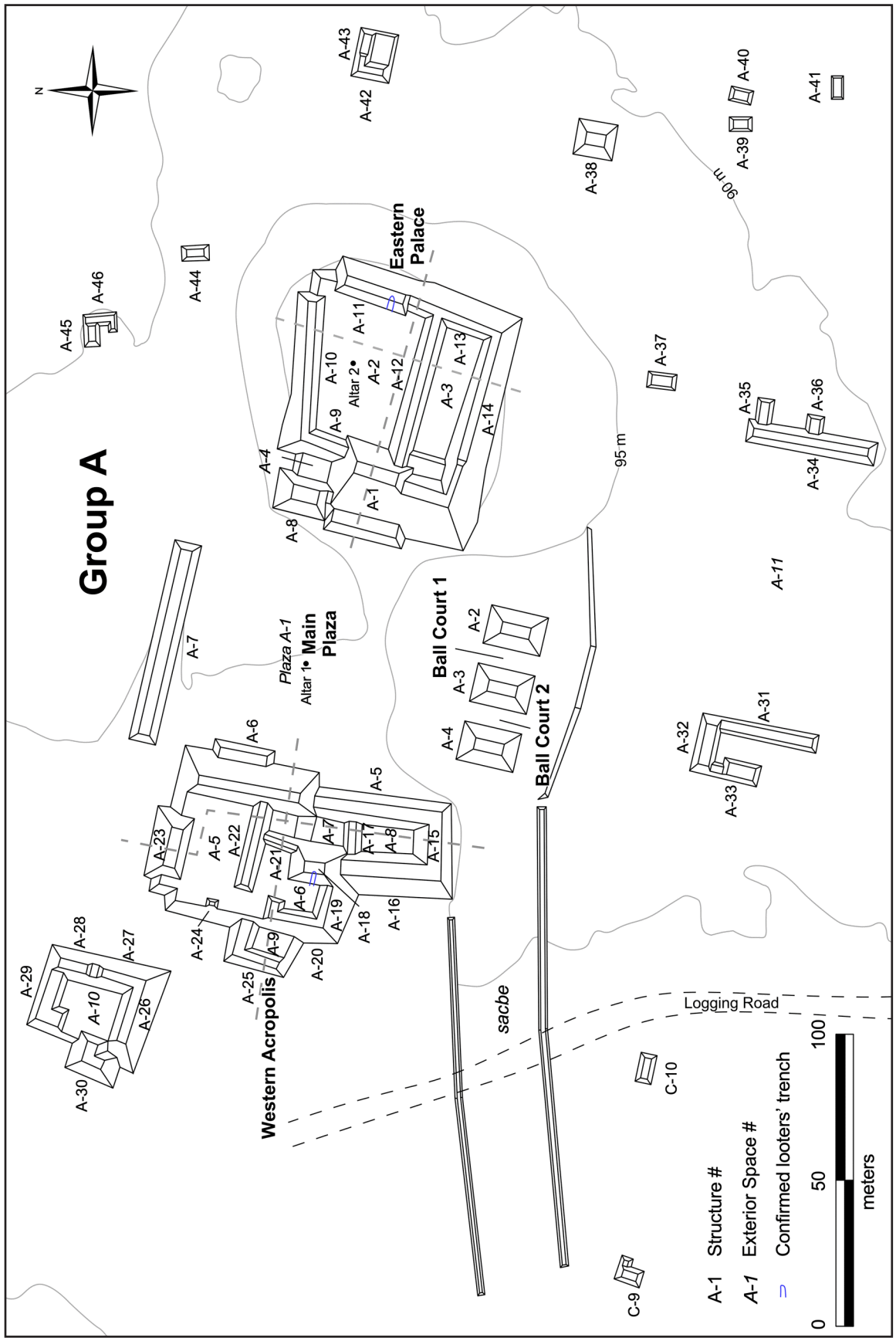

Figure 3.4. Map of Group A at Ayiin Winik, showing locations of elevation cross-sections.

comparable in form to the Western Causeway at Chan Chich and the causeways Novotny and colleagues (this volume), Thompson (this volume), and Gallareta and colleagues (this volume) describe at Gallon Jug, Laguna Seca, and BE-33, respectively.

The Eastern Palace occupies a 7-m tall hill, with Structure A-1 draped down the western face of the hill. Structure A-1 is a large range building, higher and wider on its northern end, with a 2.5-m high landing at the base of its northern half. Structure A-8 is curiously outset north and west of the northwest corner of Structure A-1, creating a small enclosed, elevated space (ES A-4) tucked between Structures A-8 and A-9. This space is open to the north and bordered by the northern end of Structure A-1 on the south.

Behind the bulk of Structure A-1, Courtyards A-2 and A-3 occupy the summit of the hill (Figure 3.5). The floors of the courtyards are approximately 7.5 m higher than the floor of Plaza A-1. Both courtyards are bound by low range (2–3 m high) structures on their eastern, northern, and southern margins. Courtyard A-2, on the north side of the complex, is the larger of the two courtyards, covering approximately 1,450 m^2. As discussed below, Altar 2 sits roughly in the center of the space, and the only looters' trench in the palace pierces the western face of Structure A-11 on the eastern edge of the courtyard. Separated from Courtyard A-2 by Structure A-12, Courtyard A-3 encloses a rectangular space of about 530 m^2. Structure orientation in the Eastern Palace varies considerably. The north-south axes of buildings range from 2° to 18°, although most cluster between 14° and 18°.

The Western Acropolis comprises a series of small courtyards that climb in elevation from south to north (Figure 3.6). Structure A-6, rising 9 m above the Main Plaza, is the largest structure in the group. At its base in the Main Plaza, it has a 3-m high landing, comparable

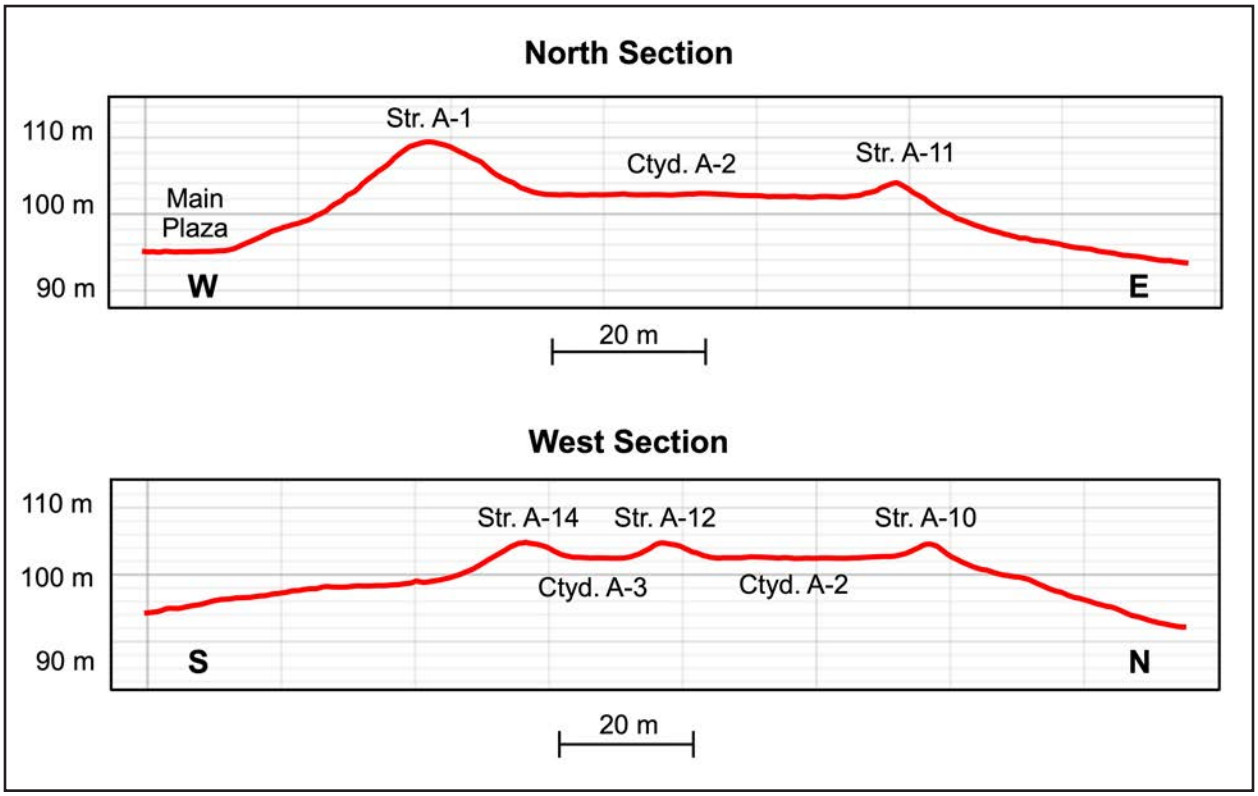

Figure 3.5. Cross-sections of the Eastern Palace derived from lidar data (see Figure 3.4).

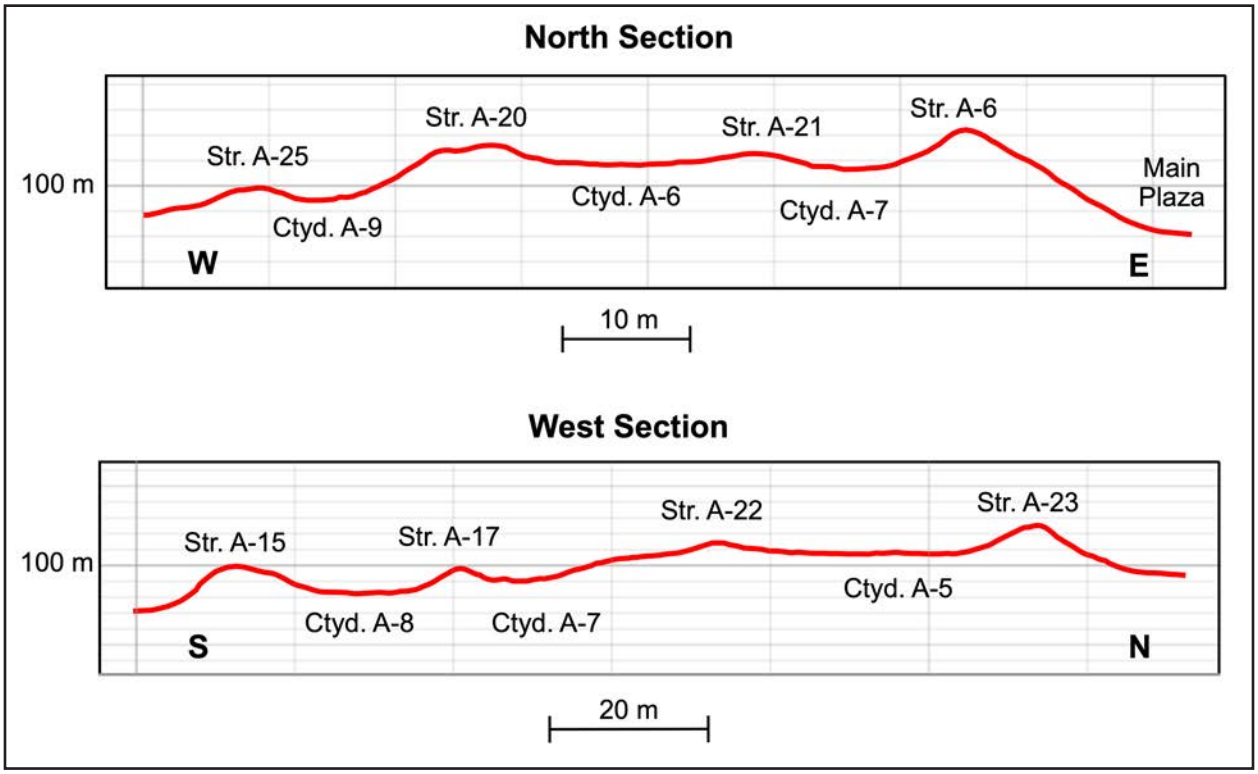

Figure 3.6. Cross-sections of the Western Acropolis showing climbing courtyards derived from lidar data (see Figure 3.4).

to the feature on Structure A-1. The largest courtyard is Courtyard A-5, bound by Structure A-6 on the east, Structure A-22 on the south, and Structure A-23 on the north. Except for a small and low mound, Structure A-24, the western edge of the courtyard is open. The floor of the courtyard is 6 m higher than the plaza's surface. This courtyard covers approximately 750 m^2, but it is possible it was originally larger. Structures A-21 and A-22 may be late additions to the group built to create the more private Courtyard A-6, which shares the same platform as Courtyard A-5 (see Figure 3.6). The only looted structure in the group is Structure A-18, a 5.5-m tall temple-pyramid on the eastern side of Courtyard A-6.

The only other two exterior spaces we will mention here in the group are Courtyard A-10, a residential group 20 m northwest of the Western Acropolis, and broad, possible plaza, designated ES A-11. Two low range buildings face each other across this 93-m wide space. Structure A-31 on the west is 3.5 m tall and 40 m long, while Structure A-34 on the east is 5 m tall and 44 m long. These parallel mounds (both are oriented 9–10°) create a possible transitional plaza between Plaza A-1 and the Southern Acropolis in Group B.

Group B

The mapped portion of Group B comprises courtyards and structures on and around the base of a 22-m tall, hemispherical hill (Figure 3.7). The Southern Acropolis, comprising Courtyards B-1 and B-2 and their associated 12 structures, dominates Group B. At the heart of the acropolis is Structure B-1, a temple-pyramid that rises 10.5 m above Courtyard B-1 to the north and 7.2 m above Courtyard B-2 to the south (Figure 3.8). Courtyard B-1 appears to be the formal entrance into the group, with a possible ramp or stair leading down toward ES A-11, with access to the acropolis perhaps mediated by the C-shaped group of Structures

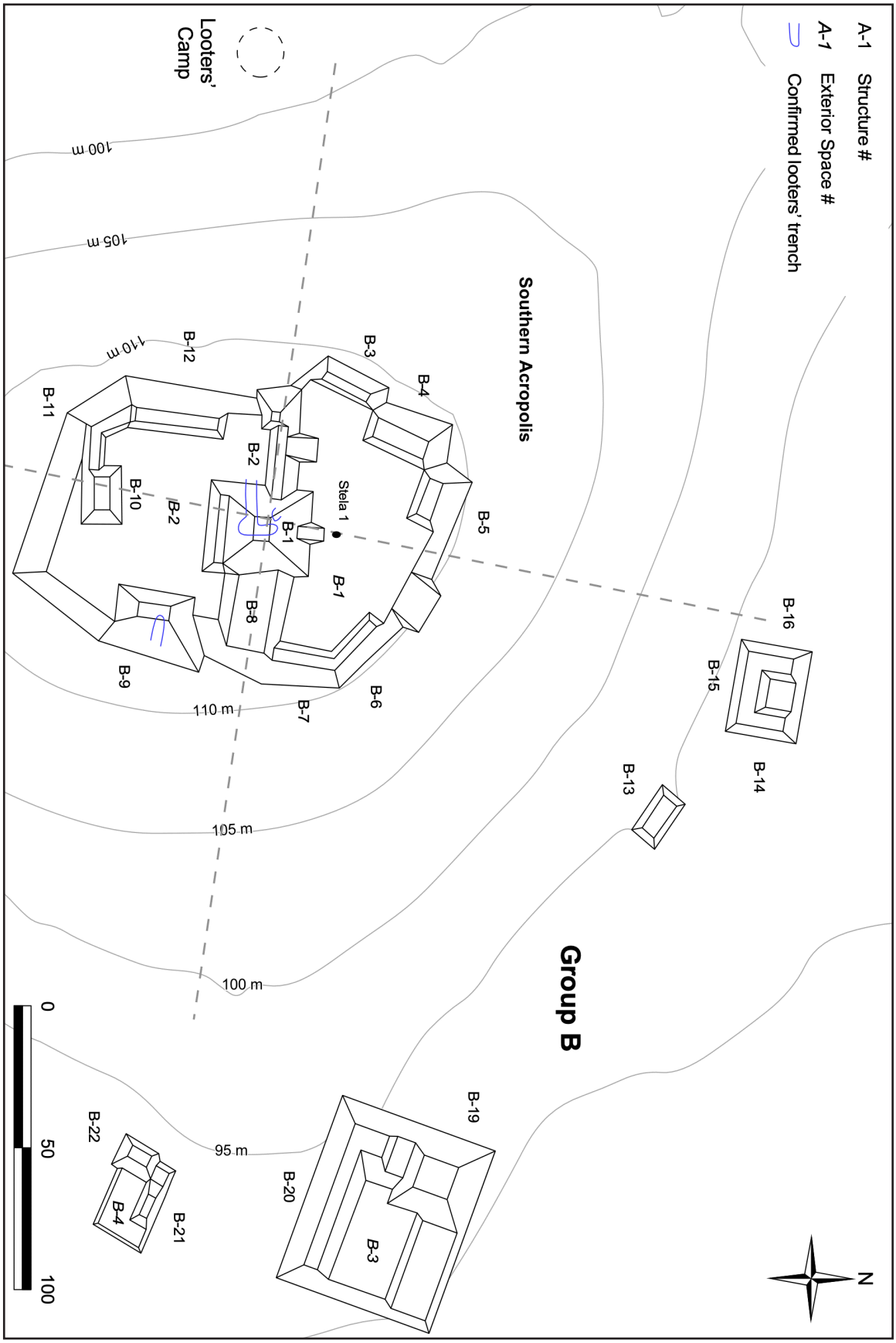

Figure 3.7. Map of Group B at Ayiin Winik, showing locations of elevation cross-sections. Note the location of the suspected looters' camp.

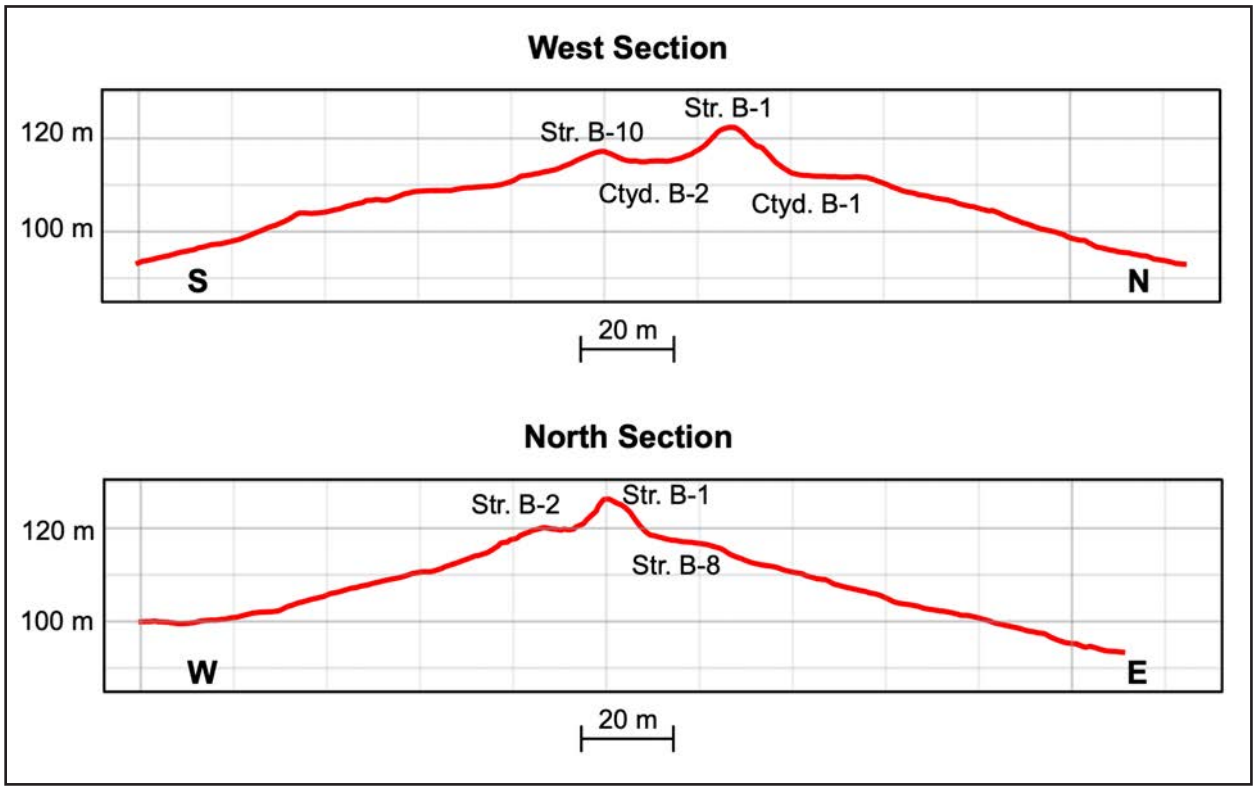

Figure 3.8. Cross-sections of the Southern Acropolis derived from lidar data (see Figure 3.7).

B-14–B-15 at the base of the hill. A large stela, Stela 1, with its base still in situ lies broken at the northern base of Structure B-1. A stairway on the north face of Structure B-2 likely provided access to the higher and more restricted Courtyard B-2.

Two of the structures in the group are looted. Structure B-1 has a large trench on its western face that pierces the mound and becomes a tunnel, turning to the north, and a higher, smaller tunnel on its northwestern corner. Structure B-9, a 3-m high mound on the eastern side of Courtyard B-2, has a trench/tunnel on its eastern face that penetrated the back of the structure to the center of the mound. These trenches are discussed below.

Group C

The mapped portion of Group C includes five formal courtyards and 40 structures, many of which are isolated mounds. The only two courtyards we visited in Group C are Courtyards C-1 and C-3 (Figures 3.9 and 3.10). Courtyard C-1 sits atop a broad, 20-m tall hill, 400 m west of the Main Plaza. It is an east-focused group with a 5-m high temple-pyramid on the east side of a 30-x-35-m platform. Four other structures, all less than 1 m high, flank the edges of the platform. Looters' trenches pierce Structure C-1 from east and west. As discussed below, two fragmented monuments with faint remnants of carving sit in front of the structure in the courtyard. Both trenches are collapsed.

Courtyard C-3 is 250 m west of the South Acropolis and occupies the summit of a smaller, 10-m tall hill. This is also an east-focused group, marked by Structure C-20, a 3-m tall mound on the east side of the courtyard. Low mounds bound the small courtyard on its other side. A single collapsed trench on the western face of Structure C-20 is the only evidence of looting in this group.

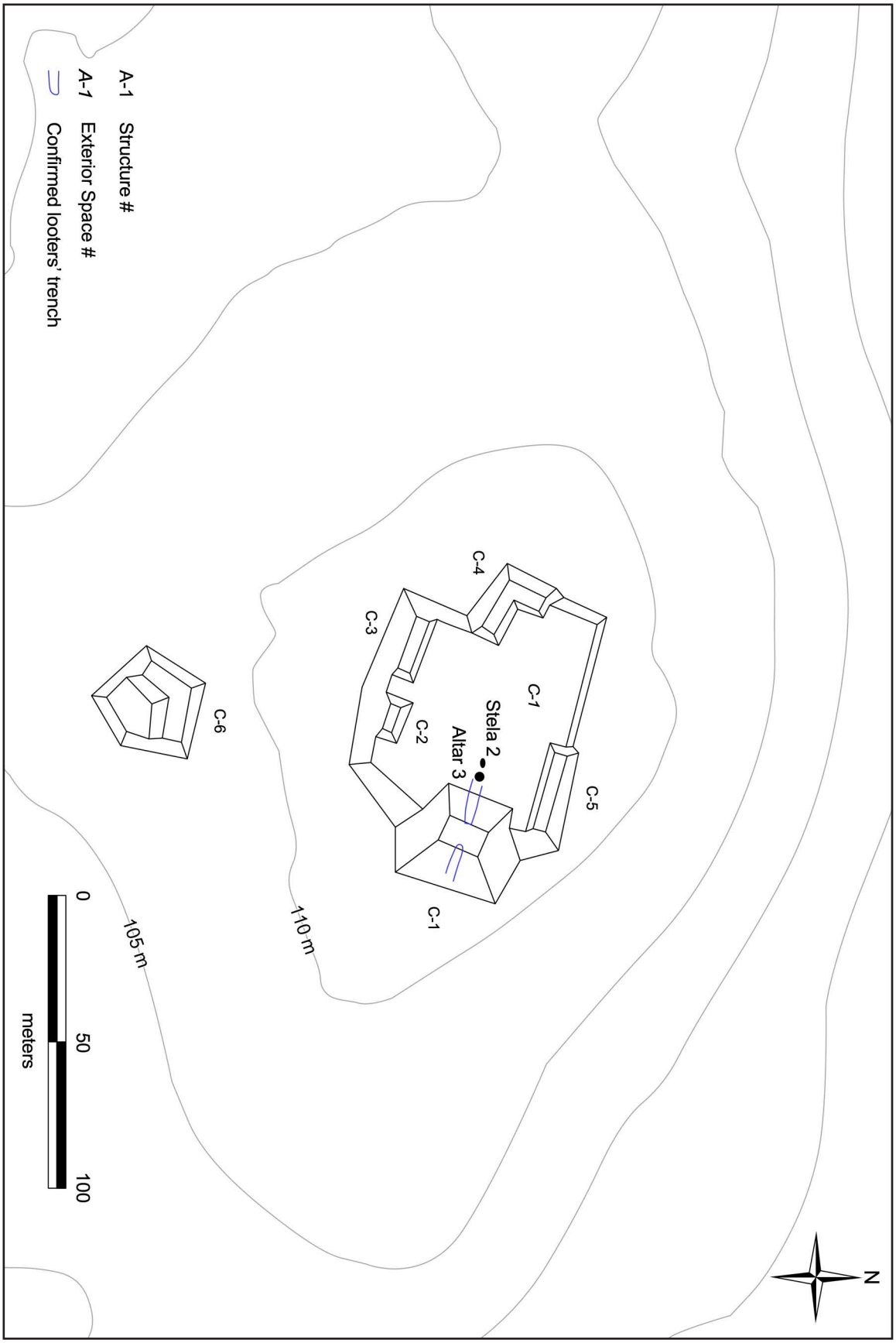

Figure 3.9. Map of Courtyard C-1 at Ayiin Winik.

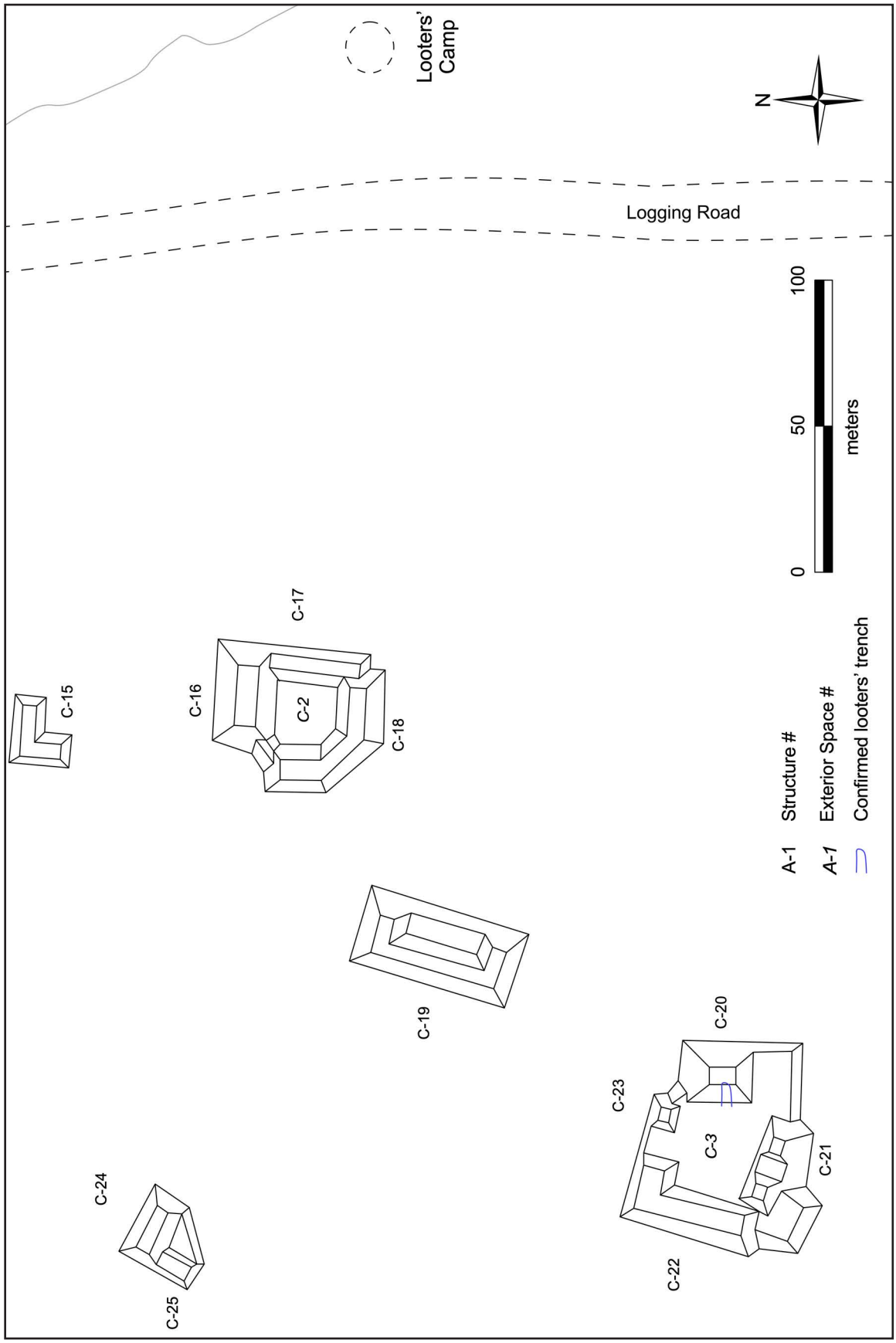

Figure 3.10. Map of Courtyards C-2 and C-3 at Ayiin Winik.

Monuments

During initial site documentation, BEAST identified five monuments—two stela and three altars—as well as a possible sixth monument that will require further exploration. All, except Stela 2, appear to be made of local limestone, which is soft, porous, and susceptible to severe erosion. Although two of Ayiiin Winik's monuments show faint evidence of carving, these are now so eroded that no glyphic elements or other artistic motifs are identifiable.

Altars

Altar 1 is in the approximate center of Plaza A-1 (see Figure 3.4). The large limestone monument is roughly 116 x 124 cm, with a thickness of 41 cm (Figure 3.11). Lying flat on the surface, the limestone is heavily weathered, and the altar is cracked down the center with other small pieces visibly cracking or exfoliating off the sides of the monument. Several smaller limestone pieces were noted nearby, although it is not clear if these are related to the altar or are displaced from surrounding structures. No carving is visible on the eroded surfaces. During clearing of vegetation and debris from the altar for photographs, we found several flakes and eroded body sherds near the base of the monument, suggesting future excavations are likely to yield cultural materials around and below the altar. We did not collect these non-diagnostic artifacts.

Altar 2 sits in the center of Courtyard A-2, a restricted access courtyard elevated above the main plaza (Plaza A-1) to the west (see Figure

Figure 3.11. Photograph of Altar 1 in Plaza A-1. Camera facing north/northeast.

3.4). It is similar in size and shape to Altar 1, measuring some 123 x 136 cm and 33 cm thick (Figure 3.12). It is also heavily weathered and fragmented and lacks evidence of carving. The coarse limestone has lots of small gravel and conglomerate inclusions that are weathering out, leaving gravel on and around the monument and giving it a craggy appearance.

Altar 3 is extremely large, 95 x 146 cm and 63 cm thick, but heavily fragmented (Figure 3.13). Located in Courtyard C-1 at the western end of the looters' trench into Structure C-1 (see Figure 3.9), Altar 3 appears to be resting on a plaster plaza floor. However, because both the altar, floor, bedrock, and construction fill are all eroded limestone, it was difficult to distinguish one from the others within the looters' trench. The top surface and southwest side of the altar are both faintly carved, although the inscription is obscured by erosion. Initial observations of the altar suggest the top may have featured a central cartouche surrounded by smaller elements. The carvings on the side of the altar appear to be the outline of two or three individual glyph blocks; although unreadable, these were very likely part of a larger text. Additionally, several stone fragments in the looters' rock pile nearby are from the altar; at least one of these was also faintly carved. Stela 2 is on its side about 2 m west of Altar 3 (see below).

Stelae

Stela 1 is extremely large. Located on the north side of Structure B-1 in Courtyard B-1, it is

Figure 3.12. Photograph of Altar 2 in Courtyard A-2. Camera facing north/northwest.

Figure 3.13. Photograph of Briana Smith documenting Altar 3 in Courtyard C-1. Camera facing east/northeast. Note the centerline trench into Structure C-1 in the right side of the photograph.

broken into two pieces; the top has cracked off and is laying on its back, while the base is still upright in the ground (Figure 3.14). The top fragment is 143 x 104 cm and 35 cm thick, while the visible portion of the base is 63 x 88 cm and 30 cm thick. Together, this stela would have stood over 2.31 m tall. It appears to be uncarved, although, like the other monuments, it is heavily weathered. The area around the stela fragments was cleaned of vegetation, and the top fragment was partially lifted to examine the back face for carved elements. None were visible. At the base of the stela, these preliminary clearing efforts revealed a small number of sherds as well as a Terminal Classic/ Postclassic figurine fragment or part of an effigy vessel (Figure 3.15) and a Postclassic incensario fragment. Christina Halperin (personal communication, August 16, 2023) estimated the age of the former from a 3D model created by Mark Willis, noting "the exposed teeth" and "horizontal nose septum" as chronological markers. None of the artifacts came from below the broken top of the stela—most came from around the edges of the supine top of the monument—suggesting that perhaps visitors placed the offerings after the monument had fallen.

Stela 1 is comparable to stelae at La Milpa and Kaxil Uinic in terms of size and weathering. The La Milpa stelae mostly date to the Late Classic period, and ceramic evidence from the base of several monuments indicates visitation and veneration into the Postclassic period (Hammond and Bobo 1994). Harris (2013) documented Postclassic and possibly Colonial monument veneration at the base of Kaxil Uinic's stela (see also Houk et

Figure 3.14. Photograph of Stela 1 in Courtyard B-1 in the Southern Acropolis. Camera facing east/southeast. Note the upright stela base still *in situ*.

al. 2013), and Houk (1996) found a Postclassic incensario fragment at the base of a stela at Dos Hombres.

Stela 2 is about 2 m west of Altar 3 at the base of the looters' trench in Structure C-1 (Figure 3.16). Laying on its side on the surface, it has certainly been moved from its original location. It is approximately 92 x 55 cm and 28 cm thick. While still weathered, the limestone appears smoother and more fine-grained than Altar 3 and other monuments documented at the site. This could suggest that it is either non-local material, or potentially that it was formerly buried and so did not weather as much as the exposed monuments. It bears faint traces of carved motifs, although no figures or glyphs are now discernable. A small fragment of similar limestone (roughly 30 x 40 cm) was found directly south across the looters' trench and is possibly the stela's base. It was uncarved.

Both Altar 3 and Stela 2 are on the north side of the looters' trench slightly offset from the centerline of Structure C-1. This raises the possibility that these were paired monuments at the structure's base.

Other Carved Stones

Finally, BEAST encountered an usual limestone block on the east side of Plaza A-1, sticking up from the ground about 25–30 cm at an odd angle. Very preliminary cleaning and excavation revealed the block is at least 65 x 55 cm in size, likely larger as the base of the monument was not exposed, and 20 cm

Figure 3.15. Terminal Classic/Postclassic figurine fragment found near Stela 1. The artifact is 9.25 cm long.

Figure 3.16. Photograph of fragment of Stela 2 in Courtyard C-1. Camera facing northeast.

thick. The edge planted in the ground appeared slightly rounded, suggesting that may be a finished edge. The team observed no clear signs of carving. This possible monument requires further exploration.

In addition to the monuments, researchers identified two large stone lintels on the southwest side of Structure A-6 in the small, elevated Courtyard A-7. Lintel 1 was identified first, as it had slid down the sloping side of the structure and was lying near the courtyard's surface. It is 43 x 110 cm in size and 25 cm thick (Figure 3.17). It was cleaned of vegetation and photographed before being flipped over to look for possible carvings. Although lacking any inscriptions, roughly parallel chisel marks were observed on one face. Lintel 2 is approximately 5 m southeast of Lintel 1. It is up the structure's slope and likely closer to its original location. Although this lintel is cracked in half, it is about the same overall size as Lintel 1, 43 x 111 cm and 25 cm thick (Figure 3.18). Structure A-6 is on the eastern side of a very small, enclosed landing elevated above Courtyard A-7. The lintel rooms would have faced west onto this landing and towards Structures A-18 and A-21.

Looters' Trenches

Looting at the site is minor, although looters clearly targeted eastern shrine structures with centerline trenches in the groups the BEAST team visited. Several of the documented trenches were likely tunnels that have collapsed; only three trenches can be entered. We documented looters' trenches with photographs and preliminary measurements. BEAST inspected the profiles and, in most cases, noted the near total absence of artifacts in the structures' fill. We observed an extremely limited number of eroded body sherds, but none showed any diagnostic aspects that would allow their identification or dating. Consequently, the crews did not collect any artifacts from looters' trenches.

Figure 3.17. Photograph of Lintel 1, Structure A-6. Camera facing northeast.

Figure 3.18. Photograph of Lintel 2, Structure A-6. Camera facing west/northwest.

Group A

Structure A-11

A single looters' trench enters the western side of Structure A-11, the eastern range building in Courtyard A-1 in the Eastern Palace. The trench is oriented roughly east-southeast. It is approximately 4.5 m long and 2.5 m deep, though it is largely filled with collapsed stones, rubble, soil, and treefall debris. It was likely deep enough to penetrate the structure, as the top of stone architecture is visible just above the debris. The width is about 1 m at the entrance and widens to about 1.4 m due to collapse towards the top of the trench. No ceramics were observed. A tree grows directly on top of the trench with roots growing into the structure.

Structure A-18

Structure A-18 is the small temple-pyramid in the Western Acropolis. The structure apparently faces west into Courtyard A-6. A single trench enters the western side of Structure A-18, oriented roughly east-southeast. It is filled with a large amount of collapsed stone, rubble, soil, and treefall debris, making it impossible to measure its length and depth. This trench is approximately 1 m wide at the base/entry and widens to 2.5 m at the top, likely due to partial collapse of the trench walls. There is a small amount of cut stone architecture visible at the top of the trench. No ceramics were observed.

Group B

Structure B-1

Out of the ten trenches visited by BEAST in April and the summer, two of the three trenches that could be entered are on Structure B-1, a small temple-pyramid in the center of the South Acropolis group. Trench 1 begins in Courtyard B-2 and penetrates the western side of the structure (Figure 3.19). The trench becomes a tunnel that turns to the north forming an L-shaped shaft into the mound. It exposed three infilled rooms and a vaulted tomb chamber, as well as several phases of construction indicated by multiple floors and types of fill seen in the tunnel profile. The looters clipped the western end of the tomb chamber's vault, looted the tomb, then continued the tunnel to the north, filling the tomb chamber to the level of their trench floor with backfill from their expanded excavations. The exposed portion of the

Figure 3.19. Photograph of Victoria Ingalls documenting Trench 1, Structure B-1. Camera facing east.

chamber measures 1.1 m wide (north-south) by about 1.5 m long (east-west).

On the eastern side of the tunnel, the exposed sections of the tomb's walls are plastered, and a wide horizontal red band runs around the chamber just below the vault (Figure 3.20). A red stripe runs downward from this band in both visible corners. On the northern and southern walls, where the wall meets the vault, are two small niche-like features approximately 10–15 cm high and 30–40 cm wide. These niche openings extend back into the dry core fill. The horizontal red stripe extends over the sill of both niches. As discussed by Ingalls and colleagues (this volume), we believe the niches represent voids left by wooden beams, which rotted away long ago. On the northern wall, the red stripe also covers a patch of wall where the plaster had fallen away, suggesting the plaster fell in antiquity before the tomb was sealed.

Stones forming the tomb chamber's vault are extremely crude and roughly shaped. From the tunnel, two lenses of chert flakes are visible in fill immediately above the top of the vault. No formal tools or eccentrics were observed. The chert appears to be mostly non-local brown material. The first/lower layer of lithics was laid directly on the vault stone and covered by about 10–15 cm of fill, with the second layer of lithics deposited above. This was then covered by the rubble and limestone fill that comprises the rest of the structure above the tomb.

The painted bands and corners resemble the art in 12 Early Classic tombs at Rio Azul (Adams 1999; Hall 1989). Notably, Rio Azul Tomb 1 has nine red painted panels with hieroglyphic texts and iconographic motifs (Adams 1999:82; Hall 1989). Each of the panels is framed by a thick red band. Researchers identified three layers of chert debitage in the fill above the tomb (Hall 1989:89). These stylistic similarities with the Ayiin Winik Structure B-1 tomb suggest that this chamber likely dates to the Early Classic period. Furthermore, the use of chert and/or obsidian flakes to cap tombs is an Early Classic practice documented at other sites in the Three Rivers region (Houk and Valdez 2011).

The discovery of the looted tomb prompted us to revise our research proposal for the summer to include a salvage excavation of the tomb, prompted by the possibility that we might encounter hieroglyphs or iconography on the painted walls. Ingalls and colleagues (this volume) describe the trench stratigraphy in greater detail and the results of our excavations.

There is a second, smaller tunnel in Structure B-1 near the mound's summit. It penetrates the structure on a steep upper portion of the structure much higher up the mound's slope than Trench 1. Trench 2 is approximately 1 m wide, 2.9 m long, and 1.2 m tall. It is a cavity in the upper portion of the structure and is not visible in the lidar visualizations because it enters the mound as a tunnel rather than as a trench. A portion of a vertical alignment of cut stone architecture is visible on the southern side of the tunnel, but most of the tunnel only exposes rubble fill. This was likely the last phase of construction of Structure B-1 due to its location near the highest point of the structure. The deepest portion of Trench 2 meets the northern end of the Trench 1 tunnel: light spills through a small hole into Trench 1 near the ceiling of the tunnel.

Structure B-9

Looters trenched and tunneled into the back of Structure B-9, which is the small eastern shrine in Courtyard B-2. The trench enters Structure B-9 from the east at the northeast corner of the mound and is oriented roughly west-northwest. It is approximately 1.3 m wide at the trench entry and mostly 1 m wide as it progresses into the structure. The trench is about 8 m long and 3.5 m deep. A plaster floor roughly 3–4 cm thick is visible about 2 m down from the top of the structure; the looters dug under this

Figure 3.20. Photograph of exposed tomb vault and plastered walls in Structure B-1. Note the red plaster framing cream-colored panels on the tomb's walls and the crudely constructed vault. The fill in the tomb is backfill from the continuation of the looters' tunnel north of the tomb. Camera facing east/southeast.

floor after encountering it, creating a tunnel into the mound. The cavity under the floor is approximately 1.1 m wide and 1.5 m tall and extends 2.8 m into the structure (Figure 3.21). Although Wallace did not enter the tunnel in April, Houk and Ingalls inspected the trench in July. The looters encountered a crypt in the southwest corner of their tunnel, clipping the northern end of it. The crypt is approximately 50 cm wide, 40 cm tall, and 1.5 m long, with flat limestone slabs creating the walls and top. The floor of the crypt is covered in rocks and dirt, obscuring its surface. To build Crypt 1, the Maya cut through two plaster surfaces visible in the wall of the tunnel (Figure 3.22).

While inspecting the tunnel and crypt, Houk noted a void visible through a small hole near the top of the tunnel, east of the looted crypt. Closer inspection revealed the void to be a second, unlooted crypt. Sometime between when the looters excavated their tunnel and June 2023, a portion of the tunnel's ceiling collapsed, creating a 25-cm diameter hole into Crypt 2. The hole allows a limited view into the void, but we were able take several photographs using an iPhone and a remotely operated 3D camera. The feature is oriented north-south and appears to be about 40 cm wide and maybe 60–70 cm long. The walls of the crypt are formed by unevenly spaced limestone slabs that slant inward, so that the ceiling of the crypt is narrower than its floor. The ceiling is approximately 40 cm higher than the floor of the crypt. In places, stacked, dry-laid rubble between the upright slabs creates part of the crypt's walls on its east, west, and north sides (Figure 3.23). The south side of the crypt is different: a chopped plaster floor, which the Maya cut through to place the crypt, and wet-laid cobbles and small boulders from the southern wall (Figure 3.24). Two large tabular pieces of limestone form most of the crypt's ceiling (Figure 3.25). Two or three smaller, irregular stones from the ceiling at the northern end of the crypt. The floor of the crypt is covered in sediment, rocks, and leaves. The only artifacts visible are the base of a black cylinder vessel and a large sherd

Figure 3.21. Opening to Crypt 1 in looters' trench in Structure B-9. Camera facing northeast.

Figure 3.22. Photograph of looters' tunnel in Structure B-9 showing the location of Crypt 1, marked by the white arrow. Note the two cut plaster floors above the crypt. Camera facing east.

apparently broken off that vessel (Figure 3.26). The broken edges of the vessel base appear to be rodent gnawed, and the leaves in the crypt indicate rodents have used it as a den. While no bone is visible on the crypt floor, this feature presumably contains a burial.

The locations of the two crypts along the southern edge of the looters' tunnel suggest the looters missed the centerline of the mound, and it is possible that other burials and/or caches are present in the building. Salvaging Crypt 2 would require either digging upward into the ceiling of the looters' tunnel, which sounds dangerous, or excavating downward from the summit of the mound.

Group C

Structure C-1

Structure C-1 is a small eastern shrine building in Courtyard C-1. This small building is notable not only for its association with two once-carved monuments, Altar 3 and Stela 2, but for its two looters trenches. Trench 1 enters Structure C-1 from the west and is oriented approximately south-southeast. The width is about 1 m at the entry but gradually increases to 1.3 m for most of the trench's length before widening to 3 m near the top of Structure C-1; this enhanced width is likely due to collapse. Measurement of length and depth were difficult to perform accurately due to debris and rubble in the trench. It was about 12 m long and 4 m deep, but may have connected with the second trench, described below, to bifurcate this structure. Wallace observed but did not collect two ceramic fragments in the southern profile and one in the northern profile. He assessed all as badly eroded and lacking diagnostic characteristics.

The second trench in the structure penetrates the mound from the east. Trench 2 is oriented roughly west-northwest. It appears that this trench was originally connected to Trench 1 and bifurcated Structure C-1 as a tunnel, before gradually being filled with debris, collapse, and treefalls. The heavy amount of collapse and vegetation did not allow for length and depth

Figure 3.23. Screenshot of a 360-degree photograph of the south wall in Crypt 2. Note the chopped floor visible at the base of the wall.

Figure 3.24. Screenshot of a 360-degree photograph of the ceiling in Crypt 2. The north end of the crypt is toward the bottom of the image.

Figure 3.25. Screenshot of a 360-degree photograph of the eastern wall of Crypt 2. Note the dry-laid rubble forming part of the wall between upright limestone slabs.

Figure 3.26. Screenshot of a 360-degree photograph of the western floor of Crypt 2. Note large black sherd in the right foreground and the ceramic vessel base in the left center of the photograph. The jagged edges of the ceramic vessel base and leaves in the vessel and on the floor of the trench suggest rodent activity.

measurements, but the trench is approximately 1 m wide for most of its length before widening to 1.5 m near the summit of the mound. The looters built a 70-cm tall wall of cut stones removed from Structure C-1 along the base/entryway of the trench. There is a large amount of back dirt and stones piled east of Structure C-1, but Wallace did not observe any ceramics.

Structure C-20

Structure C-20 is the small eastern shrine in Courtyard C-3, on a hill 250 west of the South Acropolis. A single trench enters the western side of Structure C-20 and is oriented east. It is filled with a large amount of collapsed stone, rubble, soil, and treefall debris, making it impossible to get accurate length and depth measurements. Wallace estimated it to be about 6 m long, 2 m deep, and 1 m wide. There is a massive tree growing on top of the mound, with large roots penetrating Structure C-20. The upper portion of the trench reveals the interior of the structure consists of largely rubble fill and some cut stones. No ceramics were observed.

Group D

During the summer field season, Victoria Ingalls visited Courtyards D-1 and D-2, which are less than 300 m east of the South Acropolis. She documented two looters' trenches, one in each courtyard. The descriptions below are based on Ingalls' field notes and photographs, as well as lidar data.

Structure D-1

Structure D-1 is a 3.5-m high eastern shrine in Courtyard D-1. Ingalls verified that a trench identified in the lidar data pierces the western face of the mound. Ingalls could not determine if the looters abandoned the trench in progress or if a tunnel collapsed. No architecture or artifacts were visible.

Structure D-10

Structure D-10 is a 2.5-m tall mound on the eastern side of Courtyard D-2. It is situated near the southeastern corner of the courtyard, which is trapezoidal in plan. A single trench penetrates the back (eastern side) of the mound. This shallow trench resembles the one on Structure D-1. It is either collapsed or was never completed.

Possible Looters' Camp

During the initial reconnaissance of the site, the crew noted a metal drum adjacent to the old logging road that passes partway through the site. Further inspection in July revealed a weathered nylon bag and complete metate. We suspect that these materials are evidence of a temporary camp used by the looters (see Figure 3.7). Because the nylon bag has not completely disintegrated, we estimate the looting took place no longer than 30 to 40 years ago, presumably after Bowen & Bowen re-opened Gallon Jug in the 1980s.

DISCUSSION

Our April 2023 reconnaissance of Ayiin Winik allows us to make preliminary comparisons to other sites in the region, but, because our short visit did not allow time for chronological test pitting, our understanding of the site's chronology is woefully incomplete. In terms of site plan, Ayiin Winik is like other large ceremonial centers in the eastern Three Rivers region (see Houk et al. 2019). The site has a large plaza covering approximately 10,625 m^2, which is only 1,000 m^2 smaller than Plaza A-1 at Dos Hombres (see Houk et al. 2019:Table 5.5). The site's parapet-lined *sacbe* has analogs at Chan Chich, Laguna Seca, and BE-33 in the eastern Three Rivers region and La Hondradez and Chochkitam in the western Three Rivers region. However, the *sacbe* most closely resembles the one at BE-33, which extends

from the site core but does not connect to another architectural group. The double ball court at the site, however, is rare; the only comparable feature in the region occurs at La Honradez (see Houk 1996).

Although we do not yet have chronological data from Group A, future work may demonstrate that Ayiin Winik and Tikin Ha share much in terms of construction history. At Tikin Ha, Houk and colleagues (2019) found that the monumental architecture in the site core dated to the Late Classic period, with no evidence of antecedent construction in the plaza test pits. Inspections of looter's trenches in outlying residential groups, however, indicated longer construction histories. In one case, the team documented broken Early Classic vessels in a looted crypt within an apparent adosada platform on an eastern shrine structure. That same structure had a looted vaulted tomb of unknown age (Houk et al. 2019).

Another feature that Ayiin Winik and Tikin Ha share is that they both lack large temple-pyramids in their site cores. Large and long-lived sites like La Milpa, Dos Hombres, Chan Chich, and Punta de Cacao have temple-pyramids in their largest plazas. At Ayiin Winik and Tikin Ha, the public architecture seems decidedly more secular, with palaces and range buildings, draped, perhaps performatively, in elements of ritual architecture—large plazas, ball courts, and procession ways. Outside the core architecture at both sites are elite courtyards, many with eastern shrine structures. Our limited sample of artifacts from the two sites shows that some of these groups date back to the Early Classic period, and perhaps earlier.

In both cases, the site cores "feel" late and short-lived, while the surrounding elite groups demonstrate longer occupations. In other words, ancestor veneration, which is an important consideration in architectural evolution of many Maya site cores, does not seem to be a factor in the design of the main plazas at Ayiin Winik and Tikin Ha. Rather, the ancestors lie in older family shrines around the secular site core. Explaining this contradiction may reveal and perhaps answer new questions about Late Classic rulership in the region.

The avenues for future research at the site are many. Three obvious and basic avenues of investigation include chronological test pitting in Group A, which is needed to refine the chronology. Excavations at the monuments may also yield chronological data that the stelae and altars do not offer. Additionally, controlled excavations in the Southern Acropolis would generate new mortuary data and perhaps inform us about the rulers of Ayiin Winik.

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Salvaging Tomb 1 at Ayiin Winik (BE-30)

Victoria Ingalls, Mara De Gregori, and Brett A. Houk

Ayiin Winik (BE-30) is a major ceremonial center in the Rio Bravo terrace lowlands and is one of the largest previously unrecorded sites revealed by the 2022 lidar data. The site core comprises a large rectangular plaza flanked by monumental architecture, an unusual double ball court, a parapet-lined *sacbe*, and several large hilltop groups surrounding the main plaza. One of these outlying hilltop groups south of the main plaza is the Southern Acropolis in Group B. During the spring 2023 short season, BEAST planned to spend time at BE-30 excavating around possible monuments and cleaning looters' trenches to get chronological information about the site. However, we quickly realized the road would need substantial clearing to drive closer to the site. This effort meant we only spent about 12 hours total on site during the spring reconnaissance (see Houk et al., this volume). Our limited time line meant that instead of conducting any excavations, our effort focused on recording architecture, monuments, and looters' trenches. Towards that end, BEAST visited the Southern Acropolis (Courtyards B-1 and B-2; Figure 4.1), a monumental architectural group with a large stela on a hilltop south of the Main Plaza in Group A (for a full description, see Houk et al., this volume). Additionally, BEAST documented several looters trenches, including the largest in Structure B-1, a temple-pyramid that stands between Courtyards B-1 and B-2 (see Figure 4.1). Within the Structure B-1 trench and tunnel, initial exploration identified a vaulted tomb chamber.

BEAST returned to Ayiin Winik during the summer field season from June 28 to July 5, 2023. The lead author directed the excavations and documentation of the looted chamber, designated Ayiin Winik Tomb 1. Mara De Gregori, Brett A. Houk, Kaitlin Murphy, Nahaman Guitierrez, and Julian Vasquez assisted in the field. This chapter presents the results of the investigations of the Structure B-1 tomb.

STRUCTURE B-1 LOOTERS' TUNNEL

Structure B-1 is a roughly 10-m tall temple-pyramid in the center of Courtyard B-1 with its large stela, Stela 1, to the north, and the elevated and more restricted Courtyard B-2 to the south. During our spring site visit, BEAST documented two trenches in this structure; a small tunnel on the northwestern corner, and a large trench on its western face that becomes a tunnel cutting through the center of the building (see Houk et al., this volume; Figure 4.2). This L-shaped tunnel exposed three infilled rooms and a vaulted tomb chamber, as well as multiple construction phases (Figure 4.3). During their extensive excavation, the looters clipped the western side of the tomb chamber's vault and presumably took any materials present in the chamber. When BEAST first documented this tunnel in the spring, only the vault and very

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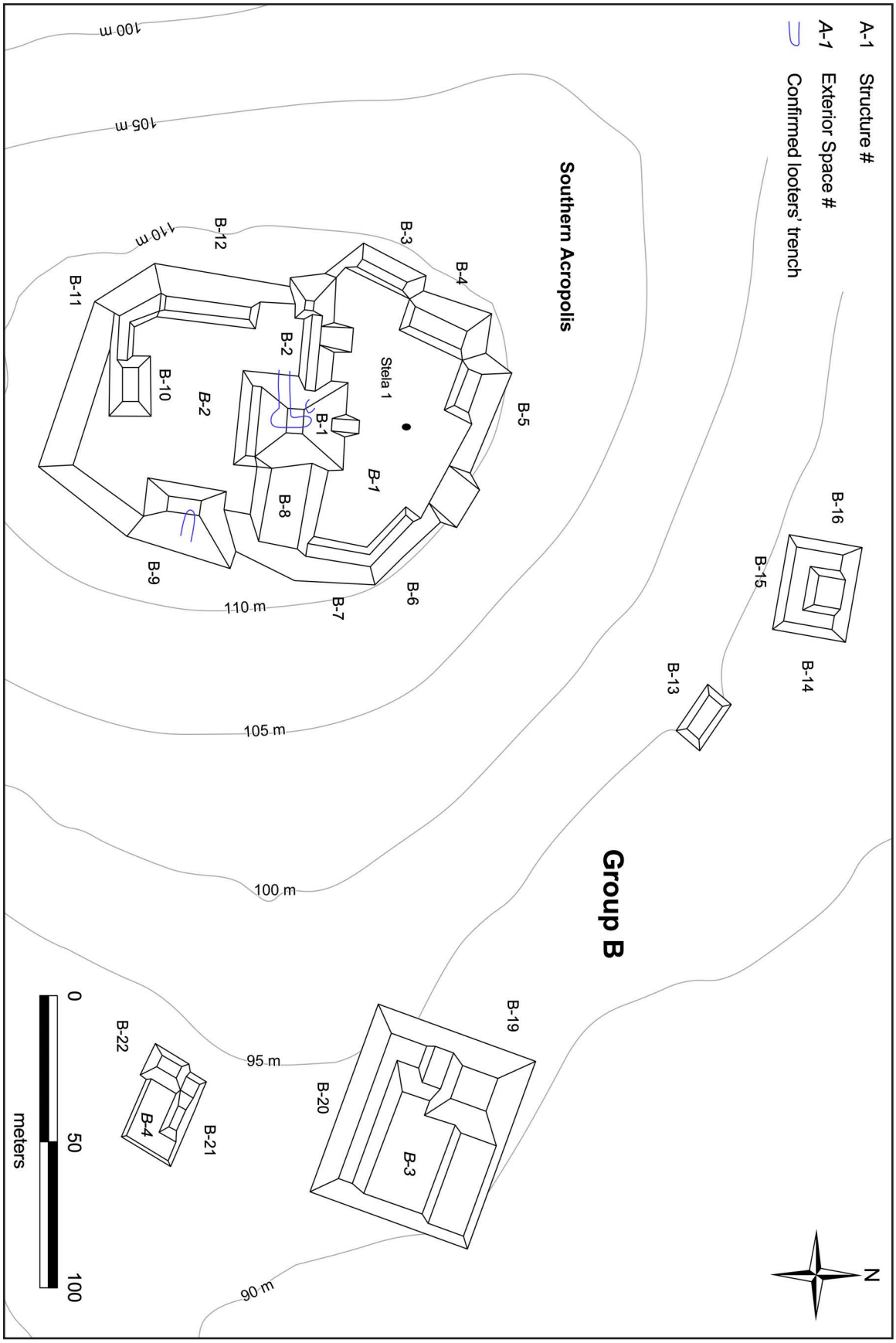

Figure 4.1. Location of Structure B-1 in the Southern Acropolis at Ayiin Winik.

Figure 4.2. Tunnel entrance. Camera facing east.

top of the tomb chamber's walls were exposed on the east side of the tunnel (Figure 4.4). At the time, we could see a wide horizontal band of red paint that runs around the chamber just below the vault as well as vertical red stripes in each corner (Figure 4.5). After looting the tomb, the looters then continued to tunnel northward, filling the chamber with their back dirt. Based on these initial observations and the exciting possibility of painted iconographic/hieroglyphic elements in the tomb, BEAST decided to return to this structure during the summer session to fully excavate the tomb and better document the structure's exposed architecture.

There are at least five major phases of construction at Structure B-1, including at least two and possibly three vaulted rooms and Tomb 1. Figure 4.6 shows the exposed architecture from the entrance to the looters' trench and is annotated to show the architectural sequence. We have so far refrained from giving these substructure numbers as our limited understanding of the building does not allow us to interpret the full construction sequence at this time. The first visible construction phase comprises small limestone cobbles and chunks in a wet-laid mud stabilizer capped with Floor 0, a thin, slightly ephemeral marl floor. The next episode of construction raised the level of the floor about 45 cm with dry-core fill capped by Floor 1. Floor 1 is a plaster floor about 10 cm thick and exploration of the tunnel, especially at the north end of the building, showed that it is burned in places. No walls or other architecture are present in the tunnel profiles on Floors 0 or 1. In the southeast corner of the looters' tunnel, Floors 0 and 1 were cut in antiquity, and, while the looters' excavation extended that direction, it did not hit another visible chamber or tomb. It is therefore possible another tomb or other cache still exists within Structure B-1.

Above this cut, Floor 2 along with Walls A (north-south) and B (east-west) were constructed. These make up the first and second

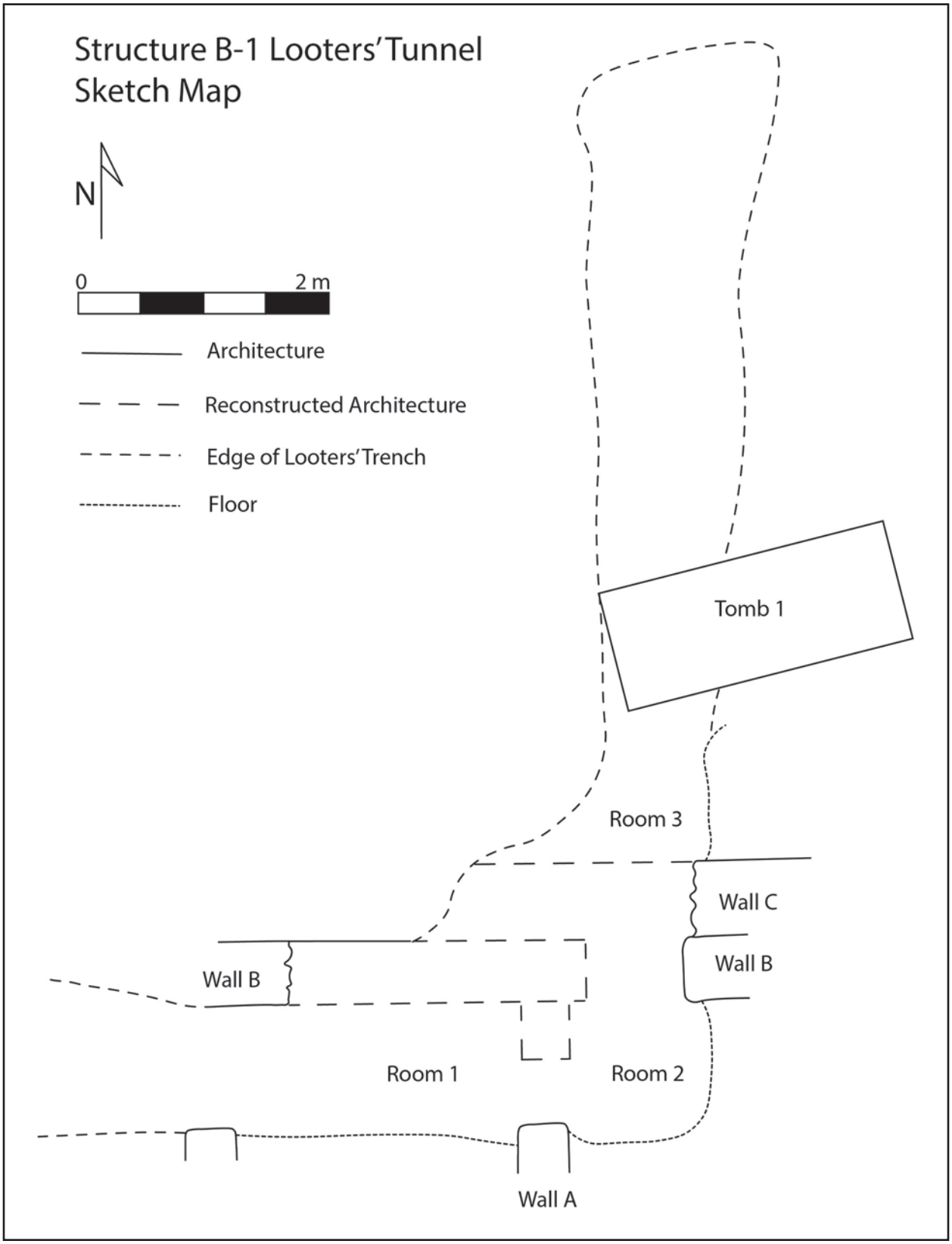

Figure 4.3. Sketch map of the looters' tunnel in Structure B-1 showing exposed architecture components.

Figure 4.4. Tomb vault as originally encountered in looters' trench. Camera facing north.

Figure 4.5. Tomb as originally encountered by BEAST crew showing painted bands. Camera facing east.

rooms as you enter the tunnel. It appears that when first entering the building, the looters hit a room (Room 1) which had mostly collapsed. The western, outer wall, of the building is only partially preserved but shows that Room 1 measured 2.25 m east-west. The looters removed the northern wall (Wall B) in Room 1, leaving a negative imprint in what we interpret to be the core fill of Wall C, described below (Figure 4.8). Entering the fill or collapse debris filling Room 1, they hit a west-facing doorway in Wall A leading into Room 2 (Figures 4.7 and 4.8). These are vaulted spaces with plastered walls and floor, and the Maya had filled Rooms 1 and 2 in antiquity. The looters removed the doorway's lintel, as well as several courses of cut stone above the doorway. The southern jamb (Wall A) between Rooms 1 and 2 is intact with slightly rounded corners and is plastered on both the east and west faces. There is a cord holder on the west facing side of Wall A (see Figure 4.6), indicating Room 1 was likely an interior space. The plaster on the walls lipped down to Floor 2, which extended across this room and into the next room to the north. Faint bands of red paint are visible along the top and bottom of the walls.

Walking east from Room 1 through the doorway in Wall A, one enters Room 2. In Room 2, the looters initially began excavating to the southeast, where the cut in Floors 0 and 1 is visible (see Figure 4.6). However, this effort was abandoned, possibly because the looters saw a sealed doorway in Wall B and turned their excavations to the north. The looters removed the portion of Wall B (which runs east

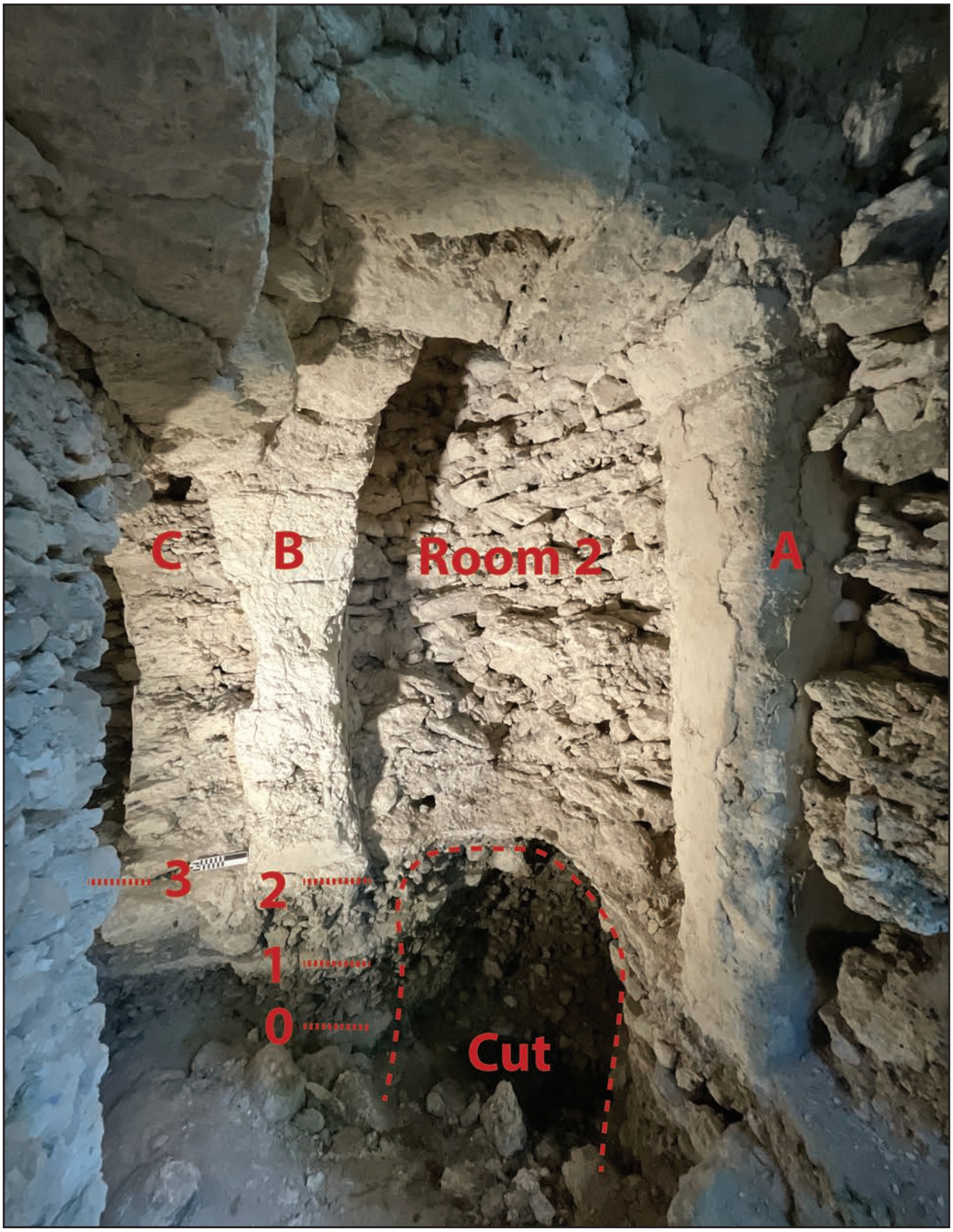

Figure 4.6. Exposed architecture from tunnel entrance annotated to show the construction sequence. Camera facing east.

Figure 4.7. Walls B and C. Camera facing east-northeast.

Figure 4.8. Work photograph showing the negative imprint of the Wall B, which was removed by the looters, exposing the wall core of Wall C. Julian Vasquez is standing in Room 2, the floor of which, Floor 2, is visible above him. Camera facing east/northeast.

west and forms the northern side of the room) east of the tunnel. What is visible now is the negative imprint of the wall where it used to meet a later addition (Wall C; see Figure 4.8), described below. The area the looters cleared out within Room 2 is just over a meter square by about 2.5 m in height.

Turning to the north, you pass through a doorway in Wall B that had been sealed in antiquity and enter a third room (Room 3). Like the western entryway to Room 2, this 50-cm-thick jamb in Wall B had slightly rounded corners and was plastered (Figure 4.6). At some point in the past, the Maya sealed the doorway and refurbished the interior of Room 3, adding the 60-cm-thick Wall C and replastering the floors and new walls. Bands of red paint are again present at the top of the wall where it would have met the vault/ceiling (Figure 4.9). On the plaster of Wall C on the east side of the looters' tunnel, faint, scratched graffiti can be seen across the surface. BEAST noted two identifiable designs—a patolli board and a human face in profile (Figures 4.10 and 4.11). The face was more deeply etched than the patolli board, and the eye and mouth look as if they have been redrawn several times. The patolli board was very faint and difficult to photograph with the equipment at hand. There were several other lines and possible circles in the plaster surrounding the board. With better lighting, it may be possible to discern additional elements and motifs across the wall.

Figure 4.9. Red paint on top west side of Wall C. Camera facing south.

Figure 4.10. Patolli board graffiti on Wall D. Camera facing south.

Figure 4.11. Graffiti face on Wall C. Camera facing south.

Continuing to the north and just over 3 m from the tunnel entrance, looters intersected the western end of a roughly east-west oriented vaulted tomb chamber (see Figure 4.4). The chamber was filled with backdirt from the northern end of the tunnel, which the looters excavated after encountering and presumably robbing the tomb of most of its contents. The tomb chamber was a later addition to the structure, built during or after Rooms 2 and 3 were infilled. Floors 1 and 2 were cut on either side of the tomb, and the space above was filled. The cut in the floor is approximately 2 m wide, while the tomb chamber itself is about 1.1 m in width. The stones forming the tomb chamber's vault are extremely crude and roughly shaped. From the tunnel, two lenses of chert flakes are visible in fill immediately above the top of the vault (Figure 4.12). No formal tools or eccentrics were observed. The chert appears to be mostly non-local brown material. The first/lower layer of lithics was laid directly on the vault stone and covered by about 10–15 cm of fill, with the second layer of lithics deposited above. This was then covered by the rubble and limestone fill that comprises the rest of the structure in this area.

The looters' tunnel continued another ~4 m north of the tomb chamber (see Figure 4.4) and revealed that Floor 2 and possibly Floor 1 extend across the whole exposed portion of the structure. At the very northern end of the tunnel, the looters hit a series of large cut limestone blocks that may be the back of a staircase on the northern face of the building. Their excavation stopped there. Although currently stable, given the extent of the tunneling, it is very likely

Figure 4.12. Chert deposits above Tomb 1 vault. Camera facing east.

that the building will become unstable at some point in the future. Additionally, it makes future archaeological exploration of the structure difficult without risking collapse.

EXCAVATION OF STRUCTURE B-1 TOMB 1

In the summer season, BEAST team members Victoria Ingalls and Mara De Gregori, assisted on different days by Houk, Murphy, Guitierrez, and Vasquez, undertook salvage excavations of the looted tomb, designated Suboperation (Subop) AW-01-A. As the looters had used their backdirt from the remainder of the tunnel to fill the tomb, our first step was to remove the backfill in the chamber. Given the amount of bat guano, this required respirators and other personal protective equipment, and timed rotations for team members in and out of the cramped space.

Archaeologists found that the backdirt was heavily mixed and fairly uniform throughout, a light grayish matrix with lots of small to medium sized limestone cobbles, consistent with fill in the trench profile. There were several large cut limestone blocks from the fill that likely came either from the tomb's vault or the architecture from the structures above.

We had hoped that, given the red painted bands we initially observed along the top and corners of the wall, there would be hieroglyphic or iconographic elements painted on the walls. Dared we hope it would be another Rio Azul style chamber? We dared! As excavation progressed, however, it became clear that there were no painted motifs in the chamber. The horizontal red bands extend around the top and bottom of the entire chamber, and vertical bands ran down each corner and in the center of the north and south walls, dividing the walls into six panels (Figures 4.13–4.17). Although the floor was heavily deteriorated and burned in places, parts of the floor appear to have originally been painted red as well.

The walls are covered in a crude and quickly applied mud plaster of uneven thickness. Brush strokes were visible in the surface of the plaster, as well as in the red painted areas. Given the variable thickness of the plaster, several areas had broken off and fallen away, exposing the fill behind. Some of this damage we believe to be caused by the looters, as several broken sections were where large stones in the backfill were resting against the walls. However, at least some of this damage happened prior to the tomb being sealed in antiquity as the red paint extended over the exposed fill in several sections, but the plaster was not repaired.

Once fully excavated, the chamber itself is approximately 1.1 m north-south by 2.5 m east-west and is 2.03 m from the floor to the top of the vault (Figure 4.17). From the floor to the spring of the vault is about 1.25 m, and the vault itself is roughly 80 cm tall. Each of the red painted bands is about 23–26 cm in width, dividing the walls into roughly 80 cm high by 100 cm wide cream-colored panels.

On the northern and southern walls, where the wall meets the vault, are two small niches approximately 10–15 cm high and 30–40 cm wide (Figure 4.18). These niche openings extend back into the dry core fill and show a likely wet-laid mud-limestone matrix around a smoothed negative space. The plaster and horizontal red stripe extend over the sill of both niches. We believe the niches represent voids left by wooden vault beams, which rotted away long ago. On the west side of the chamber where the looters removed the vault, there were matching depressions along the top of the wall, suggesting there would have been three of these beams across the top of the chamber.

Similar to what we observed in the tunnel profile, there were very few artifacts recovered

Figure 4.13. Orthomosaic of Tomb 1 north wall.

Figure 4.14. Orthomosaic of Tomb 1 south wall.

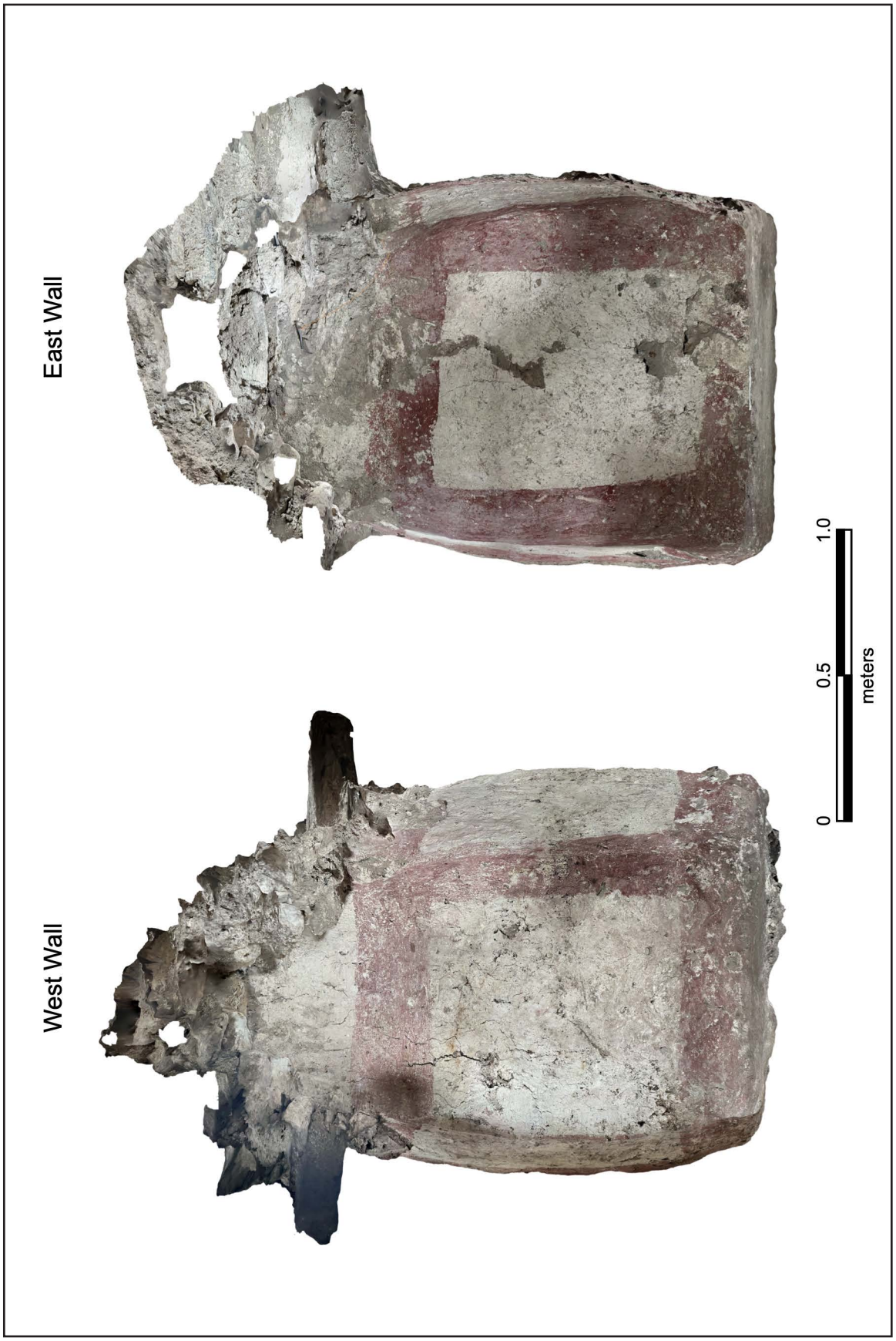

Figure 4.15. Orthomosaics of Tomb 1 east and west walls.

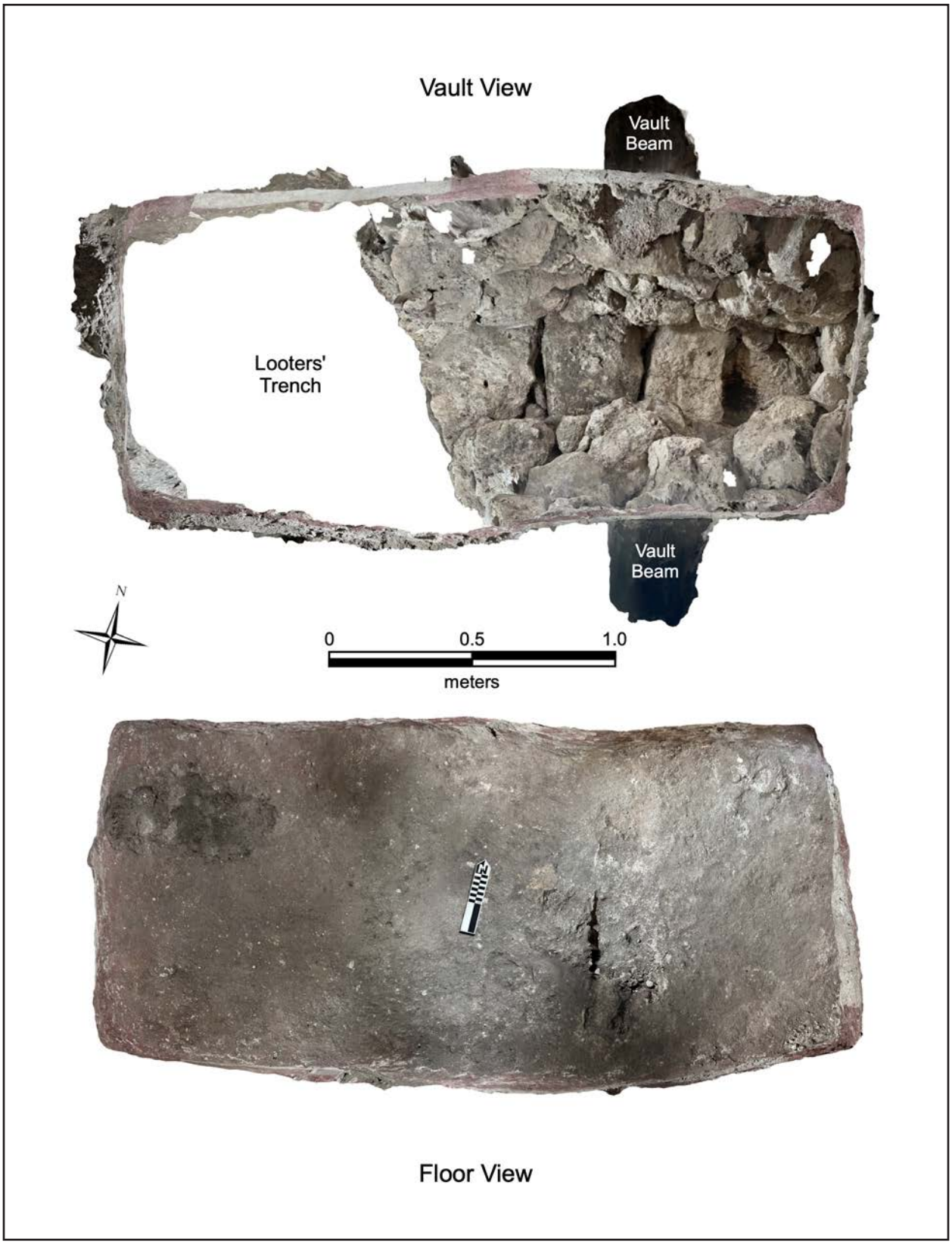

Figure 4.16. Orthomosaics of Tomb 1 vault and floor.

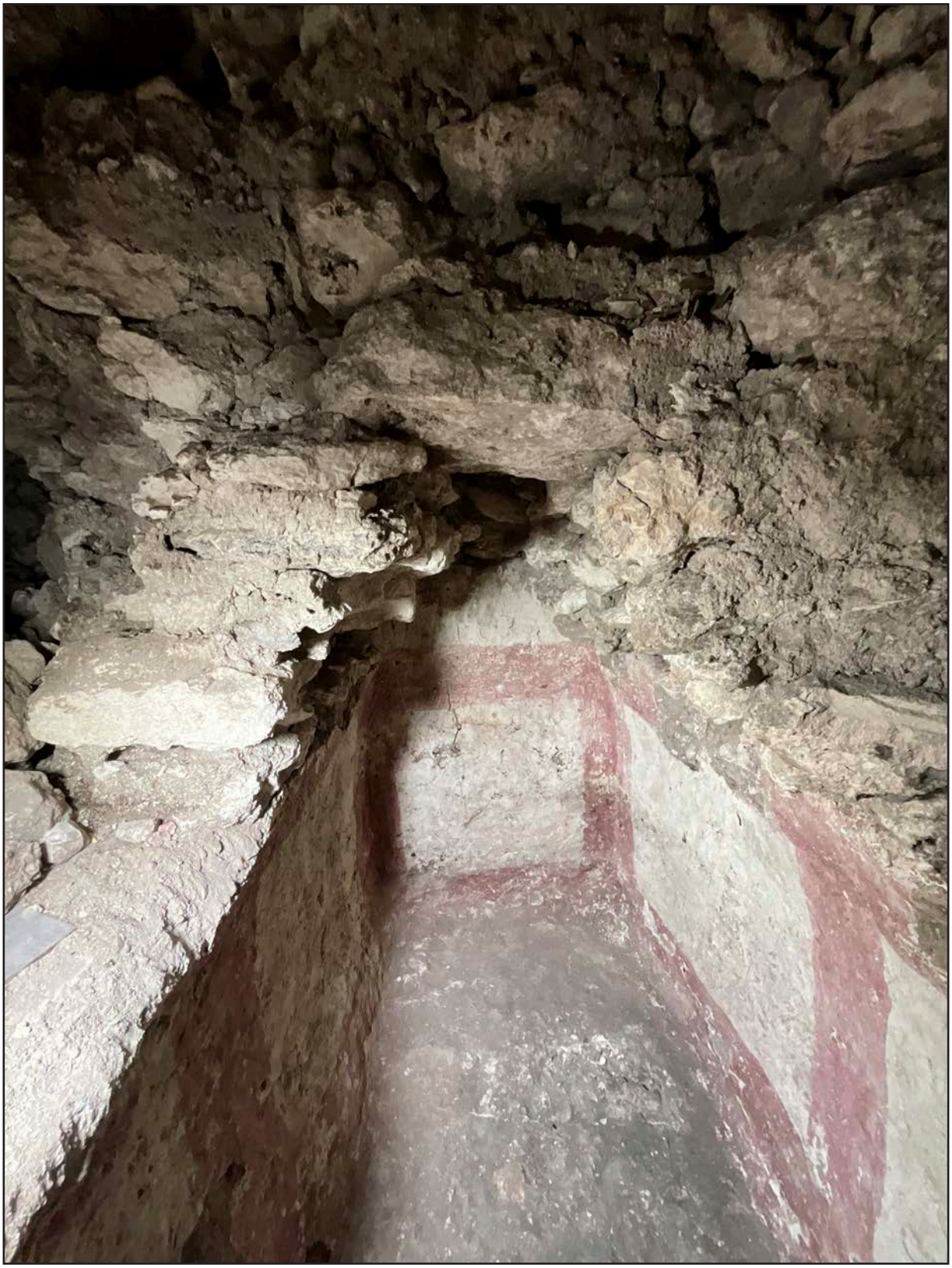

Figure 4.17. Fully excavated tomb chamber. Camera facing east.

Figure 4.18. Vault beam imprint on southern wall. Camera facing southwest.

from the fill inside the tomb. Ceramic sherds (n=328) are small, mostly less than 5 cm in size, although several large jar rims were also recovered. There was one rim sherd likely from a lid or other flat-disk (possibly a mirror back?) that was plastered and painted a light turquoise-green color (Figure 4.19). Unfortunately, this was an isolated example, and most of the ceramics were undiagnostic body sherds, and all appear to be from fill. Lithics were abundant throughout the fill (n=1,151) and are mainly tertiary flakes most likely from the lithic layers above the tomb vault.

Figure 4.19. Plastered and painted sherd from Tomb 1. Scale bar in centimeters.

As excavators came down on the tomb's floor, excavations slowed, and we took additional precautions in case there were any human remains still present. We used a fine mesh to screen the sediment from about 5 cm on top

of the floor. The looters had certainly cleaned out the tomb, and the floor appeared rough, possibly trampled or weathered. Excavators found very few materials on the western side of the chamber; these included lithic flakes and small ceramic sherds. In the northwest corner of the chamber is a mound of a dark unknown mastic substance. This was very dense and could not be removed by excavators; it may be the remains of a termite nest or similar feature.

In the center and east side of the tomb, the soil directly above the floor was much darker in color, like it was highly organic and/or had been burned (Figure 4.20). The plaster floor in this area was also discolored gray, suggesting burning. We observed a few small flecks of carbon, but these were too small to collect.

Excavators found human remains in the form of clusters of heavily fragmented bone and teeth exclusively in the tomb's eastern half. Roughly 60 cm west of the eastern wall, archaeologists found a rough cut in the tomb's floor. The human remains were clustered in and around this cut, which appeared heavily trampled, likely by the looters. Identifiable remains include several distal phalanges and eight adult teeth. The teeth include four incisors, one canine, one premolar crown, one molar crown, and one molar. All of the incisors and the canine are filed flat and have drill holes for inlays (Figure 4.21); one incisor is inlaid with jade and one with hematite, while the others no longer have their inlays. Other material in the cut includes small fragments of marine shell, about 20 small Sierra Red sherds, and 18 jade beads. The jade beads are all small, biconically drilled disks or tubes (Figure 4.22) that were clustered around the teeth in such a way to suggest they were probably strung on a necklace or around the neckline of a garment. These are the only artifacts left by the looters directly associated with the primary individual in the tomb. While we cannot know for sure, we surmise that the individual buried in the tomb lay with his or her head to the east.

Once excavations of the tomb were completed, BEAST scanned the chamber with an iPhone 14 Pro using the Scaniverse app to create a 3D model. De Gregori took 360° photographs, and Houk took 214 iPhone photographs, which he used to create a Structure from Motion model of the room in Metashape. The orthomosaics in Figures 4.13–4.16 derive from that model.

DISCUSSION

It is extremely unfortunate that the tomb had been looted and Structure B-1 so heavily damaged. The extensive tunneling done to the building will make any research and excavation in the future difficult. However, it did give archaeologists a glimpse into the site's early history.

Although lacking any iconographic motifs on the wall panels, the painted bands and corners of Structure B-1 Tomb 1 resemble the art in 12 Early Classic tombs at Rio Azul (Adams 1999; Hall 1989). Notably, Rio Azul Tomb 1 has nine red painted panels with hieroglyphic texts and iconographic motifs (Adams 1999:82; Hall 1989). Each of the white panels is framed by a thick red band. Researchers at Rio Azul also identified three layers of chert debitage in the fill above that tomb (Hall 1989:89). Furthermore, the use of chert and/or obsidian flakes to cap tombs is an Early Classic practice documented at other sites in the Three Rivers region (Houk and Valdez 2011). These stylistic similarities with the Ayiin Winik B-1 tomb suggest that this chamber likely dates to the Early Classic period.

The Ayiin Winik tomb also appears hastily constructed. The vault itself is made out of crudely shaped stones of varying sizes. Additionally, the walls are roughly covered in a mud plaster that was not smoothed or well finished. Brush strokes and smear marks can be seen across the walls. A thin coat of streaky red paint forms the borders, which also look like

Figure 4.20. Tomb floor, facing east and showing dark, discolored area and cut where human remains were recovered. Camera facing east.

Figure 4.21. Sample of teeth from the floor of Tomb 1 showing inlays and modifications (Lot AW-01-A-02).

Figure 4.22. Five of the 18 jade beads found with the human remains in Tomb 1 (Lot AW-01-A-02).

they were quickly applied. In some places, the crude plaster had broken away from the wall, and the tomb's builders simply painted over the underlying material again indicating there was not an effort to repair the plaster but rather a quick, slap dash effort to complete the tomb.

The likely Early Classic date of the tomb indicates that the architecture and floors cut to place the tomb are earlier. Combined with the cut stone architecture and thick floors associated with Rooms 2 and 3, the small cobble fill at the north end of the tunnel, and the Sierra Red sherds in the tomb fill, we believe these earlier construction phases are likely Late Preclassic. This suggests exciting research potential in exploring these early architectural phases, especially given the presence of graffiti on one of the plaster walls. This data could also suggest that while the site does not have a visibly early layout, orientation, or architecture, there was a substantial center here during the

Preclassic that deserves further exploration (see also Houk et al., this volume).

Future research at Structure B-1 could be difficult given the extent of tunneling. However, a better understanding of the building's chronology and architecture could tell us much more about the Preclassic and Early Classic occupation and political standing of Ayiin Winik within the region. The presence of the large stela and Late to Postclassic artifacts on the north side of Structure B-1 (see Houk et al., this volume) further suggest this was a persistent place in the community, likely serving as a focal point for ritual and/or political power for centuries.

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The 2023 Investigations at Chan Chich and Tiho'witz

Tomás Gallareta Cervera, Mara De Gregori, Anna DesHotels, and Brett A. Houk

In 2023, the senior author directed a field assessment of lidar data and excavations at Chan Chich (BE-01) and Tiho'witz (BE-33), a previously unrecorded site located near the Gallon Jug south gate. At various points in the season, two suboperation directors, Mara De Gregori, and Anna DesHotels, assisted in the field, as did the project director, Brett A. Houk. Finally, a rotating team of local workers operated as trailblazers and excavators.

At Chan Chich, the lidar data revealed several unrecorded features beyond the previously mapped limits of the site. To bring these new features into the site numbering system, we extended Group E to the west and south and defined Group I to encompass the structures on the north side of an unnamed creek, which separates Groups G and I (Figure 5.1). These include a possible E Group, a hilltop group with a possible monumental ramp, and a cluster of courtyard groups sharing a small hill in the *bajo* southwest of the site core. During this season, we focused on field assessment and exploration, through excavation, of some of these newly discovered features. Specifically, we aimed to excavate at Courtyard E-8 and Courtyard I-1, southwest and east/northeast, respectively, of the Main Plaza.

Courtyard E-8 is a modified hilltop 900 m southeast of the Main Plaza and 515 m south of Norman's Temple (Figure 5.2). It consists of a square plaza atop a hill with several low mounds and an elevated, attached platform on its western edge. The southern edge consists of a possible monumental ramp that runs from the south edge of the plaza downhill for a horizontal distance of 185 m. West of Courtyard E-8, the lidar identified an additional area of interest, which consists of a low hill in the *bajo* that separates Chan Chich and Kaxil Uinic to the west. Situated about 500 m west/southwest of Norman's Temple, this hill contains four formal courtyard groups.

Plaza I-1 is a possible E Group 1.9 km northeast of the Main Plaza (Figure 5.3). While E Groups are common in the Belize River Valley to the south and in the Petén to the west, they are rare in northwestern Belize. If identified, Plaza I-1 will be the first confirmed E Group in our permit area, although other possible E Groups have been identified in the lidar data.

Tiho'witz (BE-33) is a previously unregistered site that became known after the lidar analysis concluded. The site is extensive, consisting of multiple courtyards, four on top of 20-m high hills, a main plaza, a ball court, and a parapet-lined *sacbe* (Figure 5.4). The site has a small central plaza almost entirely encircled by 20-m high hills. The plaza has a 12-m high temple on the east and a 10-m high range building on the south. The plaza's platform extends south of the range building and supports a north-south oriented ball court with 5-m high mounds. Small courtyards crown the surrounding hills.

Gallareta Cervera, Tomás, Mara De Gregori, Anna DesHotels, and Brett A. Houk
2023 The 2023 Investigations at Chan Chich and Tiho'witz. In *The 2023 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 95–118. Papers of the Chan Chich Archaeological Project, Number 16. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

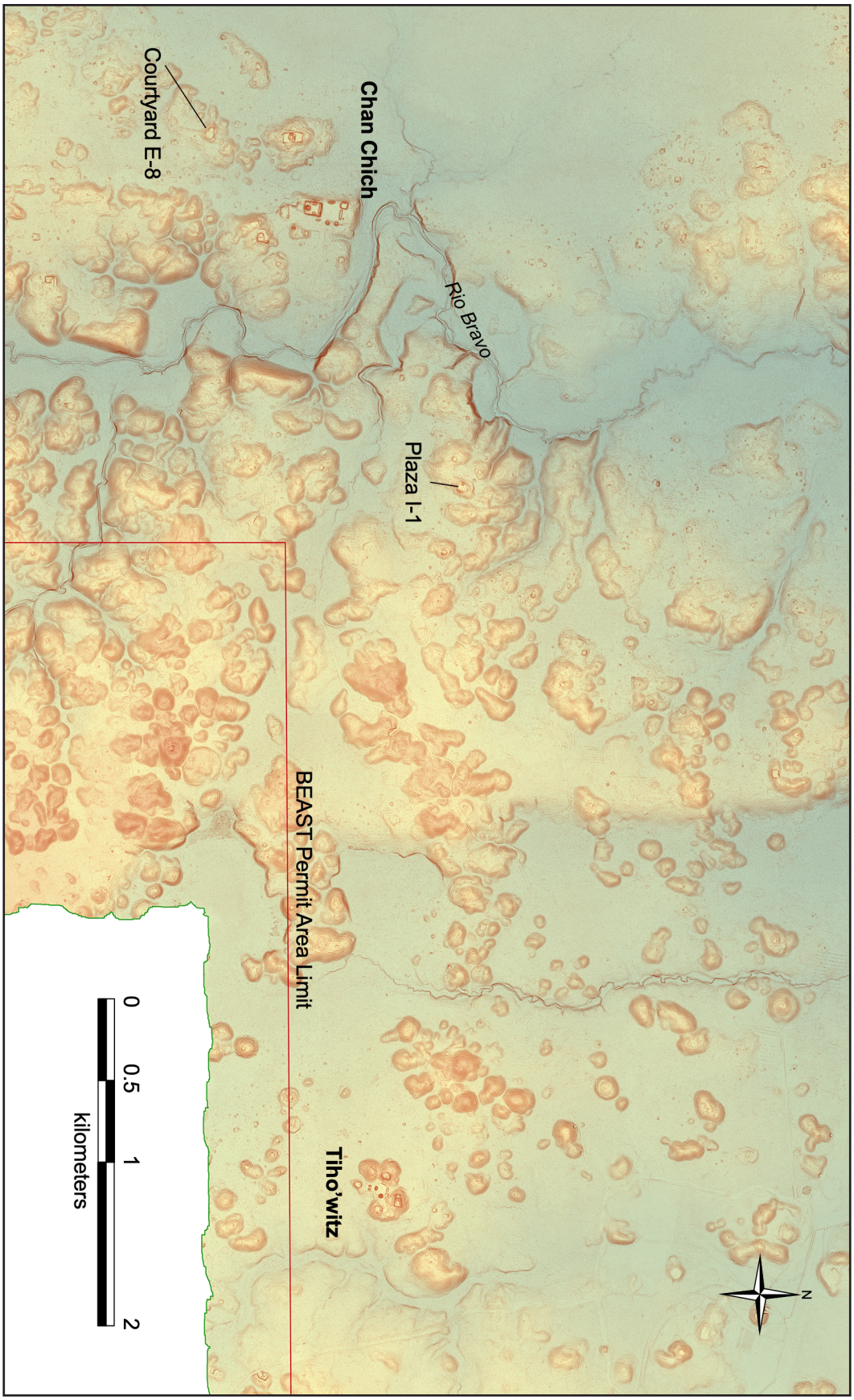

Figure 5.1. Lidar image showing the locations of Groups E-8 and I-1 at Chan Chich and the site of Tihowitz.

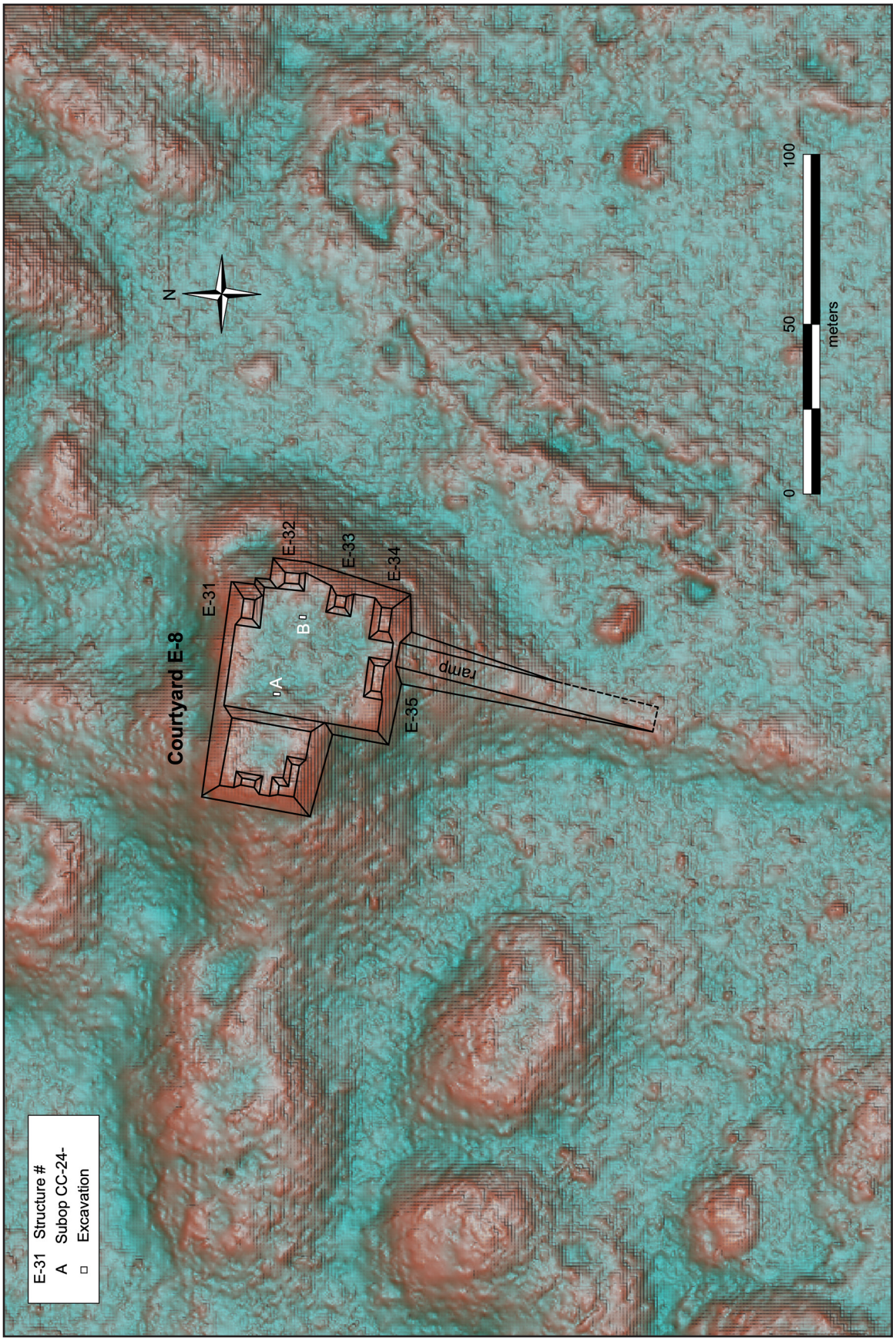

Figure 5.2. Malerized version of Courtyard E-8 on a lidar-derived simple Red Relief Image Map (sRRIM).

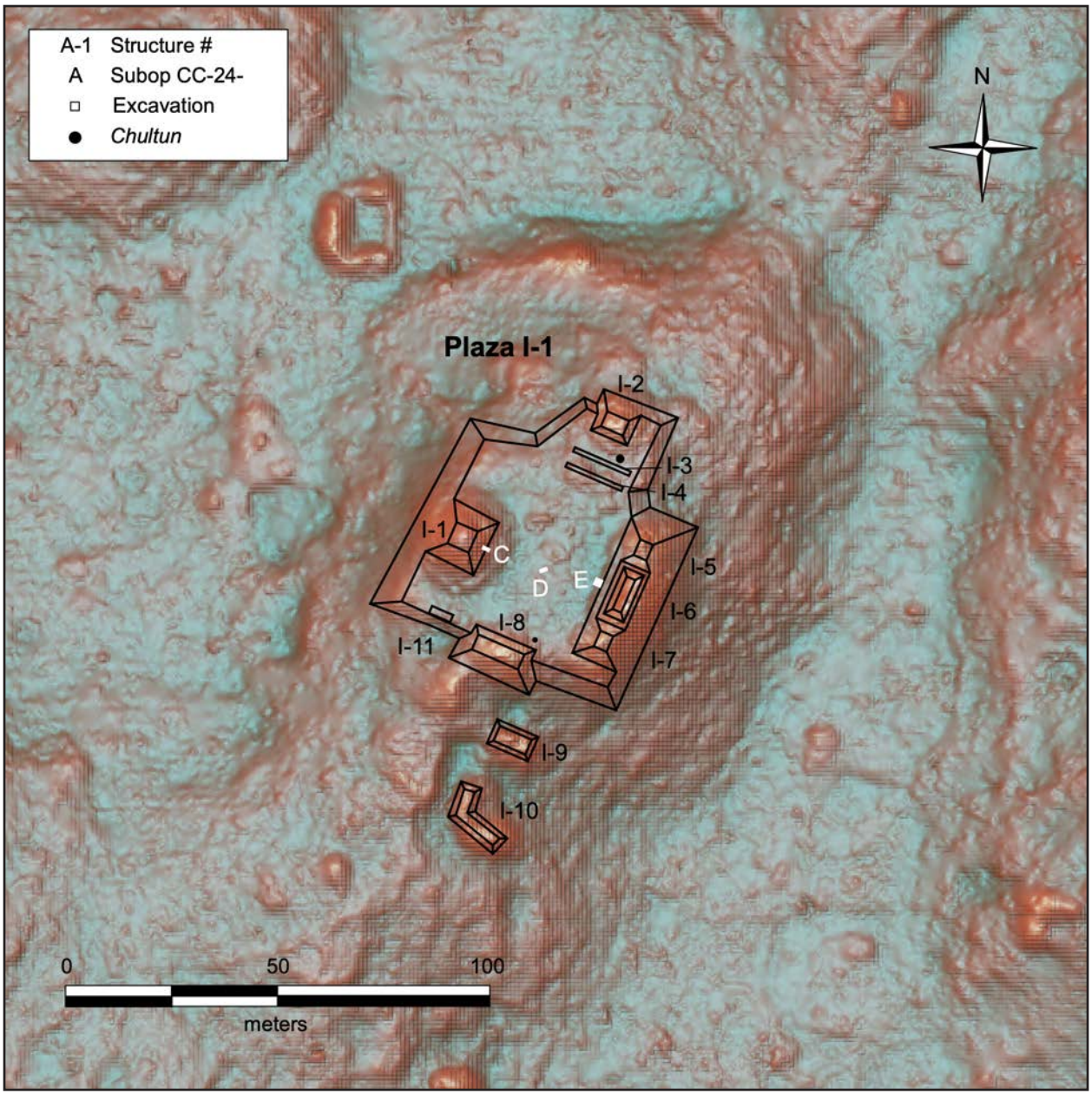

Figure 5.3. Malerized version of Plaza I-1 on a lidar-derived sRRIM.

A 325-m-long *sacbe* enters the plaza from the south; it appears to be an elevated platform with low parapets on each side. A similar but shorter feature connects the plaza to the courtyard on the hill to the north.

Naming a new site is difficult, so the crew generated a poll to be democratic in the name choosing. Some of the names included Jo'l Wit'z (Five Hills), Thundering Tapir, Place of the Flies, Luúbulche (Fallen Tree), The Silent Place, Donto Tonto, and the Didley Squat site, to name a few. While the poll showed that "Thundering Tapir" was a clear favorite among the crew, the principal author decided to veto it since he found it undignified for the site. After suggestions from colleagues Kat Brown and Jason Yaeger, we decided to call the site Tiho'witz (Five Hills). Dr. Mary Kate Kelly was kind enough to assist us with the Cholan spelling of the name.

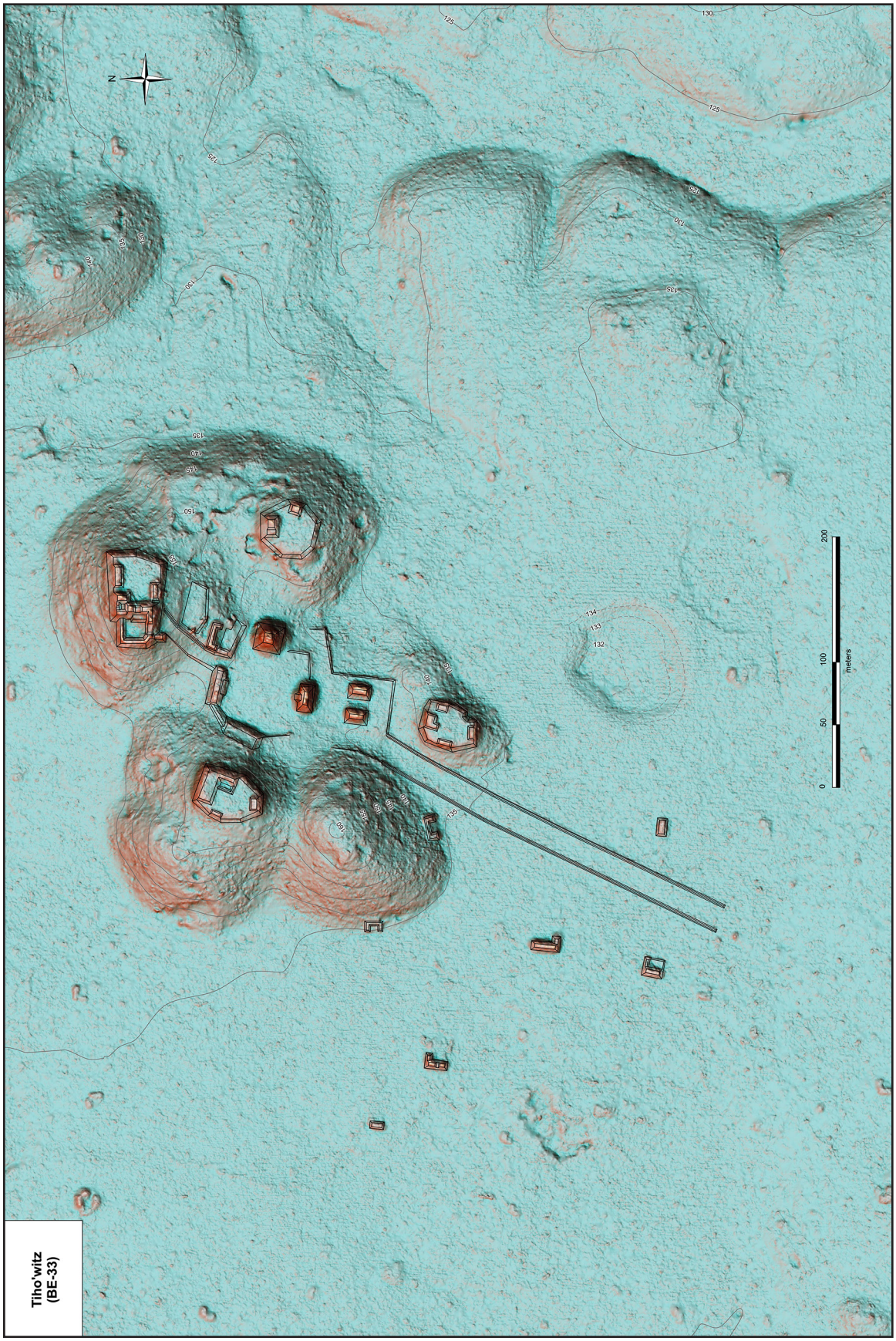

Figure 5.4. Malerized version of Tiho'witz (Be-33) on a lidar-derived sRRIM.

PREVIOUS INVESTIGATIONS AT THE PERIPHERY OF CHAN CHICH

Research on the rural areas surrounding the Chan Chich site has yet to be a priority. Our questions have traditionally focused on the rise of urbanism and kingship in the Preclassic and Early Classic Periods. Due to this, most of our excavations have focused on the site center, specifically the Upper, North, and Main Plazas and Norman's Temple. In the past, we have approached the rural areas of the site while exploring household activities and their relation to the site center rather than focusing on a concrete research question. Excavations outside Chan Chich's core area include research at Courtyard D-4 (Kilgore 2018), Structure D-36 (Booher et al. 2015), and Group H (Meadows and Hartnett 2022)

RESEARCH METHODOLOGY

Analysis of the lidar data from our permit area was able to register and uncover hundreds of structures and archaeological sites that were previously unrecorded. Our objectives during this archaeological season focused on Chan Chich's rural areas and Tiho'witz. Our objectives were as follows:

- Assess the lidar data at Courtyard E-8, Courtyard I-1, and Tiho'witz. This activity includes creating trails to the sites, using machetes to reduce our deforestation impact, and locating and corroborating archaeological features displayed in the lidar imagery.
- Create Malerized maps of Courtyard E-8, Plaza I-1, and Tiho'witz, including buildings, topography, and special features such as stelae and altars.
- Carry out chronological test pitting to recover basic chronological information about the sites.
- Determine if the Courtyard I-1 is an E Group.
- Describe and characterize the structures located in the rural parts of Chan Chich.
- Describe and characterize the main structures and groups of site Tiho'witz.

To field assess features at the sites, we loaded three high-definition hillshades derived from Digital Elevation Models (DEM) produced by one of our GIS specialist, Ray Wallace, into our smartphones. We view the hillshades using Avenza, a free iPhone application designed to view and navigate high-definition maps while offline (Figure 5.5). Moreover, the app allowed us to annotate the hillshades and drop pins, name features, calculate the arrival time and distance, and trace back our steps. A team of at least three people, including a navigator with the uploaded map, a machete-wielding trailblazer, and a flagger to mark the route, cut trails across the jungles until we reached the sites.

After arriving at the sites, the teams inspected their main architectural features and compared them to the lidar imagery. Afterward, the team drew a rectified map, or Malerized map, of the group over the hillshade and assigned numbers to all structures and monuments that were previously unregistered. After the sites were located, inspected, and fully registered, the team placed test pits in central areas, mostly plazas or courtyards, at the sites to recover chronological information. Most test pits measured 1 x 2 m and were in the group's center to collect diagnostic pottery. We visually sorted the matrix from the test pits rather than screening it.

CHAN CHICH (OPERATION CC-24)

Field assessment and excavations at Chan Chich in 2023, designated Operation (Op)

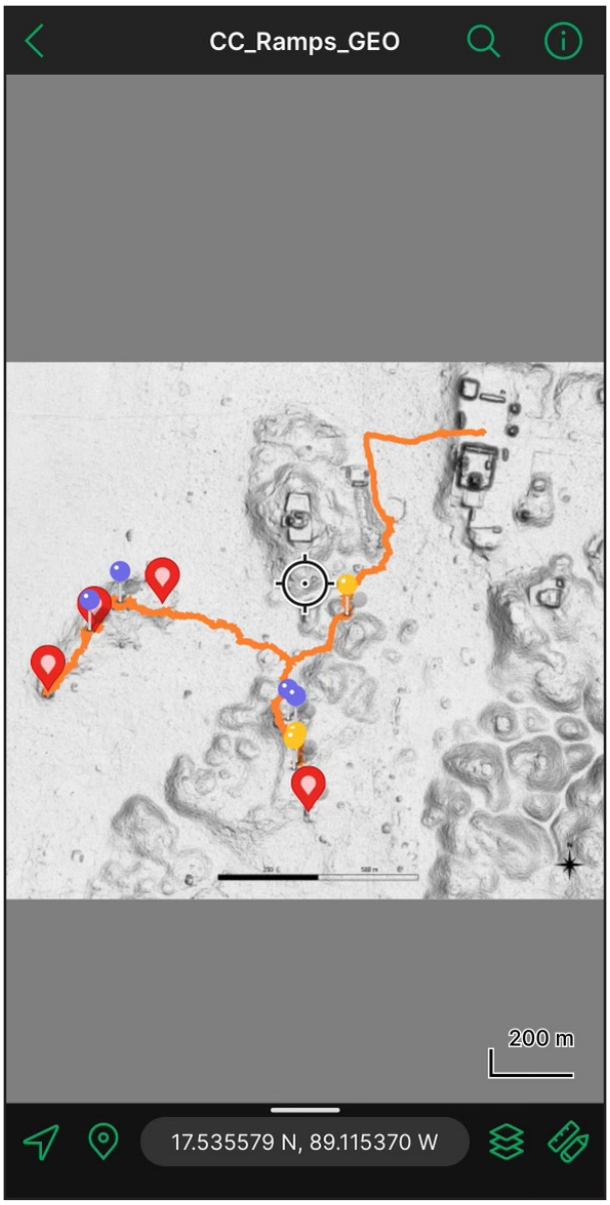

Figure 5.5. Example of hillshade annotations and navigation using the Avenza app.

CC-24, focused on Courtyard E-8 and Courtyard I-1. Excavated suboperations were all chronological test pits located on central plazas. We excavated two suboperations (Subops CC-24-A and CC-24-B) at Courtyard E-8, a possible farming outpost or market. Courtyard I-1, located 1.9 km northeast of the Main Plaza, was explored with three suboperations (Subops CC-24-C, -D, and -E).

Field Assessment at Courtyard E-8

Our initial field assessment expedition commenced with Courtyard E-8. The group is located 500 m south of Norman's Temple in a cluster of low hills east of the large *bajo* separating Chan Chich from Kaxil Uinic. After a full day of trailblazing, we reached the central group on top of the hill. The area was heavily forested, with many fallen trees and debris from Hurricane Lisa (Figure 5.6). Verifying the main features shown on the hillshades was challenging in these conditions and took more time than previously projected. However, we could discern and register the group's basic features that were still *in situ*. The courtyard was built on top of an artificially leveled hilltop overlooking the adjacent *bajo* to the west. The courtyard's surface measures approximately 40 m east-west and 45 m north-south and includes five structures (Structures E-31 to E-36) measuring between 1 and 2 m tall on the eastern and southern edges. There is a 1.5-m tall platform, measuring approximately 25 x 25 m, attached to the northwestern corner of the courtyard. The lidar data show low (less than 1 m high) mounds on the southern and western sides of this platform and a possible 0.25-m high mound or wall on the northern edge. We did not inspect this area due to dense vegetation, and these mounds have not been assigned numbers yet. The numbered structures include three mounds on the courtyard's eastern edge (Structures E-31, E-32, and E-33) and two mounds on the southern of the courtyard (Structures E-35 and E-36). Our chronological test pit excavation in Courtyard E-8 consisted of two suboperations: Subops CC-24-A and -B.

Structures E-35 and E-36 seem to frame an opening to the courtyard via the possible ramp. We found this feature challenging to evaluate because of the dense foliage and fallen trees obstructing the view. Additionally, due to time constraints, we could not excavate the ramp for chronological data during this season.

Figure 5.6. Hori Monroy (left) and Lusbin Monroy hiking past one of the many large trees that fell due to Hurricane Lisa.

Based on our understanding of the courtyard, we presume that the ramp might be a natural feature that has been modified artificially.

Subop CC-24-A

We excavated Subop CC-24-A in a 2-x-1-meter test pit at Courtyard E-8's approximate center (Figure 5.7). The unit was composed of three deposition events: topsoil (Lot CC-24-A-01), construction fill (Lots CC-24-A-02, -03, and -04), and sterile paleosol (Lot CC-24-A-05) before reaching bedrock (Lot CC-24-A-06). The topsoil was dark brown mixed with numerous small rocks, very typical of the area. Underneath it, we found an immediate layer of soft brown soil with small pebbles and medium amorphous rocks, identified as the platform construction fill. As we excavated the construction fill, we noticed that the size of the rocks increased as we got closer to the bedrock. We also observed that the eastern part of the unit had larger rocks compared to the western part (Figure 5.8). Based on this observation, we decided to halt excavation on Lot CC-24-A-04 and concentrate on the western side of the unit. We reached the conclusion that the larger rock fills on the western side may have been incidental to the platform filling and not a distinct architectural feature. There was no evidence of a stucco floor, which was possibly not preserved. We, of course, must consider the possibility of a compact dirt floor. The construction fill was about 1.5 m thick, so we excavated it in three layers. The construction

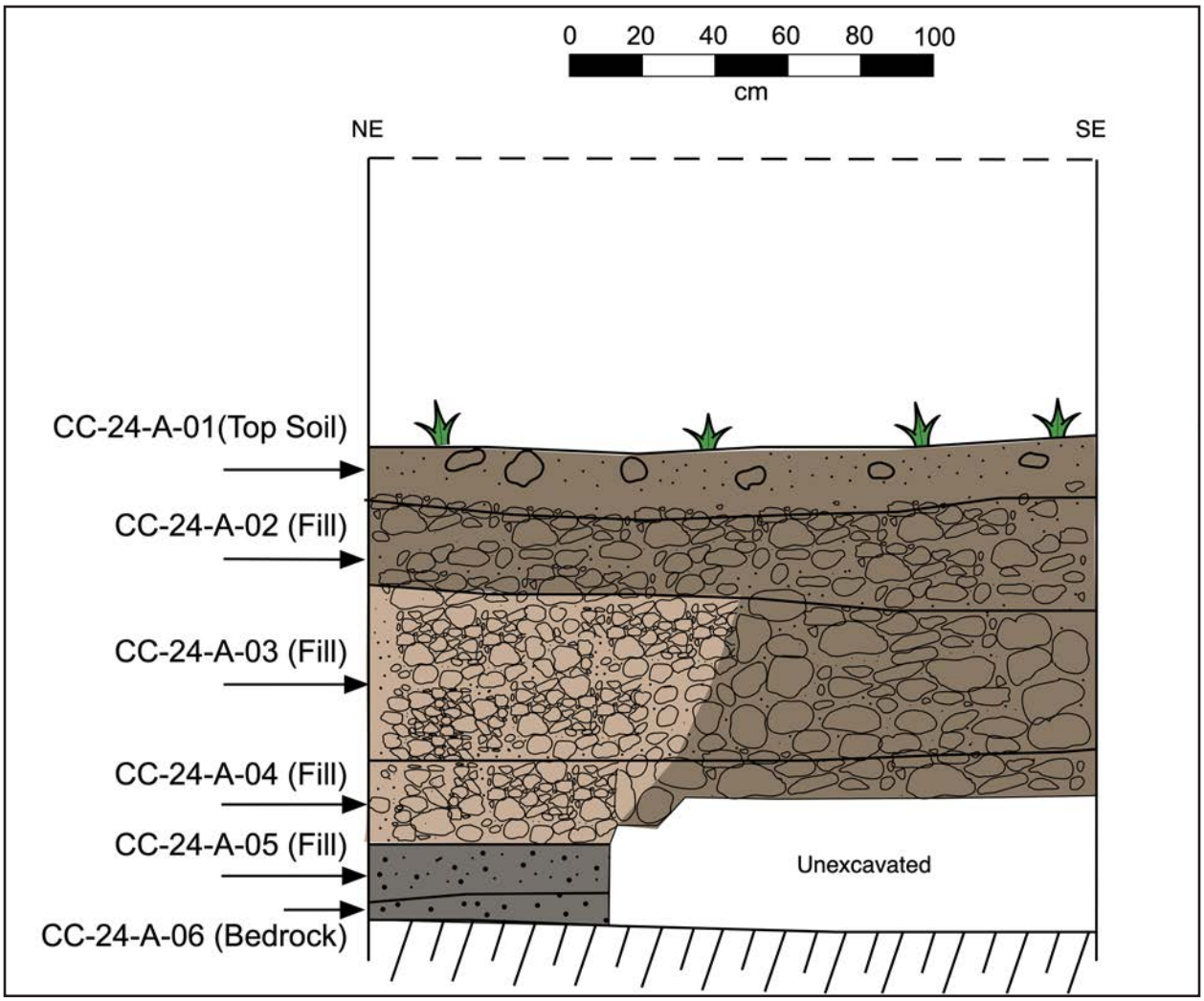

Figure 5.7. East profile of Subop CC-24-A.

fill was rich in artifacts: we recovered two shells, three obsidian blades, one ground stone artifact, 56 pieces of debitage, and 178 ceramic sherds. Underneath the construction fill and a few centimeters above the bedrock, we found very compact dark clay paleosol (10YR2/1, black).

Subop CC-24-B

Subop CC-24-B was a 1-x-2-m chronological test pit located in the courtyard on the east side of its platform, north of Structures E-35 and E-34 (Figure 5.9). The unit consisted of two depositional events: topsoil (Lot CC-24-B-01) and construction fill (Lot CC-24-B-02). Both events produced many artifacts, especially at the topsoil level, where about 180 ceramic sherds, 56 pieces of lithic debitage, three obsidian blade fragments, shells, and one ground stone artifact were recovered. Topsoil was typical for the region: very dark brown soil and many small and medium rocks. The construction fill was shallow, especially when compared to Subop CC-24-A. The fill on this side of the plaza consisted of 20 cm of very dark matrix with medium rocks. However, it was very productive; about 68 sherds, including polychromes, debitage, and ground stone were recovered. The high quantity of artifacts may be due to the unit's proximity to other structures. Similar to Subop CC-24-A, bedrock was also covered by dark paleosol.

Figure 5.8. Photograph of Lot CC-24-A-06. Camera facing east.

The Maya used much more fill in the area of Subop CC-24-A to create a flat surface on the hill. In Subop CC-24-B, we did not observe evidence of a stucco floor, but, just as in Subop CC-24-A, it probably was eroded and was not preserved.

Discussion

Our two suboperations in Courtyard E-8 show a consistent pattern. The group consisted mainly of one occupation. We see this in the construction fill and shallowness of the bedrock in the east of the plaza. Subop CC-24-B yielded many artifacts of different kinds from near-surface context. We suspect that the structures to the east of our unit were the original source of those artifacts. Moreover, ground stone artifacts and polychrome sherds suggest that this area was inhabited by elite people, or at least individuals with access to finewares. A preliminary field analysis of the ceramic rims suggests many polychrome plate rims, in other words, serving wear. Brett Houk suggests that the polychrome plates in Courtyard E-8 may result from market activities. Further excavations in the area are needed to understand the function of the structures in Courtyard E-8.

Our initial impressions of the structures and their location on a prominent hill above the landscape led us to hypothesize that Courtyard E-8 might be an observational and market location for the surrounding farmland (Figure 5.10). We observed a pattern of C-shaped structures on the slopes of the hills overlooking the *bajo*. The possible ramp described above stems from the two mounds on the southern edge

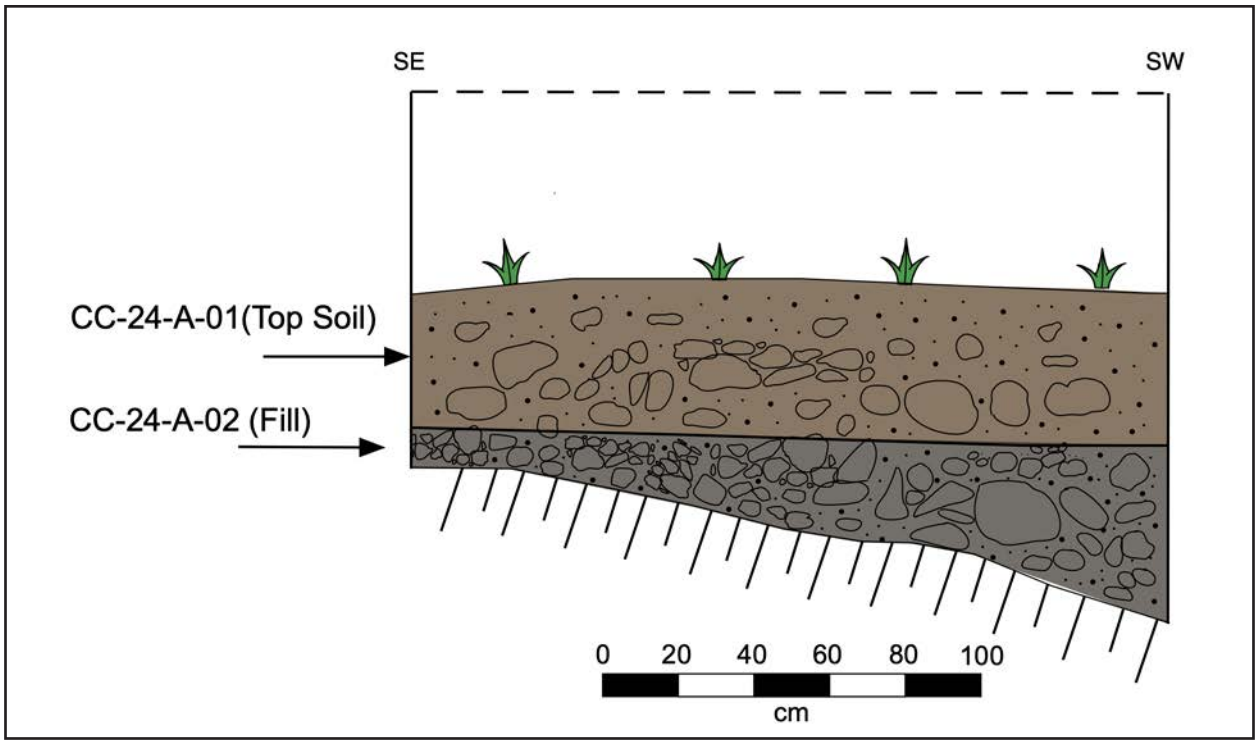

Figure 5.9. South profile of Subop CC-24-B.

of the courtyard, perhaps a road to the *bajo* and the C-shaped structures or a formal entrance to the courtyard facing, interestingly, away from the site center and toward the rural area to the south. We hypothesize that the C-shaped structures function with Courtyard E-8 as an administrator and the *bajo* as agricultural land. Moreover, we suggest that the C-shaped structures could be storage facilities related to agricultural lands. In other words, Courtyard E-8 could have been part of a farming, *bajo*-specialized community.

Excavations at Plaza I-1

Plaza I-1 was the second area we explored during the 2023 season. The team reached the site by driving Chan Chich's modern road for about 1.6 km east and then walking on foot north. Fortunately, the BEAST recon team made a trail to the group April, and the unnamed drainage separating Group G from Group I was bone dry. This allowed us to gain some speed in our explorations. Assessing the main features was easier in this area, which was a tad cleaner and much flatter than the area we worked at in Group E.

The plaza measures 33.5 m north-south by 25.5 m east-west and crowns the top of a hill, 1.9 km northeast of the Main Plaza (see Figure 5.3). Plaza I-1 comprises nine structures (Structures I-1 to I-9), including a 4-m high mound on the west (Structure I-1), a low platform with three small structures on top (Structures I-5, I-6, and I-7) on the east, a mound on the north (Structure I-2), and three low rectangular platforms (Structures I-3, I-4, and I-8) and two *chultuns* at the north and southern section of the plaza. Moreover, at least two man-made structures are on the southern outskirts of the hill, Structures I-9 and I-10. All in all, the features of the group—Structure I-6 on the west facing the low platform on the east—suggest the presence of an E Group.

During our explorations, we also located multiple courtyards below the hill. We only

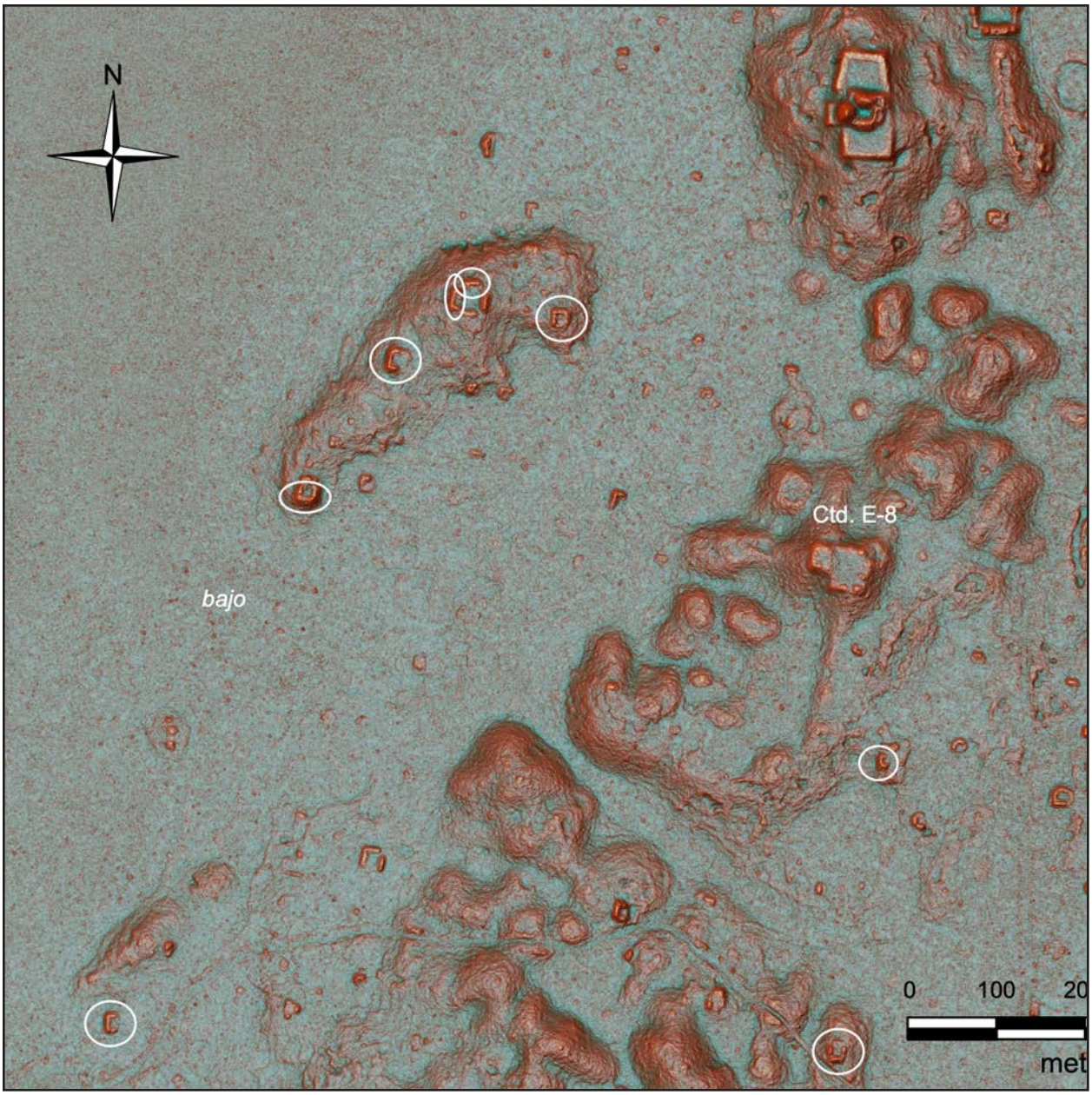

Figure 5.10. Courtyard E-8 in relation to C-shaped structures (circled) and the *bajo* west of Chan Chich.

had time to inspect four, three at the northwest of the group and one at the southwest. The first three courtyards were not flashy, mainly consisting of low mounds on top of low hills. The second group, however, is of interest. It consisted of a large platform with at least three rectangular structures, possibly vaulted, around a large courtyard. We also identified at least two *chultuns*, a large collapsed one at the north of the group outside the courtyard and a second one inside the courtyard and much smaller (Figure 5.11). The external characteristics of these groups make us hypothesize that the northern small groups were more utilitarian, while the southern group was residential. More explorations and excavations are needed to confirm this hypothesis.

Our chronological test pit excavations in Group I-1 consisted of three suboperations. These

Figure 5.11. Photograph of 3-m diameter collapsed *chultun*. Camera facing south.

were Subops CC-24-C, -D, and -E in the center, west, and east areas of the plaza, respectively.

Subop CC-24-C

Subop CC-24-C was located immediately east of Structure I-1. It was a 1-x-2-m unit roughly oriented east-west. Its main objective was to recover ceramic information and architectural features to place this structure and the plaza chronologically (Figure 5.12). The unit encountered the following stratigraphic sequence: topsoil (Lot CC-24-C-01), collapsed debris of Structure I-6 (Lots CC-24-C-02 and -03), a plaster surface (Lot CC-24-C-04), and its construction fill (Lot CC-24-C-05). The topsoil was dark brown clay loam mixed with numerous small rocks, very typical of the area. The collapsed debris consisted of loose dark brown matrix and small stones, which we identified as part of the construction collapse of the building, as opposed to the construction fill from the floor. The collapsed debris was rich in ceramic sherds and debitage, about 104 total. The plastered surface was about 10 cm thick, unleveled (it dropped at both the south and north of the unit, creating a ramp or lump), significantly deteriorated, and had a white marl consistency, which is most visible in the easter profile of the unit (Figure 5.13). The fill of the floor consisted of 15 cm of white marly matrix and small rocks.

Subop CC-24-D

Subop CC-24-D is located in the middle of Plaza I-1, between Structures I-4 and I-6. Our main purpose was to gather chronological

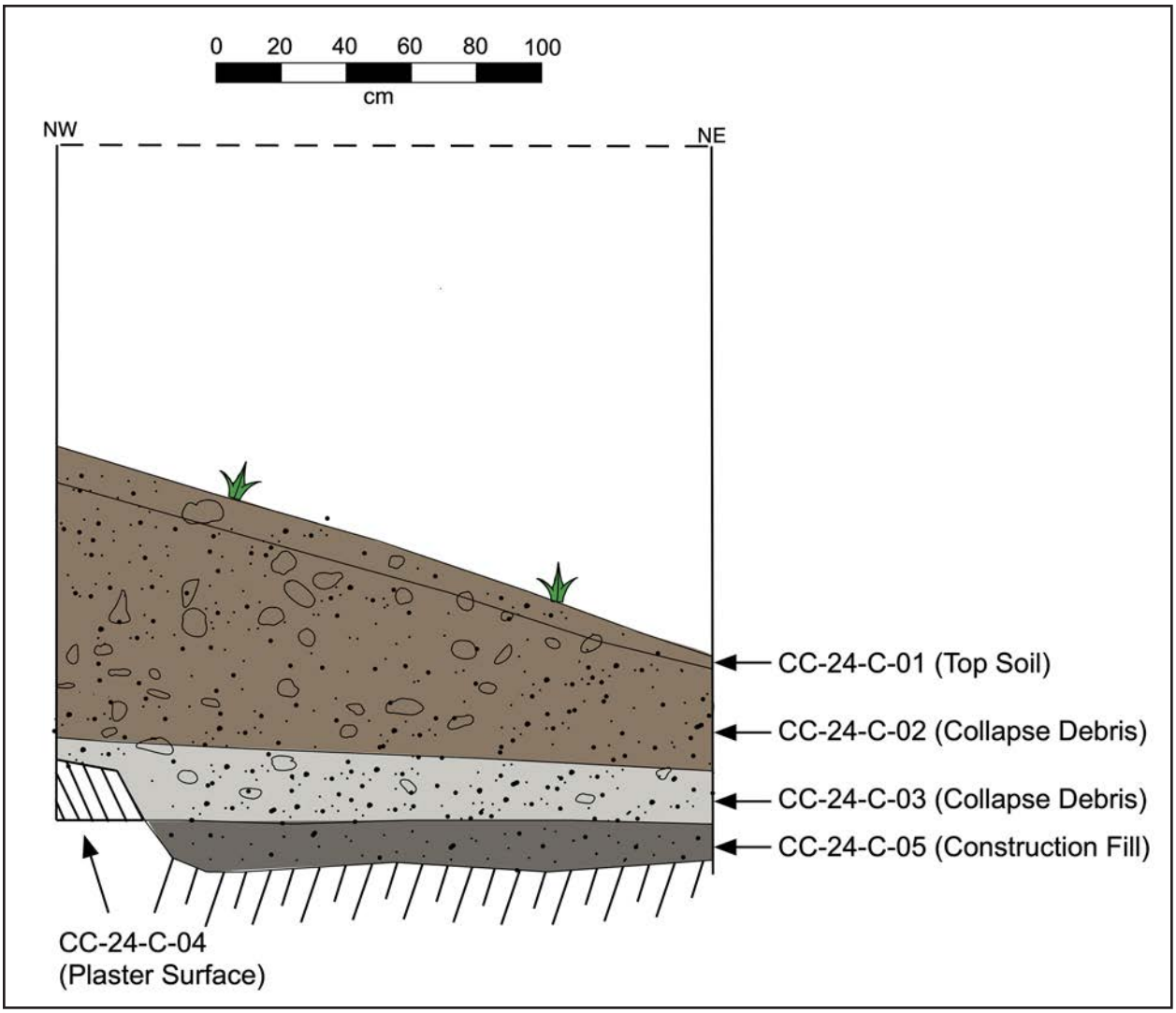

Figure 5.12. North profile of Subop CC-24-C.

information, recover some architectural information about the possible E Group, and explore two large limestone rocks we suspected were stela (but later confirmed as collapsed carved stones). The unit was oriented roughly north-south and measured 1 x 2 m. This operation was very shallow; we reached bedrock 39 cm below the surface. We could only identify two contexts: topsoil (Lot CC-24-D-01) and an alignment of four rough stones (Lot CC-24-D-02) aligned exactly north/south (Figure 5.14). Topsoil was dark brown soil with small pebbles and some larger amorphous rocks. Fortunately, the artifacts recovered from this lot were rich and consisted mostly of ceramic sherds and lithic tools. Moreover, the rock alignment sitting on top of bedrock might be the remains of a Preclassic period substructure. Typically, these structures had a round base and were made of perishable materials.

Subop CC-24-E

The unit was located approximately on the center line of Structure I-6, the central structure on the eastern platform of the E Group, at the mound's base. Subop CC-24-E was excavated as a 2-x-2-m unit, making it slightly more extensive in area than the other suboperations. We wanted the extra space to gather

Figure 5.13. Photograph of profile Subop CC-24-C. Camera facing west.

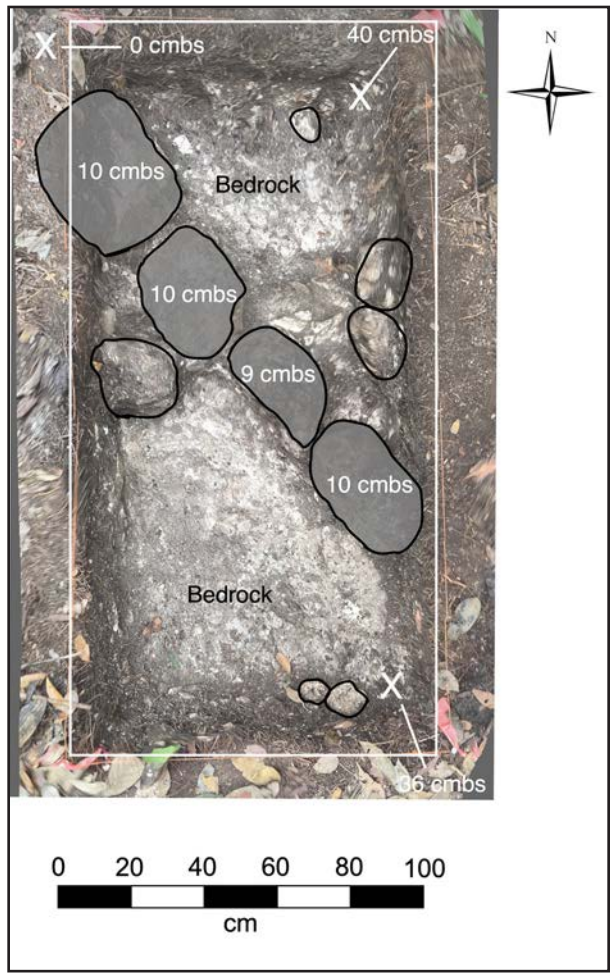

Figure 5.14. Plan view of Subop CC-24-D.

chronological and architectural information. After the excavation, we discerned at least four stratigraphic layers: topsoil (Lot CC-24-E-01), the construction collapse debris from Structure I-6 (Lot CC-24-E-02), the plaza construction fill (Lot CC-24-E-03), and the large boulders used as the base of the plaza (Lot CC-24-E-04) as shown in Figure 5.15. The topsoil was dark brown clay loam with multiple small and medium stones. These included some carved square rocks that were previously part of a building. The collapsed debris mainly consisted of medium and large rocks (some were carved) in a matrix of dark grayish-brown soil (10YR4/2). The *in situ* limestone steps of Structure I-6 were observed in the eastern section of the unit; we did not find evidence of a stucco floor. However, we reached the plaza's construction fill level, suggesting that the floor was probably present and not preserved. The construction fill consisted of huge amorphous rocks devoid of soil, leaving significant gaps between the fill stones, which measured about 40 x 60 x 50 cm. Fortunately, we recovered some artifacts that date the fill, including ceramics, debitage, shell, and a metate fragment. Before bedrock, we encountered a layer of soil below the construction fill (Lot CC-24-E-04) that was sterile of artifacts. The soil matrix was about 50 percent filled with pebbles smaller than 2 mm. The color was brown (10YR 4/1) with a dry, loose sandy loam. This suggests that the eastern part of the natural hill was raised before constructing the E-Group.

Discussion

Our excavations at Plaza I-1 suggest the hill was possibly first inhabited by people living in round structures made of perishable materials, typical

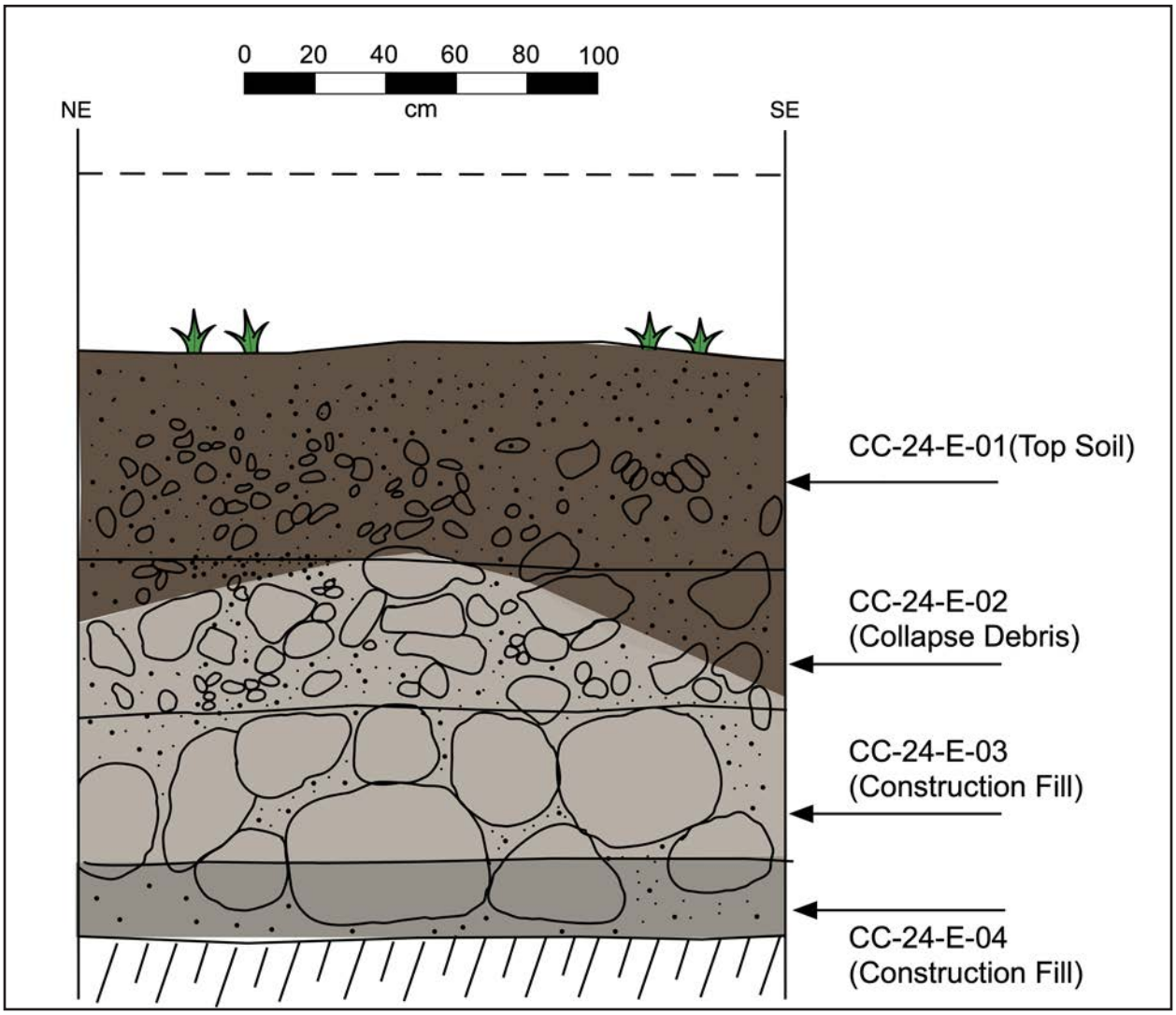

Figure 5.15. East profile of Subop CC-24-E.

of the Preclassic period. More excavations, however, are needed to confirm the presence of this round structure. Sometime afterward, parts of the hill were raised and leveled to build a 10-cm-thick stucco floor on which most stone buildings stand. Plaza I-1 might have had at least two construction phases. Ceramic analysis is still needed to pinpoint the plaza renovations.

All in all, our excavations suggest the presence of an E Group, the first verified E Group in our permit area. Rice (2023:01) argues that E Groups originated from elongated eastern structures that replicated the Milky Way, which was the celestial setting for the events recounted in Maya myths. Moreover, they are typically associated with the rise of monumentality in the Preclassic period architecture and were used as gathering places (Doyle 2012). However, the presence of two *chultuns* in the group is intriguing since these are usually associated with residential life. Ceramic analysis is still needed to understand the group's basic chronology and construction phases. The group might have functioned as an E Group and then transformed into a residence. Alternatively, we may see evidence of a group of individuals who appropriated E Group technology, which is not present in other areas of the site and incorporated it into its daily activities. Further

excavations are needed to confirm the function and chronology of this group, as well as its relationship to the west residential group recorded this season.

TIHO'WITZ (OP BE33-A)

Tiho'witz (BE-33) is a previously unrecorded site that became known after the lidar analysis concluded. The site is extensive, consisting of multiple courtyards, four on top of 7- to 18-m high hills, a central plaza (Plaza A-1) with six structures (Structures A-1 to A-6), including a ball court (Structures A-3 and A-4), and a parapet-lined *sacbe* connecting to the plaza's southwest end (Figure 5.16). The 325-m-long *sacbe* enters the plaza from the south; it appears to be an elevated platform with low parapets on each side. A similar but shorter feature connects the plaza to the courtyard on the hill to the north. The small central plaza (Plaza A-1) is almost entirely encircled by 7- to 18-m high hills. We recorded a 12-m high temple-pyramid (Structure A-1) on the east side of Plaza A-1 and a 7-m high range building on the south (Structure A-2). The plaza's platform extends south of the range building and supports a north-south oriented ball court with 5-m high mounds.

Small courtyards crown four of the surrounding five hills oriented to the cardinal points—the north hill houses the highest courtyard at the site, Courtyard A-2. The courtyard comprises four structures (Structures A-7 to A-10), a walled sunken patio (Courtyard A-3), and a small square to the south. Courtyard A-2 is open to the east, with a good view of Gallon Jug Ranch to the north (Figure 5.17). Courtyard A-5, east of the Main Plaza, consists of at least two structures (Str. A-17 and A-18), one of which has a *chultun* near it. The courtyard also had a small landing to the west. Courtyard A-4, located south of the plaza on top of the lowest hill of the five, consists of four structures, three of which are low mounds, while one was possibly vaulted. The group is next to the parapet-lined causeway. Finally, Courtyard A-5 is located to the west of the Main Plaza. It consists of two structures, one of which has an annex patio. A large hill without visible cultural remains on its summit is located to its south. However, this hill has two large C-shaped structures to the west and south.

This operation aimed to assess the basic features observed in the hillshade maps and excavate to get the basic chronological information from the site. At Tiho'witz, excavations focused on the Main Plaza (Subops BE33-01-B and -C), the ball court (Subop BE33-01-A), and Courtyard A-2 (Subop BE33-01-D).

Excavations

Tiho'witz was our final field assessment expedition of the season. After two full days of trailblazing, we reached the site's ball court and Main Plaza. Like Chan Chich, the area was heavily forested, with many collapsed trees and debris from Hurricane Lisa. However, architectural features were visible. Our trail reached the site from the south and continued north until reaching the northern group. Excavations at Tiho'witz were done under Op BE33-01. The site was explored in four suboperations: Subops BE33-01-A through BE33-01-D. All suboperations consisted of chronological test pits located in central open places to ensure the extraction of chronological information.

Subop BE33-01-A

The purpose of the unit was to establish the ballcourt's basic chronology and construction phases. Due to its importance, the unit measured 2 x 2 m, larger than usual for the exploratory units of this season. The unit was placed between Structures A-3 and A-4 to uncover the basic stratigraphy and look for a marker.

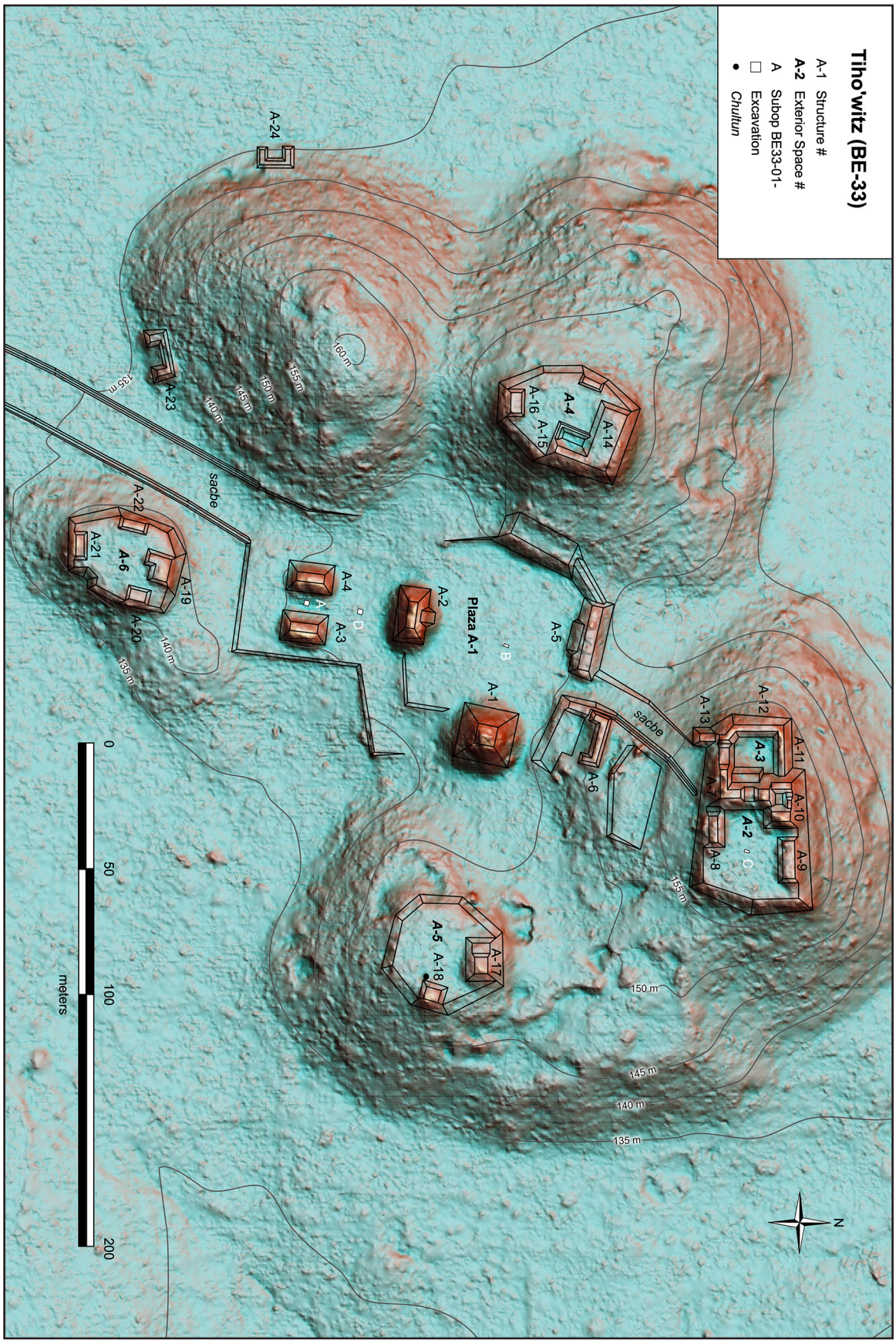

Figure 5.16. Malerized map of Tiho'witz site core showing architecture and Op BE33-01 excavations on a lidar-derived sRRIM with 5-m contours.

Figure 5.17. Photograph of Gallon Jug Ranch from Courtyard A-2. Camera facing north.

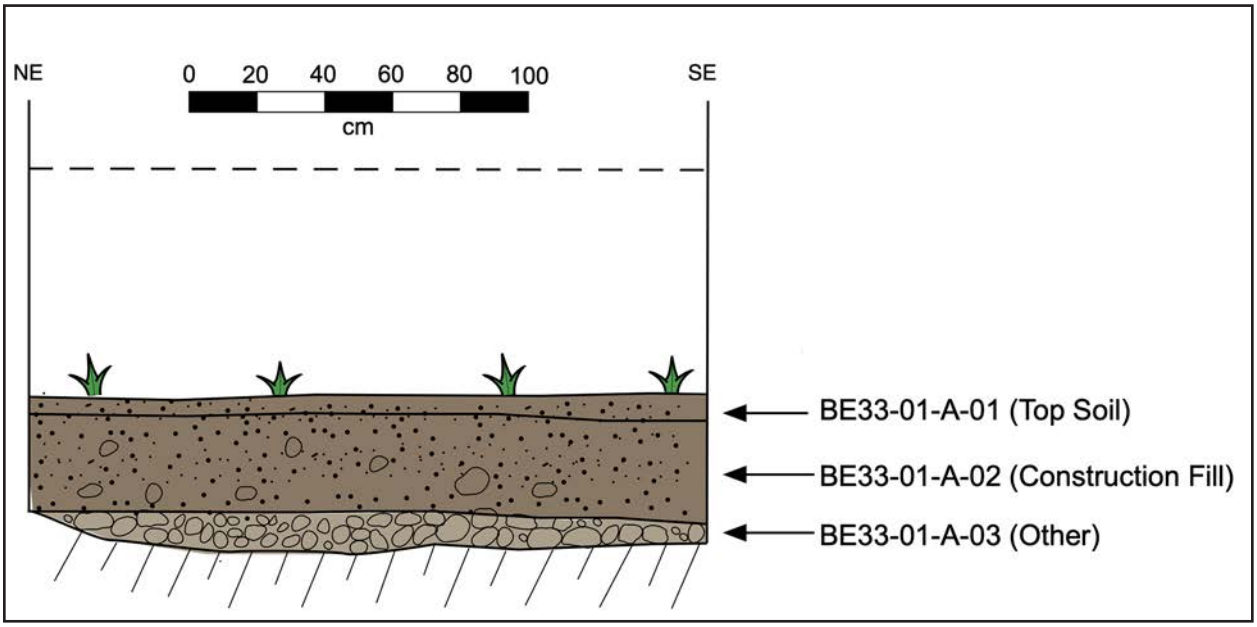

Figure 5.18. East profile of Subop BE33-01-A.

Frustratingly, the unit was shallow and mostly sterile from topsoil to bedrock (Figure 5.18). The topsoil (Lot BE33-01-A-01) consisted of dark brown soil and loosely packed humus. The unit then yielded a layer of gravel with small to medium rocks and a brown, compact, dry matrix, which we identified as the construction fill (Lots BE33-01-A-02 and -03), possibly the construction fill of the ball court's floor. However, we found no other evidence of the floor or additional architecture in the unit. We encountered bedrock at 45 cmbs.

Subop BE33-01-B

The purpose of this unit was to establish the main construction phases and chronology of Plaza A-1. The unit was located at approximately the plaza's center and measured 2 x 1 m. Like Subop BE33-01-A, excavations at Subop BE33-01-B yielded one surface (Lot B33-01-B-01), construction fill (Lot B33-01-B-02), and, soon after, bedrock (Lot B33-01-B-03), as shown in Figure 5.19. Both units were very shallow, suggesting that the site may have been only occupied in one period. The topsoil consisted of dark brown soil with small pebbles, which is typical of the region. There was no evidence of a floor between the topsoil and the level of construction fill. The fill was compact and consisted of small pebbles and dark brown soil. Below that, the soil became reddish orange with some dry rocks that we identified as paleosol and, very soon after, bedrock at 82 cmbs. The unit produced some ceramics, but, as in Subop BE33-01-A, the sherds were eroded and not that many.

Subop BE33-01-D

This operation aimed to gather more chronological information to date the basic construction phases of the site. The unit was larger than usual, 2 x 2m, and located about 20 m north of BE33-01-A. The unit was not previously planned; the low number of ceramics and architectural features uncovered in Subops BE33-01-A and -B made us decide

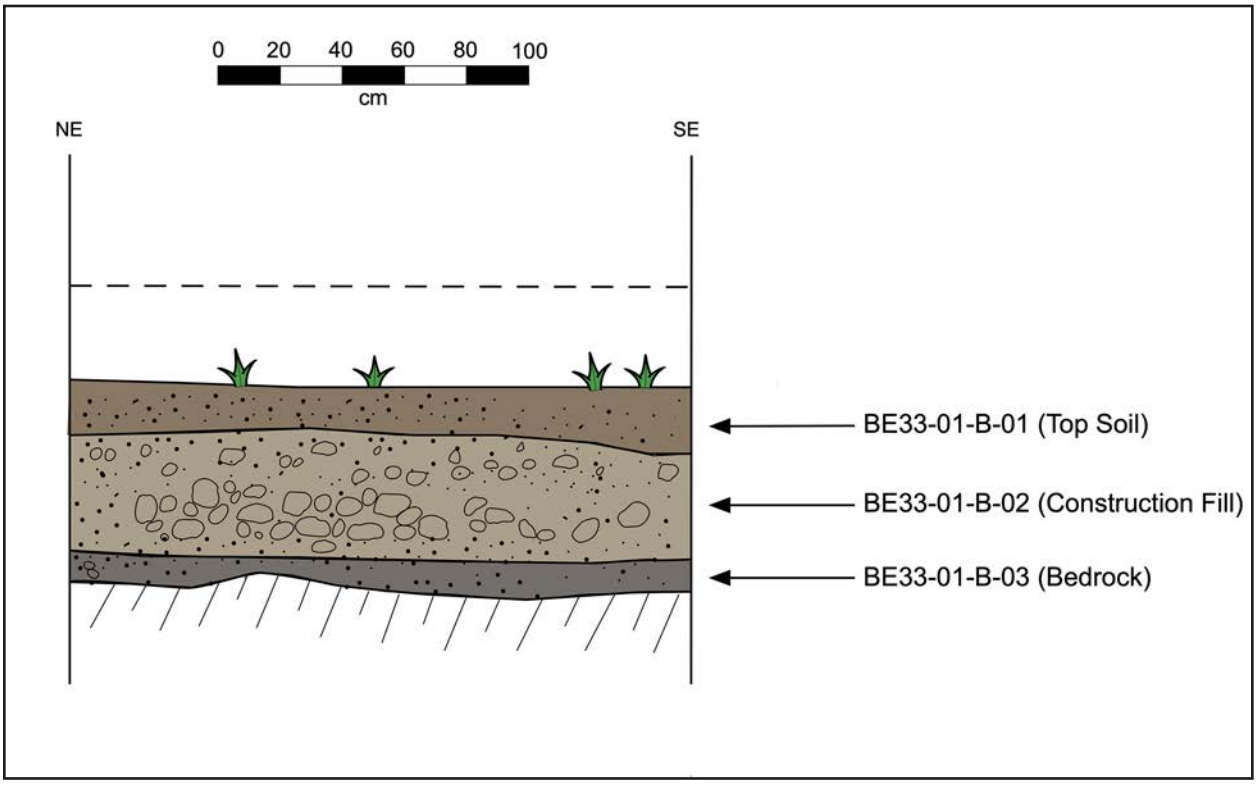

Figure 5.19. East profile of Subop BE33-01-B.

Figure 5.20. Photograph of Lot BE33-01-D-03. Camera facing south.

on another unit. Subop BE33-01-D consisted of two contexts: topsoil (Lot BE33-01-D-01) and construction fill (Lot BE33-01-D-02) as shown in Figure 5.20. The topsoil was dark brown with small pebbles. We did not observe any evidence of a floor between the topsoil and the construction fill, suggesting that it deteriorated and was not preserved. Like Subops BE33-01-A and -B, the unit was very shallow. We hit bedrock at 27 cmbs after excavating a construction fill of brown soil and small stones.

Subop BE33-01-C

Subop BE33-01-C was of a 2-x-1-m unit at the center of Courtyard A-2 on the north hill. The unit consists of at least three different deposits: topsoil (Lot BE-33-01-C-01) and two types of construction fill—one that was loose with dark gray soil (Lots BE-33-01-C-02 and -03)

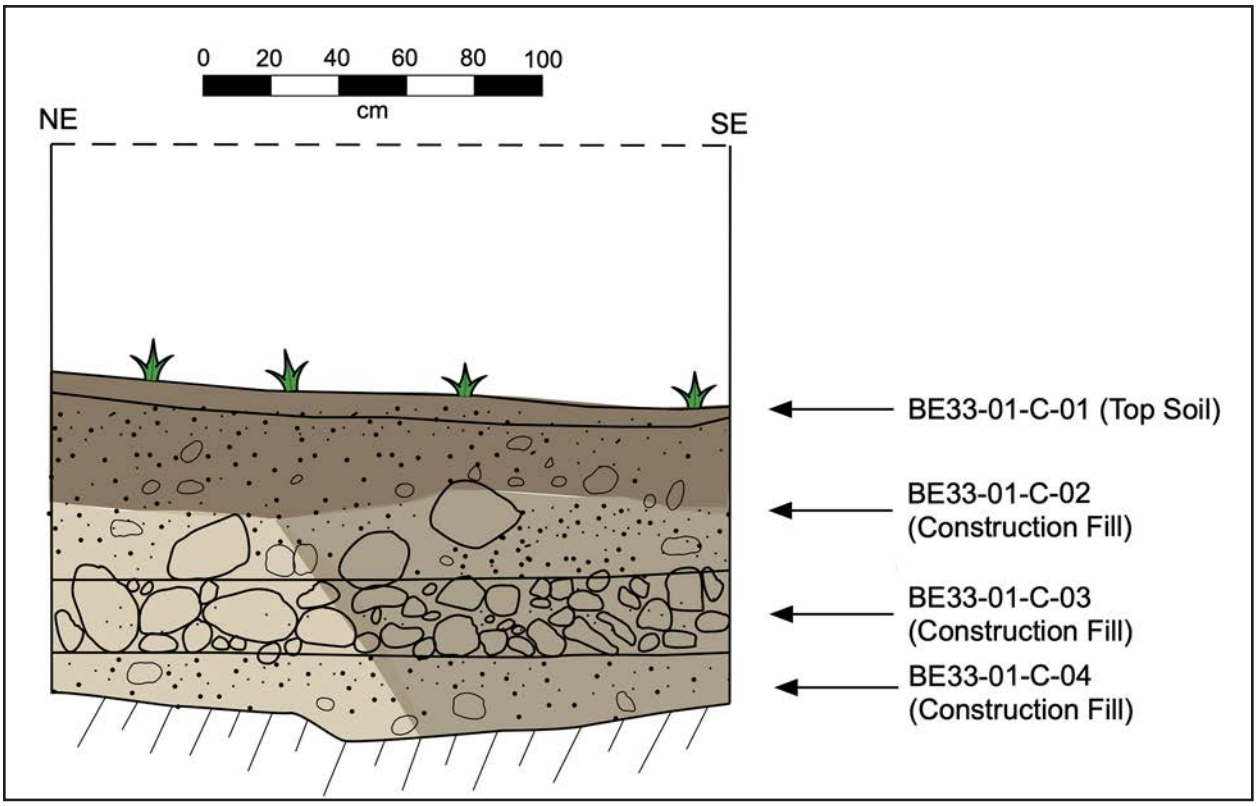

Figure 5.21. East profile of Subop BE33-01-C.

and a second one (Lot BE33-01-C-04) that was thicker with more compact dry dirt, gravel with large rocks, some of them carved (Figure 5.21). Most collected artifactual material was found within this unit's upper layer of construction fill. A surface was reached at about 62 cmbs composed of a lighter and siltier matrix with some large rocks embedded within it. At 75 cmbs in the northern half, the fill became hollow with several flat rocks. The matrix in the fill was 2.5Y8/2 in the north and 2.5Y6/2 in the south. The lot was mostly sterile. Excavation evidence suggests that Subop BE33-01-C consisted of mostly one occupation sequence, which can be dated through its first fill (Lot BE-33-01-C-02). The second fill (Lot BE33-01-C-03) might not represent an earlier construction phase but rather the same process of placing fill to level the plaza. The carved stone might suggest dismantling an earlier building and reusing materials as construction fill. We hit bedrock at 98 cmbs after excavating a construction fill.

Viewshed Analysis

During our field assessment process, the team noticed many prime real estate views on the four courtyards atop hills surrounding the main plaza. Per Houk's request, Ray Wallace, a graduate student at Texas Tech University, did a viewshed analysis of the lidar data. This type of analysis examines the locations visible from one or more specified points or lines. In ArcGIS spatial analysis, the visibility of each raster cell is determined by comparing the altitude angle to the raster center with the altitude angle to the local horizon. The local horizon is computed considering the intervening terrain between the observation point and the current cell center. It is visible if the point lies above the local horizon (ESRI 2023). Using the site DEMs, Wallace processed several viewsheds with

observational points suggested by Gallareta Cervera. His analysis suggests the following:

- Individuals in Courtyard A-6 on the west hill could have seen most of the fields surrounding the site and Norman's Temple at Chan Chich, which is 6 km away. This suggests that it is possible that both groups could have communicated easily using fire, smoke signs, or other visual aids if needed.
- Individuals in Courtyard A-2 on the northern hill can see from zero to 270 degrees of the visual circumference. It would have been harder to see the north and west hills, indicating lower priority for observation.
- Individuals in Courtyard A-4, on the eastern hill, could see most of the Main Plaza, the northwest and south main structures, and the terrain to the east and south.
- Individuals in Courtyard A-5 could view from 45 to 315 degrees of a visual circumference, mostly the planes directly south of the site core.
- The southwest hill, which has no visible architectural features, also has a wide field of view of the landscape. This might suggest that the hill could have been used as a strategic point of view. However, if this is true, it is strange that there is no material evidence to speak of this function.
- Courtyard A-6 has a wide field of view. Individuals in this courtyard would have been able to see well to the west, east, south, and north. This suggests that this courtyard might have been the main surveillance point of the site.

Final Thoughts

Our excavations at Tiho'witz suggest a sizable one-period site east of Chan Chich. The courtyards on each hill and the main plaza suggest significant public activities, surveillance of rural lands, and communication with other sites, such as Norman's Temple at Chan Chich. Excavations at the site suggest that the visible architecture was mostly inhabited for one period, with the possible exception of Courtyard A-2. However, ceramic analysis and more excavations are needed to have a better picture of the site occupation.

It is unclear if Tiho'witz was a late site that resulted from agricultural lords establishing new territories to the east of Chan Chich and southwest of Gallon Jug. It is also unclear how dependent or independent Tiho'witz was of other sites in our permit area. Was the site the result of *nouveau riche* lords trying to establish themselves as an independent entity? What we know from our 2023 excavations is that Tiho'witz can arguably represent a snapshot of a city that was only occupied for a couple of hundred years and the labor elites mustered to construct a large site in the Three Rivers region of Belize.

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Field Assessment at Gallon Jug

Claire Novotny, Kristina Priotto, and Marie Ical

In May 2022, NCALM gathered lidar data across the entire Belize Estates Archaeological Survey Team (BEAST) permit area (Houk 2022; Chapter 1, this volume), revealing previously unrecorded sites and landscape modifications, such as agricultural terracing. Our main goal this season was to conduct a ground assessment of the lidar data. The 2023 BEAST season included field assessment, mapping, and excavation of test units in three previously unrecorded groups of structures in the Gallon Jug settlement area (Groups C, D, and E; see Figure 6.1). In each group, we targeted one courtyard or plaza for investigation. Gallon Jug, along with its surrounding settlements, is mostly located in a tropical broadleaf forest north of the cleared pastures of the Gallon Jug Ranch and agribusiness. Courtyard C-1 is located west of the Gallon Jug Main Plaza (Group A), Plaza D-1 is positioned north of the Main Plaza, and Courtyard E-1 is situated southeast of the Main Plaza. Additionally, during the final day of the season our team revisited Gallon Jug's site core to assess a *sacbe* identified in the lidar maps. The *sacbe* connects Courtyard B-1 to the Main Plaza, shedding light on our interpretations regarding the potential role of the courtyard's residents in the ritual life of the community.

The 2023 field assessment and excavations took place over the course of approximately three weeks, from June 15 to July 7. Dr. Claire Novotny led the excavation team, which comprised local laborers from Chan Chich and Sylvester Village, staff member Kristina Priotto, and University of Belize undergraduate Marie Ical.

BACKGROUND

Gallon Jug's site core sits 200 m north of pastures cleared by the Gallon Jug agribusiness. The site core and its associated courtyard groups are set on low-lying limestone hills covered with tropical broadleaf forest. Though the land 200 m south of the Main Plaza has been extensively cleared with bulldozers for the cultivation of corn and sugarcane as well as for cattle pastures, the immediate vicinity of the Main Plaza remains forested, preserving archaeological remains relatively well. The nearest monumental site core, Punta de Cacao, lies 3 km east/northeast of Gallon Jug (Figure 6.2). It is one of the largest sites in the region, featuring two plazas, a ball court, 10 courtyards, and additional courtyards in outlying groups (Guderjan et al. 1991:61; Robichaux et al. 2015). However, despite its size, little is known about Punta de Cacao's hinterlands and its relationship to Gallon Jug.

Gallon Jug was originally mapped in the 1990s by Thomas Guderjan and his team from the Rio Bravo Archaeological Project (Guderjan et al. 1991). This mapping effort included the east/west Main Plaza, characterized by its irregular shape and 15-m high range structure. The team also conducted limited testing in

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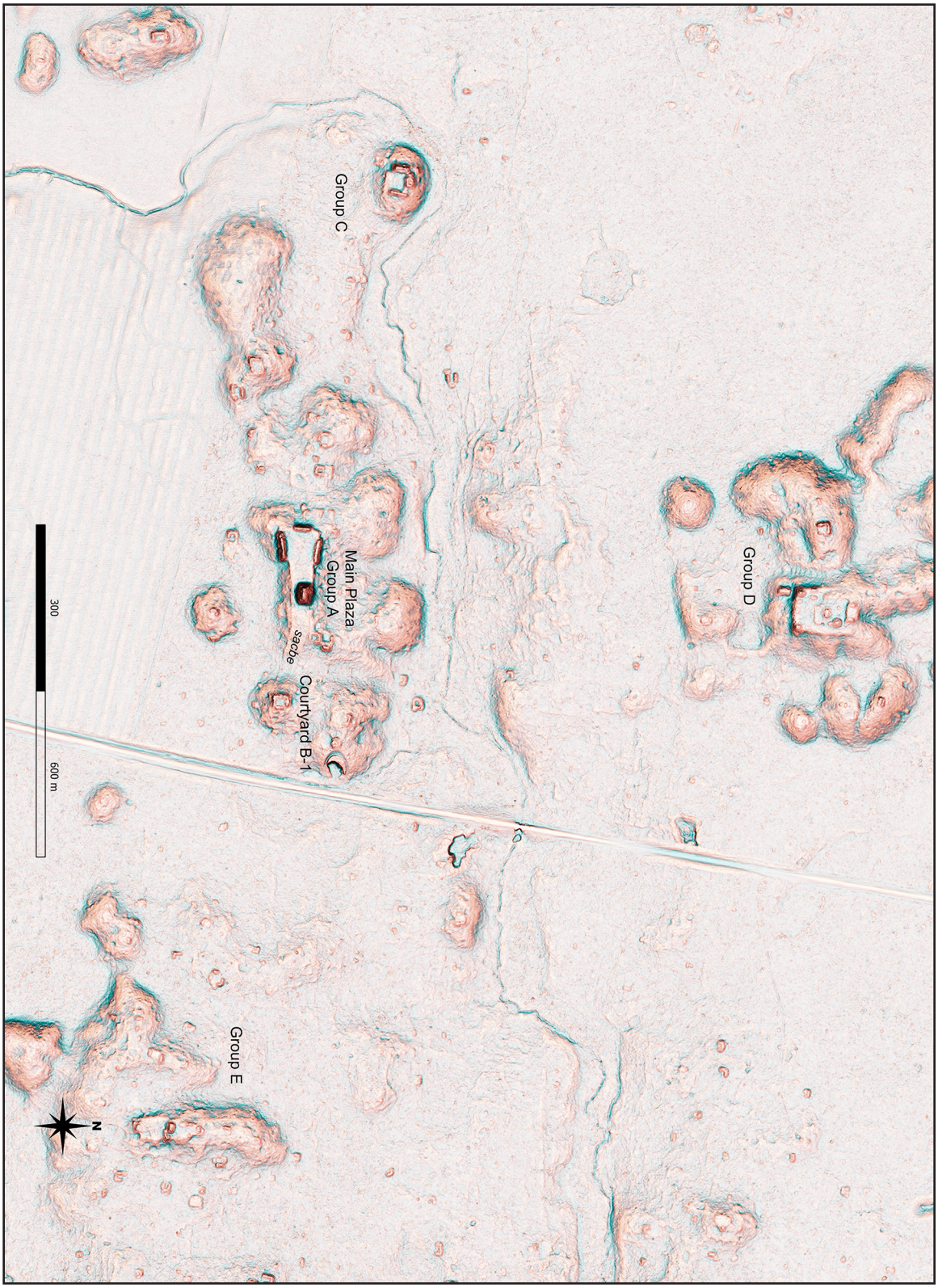

Figure 6.1. Lidar simple Red Relief Image Map (sRRIM) of the Gallon Jug study area showing each group assessed during the 2023 season.

Figure 6.2. sRRIM showing the spatial relationship between Gallon Jug and the larger center of Punta de Cacao.

the Main Plaza and two outlying settlement groups. Furthermore, Jason Yaeger conducted an archaeological survey in the pastures south of the Main Plaza, documenting 245 archaeological features dating from the Middle Preclassic to the Late Classic period (Yaeger 1991).

The BEAST team revisited the pastures surrounding the Gallon Jug agribusiness in 2013 and 2016 to map the them using drones to create a Digital Elevation Model (DEM) of topographic features, some of which were confirmed on the ground (Houk et al. 2019). Visual analysis of the DEM data improved our understanding of site density and the impact of agricultural clearing on settlements in the permit area (Houk et al. 2019:Table 5.2). The area covered by the drone survey had a density of 2.42 structures per km^2, classifying it as "vacant." However, the intensive agricultural clearing certainly contributed to the current low-density settlement pattern. In contrast, the structure density of the Gallon Jug site core is 340.74 structures per km^2, indicating its status as an urban core (Houk et al. 2019:112). Once we have completed digitizing the lidar data, we will revisit these calculations.

In 2018, BEAST resumed excavations in the Gallon Jug Main Plaza to gain insights into the site's occupational history. Excavations within the plaza revealed an Early Classic-period platform and ramp, in addition to Preclassic-period ceramics (Houk 2019:13). Our assessment also included the recording of three extremely weathered stelae, a possible fourth stela, and a possible altar. Our test units did not recover any artifacts or caches associated with the monuments (Houk 2019).

Expanding beyond the Main Plaza, our attention shifted to the courtyard groups in 2019 and 2022. We directed most of our effort at Courtyard B-1, a well-preserved courtyard group of four structures located at the end of a *sacbe* approximately 200 m east of the Main Plaza. Excavations of the architecture revealed three vaulted structures (Structures B-1, B-2, and sections of B-3), with two of them featuring benches (Structures B-2 and B-3). Structure B-4, on the north side of the group, was a 3-m high platform. In its final phase, its interior dimensions measured 13.5-m long by 2.7-m wide, with steps leading to a 2.5-m-wide entrance way. The walls, approximately 1 m in height, supported a perishable superstructure and a thatch roof. The plaster floor was remarkably well-preserved, and we discovered eight patolli boards incised into the floor (Novotny et al. 2019; Novotny and Houk 2021). Ethnohistoric sources indicate that patolli boards were used throughout Mesoamerica for divination and gambling games (Walden and Voorhies 2017). Penetrating excavations beneath the floor of Structure B-4 revealed that the structure was built during the beginning of the Late Classic period (cal AD 594–650) and subsequently expanded over three additional phases. The final phase includes the patolli boards, which were covered by a deposit of Late Classic-period sherds (Novotny et al. 2019). Test units placed in Courtyards A-3, A-4, and A-5 in 2019 uncovered Late Classic-period ceramics (Novotny et al. 2019).

We encountered several burials during our excavations of Courtyard B-1. Two individuals were buried beneath the floor in Structure B-2. One returned a C14 date (2σ cal AD 907–1020) from the Terminal Classic period (AD 850–1000), suggesting that at least some portion of the site was occupied at that time. A puzzling C14 date was retrieved from an individual buried in the *chultun* located in the center of the courtyard. The radiocarbon analysis returned a date range of cal AD 1633–1666, which is the Late Postclassic/early Colonial period. We plan to submit another sample for further testing to confirm the validity of this unexpected date.

In sum, Gallon Jug is a minor ceremonial center that was settled sometime during the Late Preclassic/Early Classic period. The site and its associated courtyards underwent significant expansion during the Late Classic period, with at least part of the area still occupied during the Terminal Classic period. Despite its minor status, Gallon Jug's residents held enough influence to erect several monuments in the Main Plaza, host gatherings there, and construct a 15-m-high range structure. Residents of Courtyard B-1 had a rich history at the site and were knowledgeable about patolli, a pan-Mesoamerican ritual game.

RESEARCH DESIGN

The lidar maps revealed previously unidentified settlement groups and offered more precise topographic information about the greater Gallon Jug settlement area. Using this map, we identified several new groups to systematically assess during the 2023 field season: Groups C, D, and E (see Figure 6.1). Additionally, we aimed to revisit Courtyard B-1 to confirm the *sacbe* identified in the lidar data.

Our interest in Group C stemmed from the size of its largest courtyard and proximity (0.68 km) to the Gallon Jug Main Plaza, and from the fact that Courtyard C-1 is architecturally unique. This group consists of six structures constructed on a modified rise that steeply drops off to the north (Figure 6.3). Three range structures (Structures C-1, C-2, and C-3) form a horseshoe shape open to the south. Notably, Structure C-1, the northernmost structure, features a sunken patio in its center. We were eager to visit this courtyard group to assess this unusual architectural feature.

Group D and Plaza D-1, located 870 m north of the Gallon Jug Main Plaza and about 600 m west of the Blue Creek road, captured our attention in the lidar data for several reasons (Figure 6.4). First, the plaza features a high number of structures (around 14) atop a heavily modified hill overlooking the surrounding area. Secondly, it has a small ball court in the southwestern corner of the group. This was intriguing to us because the Main Plaza at Gallon Jug does not have a ball court, even though residents erected other ritual architecture like a *sacbe* as well as uncarved stelae and a possible altar. Our central objective was to clarify the chronological relationship between Plaza D-1 and the Main Plaza.

Group E, located 1 km southeast of Gallon Jug, consists of four courtyard groups and some isolated mounds (Figure 6.5). Our interest in assessing this group arose from its location in the hinterland between Gallon Jug and Punta de Cacao. One of our overall goals in researching Gallon Jug is to clarify the relationship between the two sites and examining courtyard groups in this area can help us realize that objective.

The lidar data revealed a parapet lined *sacbe* connecting Courtyard B-1 to the Gallon Jug Main Plaza, which was not immediately visible on the ground due to thick vegetation (Figure 6.6). Our 2022 excavations of Structure B-3, the western structure in Courtyard B-1, revealed a passageway facing west towards the Main Plaza, and subsequently the lidar data showed that the *sacbe* terminated at this structure. This season, our objective was to assess the *sacbe* on the ground and conduct test excavations to reveal chronological and architectural information.

The lidar data provided a much deeper understanding of the settlement patterns surrounding Gallon Jug. Our primary objective this season was to target several of these previously unrecorded groups for field assessment, mapping, and 1-x-2-m test excavations into plaza and courtyard deposits.

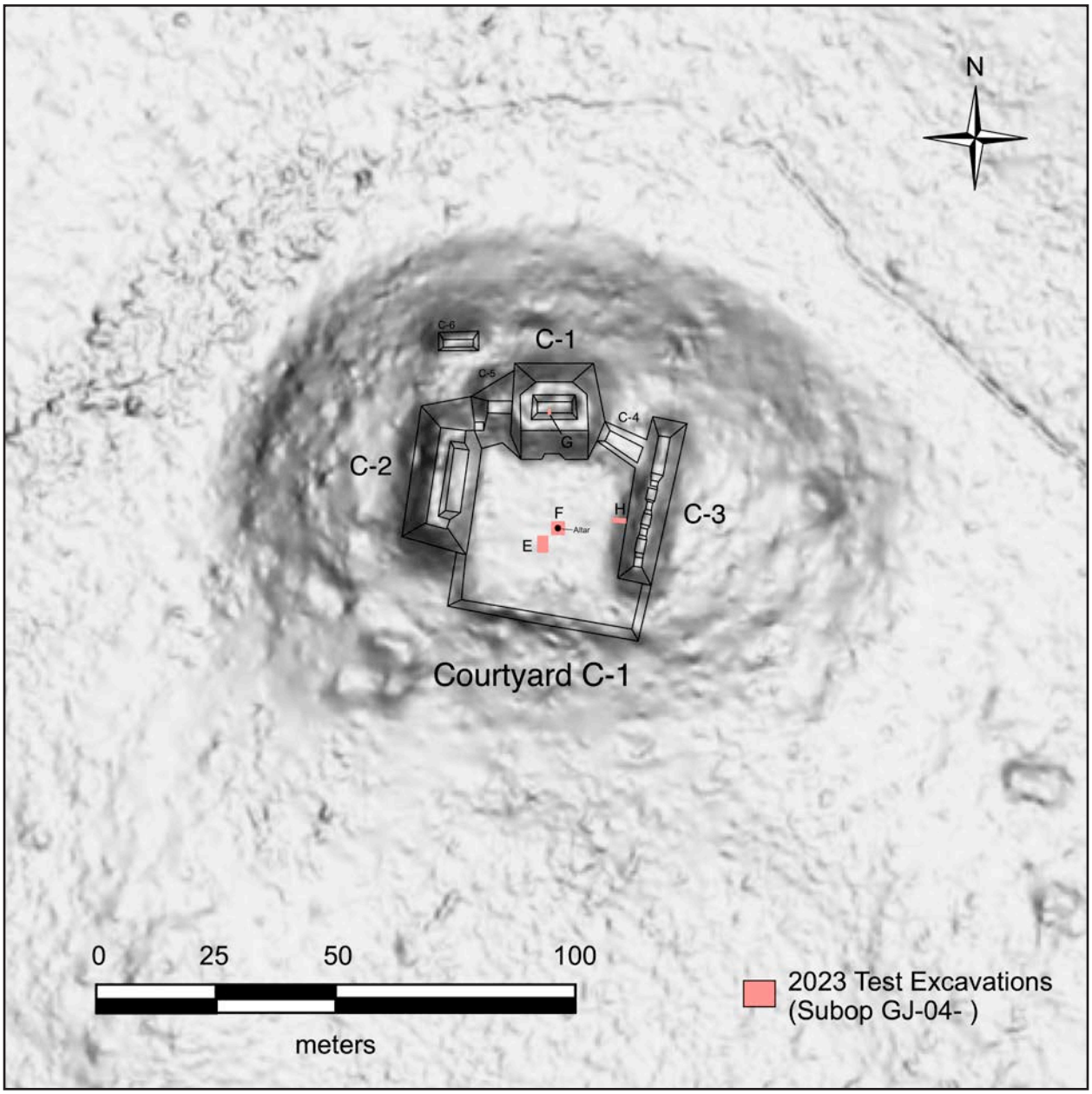

Figure 6.3. Hillshade map of Courtyard C-1 showing structures and 2023 suboperations.

METHODOLOGY

To navigate to the new groups, our team used the Avenza app on our iPhones, equipped with a topographic map. Using machetes, we cut *brechas*, or paths, from the nearest accessible road, typically the north/south-running Blue Creek road on the Gallon Jug property. However, due to significant tree fall in the study area, we accessed Courtyard C-1, as described below, by driving across a cattle pasture and then cutting a *brecha* north through the vegetation. Upon reaching the site, our workers used machetes to clear vegetation on and around the architecture, enabling us to assess and map the structures.

We used the Avenza app to record pathways and GPS points for groups and structures that we visited. Once the architecture was cleared, we drew a "Malerized" map of the structures over a hillshade derived from the lidar data using the Graphic app on the project iPad. We also

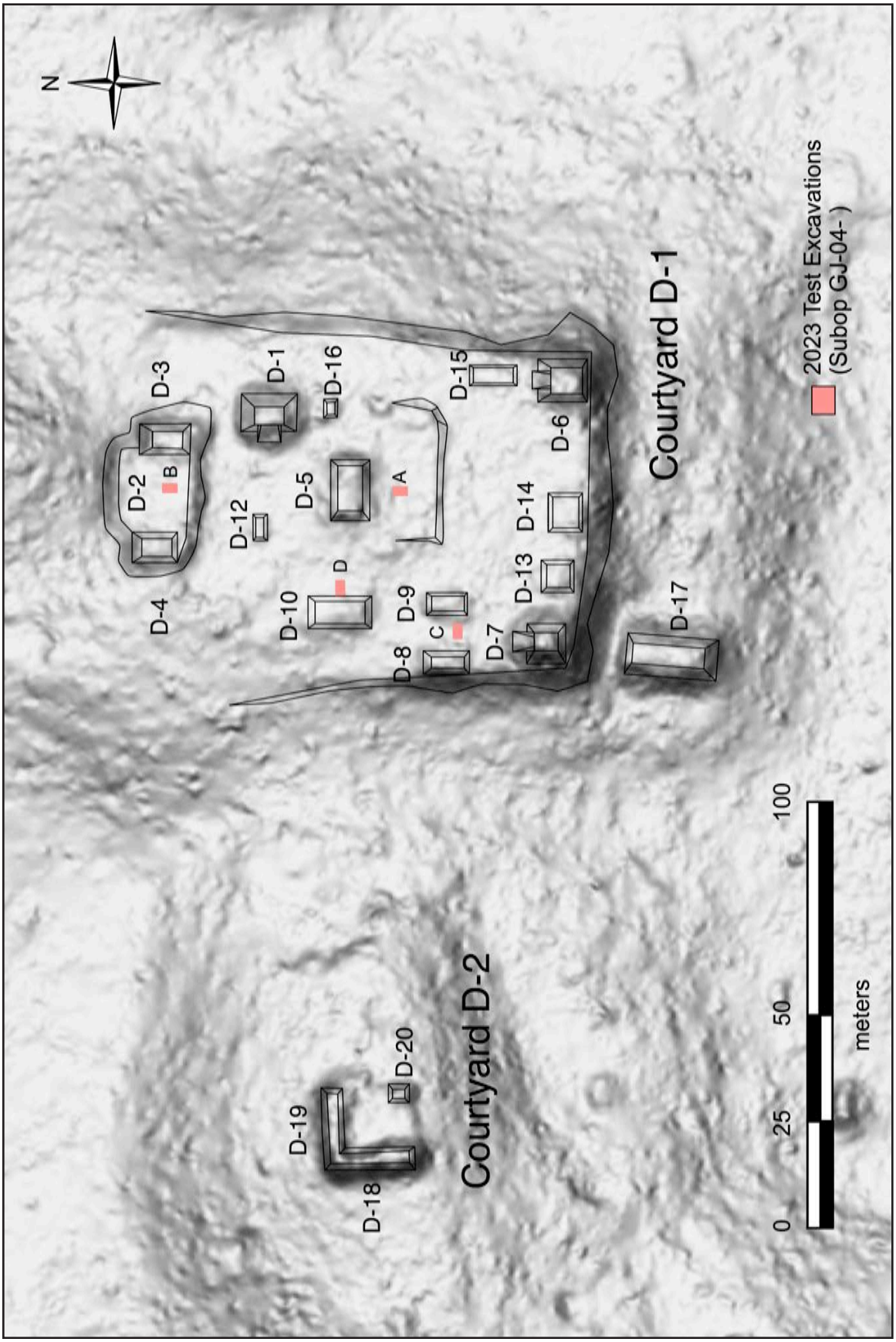

Figure 6.4. Hillshade map of Courtyards D-1 and D-2 showing structures and 2023 suboperations.

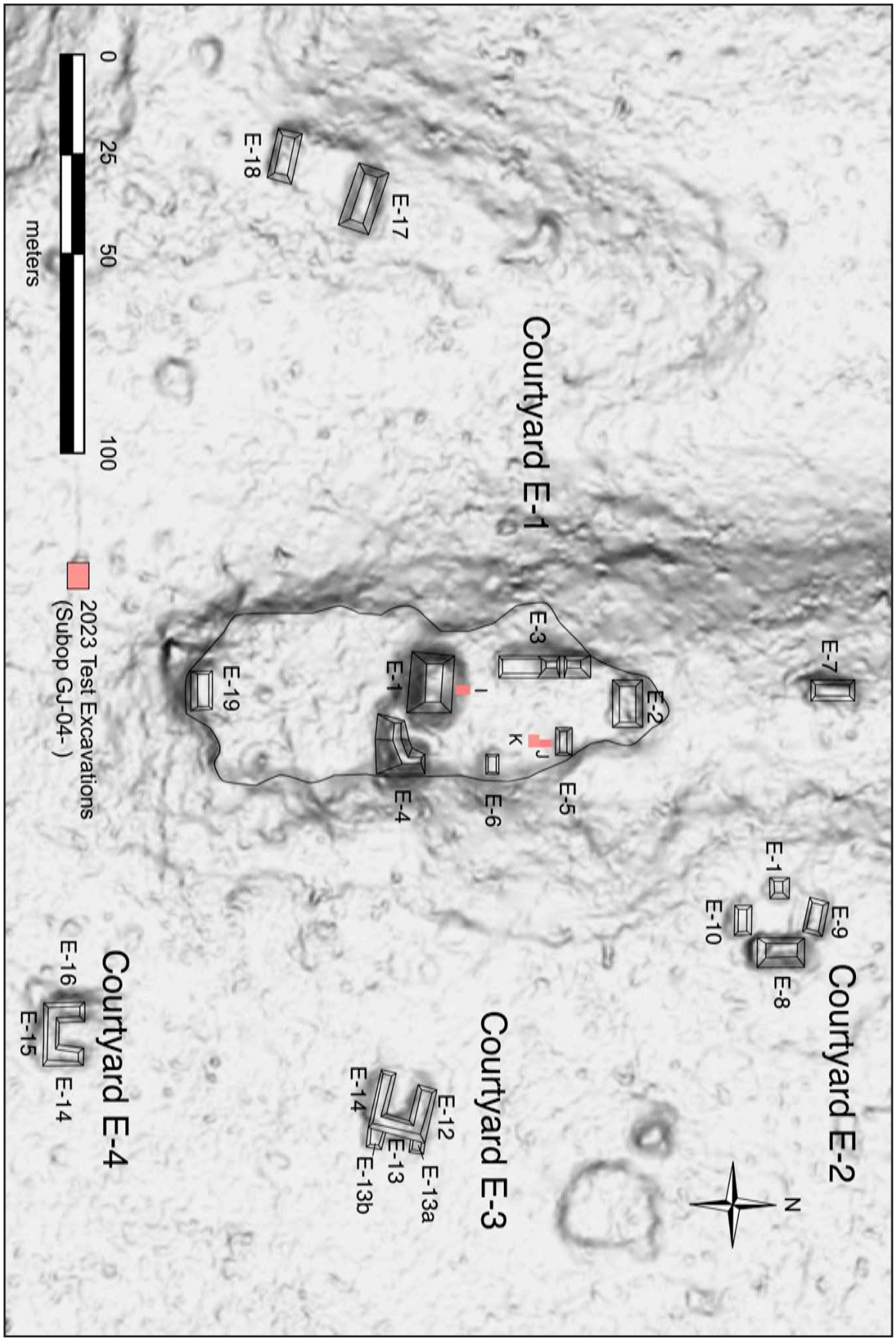

Figure 6.5. Hillshade map of Group E showing structures and 2023 suboperations.

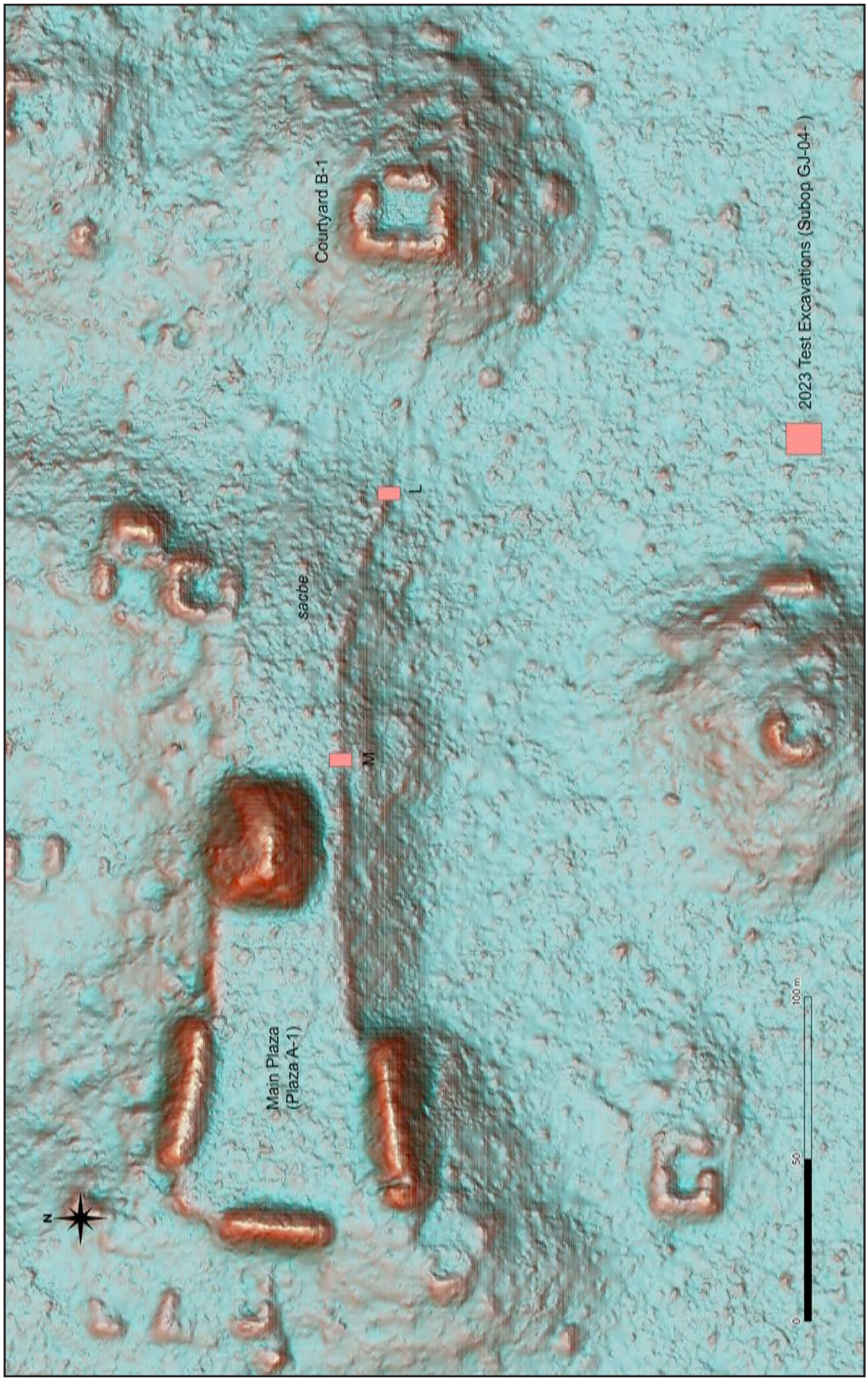

Figure 6.6. sRRIM of Plaza A-1 and Courtyard B-1 showing the *sacbe* that connects them and 2023 suboperations.

established a numbering system for courtyard groups and their associated structures.

To collect chronological information, we conducted excavations of 1-x-2-m test units into plaza floors. We followed cultural stratigraphy to investigate construction events, collect ceramics and carbon samples from construction fill contexts, and determine the depth of cultural deposits. Excavations were conducted using geopicks to remove larger limestone cobbles and collapse debris from nearby structures, as well as trowels in more delicate contexts. We recorded our observations in field journals and in standardized forms on project iPads. We documented our excavations by taking photos on our iPhones and making 3D models of each test unit at its close via the Scaniverse app on an iPhone prior to backfilling.

The following sections include an overview of our field assessments and test excavations at the newly recorded Gallon Jug groups. We describe the architecture of the groups and the process of excavating test units. Additionally, we offer preliminary interpretations about the chronology of the groups and their relationship to the broader regional context. Unfortunately, the project ceramicist has not yet analyzed the ceramics from the 2023 field season.

GROUP D

This season, we examined Plaza D-1 and Courtyard D-2 in Group D, which is located about 1 km north of the Gallon Jug Main Plaza (see Figure 6.4). The elevated bedrock ridge supporting Plaza D-1 has a total area of 6,300 m². Plaza D-1 includes 16 structures, consisting of two platforms and 14 buildings, organized into northern and southern areas. A central range structure, Structure D-5, measuring 5.8 m by 12.5 m, was constructed on top of a 0.5-m high platform (Structure D-11) that bisects these two zones. While Structure D-5 does not cross the entire hilltop, it effectively separates the area into northern and southern spaces. The northern section of the plaza has a 2 m-high platform (Structure D-2) defining its northern edge, which supports two structures on its east (Structure D-3) and west (Structure D-4) sides. Additionally, a 3.2 m-high pyramidal structure (Structure D -1) stands on the eastern side of the courtyard, with two low-lying structures on the west. Structure D-5 defines the southern edge of this zone.

The southern area of Courtyard D-1 is delineated by Structure D-5 on the north and a series of structures lining the western, southern, and eastern perimeters of the hill. Notably, two structures (Structures D-8 and D-9) form the ball court in the southwestern area. Two pyramidal structures define the southwestern (Structures D-7, 3.5 m high) and southeastern (Structure D-6, 2.3 m high) corners of the hill. Overall, the architectural layout creates an open space in the south, transitioning into increasingly confined, private space as one moves north.

In addition to Courtyard D-1, we mapped a smaller group of structures, Courtyard D-2, located 96 m west of Courtyard D-1. This modified hilltop spans 400 m² and consists of Structures D-18 and D-19, forming a corner at the northwest and opening towards the southeast. Structure D-20 is a small building located in the southeastern corner of the courtyard. Although we did not conduct test excavations at this site due to time constraints, we did map it (see Figure 6.4). We also mapped Structure D-17, a single 20-x-8-m range structure oriented east/west off the southwestern corner of the hill that supports Courtyard D-1. To gather chronological information and examine final phase architecture, we initiated test excavations in several parts of Courtyard D-1 under Operation (Op) GJ-04 and Suboperations (Subops) GJ-04-A, -B, -C, and D (Table 6.1).

Table 6.1. Summary of Suboperations by Group

Group	Suboperation
Group C	GJ-04-A
	GJ-04-B
	GJ-04-C
	GJ-04-D
Group D	GJ-04-E
	GJ-04-F
	GJ-04-G
	GJ-04-H
Group E	GJ-04-I
	GJ-04-J
	GJ-04-K
Group B	GJ-04-L
Group A	GJ-04-M

Excavations

Subop GJ-04-A

We established Subop GJ-04-A at Structure D-11 in the central part of the courtyard. We hypothesized that we would uncover multiple construction phases since we would be excavating through a platform and, presumably, its construction fill, and potentially an earlier architectural phase beneath. Subop GJ-04-A was a 1-x-2-m unit oriented north/south. Excavators cleared leaf debris from the surface and proceeded to remove the topsoil. There was one broken biface recovered from the topsoil but no ceramics. After reaching a depth of 20 cm and encountering an increase in limestone cobbles, we concluded that the fill layer (Lot GJ-04-A-02) was resting directly on the bedrock. We recovered about 20 ceramics and two lithics from the second lot. We closed Subop GJ-04-A after reaching bedrock. This suggests that either the platform was a late addition to the group, or the entire group was constructed in a single phase.

Subop GJ-04-B

We decided to place Subop GJ-04-B on the northern platform (Structure D-2). This platform represents the highest and most restricted space within Group D-1, and we hypothesized that it would reveal a longer stratigraphic sequence compared to Subop GJ-04-A. Subop GJ-04-B was a 1-x-2-m unit oriented north/south and placed roughly in the center of the platform. Extensive treefall prevented us from accessing either structure, so we placed the unit approximately in the center of the platform. After removing around 10 cm of topsoil, we encountered a platform face consisting of three rocks aligned east/west (Lot GJ-04-B-03), associated with a final phase plaster floor (Lot GJ-04-B-02) abutting the platform face. We encountered the penultimate plaster floor (Lot GJ-04-B-05) approximately 15 cm beneath the final floor. We excavated through both floors and removed their supporting fill, which consisted of small limestone cobbles and matrix. Surprisingly, we did not recover many artifacts. The exposed portion of the platform face was 0.33-m wide by 0.37-m tall and was built of three courses of modified limestone blocks facing south (Figure 6.7). The northern area of the suboperation measured 1 m east/west by 0.66 m north/south and was designated Lot GJ-04-B-04 to remove the platform fill and recover artifacts. No floors were encountered in the northern area, and we did not recover any ceramics from this section. We closed Subop GJ-04-B after reaching bedrock at 57 cm below surface in the northern area and at 40 cm below ground surface in the southern area.

Subop GJ-04-C

Exploring the ball court at Plaza D-1 was a priority for us during this season, as there is no ball court associated with the Gallon Jug Main Plaza. Understanding the chronology of the ball court may give insight into the relationship between the two groups. For that reason, we established Subop GJ-04-C in the ball court alley between Structures D-8 and D-9. The 1-x-2-m unit was placed in the southern part of

Figure 6.7. Photograph of the platform face in Subop GJ-04-B (Lot GJ-04-B-03). Camera facing north.

the alley, oriented east/west to avoid significant treefall in the northern part of the alley.

Subop GJ-04-C revealed a series of three floors separated by limestone cobbles and soil fill. Each fill layer yielded abundant ceramics and lithics, which will help us understand the chronology of the remodeling events of the ball court alley as well as the occupation history of Plaza D-1. We reached bedrock 60 cm beneath the ground surface, which was covered by a fill layer that included abundant ceramics and lithics in addition to a worked limestone block measuring 29 cm in length, 19 cm in width, and 12 cm in height. It sloped northward and was associated with a large chert cobble. The floor (Lot GJ-04-C-06) covering this fill was 10 cm thick and well preserved (Figure 6.8). A repaving event came next, evidenced by a thin layer of dirt that was laid before the paving for a new floor (Lot GJ-04-C-04). Finally, the Maya constructed the final floor (Lot GJ-04-C-02), supported by a 40-cm thick layer of limestone cobble fill with soil and artifacts. The final floor was preserved in some places with sections 10 cm thick, and we collected approximately 10 ceramics from the topsoil (Lot GJ-04-C-01).

Subop GJ-04-D

To investigate another area of Plaza D-1, we established Subop GJ-04-D east of Structure D-10. The unit measured 1 x 2 m, oriented east/west. It was placed close to the structure to catch any patio construction phases and basal architecture. Excavators removed soil and minor collapse debris from Subop GJ-04-D to a depth of 40 cm below the surface, where they encountered bedrock. No artifacts were collected. There was a highly eroded patio surface present in the western area of the suboperation, near Structure D-10, which transitioned to bedrock in the eastern area. In this part of Group D-1, the Maya flattened the bedrock and then paved directly on top of it.

Concluding Thoughts

Plaza D-1 is a significant architectural investment on a hilltop almost a kilometer north of the Gallon Jug Main Plaza. Based on our field identification of ceramics from the

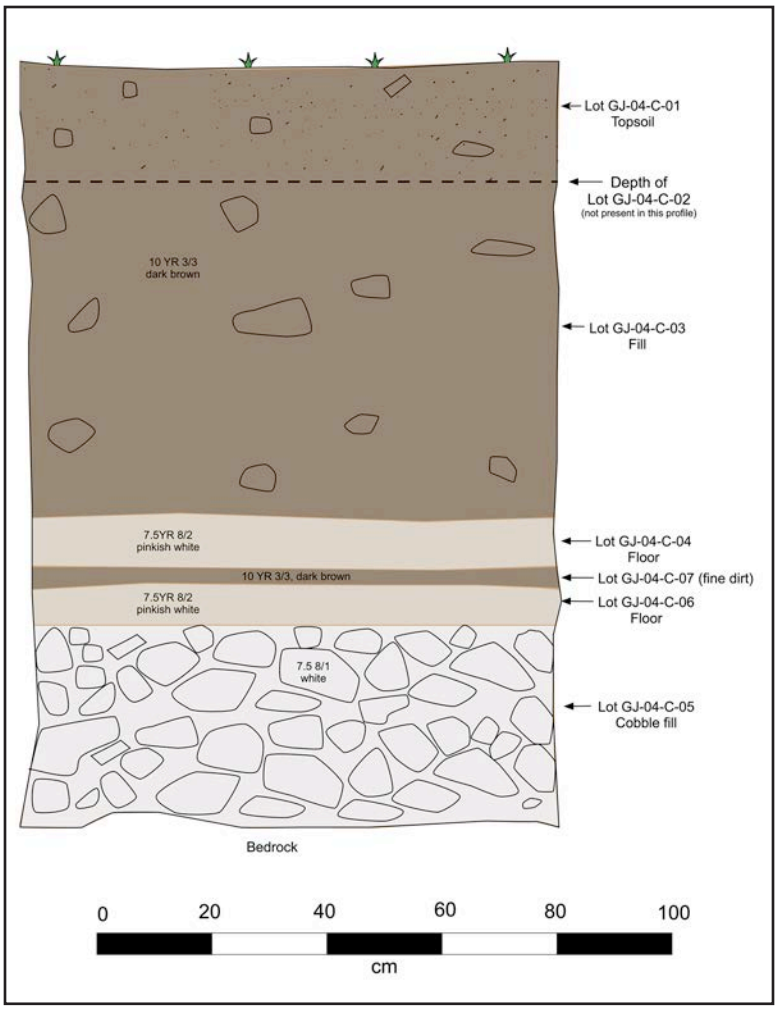

Figure 6.8. West profile of Subop GJ-04-C showing the stratigraphic sequence.

ball court alley (Lot GJ-04-C-05), it is likely that construction at Plaza D-1 commenced sometime during the Preclassic period (400 BC–AD 150). However, it is worth noting that many of our units within this plaza lacked ceramics or carbon suitable for dating. This suggests that the Maya took advantage of the natural elevations of the hill and used locally available quarry material for their construction fill.

COURTYARD C-1

Courtyard C-1 consists of six structures on a modified hill with a steep drop-off to the north (see Figure 6.3). The group forms a horseshoe shape that opens to the south, with three range buildings (Structures C-1, C-2, and C-3). These three structures do not directly connect but have additional structures at the northwestern (Structure C-5) and northeastern (Structure C-6) corners that join the longer structures. Two structures at the northwestern corner form a swale that may have been an entrance and/or provided access to the single mound (Structure C-6) off the north side of the group. Structure C-4 forms the northeastern corner and connects Structures C-1 and C-3. Structure C-2 is 3.8 m tall and has a terrace along its western side rising 2 m above the courtyard surface.

Notably, Structure C-1, the courtyard's northern range structure, forms the southern edge of a sunken patio. It is likely that there were steps on the south-facing side of the structure, leading from the courtyard to the 4-m high summit. Our excavations this season revealed steps (Lot GJ-04-F-03, see below) descending 2 m into a patio space measuring 31 m^2. The northern part of the structure rises 0.4 m above the patio, which is shorter than the southern structure facing the courtyard. Standing in the middle of the patio, one is surrounded on four sides by architecture, creating an enclosed and private, yet imposing, space.

In addition, there is an extremely eroded altar placed roughly in the courtyard's center. This is Altar 2 in the running list of monuments at Gallon Jug. Our excavations at Courtyard C-1 included Subops GJ-04-E, -F, -G, and -H (see Table 6.1; Table 6.2).

Table 6.2. Summary of Lots by Suboperation

Subop	Lot	Lot Description
GJ-04-A	01	Topsoil
	02	Construction Fill
GJ-04-B	01	Topsoil
	02	Floor
	03	Wall
	04	Collapse Debris
	05	Construction Fill
	06	Floor
	07	Construction Fill
	08	Construction Fill
	09	Step (Riser/Tread)
GJ-04-C	01	Topsoil
	02	Floor
	03	Construction Fill
	04	Floor
	05	Construction Fill
	06	Floor
GJ-04-D	01	Topsoil
	02	Construction Fill
GJ-04-E	01	Topsoil
	02	Construction Fill
	03	Construction Fill
GJ-04-F	01	Topsoil
	02	Construction Fill
GJ-04-G	01	Topsoil
	02	Collapse Debris
	03	Step (Riser/Tread)
	04	Floor

Table 6.2. (continued)

Subop	Lot	Lot Description
GJ-04-Gx	01	Topsoil
GJ-04-H	01	Topsoil
	02	Construction Fill
GJ-04-I	01	Topsoil
	02	Construction Fill
	03	Construction Fill
	04	Floor
	05	Construction Fill
GJ-04-J	01	Topsoil
	02	Construction Fill
	03	Construction Fill
	04	Construction Fill
	05	Wall
GJ-04-K	01	Topsoil
	02	Construction Fill
	03	Floor
	04	Construction Fill
	05	Construction Fill
	06	Wall
	07	Construction Fill
GJ-04-L	01	Topsoil
	02	Construction Fill
	03	Collapse Debris
	04	Wall
GJ-04-M	01	Topsoil
	02	Construction Fill
	03	Collapse Debris

Excavations

Subop GJ-04-E

Subop GJ-04-E was a 1-x-2-m unit oriented north/south and placed about a meter to the southwest of the altar. The goal of this suboperation was to collect chronological information from the patio. In total, excavators dug 40 cm until they reached bedrock. The bedrock was uneven, with small outcrops, likely filled in by the Maya to level the courtyard surface, resulting in few artifacts. We were able to collect a carbon sample from the bottom of this unit (Sample GJ-04-S01).

Subop GJ-04-F

Subop GJ-04-F was a 2-x-2-m unit placed around Altar 2 to probe for caches and other associated artifacts. Initially, we considered flipping the altar to look for inscriptions, but excavation around its base revealed it was too heavy to move. The altar is roughly 1 m long by 1 m wide and 0.5 m high. The altar is heavily weathered and has a small tree growing

on it (Figure 6.9). Additionally, only about 10 cm of soil separated it from the shallow bedrock. Despite this, we excavated around the altar until reaching bedrock, recovering some eroded Late Classic sherds and a carbon sample from the northeastern side of the unit (Sample GJ-04-S02). We closed Subop GJ-04-F after reaching bedrock without moving the altar.

Subop GJ-04-G

Subop GJ-04-G explored the final phase architecture in the sunken patio of Structure C-1. We placed Subop GJ-04-G on the south side of the patio, on the sloping face of Structure C-1, as a 1-x-2-m unit, oriented north/south. After removing topsoil and collapse debris, excavators encountered three preserved steps (Lot GJ-04-G-03) constructed of limestone blocks ascending to the south (Figure 6.10). Each step had a 20-cm high riser, and the tread of each step would have been 45 cm. The final phase plaster floor (Lot GJ-04-G-04) of the sunken patio abutted the steps and rolled up a bit, suggesting that the steps would likely have been covered in plaster. Subop GJ-04-G concluded once the final phase architecture was documented, as our research design did not include penetrating excavations of subfloor deposits.

Subop GJ-04-H

To explore the final phase architecture at a second location in Courtyard C-1, we initiated Subop GJ-04-H on the west facing side of

Figure 6.9. Photograph of Altar 2 at Gallon Jug in the center of Courtyard C-1 after excavations. Camera facing north.

Figure 6.10. Photograph of the southern steps (Lot GJ-04-G-03) of Structure C-1 in the sunken patio. Camera facing south.

Structure C-3, along the building's centerline. This 1-x-2-m unit, oriented east/west, had shallow bedrock, just 20 cm below the ground surface. Despite the shallow depth, we found abundant ceramic sherds and lithic tools, including a complete chert biface resting on a bedrock outcrop in the eastern balk. We did not encounter any architecture here but did notice small pieces of eroded plaster, likely from the nearby structure or a poorly preserved courtyard floor.

Concluding Thoughts

Group C-1 presents an architecturally intriguing group deserving of further investigation. The wide and open patio to the south contrasts with the restricted access to the summit architecture in the three range structures. Structure C-1 includes a sunken patio, a rare architectural feature in this region, and a configuration that suggests restriction in who has access to that space. The presence of an altar points to the ritual importance of the space or the high status of its residents.

GROUP E

Group E consists of four courtyard groups and some isolated mounds located 1 km east/southeast of the Gallon Jug Main Plaza (see Figure 6.5). Courtyard E-1 is the primary group, elevated on a ridgeline above the surrounding area. Courtyard E-2 is located northeast of Courtyard E-1 on the hilltop, featuring four structures arranged around a patio. Courtyard E-3 is located east of the hilltop, and Courtyard E-4 is southeast of the hilltop and directly south of Courtyard E-3. Both Courtyards E-3 and E-4 consist of three contiguous structures forming a C-shape, although they face different directions—Courtyard E-3 is open to the east (facing Courtyard E-1 on the hill), while Courtyard E-4 is open to the north (facing Courtyard E-3). In addition to the courtyard groups, we mapped several isolated mounds, including Structures E-7, E-17, and E-18. We focused our excavations on Courtyard E-1, exploring its chronology through Subops GJ-04-I, -J, and -K (Table 6.1).

Courtyard E-1

The Maya modified a 2,575-m^2 north/south trending hilltop, including a remarkably flat area to the south with minimal architecture and a northern area that is about 1 m higher in elevation (see Figure 6.5). The southern area has one 1.5 m structure at its southern end that is visible in the lidar data (Structure E-19). However, we did not assess this area because tree falls obscured much of it. The Maya focused their architectural efforts on the northern 1,000 m^2 portion on which they built the six structures comprising Courtyard E-1.

Structure E-1, on the south side of the courtyard, is a range structure 12 m long (east/west) by 7 m wide (north/south). Standing 3.7 m high, it is the tallest structure in the courtyard. Structure E-1 faces Structure E-2 on the north side, with Structure E-3, a low-range structure, defining the western side of the group. Structure E-4 is oddly placed to the southeast of Structure E-1, creating a separate small patio. Interestingly, there are only two small mounds on the eastern side of the hilltop—Structures E-5 and E-6. While Structure E-6 was partially obscured by tree debris, both structures have a height of about 1 m, contributing to an open and breezy view to the east; this view is possibly significant, and we return to this point later.

Excavations

Subop GJ-04-I

Upon clearing Courtyard E-1, we initiated Subop GJ-04-I, a 1-x-2-m unit oriented north/south at the base of Structure E-1. Our goal was to establish a site chronology by recovering ceramic sherds. As we started to remove the topsoil (Lot GJ-04-I-01), we immediately discovered about 100 sherds as well as pieces of lithic debitage. The courtyard surface had completely eroded away. We broke lots when the soil changed to include more pebbles and a few limestone cobbles. We uncovered a thick layer of compacted fill (Lots GJ-04-I-02 and -03) that yielded 200 sherds, debitage, and several obsidian blade fragments. A charcoal sample was collected for radiocarbon dating from this level (Sample GJ-04-S03). The fill was highly compacted the deeper we excavated. It covered the patchy remains of a plaster floor (Lot GJ-04-I-04)—the best-preserved fragment measured 16 cm north/south by 30 cm east/west and was located in the central/eastern section of the suboperation. Excavators retrieved a sherd concentration in the southwestern corner of the unit that was at the same elevation as the floor (Lot GJ-04-I-04), suggesting that the sherds would have rested on the same floor had it been preserved in the southern part of the unit. Due to time constraints, we decided to excavate to bedrock only in the southern 1 m of the unit (Lot GJ-04-I-05). We found that the Maya had deposited a thin layer of ceramic sherds and soil directly on the bedrock, 70 cm below surface, and then paved over it to form the first courtyard floor.

Subop GJ-04-J

To gather chronological data from another area of Courtyard E-1, we initiated Subop GJ-04-J on the southern side of Structure E-5. While originally designed as a 1-x-2-m unit, the presence of two entangled and extremely thick roots found during topsoil removal led to excavation of only the southern 1-x-1.35-m section. We recovered about 100 sherds and 10 pieces of debitage from the topsoil and broke lots when we uncovered two flat rocks—one in the southwestern side of the unit and one in the northeastern side. We removed the rocks in Lot GJ-04-J-02 because they were not associated with anything visible; we interpreted them as out of place. Beneath those two rocks, we encountered three worked limestone blocks (Lot GJ-04-J-05) 44 cm below surface, in an alignment curving from the southwest to the northeast of the unit which we interpret to be the face of a buried platform. The blocks

were 25 cm wide and approximately 40 cm long. In the southeastern corner of the unit there was loose fill composed of soil, pebbles, and limestone cobbles (Lot GJ-04-J-03); we established Lot GJ-04-J-04 in the northwestern corner of the unit to keep these two contexts separate. A possible Sierra Red sherd, dating to the Preclassic period (400 BC–AD 150), was recovered from Lot GJ-04-J-04. We closed Subop GJ-04-J to expand our excavations southward.

Subop GJ-04-K

Subop GJ-04-K was a 2-x-2-m unit established to follow the southern arc of the feature (Lot GJ-04-J-05) exposed in Subop GJ-04-J. The topsoil (Lot GJ-04-K-01) contained an abundance of artifacts—about 200 ceramic sherds, 35 pieces of debitage, obsidian, and a possible spindle whorl. Excavators switched lots as limestone cobble and pebble fill emerged throughout the unit. We separated the interior fill (Lot GJ-04-K-05) from the exterior fill (Lot GJ-04-K-04) surrounding the platform face (Lot GJ-04-K-06). Beneath the construction fill, a layer of plaster emerged in the center of the unit that was 30 cm wide by 1 m long (north/south) and 5 cm thick where preserved (Lot GJ-04-K-03). It tracked along the same arc as the curved wall in Subop J to the north, covering the section of the platform face in this unit (Lot GJ-04-K-06). It is likely that this plaster covered the fill to the east of the wall (Lot GJ-04-K-05), creating a platform surface. Figure 6.11 shows the curve of the building after excavations. The separation of assumed interior fill from exterior fill holds significance for artifact analysis. Ceramics from Lot GJ-01-K-05 may reveal when the platform was constructed, while ceramics and carbon samples (Samples GJ-04-S04 and -S05) from Lot GJ-01-K-04 will provide insights into when the platform was covered with construction fill.

To summarize, we exposed a 3-m long and 28-cm tall section of a platform that arcs from southwest to northeast; we project that it is a circular platform whose eastern side remains unexcavated. Due to time constraints we did not excavate to bedrock, so we did not reach the platform base or any associated floor. There was a thick (5 cm) layer of plaster adhering to the top of the stones, suggesting that it may have been a paved surface in antiquity that has since eroded away from the summit of the platform.

Concluding Thoughts

Our investigations in Group E have unveiled intriguing patterns that warrant further exploration. We encountered two construction phases at Courtyard E-1; field identification of ceramics suggests that the first phase occurred in the Preclassic period and the second in the Late Classic period. The unearthing of a buried circular platform was a surprising discovery. Circular platforms are indicative of the Preclassic period (1000 BC–AD 250) and are interpreted as early ritual spaces constructed for supra-household engagement (Aimers et al. 2000; MacLellan and Castillo 2022). While we did not excavate the entire circular platform, the arc of the platform face suggests that it continues to the east. This early structure is positioned at the eastern edge of the hilltop with a viewshed that would have incorporated the larger site of Punta de Cacao to the northeast (see Figure 6.2). Given that Punta de Cacao has a Middle Preclassic phase (900—600 BC), it is plausible that Courtyard E-1 was affiliated in some way with that city during this period.

Finally, the prevalence of C-shaped courtyard groups is an intriguing phenomenon that merits further research. Courtyards E-2 and E-3 provide well-preserved examples of this pattern. This phenomenon seems present throughout the permit area and holds promise

Figure 6.11. Photograph of Subops GJ-04-J and -K showing the buried round platform. Camera facing north.

for enhancing our understanding of settlement patterns in this region.

GALLON JUG MAIN PLAZA AND COURTYARD B-1

One of our objectives this season was to assess and excavate chronological test units along the *sacbe*, which the lidar data had revealed connecting Courtyard B-1 to the Main Plaza (see Figure 6.6). The southern edge of the *sacbe* was most clearly visible on the ground. Our team used it as a guide while clearing a path from Courtyard B-1 toward the Main Plaza. Once we had cleared a *brecha*, we referred to the lidar map to locate the other side of the *sacbe*. Unfortunately, we conducted this assessment on the last day of the field season and we were rained out just after lunch. Consequently, the northern side of the *sacbe* remained uncleared and unassessed, although the crew that cut a trail from Courtyard B-1 to Courtyard C-1 noted a line of small boulders in several spots along their trail that are probably part of the northern parapet (Brett A. Houk, personal communication, October 19, 2023). Nonetheless, we did manage to excavate two 1-x-2-m test units: Subop GJ-04-L on the eastern end of the *sacbe* and Subop GJ-04-M closer to the Main Plaza at the western end.

Excavations

Subop GJ-04-L

Subop GJ-04-L was a 1-m-x-2-m unit oriented north/south established perpendicular to the

sacbe, allowing us to examine the architecture as well as collect chronological information (Figure 6.12). After clearing the leaf debris, we could see at least two modified limestone blocks facing south that seemed to form the south edge of the *sacbe*. After removing the topsoil (Lot GJ-04-L-01), we split the unit into two lots because there were two different contexts emerging. Lot GJ-04-L-02 comprised the northern 1-x-1-m section of the unit, which included the construction fill of the *sacbe*. Unfortunately, any paved surface was completely eroded away. Nonetheless, we recovered a handful of ceramics from this context. Lot GJ-04-L-03 made up the southern 1-x-1-m section of the unit, which included the collapse debris from the *sacbe* wall (Lot GJ-04-L-04). Here, too, we found a few ceramics. Regrettably, excavations were cut short due to an approaching storm, so the unit was backfilled before we were able to dig further than about 20 cm.

Figure 6.12. Final excavation photograph of Subop GJ-04-L. Camera facing north.

Subop GJ-04-M

In Subop GJ-04-M, located at the western end of the *sacbe*, we established a 1-x-2-m unit, also oriented north/south (Figure 6.13). This setup allowed us to capture architectural features and gather chronological information. Excavators began by removing a thin (~5 cm) layer of topsoil, revealing a gravel layer mixed with numerous ceramics and lithic debitage. We interpreted this layer as the ballast supporting the final sacbe surface. Excavators switched lots to reflect two different contexts emerging in the northern and southern areas of the unit. In the northern 1-x-1-m section of the unit (Lot GJ-04-M-02), about 13 cm of construction fill materials like limestone cobbles, soil, pebbles, and ceramic and lithic artifacts were found. In contrast, the southern 1-m-x-1-m section (Lot GJ-04-M-03) had larger limestone cobbles, likely collapse debris from the southern edge of the *sacbe*. Excavators were only able to remove around 10 cm of material in this lot. One faced stone block in the central/eastern side of the unit was likely an in situ section of the *sacbe* wall. Ceramics, lithics, and shell were collected from Lot GJ-04-M-03. Subop GJ-04-M was closed and backfilled quickly due to adverse weather conditions.

Figure 6.13. Final excavation photograph of Subop GJ-04-M. Camera facing west.

Concluding Thoughts

We could only dedicate a few hours on the final day of the field season to assess the *sacbe* due to time and weather limitations. Nevertheless, we managed to clear the southern edge, collect chronological materials, and observe the preserved ballast material at the western end of the *sacbe*.

Angela Keller's (2006) work on the causeways at Xunantunich suggests that *sacbes* mark sociopolitical connections between the civic ceremonial center and nearby elite residential courtyards. They also provide spaces for ritual processions, as demonstrated by Keller as well as Booher and colleagues at Chan Chich (Booher et al. 2015:40; Houk and Booher 2020). This interpretation makes sense for Gallon Jug as well. In the region, parapet-lined *sacbes* are also present at Laguna Seca, Ayiin Winik, Tiho'witz, and Chan Chich, though only the *sacbes* at Chan Chich and Laguna Seca connect two architectural groups.

Furthermore, the sRRIM image of Gallon Jug indicates that the sacbe may have been constructed before the tallest structure at the site, Structure A-1, which forms the eastern edge of the Main Plaza (see Figure 6.2). The *sacbe's* northern parapet starts at the northeastern corner of that structure, and the southern parapet delineates a 12-m-wide path along the south side of Structure A-1 that continues past it and ends at Structure A-2. Structure A-1 seems to be a range structure whose longest side faces the *sacbe*—directly overlooking it and any processions that may have entered the Main Plaza. The *sacbe* may pre-date Structure A-1, whose construction would have constrained direct access to the Main Plaza from Courtyard B-1.

CONCLUSIONS

This season, we achieved our primary objectives to visit and assess unrecorded groups, produce maps, and conduct test excavations into courtyards and plazas. Preliminary

chronological interpretations, drawn from on-site assessments of ceramics and associated stratigraphy, suggest that there was earlier occupation at some groups in the area but many of the settlement groups around Gallon Jug were constructed in one phase during the Late Classic period. More specifically, the round platform discovered at Courtyard E-1 and a finely made limestone block buried in the ball court at Courtyard D-1 point to a Preclassic occupation phase in the study area. However, shallow bedrock and the lack of midden material in plaza fill also suggests that there was a construction boom during the Late Classic period at each group that we visited.

The new spatial and chronological information collected this season raises questions about territoriality and affiliation between centers of power. Gallon Jug is a minor center positioned between the bigger cities of Punta de Cacao and Chan Chich. Elsewhere, models of territoriality by Garrison (2007) and Houk (2003) argue that there is a Petén site planning style that is distinct from northern Belize, and that this may reflect differing ideologies and help us understand territorial boundaries. In this model, Chan Chich adheres to a Petén style and Punta de Cacao to that of northern Belize. Gallon Jug occupies a position on the boundary between these two architectural templates and thus a boundary not only between two capitals but also two regions. Understanding boundary areas is crucial for understanding the dynamics of regional politics, as well as the construction of distinct identities.

Future research in the Gallon Jug settlement area will evaluate the role of minor centers in the regional political landscape. One question to address is a shift in regional affiliation of courtyard groups over time. For example, the viewshed observed from Courtyard E-1 looking northeast towards Punta de Cacao coupled with the unique circular structure may suggest an affiliation with Punta de Cacao during the Late Preclassic period. However, that allegiance may have shifted by the Late Classic period, when we see a population increase and the construction of more large courtyard groups with ritually important elements like altars (Group C-1) and ball courts (Group D-1). Another potential Petén connection lies in the style of the patolli boards, which may have been incised during the Late or Terminal Classic period. The sites of Nakum and Holmul have examples of rare patolli board variants that were also documented at Courtyard B-1. If the Gallon Jug patolli were indeed incised during the Terminal Classic period, it could represent an example of a strategy employed by intermediate elites at a turbulent time during Classic Maya history. As power structures shifted, intermediate elites may have stepped in to fulfill certain ritual responsibilities, including divination.

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Classic Period and Historic Occupations in the Booth's River Lowlands: Field Assessments at Sierra de Agua (BE-09) and Wamil (BE-08)

Amy E. Thompson, Heather Richards-Rissetto, and Brooke Bonorden

Sierra de Agua (BE-09) and Wamil (BE-08) are in the southeastern reaches of the Belize Estates Archaeological Survey Team's (BEAST) permit zone (Figure 7.1), near the Booth's River. The Rio Bravo Archaeological Project first reported these sites, based on information on file at the Department of Archaeology (DOA, now the Institute of Archaeology), but did not visit them (Guderjan et al. 1991:81). Fieldwork occurred at Sierra de Agua from June 15 to June 22,

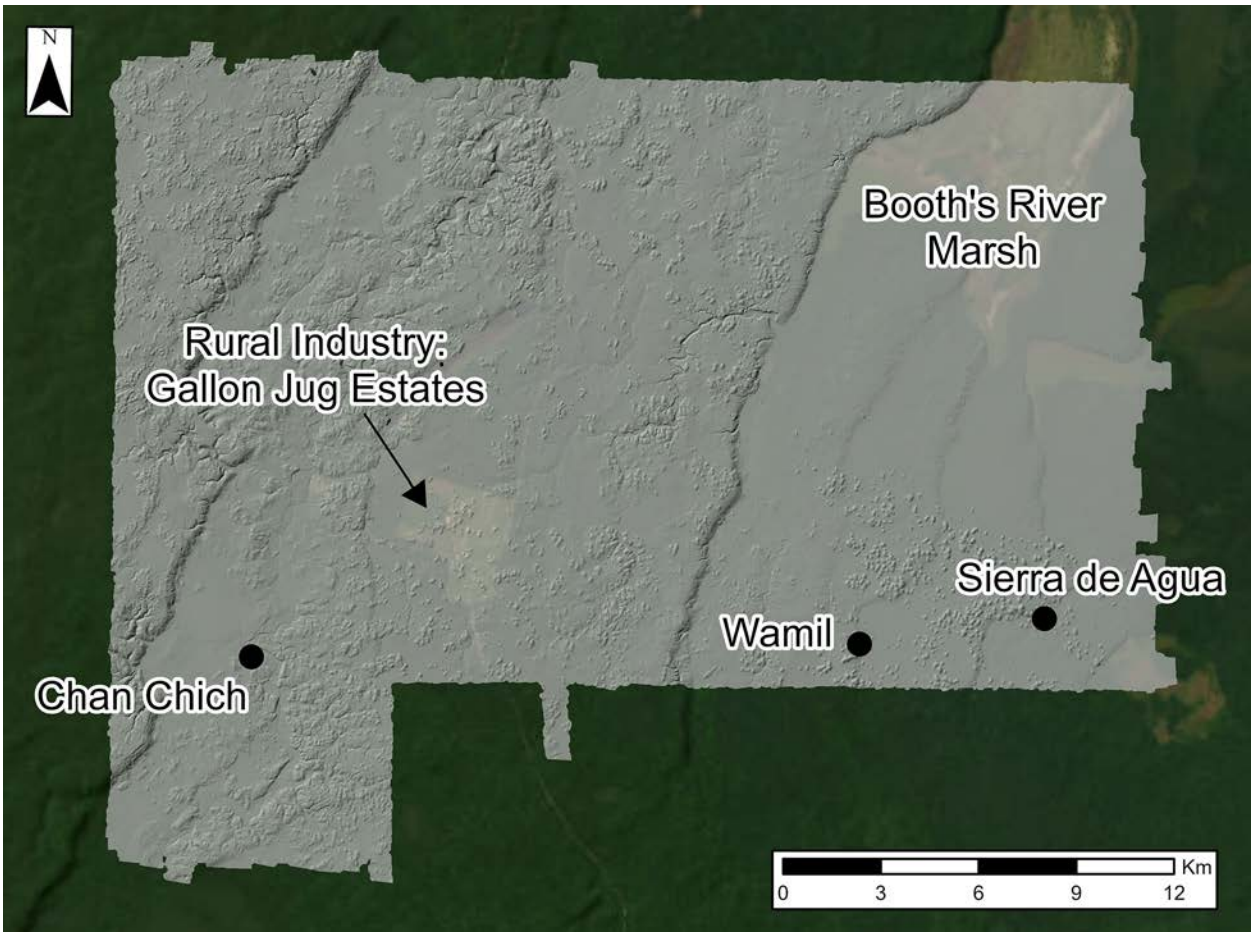

Figure 7.1. Overview map showing the locations of Sierra de Agua and Wamil in the BEAST lidar footprint.

Thompson, Amy E., Heather Richards-Rissetto, and Brooke Bonorden
2023 Classic Period and Historic Occupations in the Booth's River Lowlands: Field Assessments at Sierra de Agua (BE-09) and Wamil (BE-08). In *The 2023 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 143–180. Papers of the Chan Chich Archaeological Project, Number 16. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

2023, with Amy Thompson leading the survey and Heather Richards-Rissetto in charge of excavations. Chris Quetzal, Aloria Tush, Lorena Alvarado, Nahaman Guitierrez, Shaliny Moh, and Emanuel Cordova worked with us at Sierra de Agua. Heather Richards-Rissetto led fieldwork at Wamil from June 22 to June 24, 2023. Lorena Alvarado, Nahaman Guitierrez, Shaliny Moh, and Jerviana Serminia worked at Wamil. Brooke Bonorden, former BEAST Operation Director and now of Terracon Consultants, Inc., assisted with historic artifact identifications based on field photos.

SIERRA DE AGUA (BE-09)

Sierra de Agua is in the flat terrain of the Booth's River depression near the southeastern limits of the Belize Estates Archaeological Survey Team's (BEAST) permit area. Dense jungle foliage covers the landscape that is largely flat but speckled with small hills, many of which contain the remains of ancient Maya architectural features. Sierra de Agua is accessible via the Hillbank road that is used by the Virginia Tech jaguar research team. Thanks to Hurricane Lisa in November 2022, BEAST and the jaguar research team had to pay a Mennonite logger to reopen the road with a bulldozer. After driving 30–45 minutes east of Gallon Jug, one can hike an additional 30 minutes north before reaching the towering architecture of Sierra de Agua. Along the way as one approaches the site, scatters of historic artifacts allude to connections with other, well-documented historic communities that are scattered across the BEAST permit zone (see also, Bonorden 2016; Bonorden and Houk 2019, 2022). In this case, the historic artifacts are likely related to the Belize Estate and Produce Company's (BEC) Sierra de Agua camp, from which the prehistoric ruins derive their name. While the Hillbank-Gallon Jug Railway began at Hillbank on the New River Lagoon circa 1910, Baker (2007) reports that the BEC railroad first reached Sierra de Agua in 1925 and that the camp was fully established by 1927, including a commissary and a store. J. Eric Thompson (1963:239) reports that in 1931 the camp had hospital facilities, which the district doctor visited on his rounds. At its peak, the railway extended a total of 42 km (Weaver and Sabido 1997), closing in 1962. Evidence of the Hillbank-Gallon Jug Railway is still apparent today as you drive along the Hillbank road (Figure 7.2).

Previous Archaeological Investigations at Sierra de Agua

Sierra de Agua was briefly described by Guderjan and colleagues (1991:81), based on DOA records, stating it is "a small center near the Gallon Jug-Hillbank tram." While Guderjan and colleagues (1991) reported on the existence of Sierra de Agua, they did not actually visit the site, nor did the BEAST team (Sandrock 2017) until the 2023 field season. Little is known about the size, complexity, or occupational history of this ancient Maya civic ceremonial center. The maps provided below are the first drawn by archaeologists for the site.

Research Design and Mapping

The 2023 field work at Sierra de Agua, conducted under Operation (Op) SdA-01, focused on three primary research objectives. First, we proposed to map all visible architecture using the lidar data as a guide for pace-and-compass mapping. This approach will allow us to build an iterative model for mapping based on remotely-sensed data and pedestrian survey data. Second, we aimed to collect or document surface finds in and around the different sectors of architecture to understand the occupational periods of Sierra de Agua. The Classic period Maya presumably constructed the visible architecture at Sierra de Agua, and BEC later re-occupied the area during historic times. The

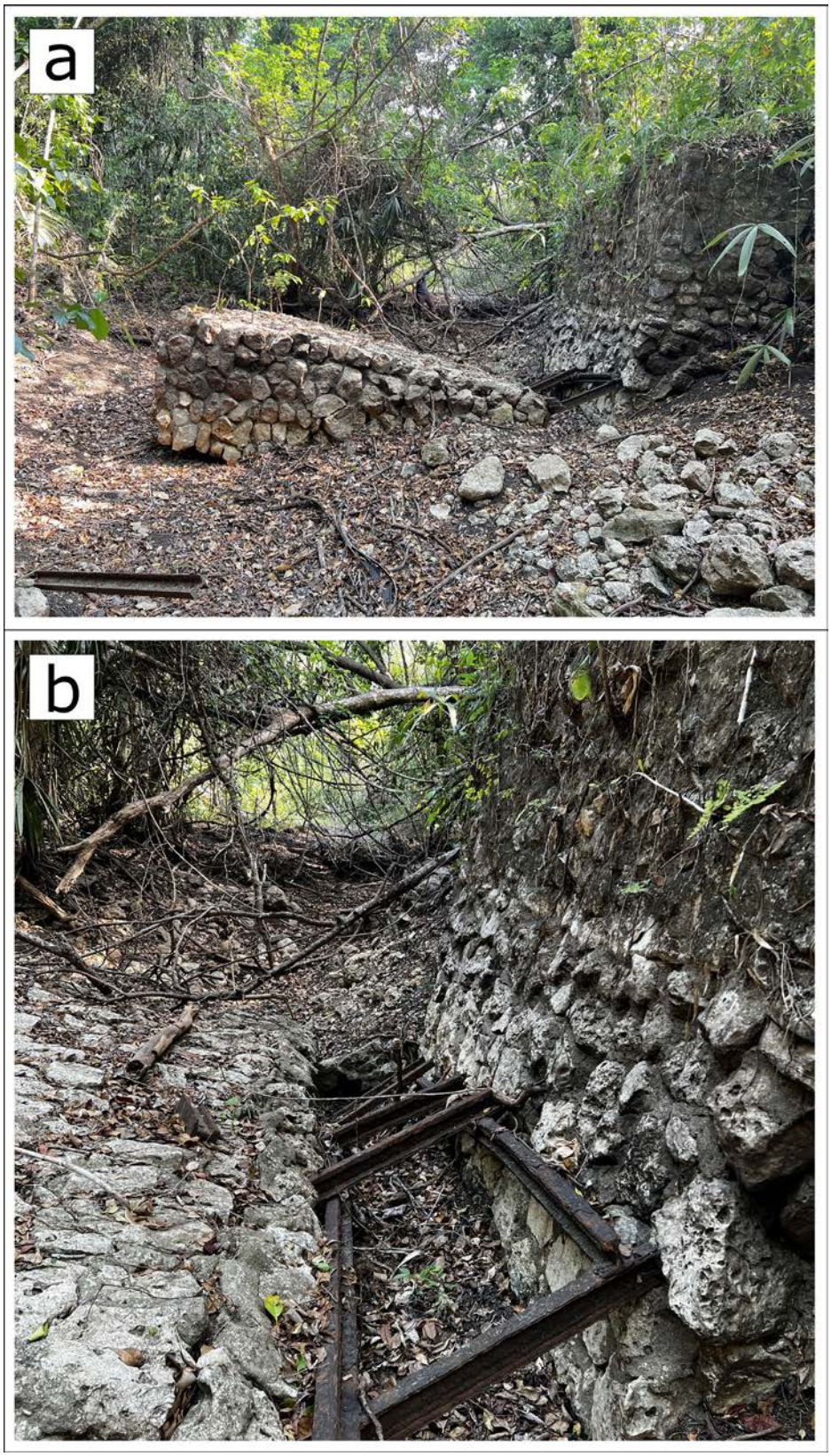

Figure 7.2. Photographs of (a) the remains of the Hillbank-Gallon Jug Railway crossing over a creek and (b) a close-up of the rails.

documentation of surface artifacts allowed us to pinpoint areas that were intensively used during historic occupations. Finally, to construct a deeper chronological sequence, we proposed to excavate a 1-x-2-m unit in the plaza (i.e., off-structure) in the highest area of Sierra de Agua, where we hypothesized would contain the most evidence of anthropogenic landscape alterations compared to the adjacent flatlands.

Thompson led the mapping of Sierra de Agua. First, we conducted an initial reconnaissance of the site, chopping pathways around and over architectural features (Figure 7.3), assessing their size, shape, and complexity. After an initial mental map was created, Thompson sketched the maps for each plaza area (e.g., Plaza A-1, Courtyard A-2, Plazuela A-3) in her field notebook, guided by the lidar data. Then, she used pace-and-compass mapping, annotating the dimensions of each building on her map. She also noted the estimated height of buildings, instances of looting or quarrying activities, artifact scatters on the surface, and other notable features such as potential historic storage pits (see Suboperations [Subops] SdA-01-D and -E, below). Using this information, Thompson digitized the map of Sierra de Agua in ArcGIS Pro, producing geospatially referenced feature classes that can be used in any GIS software for mapping and analyzing the site.

Figure 7.3. Aloria Tush and Chris Quetzal descending the northern side of Structure A-6 from the higher southern Courtyard A-2 to the northern Plaza A-1.

Sierra de Agua is an ancient Maya center that is also the location of a historic BEC logging camp. It consists of two main groups (Plaza A-1 and Courtyard A-2) with a small plazuela group (Plazuela A-3) on the southwest side of the Courtyard A-2 (Figure 7.4). We documented 17 buildings in the site core. The flat terrain surrounding Sierra de Agua seems to emphasize the grandiose nature of the 15+ m tall buildings. The site core is surrounded by small hills, each of which seem to contain the remains of ancient Maya architecture based on the 2022 lidar data. A few plazuelas are scattered throughout the flatlands, suggesting low population density. However, that does not eliminate the possibility that more houses were present, simply made of thatch situated on low dirt platforms resulting in ephemeral remains for the archaeological record.

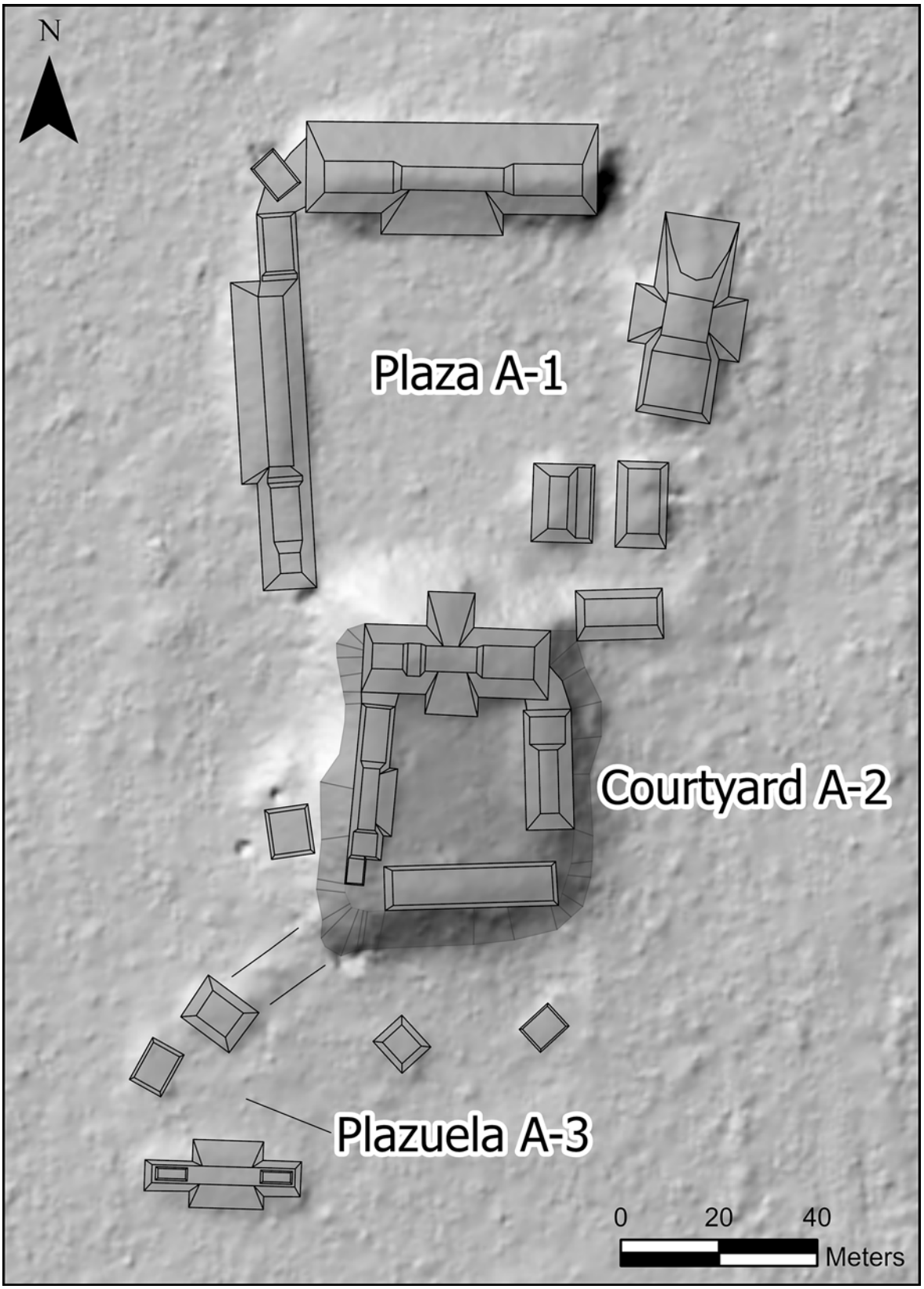

Figure 7.4. Digitized map of Sierra de Agua civic ceremonial core.

Survey Results

Group A Description

Plaza A-1 is located on the northern edge of the site. It consists of eight buildings situated around an open plaza, which measures approximately 65 m north-south by 70 m east-west (Figure 7.5). The western side of the plaza is restricted by Structure A-5 while the eastern side of the plaza is more accessible between Structure A-2 and the ball court (Structures A-3 and A-4) and Structure A-17. The northern building (Structure A-1) of Plaza A-1 is approximately 15 m tall and was likely

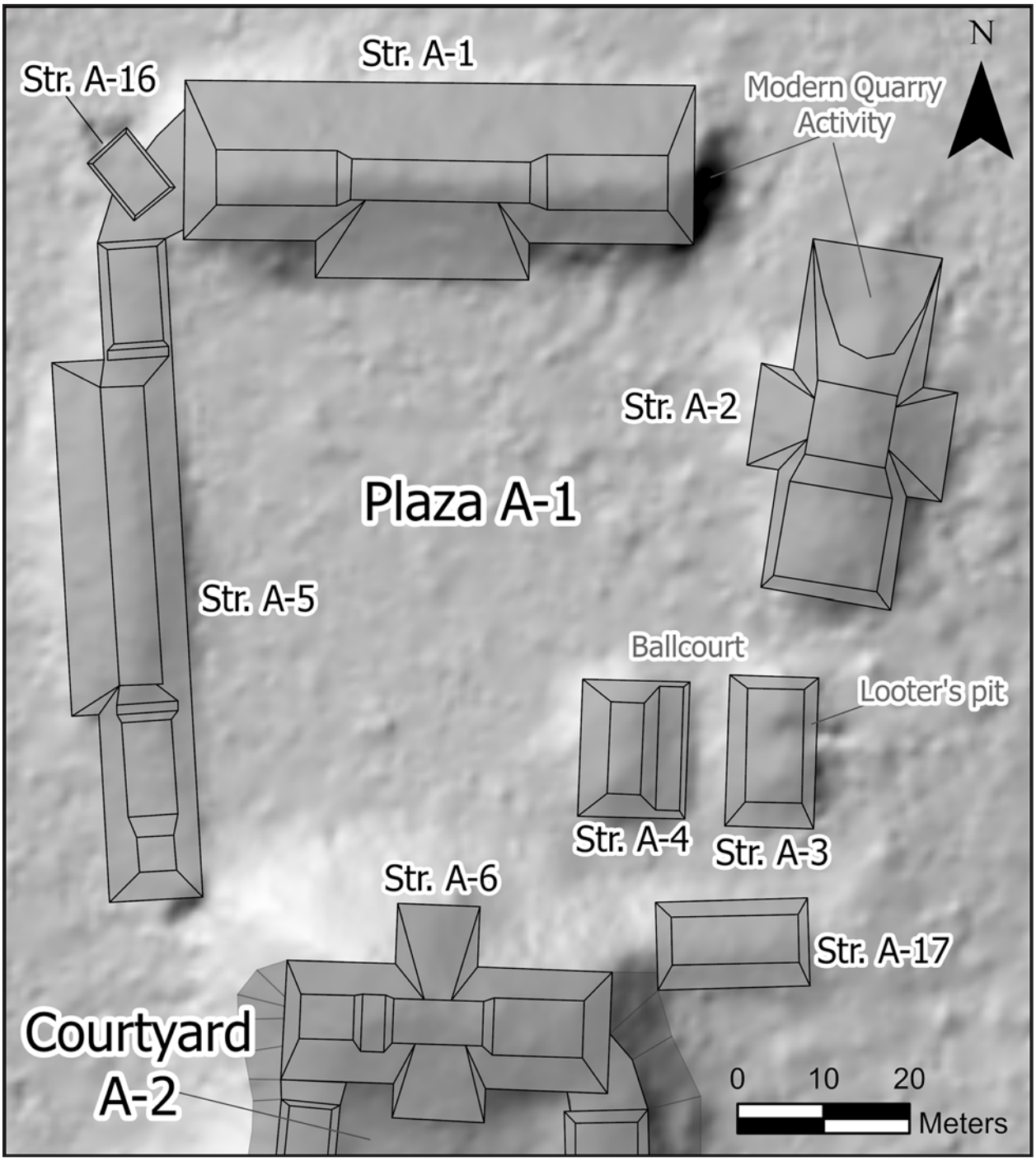

Figure 7.5. Digitized map of Sierra de Agua Plaza A-1.

a corbel vaulted building given the narrow top ridge and steep sides. It is approximately 60 m long, although the eastern side of the building was recently destroyed by modern quarrying activity (see also, Subop SdA-01-C below). On the eastern side of Plaza A-1 is Structure A-2, a tiered building where the northern side of the building is higher than the southern side of the building. The building is approximately 30 m long (north-south). Like Structure A-1, the northern end of Structure A-2 was recently destroyed by modern quarrying activities. The quarried areas are visible on the lidar data, indicating that the activity occurred prior to May 2022. To the southwest of Structure A-2 is the ball court (Structures A-3 and A-4) with a narrow 4 m wide alley. The sloped internal sides of the ball court are visible along the 16 m long buildings. The eastern building (Structure A-3) has a looters' pit that extends through the center of the building (see Subop SdA-01-B below). This was likely looted a while ago given the layer of soft green moss grown over the walls of the looters pit (which was not present on the quarried areas in Structures A-1 and A-2). Structure A-6 is located along the southern side of Plaza A-1, forming the boundary between Plaza A-1 and the high Courtyard A-2. On the east, Structure A-17 emanates from Structure A-6, delineating the southeastern edge of Plaza A-1. A narrow passage restricted access to Plaza A-1 in the southwest corner, between Structures A-5 and A-6. Structure A-5 is a 75 m long building that completes the western edge of Plaza A-1. It has a lower platform on the southern and northern sides of the building, with the highest point in the middle, reminiscent of the shape and structure of an E Group, although this mound is on the western side of the plaza. In the northwest corner of Plaza A-1 is a small building (Structure A-16) that connects Structures A-5 and A-1, restricting access from the west.

Linked by Structure A-6, south of Plaza A-1 is Courtyard A-2. This raised platform was likely constructed on a naturally occurring hill based on the excavations by Richards-Rissetto (see Subop SdA-01-A below). The courtyard space of Courtyard A-2 measures 30 m (north-south) x 25 m (east-west). It consists of four buildings, three of which are connected forming a U on the western, northern, and eastern sides of the plaza (Figure 7.6). Structure A-6 is on the north side and is the highest building, approximately 7 m tall. It has a frontal stairway descending from the top of the building into the courtyard. Between Structures A-6 and A-7 is a low platform wall that connects the two buildings and restricts access to this courtyard. Structure A-7 is located on the eastern side of the courtyard and is approximately 20 m long. Structure A-8 is located on the southern edge of the courtyard and is largely disturbed by a looters' pit or massive tree fall from years ago. Like Structure A-5 in Plaza A-1, Structure A-9 is located on the western side of the courtyard and consists of a high central platform flanked by lower platforms on the north and south. The northern edge of Structure A-9 abuts Structure A-6, restricting access along the western side of the courtyard.

In the flatlands to the southwest of Courtyard A-2 is Plazuela A-3. This area does not contain monumental architecture or have restricted access, and the mounds are not located on an elevated platform. This group consists of three buildings situated around a central plazuela (Figure 7.7) with an abundance of historic artifacts scattered across the surface. Structure A-11 is on the southern side and contains a dry-stacked platform face, which suggests this group may be historic mounds given the dissimilarity between this architecture and the architecture of the rest of Sierra de Agua. Structure A-12 is located on the western side of this group and measures 8 x 7 m. Structure A-13, on the north, measures 12 x 10 m, and

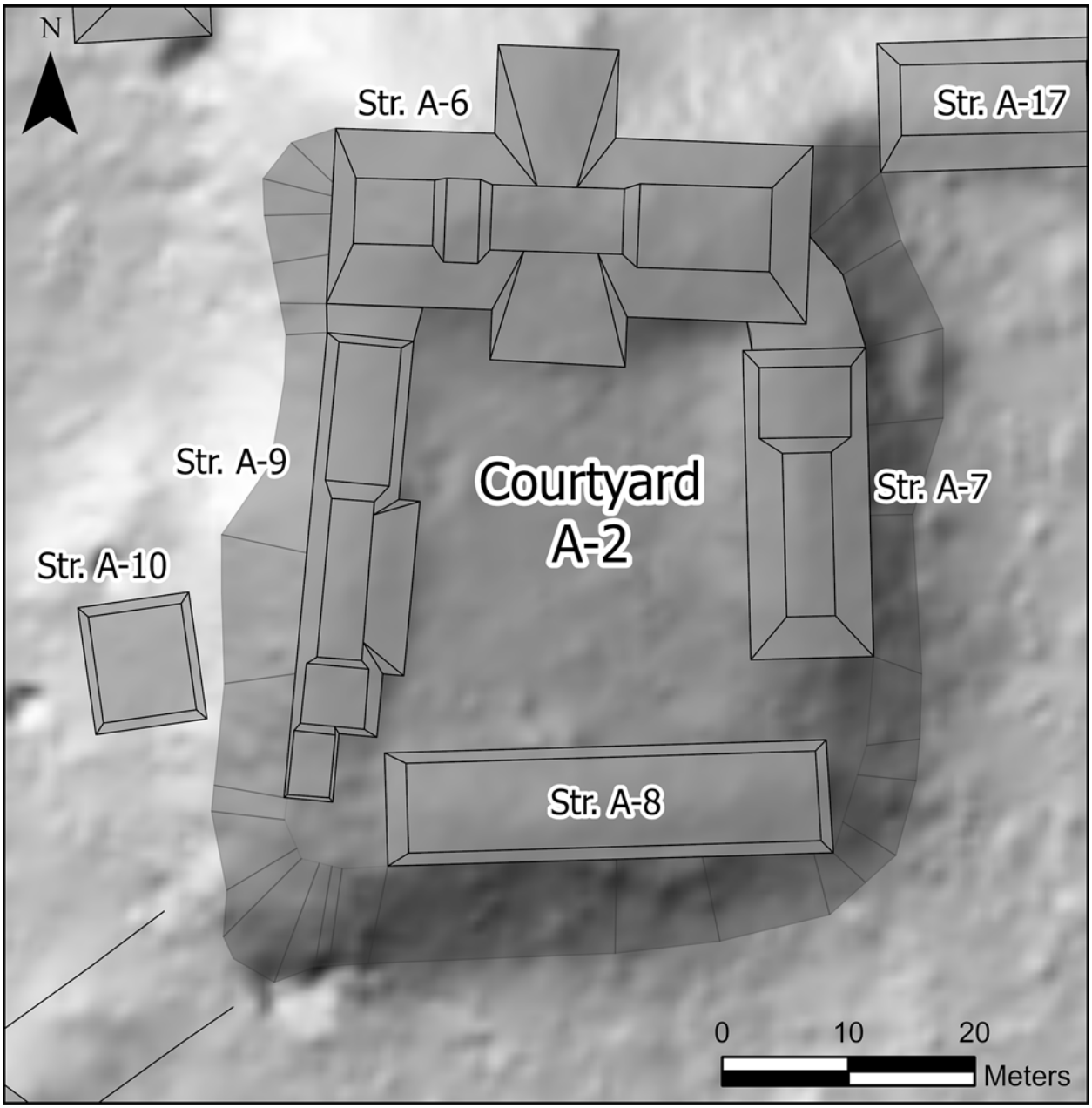

Figure 7.6. Digitized map of Sierra de Agua Courtyard A-2.

is connected to the base of Courtyard A-2 via a small, raised platform that is 7 m wide and 17 m long.

Additional Structures

Two additional areas near the Sierra de Agua civic ceremonial core contain buildings, although these are not situated around formal plazas. At the western base of Courtyard A-2 is Structure A-10 (see Figure 7.6). Near this platform are three pits, which are likely historic in nature. See Subops SdA-01-D and -E below.

On the flatlands to the south of Courtyard A-2 and east of Plazuela A-3 are two standalone mounds. The eastern mound (Structure A-14) is approximately 75 cm tall, and Structure A-15 is 1 m tall (see Figure 7.7). Walking towards Sierra de Agua from the Hillbank road, these are the first mounds you encounter. Historic

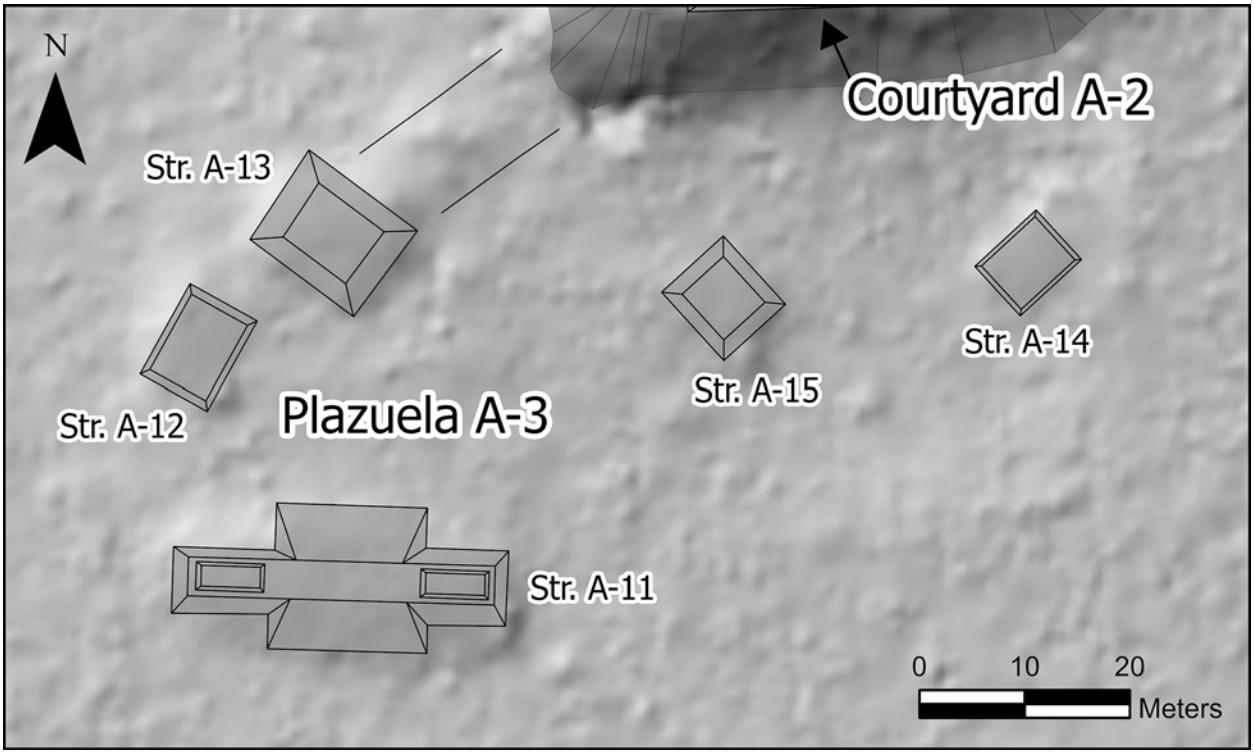

Figure 7.7. Digitized map of Sierra de Agua Plazuela A-3.

artifacts were found to the south of these buildings, helping to define the extent of the historic occupations at Sierra de Agua.

Summary of Surface Finds

Of note is the abundance of historic artifacts dispersed across the site, including areas to the south of Courtyard A-2, in Plazuela A-3, along the western side at the base of Courtyard A-2 near Structure A-10, and in the southwestern and western side of Plaza A-1 (Figure 7.8). No historic artifacts were identified in the high upper platform of Courtyard A-2. No historic artifacts were collected, although several moved from their original location (but still in the same general vicinity of the site). Notably, all historic activities were on the western and southern sides of Sierra de Agua, suggesting a clear delineation of space. Preliminary analysis of the historic bottles suggests these date to the late 1800s to early 1900s. A rough count of historic artifacts include enamelware (n = ~12), barrel loops (n = ~6), glass bottles (n = ~3 dozen), and whiteware (n = ~2 [by Lot SdA-01-D-01 in Structure A-10]), and there were also earthenware ceramics which could historic or from the Classic period, which were collected and submitted to the lab.

Based on photographs, the manufacture dates of the historic artifacts span the 1880s–1930s, with greatest occupations during the latter half of that range (circa 1910s–1930s), aligning with the documented historic occupations and activities of the region (see above). The analysis of historic artifacts included examining shape, color, and makers marks on bottles and cross-referencing these finds with other historic artifacts found locally and beyond (see Bonorden 2016). Importantly, many historic artifacts exhibit long use-life; that is, they were used repeatedly over time. So, an artifact with a maker's mark dating to the 1880s likely was used at the site years, if not decades, later. Additionally, the functionality of these artifacts likely changed through time, where a beer bottle was later used to store other liquids.

Figure 7.8. Map highlighting historic artifact scatters (black dashed lines) at Sierra de Agua Group A.

Similarly, today many folks in Central America re-use sturdy bleach containers as water jugs.

Wooden barrels were present at Sierra de Agua during the historic occupations. While all that remains today is the eroded iron hoops of the barrels, they nonetheless provide insights into the livelihoods of those residing in the historic camp. The barrels likely were initially brought to Sierra de Agua full of a variety of potential items including butter, lard, liquor, oil, spices, pickled meats, fish, biscuits, grains, fruits, or vegetables. After their primary contents were consumed, they were likely repurposed, as was the case for barrels at Holotunich, which were used a trash containers (Ng 2007:117). The rusted nature of the iron hoops and ubiquitous use of barrels for decades makes it difficult to pinpoint when they were used, but their presence may indicate a sizable community at Sierra de Agua, which Baker (2007) reports had a commissary and store.

Enamelware vessels were found in all three locales of historic occupation. The mottled enamelware generally dates from 1870–1930 and was commonly used as it was relatively inexpensive and readily available, easy to clean, and lightweight (Rohe 1996:38). While enamelware originated in the early 1800s to combat rust common on other metal cooking pots, it became common in the late 1800s. However, by the 1930s it was largely replaced by other metals (Directorate of Public Works Environmental Division Natural Resources Branch and the Colorado State University Center for the Environmental Management of Military Lands 2022). At Sierra de Agua, chamber pots, plates, and a coffee carafe made of enamel wear were identified. Four chamber pots were embedded in the soils (Figure 7.9) of the southwestern corner of Plaza A-1, perhaps alluding to the historic use of this restricted-access and secluded space. Nearby, a coffee carafe sat on the surface. Chamber pots were also found to the south of the main historic occupations of the site, and an enamel plate was found on the backside of Plazuela A-3, Structure A-11.

The most useful artifact for identifying the general date ranges of the BEC Sierra de Agua camp are historic glass bottles. Six bottles provide insights into the re-occupation of Sierra de Agua, corroborating the known historic camps in the region. Several of the bottles (Table 7.1) date to the late 1800s, but given the known occupation of BEC, may have been reused for decades prior to being brought to the camp at Sierra de Agua between 1925 and 1935. Alternatively, the camp or an unrelated settlement could have existed earlier than described in the literature.

The bottles also provide insights into different original uses of the bottles and the products they once held. For example, the aqua glass bottle (Table 7.1, Figure 7.10a) is Lydia E. Pinkham's medicine that was intended for women. The product was first produced in 1875, and the distinct oval base patent medicine shape and cup bottom restrict the original production to before 1910. Three green glass bottles indicate the possible consumption of alcohol at the BEC Seirra de Agua camp. Two likely held beer while the third is a soda/mineral style. These bottles are stylistically different and date to different time periods. One, which originally held malt extract (or beer), dates to 1910–1930 (Table 7.1, Figure 7.10b). The other, which has a crown finish is a soda/mineral style that dates to 1930–1950 (Table 7.1, Figure 7.10d). A uniquely shaped clear bottle of the "HENRY K WAMPOLE & COMPANY" has a distinct circle M maker's mark, matching the Maryland Glass Corp bottle production from 1921–1971 (Table 7.1, Figure 7.10c; Lockhart et al. 2021). The Wampole Company, founded in Philadelphia in the 1870s and moved to Canada in 1905, bottled several medicines including cod liver oil under the moniker Wampole's Perfected and Tasteless Preparation (MountainAireVintage

Figure 7.9. Four chamber pots (circled in yellow) in the southwest corner of Plaza A-1.

Table 7.1. Basic Bottle Descriptions and Date Ranges for Glass Bottles Photographed in the Field from Sierra de Agua

Bottle Description	Date Range	Figure
Aqua glass bottle	1875 - 1910	Figure 7.10a
Clear glass bottle 1	Late 1800s – early 1900s	n/a
Brown glass bottle 1	Post -1890?	n/a
Green glass bottle 1	1910 - 1930	Figure 7.10b
Clear glass bottle 2	Likely post-1921	Figure 7.10c
Brown glass bottle 2	1913-1968	n/a
Green glass bottle 2	1930 - 1950	Figure 7.10d
Green glass bottle 3	Unknown	n/a
Colorless glass bottle 3	Unknown	n/a

2023). One broken clear bottle with elaborate designs may have been a pepper (hot) sauce bottle (Ng 2007), while another green bottle clearly reads "WHISKY" on the side, further alluding to the consumption of alcohol in the camp. In summary, the original functions of the glass bottles varied from medicine bottles, to malt and liquor bottles, to possibly hot

Figure 7.10. Photographs of selected historic glass bottles from Sierra de Agua. See Table 7.1.

sauce (pepper) bottles. However, in the remote logging camp, it is likely that these bottles were re-used after the original contents were consumed.

Two miscellaneous artifacts include a small piece of whiteware and part of a potential radio battery. Undecorated whiteware is ubiquitous and could date from the 1830s until present. However, its presence indicates that the historic occupations of Sierra de Agua had access to a variety of vessels beyond enamel ware and glass. The potential radio battery contains the words "EVEREA.. AIR CELL…

"A" BATTERY" which is likely an Eveready battery. In 1906, the American Every Ready Company shortened its trademark to Eveready (Harvard University 2017). Thus, 1906 is the earliest possible production date for the battery.

Additionally, along the western side of Sierra de Agua in Structure A-10 were pit features dug into the bedrock. One of the pits was rectangular in shape (see Lot SdA-01-E-01); these may have been used for storage of black power, goods, or as privies.

Excavations

Subop SdA-01-A, a 1-x-2-m test unit was excavated in the plaza of Courtyard A-2 for purposes of chronology development at Sierra de Agua and comparison to other sites in the Booth's River region. Courtyard A-2 was selected because it contains monumental architecture and is constructed on a raised platform on a naturally occurring hill, positioning its four structures at the highest part of the site looking over additional monumental structures to the north, at a lower elevation, in Plaza 1-A, and the smaller Plazuela A-3 to the south. Due to dense vegetation cover, large fallen trees, and massive tree roots, we placed the unit in the southwest corner of the courtyard rather than in the center.

Methodology

Subop SdA-01-A excavation unit was placed approximately 3 m north of Structure A-8 and 2 m east of Structure A-9 (Figure 7.11). We selected this area because it did not have any large trees or massive roots and it was positioned to avoid collapse debris from the nearby structures. We cleared the surface debris and established a datum on a stable tree at 20 cm above the ground surface using a line-level and string. We excavated eight lots in the 1-x-2-m unit based on natural and cultural stratigraphy, taking depth measurements at the beginning of excavations and subsequently at the end of each lot, with measurements recorded for the center of the four corners of each lot. We employed a manual visual sorting of the matrix (see Black 1990:339), recording and collecting artifacts by type (ceramic, tool, debitage, etc.) for each lot. We used an iPad Pro (4th generation) to take planview photos of each of the eight lots and profile photos at the completion of the unit. Finally, drawing on the iPad Pro's lidar capabilities, we used the Scaniverse app to create a 3D model of the test excavation unit. The excavation followed *The Chan Chich Archaeological Project Field Manual* guidelines by Houk and Zaro (2015).

Subop SdA-01-A

Subop SdA-01-A comprised eight lots (Table 7.2)—topsoil, three construction/cultural fill, two eroded plaster floors, two other surfaces, and bedrock (sterile). We collected artifacts from six lots.

Lot SdA-01-A-01 comprised a relatively shallow (2–5 cm) layer of topsoil consisting of dark brown (7.5YR 3/2) soil, small roots, and pebbles and rocks. Six eroded ceramic sherds were collected. Lot SdA-01-A-02, a cultural layer, comprised multi-sized limestone cobbles and small intrusive roots with dark brown (7.5YR 3/2) soil with 116 ceramic sherds (including 13 rims), 6 chert flakes, 1 marine shell, and 1 broken obsidian blade. Lot SdA-01-A-03 comprised a rough cobble matrix (construction fill above a floor) with light brown (7.5YR 6/3) soil with 27 ceramic sherds and 1 chert flake. At a depth of 47 cmbd, we subdivided the the unit into two lots (Lot SdA-01-A-04, north portion, and Lot SdA-01-A-05, south portion) because we exposed an eroded floor in the northern portion (starting at 82 cm extending to the north wall). The eroded floor was not present in the southern 82 cm of the unit. Lot SdA-01-A-04, comprising the northern part of the unit,

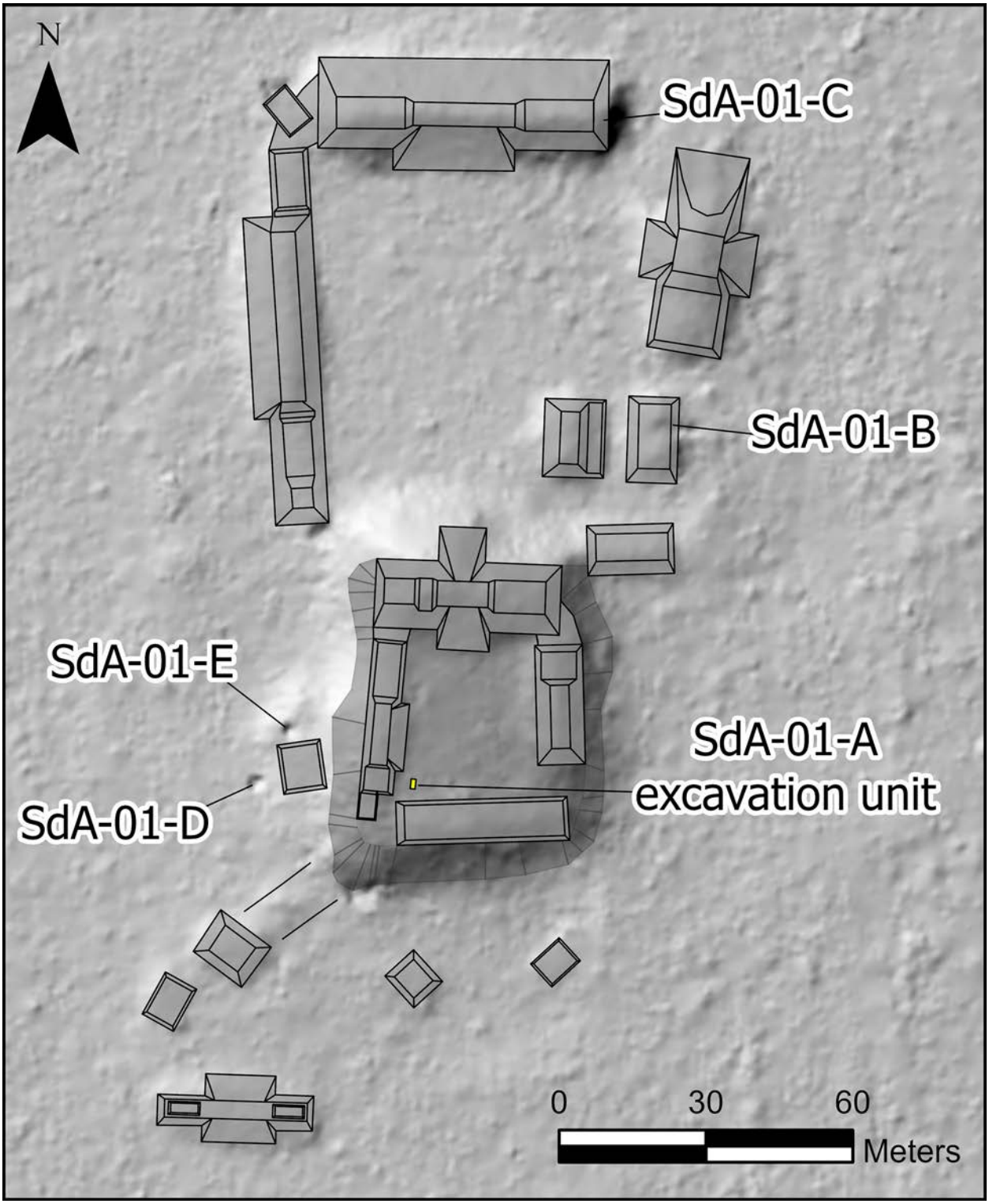

Figure 7.11. Location of 2023 suboperations at Sierra de Agua.

was excavated separately from the southern (0.8 m) part as its matrix was distinctly different. It consists of brown (7.5 YR 5/2) soil with an eroded floor that was not present in the southern part of the unit (Figure 7.12). This lot had 15 ceramic sherds including 1 unslipped,

Table 7.2. Lots in Subop SdA-01-A

Lot SdA-01-A-	Lot Description
01	Topsoil
02	Construction Fill
03	Floor/Construction Fill
04	Floor/Construction Fill
05	Construction Fill
06	Other Surface
07	Other Surface
08	Sterile/Bedrock

burnt rim and 3 body sherds (1 red-orange slipped, 1 red and black mottled, and 1 with remnants of dark brown or black slip). We took a charcoal sample (Sample SdA-01-S04) from the east wall at 54 cmbd and 82 cm north of the south wall. Lot SdA-01-A-05 comprises the southern part of unit from the south wall to 82 cm north where it abuts the eroded floor that is only present in Lot SdA-01-A-04. The matrix comprised brown sediment (7.5YR 4/3) with dispersed small rocks. We collected 10 ceramic sherds including 1 rim and a lithic chert core. Lot SdA-01-A-06 comprises the 82 cm of the unit south part of the unit with light gray (7.5YR 7/2) soil and medium-sized rocks. The level was sterile, and we closed the lot upon hitting bedrock at 68 cmbd. Lot SdA-01-A-07 comprises only the northern 118 cm of the unit (see rationale in Lot SdA-01-A-04 description). We collected eight ceramic sherds including one rim (orange slipped with orange paste) and a body sherd with a red-orange slip and orange paste. The lot was closed lot when we encountered bedrock. Lot SdA-01-A-08 comprised a small test to confirm bedrock. The level was sterile with no artifacts. The deepest part of the unit was 83 cmbd. Photos were taken for a profile drawing (Figure 7.13). The presence of two floors in the northern part of the unit that are absent in the southern part of the unit indicates that this area of the plaza was

Figure 7.12. Heather Richards-Rissetto documenting the eroded plaster floor in Lot SdA-01-A-04. Camera facing southwest.

disturbed after the original construction of the floors.

Subop SdA-01-B

Subop SdA-01-B consisted of the documentation of a looters' pit on the eastern structure (Structure A-3) of the ball court (see Figure 7.11). Structure A-3 measures 16 m long by 8 m wide. The looters' trench bisects the structure from the eastern side, terminating just beyond the peak of the building. With a length of approximately 7 m, the looters' trench is approximately 1 m wide (Figure 7.14). During the salvage operation (Lot SdA-01-B-01) we visually sorted the matrix, sifting through loose back dirt to search for artifacts (see Black 1999:339) and define the boundaries of the looters' pit. We troweled a section of the northern wall of the trench to document visible constructions. Lot SdA-01-B-01 included the collection of artifacts from the surface and back dirt. Three ceramic sherds and one shell were collected. One apple snail (*Pomacea maculata*) was observed during the documentation. The visible construction levels included topsoil, mixed marl and soil fill, and marl fill based on a side wall of the looters' pit that was scraped with a trowel. Given the general lack of visible

Figure 7.14. Photograph of the looter's trench, Subop SdA-01-B-01. Camera facing west standing at the eastern side of Structure A-3. Rite-in-the-Rain 361FX notebook (approximately 11.5-x-18 cm) for scale.

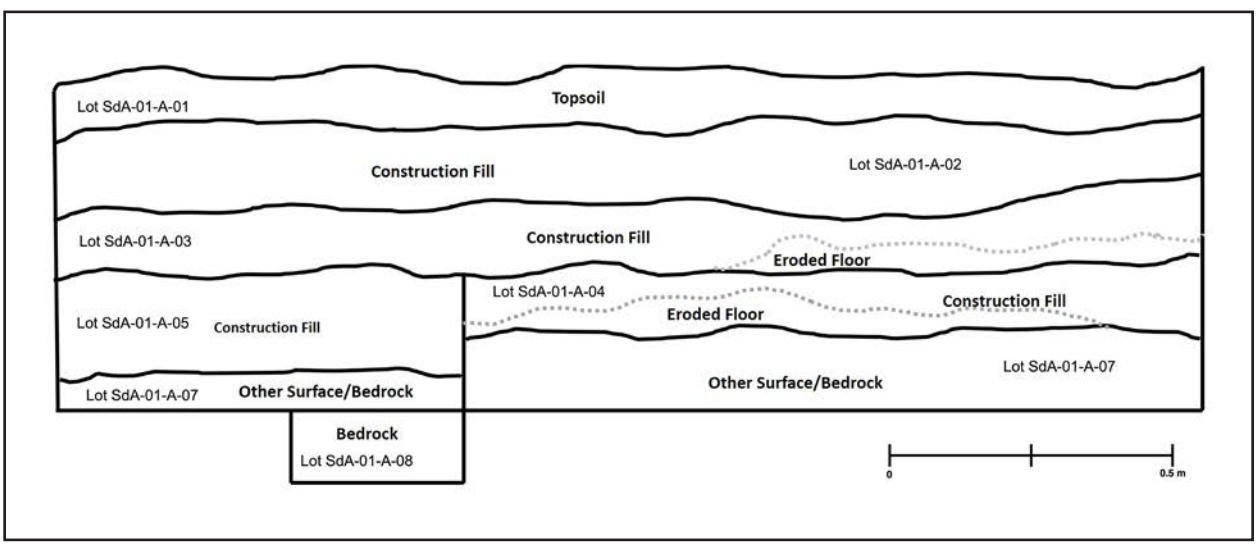

Figure 7.13. Profile of west wall of Subop SdA-01-A.

construction, a Scaniverse lidar model was captured for the looters pit (Figure 7.15).

Subop SdA-01-C

The purpose of Subop SdA-01-C was to gather chronologic data from the construction phases of Structure A-1 that were exposed during modern quarrying activity (see Figure 7.11; Figure 7.16). The quarry face shows alternating layers of dry-laid cobble and plastery marl (Figure 7.17), with one possible floor. The visible construction sequences include topsoil, lighter matrix fill with cobbles, marl fill, cobble fill (~45 cm), fill stabilizing layer intermixed with cobbles (~35 cm), and cobble fill (~50 cm). We noted that there were ceramics in the lower cobble fills under the stabilizing layer but still several meters above the surface of Plaza A-1. Due to the concave and delicate nature of the quarry scar, we scanned the area with Scaniverse and noticed part of a ceramic vessel beneath a rock. We carefully excavated out 12 sherds from the vessel, which consisted of 2 base sherds and 10 body sherds from a bowl with evidence of burning. The bowl is made of a red clay paste and potentially has an eroded red slip. While we did not find any caches or diadems within the vessel, the soil in the bottom of the dish was dark, rich with organic material (Figure 7.18). We collected both charcoal and soil from the interior of the bowl for future analysis including radiocarbon dating and potentially sedaDNA.

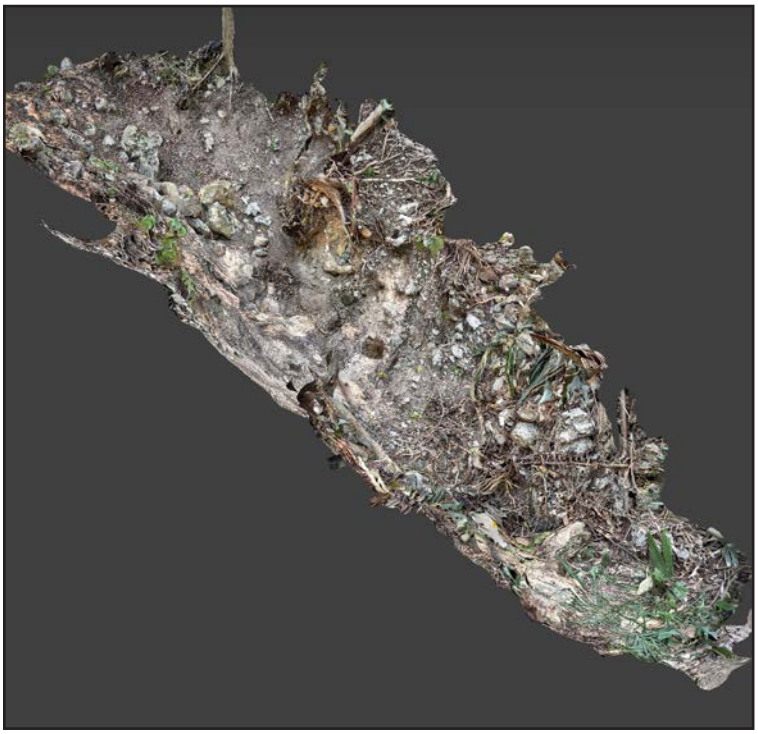

Figure 7.15. Scaniverse model of the looter's trench, Subop SdA-01-B-01, in Structure A-3. Perspective view to the northwest.

Subop SdA-01-D

Subop SdA-01-D involved the documentation of a potential historic storage pit (see Figure 7.11; Figure 7.19) at the western base of Structure A-10; the pit is visible on the lidar data. Structure A-10 is located along the western base of Courtyard A-2. The pit is generally rectangular in shape measuring approximately 1.5-x-2 m and was approximately 80 cm deep. The straight walls dug directly into the limestone bedrock are atypical for the construction patterns of the Classic Maya, suggesting the feature is historic. A pile of loose dirt was in the southeastern corner of the pit, where whiteware and bone were identified. We did not clear out the debris in the pit. Lot SdA-01-D-01 included the collection of surface finds. These included whiteware and earthenware ceramics; the whiteware ceramics are historic (n = 2; Figure 7.20), likely dating to the period when Sierra de Agua was used as a logging camp. The earthenware ceramics (n = 5) could be historic or date to the Classic period. Additional evidence of historic occupations included metal hoops (n = 5) from barrels and enamelwares. We also collected four small pieces of bone.

Figure 7.16. Photo of the modern quarry in Subop SdA-01-C-01. Camera facing west, standing at the eastern side of Structure A-1.

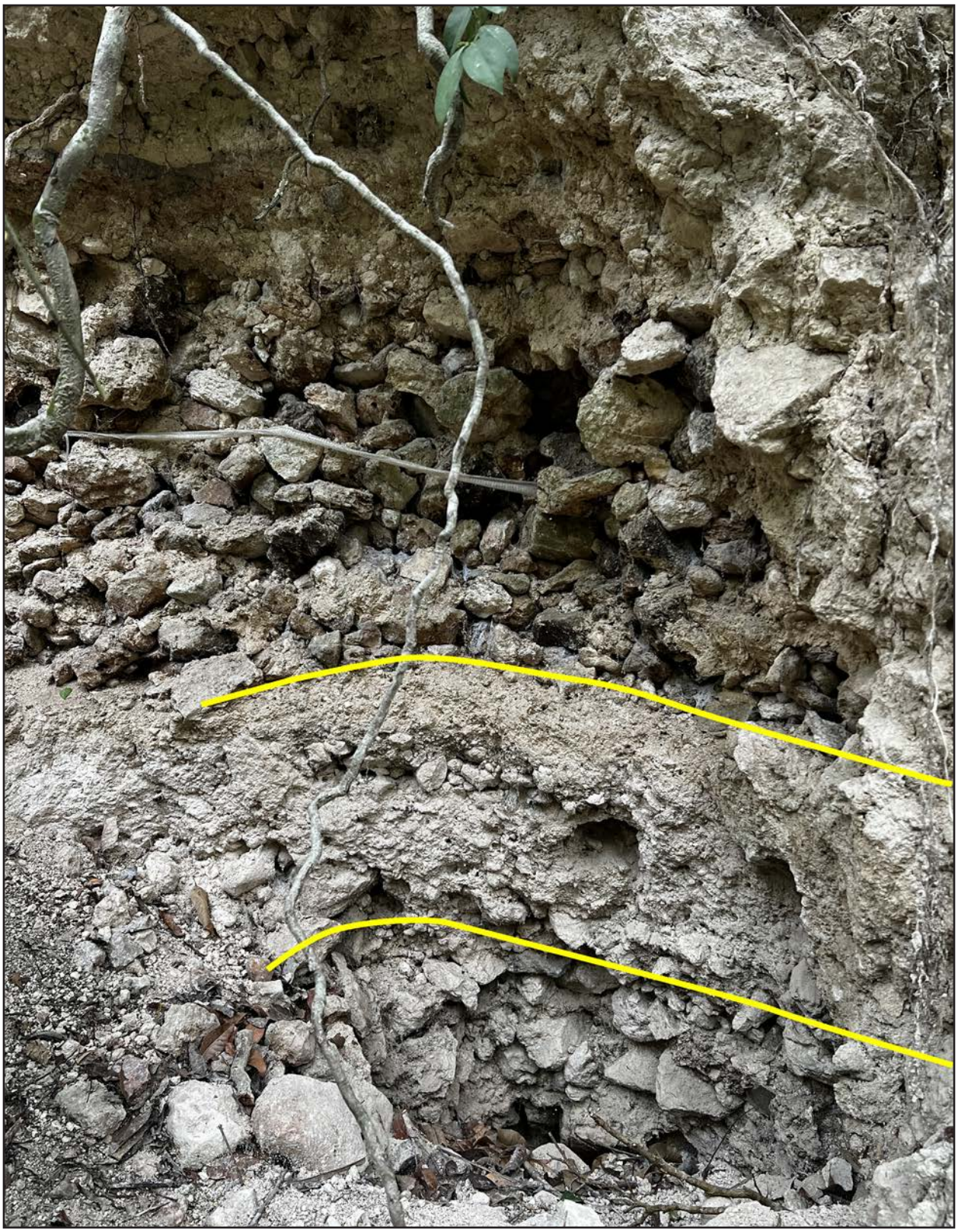

Figure 7.17. Close up photograph of the modern quarry in Subop SdA-01-C-01 showing different construction layers of cobbles and marl fill. Camera facing west while standing at the eastern side of Structure A-1.

Figure 7.18. Photograph of a close-up of the cached vessel fragments with organic rich soils and charcoal in the bowl.

Figure 7.19. Photograph of the potential historic pit of Subop SdA-01-D. Camera facing east while standing at the base of Structure A-10.

Figure 7.20. Photograph of a whiteware ceramic from the potential historic pit, from Lot SdA-01-D-01. Notebook is 11.8 cm wide.

Subop SdA-01-E

A few meters away from Subop SdA-01-D was Subop SdA-01-E, which involved the documentation of a second potential historic pit (see Figure 7.11; Figure 7.21) at the western base of Structure A-10; the pit is visible on the lidar data. The pit is rectangular in shape measuring approximately 1.77 m long by 1.27 m wide and at least 1 m deep from the surface to the top of the debris. We did not clear out the debris in the pit. As part of this Subop, Lot SdA-01-E-01 was opened to include the collection of surface finds, such as ceramics (n = 8; seven body sherds and one rim), for chronology building. The straight walls dug directly into the limestone bedrock are atypical for the construction patterns of the Classic Maya, alluding to the historic construction of this feature.

Summary of Findings from Sierra de Agua and Future Work

The four days of field work at Sierra de Agua provided the first formal maps of the ancient Maya civic ceremonial core and deeper understanding of the historic BEC camps in the region. The Booth's River Depression remains a location of activity, including quarrying ancient buildings for construction materials as documented in Structures A-1 and A-2. The massive architecture at Sierra de Agua contrasts with the flat landscape surrounding the civic ceremonial core. While little chronologic information was obtained from the ancient Maya components of the site, radiocarbon dates will aid in building the initial chronologies for Sierra de Agua. Written oral histories (Baker 2007) are supported by the historic artifacts

Figure 7.21. Photograph of the potential historic pit of SdA-01-E-01. Camera facing north.

documented at the site, with initial occupations in the region in the 1910s and the establishment of Sierra de Agua camp in the 1920s.

WAMIL (BE-08)

Lidar data collected by the National Center for Airborne Laser Mapping (NCALM) at the University of Houston guided survey and mapping of two courtyards at Wamil (BE-08) conducted under Operation (OP) WM-01. Fieldwork was carried out June 22–24, 2023. We mapped and conducted field verifications at Courtyards 1 and 2 and conducted a test unit excavation in Courtyard 1; however, to balance 2023 field season objectives (i.e., regional chronology building and comparison of lidar data to ground perspective) with time constraints, we did not visit Courtyard 3.

Wamil is located in the Booth's River Depression on the north and south sides of the Hillbank road leading east toward Sierra de Agua (see Figures 7.1, Figure 7.22). This area is relatively low-lying with dispersed hills that appear to have modifications in conjunction with ancient Maya structures. The three courtyards were constructed on separate modified hilltops (Figure 7.23). Courtyard 1 is 80 m south of Hillbank road and Courtyard 2 is 120 m southwest of the road; Courtyard 1 and Courtyard 2 are approximately 100 m apart (west-east). Courtyard 3 is 40 m northeast of the road. The area to the south of Courtyard 1 is a lower-lying area with a few smaller household mounds and slope terraces and natural canals that may have been modified for agricultural purposes (see Figure 7.22).

Historical Background and Previous Investigations

The BEC railroad reached Wamil in 1939, 14 years after it reached Sierra de Agua (located 6 miles to the east). At this time, Wamil had a commissary and store with railroad construction crossing Wamil Creek and continuing west (Baker 2007).

Research Design and Methods

The research design for fieldwork centered on three goals. First, map archaeological structures from a ground-based perspective to document details not captured or identifiable in lidar-based relief visualizations. Second, collect surface finds and carry out a test excavation for chronology building at the site to inform on temporal occupations in the Booth's River lowlands. Third, and more broadly, contribute to efforts evaluating the accuracy of remote digitization of ancient Maya archaeological structures based on lidar-based relief visualizations in diverse environmental circumstances with structures of varying size and height.

Prior to fieldwork, georeferenced lidar-based relief visualizations (e.g., slope, hillshade, etc.) were generated to identify the locations of potential archaeological structures. We imported these visualizations into the Avenza app, which permits geolocation on mobile devices (using device built-in GPS) without the Internet, for navigation and acquiring coordinates for point locations in the field.

In the field, we mapped visible structures using compass and pace and then digitized them using lidar-based relief visualizations in ArcGIS Pro 3.1. No surface finds were found at Courtyard 1 or Courtyard 2.

Field Assessment Results

Wamil (BE-08) has three courtyards that are spaced approximately 100 m apart (see Figure 7.23). Four structures (1–4) were identified and mapped at Courtyard 1 and seven structures at Courtyard 2 (5–11). While Courtyard 3 was not surveyed, a visual inspection of lidar-derived relief visualizations

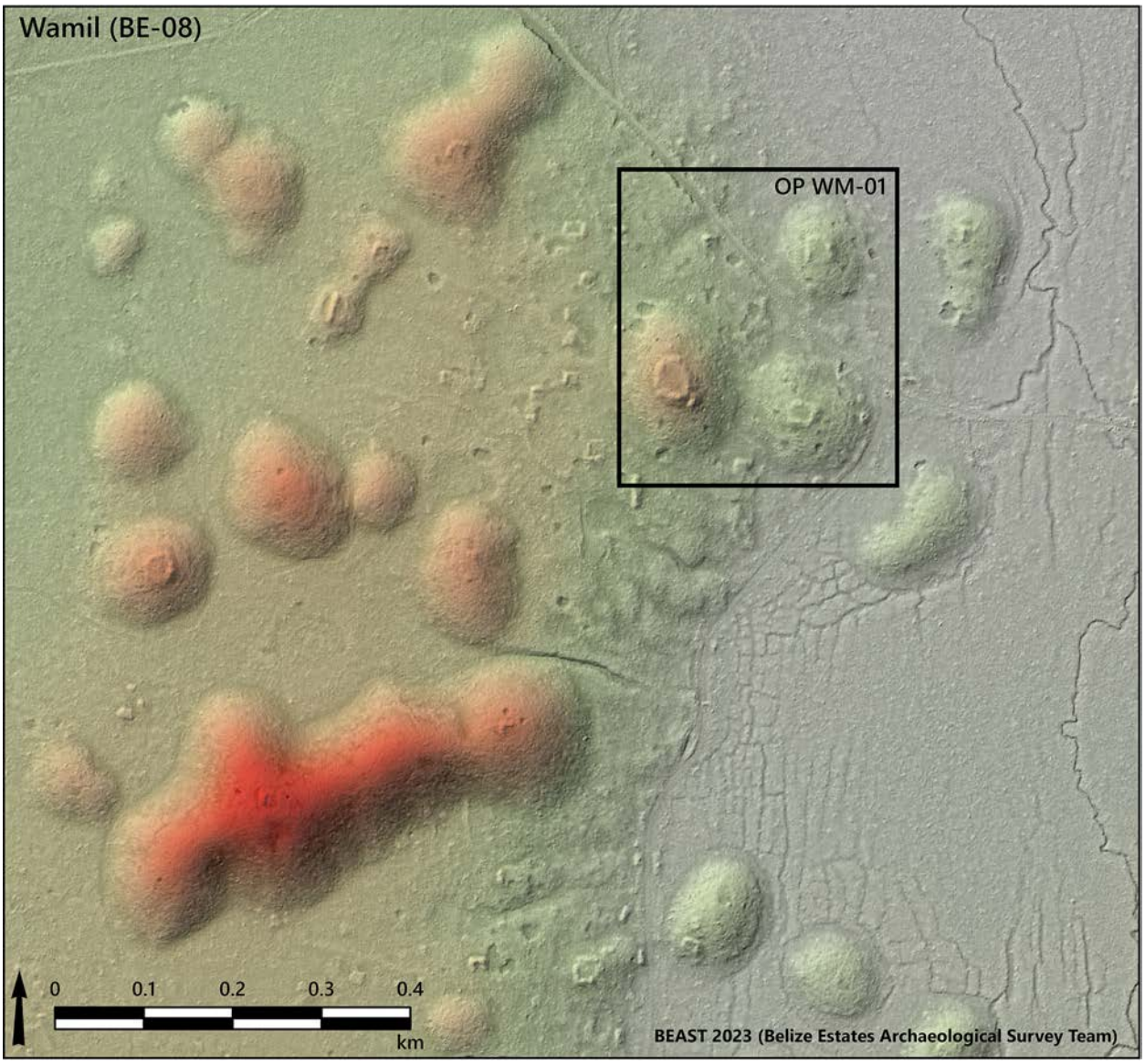

Figure 7.22. Lidar-based visualization of Wamil (BE-08), illustrating Op WM-01 location.

and 3D point clouds suggests that it has five structures.

Courtyard 1

Courtyard 1 measures approximately 30 by 30 m and has four structures (Structures 1–4) oriented north-south and east-west along the edge of a modified hilltop (Figure 7.24). Structure 1 (Figure 7.25), located on the northern edge, is 12 m long by 6 m wide and approximately 2.5 m high. Structure 2, located in the northeastern corner measures 8 x 8 m, also at a height of 2.5 m, has an east-west bisecting looters' pit. Approximately 1.5 m to the south is Structure 3, measuring 12 by 4 m, is, at a 1.25 m high, the least visually dominant of Courtyard 1's structures. Structure 4, located on the southern edge, is two-tiered and measures 12 by 4 m, and, at 3 m high, is the tallest mound in the courtyard (Figure 7.26). There are no structures on the western edge of the courtyard, which likely would have afforded a clear westward view looking up to Courtyard 2, located approximately 20 masl on higher ground (Figure 7.27).

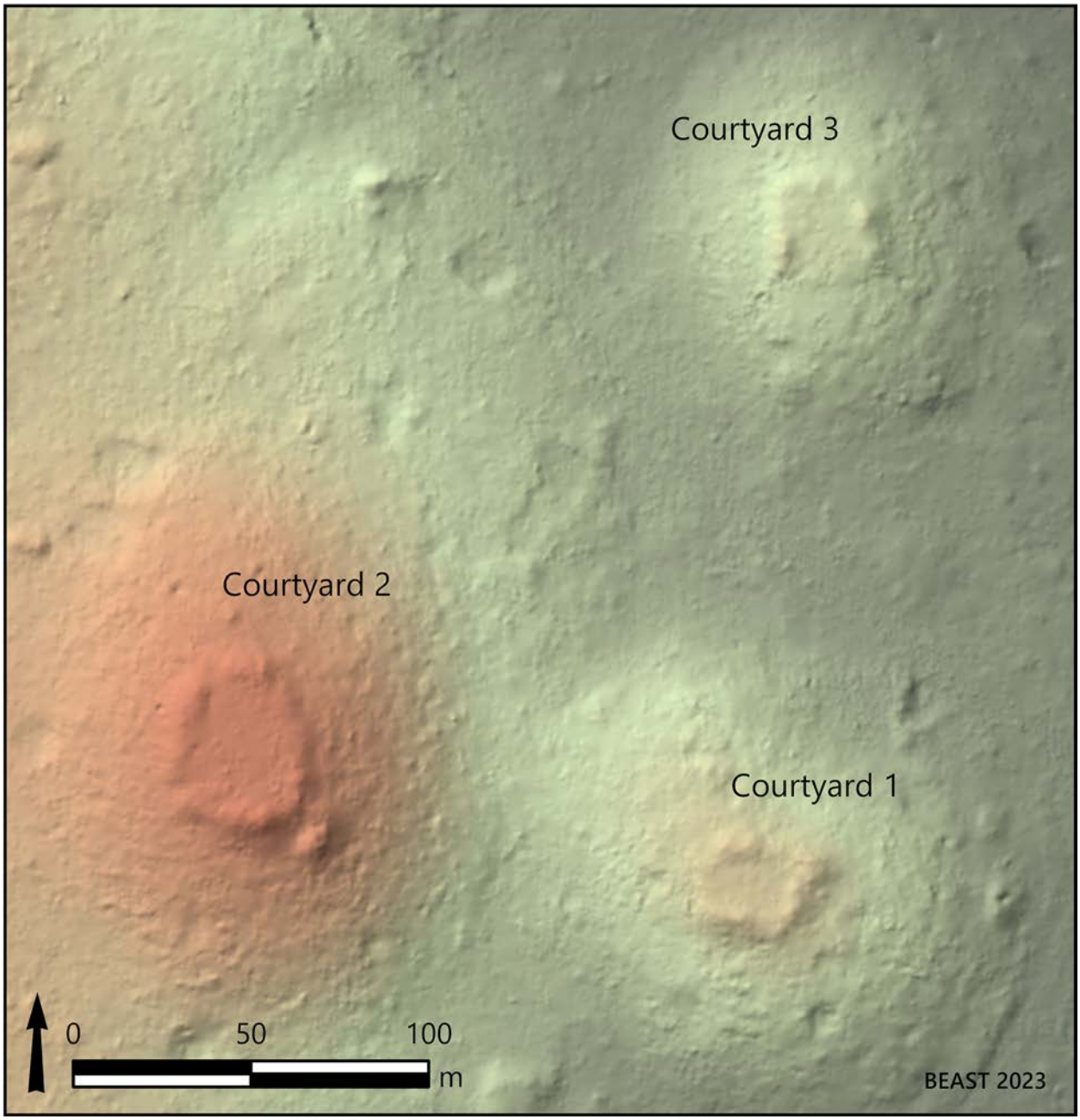

Figure 7.23. Lidar map of Op WM-01, Courtyards 1–3, Wamil.

Courtyard 2

Courtyard 2 measures approximately 50 m (north-south) by 40 m (east-west) and is the largest courtyard. It was constructed on the highest hilltop in the area (15-20 masl above Courtyards 1 and 3) and has the tallest structures of Wamil's three courtyards. It comprises six structures (Structures 5–10) oriented north-south and east-west along the edge of a modified hilltop and a seventh structure (Structure 11) located approximately 5 m downslope to the southeast of Structures 9 and 10. The courtyard has many large uprooted and downed trees that disturbed the site context, creating challenges for mapping based on expedient surface observations. Structure 5, at the northern edge, is 12 m long by 6 m wide. Structures 6 and 7 are located along the western edge. Structure 6

(aligned northeast) is 14 m long by 5 m wide, and Structure 7 (aligned north-south) is 10 m long by 5 m wide. The hillside (western) slope of Structure 7 averages 10 degrees steeper than Structure 6 reflecting a steeper natural gradient on the southern portion of the courtyard (Figure 7.28). Structure 8 (8 m long by 4 m, located on the southern, and steepest slope of the courtyard, lies approximately 2 m to the west of the tallest structure at the site, Structure 9 (5 m tall), which is 16 m long by 6 m wide. Structure 10, the only structure on the eastern side, is 10 m long by 5 m wide and leaves a large "gap" along the northeastern portion of the courtyard. As mentioned, Structure 11 is located approximately 5 m downslope of the southeast corner of the courtyard. It is 10 m long by 5 m wide and constructed adjacent to a steep slope (ranging from 35–38 degrees). Interestingly, it affords a direct line-of-sight to the western side of Courtyard 1, which lacks structures. Of significance is Courtyard 2's high location, compared to the surrounding landscape, which offers an expansive viewshed; additionally, its steep (partially modified) slope

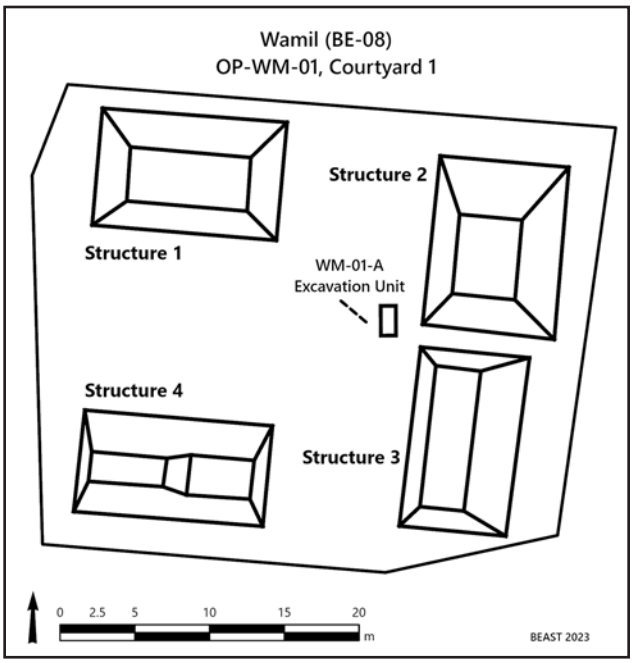

Figure 7.24. Map of Courtyard 1 at Wamil.

Figure 7.25. View looking upslope at Structure 1, Courtyard 1, Wamil. Camera facing south.

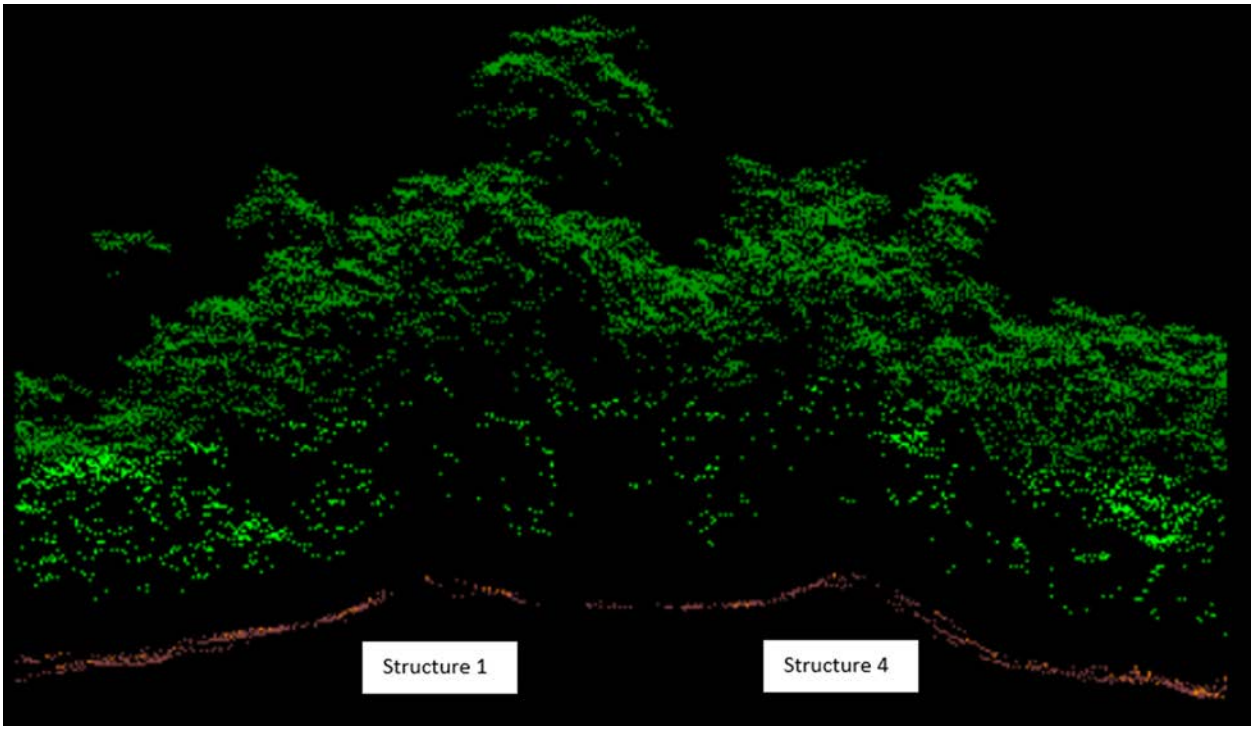

Figure 7.26. Lidar profile of western edge of Courtyard 1, Wamil (low vegetation removed). View to the east.

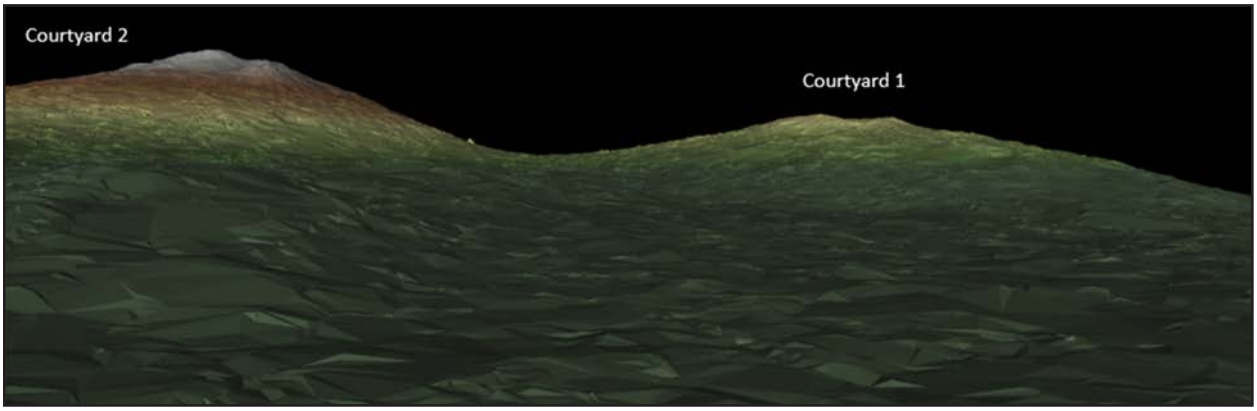

Figure 7.27. Triangulated Irregular Network (TIN) illustrating higher elevation of Courtyard 2 compared to Courtyard 1, Wamil. View to the north.

proves a challenging climb that would have restricted access.

Courtyard 3

Courtyard 3 is located approximately 105 m north of Courtyard 1. Field assessment of Courtyard 3 was not carried out due to time constraints, but visual analysis of a lidar-relief visualization combined with profiles of the 3D point clouds indicates that it is oriented N-S and comprises at least five structures located on a modified hilltop (Figure 7.29). Structure numbers were not assigned to Courtyard 3 because it was not field assessed.

Excavation (Subop WM-01-A)

Courtyard 1 is covered with large trees and massive roots, many of them poisonous

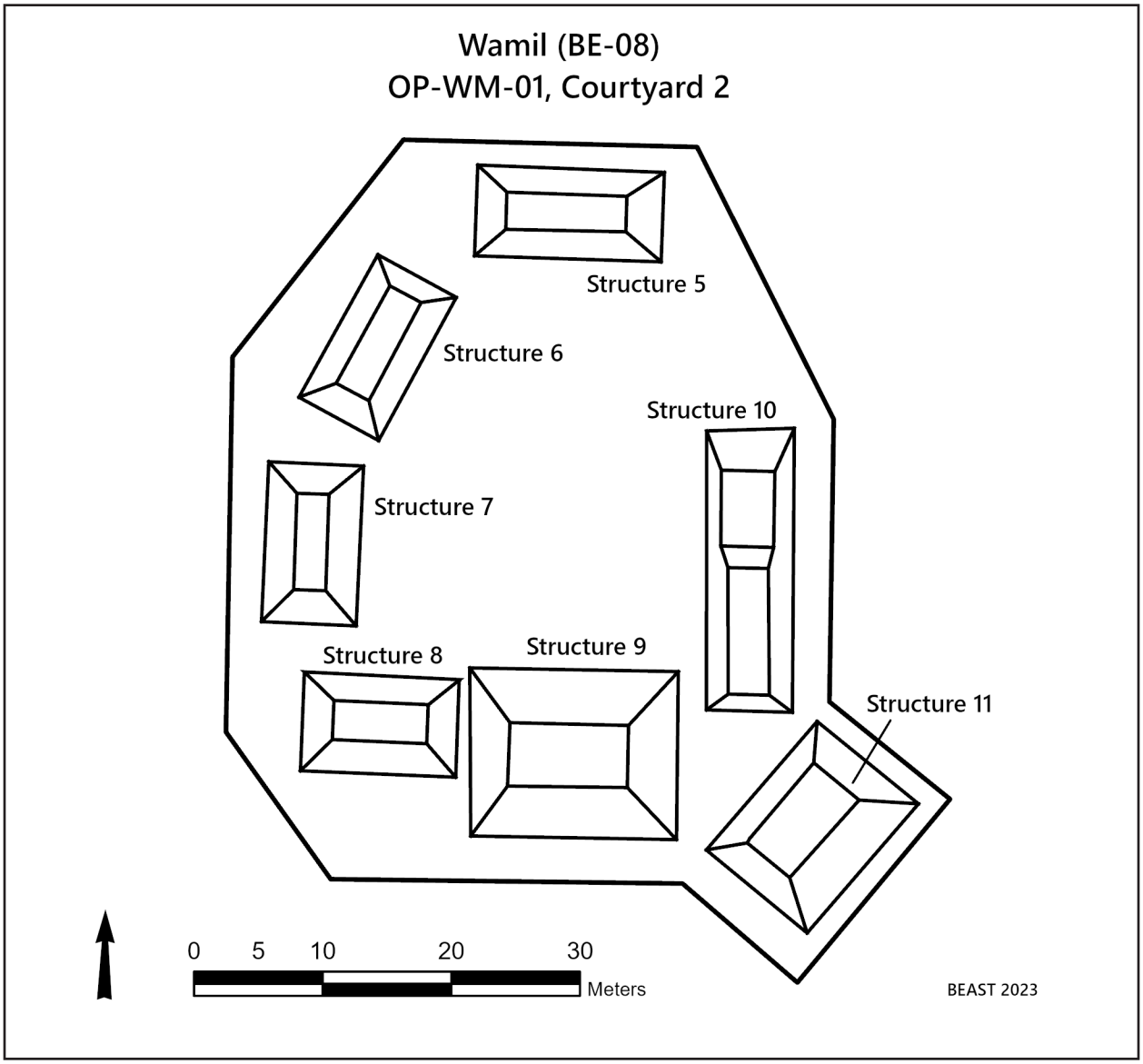

Figure 7.28. Map of Courtyard 2, Wamil.

chechem (*Metopium brownei* or black-sap poisonwood), making it difficult to find a suitable excavation area. Subop WM-01-A, a 1-x-2 m test excavation in the northeastern quadrant of Courtyard 1, was selected after several failed attempts due to encountering large chechem roots. The unit's location did not have any large trees or massive roots, and it was positioned to avoid collapse debris from the nearby structures. We cleared surface debris and established a datum on a stable tree 0.5 m northeast of the unit at 30 cm above the ground surface and located approximately 3 m southwest of the looters' pit in Structure 2 and 1 m west of the "gap" between Structure 2 and Structure 3 (Figure 7.30).

The unit comprises four lots excavated according to natural stratigraphy (Table 7.3). Depth measurements were taken at the start and end in the center and in the four corners of each lot. We employed a manual visual sorting of the matrix, recording and collecting artifacts by type (ceramic, tool, debitage, etc.; see Black 1990:339) for each lot. An iPad Pro (4th generation) was used to take planview photos

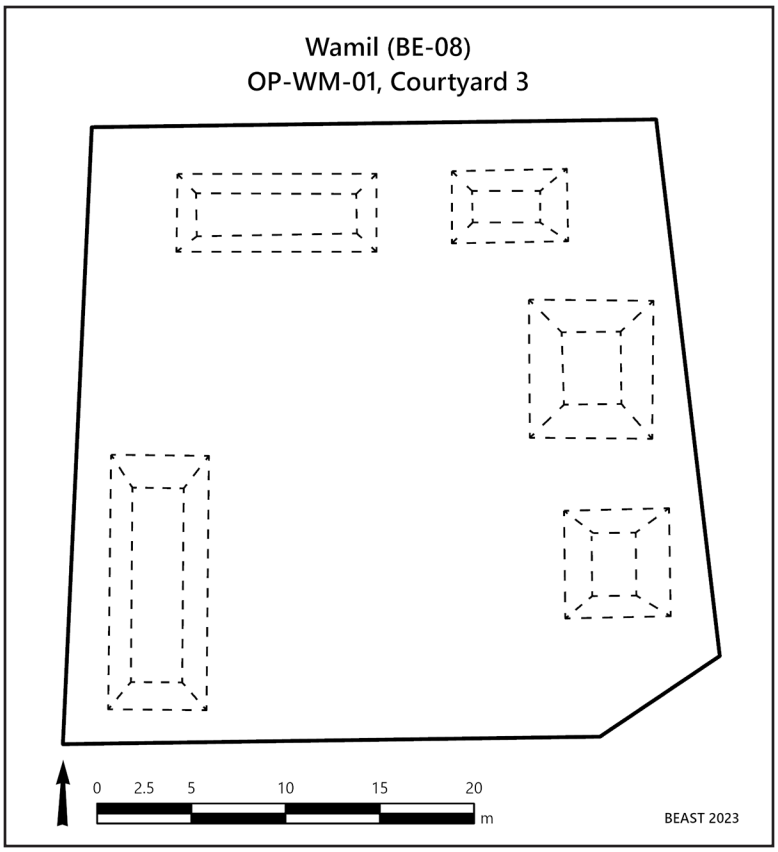

Figure 7.29. Map of interpolated structures at Courtyard 3, derived from lidar-based relief visualization and lidar 3D point cloud, Wamil.

of each of the eight lots and profile photos at the completion of the unit. The iPad Pro lidar function was employed to a create 3D model of the test excavation unit using the application Scaniverse (Figure 7.31). The excavation followed *The Chan Chich Archaeological Project Field Manual* guidelines by Houk and Zaro (2015).

Lot WM-01-A-01, which began at 56 cmbd, included topsoil and construction fill because the topsoil was very thin (2 cm), had many small roots disturbing the matrix, and was the same Munsell color as the intermixed matrix of construction fill. The fill comprised small to mid-sized limestone cobbles with dark brown soil (7.5YR 2.5/2, very dark brown). We found a Postclassic chert projectile point at 64 cmbd and collected 200 ceramic sherds of various types, comprising 28 rims, 7 bases, 4 jar sherds, and 52 shotgun sherds, and 113 body sherds) and two pieces of chert debitage.

At 90 cmbd, we opened Lot WM-01-A-02 due to a stratigraphic change including a soil color change (7.5YR 4/2, brown) along with an exposed rough floor in the profile of the east wall of the unit. The floor (4–5 cm thick) did not extend far into the unit, and part of it is located just above a large stone. An east-west linear alignment of mid-sized stones (uncut) starting approximately at a depth of 100 cmbd, slightly lower than, but in alignment with the large stone, suggests construction modification. The lot primarily consisted of small- to mid-sized limestone cobbles with many small pebbles in the matrix. The lot yielded 176 ceramic sherds of varying types (14 rims, 1 base, 80 shotgun sherds, and 81 body pieces), 5–10 pieces of chert debitage, and two spire-lopped snails, possibly for consumption. We also excavated a "pocket" of orange ceramic sherds (not present in the first lot) in the southwestern quadrant of the unit.

The upper layer of Lot WM-01-A-03 (opened at 108 cmbd) comprised small to mid-sized limestone cobbles. We collected 71 ceramic sherds (9 rims, 1 base, 37 shotgun sherds, and 24 body pieces) of various types in soil with a brown matrix (7.5YR4/2). We removed the three mid-sized stones from the east-west "linear alignment" that were exposed in Lot WM-01-A-02. In the south half of the unit we reached bedrock at 115 cmbd; however, we did not encounter bedrock to the north of the linear rock alignment supporting the interpretation of later (intrusive) construction modification.

Figure 7.30. Photograph of Lorena Alvarado, Shaliny Moh and Emanuel Cordova excavating Subop WM-01-A, Courtyard 1, Wamil. Camera facing east.

Table 7.3. Lots in Subop WM-01-A

Lot WM-01-A-	Lot Description
01	Topsoil/Construction Fill
02	Construction Fill
03	Construction Fill
04	Construction Fill/Bedrock

Lot WM-01-A-04 comprised the area north of the linear rock alignment excluding the southern part of the unit with already exposed bedrock. There was a small intrusion of a rough floor at a depth of 110 cm in the northeast corner of the unit. This lot comprised smaller limestone (rough) cobbles in the soil matrix (7.5YR 4/2, brown). We collected 50 ceramic sherds (6 rims, 2 bases, 21 shotgun sherds, and 21 body pieces) of varying types and 1 chert flake. We hit bedrock approximately 15 cm lower (at 130 cmbd) than in the southern portion of the unit (Figure 7.32).

Summary and Future Work at Wamil

Lidar-based visualizations indicate that Wamil bridges two ecozones and lacks a core ceremonial center. The western portion is at a higher elevation with dispersed hilltops; some are modified with structures. Courtyard 2, the largest courtyard at Wamil, along with most of the area's structures occur in this ecozone. In contrast, Wamil's eastern area, exhibiting a lower elevation, has only a few small household mounds that are not visible in the lidar-relief visualizations; however, we identified several during the field assessment. These dispersed

Figure 7.31. Scaniverse model of the east wall profile of Subop WM-01-A.

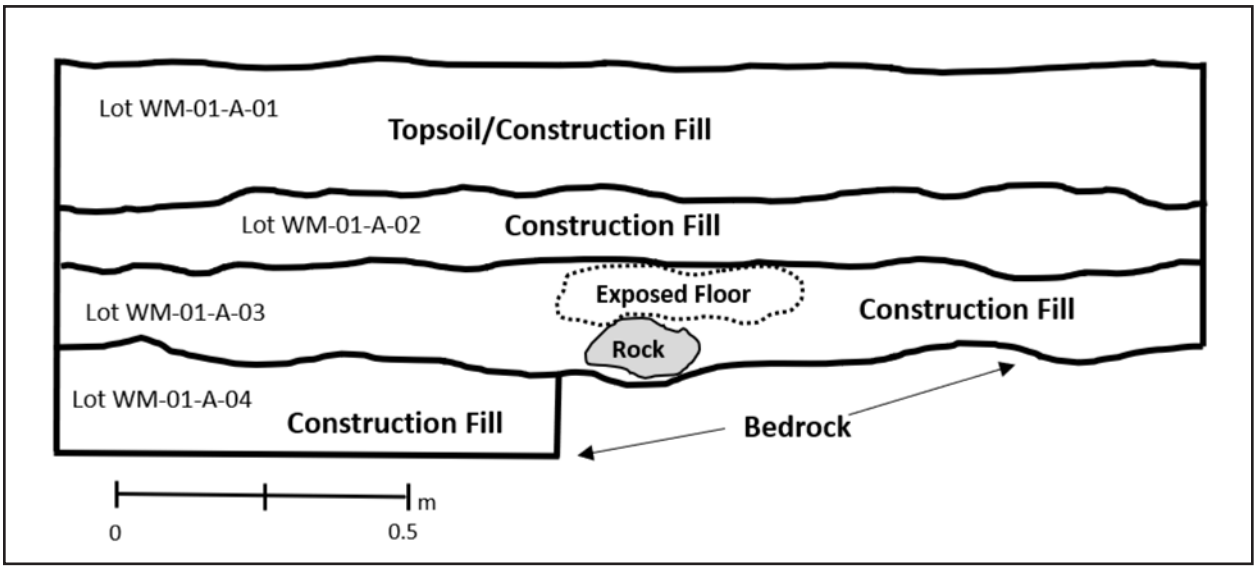

Figure 7.32. Drawing of the east wall profile of Subop WM-01-A.

house mounds begin at the southern base of Courtyard 1 and extend south, approximately 100 m, where they abut natural canals that appear to have been modified for agricultural purposes. This eastern area has few natural hilltops; those that exist occur at the boundary of the ecozones, yet two of the three hilltop courtyards in Op WM-01 are in this eastern ecozone (see Figure 7.22). The construction of Wamil's three largest courtyards at an ecozone transition and its association with potentially modified natural canals for raised agricultural fields suggests its occupants may have played an important role in regional agriculture.

Courtyard 1 comprises four structures oriented north-south and east-west at the northern, eastern, and southern edges of the hilltop. There is a noticeable absence of structures on the western side permitting a clear view looking west and up towards Courtyard 2, which is located at a markedly higher elevation (see Figure 7.27). Courtyard 2 is the largest courtyard at Wamil with seven structures primarily oriented north-south and east-west located around the edge of the hilltop. The tallest structure (Structure 9) at Wamil is in Courtyard 2 and is approximately 5 m tall when standing in the courtyard (Figure 7.33). Its elevated position on the southern

edge of the courtyard would have made it a prominent focal point in the landscape as well as afforded an expansive view to the south and east. Lidar-relief visualizations of Courtyard 3 indicate the presence of five to six structures on a modified hilltop (see Figure 7.29). Applying additional lidar-relief visualization techniques to the lidar data combined with analysis of the 3D point data may assist in future refinements to methods of structure identification.

SUMMARY OF FINDINGS FROM THE BOOTH'S RIVER AREA OF BEAST

Archaeologists are making concerted efforts to secure funding to commission airborne lidar acquisition in the Maya region. Previous research illustrates that lidar data's ability to "penetrate" forest canopy and collect 3D points of bare-earth surface has led to new insights on the expanse and density of ancient Maya settlement and landscape transformation (Canuto et al. 2018; Garrison et al. 2023). While researchers are successfully applying and developing geospatial methods using lidar data for studies of regional dynamics, as well as investigations of local (site-level) interactions based on analyses of neighborhoods, wealth, accessibility, visibility, etc. (Monteleone et al. 2021; Richards-Rissetto 2017; Richards-Rissetto and Landau 2014; Schroder et al. 2023; Thompson et al. 2018, 2022), limitations persist.

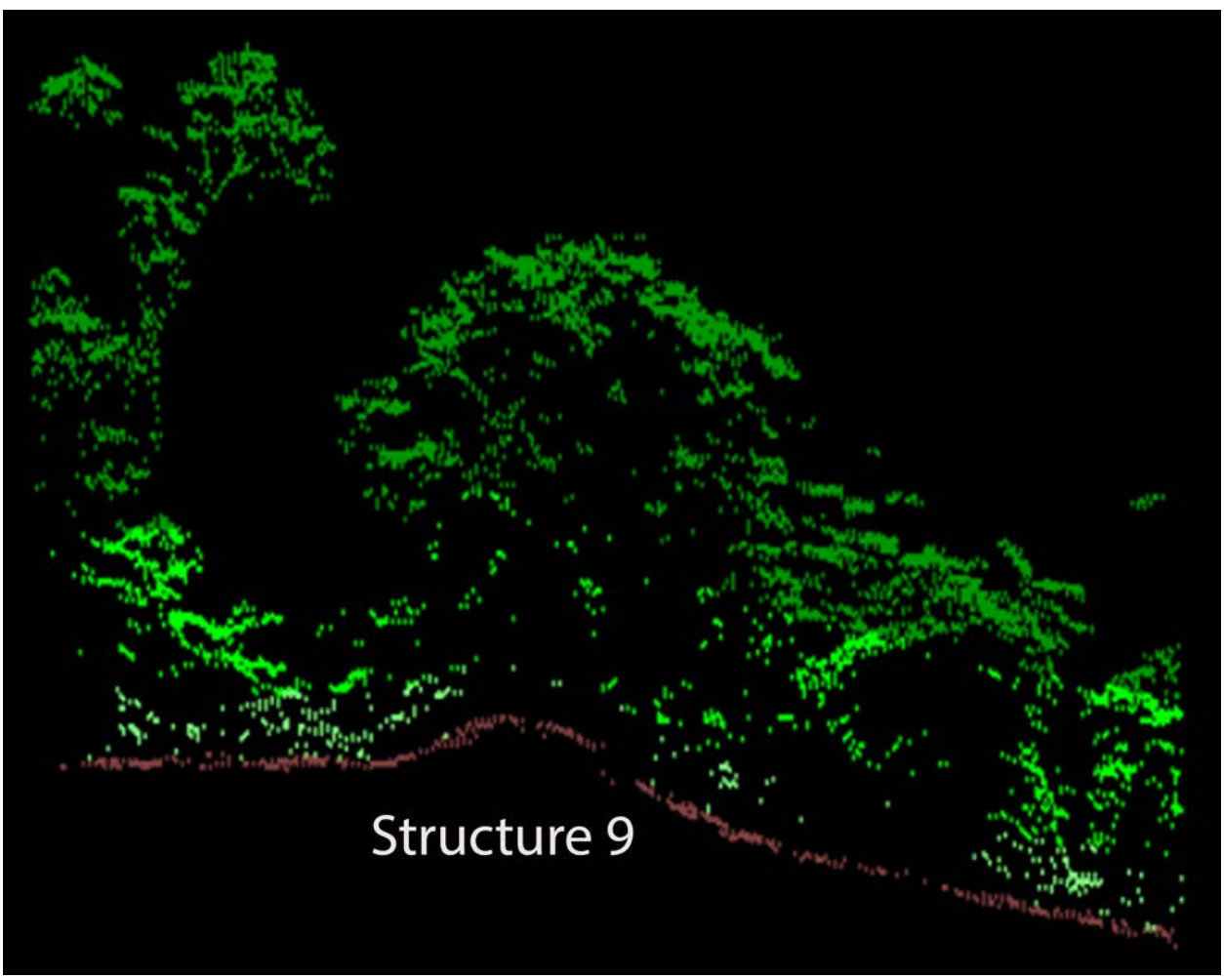

Figure 7.33. Lidar (3D points) profile of Structure 9 at Courtyard 2, Wamil, facing northeast.

The 2023 fieldwork at Sierra de Agua and Wamil acknowledges the need for field assessment to evaluate the accuracy of identifying and mapping remotely-digitized ancient Maya archaeological features based on lidar-relief visualizations (Canuto and Auld-Thomas 2021; Thompson 2020). These field data are contributing to iteratively develop new algorithms and computational approaches to improve automated detection and accuracy of ancient Maya landscape features (Kokalj et al. 2023; Richards-Rissetto et al. 2021). However, while lidar data affords previously unimagined comprehensive datasets of archeological landscapes that are transforming archaeological practice, it enriches rather than replaces fieldwork. Surface collection and test excavations are essential to establish site and regional chronologies for deeper insights into the various experiences and adaptations of the ancient Maya.

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Ebert, Anabel Ford, Rafael A. Guerra, Julie A. Hoggarth, Brigitte Kovacevich, John M. Morris, Holley Moyes, Terry G. Powis, Jason Yaeger, Brett A. Houk, Keith M. Prufer, Arlen F. Chase, Diane Z. Chase
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Thwarted by Bees: 2023 Field Assessment at Laguna Seca

Amy E. Thompson

Laguna Seca (BE-06) was initially mapped in the late 1980s by the Rio Bravo Archaeological Project (Figures 8.1 and 8.2), which identified the eastern group of monumental architecture at the site (Guderjan et al. 1991). In 2022, the Belise Estates Archaeological Survey Team (BEAST) lidar acquisition revealed a second large architectural complex approximately 800 m west of the previously mapped group, now deemed Laguna Seca Group A. The focus of the 2023 field work was to map and conduct test unit excavations at the newly identified group, Group B. Fieldwork occurred at Laguna Seca from June 21 to 24, 2023, alongside Gary Romero, Chris Quetzal, and Aloria Tush.

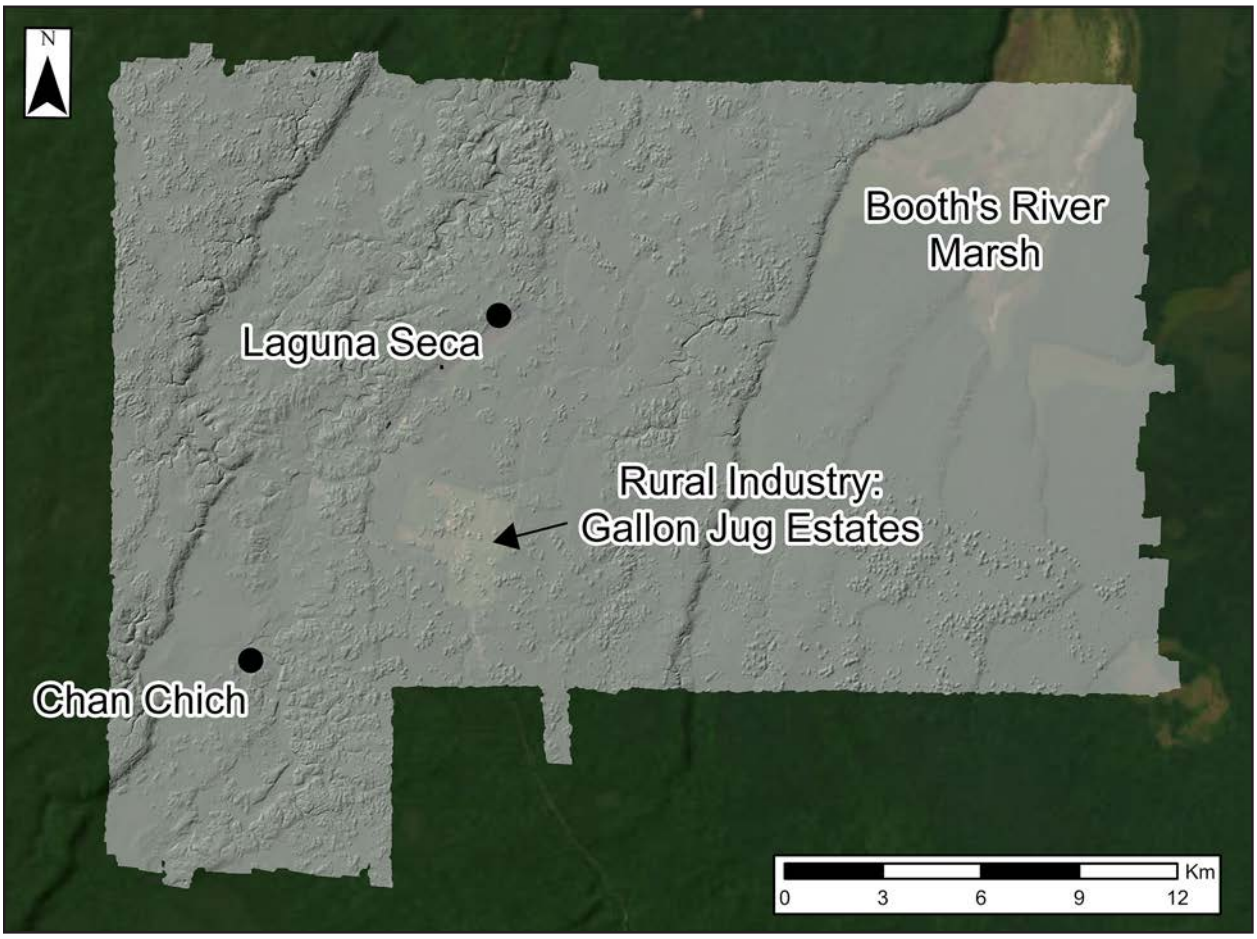

Figure 8.1. Map showing the location of Laguna Seca in relation to other key features on the BEAST lidar data.

Thompson, Amy E.
2023 Thwarted by Bees: 2023 Field Assessment at Laguna Seca. In *The 2023 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 181–204. Papers of the Chan Chich Archaeological Project, Number 16. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

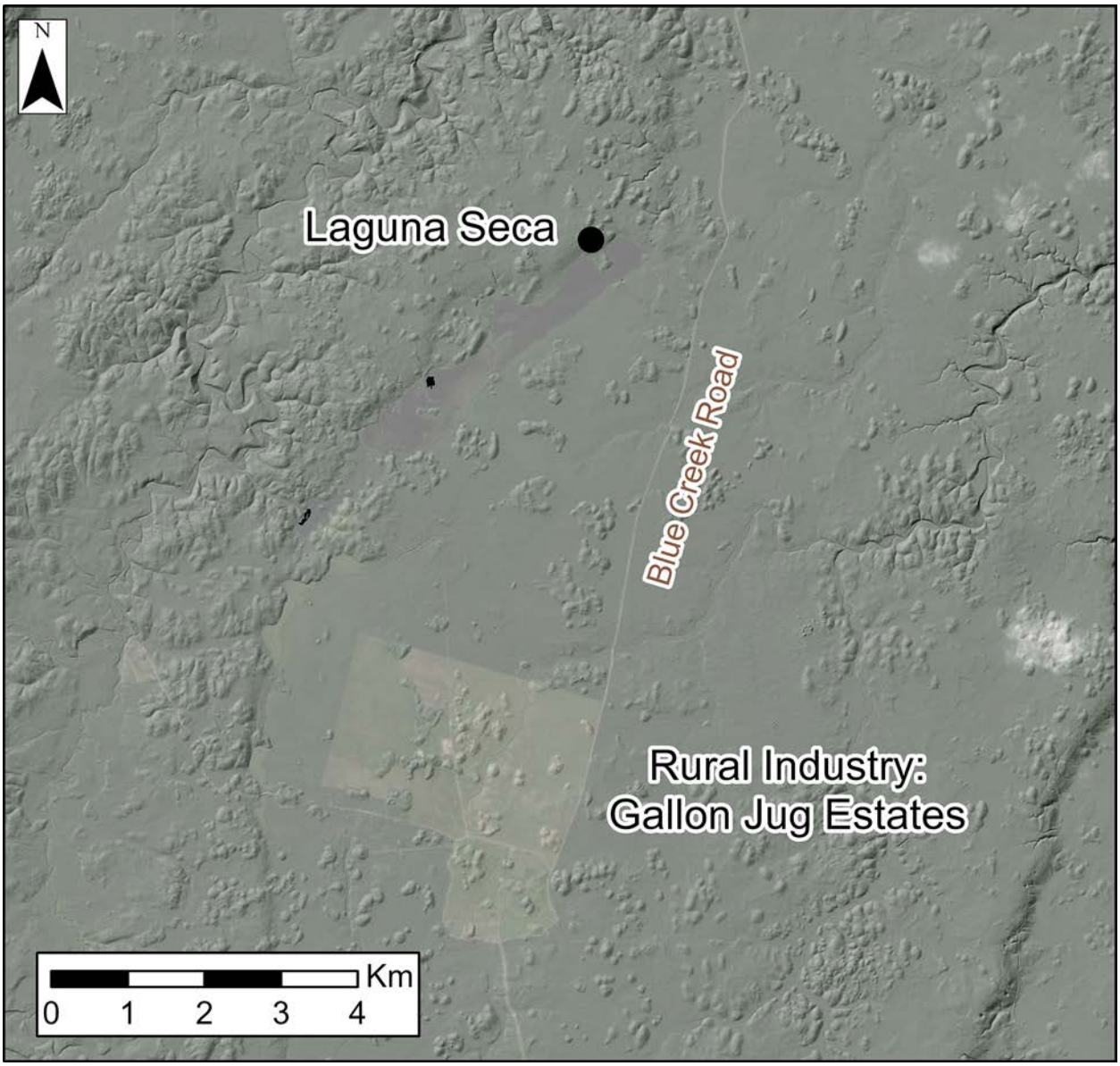

Figure 8.2. Location of Laguna Seca in relation to the Gallon Jug estate and the Blue Creek road.

Previous research in the region suggests a long occupational history, with initial occupation in the Middle Preclassic at Chan Chich (Houk 2022:Table 8.9) and substantial populations by the Late Preclassic at Gallon Jug (Yeager 1991), Chan Chich (Houk 2015), and Kaxil Uinic (Houk 2015). Populations waxed and waned at different regional centers throughout the Early and Late Classic, with ephemeral populations continuing to reside in the region during the Terminal Classic, such as at Gallon Jug (Novotny et al. 2022). Based on current archaeological evidence, Postclassic occupations were present but sparse in northwestern Belize (Houk et al. 2008), but well-documented historic Maya communities were present in the mid-to-late 1800s to early 1900s at Kaxil Uinic (Bonorden and Houk 2019, 2022; Harrison-Buck et al. 2019), Holotunich (Ng 2007), San José (Jones 1977), and San Pedro (Church et al. 2011), as well as historic industrial enterprises associated with the extraction of resources (primarily lumber) at Hill Bank, Sierra de Agua, and Qualm Hill (Bonorden 2016; Bonorden and

Houk 2019, 2022; see also Thompson et al., this volume). With this in mind, determining the occupational history of centers located near key resources, such as Laguna Seca, which is near a lagoon providing year-round freshwater to occupants, is of interest.

PREVIOUS INVESTIGATIONS AT LAGUNA SECA

The Rio Bravo Archaeological Project initially recorded Laguna Seca in 1988. Laguna Seca is easily accessible via the Blue Creek road (see Figure 8.2), and the previously recorded structures (Group A) sits on the tip of the peninsula, overlooking the lagoon (Figure 8.3). In 2013, David Sandrock (2017:82–84), directing BEAST that season, revisited the site and wrote the following report:

> Guderjan et al. (1991) first recorded the site of Laguna Seca in 1988. The structures comprising the site were constructed on a peninsula jutting into the lagoon for which it was named. Laguna Seca is located approximately 10 km north of the town of Gallon Jug and 1 km west of the Blue Creek road.
>
> The main plaza comprises four range structures flanking the plaza's edges, the tallest of which is nearly 8 m high… Four structures sit on a ridge running north-south, overlooking the lagoon. Several courtyards surround the main plaza in all directions, including two similarly arranged U-shaped complexes to the north and west (Guderjan et al. 1991). Laguna Seca is constructed on a generally north-south axis, a decision influenced by the shape and direction of the peninsula upon which the site is situated.

Figure 8.3. The Rio Bravo Archaeological Project's map of Laguna Seca (Guderjan et al. 1991:Figure 41) on top of a satellite image of the lagoon and surrounding forest.

> At the time of the BEAST revisit in 2013, the site was in good condition. Trails designated for walking and horseback riding (mostly for guests at Chan Chich Lodge) lead up to and traverse the site, and these paths are regularly raked and cleared. BEAST crews recorded the location of the site with a GPS unit and modified the site map to better reflect the mounds' shapes.

In addition to the site revisit in 2013, pedestrian survey occurred in 2013 and 2014 in the vicinity of Laguna Seca. David Sandrock and BEAST surveyors followed transect lines previously chopped by American Seismic teams in 2012 and 2013. BEAST surveyed more than 75 km of transects, mapping more than 350 archaeological features, 275 of which were structures (Sandrock 2017:4–5). The 2014 survey occurred along the American Seismic Line 6 closest to Laguna Seca; Sandrock (2017) and team mapped approximately 50 structures along this 20 km long survey line, alluding to the low-density urbanism in the hinterlands surrounding the civic ceremonial core of Laguna Seca. However, the 2022 lidar survey proves otherwise, wherein the area to the north of Laguna Seca exhibits high settlement density.

RESEARCH DESIGN

A decade later, in the 2023 field season, some of the trails are still visible, although are likely less maintained than in the previous years due to decreased tourism during the Covid-19 pandemic. Nonetheless, we were able to drive to the base of Laguna Seca Group A, parking just uphill from the lagoon and using one of the trails near the lagoon on the first part of the 800 m hike to Laguna Seca Group B. All fieldwork operations occurred under Operation (Op) LS-01.

The 2023 field work at Laguna Seca focused on three primary objectives. First, we proposed to map any visible architecture on the ground and compare our field-mapping to what is visible on the high-resolution lidar data. This will allow us to build an iterative model for mapping ancient Maya settlements across the BEAST zone. Second, we aimed to collect surface finds to understand temporal occupations. However, the dense jungle foliage and thick ground cover of decaying leaves prevented this from being a reality. Third, to further build an understanding of the temporal sequence of the region, we proposed to excavate a 1-x-2-m unit in the plaza (i.e., off-structure) of the newly identified Laguna Seca Group B.

MAPPING LAGUNA SECA

The portion of Laguna Seca that was initially documented by Guderjan and colleagues (1991) is now recognized as the eastern portion of the site. The 2022 lidar data revealed several large plazas and courtyards approximately 800 m west of the groups mapped by Guderjan's team. The portion of the site mapped in the late 1980s is now designated as Group A, while the western groups are designated as Group B (Figures 8.4 and 8.5). During the short field season at Laguna Seca, I visited and mapped Group B along with small household buildings (Group C) opportunistically mapped along the way. I did not "ground-truth" Group A but instead remapped the group using the lidar data; I took all measurements using the Avenza app on an iPhone 13 Pro with georeferenced maps produced by Ray Wallace. Additional house mounds and patio groups are visible in the lidar data surrounding Group A. These may be mapped using the lidar data and field verified in the future.

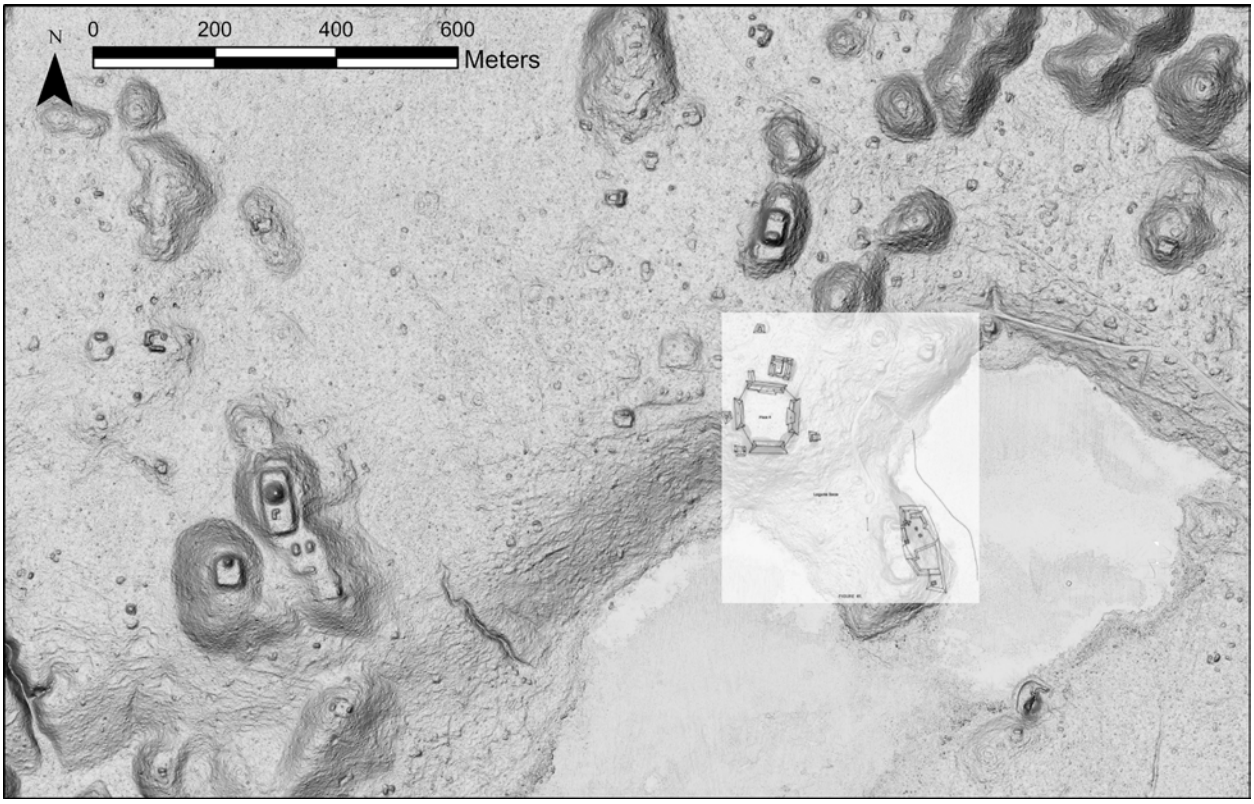

Figure 8.4. Map of Laguna Seca, with the map from Guderjan et al. (1991:Figure 41) overlaid on the lidar bare-earth DEM and slope model.

Updated Descriptions of Laguna Seca Group A

Guderjan's map was redrawn based on the lidar data and buildings were re-numbered following the BEAST convention for designated groups and numbering structures. Group A consists of the large Plaza A-1 (see Guderjan et al. 1991:69) that has four large buildings (Structures A-1–A-4) situated around a central plaza (Figures 8.6 and 8.7). The Plaza A-1 area between the buildings measures approximately 75 x 75 m. The platform forms a distinct quatrefoil shape and has a small causeway emanating from the northeast corner to a small hilltop group with a single isolated structure (Structure A-29). On the northwest side of Plaza A-1 is a low building (Structure A-5). Plaza A-1 is surrounded by small courtyard groups and households including Courtyard A-2, which consists of a sunken plaza surrounded by three distinct buildings on the west (Structure A-6), north (Structure A-7), and east (Structure A-8), and a low wall on the south. Courtyard A-2 is approximately 34 m wide (east-west) and 30 m long (north-south) along the basal platform. To the northwest of Courtyard A-2 by 50 m is a small U-shaped group, Plazuela A-5 (Structure A-9, Structure A-10, and Structure A-11). Thirty m east of Plaza A-1 is a small plazuela platform (Plazuela A-6) with two small platforms on top of it (Structure A-12, and Structure A-13). To the southwest and west of Plaza A-1 are two small plazuela platforms (Plazuela A-7 and Plazuela A-8), each with one architecturally complex platform situated on them (Structures A-14 and A-15).

About 250 m southeast of Plaza A-1 is Courtyard A-3. As of June 2023, one could drive to a flat area between Plaza A-1 and Courtyard A-3, although neither were visited by the BEAST team in 2023 as the priorities were mapping and building chronology for

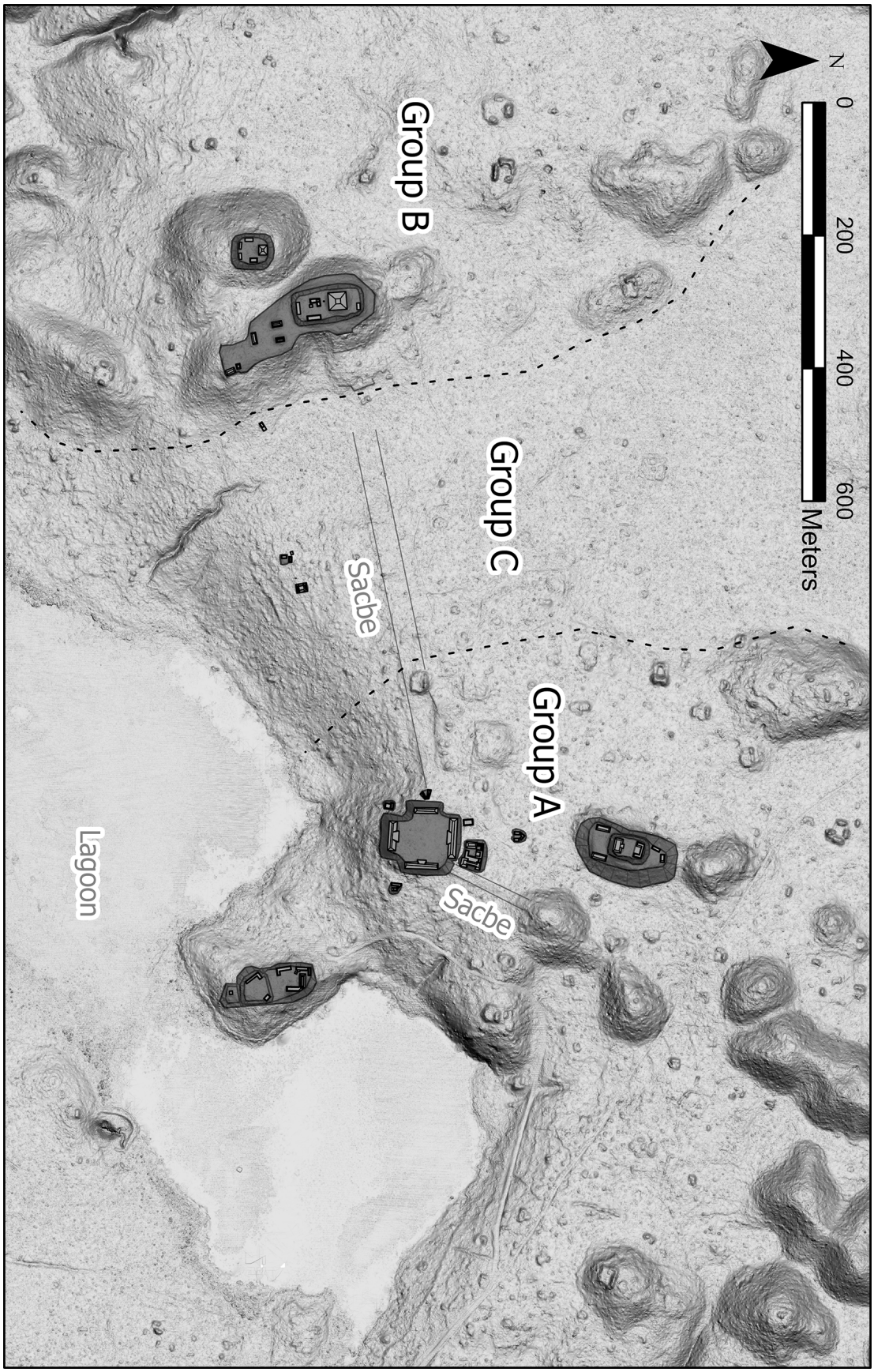

Figure 8.5. Map of Laguna Seca with digitized architectural groups.

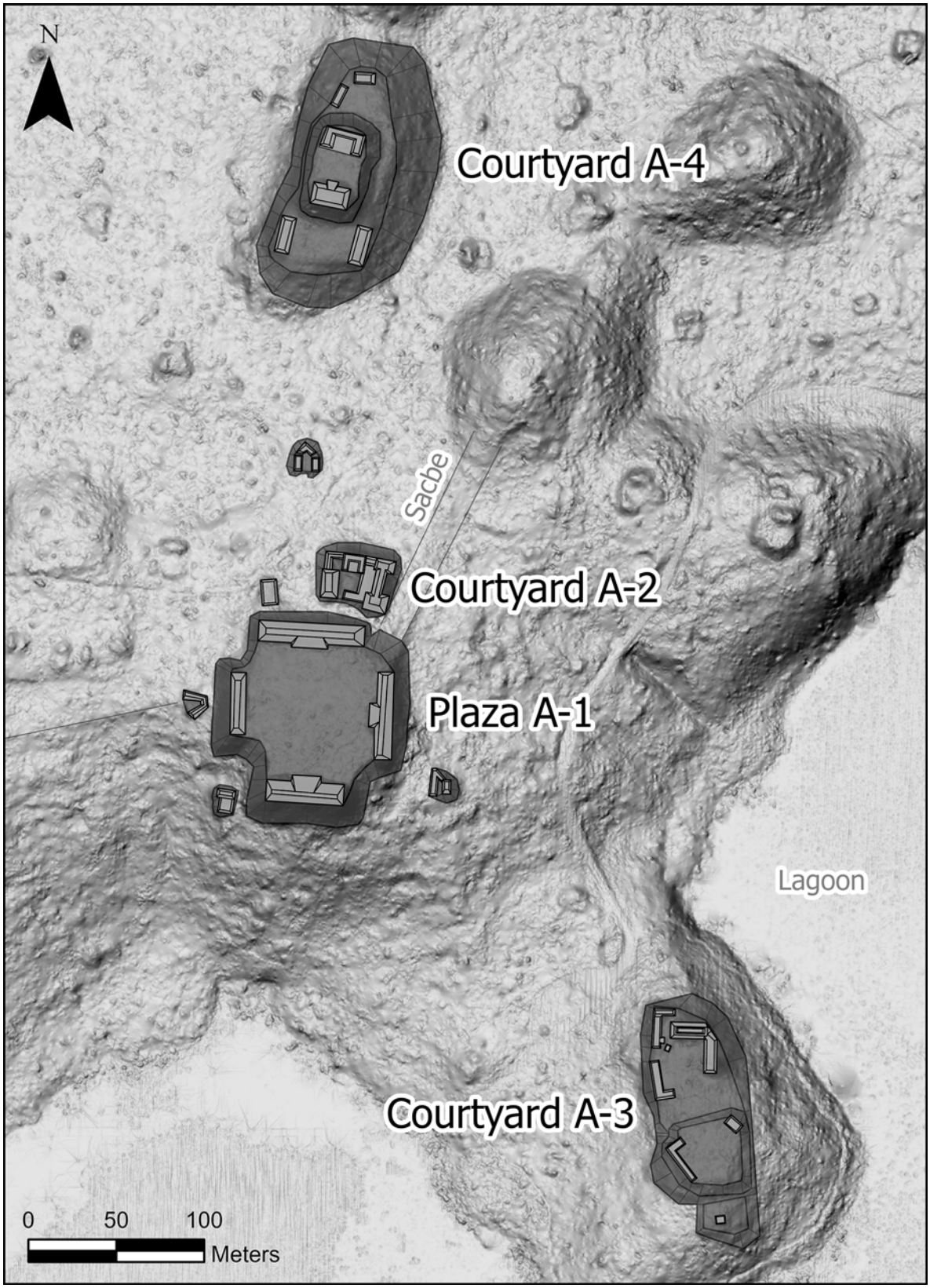

Figure 8.6. Map of Laguna Seca Group A modified from Guderjan et al. (1991:Figure 41). Figure by Amy E. Thompson.

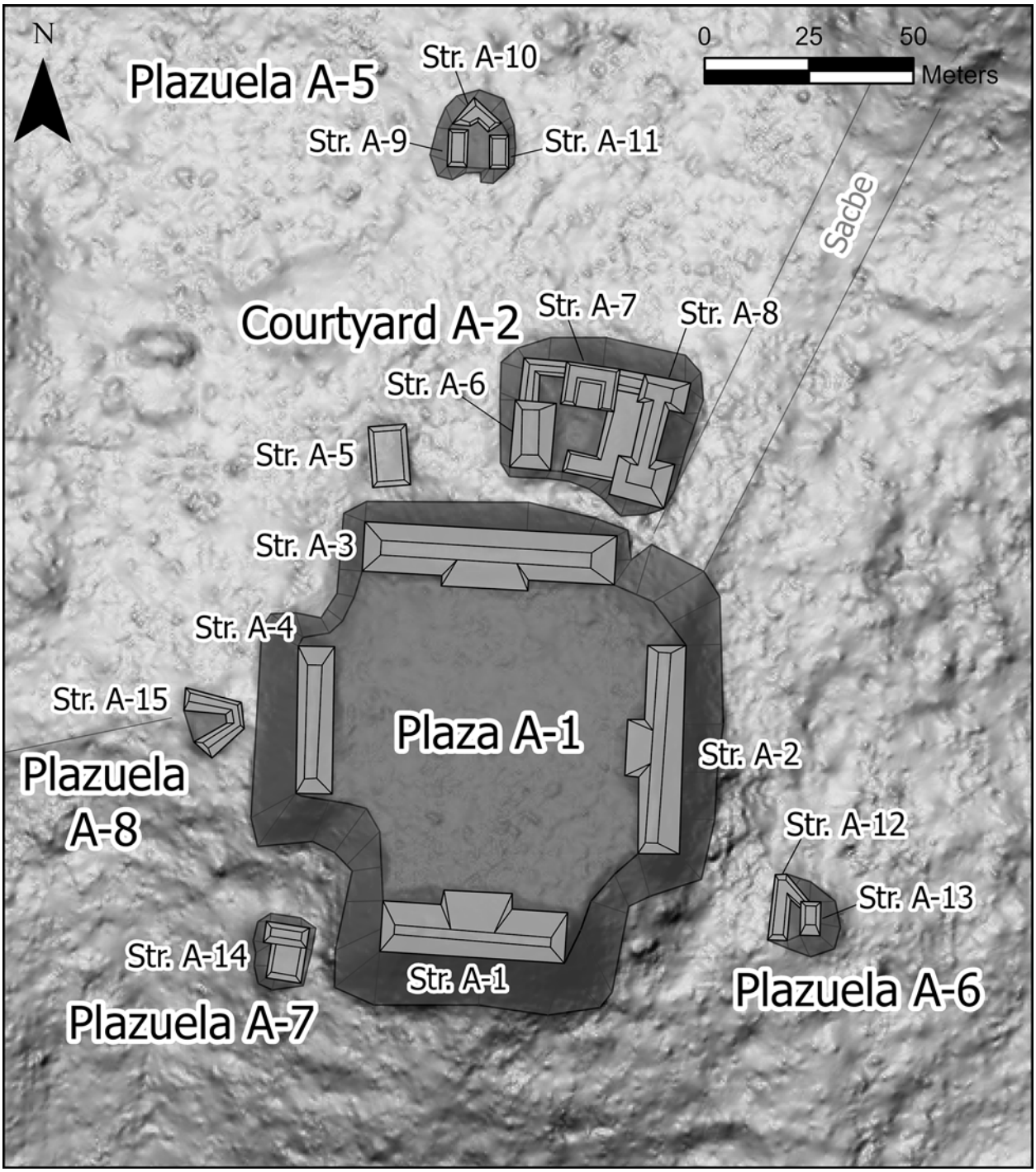

Figure 8.7. Map of Laguna Seca Plaza A-1, Courtyard A-2, and surrounding plazuela groups.

Group B. Courtyard A-3 consists of a northern lower platform with an upper platform in the middle and a small lower platform on the southern edge. This courtyard overlooks the lagoon and appears to have a series of terraces leading to the lagoon on the southeastern side of the group. On the northern lower platform, two L-shaped buildings form the northern edge (Structures A-16 and A-17; Figure 8.8). Visible in the lidar is a looters' pit in the southern portion of Structure A-17; this looters' pit was not noted in the 1991 report (Guderjan

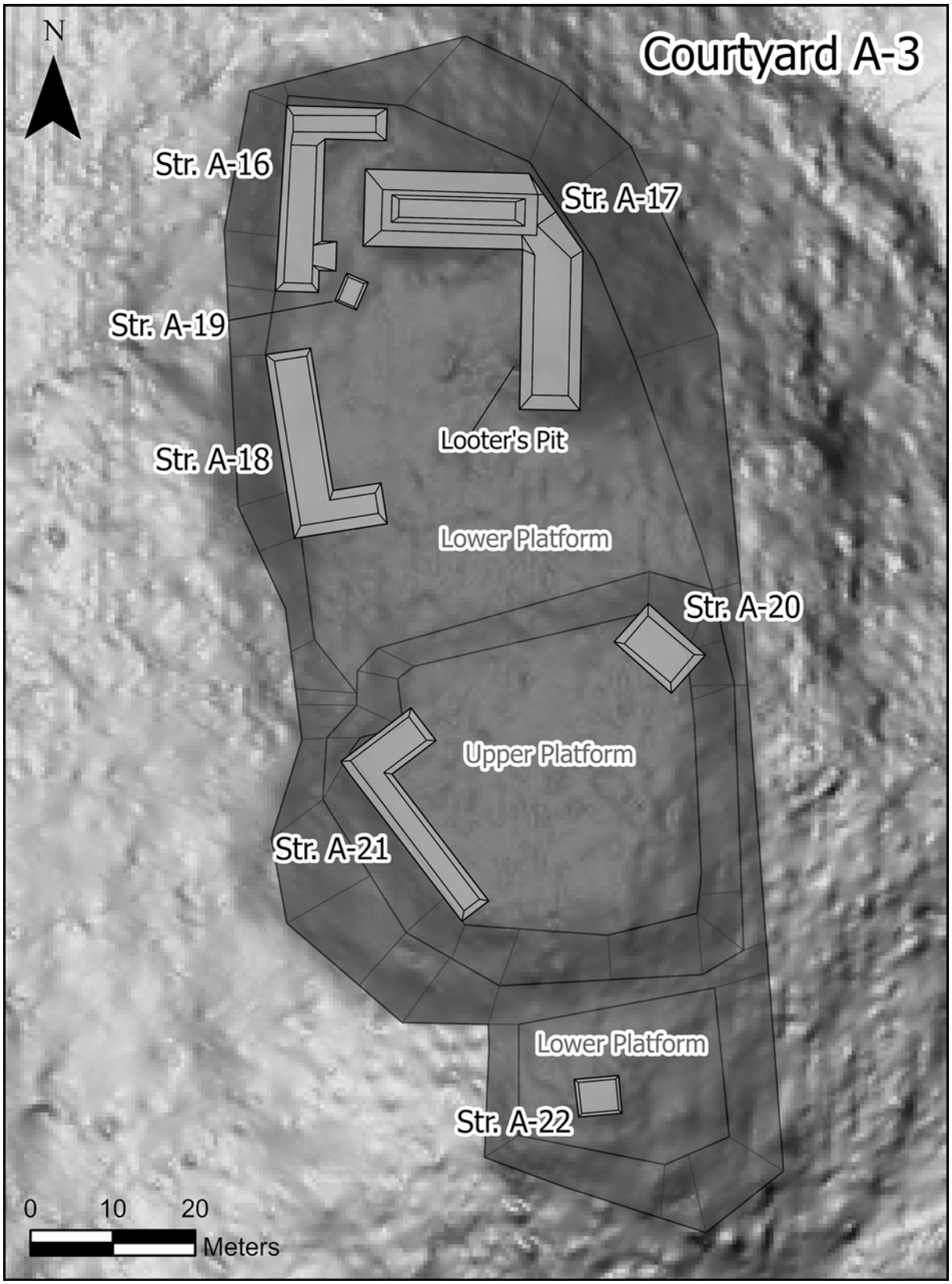

Figure 8.8. Map of Laguna Seca Courtyard A-3.

et al. 1991) nor in the 2013 BEAST site visit described by Sandrock (2017) prior to the 2022 lidar acquisition. On the western edge of the northern plaza of this group is Structure A-18, and a small building (Structure A-19) in the plaza is visible on the lidar and in Guderjan's map (Figure 8.9, see Figure 8.8). On the upper plaza is a small platform in the northeast corner (Structure A-20) and an L-shaped building in the southwest corner (Structure A-21). The southernmost area of the group has a lower platform with a small mound (Structure A-22).

North of Plaza A-1 by 200 m is Courtyard A-4, which is an elevated and flattened platform with an additional higher platform on top of it (Figure 8.10). The upper platform is 55 m long at its base and consists of two buildings. One on the southern edge (Structure A-23) appears to have a staircase on the northern edge of the building, providing occupants access from the platform plaza to the top of the building. On the northern side of the upper platform is a U-shaped platform on top of a basal platform (Structure A-24), based on the lidar imagery. The lower platform is 115 m long and has buildings on the southern and northern sides of the upper platform. The eastern side of the lower platform would have provided access to either open space on the lower platform without having to ascend to the upper platform. In the northern plaza is a lower building on the northern edge (Structure A-25) and a small building on the western side of the plaza (Structure A-26). In the southern plaza are two additional buildings, flanking the east and west edges of the plaza (Structures A-27 and A-28).

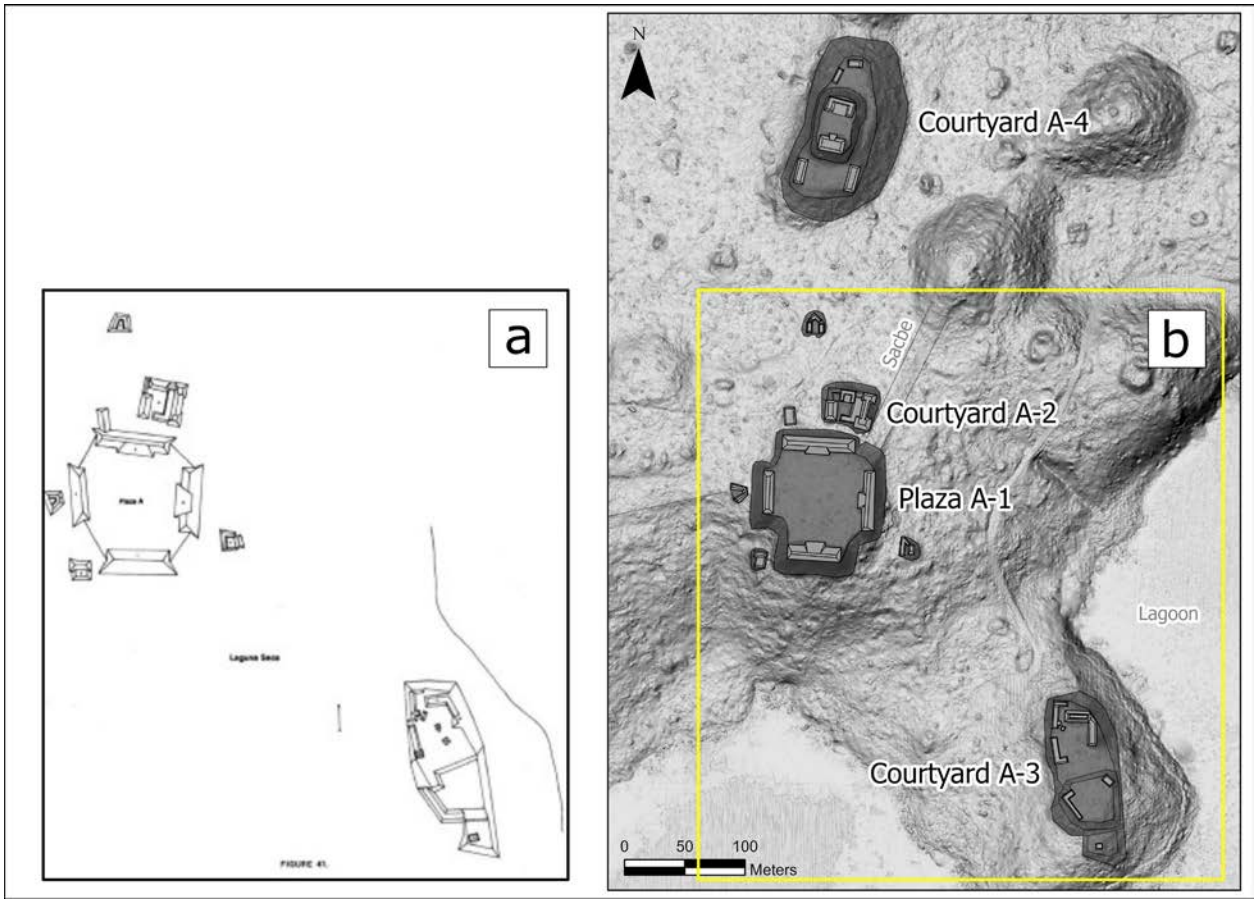

Figure 8.9. Comparison of Guderjan et al. (1991:Figure 41) map with updated digitized map of Laguna Seca Group A and surrounding settlement based on lidar data mapping.

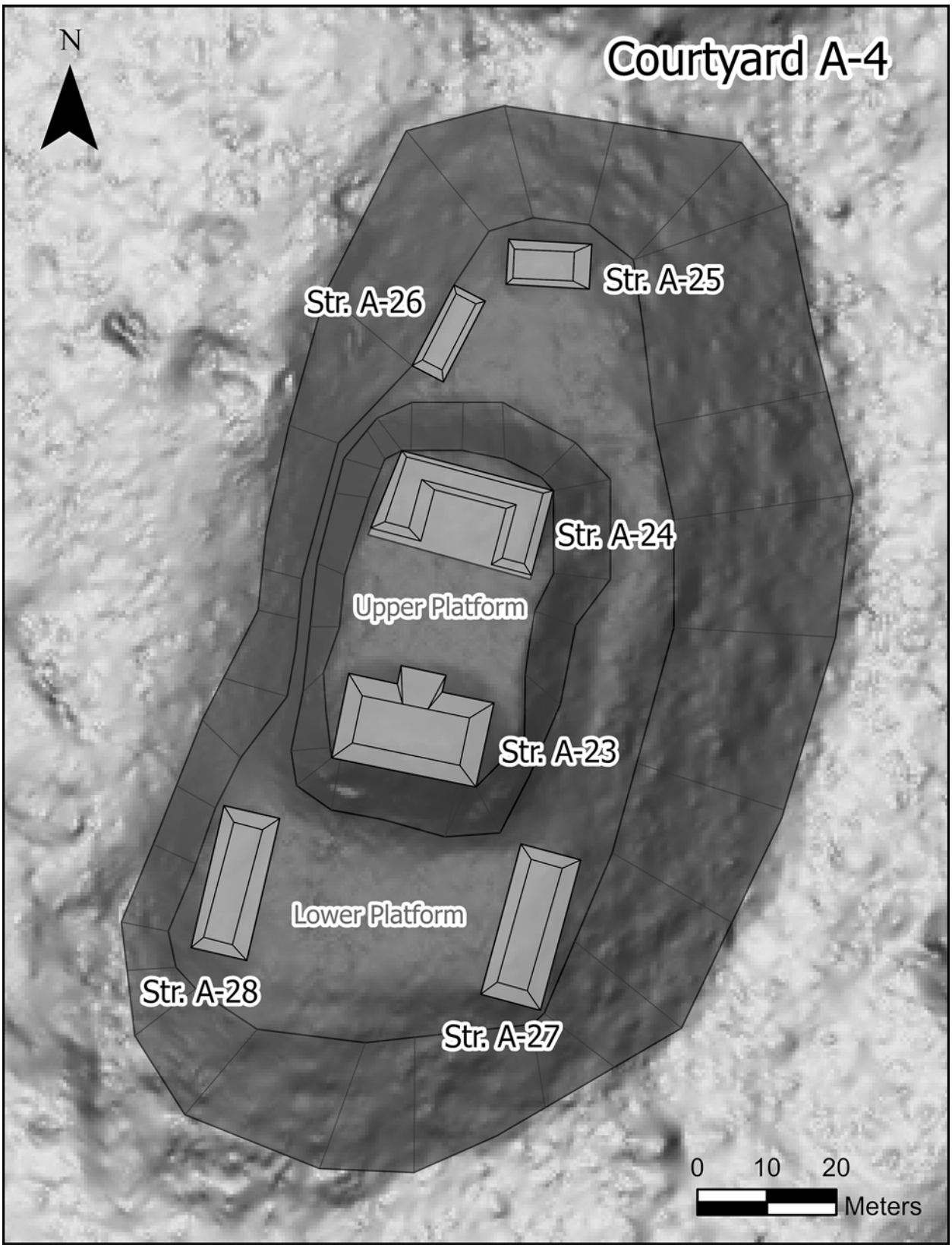

Figure 8.10. Map of Laguna Seca Courtyard A-4.

Descriptions of Laguna Seca Group B

Group B is located approximately 800 m west of Group A. Revealed for the first time in the lidar data, a long *sacbe* connects the two groups. Rather than being a raised road, the *sacbe* consists of long east-west berms or parapets delineating the road. While parts of the sacbe are difficult to see on the ground, the larger pattern of the feature is clearly visible on the lidar with different relief visualizations. The *sacbe* is approximately 620 m long, emanating from Plaza A1 and extending to the eastern entryway to Courtyard B-1 (Figure 8.11). In terms of construction, this sacbe resembles others at Chan Chich (Houk et al. 1996), Ayiin Winik (Houk et al., this volume), and BE-33 (Gallareta Cervera et al., this volume).

Group B consists of three complexes of larger architecture (courtyards and a plaza) with small households and architectural groups in the surrounding areas. Group B contains Courtyard B-1 and Plaza B-2 on the east and Courtyard B-3 on the west (see Figure 8.11). There appears to be another small platform at a lower elevation to the north of Courtyard B-1, but that was not visited during our time at Laguna Seca Group B. The southernmost side of Group B is approximately 420 m from the lagoon, providing access to freshwater for the occupants.

Courtyard B-1 is situated on top of Plaza B-2 in the northern portion of the B-2 platform. The largest building at the site is Structure B-1 in Courtyard B-1, situated just north of the center of the plaza. Structure B-1 abuts the western edge of the upper platform of Courtyard B-1, allowing passage on the eastern side of the building. Structure B-1 is approximately 10 m tall. To the south of Structure B-1 is an L-shaped building, Structure B-2, which has

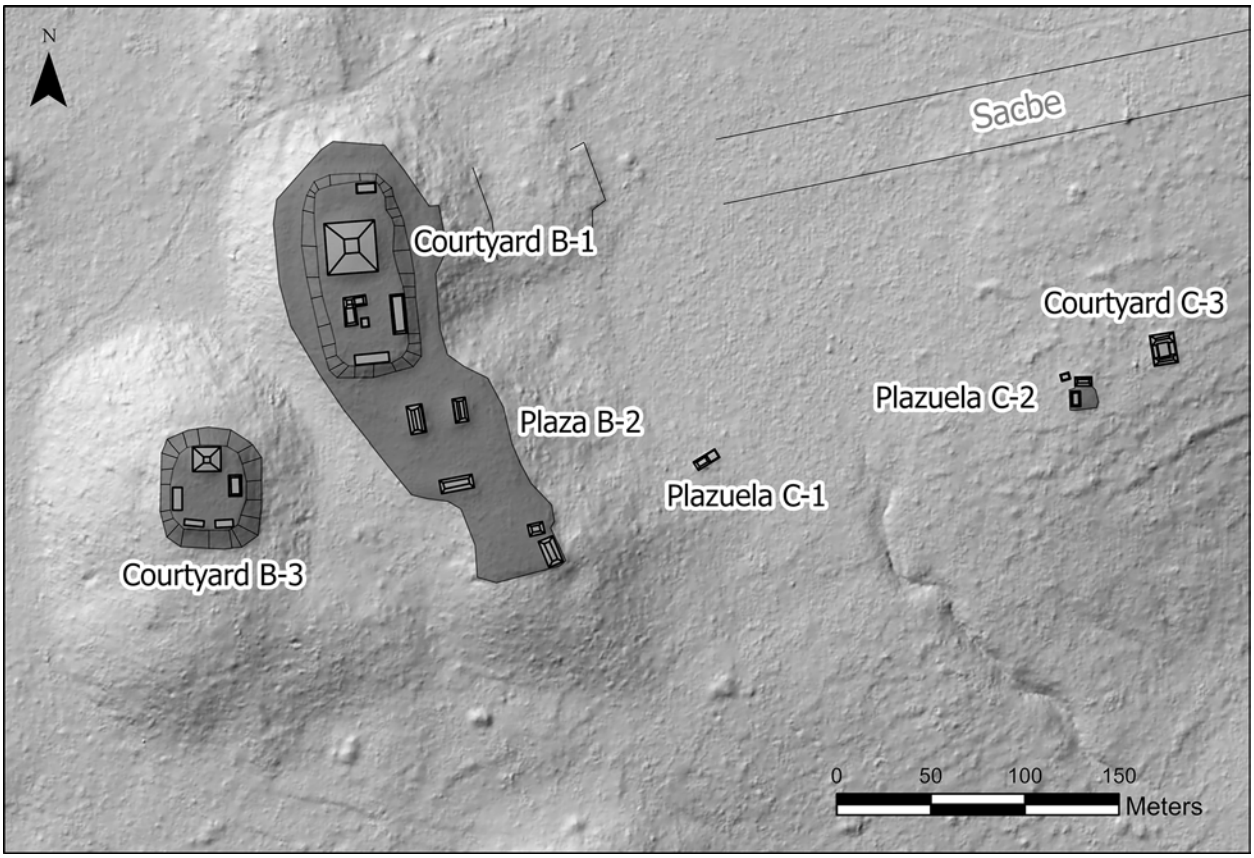

Figure 8.11. Map of Laguna Seca Group B.

a small platform south of it (Structure B-3). A *chultun* is present just south of Structure B-3; *chultuns* were often used for storage and later transformed into burial chambers (Guderjan 2007:75-76). Leaf litter was cleared from the *chultun* for a photo, but no additional investigations occurred (Figure 8.12). Structure B-4 flanks the eastern edge of the courtyard and Structure B-5 is located on the southern edge of the platform. In the far northwest corner of the courtyard, north of Structure B-1, is a small low mound, largely obscured by vegetation, Structure B-6 (Figure 8.13).

Plaza B-2 forms the base for the platform of Courtyard B-1. Plaza B-2 contains two distinct plaza spaces, one with a ball court (Structures B-7 and B-8) and the other with an open plaza flanked with mounds (Structures B-10 and B-11). Structure B-9 creates a boundary between these spaces (Figure 8.8). The ball court mounds are approximately 16 m long and 1.5 m tall, with a 10 m alley between them.

Seventy-five m to the west of Courtyard B-1 and Plaza B-2 is Courtyard B-3. Structure B-12 is situated on the northern edge of the plaza and dominates the group, standing approximately 5 m high. Surrounding the western (Structure B-16), southern (Structures B-14 and B-15), and eastern (Structure B-13) edges of the plaza are low mounds (Figure 8.14).

Figure 8.12. *Chultun* identified in the plaza of Courtyard B-1 just south of Structure B-3 (see Figure 8.13).

Descriptions of Laguna Seca Group C

In addition to the three large architectural groups of Group B, we opportunistically visited three smaller architectural groups near the trail that we took from Group A to Group B (Figure 8.15). Due the changes in the landscape, where Groups A and B are located on defined hilltops while the house mounds were not, we classified this area as Group C (see Figure 8.5). One architectural group is a single isolated structure (Plazuela C-1, Structure C-1). It is a tiered platform and is located 85 m to the east of Plaza B-2. The lower platform of the building is approximately 75 cm high and the upper platform approximately 1.25 m high. Another group, Plazuela C-2, consisted of three buildings, two of which (Structures C-2 and C-3) were situated on an elevated platform. The mounds were 50–100 cm in height. A third

building was located along the northwestern edge of the platform (Structure C-4); this is likely a household group associated with Group B given that it is approximately 290 m to the east of Plaza B-2. The third architectural group (Plazuela C-3) is located midway between Groups A and B, approximately 360 m and 340 m from each, respectively. This group consists of a sunken plaza with 1.5-2 m high mounds on the northern and southern sides (Structure

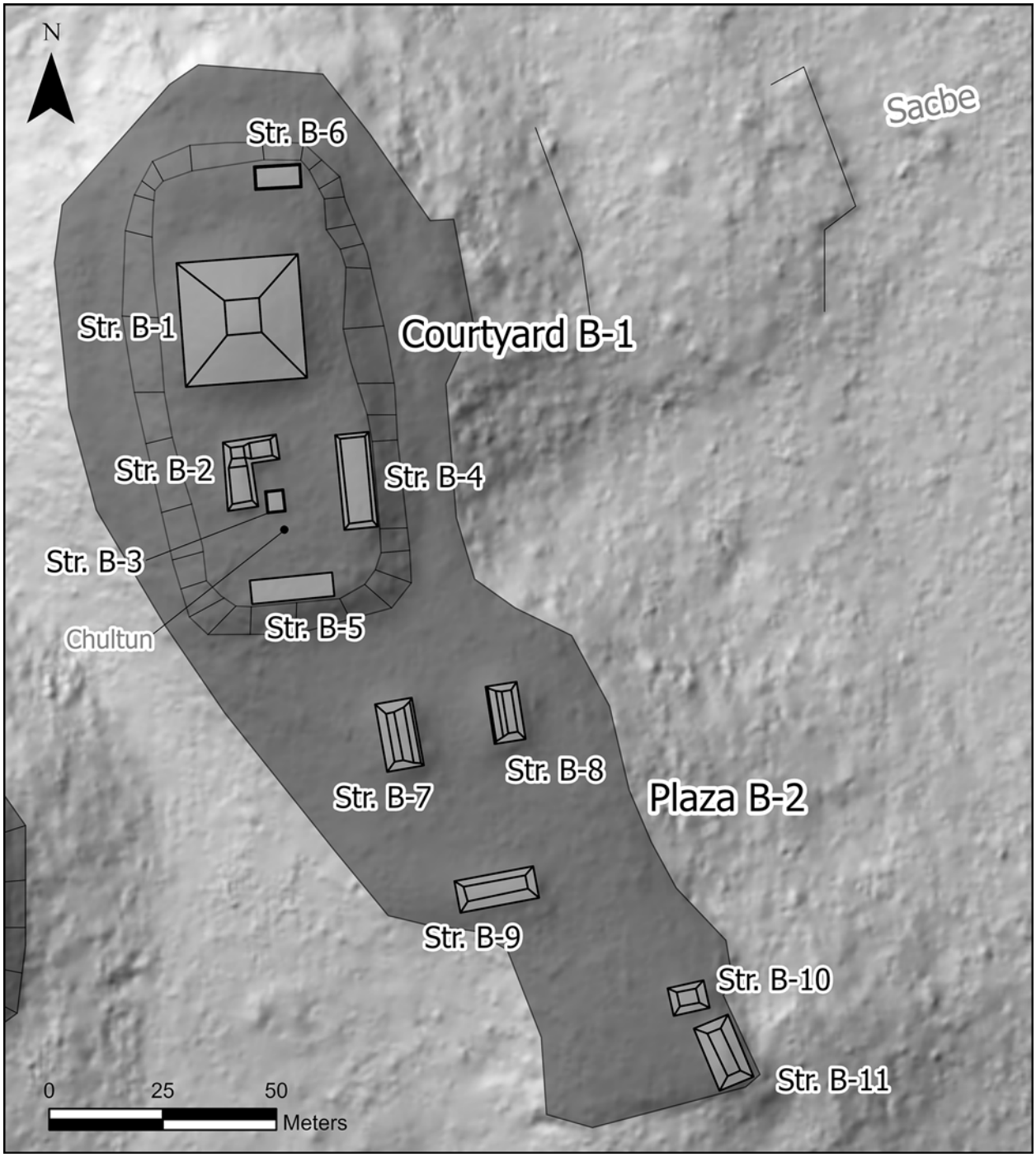

Figure 8.13. Map of Laguna Seca Courtyard B-1 and Plaza B-2 showing the location of buildings mentioned in the text.

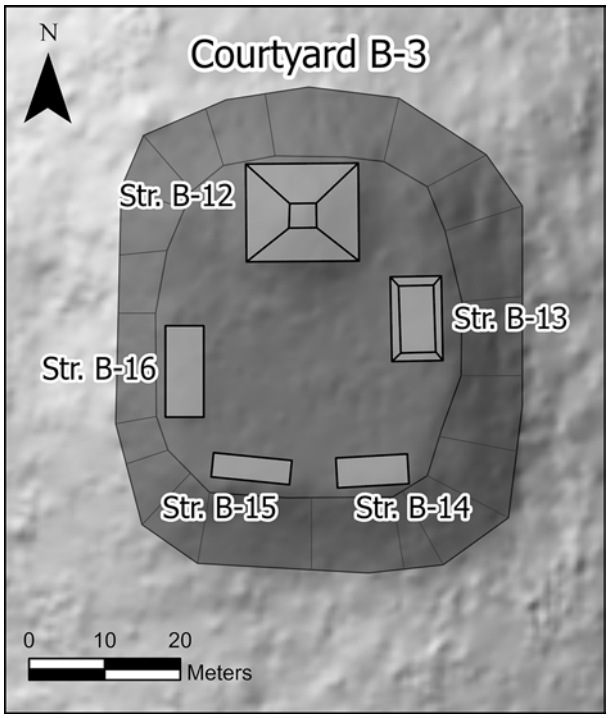

Figure 8.14. Map of Laguna Seca Courtyard B-3 showing the location of buildings mentioned in the text.

C-5 and Structure C-6) and low, but clearly elevated platforms, on the eastern and western sides. The group is approximately 20 m north-south and 15 m east-west.

Terraces at Laguna Seca

Finally, we opportunistically assessed potential agricultural terrace features during the field verification of lidar data at Laguna Seca. The lidar data revealed potential agricultural terraces on the northern edge of the lagoon. The terrace-like features are 1–2 m in height with some limestone rocks visible on the surface (Figures 8.15 and 8.16). It was difficult to determine if they were natural breaks of bedrock outcrops, natural terraces from flooding events of the lagoon, or anthropogenically created features. Future research may further investigate these features.

(ATTEMPTS AT) CHRONOLOGY BUILDING AT LAGUNA SECA: SUBOP LS-01-A

To understand the regional chronologies of the political centers of various sizes across the BEAST permit area, we attempted to establish a multi-proxy chronology for Laguna Seca through test unit excavations of Suboperation (Subop) LS-01-A. We initially sought to place the unit in the center of the ballcourt alley in Plaza B-2, but a hive of bees thwarted our plans. Instead, we ascended the hill to

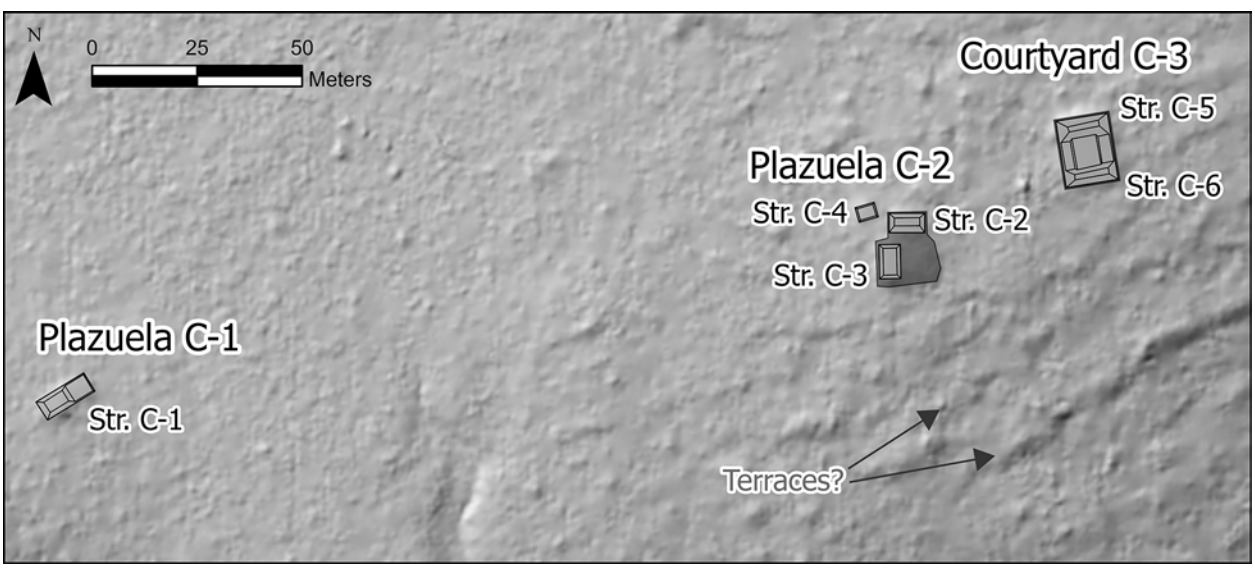

Figure 8.15. Digitized households (plazuelas) of Group C and potential terraces from Laguna Seca.

Figure 8.16. Photos of a potential terrace without (a) and with (b) digitized feature with Gary Romero for scale. Photos facing east by Amy E. Thompson.

Courtyard B-1, placing a unit in an alley between two large structures, assuming that garbage and cultural remains may have accumulated there in antiquity.

Methods

We placed a 1-x-2-m unit in the alley between Structures B-1 and B-2 in Courtyard B-1 (Figures 8.17 and 8.18). A temporary datum was established on a nearby tree for collecting depths of the unit; the datum height was 21 cm above ground surface. The datum was not shot in using a total station as it will not be used again in the future. Depths were taken at the start of the excavation (Figure 8.19) and at the end of each lot. Excavations followed natural stratigraphy, although if a lot was more than 20 cm thick, we arbitrarily terminated it with the goal of splitting thick lots for chronology building. The crew visually sorted the excavated matrix and collecting of artifacts occurred during the excavations rather than using a screen to sift through the dirt and identify artifacts (see Black 1999:339). All artifacts were collected based on artifact type (ceramics and lithics) by lot and submitted to the BEAST lab upon completion of the excavation.

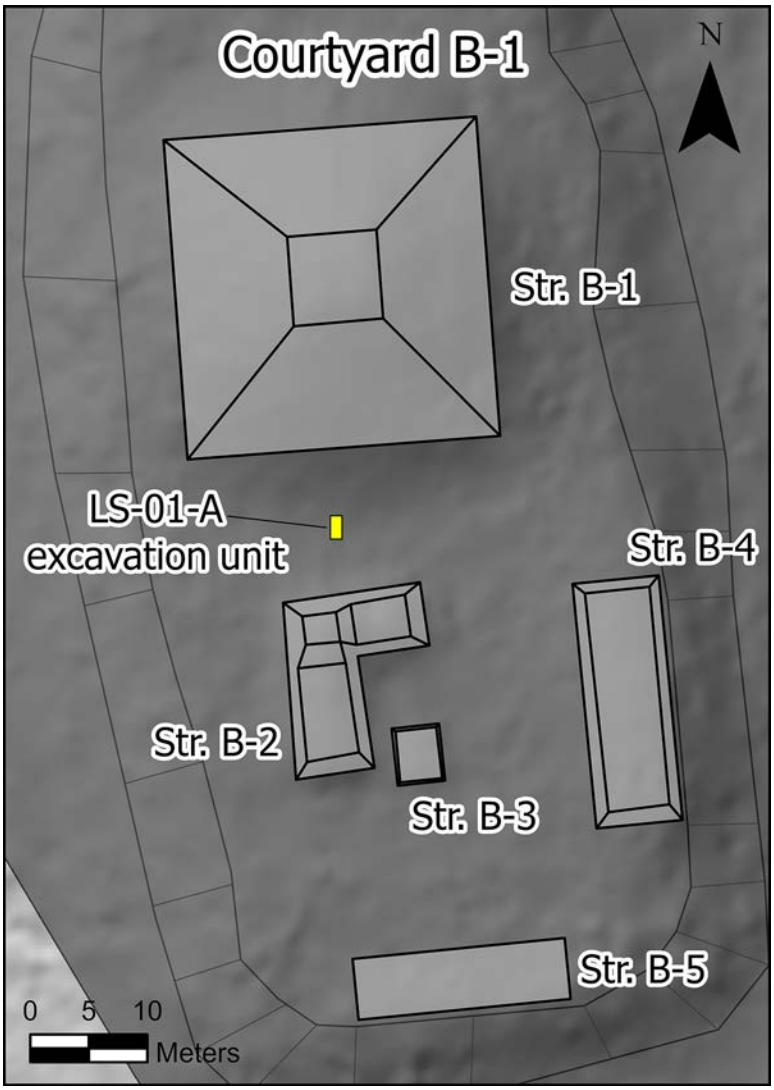

Figure 8.17. Map of Courtyard B-1 showing the location of the excavation unit Subop LS-01-A between Structure B-1 and Structure B-2.

Excavations

Excavations of Lot LS-01-A-01 began with the removal of leaf litter before the excavation of dark, organic rich topsoil between 14 and 19 cmbd. The matrix consisted of rich black soil with lots of small roots and land snail inclusions. We only recovered only three small sherds in the lot. While the sherds were quite small, smaller than a shilling, we collected them as no other artifacts were identified during the excavation. A large root was present in the western edge of the unit, resulting in bioturbation of that portion of the unit. We identified no architectural details (floors, walls, etc.) in Lot LS-01-A-01. We closed the lot at a transition to a lighter soil that was dark brown and less clumpy (or clayey) between 25 and 27 cmbd.

The matrix of Lot LS-01-A-02 consisted of soft dark brown soil with roots, including a large root running through the unit. During

Figure 8.18. Overview photo of Subop LS-01-A showing Structure B-2 (left) and Structure B-1 (right) of Courtyard B-1 with the excavation unit in the alley between the buildings. Photo taken facing west by Amy E. Thompson.

excavations, we recovered a few artifacts; again, we recovered a handful of small ceramic sherds and we identified no lithics or obsidian in the lot. We identified 23 sherds, including one rim and seven body sherds; the remaining 15 sherds were "shotgun" sherds. We collected three charcoal samples (Samples LS-01-S01, -S02, and-S03) from the northwest corner of the unit. However, given the dearth of cultural features in the unit and sparse cultural material, these are a low priority for dating. The lot ended between 29 and 36 cmbd with the appearance of small limestone cobbles and more land snail shells, resulting in a more compact soil. We identified no architectural features in Lot LS-01-A-02.

Lot LS-01-A-03 was a cultural fill layer, wherein the soil matrix consisted of a lighter gray matrix with lots of small limestone cobbles. Unlike the previous two lots, we found more ceramics and lithics in Lot LS-01-A-03, although the ceramics were small and eroded, making it difficult to distinguish temporal markers. We collected 64 sherds during excavations of Lot LS-01-A-03: 2 rim sherds, 11 body sherds, and 51 "shotgun" sherds, making it difficult to assign a temporal occupation to this context. In addition to the ceramics, we recovered 30 lithic debitage flakes from Lot LS-01-A-03. A charcoal sample (Sample LS-01-S04) was collected from the northwest corner (47 cm E, 154 cm N

Figure 8.19. Gary Romero, Chris Quetzal, and Aloria Tush taking the starting depths of Lot LS-01-A-01. Structure B-1 of Courtyard B-1 is in the background. Photo taken facing north by Amy E. Thompson.

from the SW corner of the unit; 41 cmbd). Lot LS-01-A-03 ended between 46 and 54 cmbd with the appearance of a potential eroded plaster floor and more chalky chunks in the matrix and noticeably fewer artifacts.

As discovered in Lot LS-01-A-04, the "potential eroded plaster floor" noted above was likely actually eroding bedrock, consisting of a light gray, marly matrix with small limestone cobbles. It is possible that there was a thin plaster floor placed directly on top of bedrock. In the 15–20-cm thick lot, only one small piece of debitage was found in the matrix. The lot ended with the increased appearance of cream-colored matrix that looks like eroding limestone between 66 and 69 cmbd.

The final lot of the excavation was Lot LS-01-A-05, which continued to ensure the limestone matrix was indeed eroded bedrock and not marl fill. In the 10-cm thick lot, we recovered no artifacts. The lot and suboperation ended between 77 and 80 cmbd, when it was obvious that the matrix was bedrock and when Dr. Houk visited the site and confirmed this hypothesis. Given the dearth of architectural features, we photographed and scanned the suboperation unit before backfilling.

Summary

The Subop LS-01-A consisted of five lots—two top soil lots, one cultural fill, one potential

eroded plaster floor or likely eroded bedrock, and one of eroded bedrock (Figures 8.20 and 8.21; Table 8.1). Few artifacts were found in the top soil, potentially suggesting a sweeping in the plaza prior to abandonment or post-occupational deposition. Lot LS-01-A-03 (cultural fill) contained the most artifacts, which included 64 ceramic sherds and 30 pieces of lithic debitage. A single lithic was found in Lot LS-01-A-04, which was either an eroded and poorly preserved plaster floor directly on top of bedrock or just eroded bedrock. While charcoal was recovered from Lots LS-01-A-02 and LS-01-A-03 in the northwest corner of the unit, it is not clear if it derived from ancient activities or modern, such as a fire from temporary passersby or a lightning strike. Overall, the stratigraphy of this unit suggests a single phase of construction of Courtyard B-1. Given the lack of construction phases and architectural features, additional charcoal was not collected from the unit profile.

Figure 8.20. Overview photos of the surface (left), and Lot LS-01-A-01 (second from left) through Lot LS-01-A-05 (bottom right) showing excavation of the unit and distinct lack of architectural features in the alley of Courtyard B-1. Photos taken facing north by Amy E. Thompson.

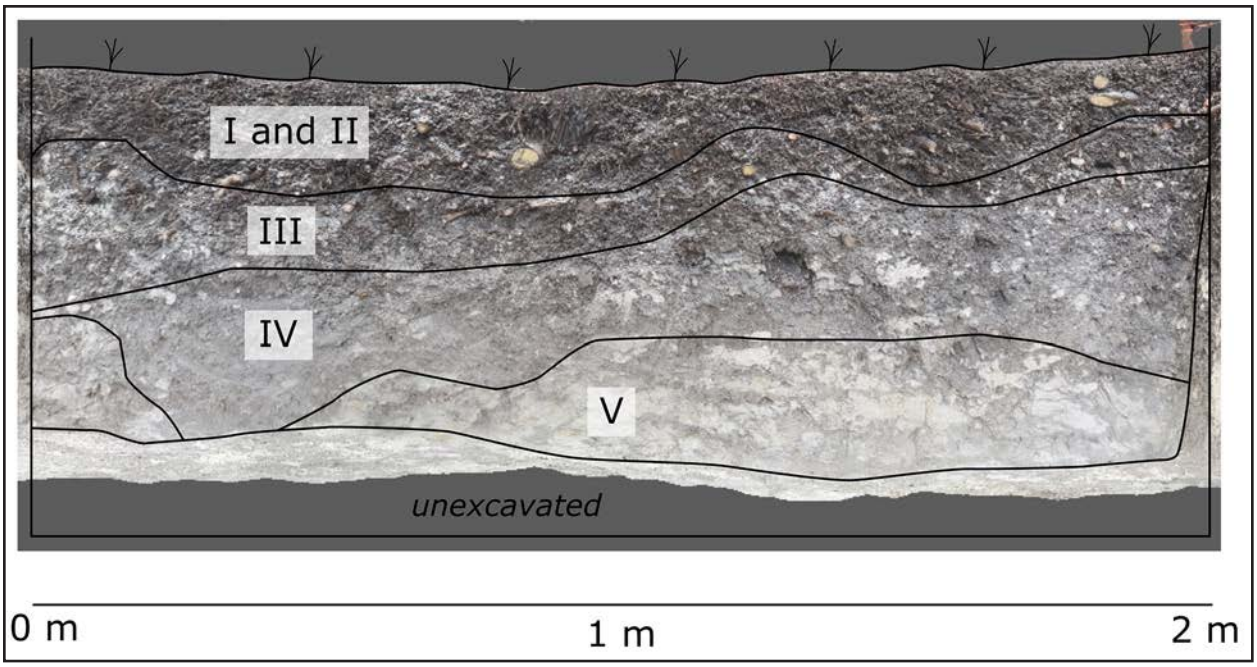

Figure 8.21. Digitized west wall profile of Subop LS-01-A with a Scaniverse capture (85 percent opacity) in the background. Stratigraphic level designations correspond with lots described above (I = Lot LS-01-A-01, etc). See Table 8.1.

Table 8.1. Summary of Lots in Subop LS-01-A

Lot (LS-01-A-)	Lot Description	Stratigraphic Level on Profile
01	Topsoil	I
02	Topsoil	II
03	Cultural Fill	III
04	Potential eroded Plaster Floor / Eroded Bedrock	IV
05	Eroded Bedrock	V

One of the primary goals of the test unit excavation was to collect charcoal and ceramics from secure and documented contexts. In total, four charcoal samples were collected, which are likely associated with a more recently burned root rather than activities of antiquity. Sample LS-01-S04 may be submitted for radiometric dating in the future. A total of 90 ceramic sherds were identified, 3 of which were rims, but the project ceramicist has not analyzed these yet. In total, 31 pieces of lithic debitage were collected and catalogued; these will be analyzed in future BEAST seasons.

SUMMARY AND FUTURE WORK

During the four days of fieldwork at Laguna Seca, we successfully mapped the western area of civic ceremonial architecture, Group B. During mapping, no looting activity was recorded in Group B or surrounding households. While one of the primary goals of Op LS-01 was chronology building, heavy leaf litter and dense vegetation resulted in no surface finds being identified during our time at Laguna Seca. Furthermore, the small test unit excavation (Subop LS-01-A) that was placed in Courtyard B-1 between Structure B-1 and Structure B-2, yielded few diagnostic sherds. Hopefully ceramic analysis of the three rim sherds may shed light on a component of the occupational sequence at Laguna Seca and future work may further explore the 2023 research objectives.

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A Comparison of Drone-based and Plane-based Lidar at Two Sites in the BEAST Permit Area

Mark D. Willis

During the 2023 field season of the BEAST project, we deployed a drone-based lidar system to map areas around the sites of Chan Chich and Gallon Jug. The National Center for Airborne Laser Mapping (NCALM) at the University of Houston mapped both sites as well as an extensive area well beyond using a plane-based lidar system in May 2022 (Figure 9.1). NCALM mapped an area of approximately 650 km^2 as compared to our 5 km^2 (see Houk 2022). Our goal was to compare the data collected using the two platforms. This work is built upon lessons learned during a similar lidar survey on the Belize River East Archaeology (BREA) project in early 2022 (Willis and Murata 2023).

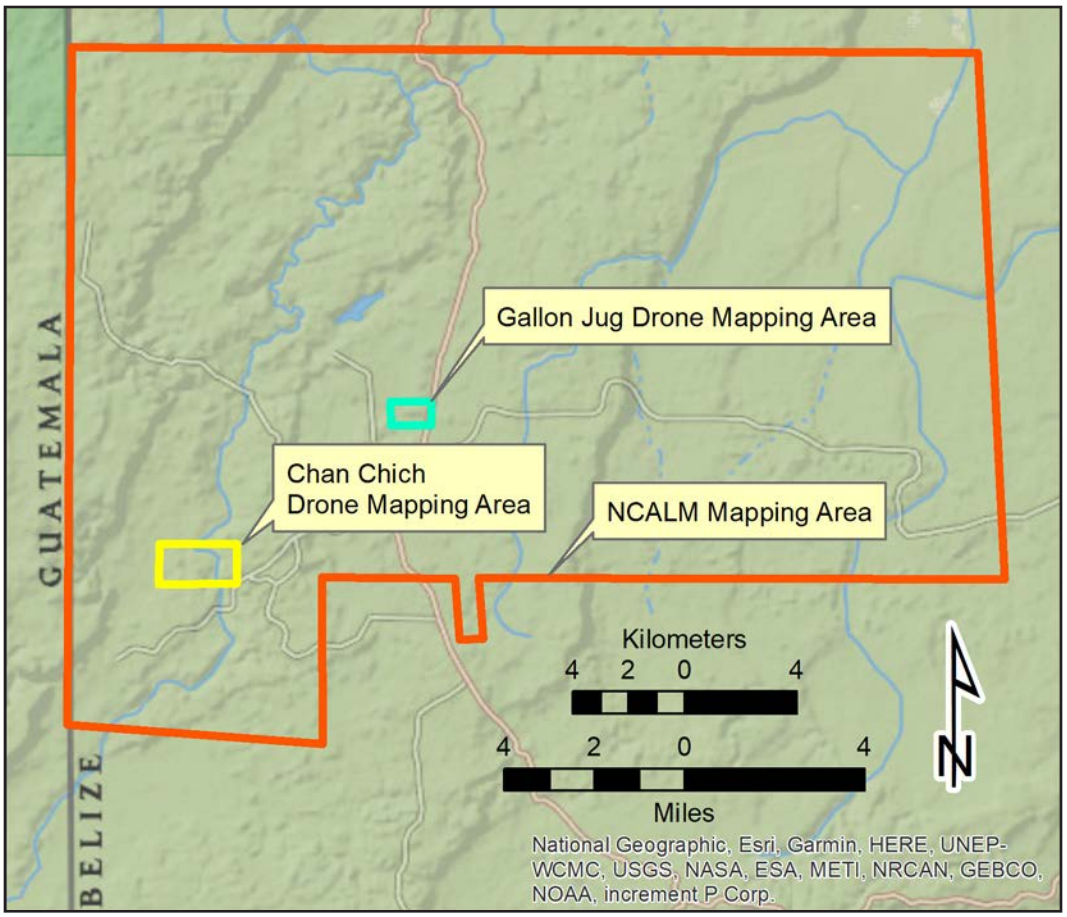

Figure 9.1. Locations of the various lidar mapping missions.

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EQUIPMENT

We employed a DJI Matrice 300 (M300) multi-rotor drone in conjunction with a Zenmuse L1 (L1) lidar sensor. The M300 and L1 seamlessly integrate via a gimbal, enabling real-time communication between them and the drone operator. Additionally, the entire package harnesses the DJI RTK-2 GNSS system to uphold exceptional positional accuracy. The DJI RTK-2 is a mobile base station that records signals from the Chinese (Baidu), European Union (Galileo), Russian (GLONAS), and American (GPS) systems (Figure 9.2). These data are correlated in real time with the drone to precisely determine its location. Thanks to its ability to utilize multiple satellite constellations, the DJI RTK-2 excels in environments with dense canopy cover, a distinct advantage over GPS-only systems. The integrated synergy of the drone, lidar unit, and base station eliminates the need for third-party devices, simplifying deployment and minimizing potential points of failure.

This system offers the advantage of employing an independent controller as its interface, rather than relying on a smartphone. The controller not only displays the drone's location on a map view but also streams a video feed from a forward-facing camera and a feed from a camera mounted on the downward-facing lidar unit. In addition, it provides real-time data such as altitude, wind speed, and distance to obstacles. Perhaps the most valuable feature of the controller is its ability to present a real-time low-resolution point cloud of the lidar data as it is being collected (Figure 9.3). This feature

Figure 9.2. GNNS base stations set up and collecting data at Chan Chich.

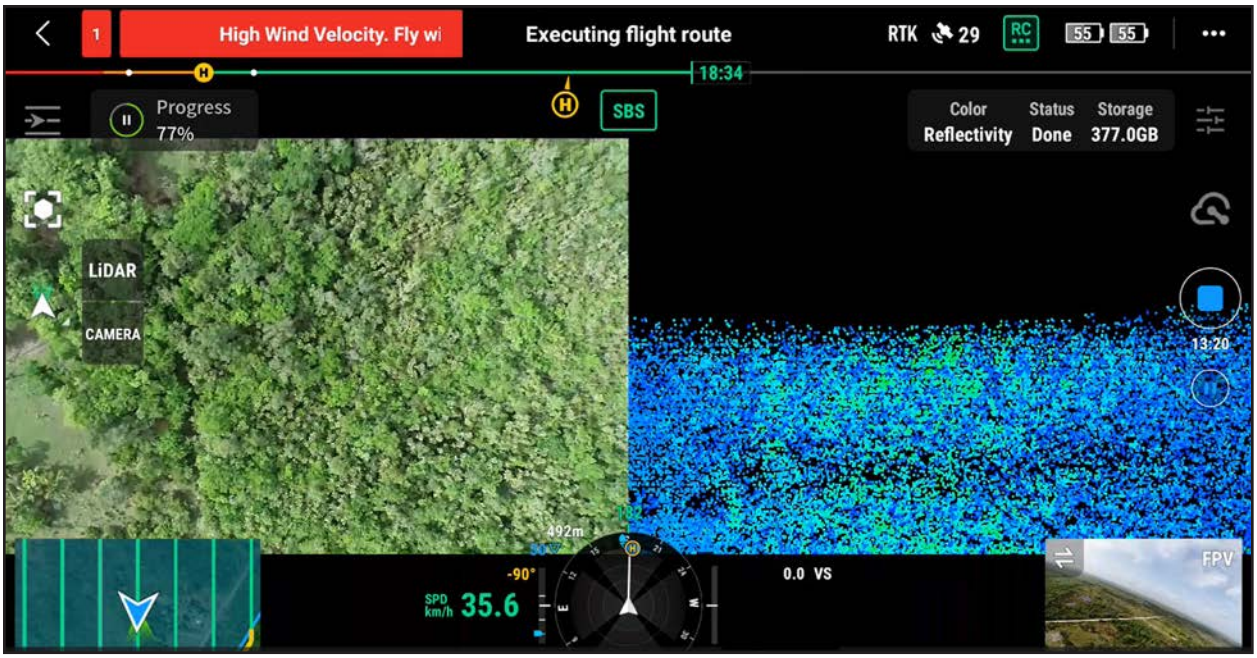

Figure 9.3. Data are shown live while they are being collected.

empowers the pilot by ensuring the acquisition of high-quality data.

At the core of this data collection apparatus is the L1, which integrates a Livox lidar module, a high-accuracy Inertial Measuring Unit (IMU), and a camera equipped with a 1-inch CMOS standard sensor mounted on a 3-axis stabilized gimbal. The CMOS camera sensor enables the L1 to colorize the laser point cloud data with the actual colors of the scanned objects. One cost-saving aspect of this system is its utilization of the solid-state Livox sensor, which has become more affordable thanks to its application in technologies like self-driving cars (Medina et al. 2022). While the sensor is exceptional, it does not reach the same level of quality and accuracy as some of the more expensive alternatives.

The M300 is powered by two large batteries for each flight, typically lasting around 30 minutes but extending to as much as 45 minutes under optimal conditions.

Just like with all drones in Belize, we went through the process of applying for permits from the Department of Civil Aviation to operate the drone and secure import permits for telecommunications equipment from the Public Utilities Commission to bring it into the country.

DATA COLLECTION

Before heading into the field, we digitized the locations for lidar data collection into Google Earth's KMZ format polygon files. The selection of these areas involved several considerations, such as their proximity to easy launch locations, the types of vegetation present, and known sites of interest. We then imported these polygons into the drone's controller, configuring mission parameters for each region. These parameters encompassed factors like flight height above the ground, transect spacing, laser pulse settings for data collection, and other specifics.

When it comes to executing a drone mission, the process closely resembles what we have been doing on the BREA project in recent years (Harrison et al. 2015). We identified one or more launch sites within or near the study area,

focusing on locations away from people and with minimal obstacles such as electric poles and trees.

The M300's protective case serves both to shield the drone from environmental elements and accidental damage and as a platform for drone assembly and launch. Upon reaching the launch site, we unfolded the large M300 and securely attached the L1 lidar payload. An important necessity is to have the DJI RTK-2 base station up and running for approximately 20 minutes before the first flight. In addition to the DJI RTK-2 system, we also established an Emlid RS2 GNSS base station at each launch location as a backup GNSS receiver. The Emlid RS2, unlike the DJI RTK-2, lacks direct communication with the drone, but it boasts a significantly longer battery life (18–20 hours) compared to the DJI device, which lasts only about 2 hours per battery. If communication with the DJI RTK-2 was lost during a flight, we had the Emlid RS2 data as a backup. Since the Emlid does not communicate directly with the drone, we used a process called Post Processing Kinematic (PPK) to correct the lidar's positional data. Nevertheless, we ultimately did not require the backup data from the Emlid units in any of the missions conducted during the field season.

To summarize, we set up the DJI RTK-2 and the Emlid RS2 on tripods, while assembling the M300, attaching the L1, and powering up the entire system. The L1 sensor necessitates 5 minutes to warm up each time it is powered on. During the 20 minutes required for the RTK-2 to obtain a strong satellite fix and while the L1 warms up, we reviewed the mission's flight plan in the controller to ensure that our plans from the camp aligned with the actual field conditions.

Once the DJI RTK-2 and the L1 were warmed up, we were ready for data collection. The M300 is an autonomous flying robot that only requires a few button presses to become airborne and start data collection. When a mission is initiated, the M300 ascends to its designated altitude and proceeds to follow the pre-programmed transects. Like a lawnmower, the drone shuttles back and forth along these transects, collecting data. During this process, the L1 emits thousands of laser beams directly below the aircraft and records when a beam is reflected to the unit. Using positional data from the DJI RTK-2 and the IMU, it accurately triangulates the three-dimensional location of each point collected on the ground or on a plant. A single flight gathers hundreds of millions of such points, and a multi-mission project can easily accumulate over a trillion points. Depending on the size of the mapped area, multiple flights may be necessary to cover the entire study region, possibly requiring multiple launch locations to optimize battery efficiency.

Regarding batteries, we had enough to carry out three consecutive flights. For multi-flight missions, we charged the batteries at the post office at Gallon Jug Ranch or by using an inverter, which was connected to a running vehicle with a lead acid battery. This resulted in downtime ranging from 20 minutes to an hour between subsequent flights and required a vehicle that could endure the Central American heat without overheating while stationary.

In total, we mapped two distinct areas within the BEAST permit region (see Figure 9.1). These areas spanned the main site of Chan Chich as well as the site of Gallon Jug (not to be confused with Gallon Jug Ranch).

DATA PROCESSING

The initial steps in data processing are straightforward and involve downloading the data from the memory cards on the L1 and performing preprocessing in DJI Terra software. This proprietary software takes the raw data from the L1, aligns individual transect

data, and consolidates data from multiple flights into a single file. These files are substantial, often reaching sizes that challenge the capacity of most modern laptops. Each evening, we processed the data collected during the day using DJI Terra software, which typically took from two to eight hours of hands-off computer processing. Ultimately, the software exported a unified dataset in the LAS format, an industry-standard ASCII format with a decades-long history of use.

Following the export of LAS data, the next step was post-processing. This involved employing third-party (non-DJI) software to analyze and assign classifications to each of the billions of points in the lidar point cloud. This is the critical phase where the software endeavors to categorize points within the cloud, distinguishing between bare earth, vegetation, water, modern buildings, and various other features. In our case, our primary interest was in extracting a bare earth model to visualize the ground without the overstory (Figure 9.4). This process relies on complex algorithms and, in some cases, artificial intelligence. The software available for this post-processing is expensive, intricate, and time-intensive to use. Due to its complexity and the multitude of adjustable parameters, considerable time was devoted to running and re-running the software on the same dataset to determine the optimal settings. The software we used is TerraScan and TerraModel (TerraSolid, 2023), developed by a Finnish company named TerraSolid, which is not affiliated with DJI, despite the similar name to DJI's Terra.

RESULTS

We mapped both sites of Chan Chich and Gallon Jug with the M300 and L1 lidar system during our work from June 30 to July 3, 2023. Good weather conditions prevailed, with only a few passing storms briefly disrupting our operations.

Chan Chich

We focused our mapping efforts on collecting lidar data around the site core of Chan Chich, where we initiated our work. Many valuable lessons were gained from previous mapping conducted on the BREA project (Willis and Murata 2023). The primary parameters crucial for data collection in dense jungle areas are the drone's flight altitude above the ground and its speed while acquiring lidar data.

We began by conducting a series of transects at an altitude of 60 m above ground level (AGL) with a flight speed of 6 m per second. Subsequently, we repeated the same transects at an altitude of 80 m AGL, maintaining the same speed of 6.5 m per second. Both sets of data were processed and compared. Remarkably, we discovered that the data collected at the higher altitude was as good as that collected at the lower altitude. This discovery proved valuable because we encountered an unexpected challenge: the dense jungle biomass interfered with the communication signal between the drone and the operator, causing signal loss.

As a failsafe mechanism, in the case of signal loss, the drone automatically returns home without completing its mission. If you cannot maintain the signal, mapping will cease. Unfortunately, this failsafe feature cannot be disabled. However, flying the drone at a higher altitude significantly improved signal retention. Ultimately, the drone was capable of flying approximately 1.2 km away from the operator without losing signal. This limitation highlights a significant difference between drone-based lidar and plane-based lidar.

Between the test mapping flight and the final lidar survey, we mapped an area of 3.8 km^2 from June 30 to July 1, using 10 flights. The

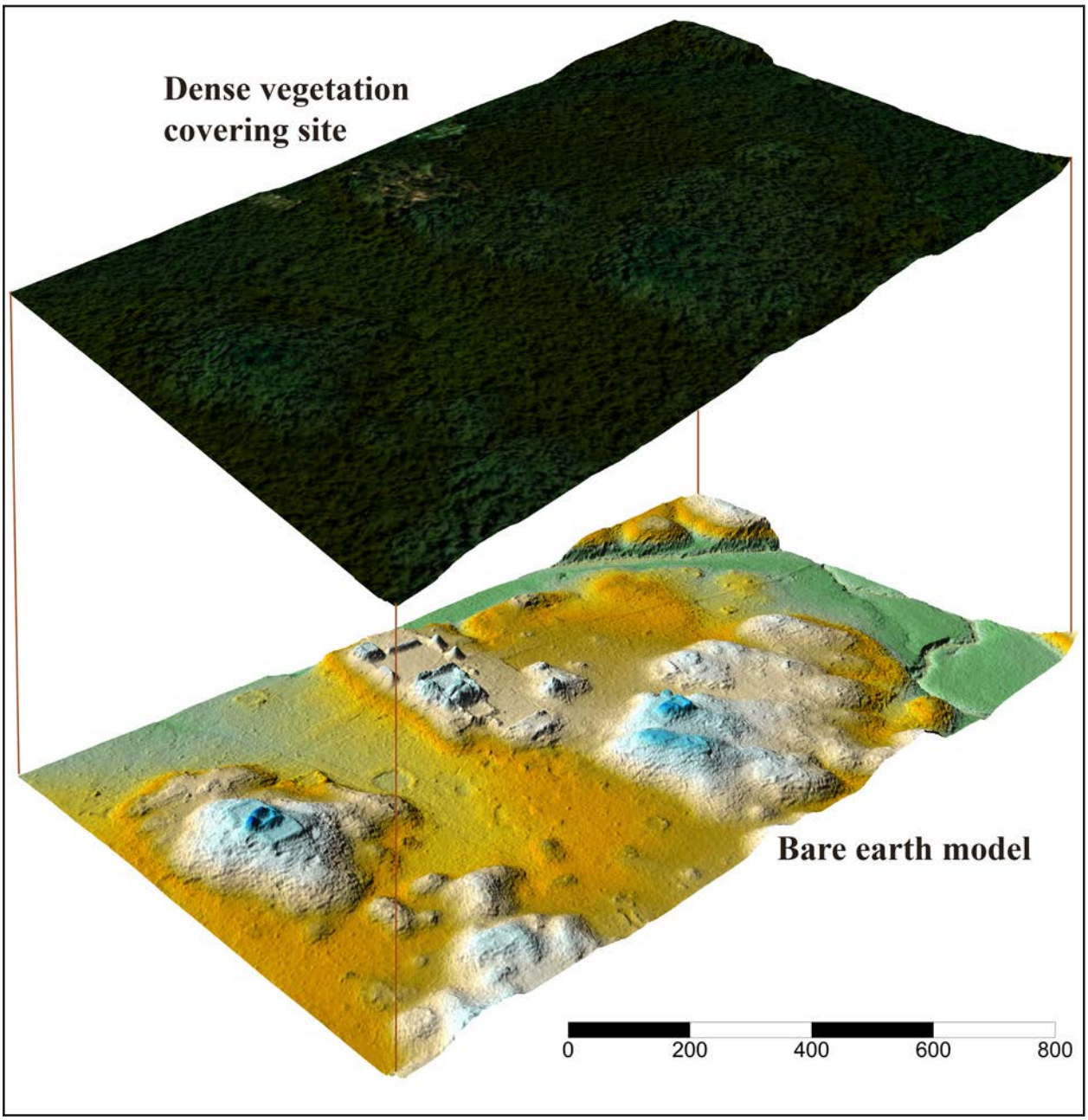

Figure 9.4. Chan Chich bare earth model and vegetation layer.

collected data was processed to generate a bare earth model with a ground resolution of 0.5 m to match that of the NCALM dataset (Figure 9.5).

Gallon Jug

The Gallon Jug site primarily lies within dense vegetation, but a portion extends into a deforested cattle pasture infested with ticks and chiggers. One of the reasons for choosing to map this site was to investigate the data transition between the jungle-covered section and the pasture.

On a single day, July 3, 2023, we mapped the site with the launch area positioned along the edge of the Blue Creek road (Figure 9.6). When flying from the edge of the pasture over the jungle area, we observed that the drone's range

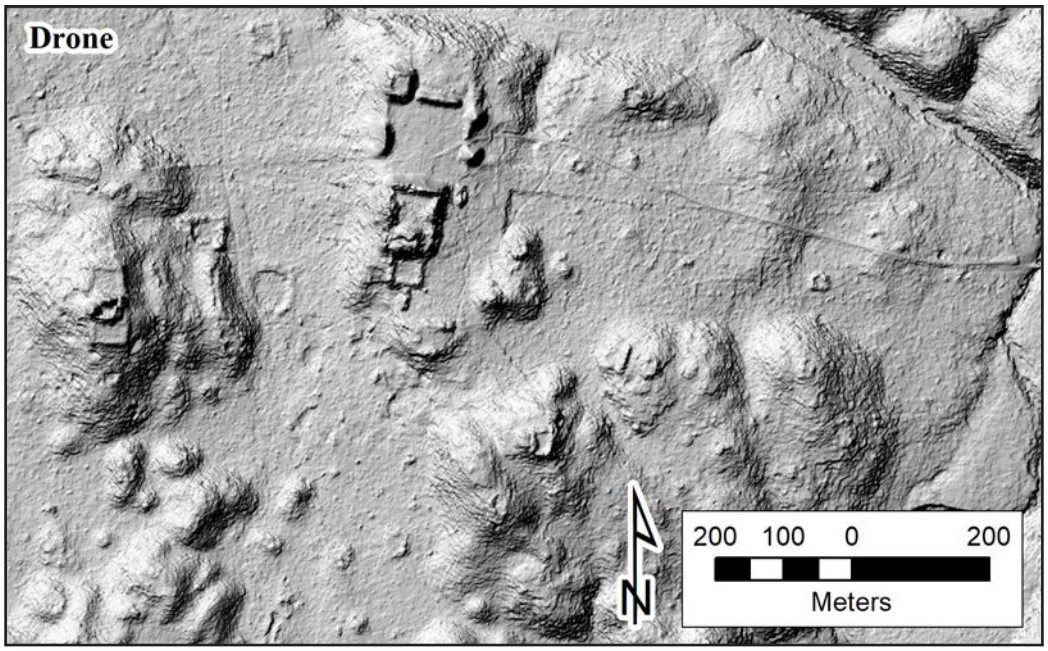

Figure 9.5. Drone-based lidar bare earth model of Chan Chich.

Figure 9.6. Photograph of our Gallon Jug launch area after a brief shower.

exceeded what we experienced at Chan Chich. The drone encountered no issues in maintaining a strong signal, even beyond 2 km. The drone was operated at an altitude of 80 m AGL and at a speed of 6.5 m per second, matching the parameters used for data collection at Chan Chich.

To map our area of interest, we conducted six flights. Unfortunately, we had insufficient battery capacity to cover the entire area without recharging. We recharged the batteries at the Gallon Jug Post Office, a 10-minute drive away. In the end, we successfully mapped an area of 1.2 km^2 and generated a bare earth model of the site (Figure 9.7).

COMPARING THE DRONE DATA WITH NCALM'S

As previously mentioned, the primary objective of this project was to compare the data collected by a multi-million-dollar plane-based lidar system, such as the one employed by NCALM, with the data from a more cost-effective lidar system. We compared the bare earth data from both the NCALM and drone datasets using ArcGIS 10.8.2. In general, the data from the two platforms are nearly identical, as depicted in Figures 9.8 and 9.9. When the two datasets are compared, only very small areas stand out as significantly different (see Figures 9.8 and 9.9). Unfortunately, we did not have the opportunity to ground-truth these areas, making it currently impossible to determine which platform more accurately mapped the region. In general, the NCALM data have smoother slopes, while the drone-based lidar has much cleaner flat surfaces.

Between the time NCALM initially mapped the area and our present study, Hurricane Lisa, a Category 3 storm, struck the region in early November 2022, causing substantial damage in the project area. It is likely that the differences between the two models can be attributed to fallen large trees, which, in turn, uprooted large root balls of earth or resulted in

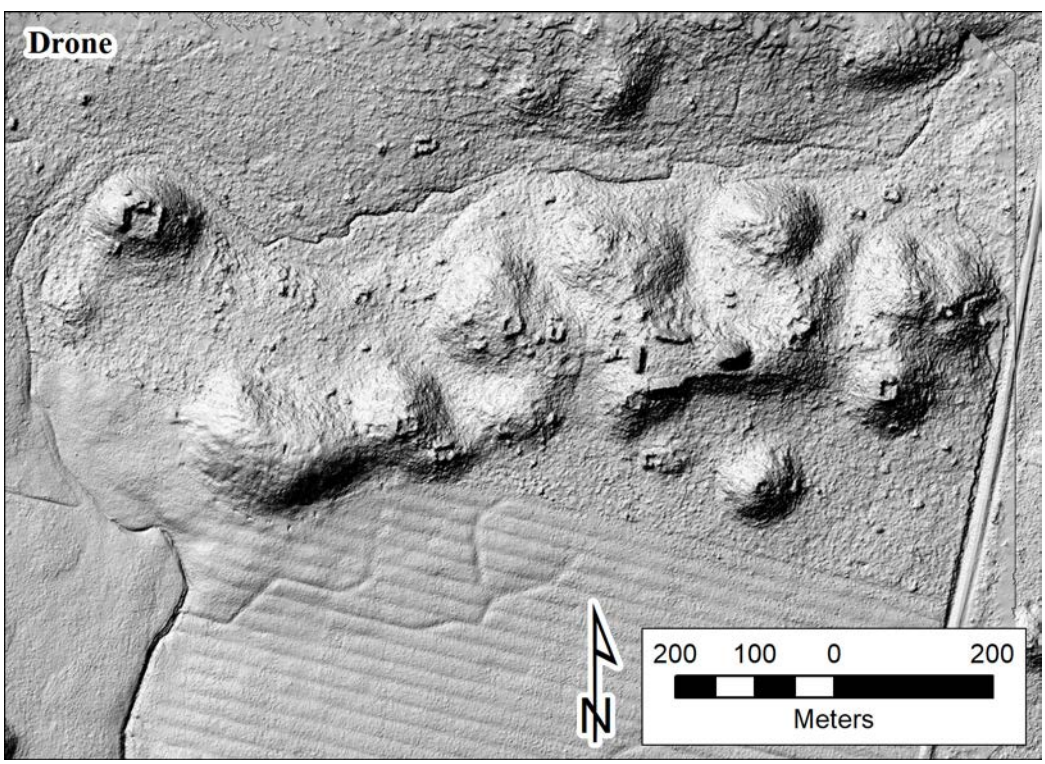

Figure 9.7. Drone-based lidar bare earth model of Gallon Jug site core.

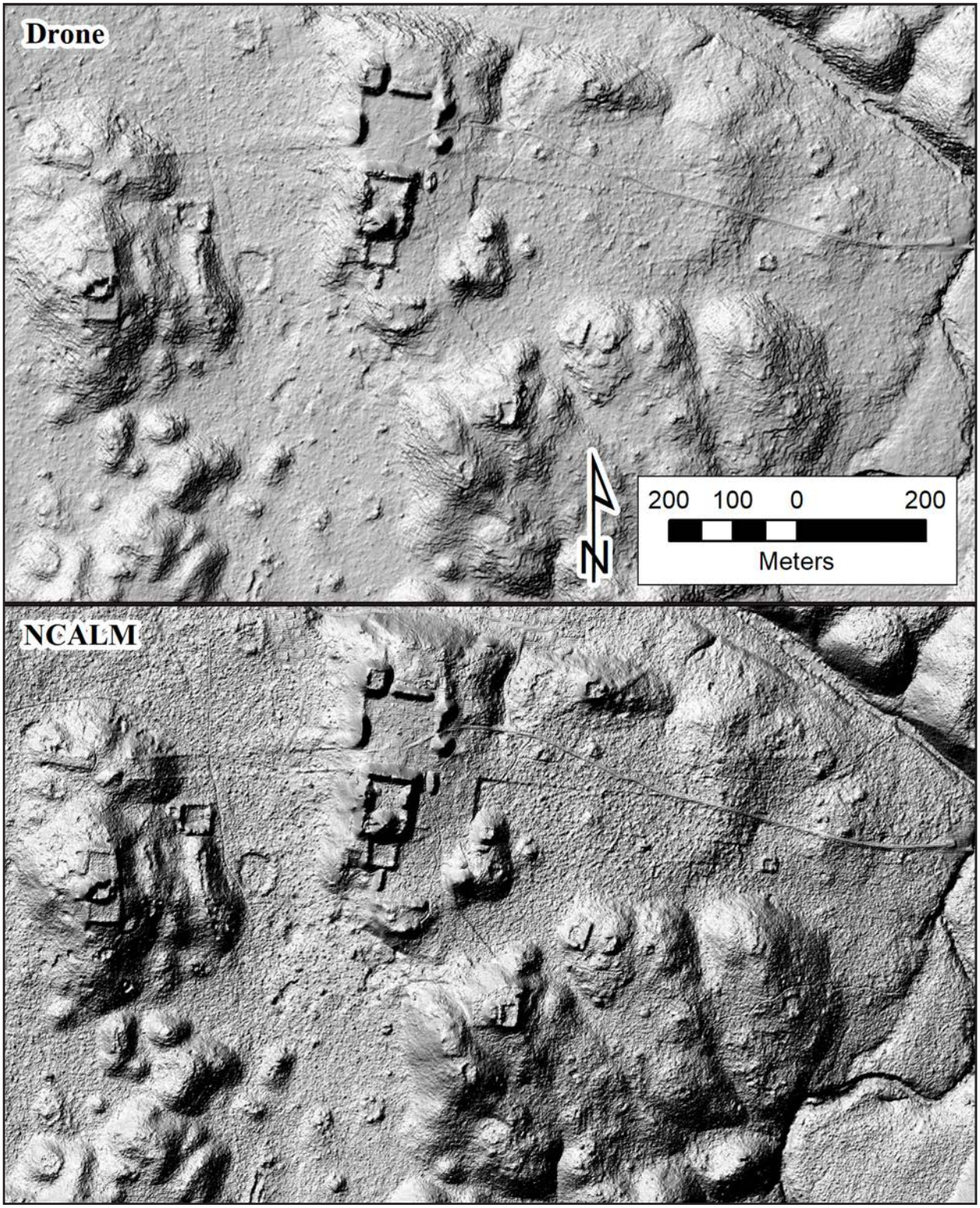

Figure 9.8. Drone-based and NCALM bare earth datasets for Chan Chich.

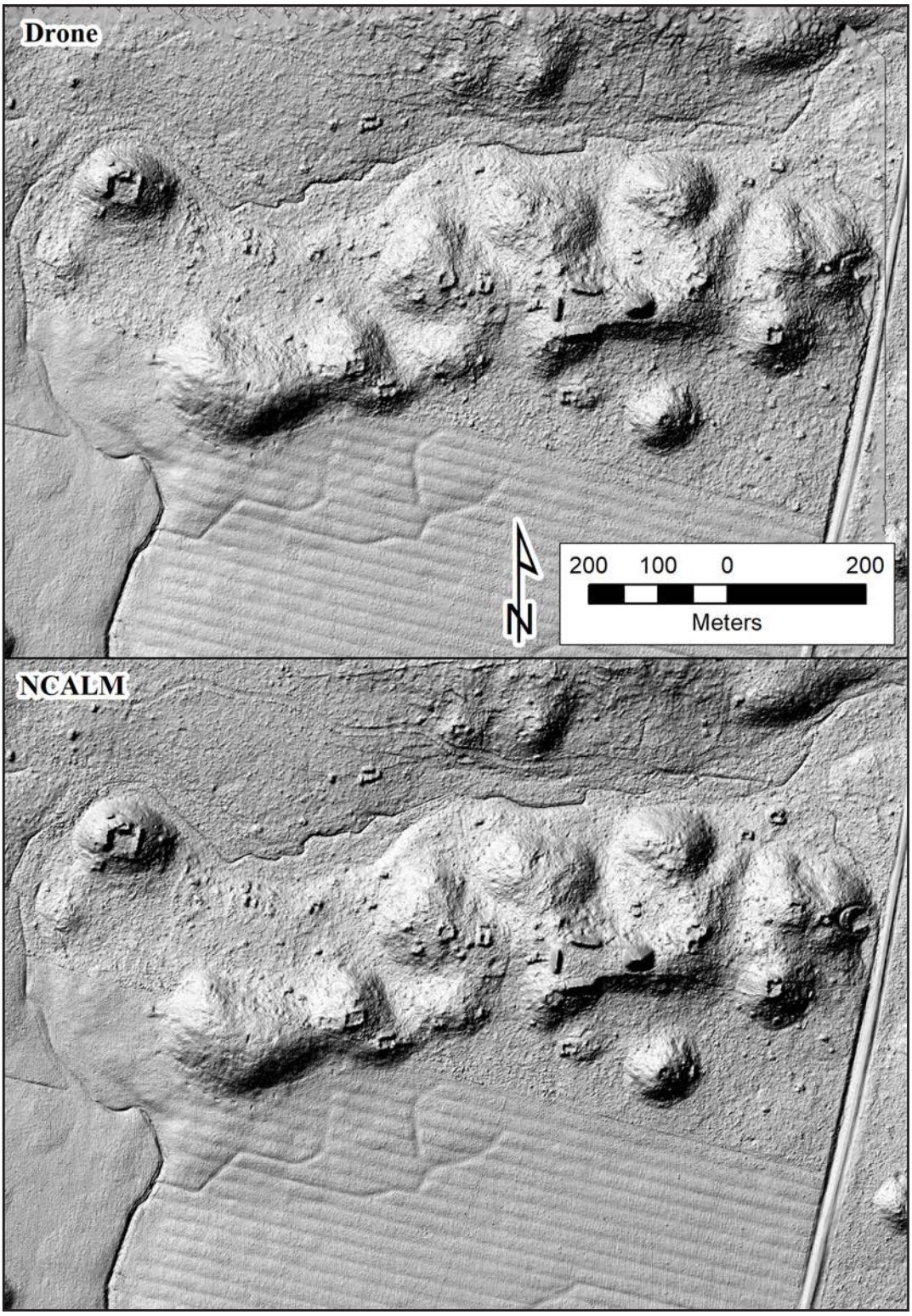

Figure 9.9. Drone-based and NCALM bare earth datasets for Gallon Jug.

significant erosion. Without physically visiting these locations, it is impossible to ascertain the exact cause.

We had also speculated whether the potentially higher point cloud density collected by the drone might reveal smaller structures or

features, such as the *albarradas* noted by Willis and Murata in 2023 at Chau Hiix, Altun Ha, and other sites near Crooked Tree (Figure 9.10). However, we did not observe anything resembling these features in the Chan Chich or Gallon Jug datasets. The NCLAM dataset did not reveal *albarradas* at either site but did discover them elsewhere in the BEAST study area (Houk et al. 2023). It seems likely that these types of features are simply not present at Chan Chich or Gallon Jug. To gain a better understanding of these features, it would be necessary to conduct field assessments of the data from the BREA project in contrast to the environment around Chan Chich, Gallon Jug, and other sites in the BEAST study area that show the presence of *albarradas*. Detailed information about *albarradas* in the region can be found in Guderjan et al. (2020).

CONCLUSIONS

We aimed to compare the quality of lidar data collected by NCALM using a crewed airborne system with that obtained robotically through a drone-based platform at both the Chan Chich and Gallon Jug study areas. We successfully achieved this goal, and our general findings

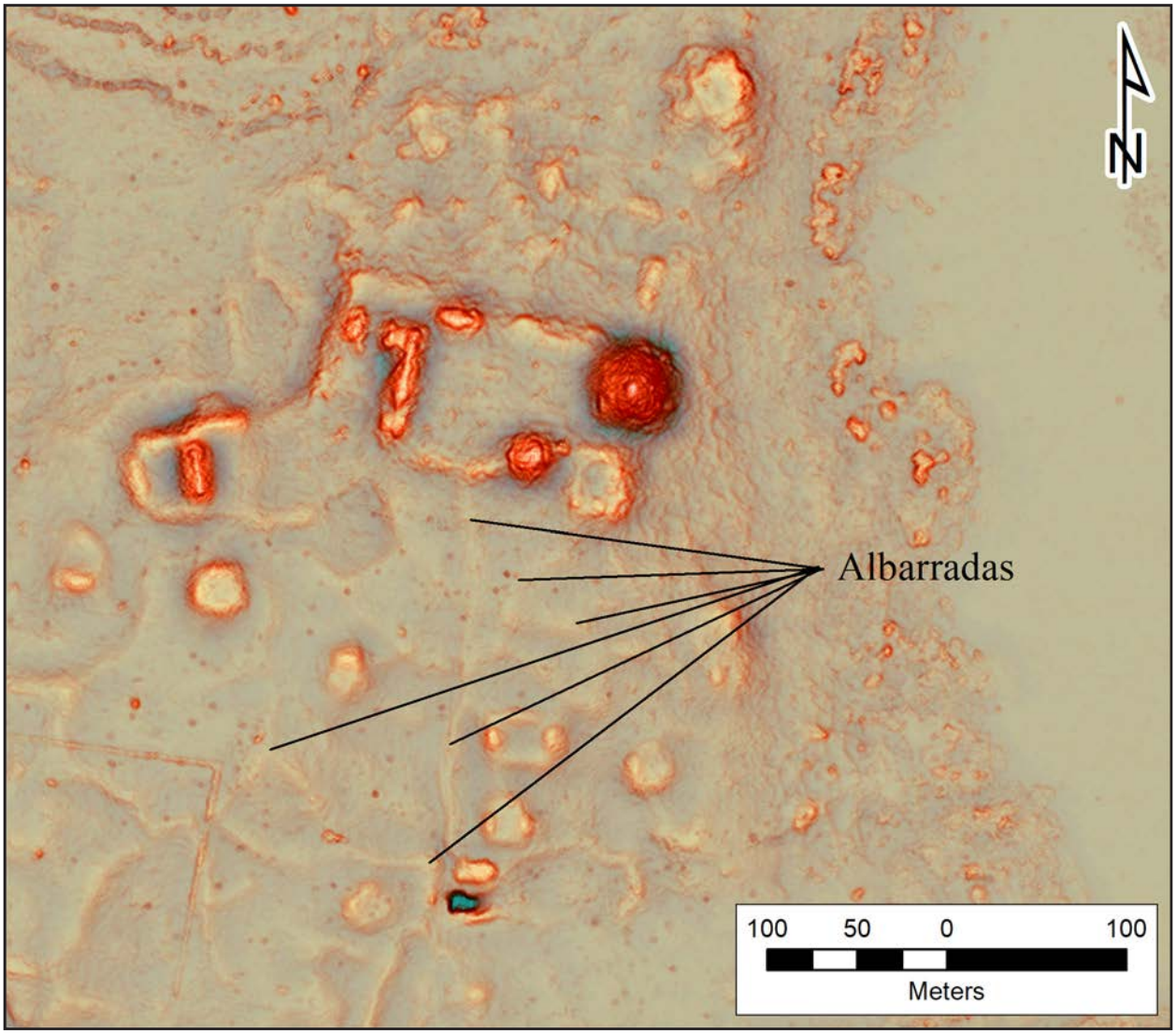

Figure 9.10. Examples of *albarradas* at Chau Hiix based on data collected by Willis and Murata (2023).

indicate that the two datasets are of comparable quality.

NCALM's mapping project covered an extensive area of approximately 650 km^2, in contrast to the significantly smaller area of around 5 km^2 covered by our drone-based work. The drone mapping covered less than one percent of the area mapped by NCALM. NCALM's data provide a broader perspective of the landscape and can access remote areas that are beyond the reach of drones. However, the NCALM mapping project required months of planning, a crew of pilots, and specialized mapping technicians on an airplane modified to carry an expensive lidar mapping instrument, making it not only costly but potentially hazardous for the crew, particularly in remote locations like western Belize.

Most archaeological projects are situated in areas accessible by vehicles under dry conditions. The availability of vehicles is crucial for transporting crews and equipment to these sites, which is vital for successful excavations. Given this context, most sites requiring lidar mapping are in places where drones can be readily deployed. For this reason, we anticipate that the use of drone-based lidar mapping will continue to expand in archaeological projects.

Plane-based lidar, though expensive, is much better as a site discovery tool than drone-based lidar, particularly in large areas like the BEAST permit. Drone-based lidar, however, is a more cost-effective site mapping tool when an archaeologist needs a smaller, known site covered. It remains to be seen whether the lower altitude and potentially higher resolution data from drones may reveal more ephemeral archaeological features. If this is the case, the utilization of drone-based lidar at specific sites becomes an even more compelling choice for archaeologists.

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2023 Lab Manual Additions

Tera Stocking

This section serves as an addition to the 2022 Lab Manual (See Stocking 2022). Previous lab manuals, while providing extensive descriptions of how to use the Lab Master Database and complete procedures for handling a variety of materials, did not include lab configuration, procedures for handling a large number of sites, or ceramic analysis. The lab procedures detailed in the previous manual have not undergone any significant changes aside from these additions. The lab manager, tasked with organizing the check-in, washing, cataloging, and facilitating the artifact analysis of each site, faced unique challenges in the 2023 season, which featured four teams and eight sites, along with the marketplace study. Additionally, the lab director conducted an initial ceramic analysis of the 2022 collection before sending it to the project ceramicists, Drs. Fred Valdez, Jr., and Lauren Sullivan. The lab director conducted an initial analysis of the 2023 ceramic collection and corresponding data entry.

LAB CONFIGURATION

A description of the physical lab space is included here to standardize the lab setup and facilitate its organization. The current configuration is the most effective space utilization from the lab director's experience. The lab is housed in the casita behind the pool and utilizes both the exterior porch and the first floor of the interior space. This season, the lab director resided in the loft space above the first floor; therefore, we did not use it for lab storage or organization. Because project members are staying in the casita and that Chan Chich Lodge is an active tourist destination, project members take care to maintain a clean and organized environment wherever possible.

The exterior organization of the lab space is as follows. When looking at the entrance of the casita, we position check-in trunks to the right of the door against the wall. We place the shelving unit that holds cataloged and analyzed artifacts on the wall directly around the first corner to the right. Buckets containing analyzed artifacts sit on the porch to the right of this shelving unit. We store wash screens against the back exterior wall when not in use. We store excavation equipment on the other side of the casita, as close to the wall as possible. The front porch of the casitas should remain relatively clear of tools.

The interior lab setup (Figure 10.1) appears as follows. To the right of the entrance behind the door is the small hutch provided by the Lodge. The top shelf holds small finds, bone, and charcoal samples. We use the second shelf for container storage and the bottom shelf for washing bowls, toothbrushes, and artifact trays. The cupboard underneath the shelves contains 2-mm and 4-mm thick artifact bags organized by size. Totes containing less used lab supplies or larger items, such as aluminum

Stocking, Tera
2023 2023 Lab Manual Additions. In *The 2023 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 219–228. Papers of the Chan Chich Archaeological Project, Number 16. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

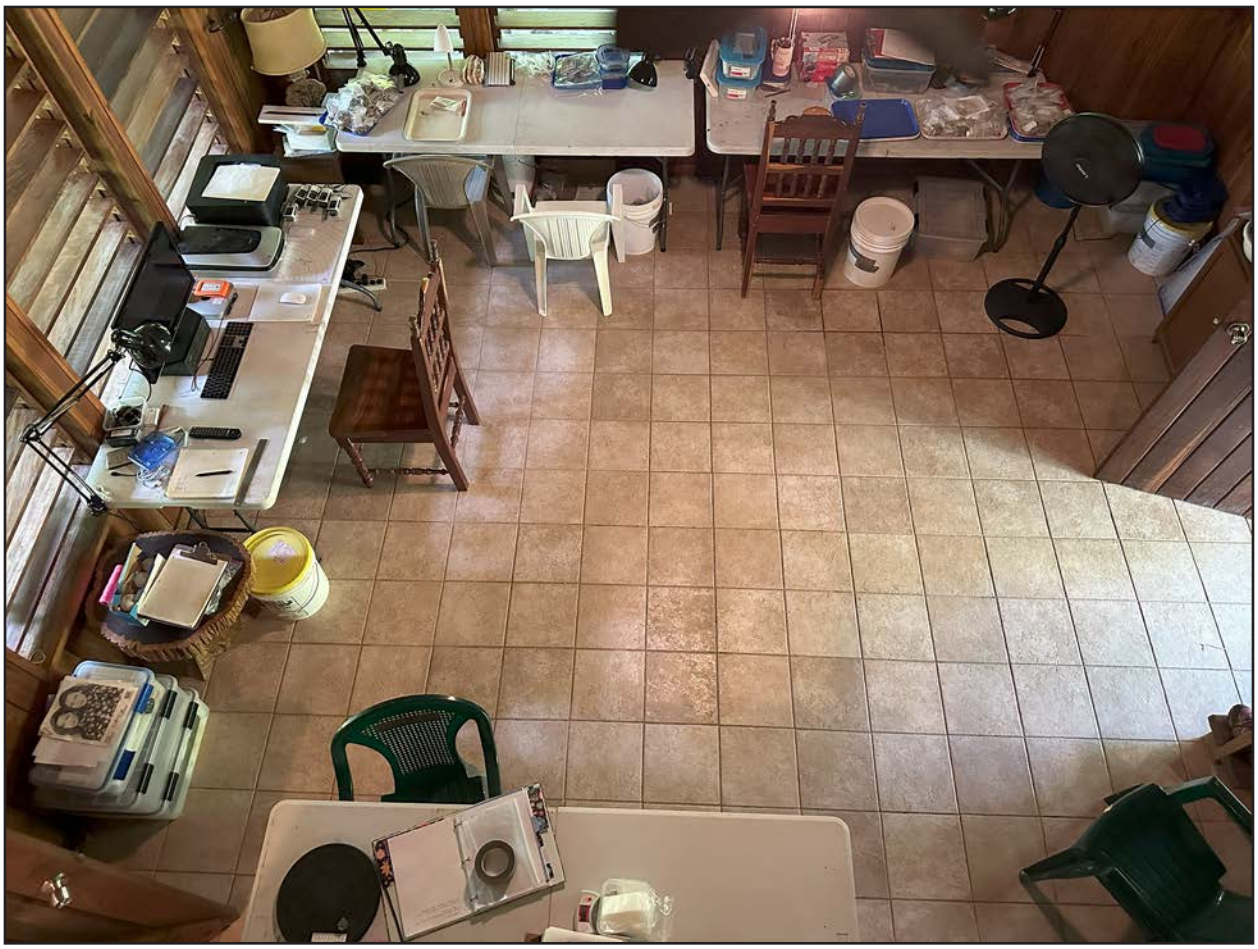

Figure 10.1. Interior lab configuration. Photograph taken from the lab director's loft.

foil, sit on the floor to the right of this cabinet. On the right wall are two white folding tables, one belonging to the Chan Chich Lodge and one to the project; the project table has holes drilled in all four corners for our desk lamps. We use these tables for artifact analysis and we keep scales, calipers, and other analysis tools organized neatly on these tables up against the wall. The wall opposite the door has a white folding table where the, Mac mini, computer monitor, scanner, printer, and radios are placed. The wall left of the entrance has the last remaining folding table, which we use for multiple purposes. Underneath this table are the boxes of artifacts waiting to be washed following check-in. We use the casita's closet space to house the special finds trunks and first aid kits.

This season, the lab director set aside the artifact analysis space for the marketplace team, which analyzed a large amount of lithic material. The lab director then used the space on the left-hand side for sorting, packaging, ceramic refitting, and some artifact analysis. Operation directors also used this space for artifact analysis. The space limitations required extensive organization, and, in some cases, the Operation directors analyzed their materials in shifts.

PROCEDURES FOR HANDLING MULTIPLE SITES

This year, the lab dealt with more sites than usual, so we subdivided the physical checkpoints to organize the artifacts

differently. When handling two or three sites, there are enough resources in the lab for each site to have its own trunk for artifact check-in and shelves for cataloging and analysis. This season, the lab director sectioned each check-in trunk in half by creating a line with duct tape. The trunks were assigned based on excavation teams rather than by individual site. Team numbers corresponded to iPad numbers. Teams 1 and 2 shared a trunk, and Teams 3 and 4 shared a trunk. As previously mentioned, these trucks are on the porch's right-hand side outside the lab. Teams placed the small and special finds awaiting check-in inside the lab on the top shelf of the small hutch provided by Chan Chich Lodge that sits on the right-hand wall behind the door. Each excavation team had a small container for checking in small and special finds on this self. Once washed and cataloged following the appropriate procedures detailed in the 2022 Lab Manual, the artifacts were placed in one of several small containers. Each team had a small container for charcoal samples, small/special finds, and bone. These small receptacles were then stacked on top of each other behind the check-in containers on the shelf.

Once the lab director checks the artifacts in, they are transferred to a box within the lab to await washing. These boxes were separated by team and then by site so that each section contained a different site. The box was subdivided using duct tape and placed underneath the plastic folding table on the left-hand wall of the lab. We washed artifacts from the same site together, which kept the process more organized. After washing, we packaged the artifacts following the methods from the previous lab manuals (Stocking 2022; Van Oss 2015). The lab director used a shelving unit provided by Chan Chich Lodge to store the artifacts to be cataloged and those awaiting analysis. We used the left-hand side of the shelving unit for the items waiting to be cataloged, with each site and artifact category having its own container. For example, the ceramics from Gallon Jug were stored in one container, while the lithics from Gallon Jug were stored in another. This separation allows for more accessible analysis and tracking of the artifacts. After the cataloging process, we placed the artifacts on the right-hand side of the shelving unit in containers separated by site and artifact type. Due to the limited number of appropriately sized containers, we stored the smaller sites with only a handful of artifacts in a single box. In prior seasons, we subdivided the shelving unit by site and then artifact type, with each site's ceramics occupying a single shelf and each site's lithics on another shelf. Due to limited space this season, we placed all artifacts from a site on one shelf.

CERAMIC ANALYSIS

The project ceramicists, Valdez and Sullivan, typically analyze the ceramics at Chan Chich after the field season. Due to the Covid-19 pandemic, we did not have the opportunity to analyze the ceramics from the 2022 season. Therefore, the lab director completed some basic ceramic analysis in the lab at Chan Chich, including filling out the ceramic analysis forms in the Lab Master Database. Ceramic analysis is not a procedure the lab has done in the past; therefore, there is no instruction for the form's completion in previous lab manuals. To have the most complete record possible at the end of the season, each season's lab director should attempt to fill out the ceramic analysis form.

Select the ceramic analysis form from the drop-down menu where the other lab forms are found when analyzing ceramics. Select New Record, found in the top center of the form, then type in the entire catalog number found on the artifact tag. The form will then auto-populate with the correct provenience information. The analyst then assigns a Spec # starting with 01. Bulk

ceramics all receive the same Spec #. Ceramic special finds from the same lot will receive separate Spec #s. If a special find, such as a figurine, incensario, or reconstructable vessel, has multiple sherds, all pieces will have a single Spec #. Next, choose the material from the first drop-down menu, then choose bulk sherds, reconstructable vessel, vessel fragment, figurine, or spindle whorl from the next menu.

Next, sort the bag of ceramics into the categories of body, rim, base, and shotgun. Then, count how many of each category there are and record that number in the appropriate field of the ceramic analysis form. Comment on the analysis form about any slip or decorative treatment on the sherds and whether there is any evidence of burning. It is also appropriate to note any type-variety information at this time. After recording all the pertinent information, place the sherds back into the 4-mm thick zip lock bag they came from and place them in a crate or bucket labeled "for Fred Valdez" or "for Lauren Sullivan," depending on who is analyzing that particular collection. Note that the bags of ceramics do not need to be sorted for transport to Dr. Valdez; the ceramics for each lot should be in one large bag, not several small, sorted bags, as this makes the chronological analysis process more difficult.

CERAMIC TYPE COLLECTION

Ceramics have been pivotal in human history, serving various utilitarian, aesthetic, and symbolic purposes across cultures and periods. Ceramic type collections are carefully curated assemblages of ceramic artifacts that serve as reference materials for researchers and scholars. These collections encompass a wide range of ceramic forms, techniques, and styles, representing the diversity of human creativity and innovation in pottery production. It is important for the project to have an updated and usable type collection for chronological analysis. The collection may also aid future researchers in stylistic analysis, technological analysis, changing cultural contexts, further typology studies, and educational tools for interested members of the public.

At Chan Chich, we conduct ceramic analysis and establish types using the type:variety-mode system, a methodology successfully utilized throughout the Maya lowlands (Gifford 1976; Sabloff 1975). We created the ceramic type collection at Chan Chich to help advance the project goals of chronological sequencing, establishing internal patterns, and identifying intersite interactions (Valdez and Sullivan 2014:145). The type collection represents all six ceramic complexes at the site to varying degrees. The collection prominently features the Middle and Late Preclassic Oropendola and Jacamar complexes and contains a few type-varieties from the Terminal Preclassic and Early Classic Trogon and Jabiru complexes.

Method

Chan Chich's existing type collection was housed in two buckets stored in the shipping container that the project uses to store its artifacts. These buckets also contained lithic artifacts from the late 1990s and other ceramic material that had not been typed. This season, the lab director set out to organize this collection and create a more easily accessible and user-friendly system. The inspiration for this undertaking was the Stan Creek Regional Archaeological Project's (SCRAP) June 22, 2023, social media post of their well-organized type collection and its catalogue (SCRAP 2023, Instagram). The photograph of the SCRAP collection served as a basic model for what could be done to make Chan Chich's type collection more functional for the project and future researchers.

First, the lab director sorted through each bucket and pulled all the ceramics that

had been analyzed and had a known type-variety classification. The lab director then photographed each type-variety represented in the collection using black fabric, artifact tags, and natural lighting. In some instances, where types are very similar, pictures of the paste were also taken.

Once we completed the sorting and photographing of the collection, the lab director created a searchable type collection PDF with the photographs and in-depth descriptions of the type-varieties (Figure 10.2). Each type-variety entry describes the slip or decorative treatment and surface color. Each type-variety paste is also described by identifying color, temper type, and temper size. In cases where two types are very similar, the percentage of temper or inclusions was recorded, as well as a brief statement on how the discussed type differs from other similar types to help differentiate them. For example, the Cubeta Incised sherd

BEAST CERAMIC TYPE COLLECTION 2023

Period	Complex	Ceramic Sphere	Dates
Middle Preclassic (early)	Kiskadee	Swasey	900-600 B.C.
Middle Preclassic (Late)	Oropendola	Mamom	600-400 B.C.
Late Preclassic	Jacamar	Chicanel	400 B.C.-AD 150
Protoclassic	Trogon	Floral Park	AD 150-250
Early Classic	Jabiru	Tzakol	AD 250-600
Late Classic	Motmot	Tepeu 1-2	AD 600-800
Terminal Classic	Pauraque	Tepeu 3	AD 800-850

Middle Preclassic (Early): Kiskadee Complex; Swasey Sphere:

Type-Variety	Description	Photograph
Calcutta Incised	Slip: Red-orange, incised and burnished Paste: Red-orange; medium-fine calcite/quartz sand, hematite	
Consejo Red	Slip: Red-Orange Paste: Light yellow orange; very fine calcite/quartz inclusions	

Figure 10.2. Example of type-variety PDF entry.

in the collection has large and fewer inclusions than the Achote Black examples but otherwise looks very similar as they are part of the same ware group. The lab director notes these differences in the Cubeta Incised and Achote Black entries.

Organization

The document was initially organized by ceramic complex, followed by arrangement by ceramic sphere. Valdez (1998) described the ceramic sequence at Chan Chich following the 1997 field season and revisited it to incorporate new excavation data in subsequent seasons (see Valdez and Houk 2000; Valdez and Sullivan 2014:146;). Type-varieties within each complex were then alphabetized within the PDF to facilitate easy retrieval.

The PDF of this new type-collection database is currently on a thumb drive with the lab office supplies. The lab director will upload a second copy onto the lab computer in the 2024 season. A third copy is on the Lab Director's Google Drive that is only available with internet access, which the field lab does not currently have. One copy on the lab computer and one copy on a mobile thumb drive should allow flexibility in accessing the document, as the lab computer is not always accessible when Operation directors want to analyze their ceramic collections.

We now house the physical collection in a large flat container, which enables better organization. Each sherd in the collection is in a small 4-mm specimen bag with its provenience information and type identification. Several sherds are identified for each type-variety, allowing researchers to familiarize themselves with the variation of each type. All the sherds of a specific type-variety are then placed into a larger 4-mm specimen bag and labeled with the type-variety. The physical collection is alphabetized for easy retrieval.

Future Additions

While the lab director made significant progress on creating and organizing the ceramic type collection during the 2023 field season, there is still a significant amount of work to do as the collection still needs to be completed. Several type-varieties described by Valdez (1998; Valdez and Houk 2000) in early project interim reports need to be added to the current type collection (see Table 10.1). In the coming field seasons, the lab director will sort through the ceramics analyzed by the project ceramicists for the missing type-varieties. This task may take multiple seasons and should be ongoing for the lab director, as not every excavation season will recover any or all of the missing types. When we identify missing types in future seasons, photographs should be taken of the sherds using the methods in the 2022 lab manual (Stocking 2022) and as briefly summarized here. Then, the PDF should be updated by adding the newly identified type-variety under the appropriate complex. The photograph should be added along with an appropriate description of the surface and paste, as previously mentioned. The updated document should be saved to the lab computer and the thumb drive copy titled "Ceramic Type Collection [year]."

These collections provide a wealth of information for comparative analysis, allowing researchers to explore the technological, stylistic, and cultural dimensions of ceramics across time and space. Though this collection consists only of ceramics recovered from Chan Chich, future seasons should also focus on the creation or addition of type collections for the other sites handled by the Belize Estates Archaeological Survey Team, especially Gallon Jug, to examine further the project's goals of chronology and intersite interactions.

Table 10.1. The Chan Chich Ceramic Complexes and the Type-Varieties Present and Absent Within the Current Type Collection

Period, Complex, and Sphere	Type-Varieties Present in Type Collection	Type-Varieties Absent From Type Collection
Middle Preclassic (early) Kiskadee Complex Swasey Sphere	-Calcutta Incised -Consejo Red -Cotton Tree Incised -Ramgoat -Tower Hill Red and Cream	-Chicago Orange: Nago Bank Variety -Savannah Orange: Rejolla variety -Quamina Cream: Quamina variety -Machaca Black: Wamil variety -Barquedier Grooved -Incised: Barquedier variety -Unnamed Red-on-orange paste
Middle Preclassic (Late) Oropendola Complex Mamom Sphere	-Joventud Red -Pital Cream -Middle Preclassic (MPC) Black -MPC Black and Red mottled with cream -MPC Brown -MCMO Chic -Unnamed Pink mottled -Unnamed Mottled Red and Black -Unnamed Dark Red with Brown Glitter Paste	-Richardson Peak Unslipped: Unspecified variety -Sapote striated: Unspecified (thin-walled) variety -Chunhinta Black: Chunhinta variety -Chicago Orange: Warrie Camp variety -Muxanal Red-and-cream: Lazaro variety -Guitara Incised: Grooved-incised variety -Desvario Chamfered: Unspecified variety -Unnamed “Belize Valley Orange Paste” -Unnamed “Unslipped Incised Orange Paste”
Late Preclassic Jacamar Complex Chicanel Sphere	-Flor Cream -Laguna Verde Incised -San Antonio Golden Brown -Sierra Red -Society Hall -Polvero Black -Late Preclassic (LPC) Black -LPC Black and Red mottled -LPC Brown -LPC Buff -LPC Red and Black mottled -LPC Red	-Richardson Peak Unslipped: Unspecified variety -Sapote Striated: Unspecified variety -Nictaa Buff: Unspecified variety -Mateo Red-on-cream: Unspecified variety -Puletan Red-and-unslipped:Unspecified variety -Lechugal Incised: Macaw Bank variety -Repollo Impressed: Unspecified variety -Lagartos Puncatated: Unspecified variety -Escobal Red-on-buff: Unspecified variety

Table 10.1. The Chan Chich Ceramic Complexes and the Type-Varieties Present and Absent Within the Current Type Collection (continued)

Period, Complex, and Sphere	Type-Varieties Present in Type Collection	Type-Varieties Absent From Type Collection
Terminal Preclassic (Protoclassic) Trogon Complex Floral Park Sphere	-Proto Orange	-Sapote Striated: Unspecified variety -Caribal Red: Unspecified variety -Nictaa Buff: Unspecified variety -San Felipe Brown: Unspecified variety -Tanjoc Burnished: Unspecified variety -Escobal Red-on-buff: Unspecified variety -Puletan Red-and-unslipped: Unspecified variety -Repollo Impressed: Unspecified variety -Unnamed Red-rimmed Buff: Unspecified variety -Unnamed Buff Incised -Unnamed Red-and-unslipped Punctated -Unnamed Red Incised-and-Punctated -Unnamed Red Incised and Punctated -Unnamed Red-on-black and punctated -Unnamed Cream-and-brown with grooved rim
Early Classic Jabiru Complex Tzakol Sphere	-Balanza Black -Dos Arroyos Polychrome	-Hewlett Bank Unslipped: Unspecified variety -Mopan Striated: Unspecified variety -Minanha Red: Minanha variety -Aguila Orange: Unspecified variety -Lucha Incised: Unspecified variety
Late Classic Motmot Complex Tepeu 1 -2 Sphere	-Achote Black: Unslipped -Achote Black: Incised -Cubeta Incised -Subin Red -Torro Gouged Incised	-Zibal Unslipped: Unspecified variety -Encanto Striated: Folded Rim variety -Encanto Striated: Unspecified variety -Tinaja Red: Unspecified variety -Teakettle Bank Black: Unspecified variety -Pantano Impressed: Unspecified variety -Palmar Orange -Polychrome: Unspecified variety -Unnamed Black-rimmed Red-on-brown
Terminal Classic Pauraque Complex Tepeu 3 Sphere	-Belize Valley Red on Orange -Fine Orange -Imitation Fine Orange -LC Ash Tempered -LC Brown	-Alexanders Unslipped: Unspecified variety -Encanto Striated: Everted Rim variety -Encanto Striated: Giant variety -Cameron Incised: Unspecified variety -Tunich Red-on-Orange: Unspecified variety -Yuhactal Black-on-red: Unspecified variety -Daylight Orange: Darknight variety -Ticul Thin Slate: Unspecified variety -Unnamed Incised (ash temper)

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Sacred Flames: Preliminary Identification of Tree Species through Analysis of Charcoal from Funerary Contexts at the Ancient Maya Site of Chan Chich, Belize

Kaitlin Murphy, Brett A. Houk, and Bo Zhao

Identifying wood species from charcoal found in a funerary context can provide information about funerary rituals practiced at the Maya site of Chan Chich. These charcoal remains are evidence of practices in rituals related to fire in a funeral setting and can tell us more about how tree species and ritual burning played a role in the lives of the Maya. Anthracology, a term usually limited to Europe, is the identification and study of charcoal typically from archaeological contexts (Dussol et al. 2016; Scott and Damblon 2010). The use of charcoal identification in archaeological settings has been rising for many years, and the approach has been used in studies located in Africa and Europe (Scott and Damblon 2010). Studies of charcoal have identified species commonly used by the Maya and other ancient societies in Mesoamerica and South America as firewood and for ritual use and have been used to reconstruct the composition of the forests these cultures utilized (Dussol et al. 2017; Dussol et al. 2021; Slotten and Lentz 2021). Studies have also investigated ritual use of wood species like pine (Morehart 2002; Morehart et al. 2005), but, more recently, studies have used charcoal research to study the Maya funerary customs more broadly, looking into the significance of charcoal and tree species in a funerary context (Dussol et al. 2016).

The objective of this analysis of charcoal samples recovered at Chan Chich, Belize is to contribute to a larger study on mortuary practices at the site. That research, which is being conducted by Anna Novotny, is part of the Chan Chich Archaeological Project's ongoing work at the site.

Charcoal typically has a level of preservation similar to recent wood samples, and using a Scanning Electron Microscope (SEM) reveals the 3D details present in samples that are used to identify taxonomies (Sander and Gee 1990). Specimens must be larger than 200 micrometers (μm) for identification, which works well for most samples taken from the field (Sander and Gee 1990). Using charcoal in an archaeological research project can provide a lot of information regarding dating of the site, combustion temperature, and the relationship between taxon and human activity (Scott and Damblon 2010). This project examines charcoal from primarily burial contexts to identify possible funerary ritual use of specific species of trees located in the area of Chan Chich.

MODERN ENVIRONMENT OF THE STUDY AREA

The Maya site of Chan Chich is in northwest Belize (Figure 11.1), about 4.25 km east of

Murphy, Kaitlin, Brett A. Houk, and Bo Zhao
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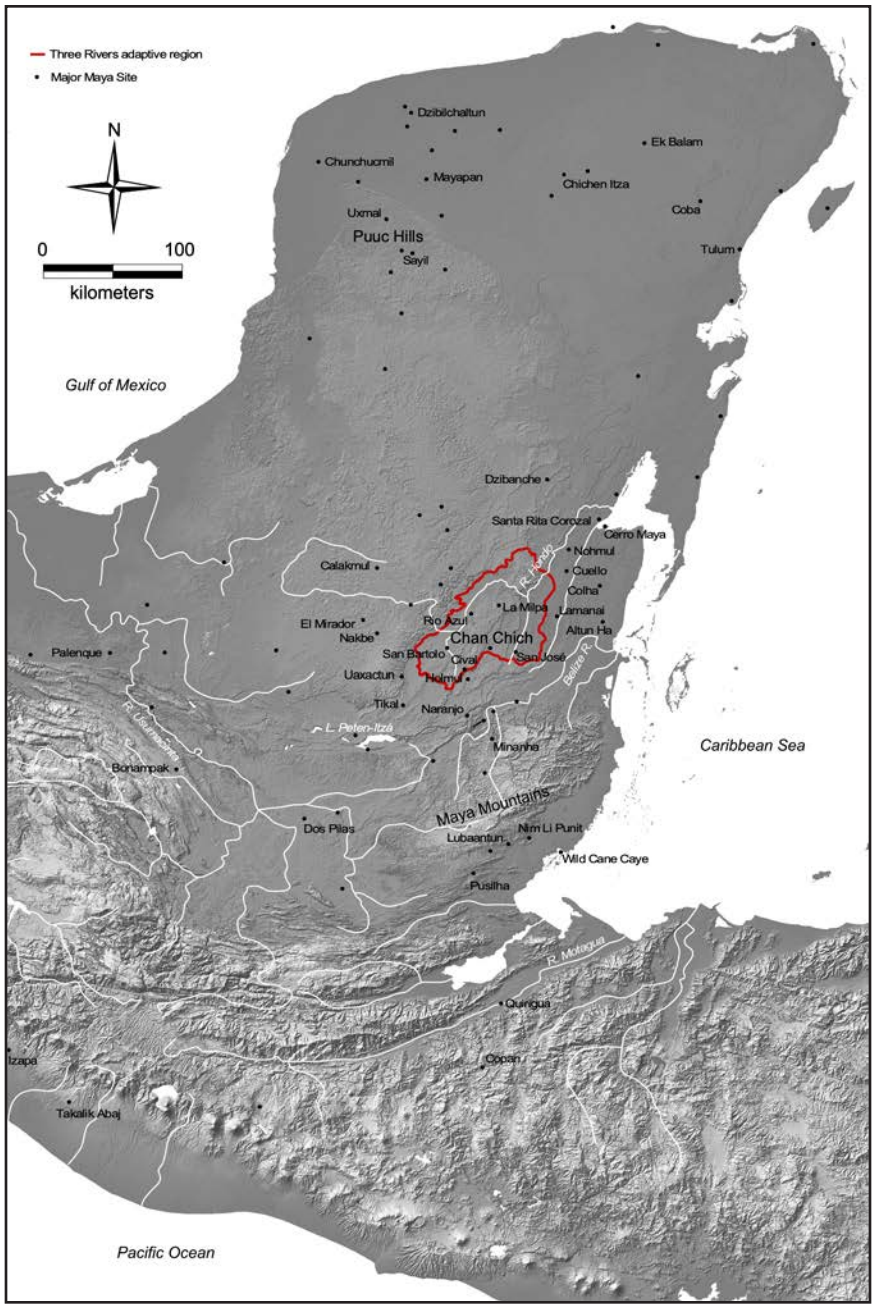

Figure 11.1. Map of the Maya Lowlands Showing the Location of Chan Chich and the Three Rivers adaptive region.

Guatemala, on the west bank of Chan Chich Creek (Houk et al. 2015:169). The site is in the eastern Three Rivers adaptive region of Beliz,e which is a large physiographic area featuring escarpments, uplands, and *bajos* (Houk et al. 2015). The underlying geology of the area comprises the Buena Vista and Santa Amelia formations in the Eocene Peten Group, which is made of dolomites, limestone, and marl (Hartshorn et al. 1984:9). The climate in the region is subtropical with high temperatures during the summer months and a dry season from January to May (Hartshorn et al. 1984:11).

The country of Belize is home to about 700 native tree species hosted by two subtropical regions (Hartshorn et al. 1984:88). Colonial

settlement in Belize was influenced by the logging and timber industry, exploiting the forests for logwood (*Haematoxylon campechianum*, Caesalpiniaceae) and mahogany (*Swietenia macrophylla*, Meliaceae) species (Hartshorn et al. 1984:88). Timber was the main export of the forest area where Chan Chich is located, and, although the forest has grown back since the abandonment of the area by the Maya around AD 900, historic logging and continual regeneration of the forest mean that modern forests are not fully representative species-wise of what the Maya could access (Hartshorn et al. 1984).

Most of the area is covered by dense rainforest, categorized as Subtropical moist forests, characterized by a litany of tree species. Hartshorn and colleagues (1984:90) list "*Swietenia macrophylla* (mahogany, caoba), *Manilkara zapota* (sapote, sapodilla), *Brosimum alicastrum* (breadnut, ramón), *Pouteria izabalensis* (silly young, silión), *Pimenta dioica* (allspice), *Manilkara chicle* (chiquibul, chicle), *Drypetes brownii* (bullhoof), *Pseudolmedia spuria* (cherry), *Dialium guianense* (iron wood), *Calophyllum brasiliense* (santa maria), *Orbignya cohune* (cohune, corozo) and *Terminalia amazonia* (nargusta)" as common species. *Pinus caribaea* (Caribbean pine) is another important species found in the area.

Brokaw and Mallory (1993) described the physiography and vegetation of the Rio Bravo Conservation and Management Area (RBCMA), which is a large, protected area approximately 18 km north of Chan Chich. Many of their observations are applicable to the area around Chan Chich. Dunning and colleagues (2003) expanded on their initial observations to describe the physiography of the rest of the Three Rivers region.

Chan Chich is in the Rio Bravo Terrace Lowland (Figure 11.2), a generally level area punctuated by *bajos*—internally drained karst depressions—and hemispherical hills (Dunning et al. 2003). A *bajo* is just to the west of the site, separating it from the smaller site of Kaxil Uinic approximately 2 km away (Houk et al. 2015:169). Kaxil Uinic sits near the base of the La Lucha Escarpment, which rises steeply about 100 m to the La Lucha Uplands (Dunning et al. 2003:15). The La Lucha Uplands are "a mix of steep hills, rolling ground, and level stretches" extending into Guatemala (Brokaw and Mallory 1993:13).

Brokaw and Mallory (1993:5) observe that "Vegetation type is closely linked to topography and soils, especially as they affect soil moisture. The gently varying topography of much of Rio Bravo produces a long, shallow gradient of soil conditions and a correspondingly long continuum of subtly different forest types." Their report identified eight different forest types, excluding areas of modern milpa, in the RBCMA, with upland and transitional forests dominating the landscape (Brokaw and Mallory 1993:Table 1). Around Chan Chich, Houk and colleagues (1996:Table 4.1) observed primarily upland, cohune palm, and cohune palm riparian forests during their mapping of the site's core, although the *bajo* west of the site constitutes scrub swamp forest. Table 11.1 shows tree species identified by Nicholas Brokaw and Sheila Ward at six excavation areas at Chan Chich (Figure 11.3). Importantly for this study, Brokaw and colleagues (2023:Figure 2) identified the closest pine forest to Chan Chich, approximately 5 km northwest of the site just above the La Lucha Escarpment (see Figure 11.2).

CONTEXTS

This study examines charcoal samples recovered from five burials: Burials CC-B11, CC-B15, CC-B24, CC-B16A to 16D, and CC-B18 (Table 11.2). The other samples are

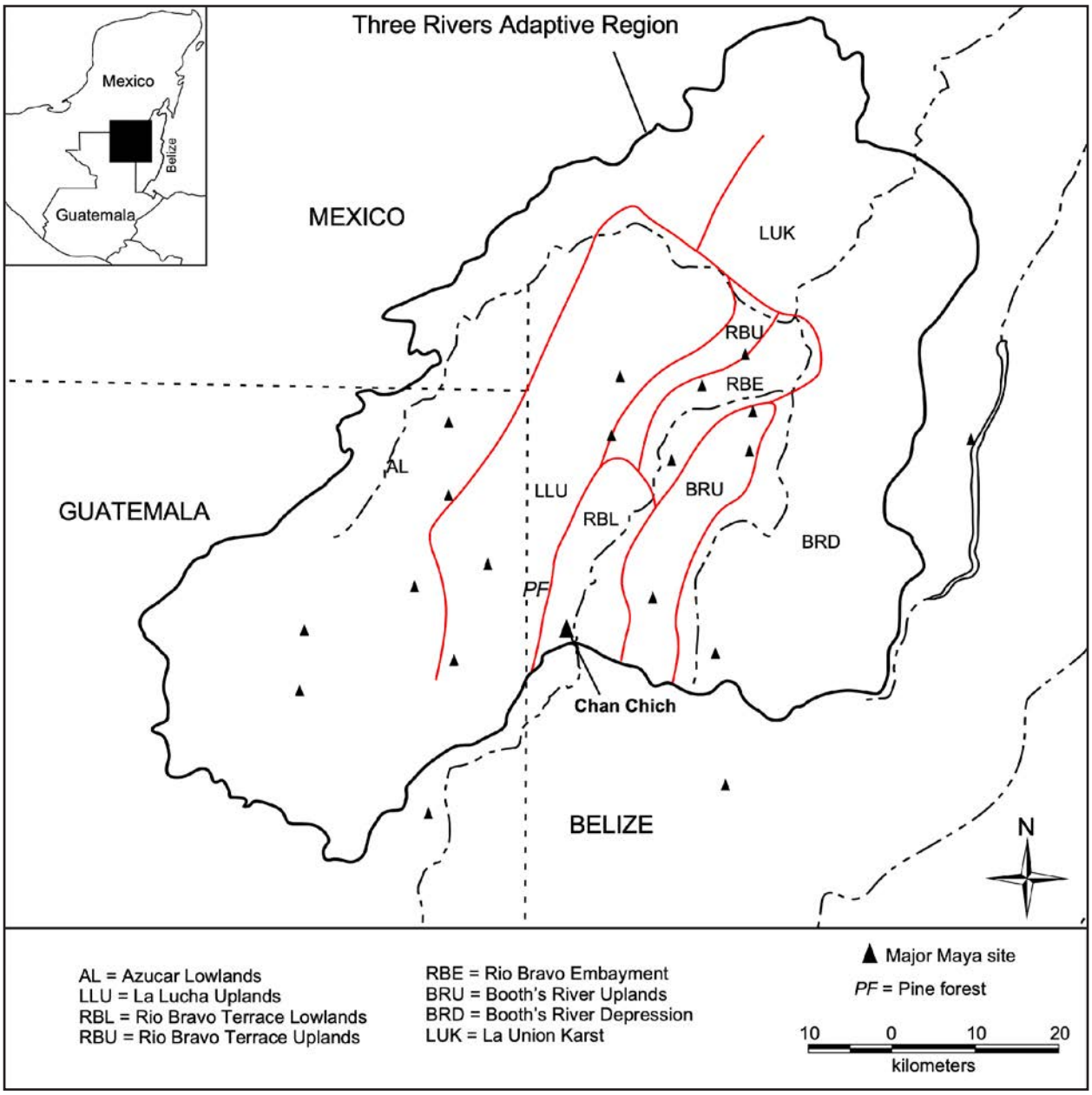

Figure 11.2. Physiographic regions in the Three Rivers adaptive region (after Dunning et al. 2003:Fig. 2.1).

from a midden in the Upper Plaza, and Courtyard D-1. Most date to the Late Classic period (ca. AD 650–970), while the sample from the Upper Plaza dates to the Middle Preclassic period (ca. 805–569 BC). The charcoal samples were collected during the 2014, 2015, 2016, 2017, and 2022 field seasons.

Funerary Contexts

Chan Chich Operation (Op) CC-12 contains two lots in which five charcoal samples were found associated with Burial CC-B11. One sample (CC-12-S13) was taken from a sub-floor fill that contained a layer of charcoal-laden marl over a construction fill where the burial was located (Herndon et al. 2014:Table 3.2). The structure dates to the Late Classic period, and one of the charcoal samples (Sample

Table 11.1. Tree Species Identified at Six Excavation Areas at Chan Chich

Scientific Name	Common Name	Excavation Area (see Figure 11.3)						Frequency
		1	2	3	4	5	6	
Ampelocera hottlei	female bullhoof	-	-	-	-	X	-	1
Amphitecna sp.	—	-	X	-	-	-	-	1
Aspidosperma megalocarpon	white mylady	X	-	-	-	-	X	2
Attalea cohune	cohune	X	X	X	X	-	X	5
Bourreria mollis	wild craboo	-	-	-	X	-	-	1
Brosimum alicastrum	ramón	X	X	-	-	X	X	4
Bursera simaruba	gumbolimbo	-	X	-	-	-	-	1
Cecropia peltata	trumpet, guarumo	X	-	X	-	X	-	3
Cedrela odorata	spanish cedar	-	-	-	X	-	-	1
Ceiba pentandra	ceiba	X	X	-	-	-	-	2
Chamaedorea sp.	—	-	X	-	-	X	X	3
Asteraceae	—	-	-	X	-	-	-	1
Cryosophila stauracantha	escoba	-	X	X	X	X	X	5
Cupania belizensis	grande betty	-	-	X	X	-	-	2
Cymbopetalum mayanum	guanabano	-	-	X	-	-	-	1
Drypetes brownii	male bullhoof	X	-	X	-	-	-	2
Drypetes lateriflora	—	X	-	-	-	-	-	1
Ficus sp. 1	fig	X	-	X	-	-	-	2
Ficus sp. 2	strangler fig	-	-	-	X	-	-	1
Forchammeria trifoliata	tres Marías	-	-	X	X	-	-	2
Guarea glabra	cramantee	-	-	X	X	-	-	2
Leptolobium panamense	billy web	-	X	-	-	-	-	1
Manilkara zapota	chicle	-	-	-	-	X	-	1
Mariosousa usumacintensis	jesmo, guiin	X	X	-	-	-	-	2
Mosannona depessa	lancewood	-	-	-	-	X	X	2
Pimenta dioica	allspice	-	-	-	X	X	-	2
Piper psilorrachis	Spanish elder	X	-	X	X	X	X	5
Piper sp.	—	X	-	-	-	-	-	1
Pouteria amygdalina	silión, silly young	X	-	-	-	-	-	1
Pouteria campechiana	mammee ciruela	-	-	X	-	-	-	1
Pouteria durlandii	mamey cerera	-	-	X	-	-	-	1
Pouteria reticulata	zapotillo	X	X	-	X	X	X	5
Protium copal	copal	X	X	-	X	-	X	4
Pterocarpus rohrii	mountain kaway	-	-	X	-	-	-	1
Rinorea hummellii	wild coffee	X	X	X	-	-	-	3
Sabal mauritiiformis	botán, thatch palm	X	-	X	X	X	-	4
Sapotaceae	—	X	-	-	-	-	-	1
Senegalia glomerosa	white tamarind	-	-	X	-	-	-	1

Table 11.1. Tree Species Identified at Six Excavation Areas at Chan Chich (continued)

Scientific name	Common name	Excavation Area (see Figure 11.3)						Frequency
		1	2	3	4	5	6	
Sideroxylon foetidissimum	cream tree	-	-	X	-	-	-	1
Simarouba amara	negrito	X	-	-	-	-	-	1
Simira salvadorensis	john crow redwood	-	-	-	X	-	-	1
Spondias mombin	hog plum	-	-	-	X	-	X	2
Swartzia cubensis	bastard rosewood	-	-	-	X	-	-	1
Swietenia macrophylla	mahogany	X	-	-	-	-	-	1
Tabernaemontana alba	cojón de perro	-	-	-	-	X	-	1
Tabernaemontana donnell-smithii	cojotón	-	X	-	X	-	X	3
Trichilia minutiflora	wild lime	-	X	X	X	X	X	5
Trichilia pallida	carbón del río	X	X	X	-	X	-	4
Trophis racemosa	white ramón	-	X		-	-	-	1
Urera baccifera	cow itch	-	-	-	X	-	-	1
Vachellia gentlei	ant acacia, cockspur	-	-	X	X	X	X	4

CC-12-S13) from Lot CC-12-D-07 dates to cal. AD 540–602 based on radiocarbon dating (Houk 2022:Table 8.9). Burial CC-B11, where the last four charcoal samples (Samples CC-12-S15, -S17, -S18, and -S26) were found, is located on the central landing of Structure A-1, the most massive structure at Chan Chich. Excavators found the burial underneath Lot CC-12-D-07. It contained the remains of one individual (Herndon et al. 2014:59). Charcoal that is directly associated with the burial (Sample CC-12-S17) dates to cal. AD 658–758 (Houk 2022:Table 8.9), and the four ceramic vessels from the burial are all Late Classic type, suggesting a burial date of ca. AD 700. The bone (Sample CC-12-S33) from the burial dates to 413–235 cal. BC, however, which suggests a secondary burial, re-interred in Structure A-1 (Houk 2022:Tables 8.4 and 8.16).

Burials CC-B15 and CC-B24 contained four charcoal samples (Samples CC-16-S01, CC-21-S09, -S11, and -S12) from two different burials in a bench in Structure C-2 in the Norman's Temple complex (see Gallareta Cervera and Houk 2022:Table 2.3). Booher (2016) excavated Burial CC-B15 in the northwestern corner of the bench in 2016, and Gallareta Cervera's team excavated Burial CC-B24 along the north-central edge of the bench in 2022 (Gallareta and Houk 2022). Burial CC-B15 contained a single, young male on his right side (Novotny et al. 2016:70). Charcoal Sample CC-16-S01 from Lot CC-16-L-01 was found in the sub-bench fill surrounding Burial CC-B15 and dates to cal. AD 771–970 (Houk 2022:Table 8.11). A bone sample (Sample CC-16-S02b) from Burial CC-B15 dates to cal. AD 675–777 (Houk 2022:Table 8.16). Charcoal Sample CC-21-S09 comes from collapse debris above the bench that contained the burials. Samples CC-21-S11 and -S12 came from the bench's fill near Burial CC-B24. A bone sample from Burial CC-B24 dates the individual to cal. AD 675–876 (Gallareta Cervera and Houk 2022:25). These dates suggest the Maya placed the burials in the Late Classic period, but perhaps re-entered the graves later in the Late Classic or during the Terminal Classic period.

The Maya built Crypt 1 in the Upper Plaza during the Early Classic period. The crypt's

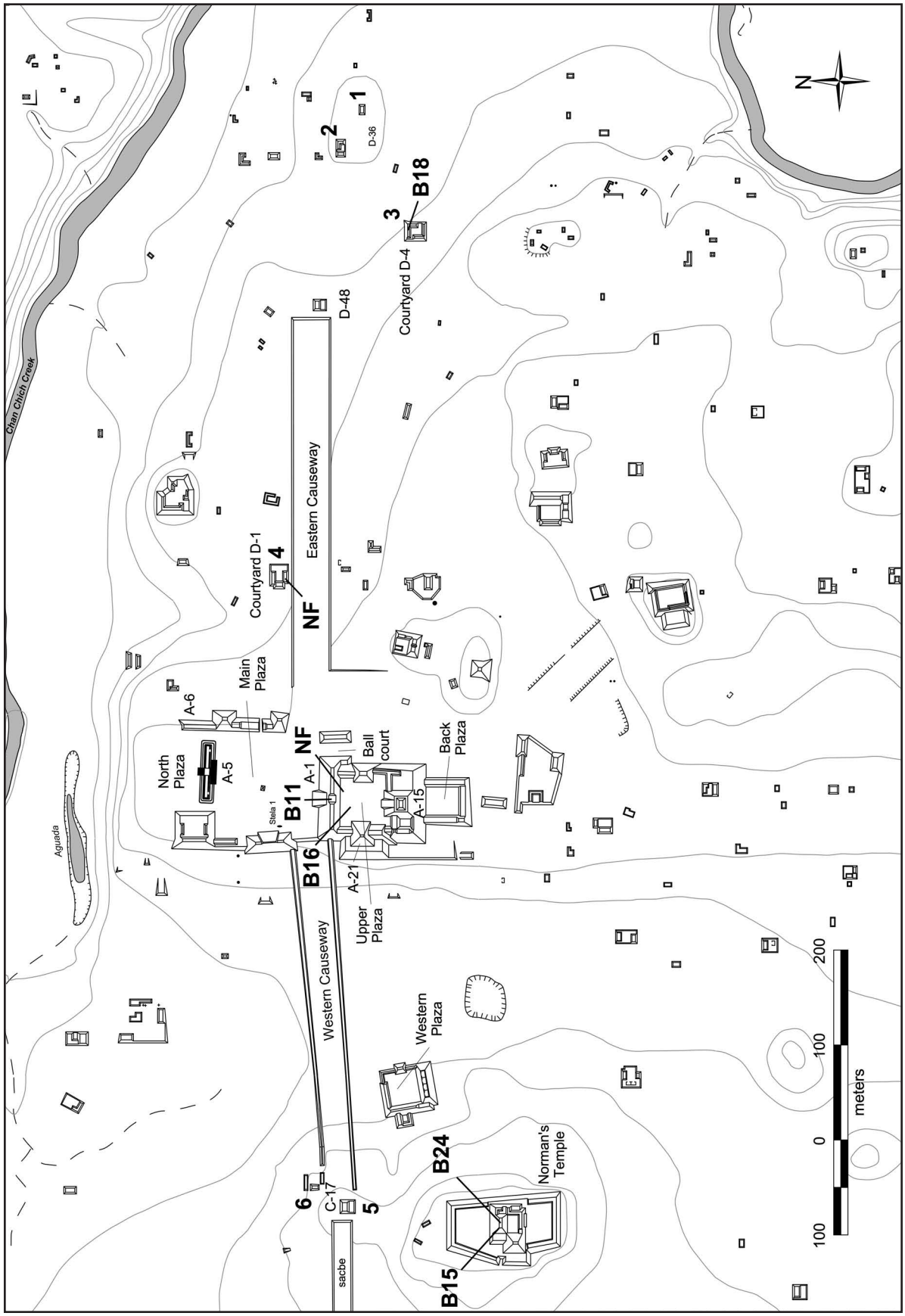

Figure 11.3. Map of Chan Chich with the locations of tree inventory areas (1–6), burials (B#), and non-funerary contexts (NF) discussed in the text.

Table 11.2. Summary of Charcoal Samples' Contexts and Ages

Sample(s)	Lot	Context	Sample Date
CC-10-S16	CC-10-C-08	Charcoal from a Middle Preclassic midden in the Upper Plaza at Chan Chich.	805–569 cal BC (Houk 2022:Table 8.9).
CC-12-S13	CC-12-D-07	Charcoal from the fill capping Cache CC-C01 and Burial CC-B11. See below.	cal AD 540–602 (Houk 2022:Table 8.9)
CC-12-S15, -S17, -S18, and -S26	CC-12-D-09	We discovered Burial CC-B11 in 2014 on the central landing of Structure A-1, the most massive structure at Chan Chich. The burial and a related cache (CC-C01) are located at the horizontal center of the structure. The four ceramic vessels from the burial are all Late Classic types, suggesting the deposit dates to ca AD 700. Bone (CC-12-S33) from the burial itself dates to 413–235 cal BC (Houk 2022:Table 8.17). The dates suggest the burial is secondary, removed from elsewhere and re-interred in a Late Classic deposit.	Charcoal (CC-12-S17) dates to cal AD 658–758 (Houk 2022:Table 8.9).
CC-14-S08	CC-14-S-06	This large chunk of charcoal came from a complicated termination deposit or midden found on the west side of a small structure in Courtyard D-1. The deposit included a horse whelk, burned ground stone, human bone fragments, lithic tools, and thousands of ceramic sherds.	Not dated.
CC-21-S09	CC-21-C-02	This charcoal comes from above the bench containing Burials CC-B15 and -B24 in Structure C-2. While technically in collapse debris, the charcoal may be associated with a burning ritual, which burned the surface of the bench and stained the plaster on the north wall of the room.	Not dated.
CC-21-S11 and -S12	CC-21-C-03	We recovered these samples from the bench covering Burial CC-B24. It is unclear if the sample comes from directly below the bench, the bench's fill, or the fill surrounding the burial.	Not dated.
CC-15-S095, -S115, and -S116	CC-15-G16 and -G17	These samples come from the debris filling Crypt 1, close to the floor. Bone (Sample CC-15-S041) from the final individual interred in the crypt dates to cal AD 252–384 (Houk 2022:Table 8.11). Ceramics and other dates from this context suggest the crypt was used and then filled and buried in the Early Classic period.	Not dated.

chamber was unusual in that it appears to have been a sunken, vaulted chamber, with only the roof sticking above the plaza's floor. Steps led down from the plaza into the chamber through its northern wall (Gallareta Cervera et al. 2017:47–53). The crypt contained four burials (Burials CC-B16A to D), which were excavated at different times, and the charcoal was collected before the context of the burials was fully understood. Subsequent analysis

of the human remains, and context suggest that only two, or possibly three, individuals are in the crypt (Anna Novotny, personal communication, December 4, 2023). Burial CC-B16B was an adult male in an extended, supine position and the last person interred in the crypt (Novotny et al. 2017:50). Sample CC-B15-S141 dates the remains to cal. AD 252–384 in the Early Classic period (Houk 2022:Table 8.11). While placing Burial CC-B16B in the crypt, the Maya disturbed the remains of one or more individuals already buried there, now represented by the bones in Burials CC-B16A, -B16C, and -B16D. They were found in the crypt as piles of partial adult human remains near the remains of Burial CC-B16B. During a remodeling event, the Maya dismantled the crypt's vault, filled the chamber with the debris, and sealed the filled chamber beneath a new plaza floor. Charcoal Samples CC-15-S115, and -S116 were found in the debris filling Crypt 1, close to the crypt's floor.

Non-Funerary Contexts

Charcoal Sample CC-10-S16 was found in a Middle Preclassic midden located in the Upper Plaza. The sample dates the deposit to 805–569 cal. BC (Houk 2022:Table 8.9).

Sample CC-14-S08 was found in a midden or complicated termination deposit in Courtyard D-1 in Lot CC-14-S-06. It was found alongside a horse whelk shell, burned ground stone, human bone fragments, lithic tools, and thousands of ceramic sherds (Booher et al. 2015). This is a Late-to-Terminal Classic period deposit.

MATERIALS AND METHODS

BEAST project members collected the charcoal samples during the excavation of each burial over the course of multiple field seasons. In the field, excavators removed the charcoal with a trowel and placed it in an aluminum packet. In the field lab, all soil was carefully removed using sterile metal dental tools before export.

Dr. Bo Zhao used a Hitachi S-3400N Scanning Electron Microscope at the Texas Tech University (TTU) Microscopy Lab to analyze the samples (Figure 11.4). She prepared a cross-section of each sample using a quick scraping cut with a brand-new sharp blade. She then mounted each sample onto an aluminum sample mount using double-sided carbon tape. The images were taken at 20 kV accelerating voltage under 140–150 Pa variable pressure by backscattered detector. Each image measures 847 μm by 625 μm and covers an area of 529,375 μm^2. To clarify our analysis of three samples, Zhao took new images at a larger scale.

Kaitlin Murphy analyzed each image, recording the presence of growth rings, porosity type, pore arrangement, size and frequency, parenchyma type, ray width, spacing, and type guided by wood identification methods of Conners (2015), Dussol et al. (2021), Jones (2010), Meier (2023), and Wheeler and Baas (1998). To calculate pore size, she measured each pore diameter horizontally in micrometers and then averaged all pore sizes in the image to identify the qualitative pore size of small, medium, large, very large (Meier 2023). To calculate pore frequency, Murphy counted the number of pores present in the entire 529,375 μm^2 image and multiplied the total by 1.889 to get an estimation of the number of vessels per 1 mm^2. This calculation is used to find the least biased pore frequency for each image. The final number was then translated into comparative terms of Very Few, Few, Moderately Numerous, Numerous, and Very Numerous following Meier (2023).

Murphy then identified the axial parenchyma using descriptions from Meier (2023) and Jones (2010) to find the classification type. Following Meier (2023) ray width was measured by

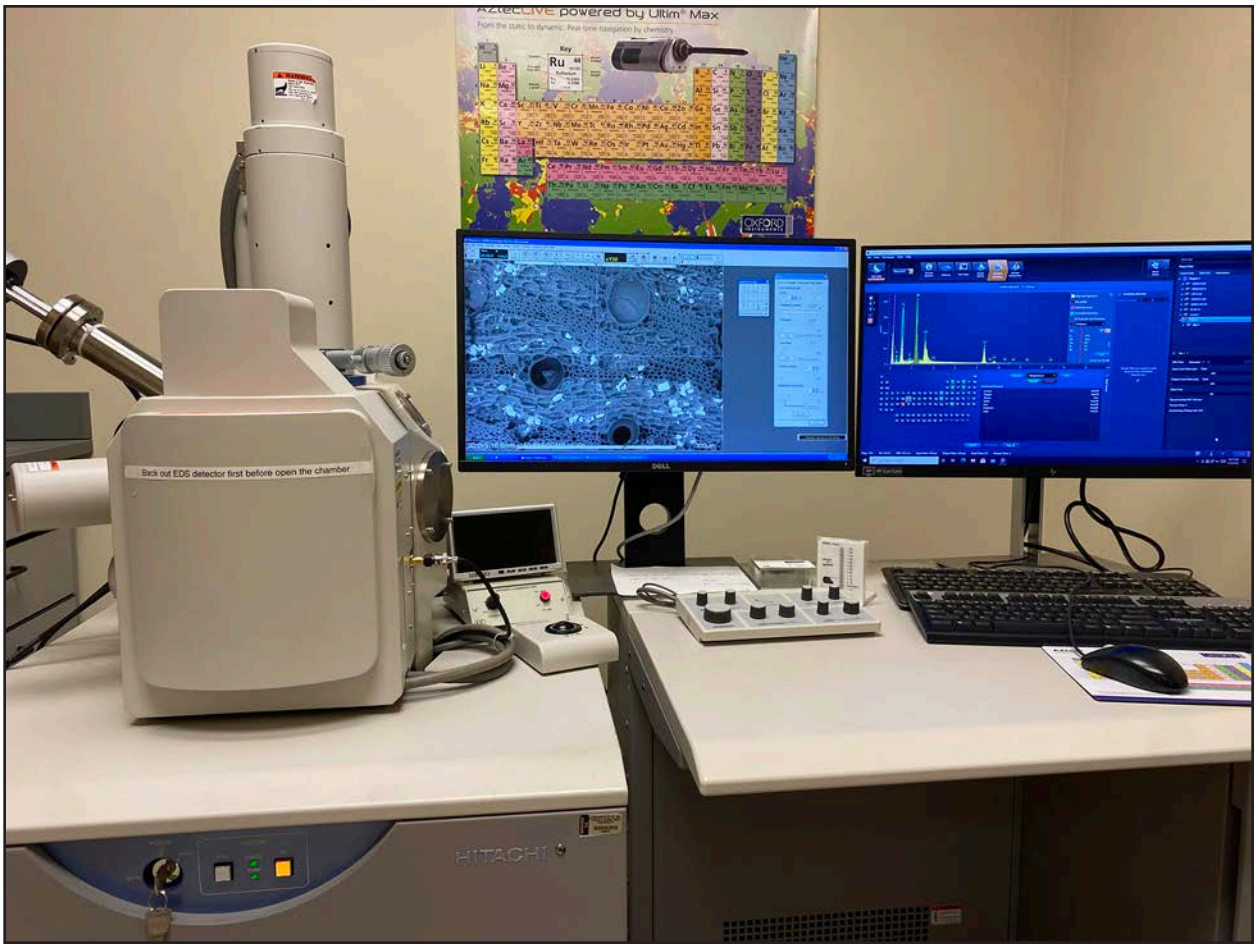

Figure 11.4. Taking the SEM Images in the TTU Microscopy Lab.

counting the number of cells in a row, and ray spacing was measured by counting the number of rays within a 500 μm line and doubling the total to get the number of rays per millimeter, which then was recorded in comparative terms of Wide (< 4 rays/mm), Normal (4–12 rays/mm), and Close (> 12 rays/mm). The type of ray present was identified using visual analysis and comparison of images from Meier (2023). This analysis was conducted to help in the visual comparison of wood species.

Murphy made visual comparisons of the charcoal samples against modern wood specimens from the InsideWood (2023) database (hosted by the InsideWood Working Group and North Carolina State University) and images of charcoal from similar studies (Dussol et al. 2016; Dussol et al. 2017; Lentz and Slotten 2021; Morehart 2002; Scheel-Ybert 2014;). Murphy also consulted with Dr. Elisabeth Wheeler and Dr. Lydie Dussol for their feedback on her identifications and analyses.

RESULTS

The results of the analysis are shown in Table 11.3. We analyzed 13 samples in this study, and we were able to identify all 13 samples at the family or genus level. Three additional samples were determined not to be wood and were, therefore, excluded from the results. At least three taxonomic families and four genera were identified. Due to only having cross-section images of each sample, the missing family and genera were impossible to conclude with certainty.

Only four families are present in the assemblage (Table 11.3; Figure 11.5). The Sapotaceae family represents 38 percent of the samples, but its genera are difficult to distinguish between due to the high similarity in anatomy (Dussol et al. 2016:61). One sample genus and two sample species were not able to be identified. In northwestern Belize, there are at least 10 species of Sapotaceae present among the four genera (*Manilkara*, *Sideroxylon*, *Pouteria*, and *Chrysophyllum*) according to Brokaw et al. (2023). Brokaw and Ward (see Table 11.1) identified *Manilkara zapota*, *Sideroxylon foetidissimum*, *Pouteria amygdalina*, *campechiana*, *durlandii*, and *reticulata*, and *Cryosophila stauracantha* at Chan Chich excavation sites in 2015. Typically, these species can be found in "upland and transition forests, occasionally in *bajos*," riparian, or secondary forests (Brokaw et al. 2023:51, 53).

Pinaceae makes up 31 percent of the total assemblage. There are two species of pine found in the area, *Oocarpa* Pine (P. *oocarpa*) and Caribbean Pine (*Pinus caribaea*). Both have similar anatomical structures. The presence of intra-annual growth rings in Sample CC-21-S09 points towards the identification of P. *oocarpa* (see Dussol et al. 2016:61), and the rest remain under Pinus sp. These species can grow in different areas but are mostly found in the central Maya lowlands and the Belize Mountains regions (Dussol et al. 2016:61). A separate sample from Burial CC-B24 analyzed by Chris Lintz (personal communication to Houk, December 2022) is also Caribbean pine (*Pinus caribaea*).

Boraginaceae makes up 31 percent of the samples. We have only identified the species ziricote (*Cordia dodecandra*) in this assemblage. A few other species have been found in the Maya lowlands region— Brokaw et al. (2023) identify one (*Bourreria mollis*)— but none in a modern survey of our site region.

Comparisons of the context versus the families shows a clear pattern (Table 11.4). The families Boraginaceae and Pinaceae were both found in association with burial contexts. The family Sapotaceae was found in midden and burial contexts. There is a distinct pattern of fuel usage indicated by both the Boraginaceae and the Pinaceae families associated with only Burials CC-B11 and CC-B24. The Pinaceae family was found with Burials

Table 11.3. Charcoal Sample Identification

Sample #	Family	Genus	Species	Common Name	Figure
CC-10-S16	SAPOTACEAE	*Sideroxylon*	sp.		11.5a
CC-12-S13	BORAGINACEAE	*Cordia*	*dodecandra*	Ziricote	
CC-12-S15	BORAGINACEAE	*Cordia*	*dodecandra*	Ziricote	11.5b
CC-12-S17	PINACEAE	*Pinus*	sp.	Pine	
CC-12-S18	PINACEAE	*Pinus*	*caribaea*	Caribbean Pine	
CC-12-S26	PINACEAE	*Pinus*	*caribaea*	Caribbean Pine	11.5c
CC-15-S95	SAPOTACEAE	*Manilkara*	*zapota*	Chicle	11.5d
CC-15-S115	SAPOTACEAE	Unknown	-		11.5e
CC-15-S116	SAPOTACEAE	*Manilkara*	*zapota*	Chicle	
CC-21-S09	PINACEAE	*Pinus*	*oocarpa*	*Oocarpa* Pine	11.5f
CC-21-S11	BORAGINACEAE	*Cordia*	*dodecandra*	Ziricote	
CC-21-S12	BORAGINACEAE	*Cordia*	*dodecandra*	Ziricote	
CC-14-S08	SAPOTACEAE	*Manilkara*	*zapota*	Chicle	

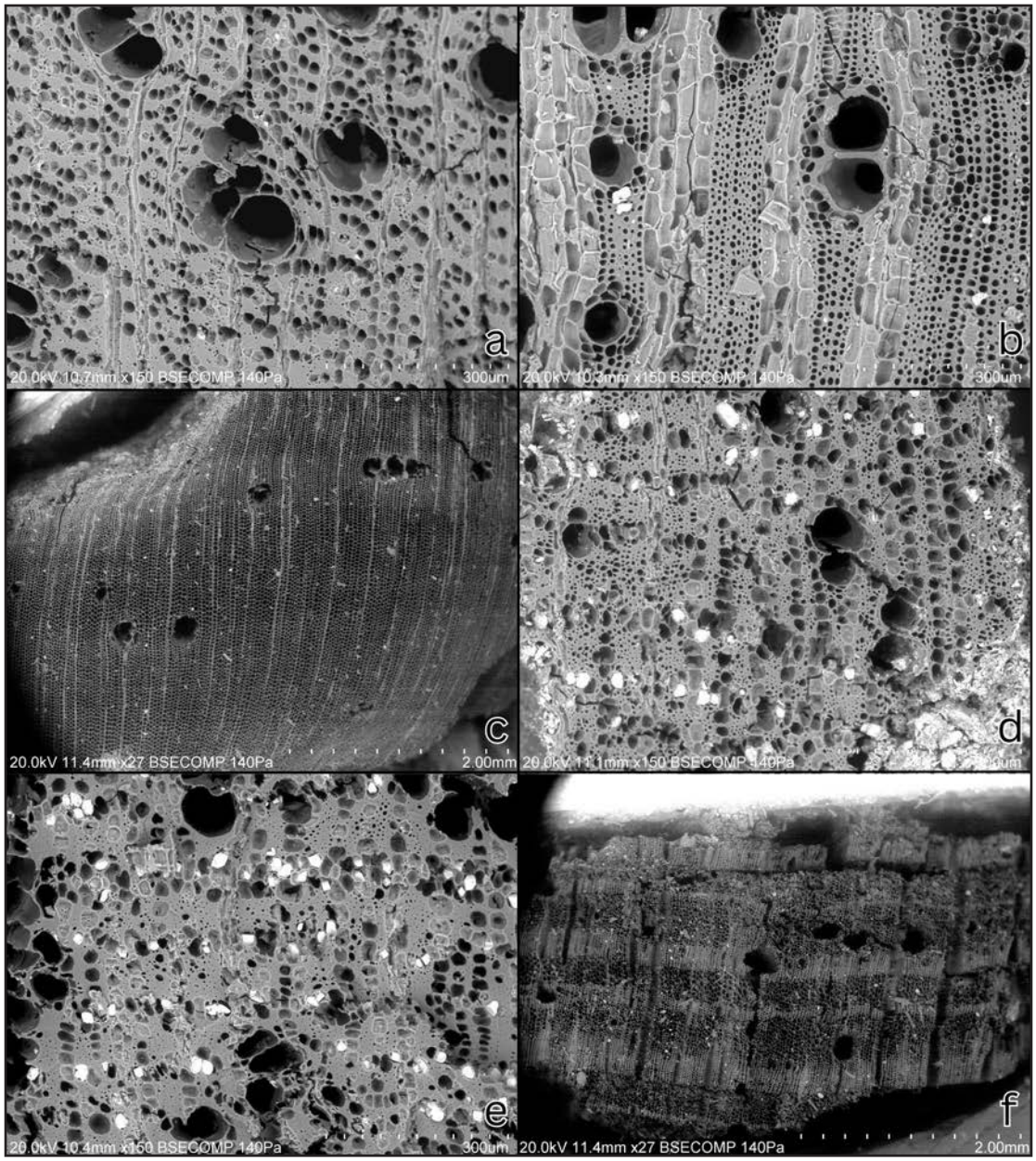

Figure 11.5. SEM cross section images of charcoal samples from Chan Chich: (a) Sample CC-10-S16, *Sideroxylon* sp.; (b) Sample CC-12-S15, *Cordia dodecandra* (ziricote); (c) Sample CC-12-S26, *Pinus caribaea* (caribbean pine); (d) Sample CC-15-S95, *Manilkara zapota* (chicle); (e) Sample CC-15-S115, Sapotaceae family; (f) Sample CC-21-S09, *Pinus oocarpa* (*oocarpa* pine).

Table 11.4. Sample Family and Genus and Related Contexts

Family	Genus	Non-Funerary	CC-B11	CC-B16	CC-B24	Funerary Total
SAPOTACEAE	*Manilkara*, *Sideroxylon,* and unknown	2	-	3	-	3
BORAGINACEAE	*Cordia*	-	2	-	2	4
PINACEAE	*Pinus*	-	3	-	1	4

CC-B11 and CC-B24. In Burial CC-B11, five samples were found: two are Boraginaceae, and three are Pinaceae. A Pinaceae sample was also recovered with Burial CC-B24 along with two Boraginaceae samples. Three samples of Sapotaceae were found in Burial CC-B16, and two were found in non-funerary contexts.

Although our sample size is small, the pattern of wood species in context shows that two families were exclusively found in burial contexts, while one family was found in midden and funerary contexts. The pattern of distribution among the burial contexts shows similar wood use between two burial contexts and exclusive wood use in one burial.

DISCUSSION

This study aims to understand what types of wood were burned in funerary contexts to look for patterns of wood species use. Identifying the charcoal found at Chan Chich leads to understanding the human activities that led to the deposition of our samples. Since we have a limited amount of charcoal that was recovered from Chan Chich, using outside literature is key for identifying and analyzing the ritual aspect of charcoal usage.

Shown in Table 11.4, there is a clear pattern of tree species use between non-funerary and funerary contexts. Only *Cordia*, *Pinus* sp., and Sapotaceae were found in burial-related contexts, pointing to possible ritual use of those species. Consistent with Dussol et al. (2016), the non-funerary assemblage is less diverse compared to the funerary assemblage, although we have much fewer samples from non-funerary contexts compared to funerary. Two Sapotaceae samples were from middens or termination deposits, which could have been related to a different ritual or a non-domestic use of firewood. They are likely secondary refuse, and therefore could be the result of a long-term deposit (Asouti and Austin 2005:4). If repetitive burning in a midden or occupation level is present, then it can help to reconstruct the use of wood species over time, showing species selection changes throughout time (Asouti and Austin 2005:4).

Today, the forest around Chan Chich contains chicle (*Manilkara zapota*) and Sapotaceae species, both of which are present in the assemblage. The Sapotaceae family was heavily used by the Maya for construction wood, fruits, and medicinal properties (Dussol et al. 2016:65). The Maya used Sapotaceae in construction because of its durability and resistance to insects (Thompson et al. 2015). The *Manilkara* charcoal in Burial CC-B16 came from the material filling the crypt. This charcoal could have resulted not from a funerary ritual but from the burning of structural elements of the crypt's vault when the Maya filled the chamber.

Sapotaceae trees were highly favored resources because of their usefulness, which might be why they are still so abundant today around Maya sites (Dussol et al. 2016). However, species of pine (Pinus sp.) and ziricote (*Cordia*

dodecandra) have not been found in the local survey of Chan Chich by Brokaw and Ward (see Table 11.1), or in the modern forest of La Milpa (Brokaw et al. 2023). This does not mean, however, that they were not present in the local forest when it was occupied by the Maya, as centuries of usage by the Maya and subsequent decades of logging have transformed the forest. These species have been found in the central Maya lowlands, so we know they were likely encountered by the Maya at some point (Dussol et al. 2016). Wood properties and cultural factors of wood selection and trade might also have influenced the presence of these species in charcoal assemblages at Chan Chich (see Asouti and Austin 2005; Morehart et al. 2005).

Morehart (2002) mentions the recovery of pine as the most common in charcoal assemblages, and pine is abundant in the Maya region. Pine is well-known for its fragrance, which can be brought out by creating incense or burning the wood (Dussol et al. 2016:65). It is also a great fuel source and was likely a trade good during the Classic period. There is evidence of its use by many Maya groups (Morehart 2002). Pine was used for torches, and the scent was seen as food offerings for the gods; the act of burning the offering was seen as releasing it's "inner soul with fire" (Morehart et al. 2005:19). There is an abundance of evidence for the use of pine in ritual contexts across the Maya region, suggesting a shared knowledge of plant symbolism and tradition (Morehart et al. 2005:19).

Dussol et al. (2016) argues that the plant life cycle is symbolic of the Maya life cycle of transforming the dead into ancestors. Maya imagery has depicted the dead as varied species of fruit trees like cacao and soursop (Dussol et al. 2016). There might be a link between the ritual funerary burning practices and the life cycle of plants, potentially relating to the plant symbolizing the cremation of the individual to release the soul to the underworld. There was no evidence of cremation of human remains in the burials at Chan Chich that contained charcoal, meaning burned wood came from a specific event unrelated to cremation. The radiocarbon age discrepancies between bone samples and charcoal samples in some of the burials likely relate to burial rituals involving re-interment (Burial CC-B11) and re-entry (Burials CC-B16 and CC-B24), which may have involved fire. The secondary and re-entered burials contained more *Cordia dodecandra* than *Pinus* sp., which might prove to be part of a ritual pattern of wood use, but further study on assemblages is needed. Residents of Chan Chich chose specific tree species to use in their burials, and we can suggest the correlation between pine and ziricote and their funerary rituals.

CONCLUSION

This study has demonstrated the relationship between funerary rituals and wood species at Chan Chich. Despite the small sample size, we have shown a pattern of tree species usage that offers insight into the complex relationship between the Maya and their choice of fire fuel. We show a new way of understanding how the natural world was understood and appreciated by the Maya, and how it played into their complex burial rituals. This study is preliminary in that we are missing images of the transverse sections of our samples, but we were still able to identify 100 percent of our assemblage to at least the family level.

There are still many questions left unanswered related to the use of fire fuel. Where was the firewood burned? What do pine and ziricote in funerary rituals represent?

With further studies at more sites throughout the Maya region, we might be able to find evidence to support answers to these questions. We know that the Maya carried out rituals in caves, among other sacred spaces, so where might Chan Chich burial rituals have taken

place? There is Maya imagery that might help to explain what different species meant to the Maya, but further research on charcoal and ceremonial practices can provide evidence to support these meanings.

We emphasize the importance of paleoethnobotanical studies in archaeology to better understand past humans and their funerary rituals. Identifying wood species from charcoal has shown evidence of the deep understanding that the Maya have with their local environment, and further study may show the true extent of this. It can also show the extent to which it played into their religion and rituals. This study will add to the broader study on Chan Chich funerary practices by showing the deliberate use of firewood in funerary rituals.

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Project Lists for the 1996 through 2023 Seasons

Compiled by Brett A. Houk

This chapter includes lists of sites, operations, tombs, burials, caches, and stone monuments recorded by the Chan Chich Archaeological Project (CCAP) since its inception in 1996 and the Belize Estates Archaeological Survey Team (BEAST) since 2013. This year's chapter omits radiocarbon dates since we did not process many new samples. This document is meant to serve as a reference document for future seasons and is updated each year.

BELIZE ESTATES SITES

Table 12.1 lists Maya sites on and near the Gallon Jug (GJ) and Belize Maya Forest Trust (BMFT) properties with Belize Estate (BE) designations. Two sites also extend onto Programme for Belize (PfB) lands. As noted by Sandrock (2013) and Sandrock and Willis (2014), BEAST assigned BE numbers to previously named sites and to newly discovered sites with four or more structures, the tallest of which must be at least 4 m high including structure and substructure or basal platform, that are not within 1 km of another recorded site BE site. This definition is obviously a bit subjective. During our inspection of our 2022 lidar data, we generally applied BE designations to sites with some sort of public architecture (plaza, ball court, *sacbe*, and so forth) or large courtyard groups not associated with a nearby civic/ceremonial center. The table also lists lab codes for sites where we have collected artifacts. We also assign BE numbers to important historic period sites once our crews have verified a site's location (Table 12.2).

Table 12.1. List of BE Sites

BE #	Site Name	Lab Code	Property	Original Source	UTM N	UTM E
1	Chan Chich	CC	GJ	Guderjan (1991)	1940467	275908
2	Kaxil Uinic (E'kenha)	KU	BMFT	Guderjan et al. (1991)	1940631	273459
3	Punta de Cacao	PdC	BMFT	Guderjan et al. (1991)	1946178	286679
4	Gallon Jug	GJ	GJ	Guderjan et al. (1991)	1945581	283708
5	Laguna Verde		GJ	Guderjan et al. (1991)	1947265	281025
6	Laguna Seca	LS	GJ/BMFT	Guderjan et al. (1991)	1951231	283854
7	Qualm Hill (ruin)		BMFT	Guderjan et al. (1991)	1957120	287634
8	Wamil	WM	BMFT	Guderjan et al. (1991)	1940898	294661
9	Sierra de Agua	SdA	BMFT	Guderjan et al. (1991)	1941524	300344
10	Gongora Ruin		BMFT	Guderjan et al. (1991)	1954481	293510

Houk, Brett A. (compiler)
2023 Project Lists for the 1996 through 2023 Seasons. In *The 2023 Season of the Belize Estates Archaeological Survey Team*, edited by Brett A. Houk, pp. 247–278. Papers of the Chan Chich Archaeological Project, Number 16. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Table 12.1. List of BE Sites (continued)

BE #	Site Name	Lab Code	Property	Original Source	UTM N	UTM E
11	Ix Naab Witz		BMFT	Sandrock (2013)	1955134	285064
12	La Luchita		BMFT	Sandrock (2013)	1950083	277133
13	Montaña Chamaco		BMFT	Sandrock (2013)	1951055	275212
14	Sylvester Camp		GJ	Sandrock (2013)	1945544	278113
15	Qualm Hill camp	QHC	BMFT	Sandrock and Willis (2014)	1957213	285282
16	Kaxil Uinic village	KUV	BMFT	Thompson (1963)	1940073	273487
17	Sak Mut		BMFT	Houk et al. (2017)	1934386	272740
18	Tikin Ha (formerly Xma Ha Ak'al)	TH	BMFT	Houk et al. (2017)	1958096	296807
19	Unnamed		BMFT	Houk (2023)	1934222	274213
20	Unnamed		BMFT	Houk (2023)	1935621	274082
21	Unnamed		BMFT	Houk (2023)	1938286	275681
22	Unnamed		BMFT	Houk (2023)	1938576	272738
23	Unnamed		GJ	Houk (2023)	1944247	274733
24	Unnamed		BMFT	Houk (2023)	1949532	275248
25	Unnamed		BMFT	Houk (2023)	1949370	280796
26	"Sutton Hoo"		BMFT	Houk (2023)	1954346	274276
27	Unnamed		BMFT	Houk (2023)	1957167	275248
28	Unnamed		BMFT/PfB	Houk (2023)	1958363	273044
29	Unnamed		BMFT	Houk (2023)	1957188	279873
30	Ayiin Winik	AW	BMFT	Houk et al. (2023); Ingalls et al. (2023)	1953908	278585
31	Unnamed		GJ	Houk (2023)	1947575	278822
32	Unnamed		BMFT	Houk (2023)	1937739	285075
33	Tiho'witz	BE33	GJ	Gallareta Cervera et al. (2023)	1940780	282034
34	Unnamed		GJ	Houk (2023)	1940490	285623
35	Unnamed		BMFT	Houk (2023)	1956500	281555
36	Unnamed		BMFT/PfB	Houk (2023)	1958051	281041
37	Unnamed		BMFT	Houk (2023)	1957379	290055
38	Unnamed		BMFT	Houk (2023)	1944968	286267
39	Unnamed		BMFT	Houk (2023)	1943137	289122
40	Unnamed		BMFT	Houk (2023)	1939706	292209
41	Unnamed		BMFT	Houk (2023)	1942457	295766
42	Unnamed		BMFT	Houk (2023)	1942775	292549
43	Unnamed		BMFT	Houk (2023)	1945806	293802
44	Unnamed		BMFT	Houk (2023)	1949056	294319
45	Unnamed		BMFT	Houk (2023)	1951231	292104
46	Unnamed		BMFT	Houk (2023)	1952809	297462

Table 12.2. List of Known and Reported Historic Sites in the BEAST Permit Area

Name	Location	Description	Source(s)
Kaxil Uinic village (BE-16)	Approximately 500 m south of BE-2 on BMFT land	In 2012, the CCAP re-located the remains of the historic Maya village and chicle camp known as Kaxil Uinic and its associated aguada. The village was probably settled in the 1880s, and was closed in 1931 by the Belize Estate and Produce Co (BEC). BEAST mapped and excavated the site in 2015, recording seven three-stone hearths and multiple artifact scatters, which included turn of the century glass bottles and cast iron pots. BEAST returned to the site in 2016 and mapped additional surface finds, hearths, and mounds. The 2016 work included archival research in Jamaica and England.	Bonorden (2016); Bonorden and Houk (2015, 2016, 2019, 2022); Bonorden and Kilgore (2015, 2016); Booher et al. (2016); Houk (2012); Houk and Bonorden (2015); Houk et al. (2015, 2022); Harrison-Buck et al. 2018; Thompson (1963
Qualm Hill Camp (BE-16)	Immediately west of Cedar Crossing on the west bank of the Río Bravo	A 215-x-90-m scatter of historic artifacts that likely represents the location of Qualm Hill (also known as Quam or Quam Hill), which was "the seasonal headquarters of the British Honduras Company during the mid 1800s" (Cackler et al. 2007:124). Qualm Hill is historically important as the site of a "Chichina" Maya raid led by Marcus Canul in 1865 (Bristowe and Wright 1888:27–28), yet artifacts recovered from the 2015 survey and excavation generally post-date the raid. The site, which primarily consists of surface artifact deposits, has been disturbed in recent years by individuals scavenging the historic logging equipment and modern loggers camping in the middle of the historic camp.	Bonorden (2016); Bonorden and Houk (2016; 2022); Bonorden and Smith (2015); Bristowe and Wright (1888:27–28); Houk et al. (2015); Cackler et al. (2007:124)
El Infierno logging camp	Reportedly 1 km east of Guatemala border, northwest of Gallon Jug	This site is mentioned in reference to the location of the Maya site of El Infierno, which is described as "behind" the logging camp; no other details provided.	Guderjan et al. (1991:61)
Unnamed	Approximately 75 m southwest of BE-13, 50 m west of a swamp	BEAST located a possible abandoned chiclero camp, as evidenced by a small collection of bottles, in 2013.	Sandrock (2013)

Table 12.2. List of Known and Reported Historic Sites (continued)

Name	Location	Description	Source(s)
Sierra de Agua Camp	Historic artifact scatters in and around the site core of Sierra de Agua (BE-09)	While documenting the Maya ruins of Sierra de Agua (BE-09), BEAST recorded multiple historic artifact scatters and possible historic features in and around the ruins. These materials are likely associated with the BEC camp called Sierra de Agua.	Thompson et al. (2023)
Wamil Camp	BEC camp along the Hillbank-Gallon Jug railway, near BE-08 (N 1940900, E 294650)	This BEC camp is shown on various historic maps, but BEAST has not determined its location.	Directorate of Overseas Surveys (1958)
Canal Bank Camp	BEC camp near eastern end of large canal in the Booth's River Marsh, ca. N 1955400, E 301370	This BEC camp is shown on various historic maps, but BEAST has not determined its location.	Directorate of Overseas Surveys (1958)
Newhaven Camp	BEC camp in prominent bend in Rio Bravo along the "Cabaret" road, southeast of BE-30, ca. N 1953000, E 280500.	To date, this camp is only known from a 1958 soils map. It may be the camp known as "Cabaret" by workers at Chan Chich Lodge and Gallong Jug, but BEAST has not determined its exact location.	Directorate of Overseas Surveys (1958)
Gongora Camp	BEC camp near Gongora Ruin (BE-10)	This BEC camp is shown on various historic maps, but BEAST has not determined its location.	Directorate of Overseas Surveys (1958)

OPERATIONS

Table 12.3 lists the Operations BEAST has assigned between 1996 and 2023. In 2023, the number of sites where we have excavated increased from six to 10. To date, the CCAP has conducted excavations at Chan Chich and Kaxil Uinic ruins, and BEAST has conducted excavations at Qualm Hill camp, Kaxil Uinic village, Gallon Jug, Laguna Seca, Wamil, Sierra de Agua, Tikin Ha, Ayiin Winik, and Tiho'witz. Operations numbers are assigned sequentially by site, preceded by a site's lab code. Thus, the first operation at Chan Chich is designated Op CC-01. If a site does not have a name when excavations commence, the lab code will be the site's BE number without a hyphen (BE33, for example).

Table 12.3. List of Operations Opened by BEAST and CCAP

Site	Op	Season(s)	Definitions	Subops	Source(s)
Ayiin Winik	AW-01	2023	Surface collections and looters' trench salvage excavations at Ayiin Winik in 2023	A, B, and SF	Houk et al. (2023); Ingalls et al. (2023)
Chan Chich	CC-01	1997	Excavations on the northern stairs of Structure A-1	A–C	Houk (1998)
Chan Chich	CC-02	1997	Excavations at the Upper Plaza	A–J	Robichaux (1998)
Chan Chich	CC-02	1998	Excavations at the Upper Plaza, including landing of Structure A-1	K–W	Robichaux et al. (2000)
Chan Chich	CC-02	1999	Excavations at the Upper Plaza including summits of Structures A-1 and A-13	X–AK	Robichaux (2000)
Chan Chich	CC-03	1997	Excavations at the ball court	A–E	Ford (1998)
Chan Chich	CC-04	1997	Test pits in Group C	A–C	Meadows (1998); Houk (2020)
Chan Chich	CC-04	1998	Test pit in Plaza C-2	D	Ford and Rush (2000); Houk (2020)
Chan Chich	CC-05	1998	Excavations at Courtyard C-1	A–L	Ford and Rush (2000); Houk (2020)
Chan Chich	CC-06	1998	Excavations at Group H	A–F	Houk and Zaro (2015); Meadows and Hartnett (2000)
Chan Chich	CC-07	1999	Excavations at Structure C-6	A–E	Harrison (2000)
Chan Chich	CC-08	1999	Excavations at Structure A-11	A–B	Houk (2000)
Chan Chich	CC-09	2001	Excavations at Plaza C-2	A–M	Unpublished field notes
Chan Chich	CC-10	2012	Excavations at the Upper Plaza	A–F	Kelley (2014); Kelley et al. (2012)
Chan Chich	CC-10	2013	Excavations at the Upper Plaza	G–T (plus Ix)	Kelley (2014); Kelley et al. (2013)
Chan Chich	CC-11	2013	Excavations at Structure A-5	A–R (plus Fx)	Herndon et al. (2013)
Chan Chich	CC-12	2014	Excavations at the Upper Plaza, Chan Chich Dynastic Architecture Project	A–T (plus Ax)	Herndon et al. (2014, 2015)
Chan Chich	CC-13	2014	Excavations at the Back Plaza	A–N (plus ST)	Herndon et al. (2015); Vazquez (2014); Vazquez et al. (2014)

Table 12.3. List of Operations Opened by BEAST and CCAP (continued)

Site	Op	Season(s)	Definitions	Subops	Source(s)
Chan Chich	CC-14	2014, 2015	Excavations associated with processional architecture including the Eastern and Western Causeways, Courtyard D-1, Structure D-48, Structure C-17, and Structure C-18A, and Structure D-36	A–AW (plus Ex, ARx, AMx, and SF)	Booher (2016a); Booher et al. (2015); Booher and Houk (2016); Booher and Nettleton (2014); Houk and Booher (2020); Houk et al. (2015)
Chan Chich	CC-15	2016–2018	Excavations at the Upper Plaza, Chan Chich Dynastic Architecture Project. The 2016 through 2018 seasons focused on chronology building and the northern part of the plaza.	A–Z, AA, BB, CC, DD, EE, FF, GG, HH, II, JJ, and KK (plus Bx, Kx, and Px)	Booher et al. (2016); Gallareta Cervera et al. (2017; 2019); Houk (2016)
Chan Chich	CC-16	2016	Excavations at Norman's Temple complex	A–X (plus Dx)	Booher (2016b); Booher et al. (2016); Houk (2020); Houk and Booher (2020)
Chan Chich	CC-17	2017	Excavations at Courtyard D-4	A–U (plus Ix, Ox, and ST)	Kilgore (2018); Kilgore et al. (2017)
Chan Chich	CC-18	2017, 2018	Excavations at Structure A-6/North Plaza lithic workshops and debitage deposit	A–H	Degnan (2018); Degnan and Houk (2019); Degnan et al. (2017)
Chan Chich	CC-19	2019	Excavations in Upper Plaza, primarily at Structures A-12 and A-13 in 2019	A–V (plus Qx)	Gallareta Cervera and Houk (2019)
Chan Chich	CC-20	2019	Salvage excavations on the summit of Structure A-4 to recover a cache discovered by cell tower contractors	A–E	Houk, Bedrosian, and McKinney (2019)
Chan Chich	CC-21	2022	Excavations at Norman's Temple complex	A–D	Gallareta Cervera and Houk (2022)
Chan Chich	CC-22	2022	Marketplace investigations at the North Plaza, Chan Chich	A–H (plus OB, SF, and ST)	Degnan et al. (2022)

Table 12.3. List of Operations Opened by BEAST and CCAP (continued)

Site	Op	Season(s)	Definitions	Subops	Source(s)
Chan Chich	CC-23	2022	Excavations at Structure D-36	A	Houk 2022 field notes
Chan Chich	CC-24	2023	Text excavations during lidar field assessment at Courtyard E-8 and Plaza I-1 in 2023	A–E	Gallareta Cervera et al. (2023)
Gallon Jug	GJ-01	2018	Excavations in the plaza at Gallon Jug in 2018	A–U	Houk (2019); Kilgore, unpublished field notes
Gallon Jug	GJ-02	2019, 2022	Excavations at Courtyard B-1 at Gallon Jug in 2019 and 2022	A–AU (plus Kx)	C. Novotny et al. (2019, 2022); Novotny and Houk (2021)
Gallon Jug	GJ-03	2019	Test pit excavations at Gallon Jug settlement groups in 2019	A–G	C. Novotny et al. (2019)
Gallon Jug	GJ-04	2023	Test excavations during field assessment of lidar data at Gallon Jug sacbe, Courtyard C-1, Plaza D-1, and Courtyard E-1	A–M	C. Novotny et al. (2023)
Kaxil Uinic	KU-01	2012	All excavations at Kaxil Uinic in 2012	A–H	Harris (2013); Harris and Sisneros (2012); Houk (2012); Houk et al. (2012, 2013)
Kaxil Uinic village	KUV-01	2015, 2016	All excavations at Kaxil Uinic village in 2015 and 2016	A–AD (plus Rx and SF)	Bonorden (2016); Bonorden and Houk (2016, 2019, 2022); Bonorden and Kilgore (2015, 2016); Harrison-Buck et al. (2019); Houk (2012); Houk and Bonorden (2015, 2020); Houk et al. (2015, 2022)
Laguna Seca	LS-01	2023	Test excavations during field assessment of lidar data at Laguna Seca in 2023	A	Thompson (2023)
Quam Hill camp	QHC-01	2014	Surface collections made by BEAST at Qualm Hill Camp	SF	Phillips and Sandrock (2014); Sandrock and Willis (2014)

Table 12.3. List of Operations Opened by BEAST and CCAP (continued)

Site	Op	Season(s)	Definitions	Subops	Source(s)
Quam Hill camp	QHC-02	2015	All excavations at Qualm Hill camp made by BEAST in 2015	A–S and SF	Bonorden (2016); Bonorden and Houk (2016, 2022); Bonorden and Smith (2015); Houk et al. (2015)
Sierra de Agua	SdA-01	2023	Test excavations and looters' trench and historic feature documentation during field assessment of lidar data at Sierra de Agua in 2023	A–E	Thompson et al. (2023)
Sierra de Agua	SF-01	2014	Surface collections made by BEAST that were not associated with a site	SF1–SF3	FileMaker Pro database
Tiho'witz	BE33-01	2023	Test excavations during field assessment of lidar data at Tiho'witz (BE-33) in 2023	A–D	Gallareta Cervera et al. (2023)
Tikin Ha	TH-01	2019	Test excavations at Tikin Ha in 2019	A–H, LT, and SF	Houk et al. (2020); Houk, Zaro, et al. (2019)
Wamil	WM-01	2023	Text excavations and geomorphological testing during field assessment of lidar data at Wamil in 2023	A and B	Thompson et al. (2023)

SPECIAL DEPOSITS

Table 12.4 lists the burials thus far recorded by CCAP and BEAST. Table 12.5 lists the tombs and crypts documented at BE sites, including a looted tomb first recorded by Guderjan (1991) at Chan Chich. Table 12.6 includes the two caches in the list of special deposits. See Houk (2022) for radiocarbon dates from burials.

Table 12.4. List of Burials

Burial	Year	Lot	Context	Source(s)
CC-B01	1997	CC-4-A-3	Primary burial in Late Preclassic fill, Courtyard C-1	Meadows (1998)
CC-B02	1997	CC-2-J-6	Tomb 2, Terminal Preclassic burial in Upper Plaza	Houk et al. (2010)
CC-B03 (04, 06)	1998	CC-5-C-3 and -H-2	Secondary scatter of human bone associated with surface deposit of artifacts on steps of Structure C-2; Terminal Classic (?). Burials CC-B3, -B4, and -B6 combined by Frank and Julie Saul into Burial CC-B3.	Ford and Rush (2000)
CC-B05	1998	CC-6-C-9	Late Classic (?) primary burial beneath Courtyard H-3	Meadows and Hartnett (2000)
CC-B07	1998	CC-4-D	Secondary scatter of human bone associated with surface deposit of artifacts on steps to Structure C-6; Terminal Classic (?)	Ford and Rush (2000)
CC-B08	1999	CC-7-B	Primary Terminal Classic burial beneath bench in Structure C-6	Harrison (2000)
CC-B09	2001	CC-9-G-7	Primary burial of a child in Structure C-12 patio; Late Classic (?)	Unpublished field notes
CC-B10	2012–2013	CC-10-A-8 (extends into CC-10-G)	Primary (?) subfloor, simple cist, burial, poorly preserved; early Late Preclassic. Interment consisted of a single, adult individual, likely of a young age at death. The presence of 19 unmodified dog teeth suggests that an animal was placed in the grave with the human individual. Oldest burial yet excavated at Chan Chich.	Kelley (2014); Kelley et al. (2013); A. Novotny et al. (2017)
CC-B11	2014	CC-12-D-9	Primary burial of an adult in a small crypt in Structure A-1. The burial is associated with the penultimate construction phase and was encountered beneath the central landing on the structure. The small crypt contained four complete vessels. Likely associated with Cache CC-C1. Charcoal from the burial dates to the Late Classic, but a sample of bone from the burial, which was processed in 2022, dates to the Late Preclassic (see Houk 2022:Figures 8.2 and 8.3 and Table 8.17). The skeletal material appears to be in secondary context, suggesting a complex ritual deposit.	Herndon et al. (2014); A. Novotny et al. (2015)

Table 12.4. List of Burials (continued)

Burial	Year	Lot	Context	Source(s)
CC-B12	2014	CC-14-F-3	Primary, simple found in dry-laid fill within a bench, very close to the surface in Structure D-1. Burial contained a single shallow Achote Black bowl with nubin feet and post-firing graffiti—incised quadripartite designs—on two exterior sides and in the middle of the vessel's interior.	Booher (2016); Booher and Nettleton (2014); A. Novotny et al. (2015)
CC-B13	2014	CC-12-H-13	Primary burial of robust adult in a small crypt associated with the penultimate phase of Structure A-18 in the Upper Plaza. No grave goods.	Herndon et al. (2014); A. Novotny et al. (2015)
CC-B14	2015	CC-14-J-04	Primary burial of adult female buried in a seated position within a bench in Structure D-1. She was interred with a piece of antler, a small shell bead, a jute shell, and a mold-made ceramic spindle whorl.	Booher (2016a); Booher et al. (2015); Mitchell and Booher (2015); A. Novotny et al. (2015)
CC-B15	2016, 2022	CC-16-L-02	Late Classic; primary interment of a single, young adult, male individual interred in a simple cist within a bench in Structure C-2. The individual was placed in a tightly flexed position with head to the east. Grave goods included a small, modified shell, a shell labret, two obsidian blades, and a complete Cameron Incised bowl. In 2022, we submitted two bone samples from the burial for AMS dating. The first bone sample submitted returned a 2-sigma radiocarbon date of cal AD 1074–1157 (Sample CC-16-S02a; see Figure 5.7 Table 2.3, this volume). A second bone sample from the same bone, a femur, was submitted for analysis and returned a 2-sigma radiocarbon date of cal AD 675–777 (Sample CC-16-S02b; see Figure 5.7 and Table 2.3, this volume). This Late Classic date is consistent with other radiocarbon dates from Norman's Temple as well as relative dating of ceramics. See Figures 8.2 and 8.3 and Table 8.17.	Booher (2016b); A. Novotny et al. (2016); Novotny and Castillo (2022)

Table 12.4. List of Burials (continued)

Burial	Year	Lot	Context	Source(s)
CC-B16	2016, 2017	CC-15-G-11, -13, and -14	Discovered in 2016, but only partially excavated, Burial CCB-16 was located in Crypt 1 in the Upper Plaza. The burial dates to the Early Classic period. Excavations on the crypt were completed in 2017. Burial CC-B16A, excavated in 2016, consisted of bones of the left foot, an articulated right leg, and an articulated right wrist and hand (A. Novotny et al. 2016). Burial CC-B16B was excavated in 2017 and was the primary interment of a single adult male in an extended and prone position with hands on the pelvis and the right leg crossed over the left. Burials CC-B16C and CC-B16D were clusters of human bone likely associated with Burial CC-B16A. The best explanation is that an individual was buried in crypt, perhaps in a flexed position given the position of the right leg (CC-B16A), and disturbed by the interment of CC-B16B before decomposition was complete. The primary individual was buried with a bib-helmet head pendant, which may indicate he was a member of the ruling family.	Gallareta Cervera et al. (2017); Houk (2016); A. Novotny et al. (2016, 2017)
CC-B17	2017	CC-15-N-4	Burial CC-B17 is a Late Preclassic burial of a young to middle age adult found shallowly buried beneath the plaza surface of the Upper Plaza. The individual was placed in an extended position with the head oriented to the north. A complete Society Hall Impressed bowl was intentionally placed over the skull. Subsequent excavations encountered Burial CC-B22 3 meters to the north of this burial (see below). A radiocarbon sample from this burial returned a 2-sigma calibrated date range of 154 BC–AD 27.	Gallareta Cervera et al. (2017); A. Novotny et al. (2017)
CC-B18	2017	CC-17-C-9	Late Classic Burial CC-B18 was found within the southeast corner of a bench in Structure D-41, in Couryard D-4. Burial CC-B18 consisted of two individuals. Individual CC-B18A was in a flexed position in the western part of the burial area, oriented east-west. No cranium was found with this individual. The second skeleton, Individual CC-B18B was also in a flexed position in the northeastern corner of the burial, oriented east-west.	Kilgore (2018); Kilgore et al. (2017); A. Novotny et al. (2017)

Table 12.4. List of Burials (continued)

Burial	Year	Lot	Context	Source(s)
CC-B19	2018	CC-15-V-07	The remains of two adults were recovered from Early Classic construction fill in the northeast corner of the Upper Plaza, one young in age and one possibly a male. The bones were in a secondary context, and it is not clear how they came to be commingled. The color and root etchings on the bone surface are similar but could be due to their common deposition in the primary context from which they were recovered. Ceramics from the context suggest these individuals were deposited in the Early Classic period, and a single radiocarbon date suggests one of the individuals died near the end of the Late Preclassic period or the beginning of the Early Classic period.	Gallareta Cervera et al. (2019); Novotny, Hughes, and Gallareta Cervera (2019)
CC-B20	2018	CC-15-V-16	Burial CC-B20 was the primary interment of an older individual, possibly a female, in a stone-lined crypt (Crypt 2) with capstones. The crypt was constructed on an earlier floor within a platform in the northeast corner of the Upper Plaza. The burial did not include grave goods. The skeletal elements were extremely well preserved, particularly the skull, but it is not immediately clear why the bones were so well preserved in this context. The lack of soil surrounding the bones, which is acidic and remains damp in the tropical climate of Belize, may have contributed to their good preservation. There were several pathologies identified, but none that were acute or unexpected for an individual of advanced age. The interment dates to the Early Classic period.	Gallareta Cervera et al. (2019); A. Novotny et al. (2023); Novotny, Hughes, and Gallareta Cervera (2019)
CC-B21	2018	CC-15-EE-06	Burial CC-B21 consists of the secondary interment of one individual who died during the Late Preclassic period. Although fragmentary, the few diagnostic elements suggest the individual was a possible female of middle to older adulthood. The secondary deposit was not marked by any formal grave architecture and dated to the Late Preclassic or Early Classic period based on ceramics found within the fill.	Gallareta Cervera et al. (2019); Novotny, Hughes, and Gallareta Cervera (2019)

Table 12.4. List of Burials (continued)

Burial	Year	Lot	Context	Source(s)
CC-B22	2019	CC-19-A-03	Burial CC-B22 was first discovered in 2018 as part of Subop CC-15-R, but the burial was not excavated until 2019. The interment contained one, adult individual, probably a male. The skull was covered by a Society Hall bowl and an unslipped jar were found next to the left humerus. A single radiocarbon sample returned a 2-sigma date range of 200–91 cal BC (PSUAMS# 6913; Sample CC-19-S15), confirming the Late Preclassic date for this burial. See Burial CC-B17, which is roughly contemporaneous and approximately 3 m to the south.	Gallareta Cevera and Houk (2019); Novotny, Bedrosian, and Copper (2019)
CC-B23			Number inadvertently skipped.	
CC-B24	2022	CC-21-C-07	Burial CC-B24 consists of the primary interment of a probable female, young adult individual. She was placed in an extended, supine position with head to the west within dry fill of a bench in the central room of Structure C-2. One ceramic vessel was placed in the grave, and a broken fragment of shell ornament was also recovered. The grave shows signs of reentry. Charcoal was encountered throughout the grave space and the bones of the left femur and pelvis, as well adjacent vertebrae of the lower back and left hand, were discolored in a way consistent with exposure to fire. The left arm and left leg were disturbed in antiquity; the left fibula was missing, the left patella was out of place, and the bones of the left arm were disarticulated. The ceramic vessel suggests a Late Classic date for the interment. Samples of charcoal and human bone were selected for AMS radiocarbon dating. A radiocarbon date from the bone sample returned a 2-sigma age range of cal AD 675–876 (Sample CC-21-S14; see Table 2.3, this volume). The charcoal fragment returned a 2-sigma radiocarbon date of cal AD 702–881 (Sample CC-21-S10; see Table 2.3, this volume).	Gallareta Cervera and Houk (2022); Novotny and Castillo (2022)
GJ-B01	2019	GJ-02-N-03	The skeletal remains present in Burial GJ-B01 were too fragmented to provide any detail as to who the individual was in life. The fragmentary state of the remains strongly suggests that the body decomposed elsewhere and was disinterred for an unknown amount of time prior to being re-interred in Structure B-1.	C. Novotny et al. (2019); Novotny, Bedrosian, and Copper (2019)

Table 12.4. List of Burials (continued)

Burial	Year	Lot	Context	Source(s)
GJ-B02	2019	GJ-02-O-07	The interment of one older adult, probable male was made into subfloor construction fill without any formal grave architecture in Structure B2. No grave inclusions were recovered. The only bones of the skull present were fragments of occipital and parietal, as well as six teeth. Although not well preserved, skeletal elements from the all other regions of the body were present and well-articulated, indicating that it was a primary interment. The absence of the skull in an interment where all other bones were represented, and the presence of red pigment suggest that the individual was subject to a mortuary ritual sometime after the body was originally placed under the floor. This may have occurred to inter a second individual, Burial GJ-B04 (see below), under the floor. A single radiocarbon date from the burial returned a calibrated 2-sigma date range of AD 907–1020 (PSUAMS# 6914; Sample GJ-S02). The Terminal Classic date for the burial is unexpectedly late.	C. Novotny et al. (2019); Novotny, Bedrosian, and Copper (2019)
GJ-B03	2019, 2022	GJ-02-A-07	Crews encountered Burial GJ-B03 near the eastern and northern edges of the chamber in a chultun, located in the approximate center of Courtyard B-1 at Gallon Jug in 2019. Burial GJ-B03 was not fully excavated due to time constraints, and excavations resumed in the 2022 field season. Burial GJ-B03 consisted of the primary interment of one individual in a chultun. The living created a simple cyst of unworked limestone rocks around the body, which they laid in a flexed position on its right side with head to the south. While it is likely that the entire skeleton was present, preservation was poor, and not all elements were observed for analysis. There were no clear grave goods placed with the individual, although excavators collected several artifacts from the matrix around the skeleton. A radiocarbon sample of bone collected in 2022 from the burial returned a 2-sigma date range of cal AD 1633–1666 (Sample GJ-02-S10; see Novotny et al, Chapter 4, this volume). If correct, this date suggests Burial GJ-B03 is a Postclassic or early Historic period interment. Another round of testing will be needed to confirm this date.	C. Novotny et al. (2019); Novotny, Bedrosian, and Copper (2019); Novotny and Castillo (2022)

Table 12.4. List of Burials (continued)

Burial	Year	Lot	Context	Source(s)
GJ-B04	2019	GJ-02-O-09	Burial GJ-B04, an adult, probably male, was interred in a simple pit grave within sub-floor fill in Structure B-2. He was interred in a flexed position with head oriented to the south. No artifacts were recovered from the grave space. Burial GJ-B04 was stratigraphically lower than Burial GJ-B02, however the missing facial bones and teeth and the red pigment found on Burial GJ-B02 suggest that the interment of Burial GJ-B04 may have disturbed Burial GJ-B02	C. Novotny et al. (2019); Novotny, Bedrosian, and Copper (2019)

Table 12.5. List of Tombs and Crypts

Site	#	Season	Provenience	Location	Source(s)
Ayiin Winik	Tomb 1	2023	Structure B-1, Lots AW-01-A-01 and -02	Looted tomb in small temple-pyramid (Structure B-1) in Southern Acropolis. Chert flake lenses cap the vaulted chamber. Those and the painted tomb walls (cream-colored panels bordered by red bands and bars) suggest an Early Classic date. Salvage excavations recovered several teeth and small jade beads.	Houk et al. (2023); Ingalls et al. (2023)
Ayiin Winik	Crypt 1	2023	Structure B-9, Lot AW-B	Looted crypt in looters' tunnel in eastern structure (Structure B-9) in Courtyard B-2, Southern Acropolis. One piece of bone collected from floor of tunnel	Houk et al. (2023)
Ayiin Winik	Crypt 2	2023	Structure B-9	Unlooted crypt in eastern structure (Structure B-9) in Courtyard C-2, Southern Acropolis. Rocks collapsing from the ceiling of the looters' tunnel into this mound revealed a small opening into the crypt. One broken ceramic vessel is visible in the small stone lined and capped chamber.	Houk et al. (2023)
Chan Chich	Tomb 1	--	Structure C-31	Looted tomb referred to as the King's Tomb; Late Classic (?)	Guderjan (1991)

Table 12.5. List of Tombs and Crypts (continued)

Site	#	Season	Provenience	Location	Source(s)
Chan Chich	Tomb 2	1997–1999	Upper Plaza, Lot CC-02-J-06	Tomb 2, Terminal Preclassic tomb in Upper Plaza (Burial CC-B02)	Houk et al. (2010); Robichaux (1998, 2000); Robichaux et al. (2000)
Chan Chich	Crypt 1	2016, 2017	Upper Plaza, Subop CC-15-G	Early Classic crypt in northern part of Upper Plaza (Burials CC-B16A–C)	Gallareta Cervera et al. (2017); Houk (2016)
Chan Chich	Crypt 2	2018	Upper Plaza, Subop CC-15-V	Early Classic crypt built on Middle Preclassic floor in the northeastern corner of the Upper Plaza (Burial CC-B20)	Gallareta Cervera et al. (2019); Houk (2019); A. Novotny et al. (2019, 2022)

Table 12.6. List of Caches

Site	Cache #	Season	Provenience	Context	Source(s)
Chan Chich	CC-C1	2014	CC-12-D-8	Structure A-1, penultimate phase. This cache contained 17 obsidian blades, found loose but grouped together in fill, resting on one of the capstones of Burial CC-B11.	Herndon et al. (2014)
Chan Chich	CC-C2	2019	CC-20-E-03	Central area of Structure A-4 platform. Initially discovered by contractors excavating pits for a new cell tower, this cache contained at least four pairs of lip-to-lip bowls and two obsidian blades. Ceramics suggest the cache dates to ca. AD 250.	Houk, Bedrosian, and McKinney (2019)

STONE MONUMENTS

Table 12.7 lists the stone monuments recorded within the BEAST permit area. To date, no monuments with legible texts or dates have been found in the area. The only monuments with evidence of carving are Stela 1 at Kaxil Uinic (see Harris and Sisneros 2012; Thompson 1939), Stela 2 and Altar 3 at Ayiin Winik (Houk et al. 2023), and Stela 2 at Tikin Ha (see Houk, Zaro et al. 2019).

Table 12.7. Recorded Stone Monuments in the BEAST Permit Area

BE#	Site	#	Location and Description	Source(s)
BE-01	Chan Chich	Stela 1	Main Plaza, base of Structure A-2. Uncarved and burned stela.	Guderjan (1991:43)
BE-02	Kaxil Uinic	Stela 1	Main plaza, base of Structure 3. Broken in two pieces, heavily eroded stela with evidence of carving, illegible; 1.95 m tall, 80 cm wide, 55 cm thick.	Guderjan et al. (1991); Harris and Sisneros (2012:52); Thompson (1939)
BE-02	Kaxil Uinic	Altar 1	Main plaza, base of Structure 3. Round, limestone altar (ca. 130 cm diameter; 30 cm thick), uncarved.	Guderjan et al. (1991); Harris and Sisneros (2012:56–56); Thompson (1939)
BE-03	Punta de Cacao	Stela 1	Plaza A, near base of Structure A-5. Uncarved stela.	Robichaux (2004:200)
BE-03	Punta de Cacao	Possible stela or altar	Plaza A, in front of Structure A-5. Large, uncarved block of stone, 82 x 82 x 40 cm, broken into two parts.	Hartnett (2005)
BE-04	Gallon Jug	Stela 1	Northern part of the plaza in front of Structure A-4. Upright, small uncarved stela with a hole in it. Dimensions not reported.	Kilgore, unpublished 2018 field notes
BE-04	Gallon Jug	Stela 2	Southwestern corner of the plaza between Structures A-2 and A-3. Uncarved, broken stela, laying flat. Dimensions not reported.	Kilgore, unpublished 2018 field notes
BE-04	Gallon Jug	Stela 3	Eastern end of the plaza, west of the southwest corner of Structure A-1. Uncarved stela discovered by Houk “floating” above the plaza in the roots of a fallen tree. Stela is 1.41 x 0.68 x 0.25 m.	Houk, unpublished 2018 field notes
BE-04	Gallon Jug	Stela 4?	Eastern end of the plaza, west of Structure A-1. Group of limestone fragments near centerline of Structure A-1 which may be a broken, uncarved stela.	Houk, unpublished 2018 field notes
BE-04	Gallon Jug	Altar 1?	Approximate center of Main Plaza. Small, broken, uncarved altar. Dimensions not reported.	Kilgore, unpublished 2018 field notes
BE-04	Gallon Jug	Altar 2	Center of Courtyard C-1. Large, heavily eroded altar; 1 m diameter and 0.5 m thick.	C. Novotny et al. (2023)
BE-07	Qualm Hill	Stela 1	Northeastern corner of Plaza A. Uncarved stela, laying flat; 1.8 m long, 0.6 m wide, and 0.4 m thick.	Cackler et al. (2007:121)
BE-07	Qualm Hill	Altar 1	Plaza B. Broken in half, plain altar measuring 1.5 m in diameter and 1 m thick.	Cackler et al. (2007:123)
BE-10	Gongora Ruin	Stela 1	In plaza in front of Structure 1. Small, uncarved stela. Note that BEAST was unable to re-locate this monument in 2014.	Guderjan et al. (1991:81); Sandrock and Willis (2014)

Table 12.7. Recorded Stone Monuments (continued)

BE#	Site	#	Location and Description	Source(s)
BE-11	Ix Naab Witz	Stela 1	Upper plaza near southwestern corner of Structure 6. Small, uncarved stela, 1.05 m tall, 40–60 cm wide, 35 cm thick.	Sandrock (2013)
BE-18	Tikin Ha	Stela 1	Main Plaza, base of Structure A-9. Found face down in front of Structure A-9. It appears that looters had originally cleaned around this monument and attempted to lift it. The monument is uncarved and measures 128 x 78 cm, with a thickness of 35 cm. It is clearly broken at one end, if not both ends. A second fragment found nearby may have been part of Stela 1 and measures 68 x 60 cm, with a thickness of 32 cm. We collected nearly 90 Tepeu 3 sherds, with a few possible Postclassic sherds in the mix while cleaning the stela.	Houk, Zaro, et al. (2019)
BE-18	Tikin Ha	Stela 2	Main Plaza, southeastern corner between Structures A-3 and A-4, with 23 cm east of Altar 2. The base of this stela is *in situ*, but the upper portion is broken into approximately 16 large fragments and a half dozen small fragments. The base is 34 cm thick, 122 cm wide, and 42 cm tall. The base extends another 43 cm below the surface. The top is too fragmented to estimate the monument's original height. Traces of faint carving are present on one fragment from the top portion of the monument, but no hieroglyphs were observed. The stela and altar pair may be associated with a formal entrance into the plaza through the gap between Structures A-3 and A-4.	Houk, Zaro, et al. (2019)
BE-18	Tikin Ha	Stela 3	Main Plaza, base of Structure A-3. This uncarved monument is broken into two pieces. The base stands upright and appears to be *in situ*. The second fragment was also encountered in an upright position on the ground surface adjacent to the basal fragment, but it is unclear if it fell into this position or was reset sometime later. The basal fragment measures 90 cm tall, 96 cm wide, and 31 cm thick. The second fragment measures 0.91 m tall, 73 cm wide, and 29 cm thick.	Houk, Zaro, et al. (2019)

Table 12.7. Recorded Stone Monuments (continued)

BE#	Site	#	Location and Description	Source(s)
BE-18	Tikin Ha	Stela 4	Between Groups A and B. Plain, broken stela set midway between East Plaza and Courtyard A-5. The monument faces east-west (its long axis is oriented 10° east of north), toward the two architectural groups and may be associated with an unmapped sacbe connecting the two groups. The base is *in situ*, but the top of the stela is broken off, laying to the east of the base. Base is 75 cm tall (above ground surface), 97 cm wide, and 43 cm thick. The top is broken into two pieces and would have added 61 cm to the height of the monument.	Houk, Zaro, et al. (2019)
BE-18	Tikin Ha	Altar 1	Courtyard A-3. Altar 1 sits in the center of Courtyard A-3, framed by Structure A-17 to the west and Structure A-18 to the south. The primary piece lies flat and measures 100 x 80 cm, is oriented 71° east of north, and is 32 cm thick. It does not appear to be carved, but it is eroded and obscured by roots making it difficult to determine with certainty. Several smaller stone fragments lie just west of the monument and may have broken off it.	Houk, Zaro, et al. (2019)
BE-18	Tikin Ha	Altar 2	Main Plaza, southeastern corner between Structures A-3 and A-4, with Stela 2. Set only 23 cm west of Stela 2, this eroded, uncarved altar is approximately 35 cm thick, 108 cm long, and 78 cm wide (see Figure 8.4). Small pieces have spalled off its edges, so it was originally larger. It is oriented approximately 16° west of north. In plan view, it is roughly rectangular with rounded corners. Excavations beneath the monument did not encounter a cache. The stela and altar pair may be associated with a formal entrance into the plaza through the gap between Structures A-3 and A-4.	Houk, Zaro, et al. (2019)
BE-18	Tikin Ha	Altar 3	Courtyard D-1. Altar 3 sits in the central area of Courtyard D-1. This small, uncarved monument measures 100.5 cm long by 85 cm wide and is 15 cm thick. It is rectangular in plan view.	Houk, Zaro, et al. (2019)

Table 12.7. Recorded Stone Monuments (continued)

BE#	Site	#	Location and Description	Source(s)
BE-30	Ayiin Winik	Stela 1	Courtyard B-1 at base of Structure B-1. This monument is broken into two pieces; the top has cracked off and is laying on its back, while the base is still upright in the ground. The top fragment measures 143 x 104 cm and 35 cm thick, while the visible portion of the base is 63 x 88 by 30 cm thick. Together, this stela would have stood over 2.31 m tall. It appears to be uncarved, although like the other monuments is heavily weathered. Terminal Classic figurine head and Postclassic *incensario* sherds recovered while cleaning around the monument.	Houk et al. (2023)
BE-30	Ayiin Winik	Stela 2	Courtyard C-1, 2 m west of Altar 3 at the base of the looters' trench in Structure C-1, on the north side of the trench. Broken and mixed with backdirt from the looters' trench in Structure C-1. The visible fragment measures approximately 92 x 55 cm and 28 cm thick. While still weathered, the limestone appears smoother and more fine-grained than Altar 3 and other monuments documented at the site. It bears faint traces of carved motifs, although no figures or glyphs are now discernable. A small fragment of similar limestone (roughly 30 x 40 cm) was found directly south across the looters' trench and is possibly the stela's base. It was uncarved.	Houk et al. (2023)
BE-30	Ayiin Winik	Altar 1	Approximate center of Plaza A-1. This large limestone monument is roughly 116 x 124 cm, with a thickness of 41 cm. Lying flat on the surface, the limestone is heavily weathered, and the altar is cracked down the center with other small pieces visibly cracking or exfoliating off the sides of the monument. No carving is visible on the eroded surfaces.	Houk et al. (2023)
BE-30	Ayiin Winik	Altar 2	Approximate center of Courtyard A-2. Altar 2 is similar in size and shape to Altar 1, measuring some 123 x 136 cm and 33 cm thick. It is also heavily weathered and fragmented and lacks evidence of carving. The coarse limestone has lots of small gravel and conglomerate inclusions that are weathering out, leaving gravel on and around the monument and giving it a craggy appearance.	Houk et al. (2023)

Table 12.7. Recorded Stone Monuments (continued)

BE#	Site	#	Location and Description	Source(s)
BE-30	Ayiin Winik	Altar 3	Courtyard C-1 at the western end of the looters' trench into Structure C-1. Altar 3 is extremely large, 95 x 146 cm and 63 cm thick, but heavily fragmented. Located in Courtyard C-1 at the western end of the looters' trench into Structure C-1, Altar 3 appears to be resting on a plaster plaza floor. However, because both the altar, floor, bedrock, and construction fill are all eroded limestone, it was difficult to distinguish one from the others within the looters' trench. The top surface and southwest side of the altar are both faintly carved, although the inscription is obscured by erosion. Initial observations of the altar suggest the top may have featured a central cartouche surrounded by smaller elements. The carvings on the side of the altar appear to be the outline of two or three individual glyph blocks; although unreadable, these were very likely part of a larger text. Additionally, several stone fragments in the looters' rock pile nearby are from the altar; at least one of these was also faintly carved. Stela 2 is on its side about 2 m west of Altar 3 (see below).	Houk et al. (2023)

STUDENT RESEARCH

Much of the research conducted by CCAP and BEAST supports graduate student thesis projects. Beginning with the 2012 season, eight graduate students and one undergraduate have collected thesis data through CCAP or BEAST research (Table 12.8).

Table 12.8. List of Theses Resulting from CCAP and BEAST Research

Harris, Matthew C.
2013 A Short Walk from Paradise: Initial Excavations at Kaxil Uinic. Unpublished MA thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Kelley, Krystle
2014 Establishing the Acropolis: Two Seasons of Investigations in the Upper Plaza of Chan Chich, Belize. Unpublished MA thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Vazquez, Edgar
2015 In Service of the King: The Form, Function, and Chronology of Courtyard A-3 at Chan Chich, Belize. Unpublished MA thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Table 12.8. List of Theses (continued)

Booher, Ashley M.
2016 Assessing the Form and Function of the *Sacbeob* and Associated Structures at Chan Chich, Belize. Unpublished MA thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Bonorden, Alyssa Brooke
2016 Comparing Colonial Experiences in Northwestern Belize: Archaeological Evidence from Qualm Hill Camp and Kaxil Uinic Village. Unpublished MA thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Sandrock, David
2017 BEAST Mode: Two Seasons of Archaeological Survey on the Gallon Jug-Laguna Seca Property in Northwestern Belize. Unpublished MA thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Degnan, Bridgette
2018 An Evaluation of Ancient Maya Urban and Suburban Lithic Production at Late Classic Chan Chich, Belize. Unpublished honors thesis, University of Virginia, Charlottesville.

Kilgore, Gertrude B.
2018 Maya Household Identity and Domestic Activity Areas at Courtyard D-4, Chan Chich, Belize. Unpublished master's thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

Castillo, Leann
2023 A Bioarchaeological Study of Life History and Body Treatment at the Maya Site of Chan Chich, Belize. Unpublished master's thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

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2016 Archaeological Investigations at Kaxil Uinic and Qualm Hill, Two Colonial Period Sites in Northwestern Belize. *Research Reports in Belizean Archaeology* 13:337–347.
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Booher, Ashley
2016a Assessing the Form and Function of the *Sacbeob* and Associated Structures at Chan Chich, Belize. Unpublished master's thesis, Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.
2016b Results of the 2016 Norman's Temple Complex Investigations at Chan Chich. In *The 2016 Season of the Chan Chich Archaeological Project*, edited by Brett A. Houk, pp. 39–66. Papers of the Chan Chich Archaeological Project, Number 11. Department of Sociology, Anthropology, and Social Work, Texas Tech University, Lubbock.

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