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THE PALENQUE MAPPING PROJECT:
SETTLEMENT AND URBANISM AT AN ANCIENT MAYA CITY

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THE PALENQUE MAPPING PROJECT:
SETTLEMENT AND URBANISM AT AN ANCIENT MAYA CITY

By

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Dissertation

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THE PALENQUE MAPPING PROJECT:
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Supervisor: Brian Stross

The Palenque Mapping Project (1998-2000) intensively surveyed the ancient Maya ruins of Palenque, in Chiapas, Mexico. The project covered 2.2 square kilometers of the city's jungle shrouded plateau, documenting 1481 structures and over 16 linear kilometers of terracing. After a brief summary of Palenque's mapping history, this dissertation presents the site's new map. Each group within the city's boundaries is discussed individually and illustrated with a detailed map. These new maps, combined with selected data from the last 100 years of excavation, are then used to present a preliminary evaluation of Palenque's settlement pattern. Aspects including settlement density, population estimates and land use strategies are the primary topics of discussion. The degree of urbanism achieved at Palenque is also evaluated. Through comparison to other well-documented ancient Mesoamerican cities, Palenque is shown to have had an extremely high settlement density and one of the most extensive public works systems ever built by the Maya. The conclusion of this study provides a low-impact excavation plan, one not possible before the new map, designed to clarify three still poorly understood aspects of Palenque; chronological development, subsistence strategies and social organization.

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CHAPTER 1: INTRODUCTION

The ruins of Palenque, nestled in the foothills of Chiapas, Mexico (Map 1.1), were once a major capital of Classic Maya civilization (AD 250-900). Today, more than 200,000 tourists per year visit the site. The last 100 years of archaeology at Palenque focused on the exploration and restoration of its beautiful ceremonial center.

Map 1.1 Regional Map

However, thanks to a 1997 agreement between Mexico's Instituto Nacional de Antropologia y Historia (INAH) and the California-based Pre-Columbian Art Research Institute (PARI), we are now beginning to improve our understanding of Palenque's outer regions. As part of that agreement a new, intensive survey began, directed by your author and funded by the Foundation for the Advancement of Mesoamerican Studies, Inc. (FAMSI).

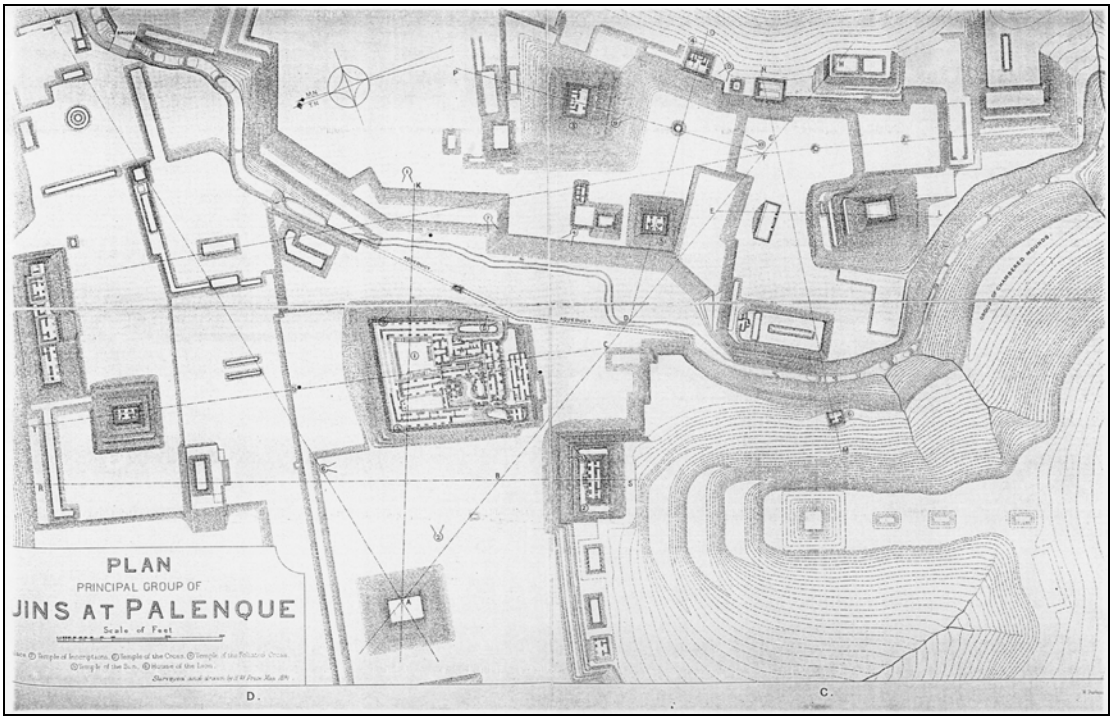
The topic of this dissertation is the new map and what it can tell us about Palenque as an urban center. Chapter 2 presents map along with observations made during the course of the survey. Each group defined within the city is discussed individually in terms of the nature of its architecture, the topography upon which it was built, and, when applicable, the water management features it contains. Chapter 3 discusses what the map can tell us about Palenque's settlement pattern. After first presenting settlement density and population estimates, it concludes with an analysis of land use strategies and how they compare to various theories of social organization. Chapter 4 examines and evaluates Palenque's degree of urbanization through a comparison to other major Mesoamerican sites. The concluding chapter, Chapter 5, presents your author's ideas of how continued survey and preliminary excavations can further clarify settlement patterns, chronology, subsistence strategies and many more unknowns regarding Palenque's development as an urban center.

Previous Research

The Maya abandoned Palenque between AD850 and 900. Roughly 900 years later Spanish expeditions began to "rediscover" it. Between 1784 and 1786 the Spanish launched three consecutive expeditions. Reports, drawings and maps were sent to Spain and subsequently lost, some never to be found again. The report from a fourth Spanish expedition in 1807 survived but was not published until 1831, after the Mexican War of Independence. Palenque's first "tourists" began to arrive in the mid-nineteenth century. European and American explorers including Waldeck, Caddy and Walker, Stephens and Catherwood, and Charnay visited the site and published their accounts in adventure oriented and popular literary styles. Palenque's now mystic reputation is fueled by those romantic early accounts.

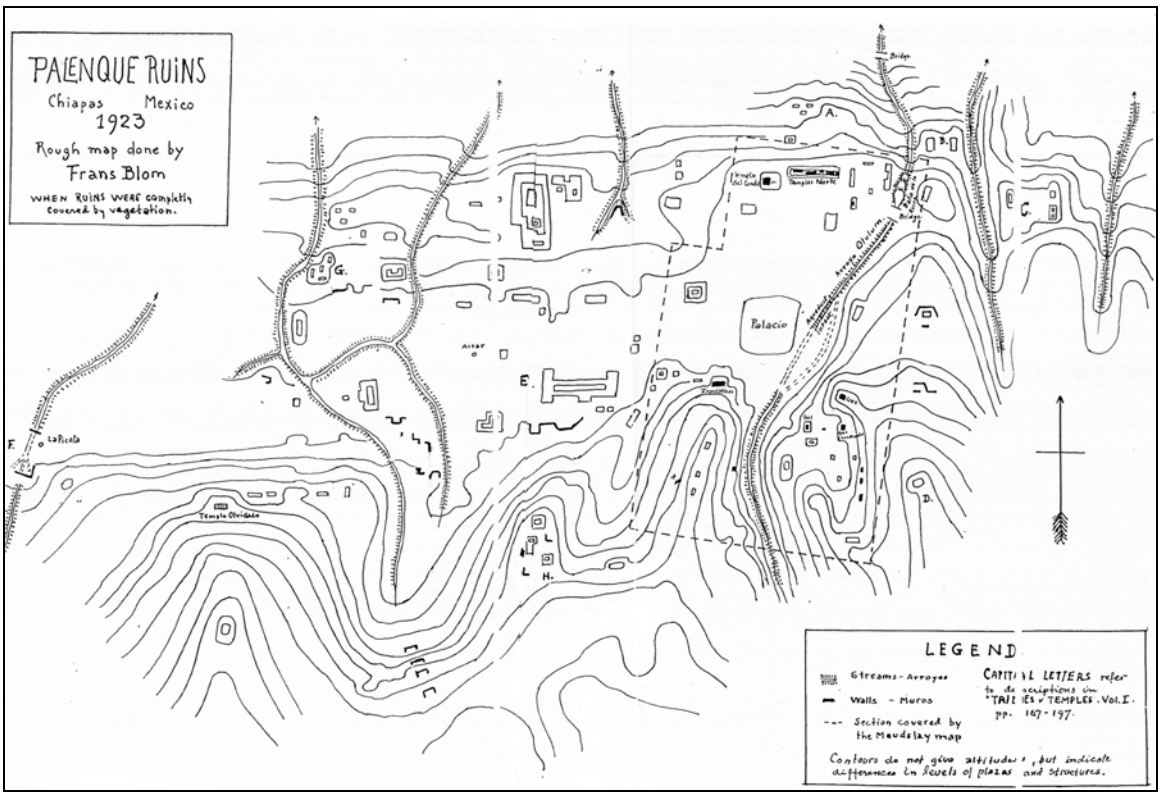
Formally trained archaeologists finally took notice of Palenque in the late 1800s. Teobert Maler took the first series of photos of Palenque in 1877 using newly developed photographic equipment. Inspired by those photos and previous written

accounts, Alfred Maudslay began the first excavations at Palenque during the 1890s (1889-1902).



Map 1.2 Price's 1891 map

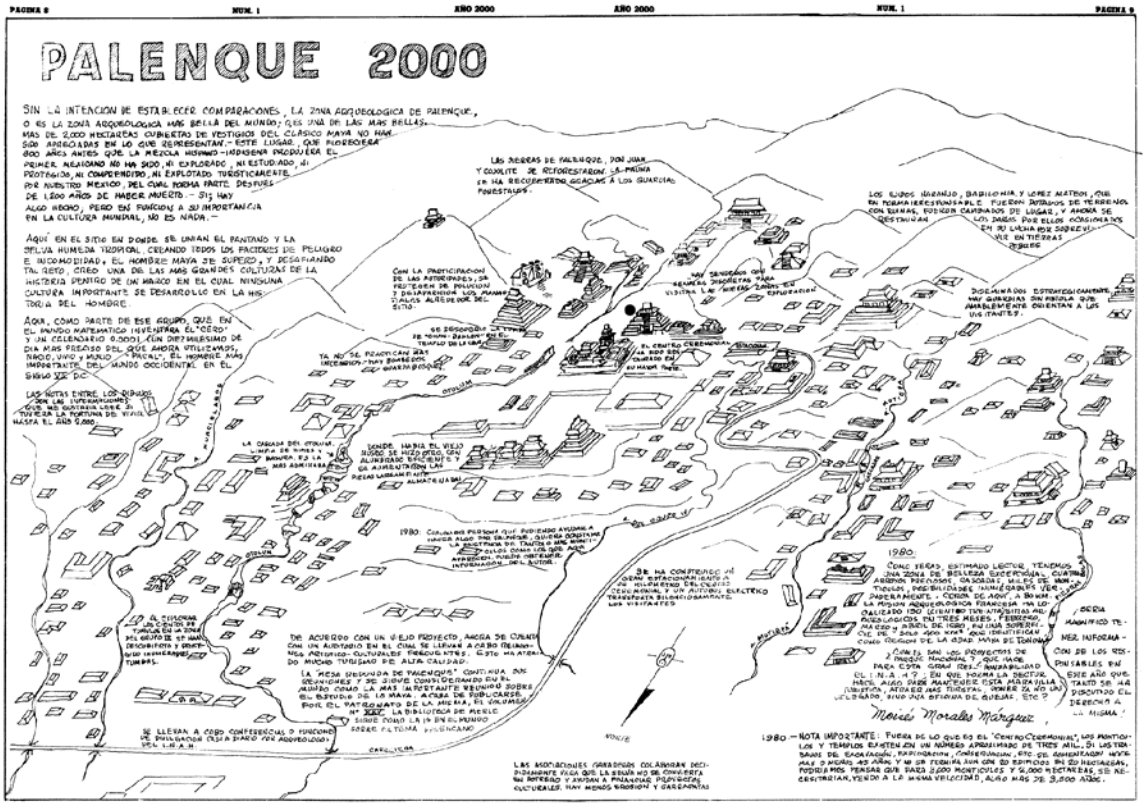
Maudslay's surveyor, H.W. Price, produced the first accurate map of the city's central precinct (Map 1.2). Though it covers only a small section of the city, Price's map remains one of the most accurate ever published on Palenque. After a hiatus during the Mexican Revolution, research at Palenque picked up again, this time under the direction of Franz Blom. Between 1922-1927 Blom surveyed the site and its immediate periphery. He found many outer groups and named them using an alphabetic designation system (Map 1.3). His map, though it covers roughly the same area as the Palenque Mapping Project (PMP) map, depicts only the city's largest structures. As was the practice in the 1920s, house mounds were disregarded as insignificant.



Map 1.3 Blom's 1923 map

The fifty years after Blom's map saw a surge of excavation and research projects, all of which focused on Palenque's central precinct. Mexican archaeologists Miguel Angel, Alberto Ruz and Jorge Acosta were the major project directors of the time. Ruz's 1952 discovery of Pakal's tomb received global attention and instantly made Palenque one of the Ancient Maya's most celebrated ruins. It was not until the 1980s that research attention returned to Palenque's periphery. As part of a 1980 local newspaper article entitled "Palenque 2000", Palenque resident and tour guide Moises Morales drew a fictitious map of what he believed Palenque would look like in the year 2000 (Map 1.4). It demonstrated that, at the time, Morales knew more about Palenque's periphery than any other professional of the site. Prophetically, the

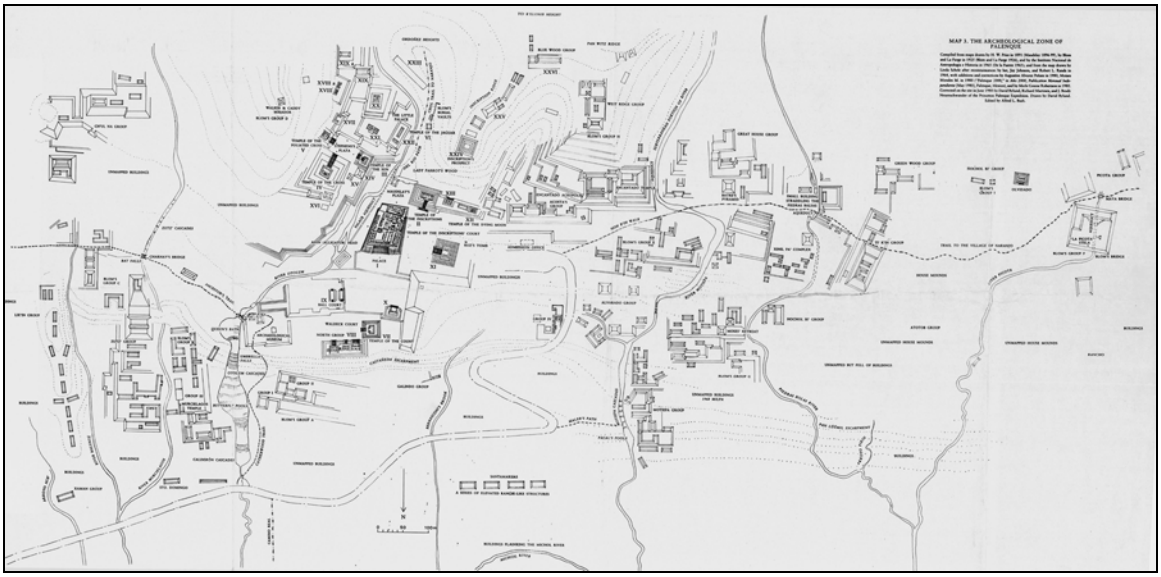
Morales map predicted that by the year 2000 researchers would have documented 1000's structures in the city.



Map 1.4 Morales' 1980 map

In 1983, a new map compiling all previous maps (including the Morales map) was published in Merle Green Robertson's in the first volume of her *Sculpture of Palenque* series. Reconnaissance survey data collected in 1974 by Linda Schele, Robert Rands and Jay Johnson was also incorporated into the Robertson map. Though Robertson's map was the most inclusive available, it contains large areas marked as "unmapped buildings" (Map 1.5). The Palenque Mapping Project, supported by Robertson's Precolumbian Art Research Institute (PARI) set out to

improve on that map, both in detail and accuracy. Chapter 2 presents the results of that project.



Map 1.5 Robertson's 1983 map.

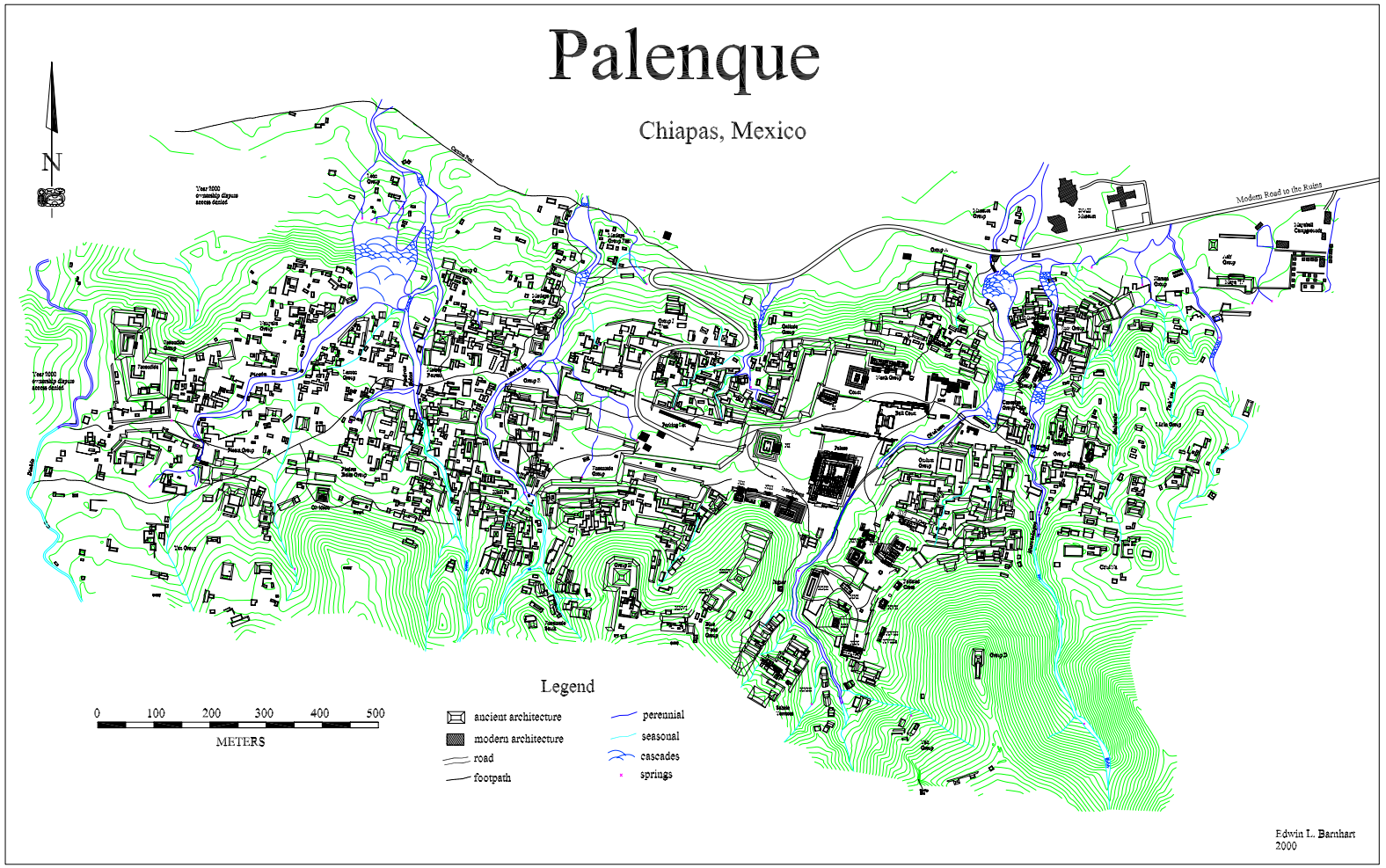
CHAPTER 2: THE MAP OF PALENQUE

The Palenque Mapping Project (PMP) was completed in August of 2000. The project recorded a total of 1481 structures and over 16 linear kilometers of terracing (Map 2.1). Robertson's 1983 map covered essentially the same area and contained only 329 structures. An area of 220 hectares was investigated over the course of 18 months and determined to be over four times more densely settled than previously understood. Data points were taken at every building corner, river's edge and topographic change, over 24,500 points in total. Accuracy was one of the project's major goals and as a result the locations of features on the map are correct within +/- 20 centimeters of error. The over 1000 newly recorded structures range from small, half meter tall platforms to the largest structure ever found in Palenque, the Escondido Temple.

Survey and Mapping Methodology

The survey methodology was designed to achieve 100% coverage of a 1x3 kilometer area. Computer software allowed the survey crew to have daily-generated maps of what they covered and which areas needed further documentation. Water-resistant notebooks were used to record the data and accompanying field sketches. The survey instrument, a *GTS-211D* total station on loan from the Topcon Corporation, recorded data points by bouncing light off a movable prism. The prism was placed in a desired locations and the instrument recorded its position in reference to its own. Locations where the instrument was to be set up were given individual station numbers and marked with five-inch steel nails. Each new station was established by sighting it from the prior station. The crew moved the instrument in loops of stations, regularly returning to previously established locations in order to monitor and control the accumulation of error.

The data entered from the survey was recorded as three-dimensional points, one for each shot taken in the field. Those 3-D points were then manipulated in



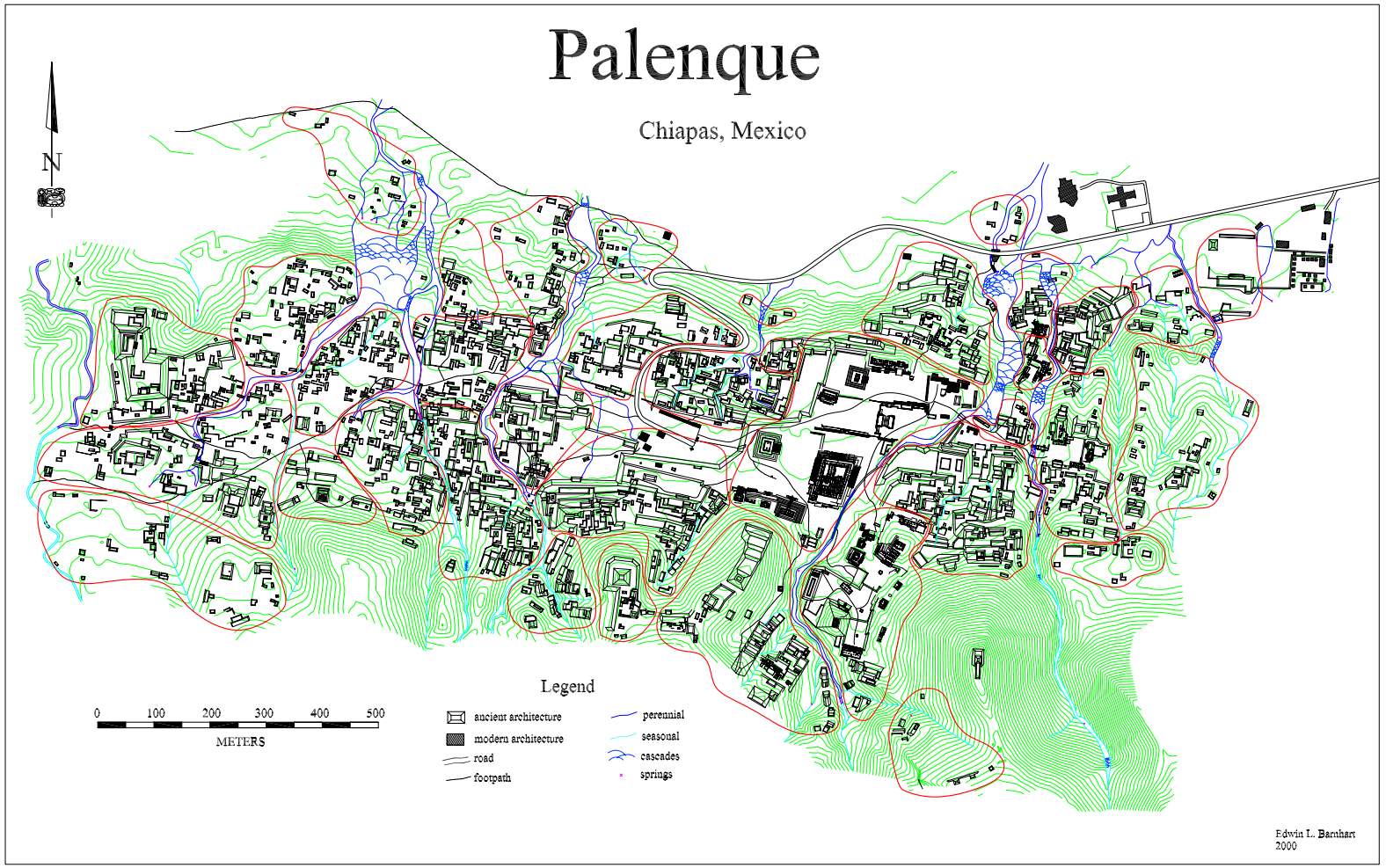
Map 2.1 The PMP 2000 Map

Foresight, a professional survey software package, to create a map of contour lines and structure footprints. This process allowed the map to be checked in the field as it was generated, ensuring accuracy and completeness. The *Foresight* file was transferred to *AutoCAD* (computer aided drafting software) at the conclusion of the season and combined with digital architectural drawings to create the final maps.

The coordinate grid begun in the 1998 season was expanded as the survey continued outward. The grid's point of origin, designated 8000N, 8000E, is located on the west side of the Temple of the Cross. Its location was chosen to link with a small grid of benchmarks placed in the Cross Group by INAH archaeologist Rosalba Nieto in the 1980s. The PMP placed benchmarks like Nieto's in twelve new locations at the site, all in outer groups and marked with their coordinates.

Structure Designation

Each structure encountered during survey must be given a designation. In the case of Palenque, this presents a methodological problem. The major structures of the site already have designations, mostly roman numerals. The groups of the periphery, however, were named during different projects resulting in a mixture of designation systems. Some groups have received more than one designation, creating confusion in the literature. The task of the PMP was to use a designation system that did not require changing existing names and at the same time built upon an existing system. It was decided that using the oldest, most expansive designation system was the best solution. The first project to map Palenque's periphery was Blom's in the 1920s. His system identified peripheral structures by group and gave each an alphabetic designation. Eventually, they became known as Blom's Groups A through J. The PMP chose to build from the Blom's Group system and assigned each structure a letter reflecting its group affiliation and a number individualizing it within the group. Outer groups not clearly identified by Blom or Robertson were assigned new names.



Map 2.2 The PMP Map with group boundaries

Discussions by Group

In keeping with the designation system begun by Blom in the 1920s, discrete regions of Palenque have been divided into groups (Map 2.2). The extremely dense settlement pattern encountered made identifying group boundaries difficult. As a general rule, natural features like rivers and arroyos were used as group boundaries. Some boundaries were established along monumental terrace faces. In a few cases (i.e. Group J West and the Piedras Bolas Group) modern trails and roads were used as boundaries. While not an ideal system of sub-division, the groupings presented in this report were the best solution to the issue of compatibility with previous publications. A list of dimensions for each structure mapped appears in Appendix A.

The Cross Group (Map 2.3)

Richard Bidstrup, chief topographer for the Proyecto Grupo de Las Cruces (PGC) in 1997 and 1998, oversaw the survey of the Cross Group. Studio Mexico, lead by Logan Wagner of the University of Texas at Austin made measured drawings of each exposed structure for the PGC. The new site map incorporated those drawings, with additions by your author to identify buried architecture. The small structures named Monticulo 1 and 2 were uncovered by the PGC in August of 1998 and added to the current map. The current map also illustrates Temple XIX's architecture as revealed and consolidated by the PGC in 1999 and 2000.

Central Palenque (Map 2.4)

The central precinct of Palenque is the most extensively studied portion of the site. As early as 1891, H.W. Price had made architectural drawings and a beautiful topographic map of the center (Maudslay 1889-1902). Subsequent maps of the center were published by Noguera (1926), Escalona (1933), Fernandez (1936), and Berlin (1940). The most updated map available up until now was published in the *Sculpture of Palenque*, Volume 1 (Robertson 1983).

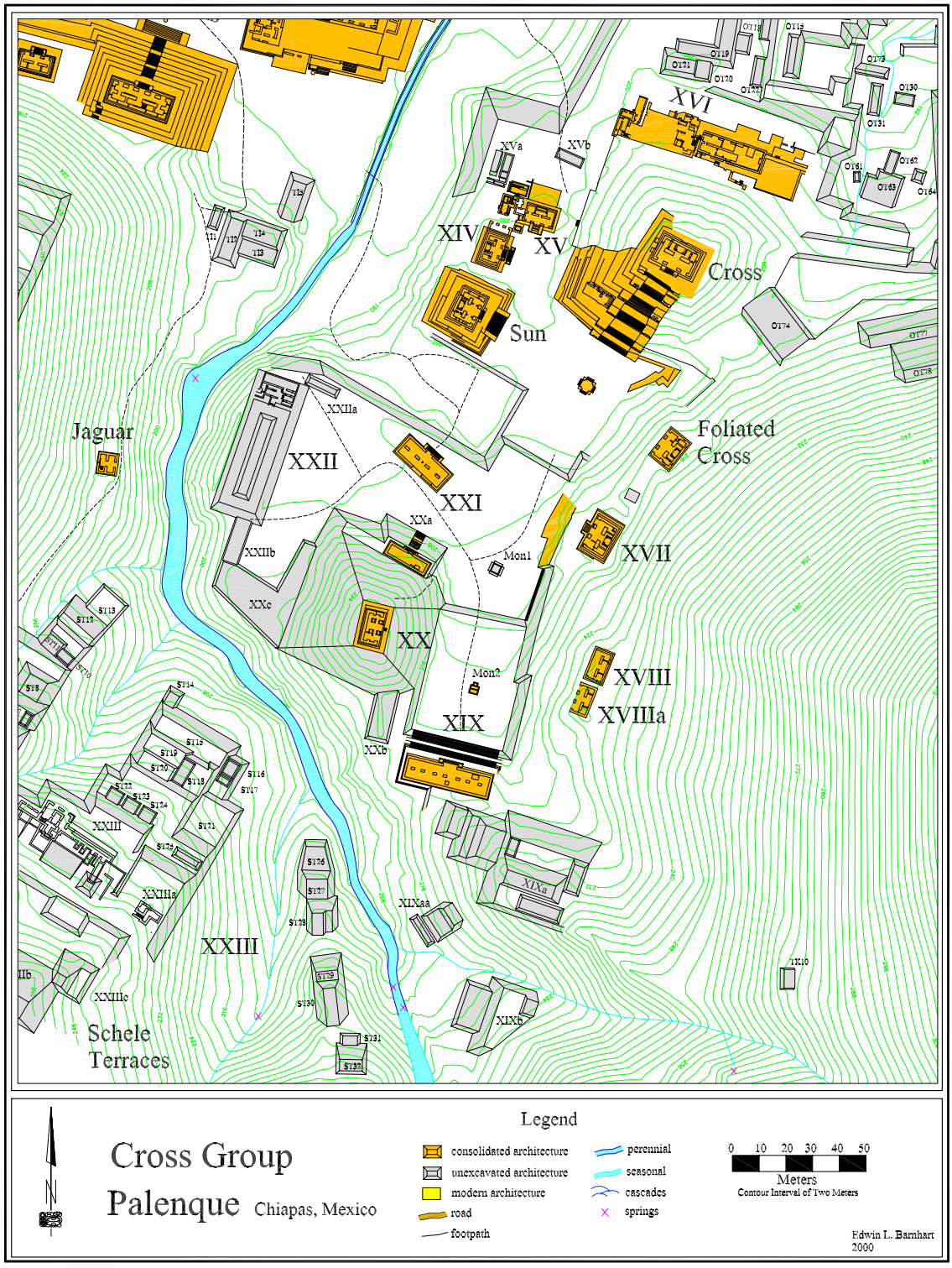


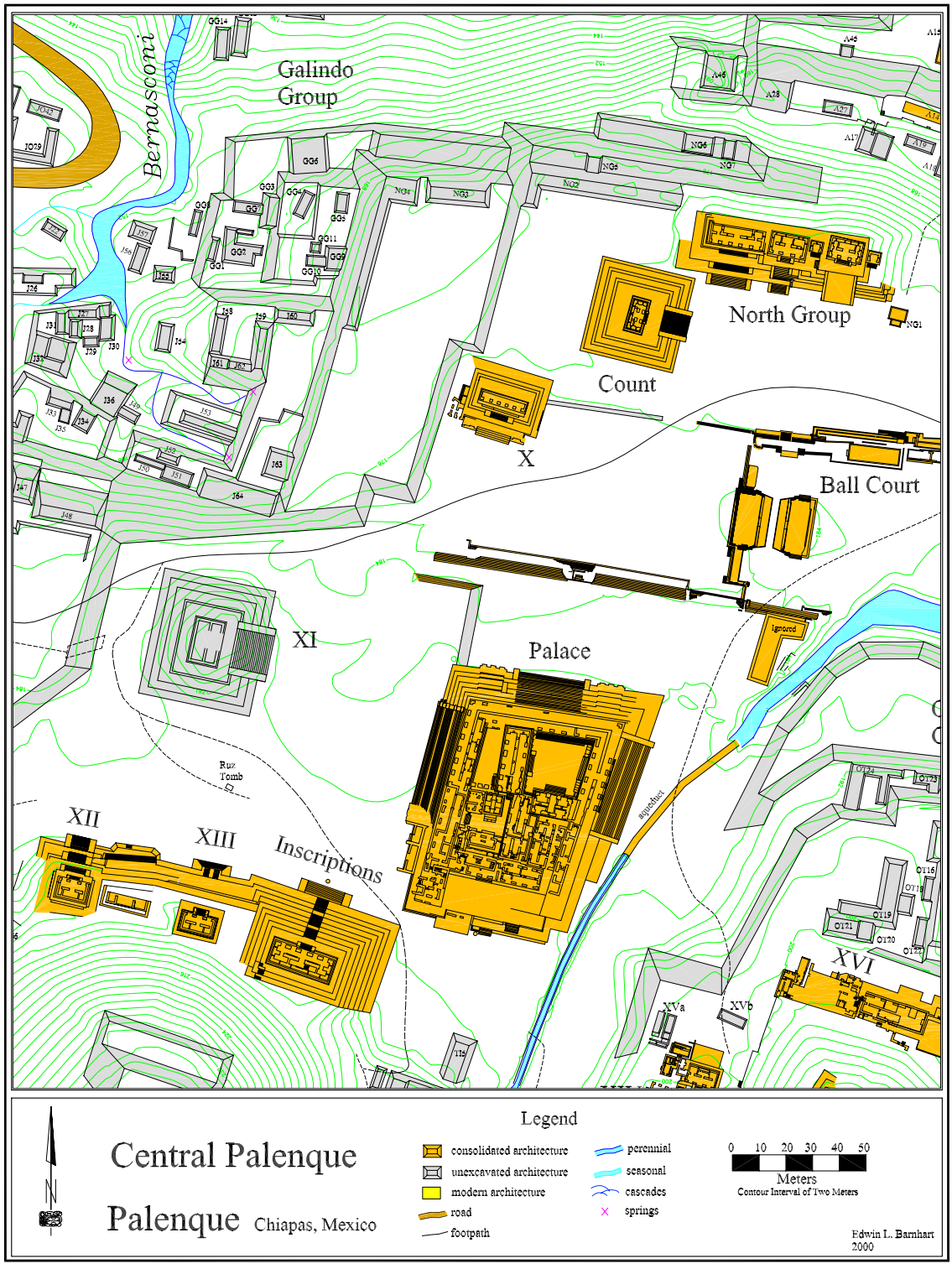
Figure 2.3 The Cross Group

In the late 1980s and 1990s Palenque Site Director, Arnoldo Gonzalez Cruz, conducted multiple consolidation projects in the center, including the east side of the Palace, Temples XII and XII, Temple X, the Ballcourt, and the Ignorado. Each of these recently restored architectural features were measured, drawn, and incorporated into the current map. Aside from monumental architecture, three smaller groups of structures were directly associated with the center; the Camp Group, the Temple of the Inscriptions Group and the small buildings around the North Group.

The Camp Group is thus named because it occupies the same area as the modern INAH archaeological camp. Price's 1891 map shows a security guard structure in the same location. Later, in the 1950s, the site museum was built there. In the 1970s the museum was converted into archaeological team quarters, lab spaces, and storage facilities and has remained that ever since. The Camp Group consists of eight small structures arranged around an irregularly shaped courtyard. The north end is bounded by the edge of the Casteneda Escarpment. On its east side flows the Otulum, which falls off the escarpment into cascades and the Queen's Bath. A bridge in the Camp Group allows the tourist trail to cross the Otulum, providing access down to the Murcielagos Group and the modern museum. Though the top of this bridge is reinforced concrete, the architecture underneath is a corbelled arch tunnel built in the Classic Period. Known at least since Price's 1891 map, it stands as a rare example of a still functioning ancient Maya bridge.

The Temple of Inscriptions Group is located directly east of the temple itself, at the head of the trail leading up to the Temple of the Jaguar. Four of the group's five structures are interconnected on a small plateau six meters above the plaza. The fifth structure, built into the plateau at plaza level, has been partially consolidated but never given a formal designation. This current map identifies it as structure TI5.

The North Group has been historically defined as the five temples standing upon one platform designated collectively as Temple VIII. In addition to these temples, there are seven other structures of lesser size associated with the group, designated by the PMP as NG1-7. NG1, located at the southeast corner of the North



Map 2.4 Central Palenque

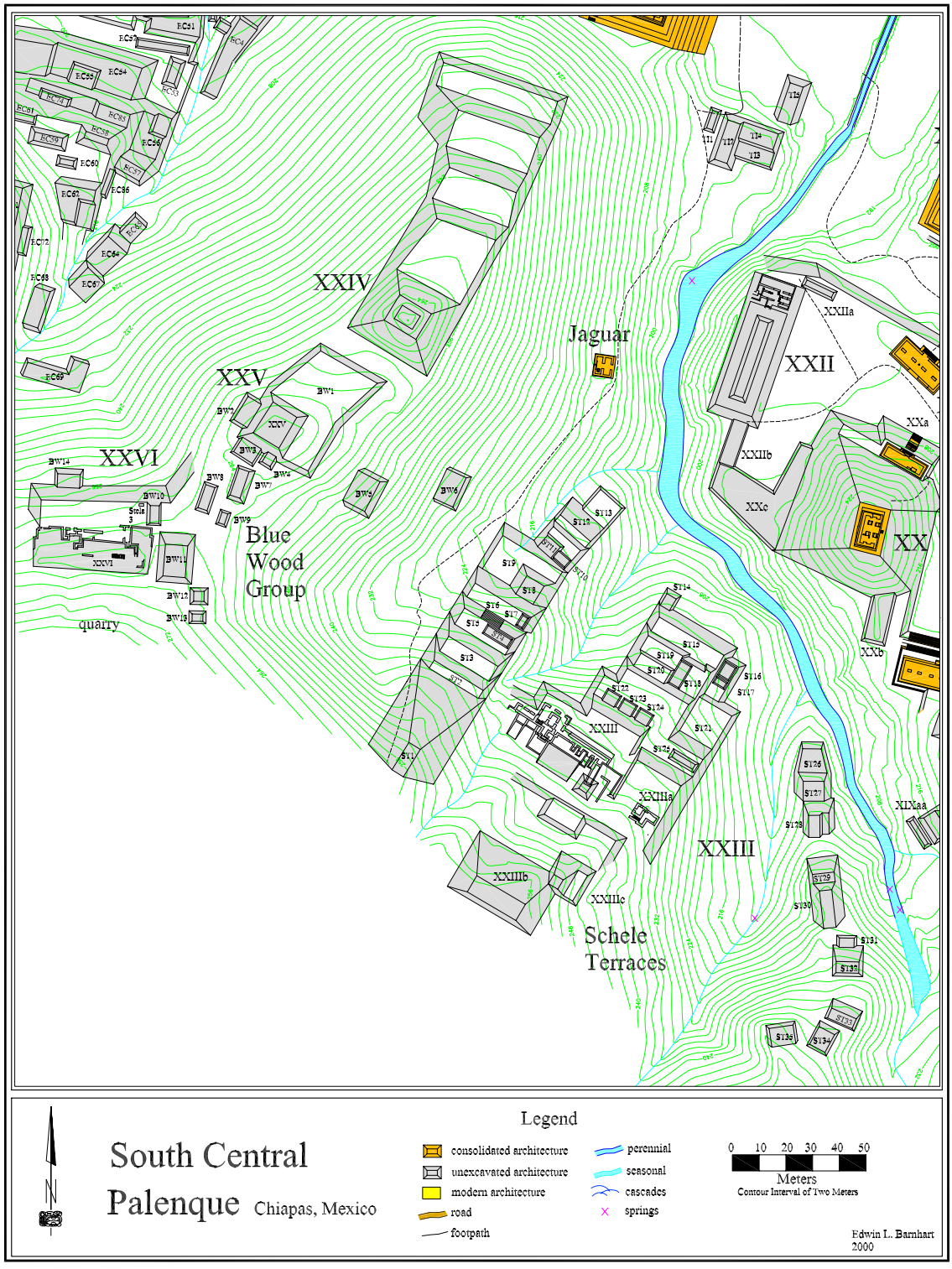
Group platform, is consolidated and has a south-facing staircase. A series of two meter tall range structures extend from the North Group's west side for 110 meters. These structures,
designated NG2, 3, and 4, bound the north edge of two open plazas, one wrapping around the Temple of the Count, the other extending south to Temple XI. Structures NG6 and 7 are low-lying platforms, less than one half meter in height, located upon a terrace linking the North Group to the western edge of Group A.

South Central Palenque (Map 2.5)

South Central Palenque includes the Temple of the Jaguar and the areas designated the Blue Wood Group and the Schele Terraces. The foot trail leading to the village of Naranjo cuts between the groups as it winds up the mountainside.

At the northern end of the Blue Wood Group, Temple XXIV stands twelve meters in height. Descriptively named "Inscriptions Prospect", Temple XXIV looks down over the Temple of the Inscriptions. Extending from its north side are four large terraces that step down the steep hillside to the back of Temple XII. Today, when one stands in front of the Temple of Inscriptions they can see the temple's roof comb and a wooded hillside towering above. Temple XXIV and its northern terraces, now covered, would have originally made the entire hillside appear as one massive temple, dwarfing the Temple of Inscriptions below.

The rest of the Blue Wood Group snakes back to the south following the shape of the flat ridge top and arranged around two main structures, Temples XXV and XXVI. Temple XXVI is in an excellent state of preservation. Figure 2.1 shows a reconstruction view drawn as part of the PMP investigation of the structure. A measured drawing of its exposed architecture was made and incorporated into the map. A similar drawing made by Blom demonstrates the building was in the same condition at least as early as 1923. On the northeast corner of Temple XXVI's frontal patio lies Stela 3. Broken, fallen, and uncarved, it was easily over looked by earlier projects. Though fragmented and eroded, its dimensions can be estimated at 2.5m



Map 2.5 South Central Palenque

high, 70cm wide, and 40cm thick. Directly south of Temple XXVI, on the hillside above, lies the first limestone quarry ever identified at Palenque. An outcrop of limestone, approximately 30m in length, has partially carved blocks strewn in front of it. It stands to reason that the Blue Wood Group was connected in some way to the exploitation of this nearby resource.

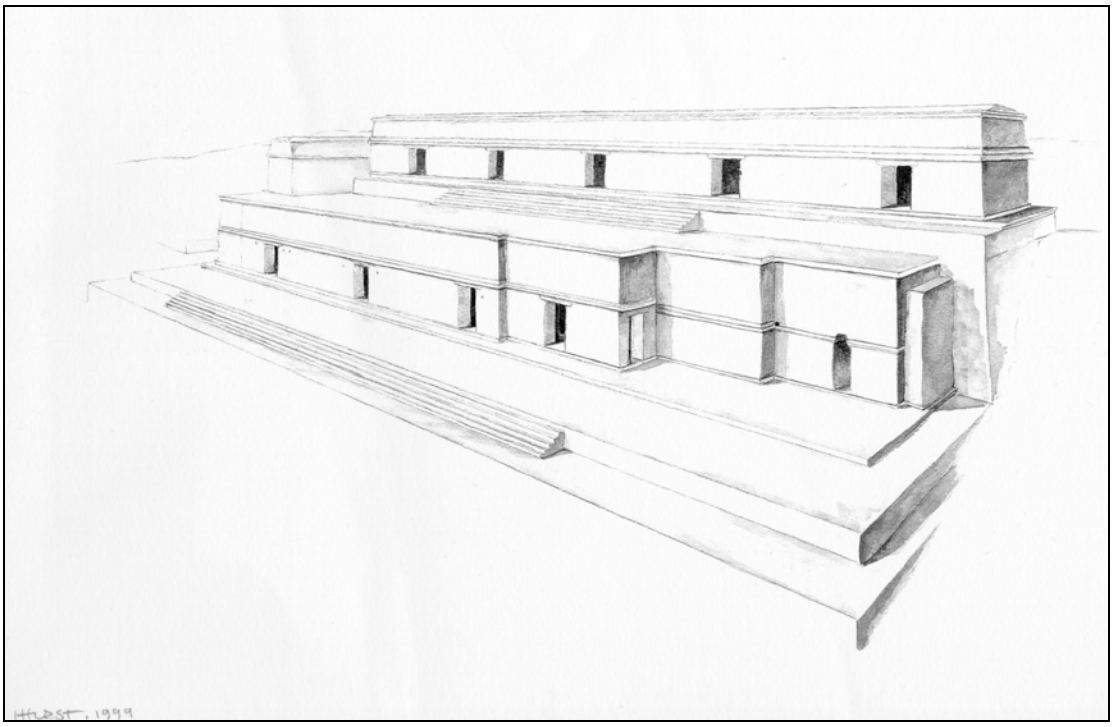
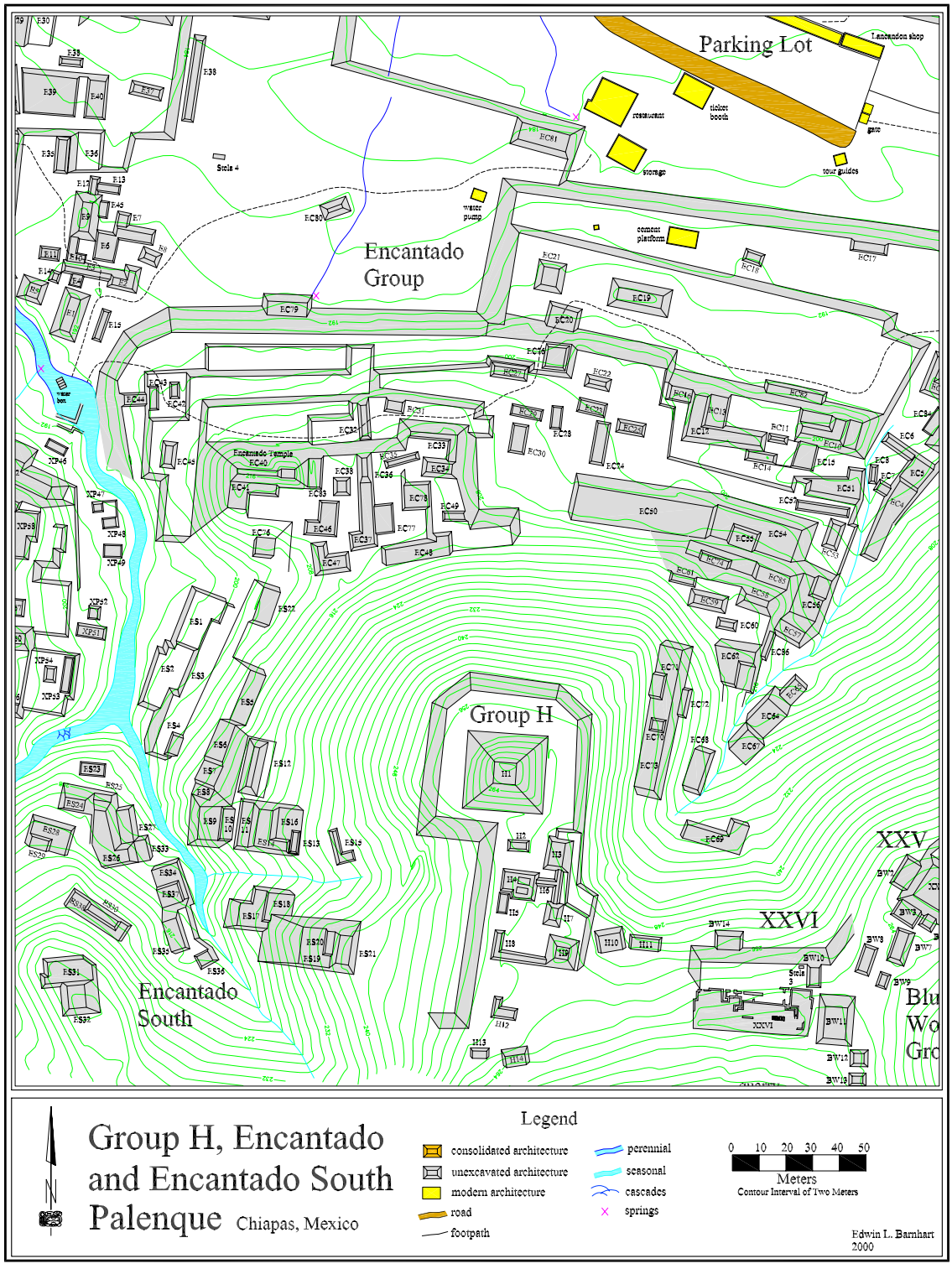


Figure 2.1 Reconstruction of Temple XXVI drawn by Heather Hurst, 1999

The Schele Terraces, named after the late Linda Schele, are a monumental set of terraces never before recorded. Temple XXIII (Figure 2.2) has always been depicted as a single structure (Maudslay 1989-1902, Robertson 1983). We now know that XXIII is in fact one part of a complex of stepped terraces reaching up from the Otulum far below. Two deep arroyos feeding down into the Otulum divide the Schele Terraces into three sections with the central section being the most massive. The western section has eleven levels and reaches a total vertical height of thirty-five



Map 2.6 Group H, Encantado and Encantado South

meters. The central section has six terraces leading up to Temple XXIII. Temple XXIII has been known for some time due to its great extent of exposed architecture. The structure has a central room with a long colonnade extending to the east and contains the entrances to five looted tomb shafts. Blom's 1923 profile view drawing depicts Temple XXIII in the same condition it stands in today.

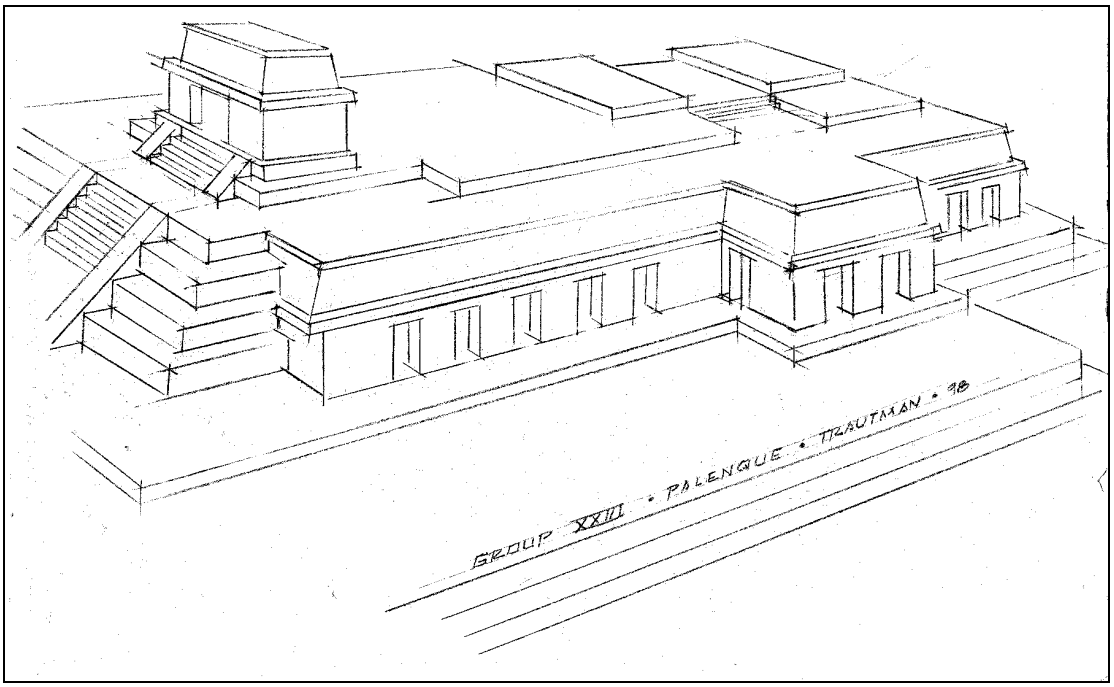
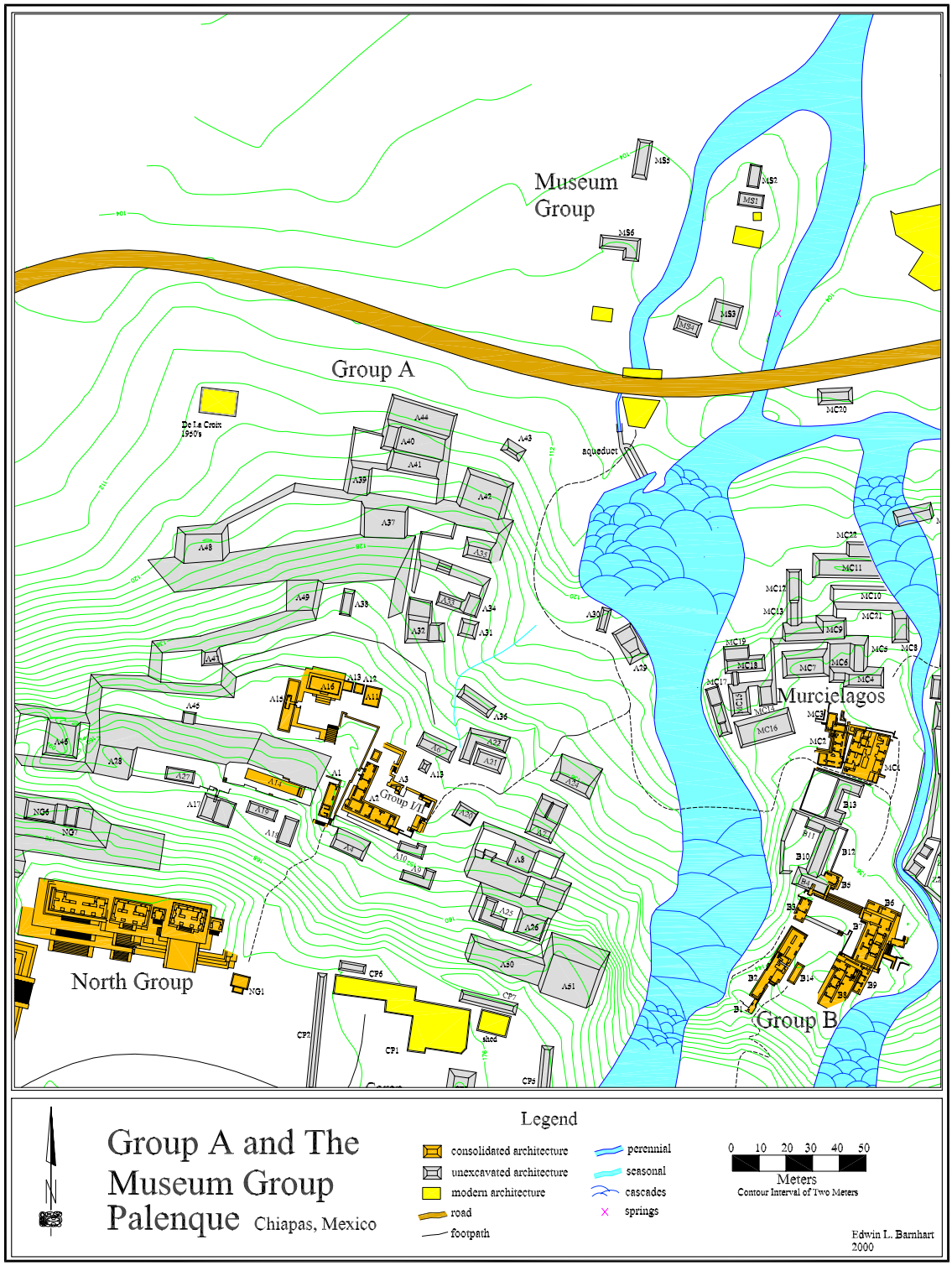


Figure 2.2 Reconstruction of Temple XXIII drawn by David Trautman, 1998

Structures XXIIIa, b, and c were located to the east and south of Temple XXIII. XXIIIa has three sections of exposed architecture revealing two rooms and a staircase leading down. XXIIIb and c are interconnected and built into the mountainside. At a frontal height of ten meters, it is surprising that previous surveys overlooked XXIIIc.

The ten structures of the Schele Terrace's eastern section are more loosely organized and not completely interconnected as they climb up the hillside. Though



Map 2.7 Group A and The Museum Group

geographically associated to the Schele Terraces, this eastern section appears to be oriented east towards the Otulum spring and the back end of the Southern Acropolis.

Encantado Group (Map 2.6)

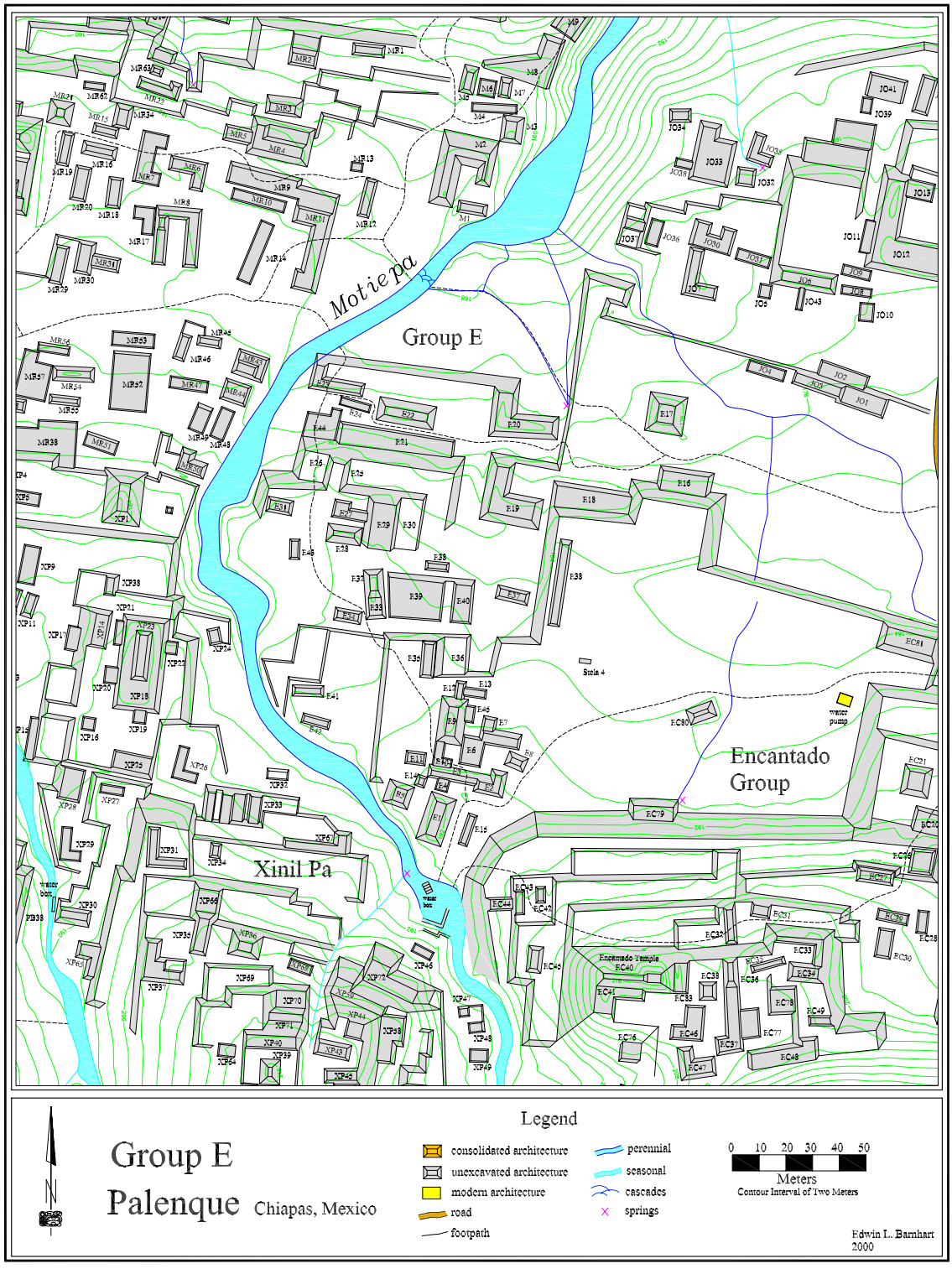
The Encantado Group is arranged around the base of a fifty-meter tall hill. There are eighty-six structures in the Encantado group, most of which are completely buried. Two structures, EC27 and EC41, were excavated by Acosta in the 1970s (unpublished) and as a result have significant areas of exposed architecture. Acosta also excavated a trench into the north face of the Encantado Temple (EC40) exposing the wall of an interior building phase.

Stretching out in front of the Encantado Group are three wide plazas, each relatively devoid of structures. The westernmost of the three plazas contains only one structure, EC80. In opposition to the 19 degrees East of North orientation common to many of the structures in the central precinct, EC80 has an orientation of 19 degrees West of North. Stela 4 was found forty meters west of EC80, fallen and uncarved. It is 3m in length, 1m wide, and 50cm thick.

The western Encantado Group plaza also contains a small creek emerging from a spring at the northwest corner of structure EC79. The creek runs north to the edge of the plaza where it drains underneath a terrace wall and then resurfaces below, continuing north to join another creek. While no surface evidence indicates the creek is man made, its path across the plaza suggests there may be a defunct drainage system below the surface.

Encantado South (Map 2.6)

The PMP recorded the structures of the Encantado South first in 1998 and then finished defining the group in 2000. The group is a complex of terraces and structures built into the steep hillsides of a tributary of the Motiepa. All structures in the group are completely buried except structure ES12 which has exposed sections of



Map 2.8 Group E

a superstructure and ES24 which has a window of collapse through its intact roof leading into a small interior chamber.

Group A (Map 2.7)

Group A extends north along the west side of the Otulum from the base of the Casteneda Escarpment down to the modern paved road. Previous maps of Group A have focused on the area called Group I and II, a group of eleven consolidated structures, designated here as A1-3, A5, and A11-17. The PMP recorded fifty-one structures in Group A, the majority of which were built into the slope of the hillside. This group's southernmost terraces lead directly up into Palenque's main plaza via the Camp Group. If a major access from the flat plains to the north up into the city's central precinct existed, it was through Group A. In the group's northwest section is a wide, flat area of land. Though flat land is clearly easier to build on then slopes, the flat area is completely devoid of ancient structures. Today the area is called "Los Mangos" (due to the mango grove growing there) and contains only a single modern cement platform. Local informants say the structure was once the home of a German rancher named Delacroix who lived in Palenque during the 1950's. It seems likely that Palenque left Los Mangos clear for agricultural purposes, choosing instead to build on the slopes above.

Group E (Map 2.8)

Group E is loosely arranged along the east side of the Motiepa, north of the Encantado Temple. The group's largest architecture is located on its north end where large platforms are built out of the hillside and follow the contour of the land where it takes a natural step down. Structures E19 and E20 are the only structures in the area that retain exposed architecture. A hypothetical reconstruction of these two structures is shown in Figure 2.3. Structure E20 is in especially good condition. Though its roof is now collapsed multiple plastered columns still stand, some in excess of two meters

in height. Directly in front of E20 a perennial spring wells up from the ground and creates a small stream feeding down into the Motiepa.

Group H (Map 2.6)

Perched atop the hill above the Encantado Group, Group H is linked with the Blue Wood group on the hilltop just to the east. Both groups have large temples constructed on their northern edges and overlook the central precinct. In turn, these structures could have been viewed from anywhere in the city and from miles away into the plains. Structure H1, Group H's main temple, is roughly the same size as its counterpart, Temple XXIV. The structure in the best state of preservation is H3. Due to a tree fall in its east side, three rooms can be detected in H3's floor plan. The north room (3x4m) retains its roof and can be entered through a collapsed outer wall.

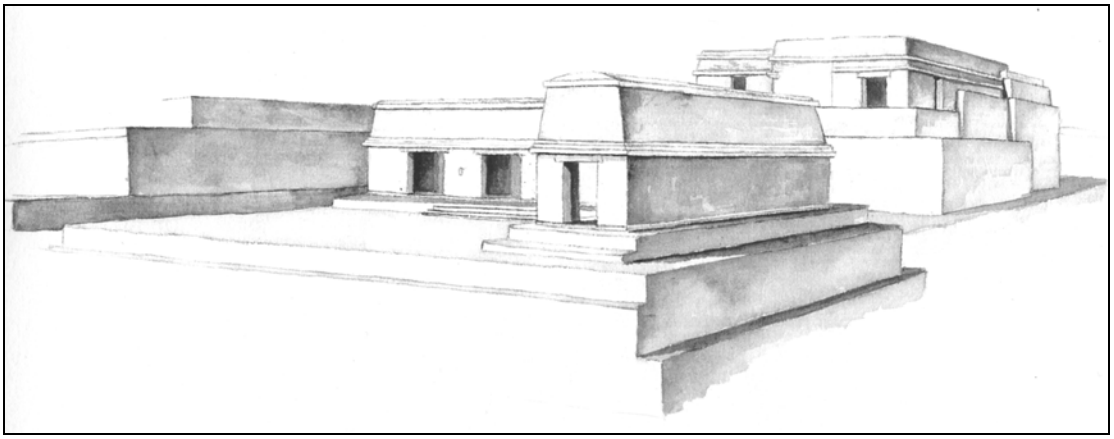


Figure 2.3 Reconstruction of structure E19 and E20 drawn by Heather Hurst, 2000

The flat land in southern end of Group H is littered with large limestone chunks, most with evidence of shaping. They appear to be large architectural blocks or monuments in progress. The quarry behind Temple XXVI is less than fifty meters away and is probably the point of origin for the stones.

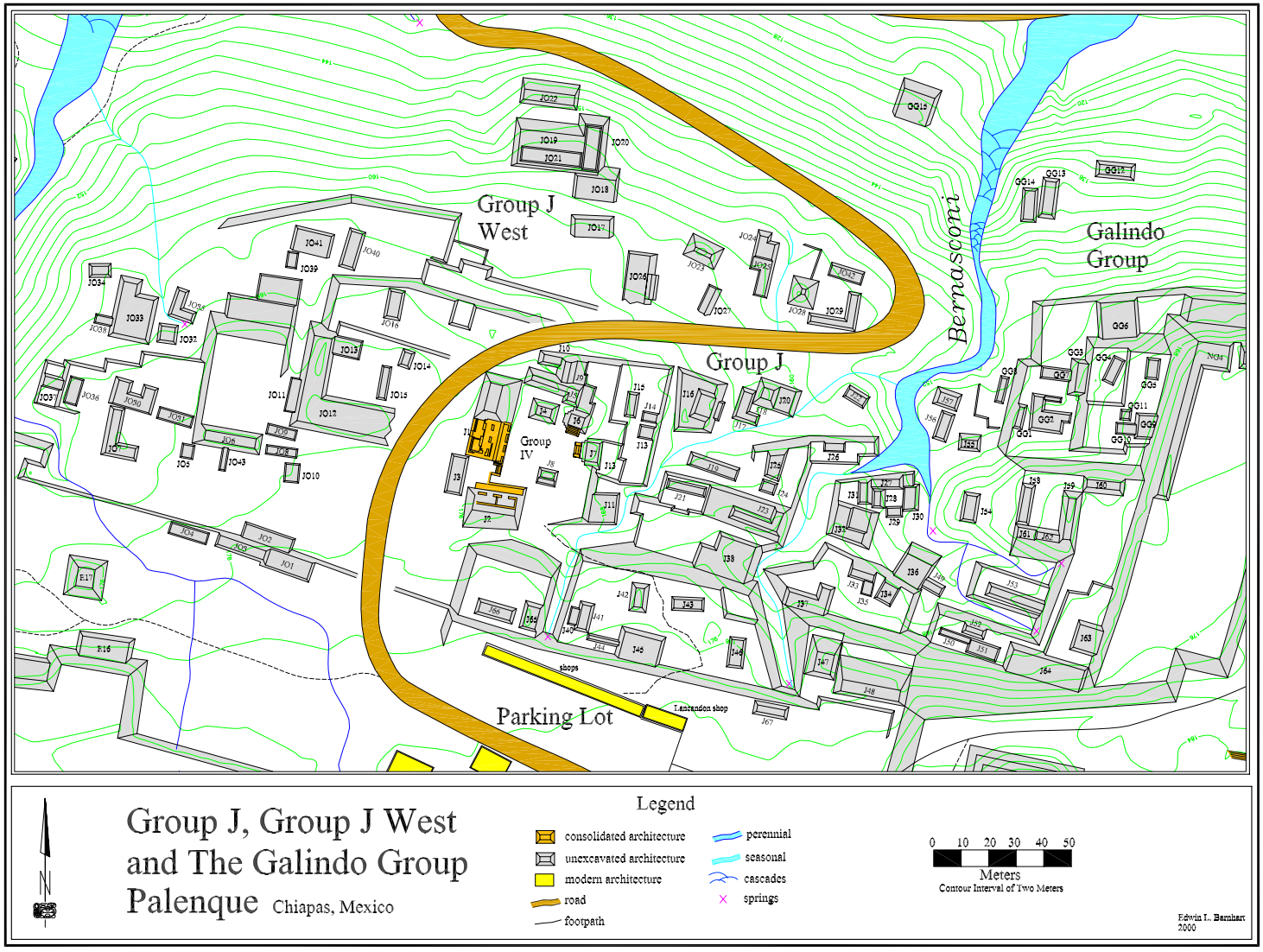
Group J (Map 2.9)

Group J is more commonly known as Group IV. Group IV is defined in past literature as the courtyard group identified here as structures J1-J8 (Figure 2.4). Group J includes Group IV but extends to include the dense area of structures to its immediate east recorded by the PMP. Structures J1, J6, and J7 were partially consolidated by INAH in the 1980-90s. Most of Group J's 67 structures are completely buried. J28, J59, and J61 are the only structures in the area that have significant portions of architecture exposed. Group J's most interesting feature is its canal system. There are four separate canals, all of which join up on Group J's north side and fall off the Bernasconi Cascades. Each canal has sections of standing walls and begins at the

base of a terrace, apparently at the mouth of an underground spring. While the heads of the canals did not produce water during the dry season, each canal contains multiple sections where spring water wells up and continues to flow perennially. The surface evidence suggests that Group J began as an area of land riddled with bubbling springs and that the canals were built as a way to confine their flow and open land for architecture.

Galindo Group (Map 2.9)

First identified in Robertson's map (1983), the Galindo Group is separated from Group J by the tall hill topped by structures J58-J62. It consists of a large platform extending off the northwest corner of Palenque's central precinct. The platform mounds are small and completely buried. Off the Galindo Group's north side the hill drops off fifteen meters to a ledge containing a tiny group of structures straddling the Bernasconi Cascades.



Map 2.9 Group J, Group J West and The Galindo Group

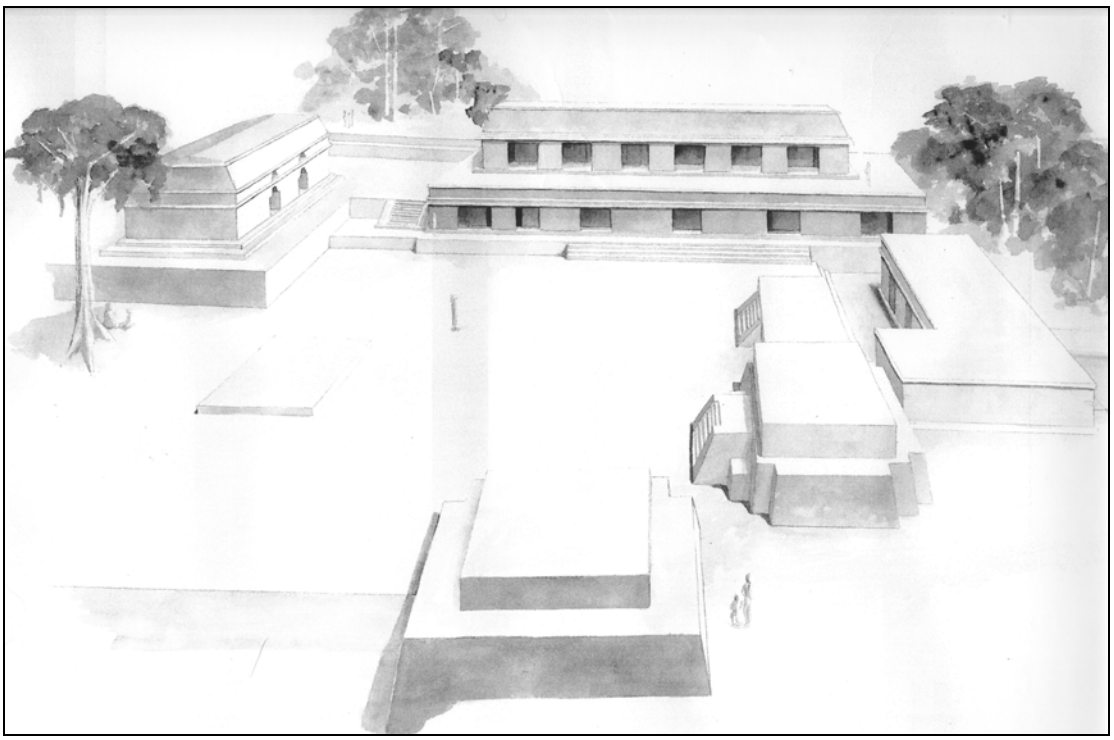
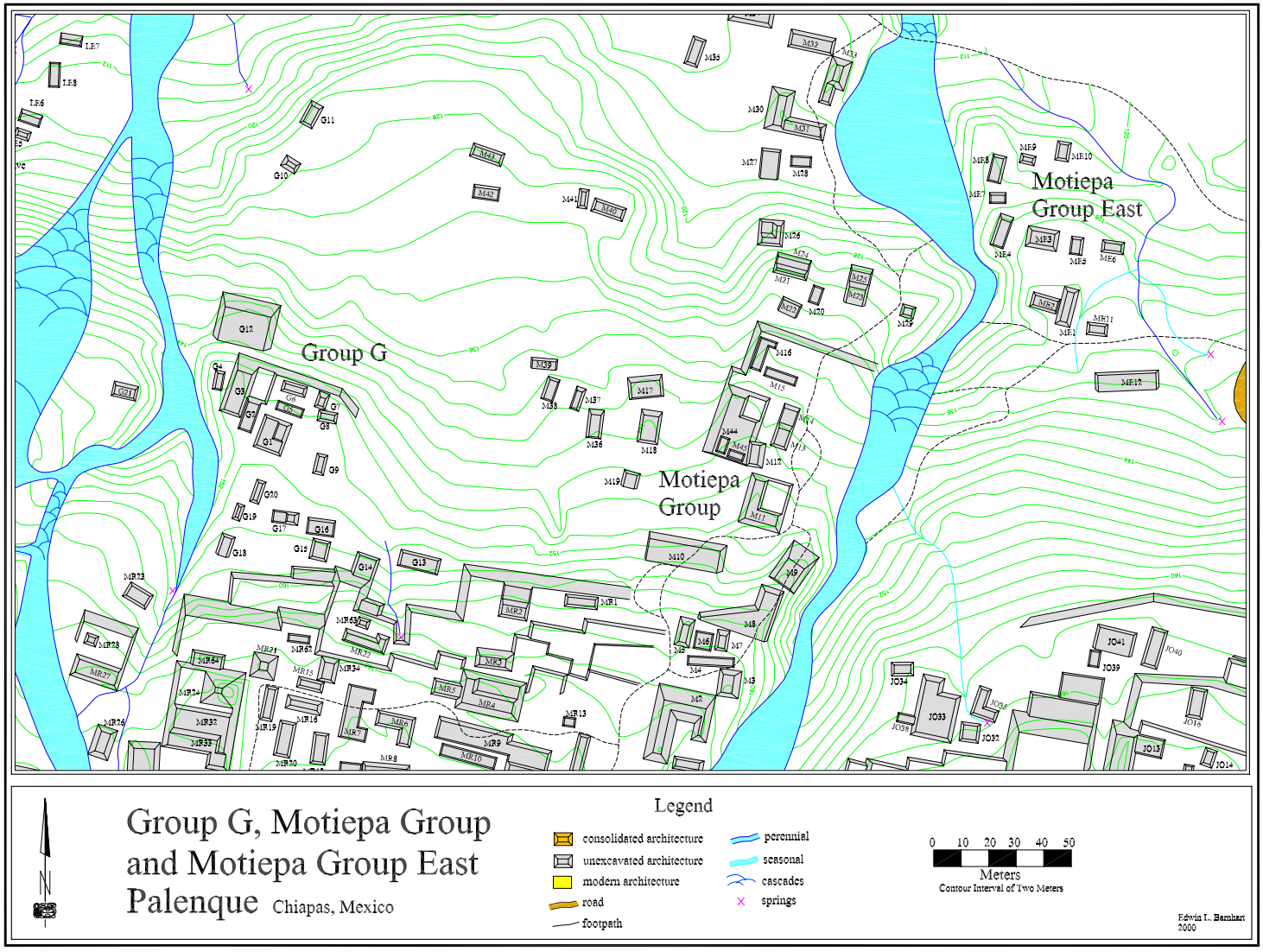


Figure 2.4 Reconstruction of Group IV dawn by Heather Hurst, 2000

Group J West (Map 2.9)

Group J West was clearly part of Group J but has now been physically separated from it by the road to the ruins parking lot. The road cuts off two large structures, JO12 and JO26, and four east-west running terraces. The group sits upon land that slopes gently down to the north. There are a total of forty-three structures, ten courtyards and seven terraces in Group J West. Exposed architecture exists within structures JO7, 12, 20, 22, 26, and 33. There was no evidence of looting. The southernmost terrace (connected to structures JO1–4) is part of a series of interconnected terraces running almost 300 meters from the site center to the Motiepa River. Only two structures, JO26 and JO28, are strongly suspected as non-residential. Their form and size are suggestive of the lineage ancestor worship shrines commonly found in association with elite residential courtyard groups.

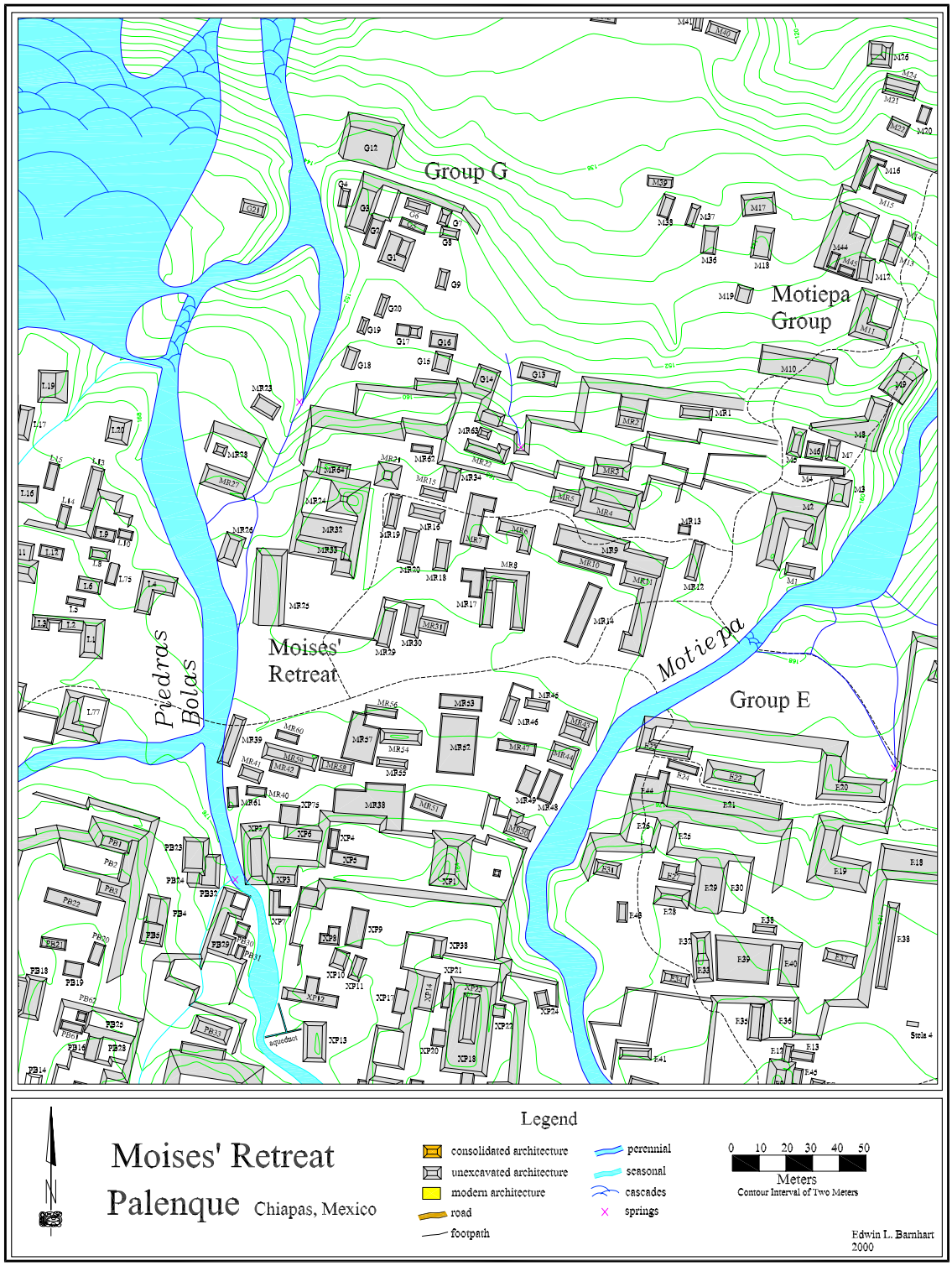


Map 2.10 Group G, Motiepa Group and Motiepa Group East

Two locations in Group J West exhibit surface evidence of ancient water management. The first is an arroyo originating next to JO35, construction around a seasonally active spring. The second is the arroyo at the group's southern end. It drops off a terrace, passing through without destroying it, and feeds a diversion pool inside the elbow of a "L" shaped terrace extension. Structure JO12, now cut by the modern road, seems to have once been connected to structure J1, the Group IV residence of Chak Zutz', the K'ak' Ahaw of one of Palenque's last kings, Akal Mo' Nab III.

The Motiepa East Group (Map 2.10)

The Motiepa East Group is situated on two natural plateaus stepping down to the north above the Motiepa's eastern bank. Many of its structures have an unobstructed view of the Motiepa cascades. The group is quite small with only twelve structures arranged around two irregularly shaped patios. No constructed terracing was detected. The architecture is small and low-lying, probably all residential. We found no exposed architecture and only one looter's pit (in ME1). While there was no clear evidence of water management, the three arroyos that join within the group seem to have been redirected in ancient times. Artificial leveling done during the construction of the nearby modern road may have affected the course of the easternmost of those arroyos, further confusing the surface evidence. To the south of the Motiepa East Group and situated on top of a large limestone outcrop sits a ruined modern structure. A staircase carved into the face of the outcrop and quite near the path provides access to the structure. Through discussions with long time Palenque resident Moises Morales it was learned that a German woman named Herta had once owned the structure. Herta lived in Palenque during the 1960s and used the structure as a restaurant and bar. A gas explosion is rumored to have been the source of the structure's demise. It is now little more than a cement platform and some crumbing red brick walls.



Map 2.11 Moises' Retreat

The Motiepa Group (Map 2.10)

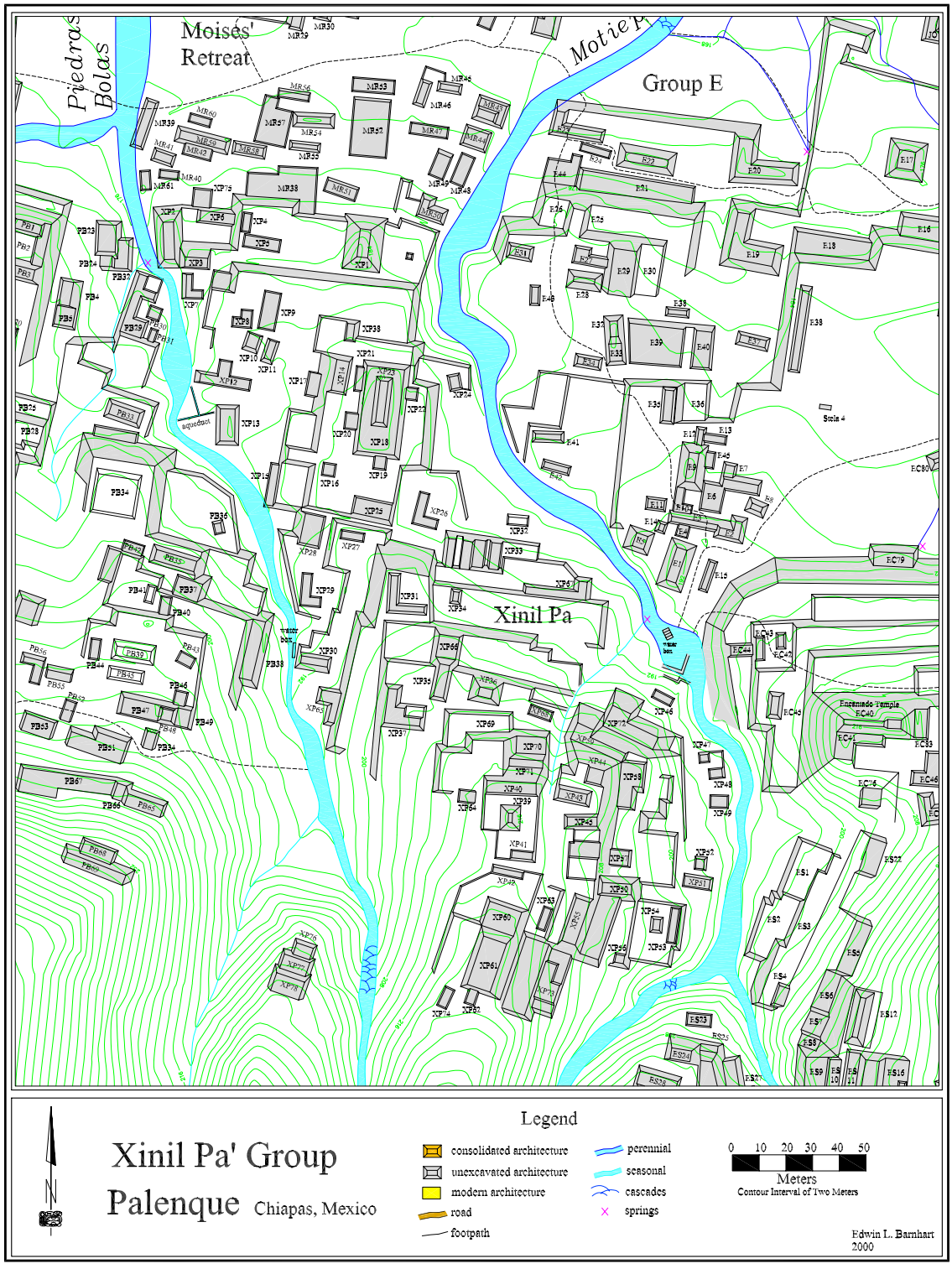
The Motiepa Group is arranged on the hillside from Palenque's main plateau down to the edge of the plains. Topography that appears to be an approximately twenty meter wide, dried watercourse runs down through the middle of the group. Calcified ledges stepping down the hillside, much like those in the Motiepa and Otulum cascades, show that water once flowed through the area in large quantity. There are forty-five structures and ten residential courtyards. Exposed architecture exists on the surfaces of structures M2, 11 and 13. In addition, a subterranean chamber of unknown character was detected in between structures M42 and M41. Looters have dug two separate pits into structure M2, one revealing an entrance into an intact inner chamber. While no water management features were securely identified, the aforementioned dried watercourse running through the Motiepa Group seems controlled in its placement. While surveying at the top of the dried watercourse, just below structure M10, the team noticed many bats flying around in the middle of the day. As bats are nocturnal, the presence of a cave or underground opening was suspected to be nearby. Though none was found, the possibility that it exists is still quite high. An extinct spring emerging from a cave would neatly explain the presence of the dried watercourse.

Moises' Retreat (Map 2.11)

The editors of Robertson's 1983 map named this group after Moises Morales, long-time advocate of the ruins and Palenque's most knowledgeable tour guide. Though originally identified only as the group's central large complex (the platform unifying structures MR21, 24, 32 and 33) the PMP has expanded its definition to include the surrounding smaller structures as well. Moises' Retreat sits upon almost completely flat land and commands a beautiful view of the plains below. There are sixty structures in the group and nineteen small courtyards. Tall terraces bound the group to the north and south, architecturally separating it from the G and Xinil Pa' Groups. Within the group there are three low-lying terraces in its eastern section.

The central complex (comprised of structures MR21, 24, 32 and 33) sits upon a single large platform containing subterranean architecture. Much of the complex has exposed architecture, allowing interior investigation. Project members Jim Eckhardt and Heather Hurst crawled inside each subterranean chamber and passageway in order to record their dimensions and descriptions. The long dark corridors encountered inside are reminiscent of those underneath Palenque's central Palace. Elsewhere in the group, exposed architecture was found on the surfaces of structures MR4, 5, 8, 25, 26 and 28. MR4, in particular, is in a very good state of preservation. In addition, intact walls held in place by calcification were found along the face of Moises' Retreat's northern terrace. A small rectangular tomb chamber has collapsed into the side of a terrace two meters to the east of structure MR28. Evidence of looting was recorded in structures MR21, 24, 26, 32 and on the platform directly north of MR34.

Two separate areas of water management were detected within Moises' Retreat. The smaller of the two is a seasonally flowing spring two meters to the east of structure MR22. The terrace there appears to have been intentionally in-set to provide an architectural opening from which the spring could flow downhill in a controlled fashion. The second, larger area of water management is located to the west of the group's main complex and flows out of the nearby Arroyo Piedras Bolas. There are two tributaries that appear to have been redirected to flow in between structures, one in between MR25 and 26 and the other in between MR26 and 27. Both join together just before dropping off into a small ravine that curves and rejoins the Piedras Bolas downstream. Sporadic areas of wet and dry patches along the courses of the tributaries indicate that water is seeping under the patio they cross, likely re-emerging from a spring detected at the base of the ravine. This area is one of the best examples of Palenque's architecture harmonizing with its natural setting.



Map 2.12 Xinil Pa' Group

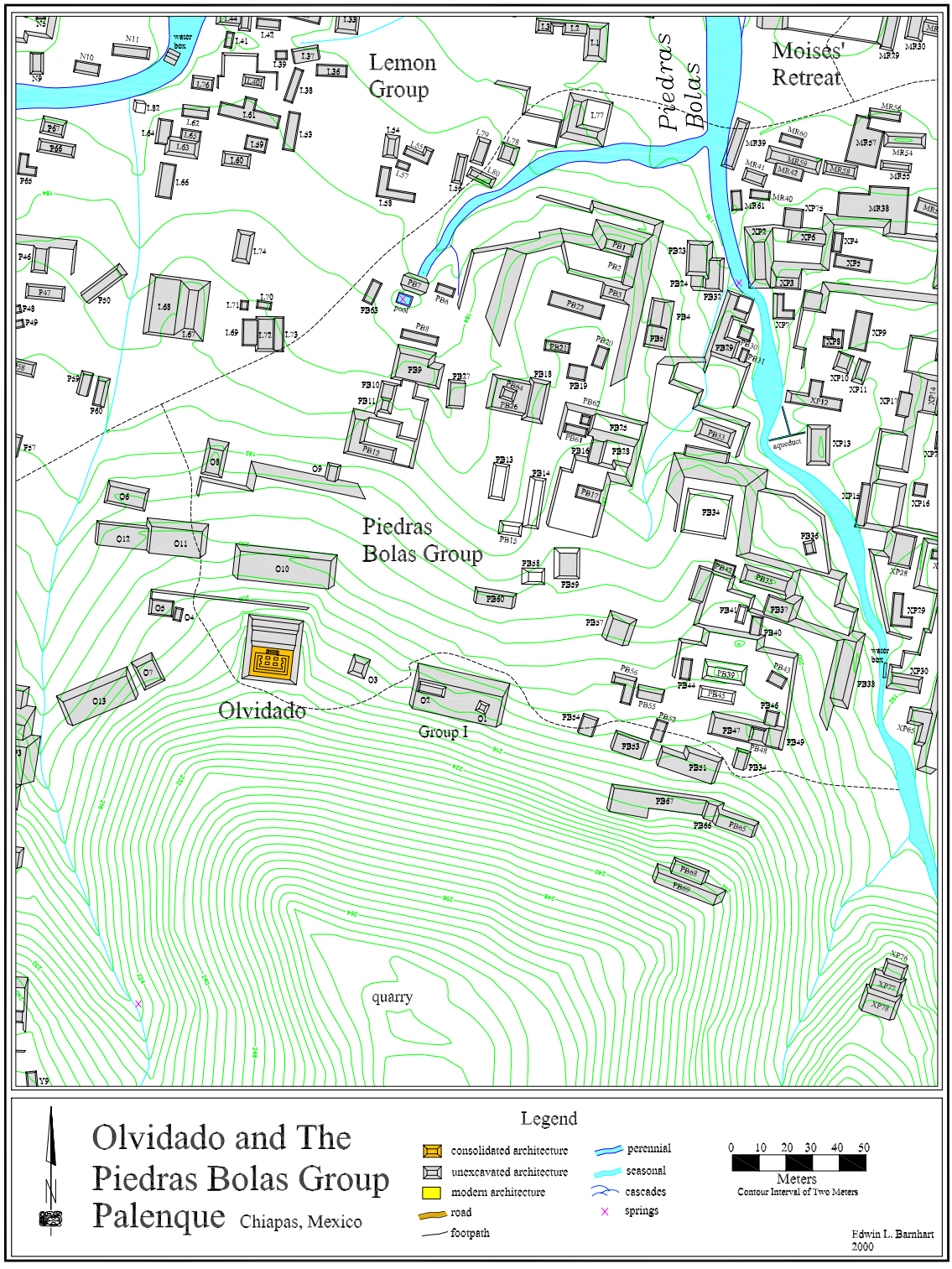
Group G (Map 2.10)

Group G, also called "Blom's Group G", was one of the locations identified during the 1920s expedition of Franz Blom. As with most of Blom's work, his attention was focused on the group due to its accessible tombs. While Blom's drawing of Group G (1927) identified only two structures, the PMP map identifies twenty structures and five small courtyards. One large platform, structure G12, forms the step down in between Group G's two flat areas. Structures G3, 6, 12 and 17 have exposed architecture. G17's visible architecture is accessed through a hole in its half-meter tall platform and appears to be a pair of small tomb chambers. G3, recorded first by Blom, is a two-meter tall structure with a collapsed hole in its top. The structure's interior is still in good condition with stucco on the walls and two intact doorways (one sealed up).

The wide plateau below and to the north of Group G is an area of unique character. Though it is a flat, upland plateau, ideal for residential construction, the land is completely empty of buildings. The 1983 Robertson map identifies it as a "1968 milpa". The area's north edge ends sharply by dropping off a ten-meter limestone cliff. The face of that cliff is highly eroded and calcified, indicating prolonged exposure to flowing water. Evidence of water run-off combined with the plateau's oddly empty state, led the survey team to suspect it may have been a small, inner-city milpa. Unfortunately, its use as a milpa in modern times may have precluded phosphate soil testing to confirm or deny said hypothesis.

The Xinil Pa' Group (Map 2.12)

The Xinil Pa' group is a densely arranged group of structures climbing up hill in between the Piedras Bolas and Motiepa Rivers. A series of eight terraces step forty-two meters up the hillside creating flat surfaces for Xinil Pa's seventy-eight structures and fifteen small courtyards. The two largest structures in Xinil Pa', XP1 and 2, are located at its northernmost edge, bordering Moises' Retreat. XP1 is the largest and has an associated altar-like feature on its eastern side patio. XP2 flanks



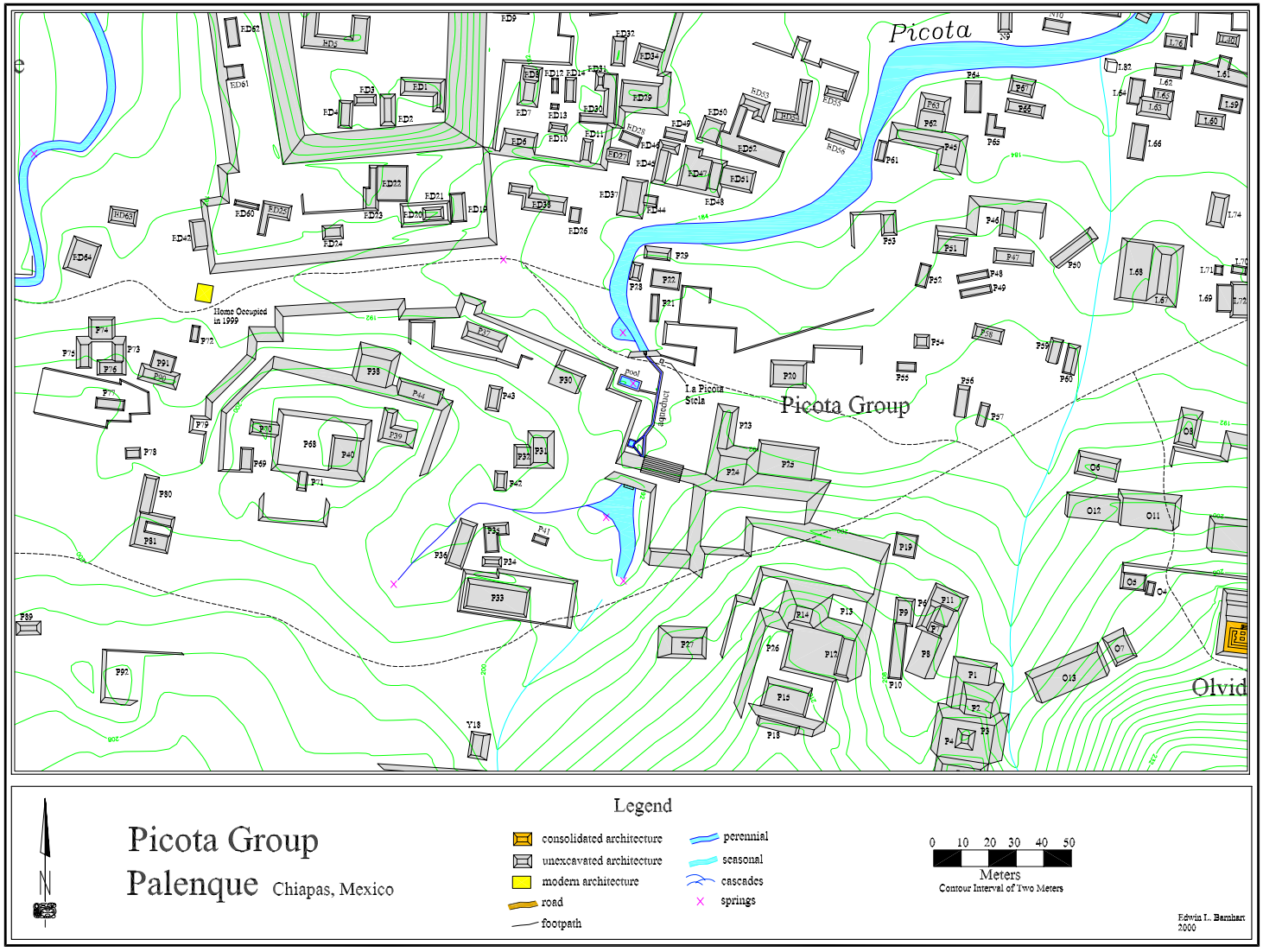
Map 2.13 Olvidado and The Piedras Bolas Group

the Piedras Bolas and has an almost completely intact western wall. The southern section of the Xinil Pa' group, containing the highest density of structures, may be the area of Robertson's map named the "Great House Group". Location discrepancies make map comparisons less than clear. Considering the interconnected nature of the construction as it climbs up the hillside, the entire area was included under the Xinil Pa' Group name. Robertson's map also records a large structure named "Bates Pyramid". Though map comparison was again unclear, structure XP36 appears to be the most likely candidate.

Inaccessibility and many small structures arranged around private courtyards give the area a highly residential character. Eleven structures in the Xinil Pa' Group have exposed architecture, including structures XP2, 3, 13, 18, 31, 33, 35, 43, 55, 69 and 72. Looter's pits were found in only two structures, XP 40 and 54. Evidence of water management in the Xinil Pa' Group concentrates around the Piedras Bolas River. Drain-like features are visible in the river's bank west of structures XP13 and 30. Large amounts of cut stone lie strewn around in the Piedras Bolas River from structure XP12 down to Moises' Retreat structure MR61. On the opposite side of the group, the dry arroyo between structures XP40 and 43 feeds down into the Motiepa River without cutting into the surrounding architecture, suggesting that its course was accounted for during construction, if not created by the construction. A word on the Xinil Pa' terraces should end this section. Because of their great size and function as the platforms for most of the group's residential courtyards, it seems clear that they could not have been built without a large communal labor force.

The Piedras Bolas Group (Map 2.13)

Like the nearby Xinil Pa' Group, the Piedras Bolas Group climbs up the hillside partially using four wide terraces as leveled building surfaces. The group runs primarily along the western bank of the Piedras Bolas River and contains sixty-seven structures and twelve small courtyards. Exposed architecture was documented on structures PB1, 7, 9, 15, 18, 31, 32, 39 and 48. There were looter's pits in only



Map 2.14 Picota Group

three structures, PB1, 15 and 35. Built into a steep hillside as long, narrow platforms lie the southernmost structures of the Piedras Bolas Group. The hill rises above those platforms another fifty meters to a flat, natural plateau. Though the plateau was fully searched, no structures were found. The plateau did, however, contain three interesting pits, ten meters in average diameter and one to two meters in depth, with large limestone chunks scattered around their edges. Their form suggests quarry pits. Thick vegetation patches growing on the plateau may be concealing other small pits.

One of Palenque's more interesting water management features was documented in the northwest part of the Piedras Bolas Group. Structure PB7 has a pool connected to its southern side. The pool is walled on all four sides and has a spring welling up from its southwest corner. The pool drains through a conduit underneath structure PB7. The water flows out of the structure's north side, travels under an arroyo level stone-covered channel (2m in length) and winds eastward to join the Piedras Bolas. At that point of the Piedras Bolas' course most of its water is being fed into it via this small arroyo. The pool at the arroyo's origin still collects water from the spring it was built around.

The Olvidado Group (Map 2.13)

The Olvidado Group is a small group of structures arranged around the well-known Olvidado Temple. The Olvidado Temple was first recorded by Blom in the 1920s and excavated by Berlin in the 1940s. There are ten structures and four wide platforms in the group, including the Olvidado Temple. Thirty meters to the east of the Olvidado Temple lies a large platform identified by Blom as "Group I". The Group I platform was built into the hillside and has two small structures on top. The easternmost structure, O1, has a collapsed hole on its top revealing a two-meter deep chamber inside the large platform. Blom's report (1926-27) records a burial chamber within the platform.

The Olvidado Group does not appear to be residential. The Group I platform and the Olvidado Temple are too imposing to have functioned as private quarters.

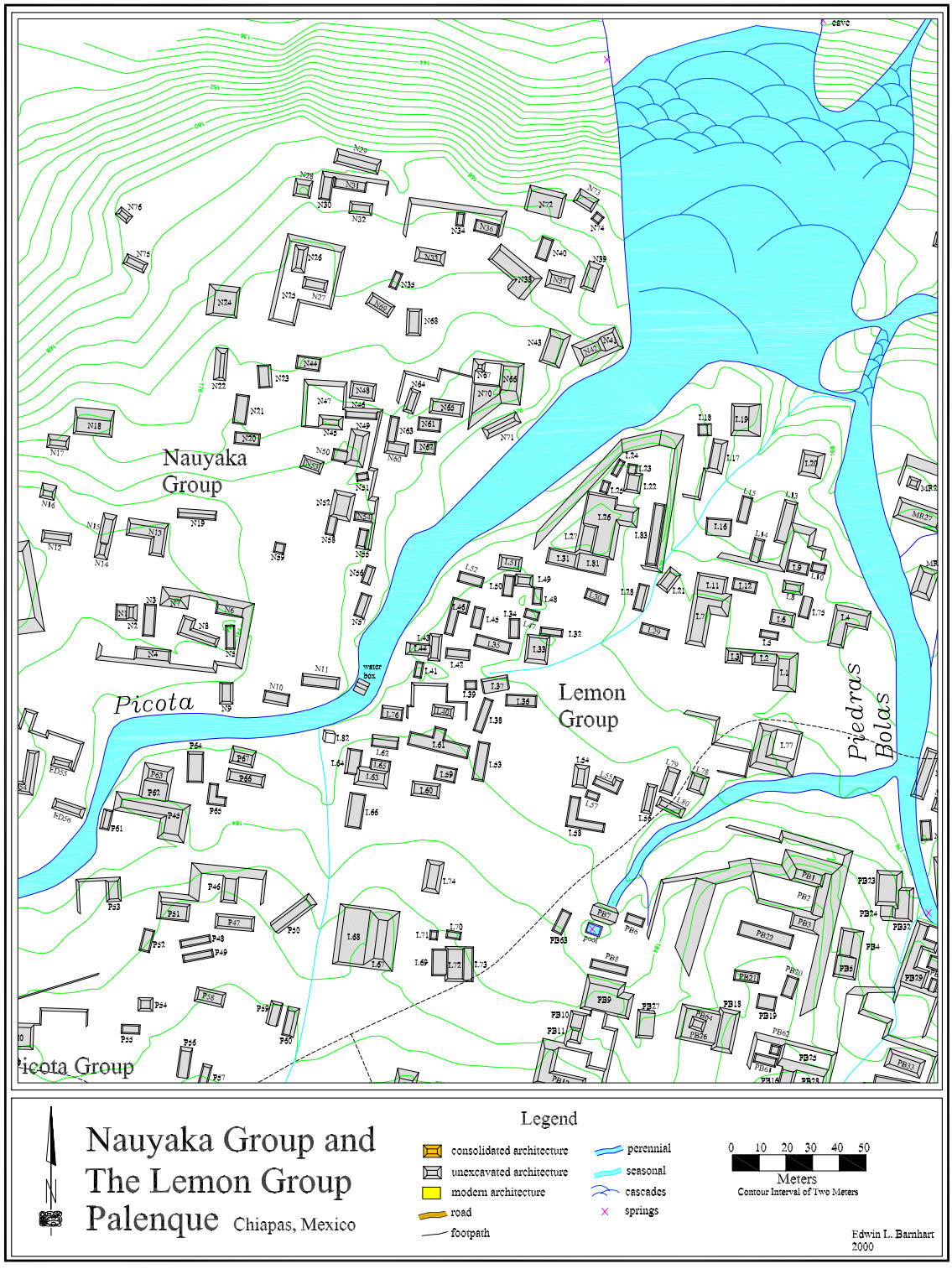
The smaller associated structures, especially the low terraces, seem to be supporting architecture rather than private spaces. There are none of the patios or courtyards typically associated with residential activities in the Olvidado Group.

The Picota Group (Map 2.14)

The Picota Group includes a diverse collection of structures, both public and residential. Bounded by watercourses, there are a total of ninety-one structures and fourteen small courtyards within the Picota Group. Exposed architecture exists on the surfaces of structures P3, 5, 12, 26, 37, 61 and 81. There were no looter's pits in direct contact with the structures of the Picota Group and only one pit dug into the terrace directly in front of structure P37. The structures and features encountered within the group differed from those recorded in previous maps to such an extent that, besides the Picota's stela and aqueduct, the PMP map presents entirely new information.

The heart of the Picota Group is the irregularly shaped Picota Plaza. The irregular shape is caused by the protrusion of structures P23, 24 and 25 into the plaza, creating two distinct sections of plaza space. The western part of the plaza contains the La Picota Stela (the feature for which the area is named), the Picota aqueduct, and a well-preserved staircase climbing nine steps up from its southern boundary. Towering above the Picota Plaza to the south are a series of three terraces topped by structure P14 and its associated courtyard group. Structure P12, located five meters to the southeast of P14, has an area of collapse in its top revealing a subterranean tomb chamber below.

In form and geographic placement, the line of temple-like structures running from structure P14 eastward to the Group I platform are reminiscent of the line of structures in Palenque's primary center created by Temple XII, XIII and the Inscriptions. Both areas have temples built into the hillside that overlook a plaza. Acknowledging that Temples XII, XIII and the Inscriptions are funerary monuments, a similar function is suspected for these southern temples of the Picota Group.



Map 2.15 Nauyaka Group and The Lemon Group

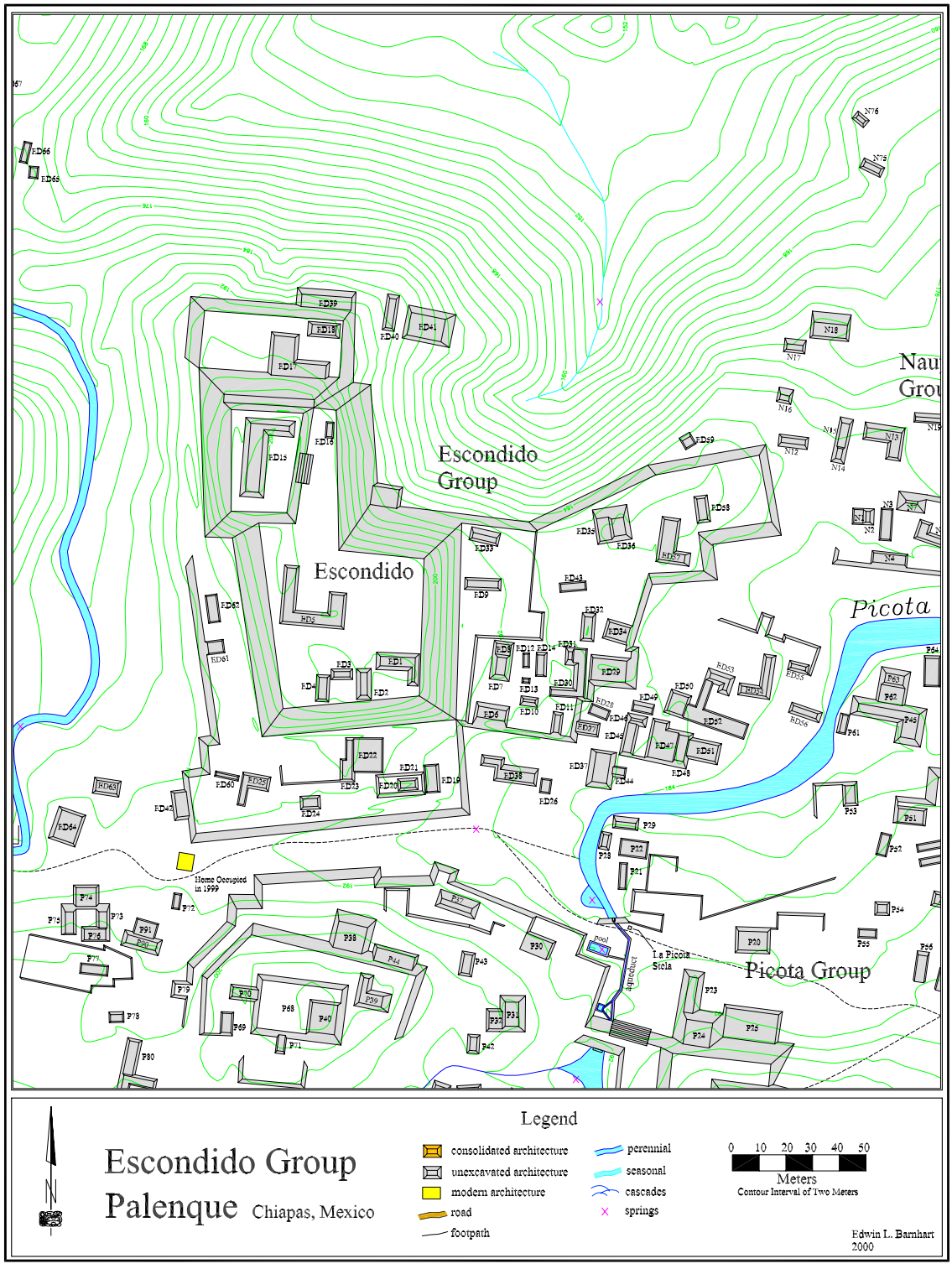
Collectively, the presence of a large plaza, a stela, an elaborate aqueduct and a line of funerary temples along the south edge give the Picota area a distinctly "central precinct" character. The massive the Escondido Platform positioned nearby only lends more credence to that conclusion. Palenque appears to have had not one, but two "centers".

The Picota Group's northeastern section is more residential in character, comprised of smaller buildings arranged around courtyards and open patio spaces. Though included as part of the Picota Group, this area of residential settlement also seems associated with the Lemon Group's settlement just to the east.

The water management of the Picota Group is arguably Palenque's most sophisticated system. The aqueduct is built of tightly fitted stones and fed by multiple springs. Its state of preservation is superior to that of the aqueduct in Palenque's central precinct. With the exception of a few capstones that have fallen in, the Picota aqueduct is completely intact and functional. As the water spills from the aqueduct's exit, it forms the watercourse known as the Picota River. The course of this river turns sharply to the east, passing through the Lemon and Nauyaka residential zones, ultimately joining the Piedras Bolas River via a wide area of shallow cascades. The fact that the Picota, unlike Palenque's other rivers, does not follow gravity and flow straight north towards the floodplains below strongly suggests its course was altered to flow through the residential areas. The Arroyo Diablo, bounding the Picota Group's western side, contains two springs and sporadic evidence of canal walls.

The Lemon Group (Map 2.15)

The Lemon Group sits on almost completely flat land along the southern side of the Picota River. The vegetation surrounding the group is extremely dense from its former use as cattle land. The group's name comes from the presence of many lemon (not lime) trees sporadically found within its boundaries. Since they are not indigenous to the area it is assumed the former landowner planted them. The groups



Map 2.16 Escondido Group

named Hochol Bi' and Atotob in the Robertson map could not be clearly identified but were probably found within what is now defined as the Lemon Group. There are eighty-three structures and fifteen residential courtyards within the group, most of which were built along the southern bank of the Picota River. The majority of the group's structures are small and tightly clustered. Architecture exposed at the surface was documented on structures L4 and 7. The group's only looter's pit is located one meter north of structure L10. The group's largest structure, L67, was found less than ten meters from the main footpath through the area. Though the structure is over four meters in height and thirty meters long it was hidden from view by dense vegetation. Unlike other groups found in Palenque's western region, the Lemon Group has a large open area in its center, linking all the individual courtyard groups to one communal space. There may have been a communal agreement to leave the area free of buildings for other purposes.

The Nauyaka Group (Map 2.15)

Except for its very northern end, the Nauyaka Group sits on flat land. It is bounded on the south by the Picota River and on the north by a steep hillside. Like the Lemon Group, many structures line the Picota River. The inspiration for the group's name came from the large number of poisonous snakes encountered within its boundaries, five in the course of two weeks. Nauyaka is the local name for the snake more commonly called the Fer-de-Lance. A total of seventy-six structures and seventeen courtyards were found within the Nauyaka Group. In a pattern not seen in other sections of Palenque, most of the residential groups in this area are connected by elevated platforms. Evidence of looting in the Nauyaka Group is by far the worst the PMP encountered in Palenque. A total of eighteen looter's pits were found, primarily in the groups on elevated platforms. Looted structures include structures N26, 29, 43, 45, 46, 47, 65 and 70. The very thick vegetation of the area combined with the noise of nearby rushing water made it a perfect place for clandestine looting. In July of 1999 coke cans, chip bags and cigarette packs were found lying outside of

the pits in structure N25, still in good condition and as yet unaffected by the fast acting elements of a rain forest environment.

Structure N70 has a uniquely triangular base. A terrace on the other side of the Picota also has an odd orientation, one mirroring N70's riverside wall. The two structures together seem to bracket the Picota's end as it falls into the Piedras Bolas River. Sitting in the Picota River next to structure N11 lays an interesting water management feature of indeterminate function. Though partially destroyed, it appears to be similar to the feature in the Motiepa River next to the Encantado Temple. It is a stone slab box that has openings on either side through which water can pass. The similar Motiepa example was loosely termed an aqueduct in the Robertson map.

The Escondido Group (Map 2.16)

The Escondido Group is arranged around a massive platform documented for the first time by the PMP. The name "Escondido" was chosen because the platform had remained hidden for such a long time. Most of the group's sixty-seven structures, though associated with the Escondido Temple, are arranged around residential-type courtyards. Almost all the structures on its east side are arranged in small courtyard groups. There are looter's pits in structures ED15, 37, 38 and 46. Exposed architecture exists on structures ED15, 36 and 57. The Escondido Group was built on flat ground with a commanding northern view of the plains below. The view from the Escondido Temple is one of the most far reaching in all of Palenque

The Escondido Temple itself measures 80x140m at its base, making it slightly larger than the Palace (Figure 2.5). Though no surface evidence indicates entrances into the platform itself, Palenque's predilection towards subterranean chambers suggests the presence of internal rooms and passageways. The structures encountered on top of the Escondido Temple are small and arranged much in the way of typical residential patio groups. Structure ED15 is the largest structure on top of the temple. It is "L" shaped and has a stone feature on top that looks most like a destroyed bench. A partially intact stairway steps down off ED15's eastern side patio. Lower platforms

supporting smaller structures extend off of the Escondido's north, south and east sides. To the west is the Arroyo Diablo and a cleared, presently inhabited hill. To the north, platforms step downhill twice before ending at the edge of a shear cliff dropping off over fifty meters to a wide ledge and then plains below. A man named Heber, an INAH employed guard of the ruins, owns the property directly to the west. In 1999 and 2000 caretakers living on his land were tending milpas around and on top of the Escondido Temple.

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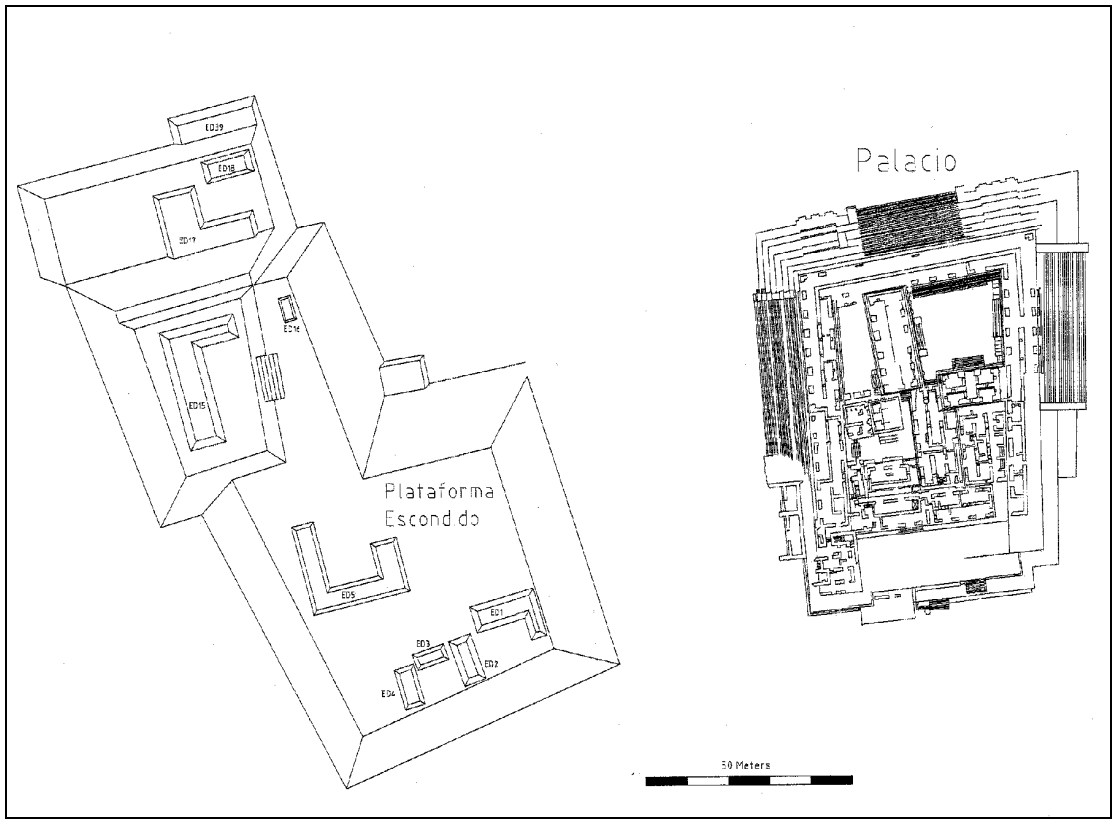
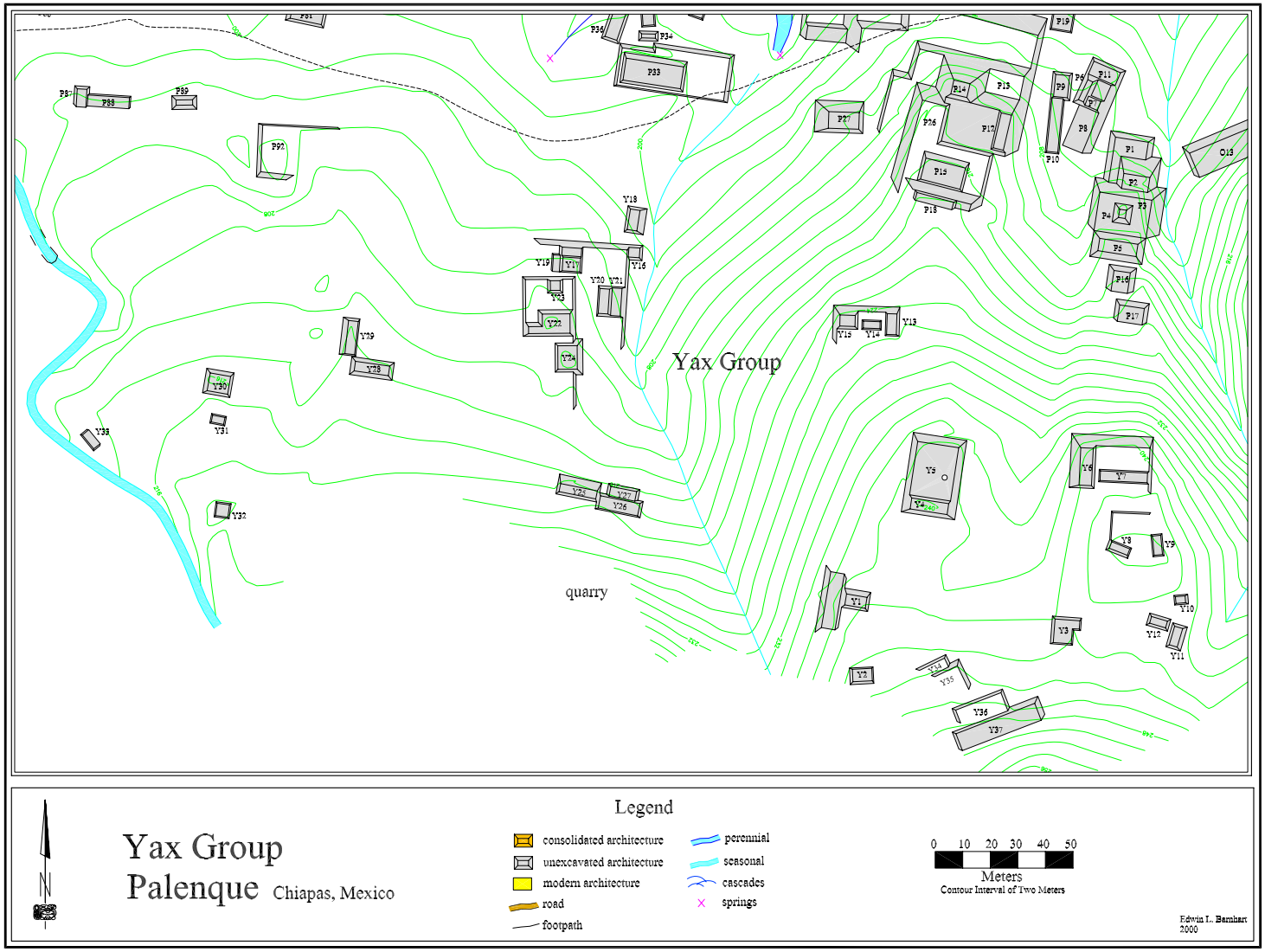


Figure 2.5 Comparison of the Palace vs. the Escondido



Map 2.17 Yax Group

The Yax Group (Map 2.17)

The Yax Group is located on the hills south of the Picota Group and on the gently sloping land south of the Naranjo Trail in between the Picota and Diablo Arroyos. Thirty-seven structures and seven small courtyards were found in the Yax Group. Structures Y1, 6, 22, 25, 26, 27 and 30 have exposed architecture.

A cornfield complicated survey south of the Naranjo Trail. None of the structures in the milpa had been looted and the land's caretaker allowed the team to survey it with the agreement that no corn plants would be cut. Though more structures were seen on the west side of the Arroyo Diablo, land ownership disputes during the year 2000 prevented the team from surveying there.

Figure 2.6 Photo of Structure Y27's northeast corner.

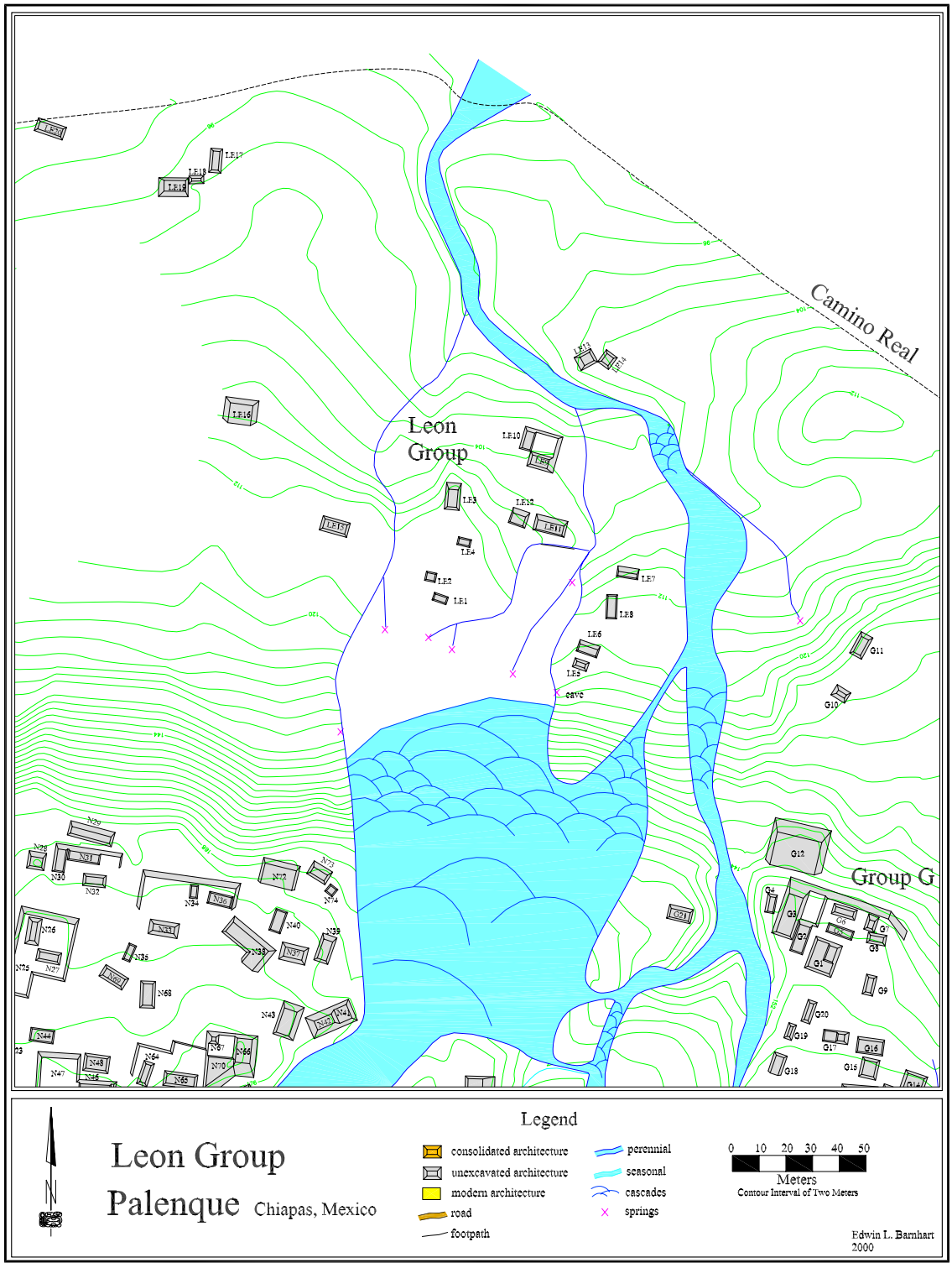
During the last two weeks of the year 2000 season, a well-preserved platform was found just to the west of the Arroyo Picota and some 140 meters south of the Naranjo Trail. This platform, holding structures Y25, 26 and 27, has exceptionally large cut blocks, some over two meters in length (Figure 2.6). Though its entire front face is intact there was no evidence of doors or interior spaces. Based on location and matching characteristics it is likely Franz Blom wrote about this platform as a single building and referred to it as the Selado or "sealed" structure (1926-27).

The Picota Falls and the Leon Group (Map 2.18)

The lower falls of the Picota, one of Palenque's most pristine areas of forest, were a challenge to map. The Picota Falls drop forty meters and are over one hundred meters across. Their eastern side cascades down into the Arroyo Piedras Bolas. Most of the water of the Picota Falls flows just under the surface, dropping into sporadic holes in the limestone shelf and reemerging at lower points along the hillside. At the base of the falls water reemerges from four active springs and separates into small streams. Two small, water formed caves were also found at the base of the cascades. Around the streams, all of which flow down into the Piedras Bolas, is a small group of twenty structures, none of which are more than two meters in height. That group has been designated the "Leon Group" after Mario Leon, Palenque's first Head of Site Security in the 1950's, who donated the neighboring parcel of land to the National Park for reforestation in 1997.

Group B and Murcielagos (Map 2.19)

Work in the east began in 2000 with Group B and the Murcielagos Group. Unable to find published drawings, new plan view drawings were made of all structures. Figure 2.7 shows a reconstruction drawing made from the group's mostly consolidated structures. The Arroyo Murcielagos has partially intact canal walls



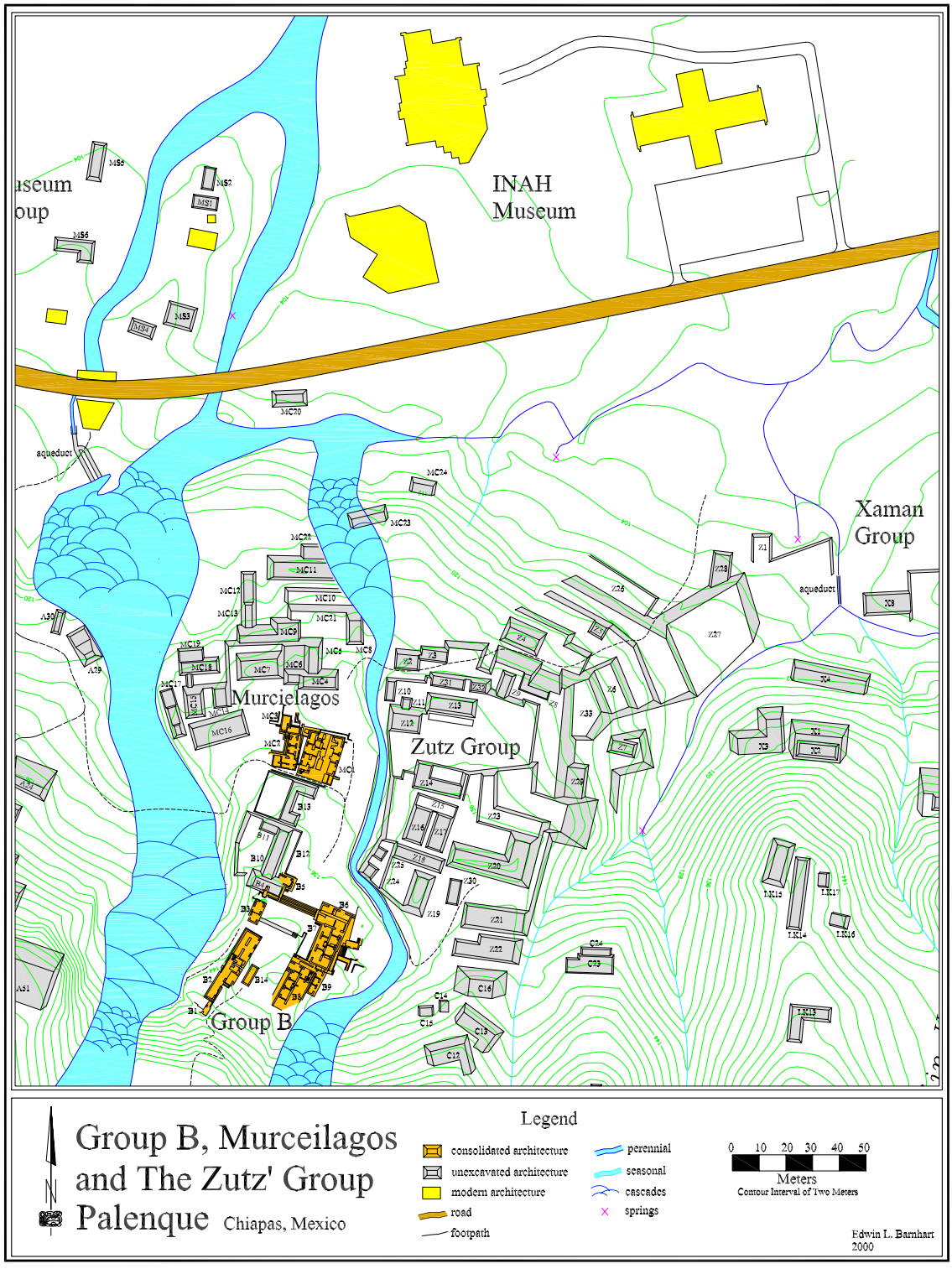
Map 2.18 Leon Group

extending from the base of its cascades all the way to the top of the drop off to the modern road, some one hundred thirty meters of construction. The Murcielagos Group extends north down the hillside following the east bank of the Arroyo Otulum's lowest tier. In all, twenty-two new buildings were added to the Murcielagos Group and six to Group B.

Figure 2.7 Reconstruction of Group B drawn by Alondso Mendez, 2000

Cascade Group (Map 2.20)

South and uphill from Group B is a small group. Designated the Cascade Group, it sits just atop the extinct falls between the Otulum and Murcielagos cascades. The group's seventeen structures are built directly on top of cascade calcification. It is possible that the ancient Palenqueños shut this section of the falls down prior to the building of both the Cascade and B Groups.



Map 2.19 Group B, Murceilagos and The Zutz' Group

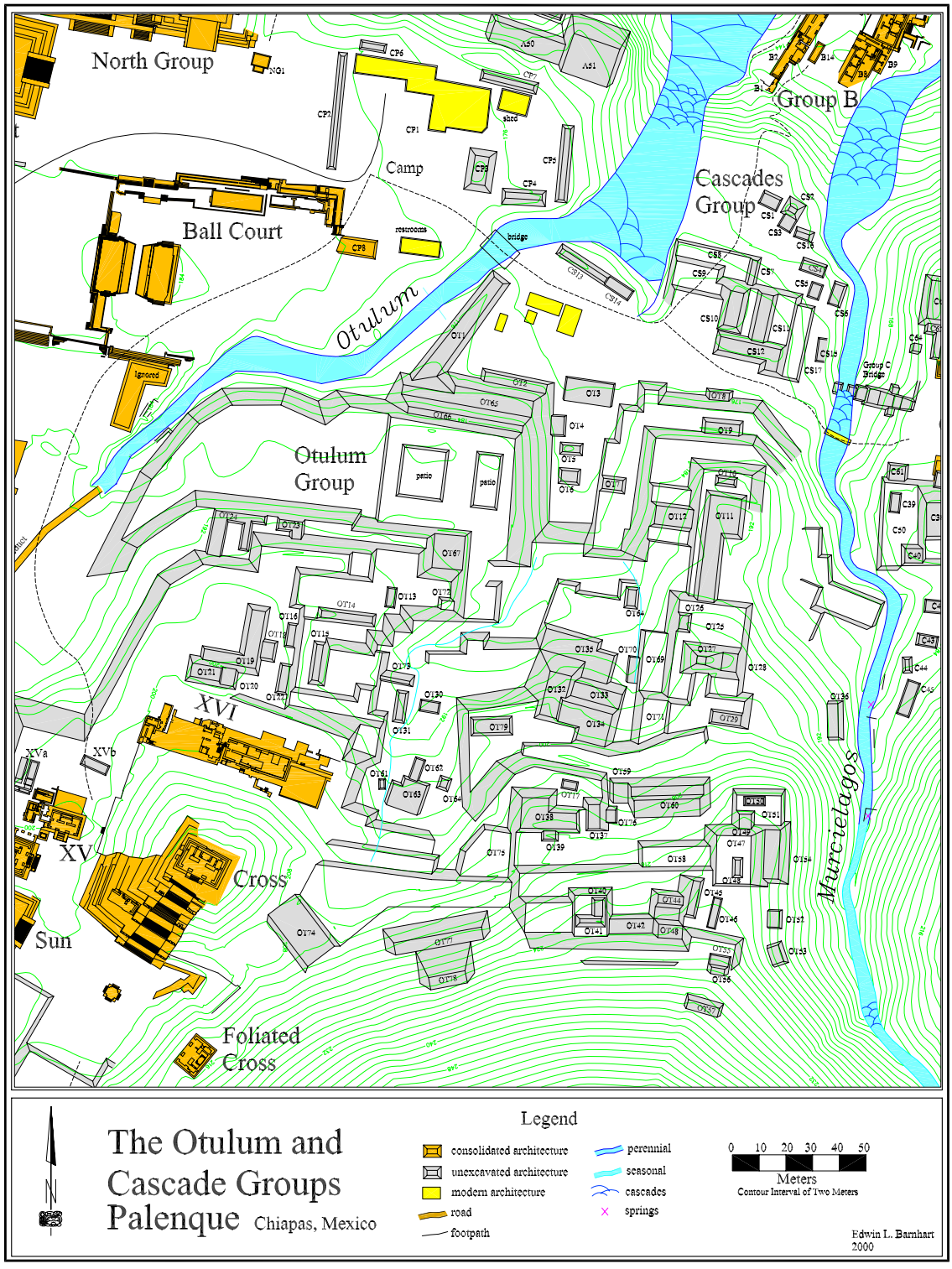
Otulum Group (Map 2.20)

The terraces of the newly recorded Otulum Group, just to the south of the Cascade Group, are separated by an irregularly shaped plaza,. The Otulum Group includes seventy-eight individual structures, almost all of which are interconnected by terraces as they climb up to the north face of El Mirador. On the southern end of the Otulum Group are a few platforms on the steeply rising base of El Mirador and other structures that lead up to the back of the Temple of the Cross. The group's northern section is arranged around a rectangular plaza roughly equal in size to that of the Southern Acropolis. Throughout this group are large sections of intact walls. Though few interior chambers were encountered, the Otulum Group is overall one of the better-preserved sections of the ruins. Given this group's connection to the Cross Group and its proximity to the Palace, it may be a neglected part of the city's central precinct.

Group D (Map 2.21)

El Mirador, the hill towering one hundred fifty-two meters over the Cross Group, was intensively survey on all three sides producing no evidence of architecture on its steep slopes. Its summit holds one modestly sized structure upon a ground-leveling platform. A looter's hole on its top appears to have been back-filled. Moving south from El Mirador's summit structure one travels along a flat narrow ridge, averaging ten meters in width and reaching a distance of approximately one hundred fifty meters. An overgrown trail said to lead to the village of Babylonia follows that same ridge going south and then southeast. The ridge itself terminates in the taller southern hillsides.

The area around the Otulum spring, just south of the Southern Acropolis, was investigated first in 1998 and then further in the 2000. A narrow ridge was found in between the Otulum's main course and an unnamed arroyo just to the west. On that ridge sit a series of structures terracing up to the south, the largest of which seems to



Map 2.20 The Otulum and Cascade Groups

be facing east towards the XIXa, XIXaa area, making up the eastern section of the Schele Terraces.

South of the Otulum spring the arroyo continues uphill as a dry watercourse. another dry arroyo begins fifty meters south of the spring and splits off to the southeast. The channel of this side arroyo climbs one hundred sixty meters further uphill becoming increasingly full of large boulders and finally terminates in a twenty-five meter tall cliff. Within the cliff's face are two caves, one tall enough to walk into and the other with an opening approximately one meter in diameter. Both caves have multiple rooms and extend roughly thirty meters back into the earth. The taller of the two caves was drawn in plan and profile (Figures 2.8 and 2.9).

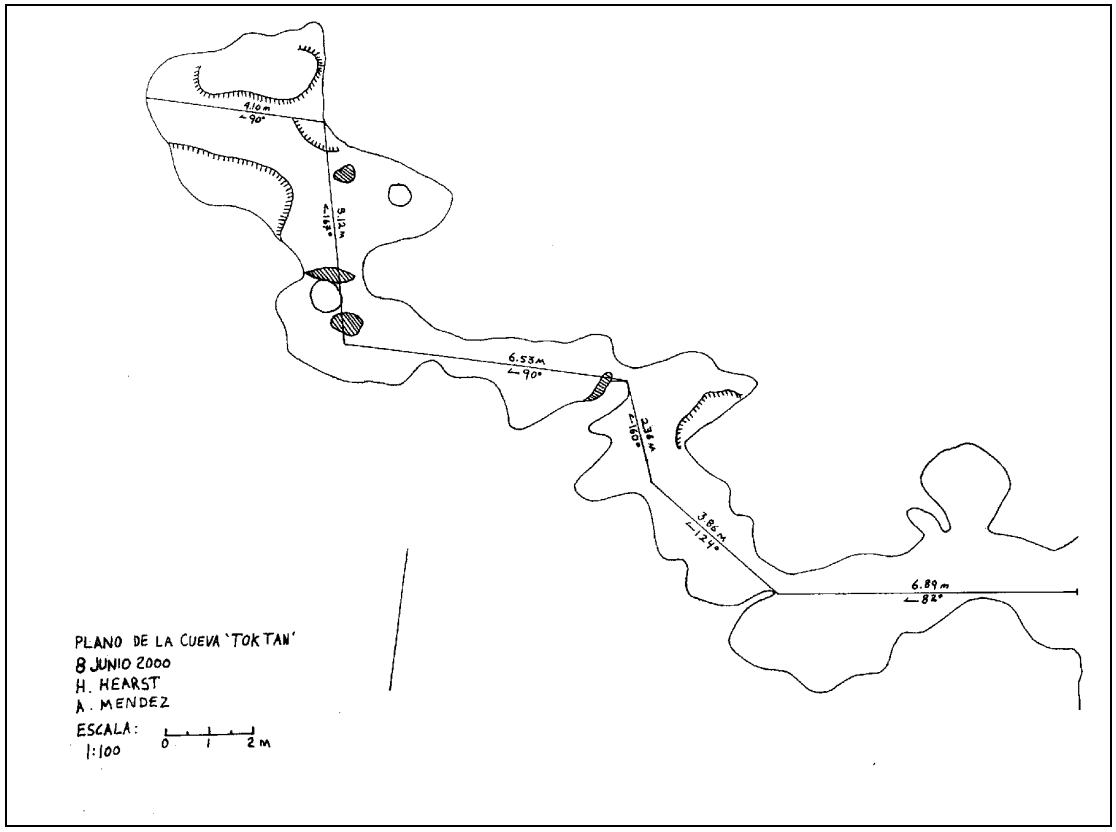
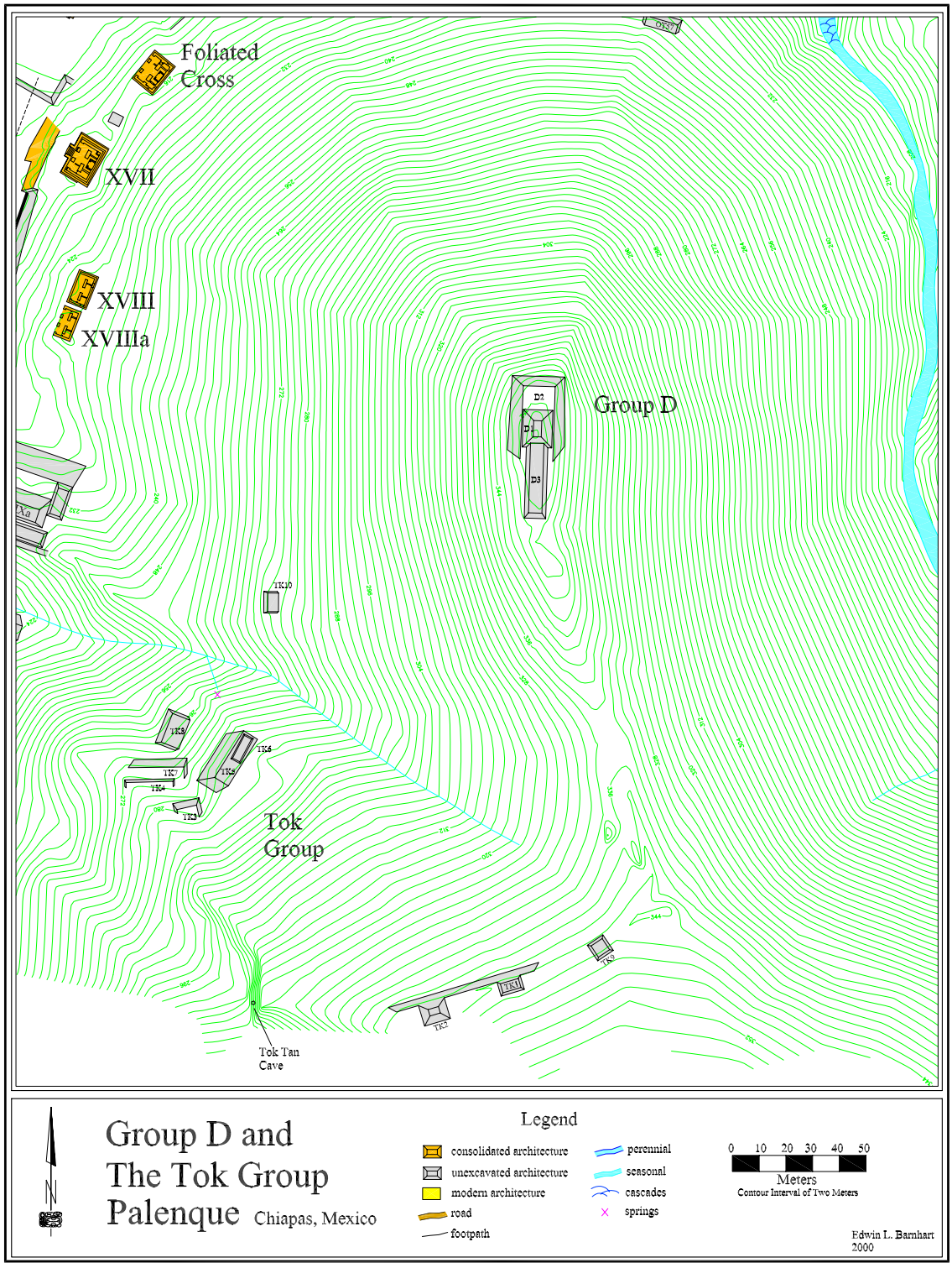


Figure 2.8 Plan view of Tok Tan Cave drawn by Hurst and Mendez, 2000



Map 2.21 Group D and The Tok Group

Tok Group (Map 2.21)

Just below Tok Tan Cave and to the northeast sits a small cluster of structures. There are ten structures in total and all but one are low-lying platforms. The tenth may not be a building at all. A partially fallen wall on the north face of structure TK3 reveals an interior consisting of faced stones, not the typical rubble core. Considering its proximity to the cave's limestone cliff, this "building" may in fact be a pile of quarried stones stacked for temporary storage.

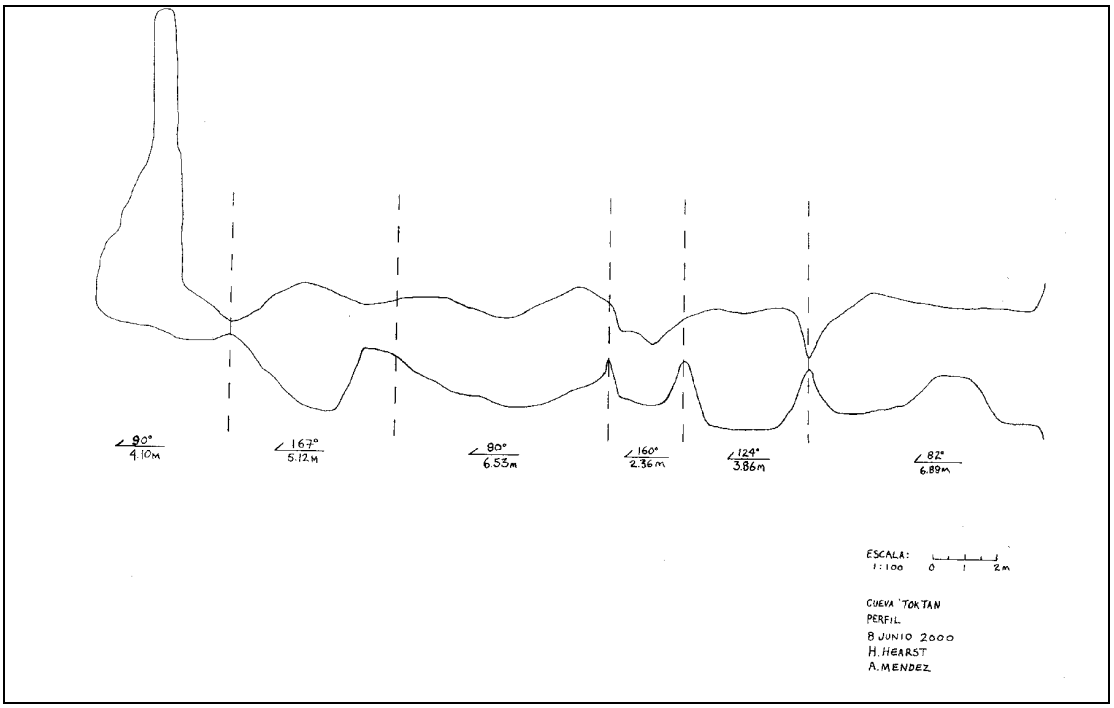
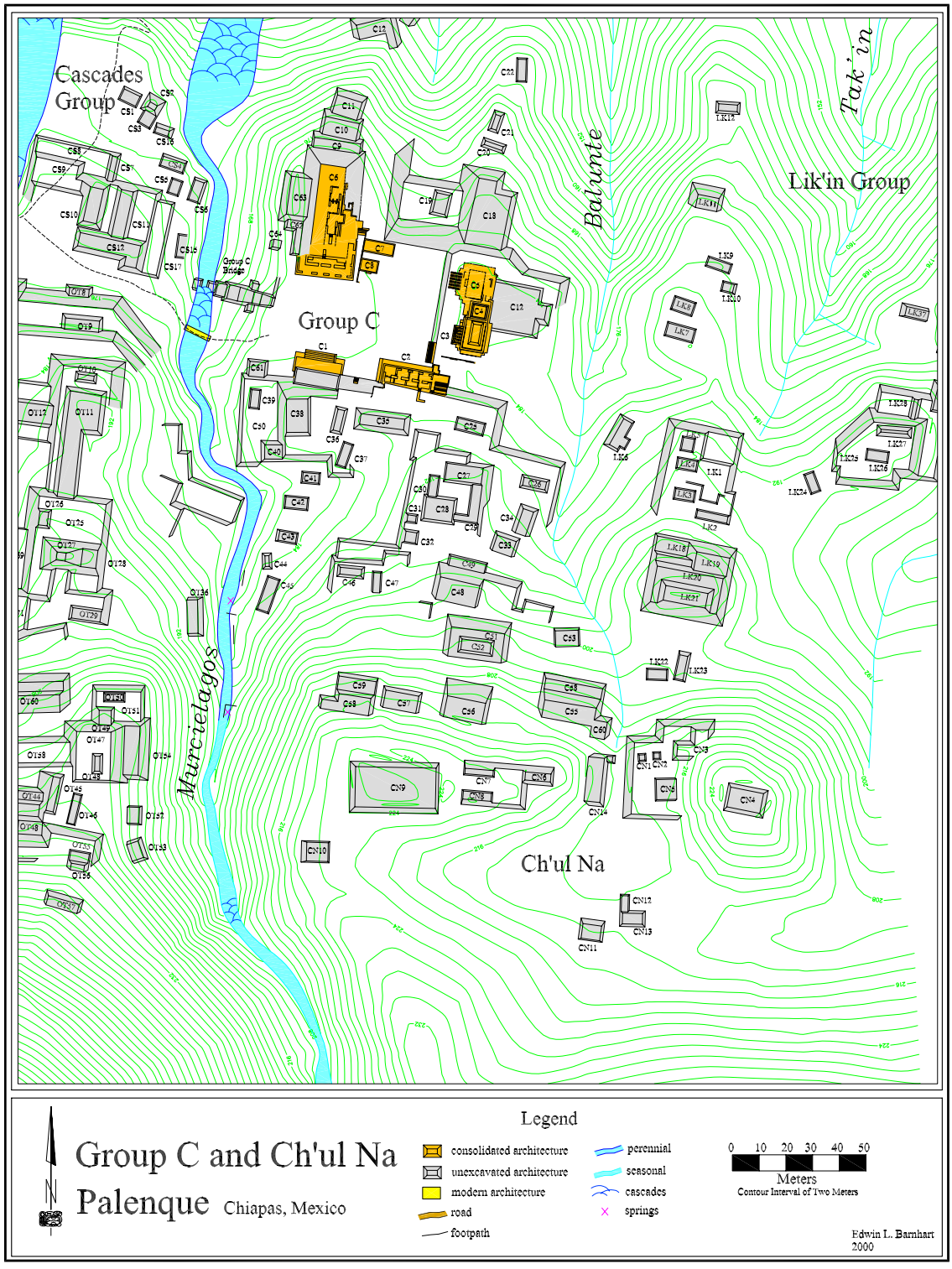


Figure 2.9 Profile view of Tok Tan Cave drawn by Hurst and Mendez, 2000

Group C (Map 2.22)

The area in between the Arroyos Murcielagos and Balunte is densely covered in ruins. In the middle of this densely built-up area lies Group C's large open plaza (Figure 2.10). The structures flanking the Group C plaza were excavated and consolidated by INAH in the early 1990s (Gonzalez 1993). Ceramics collected during excavations were late, ascribed primarily to the Balunte Phase, AD 770-850



Map 2.22 Group C and Ch'ul Na

(Rands 1974). As with Group B, new plan views were drawn for each consolidated structure.

Figure 2.10 Reconstruction of Group C drawn by Alonso Mendez, 2000

Just north of the wooden bridge crossing the Murcielagos along the tourist trail are the pillars an ancient bridge (Figure 2.11). Connected to that bridge was a staircase with two landings leading up to the Group C's plaza. This discovery marks only the second stone-constructed bridge identified in Palenque. Group C's central plaza is bordered by smaller arrangements of structures to the north and south. To the north, platforms step down the hillside to the southern edge of the Zutz' Group. To the south, structures arranged in multiple patio groups climb up hill some one hundred thirty meters to the Ch'ul Na Group. Along the Murcielagos, a few Group C structures are located in close proximity to a section of canal walls remnants and two

springs. Sixty-four structures were recorded in Group C and, excluding the consolidated section, three structures exhibit exposed architecture; C37, C58 and C60.

Figure 2.11 Photo of the Group C Bridge's eastern pillar.

Ch'ul Na (Map 2.22)

The Ch'ul Na Group is built around and on top of two large limestone outcrops straddling the uppermost point of the Arroyo Balunte. Its western portion sits atop an outcrop and includes five small structures and one large platform. The

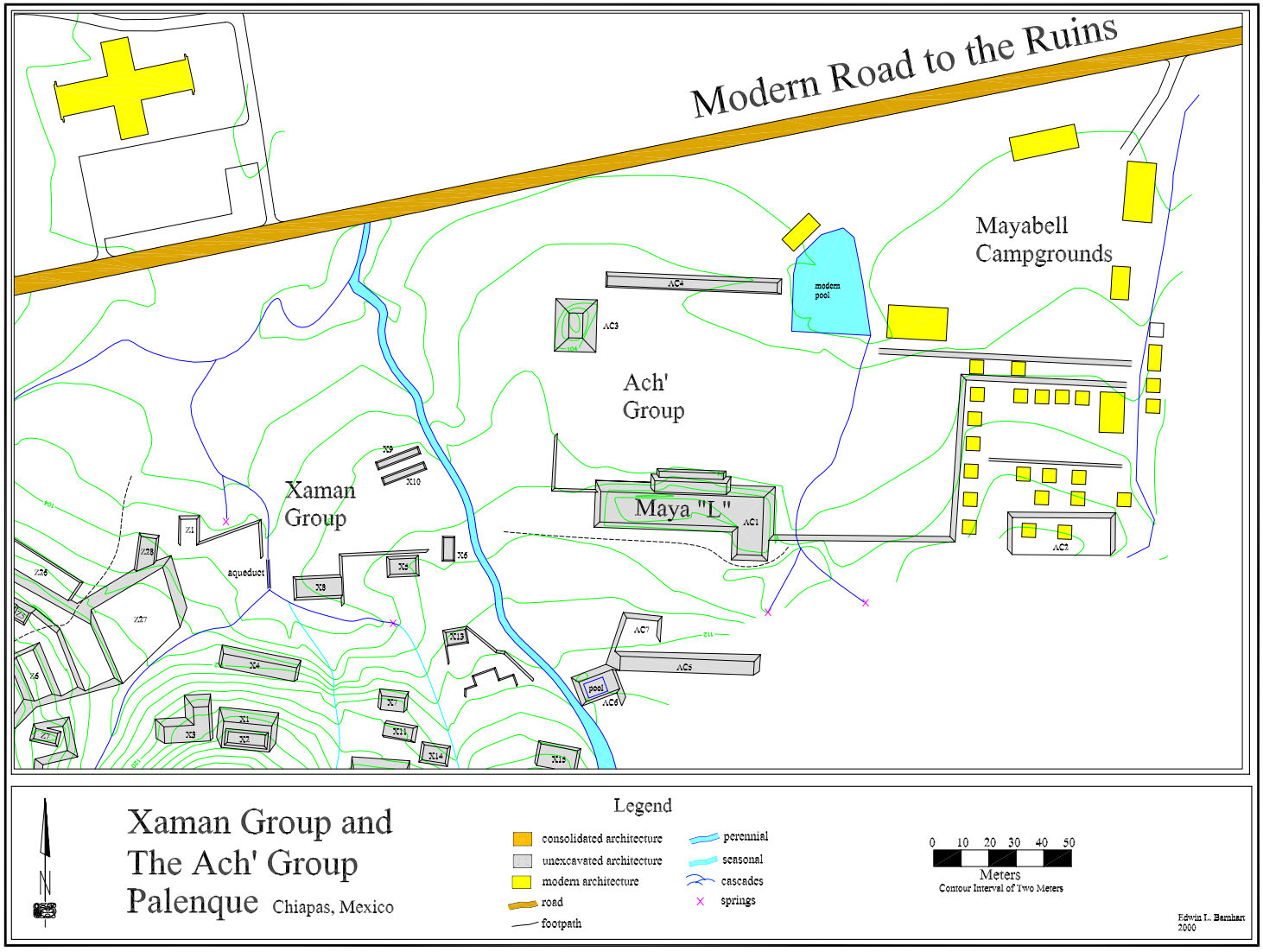
large platform's western edge looks down on the Arroyo Murcielagos some thirty-four meters below. The eastern outcrop is built up along its northern and western sides. The outcrop itself is thirteen meters tall and has a one-meter tall platform covering its flat-topped summit. A wide flat area some 120x70 meters in size forms the south end of the Ch'ul Na Group. Only three small structures were encountered there leaving a large amount of the area open, perhaps for agricultural purposes. The Arroyo Murcielagos flows alongside and below that wide flat area at the base of a deep canyon. Following the Murcielagos up some 380 meters past Ch'ul Na leads to a dry cascade wall, ten meters tall and almost completely vertical.

Zutz'Group (Map 2.19)

Just across the Arroyo Murcielagos from Group B lies the southernmost section of the Zutz' Group. The Arroyo Balunte bounds the group on its eastern side. Building density in the Zutz' Group is high. Patios and platforms cover areas not occupied by structures. The group reaches from Group C's northern part down to a point where the Arroyo Murcielagos begins to fan out towards the east and covers a wide area of land with calcified cascade formations. Within those partially wet formations lies a structure almost entirely buried by calcification. Located just fifty meters south of the modern road, this building has doors opening to the north and two intact interior chambers. Though found in a slightly different location, this building is probably the same one named "Santa Domingo" in Robertson's 1983 map.

Xaman Group (Map 2.23)

The southeastern edge of the Zutz' Group reaches down to the beginning of the flat plains and a group called the Xaman Group. As the watercourses of the Arroyos Murcielagos, Balunte and Ach' connect to the flat land of the plains they fragment into multiple small streams. The Xaman Group is a small group of modestly sized structures arranged around those streams. The modern road and its associated drainage features have permanently altered the original courses of the streams at their



Map 2.23 Xaman Group and The Ach' Group

northern extents. An intact aqueduct was encountered at a point where the Arroyo Balunte connects to another small spring-fed stream. The Xaman Aqueduct is ten meters in length unites the two watercourses sending them out its other end as one. Sections of canal walls extend a short distance past the exit of the aqueduct. The largest structures of the Xaman Group are built into the hillside just east of the Balunte and north of the Lik'in Group.

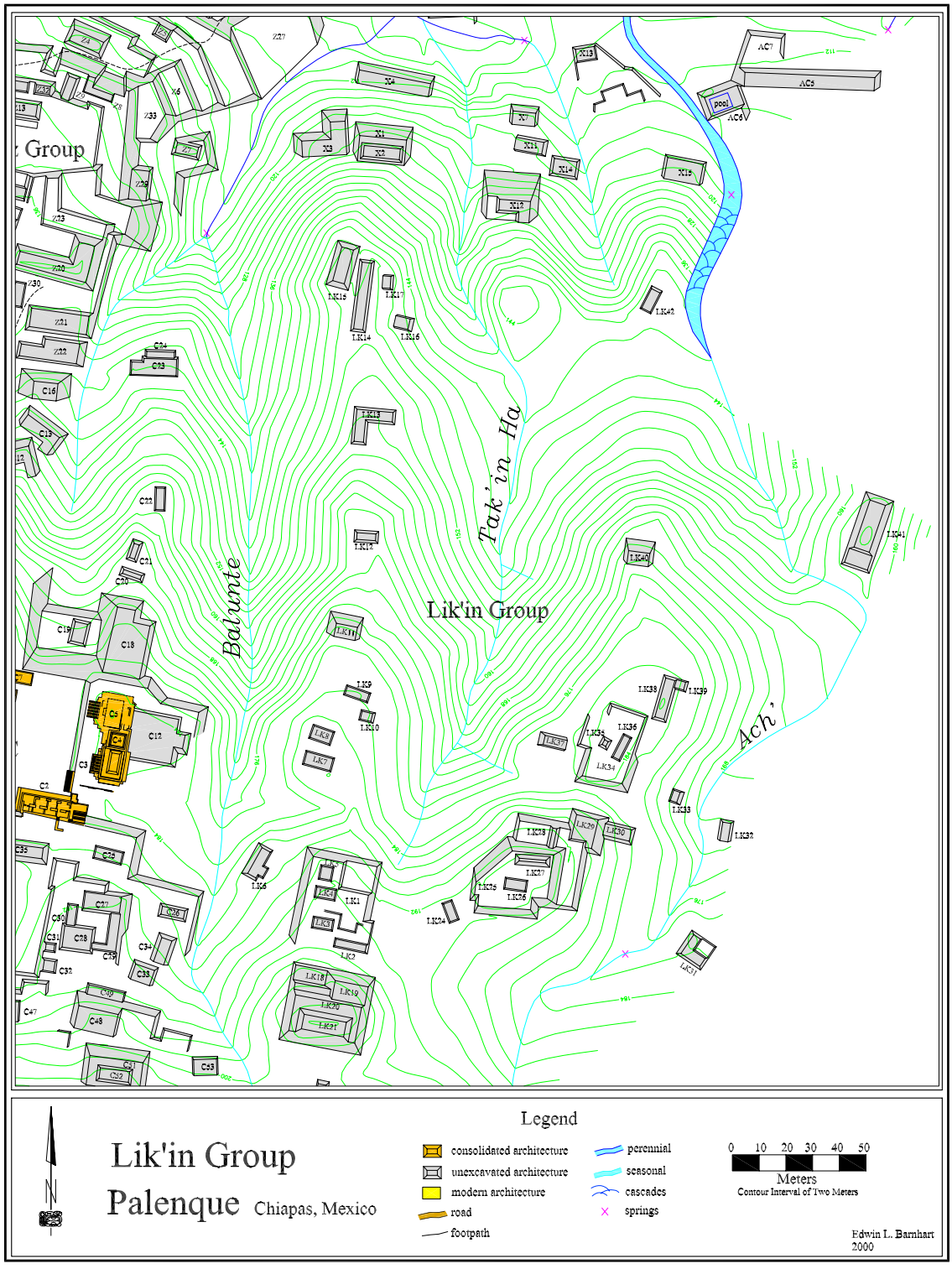
Lik'in Group (Map 2.24)

The Lik'in Group is built upon and around two narrow, north-south running ridges, one high above the east bank of the Arroyo Balunte and the other above the west bank of the Arroyo Ach'. A dry but deep arroyo bed running down between the ridges was named Arroyo Tak'in Ha. The ridges connect at their southern ends but the Lik'in Group continues to extend all the way to the base of the Ch'ul Na Group. Despite the narrowness of the ridges, the Li'kin Group contains forty-two structures.

The Lik'in Group is bordered by the Ach', easternmost arroyo surveyed in the year 2000. This arroyo's northern section hits the modern road, flows underneath it, and joins with the Michol River, as all of Palenque's arroyos eventually do. Its course is perennial only up to its first cascade, 220 meters south of the road. Above the cascade, it winds through a rocky bed and finally dies out on the east side of the Ch'ul Na Group. An area without a clear riverbed was encountered 420 meters up its course from the modern road. The same area is flanked by two isolated structures of the Lik'in Group. It is strongly suspected that a collapsed aqueduct running some seventy meters in length lies just under the surface here. Above this suspected aqueduct the soil contains a dark red pigment tested by Proyecto de Las Cruces Director Alfonso Morales and found to be suitable for use as paint.

Ach' Group (Map 2.23)

The Ach' Group was the easternmost group covered by the PMP. Located between the Arroyo Ach' and the Mayabell campgrounds, the Ach' Group is arranged



Map 2.24 Lik'in Group

around a 70x70 meter open plaza. The group's main building is a sixty-seven meter long "L" shaped structure standing five meters in height (Figure 2.12). Its top contains the stubs of fifty columns and its front has a partially intact two-tier staircase leading down to the plaza. Initial impressions of the group suggest it may have been an administrative area connected to farming commerce in the plains. Connected to this group and extending out towards the east are three wide terraces stepping up the hillside within what is now the Mayabell campground. These terraces have no structures built atop them and are probably agricultural terraces like the one's documented just to the east (Liendo 1999).

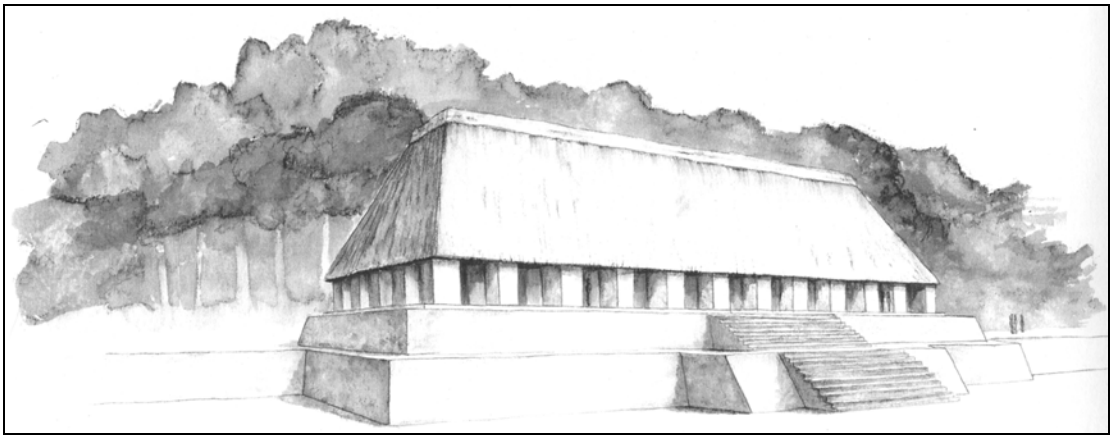


Figure 2.12 Reconstruction of the Maya L drawn by Heather Hurst, 2000

Water Management

Palenque has long been known for its aqueducts. The PMP survey has expanded our understanding of water management to the residential areas of Palenque. Within the 220 hectares covered by the survey, nine perennial arroyos and fifty-six springs were encountered. With few exceptions, every flowing water source in central Palenque was managed and harnessed to serve the people who lived there. Water management architecture recorded over the course of the survey includes four aqueducts, three "waterboxes", two bridges and the remnants of canal walls in

segments of virtually every arroyo in Palenque. Two more aqueducts may be buried under the calcified beds of the Arroyos Ach' and Motiepa. Exposed sections of drains were found in most of Palenque's outer groups.

Ancient settlement in an area of such abundant resources provides modern archaeologists with research opportunities otherwise unavailable in the Maya region. More than any other Classic Period site, Palenque demonstrates the ancient Maya capacity to engineer a variety of water management features. Now that the PMP has identified the locations of some of these features, an in-depth study of their forms and functions can be planned and initiated. For a more detailed discussion of Palenque's water management refer to Kirk French's upcoming thesis for the University of Cincinnati.

Summary

Thanks to the efforts of the PMP we now know that Palenque's settlement density was much greater than previously believed. While the 2.2 square kilometer area surveyed does not include every ancient structure in the Palenque's sphere of influence, we feel confident it accurately depicts the city's urban center. Geography restricted Palenque's expansion pattern. To the north are the plains, seasonally flooded and better suited for agricultural activities. To the south were increasingly steep hillsides, difficult to securely build upon. The plateau that the majority of Palenque is built upon pinches to the east and west and becomes narrow ridge-tops divided by deep arroyo cuts. The areas of hillside settlement outside of this new map's boundaries are different in nature; more spread out, large single platforms and few interconnected groups. These differences were also a product of geography – where land suitable for building was located. Those parts of the urban core that were missed lie to the west where PMP access was denied.

The wide-open plazas and large temples surrounding the Palace have long been identified as the city's central precinct. Now the Picota Plaza may be the center from an earlier epic of the city's history. At minimum, its monumental architecture

classifies it a public activity sector. In addition to these two public zones of Palenque, many of the outer groups mapped by the PMP have small centers of their own. The centers of Groups IV, I/II, C, B and Murcielagos have all been excavated and consolidated by INAH (Gonzalez 1993) and are clearly the most monumental sections of their respective areas. The Encantado Group has the Encantado Temple standing tall over the group's closest arroyo, the Motiepa. Moises' Retreat has a large elevated platform holding a square based temple and four other structures. The platform is flanked by open courtyards and again located next to a perennial arroyo. Located a half kilometer northeast of and over seventy meters below Palenque's center, a clearly public plaza group, the Ach' Group, was identified for the first time in July of 2000. The plaza is 80x80m and a structure named the Maya L bounds its south side standing five meters tall and measuring sixty-seven meters across its front side. A wide staircase with two tiers climbs up to the structure's top where the stubs of fifty columns testify to the Maya L's open colonnade architecture. The Ach' Group is one of the strongest examples that Palenque had a multiple public gathering areas.

Structure density was greatest in Palenque's western region, specifically in between the Arroyos Picota and Motiepa. Structure density is also quite high in between the Arroyos Otulum and Balunte. Examples of water management architecture and landscape alteration found throughout those densely settled zones seem to be primarily focused on freeing habitable lands from seasonal inundation.

The second center on Palenque's western edge, located around the Picota Plaza, is probably older than the city's much larger primary center for the following reasons. First, the ceramic sequence defined by Dr. Robert Rands has identified specimens from the Picota area as some of the oldest at the site (1964). Second, data points collected in the Picota Plaza were found to be less than 50cm (on average) in elevation difference from those recorded in the plaza surrounding Palenque's Palace. The central complex of Moises' Retreat, though located along the same central plateau as the two big plazas, sits at an elevation seventeen meters lower. If the

identical elevation of the two plazas is not a coincidence then one must have patterned itself upon the other. Two facts point to the central plaza as the emulator. First, the Picota Plaza slopes almost imperceptibly down to the river that defines its northern boundary. Since the river is shallow and at essentially plaza level we can assume the Picota Plaza was neither built up nor dug down to any large extent. In contrast, Palenque's central plaza sits upon a terrace, built up as much as four meters in places. If one plaza emulated the other, the smaller Picota Plaza was the original.

The discovery of this second center at Palenque could answer growing questions regarding the members of Palenque's early royal lineage. Despite decades of excavation in Palenque's central precinct archaeologists have found little evidence of royal activities before the time of Pakal. The antiquity of the two exceptions, the XVIIIa tomb (Berlin 1943) and the Reyna Roja (Gonzalez Cruz 1998), is still under debate. Palenque hieroglyphic texts refer to a place named "Tok Tan" as the origin place of the Palenque lineage, a place believed to be separate from the primary center, and named "Lakam Ha" (Martin and Grube 2000). The Picota Plaza could be the center of the dynasty's original family members. Its size, suspected age, and obvious association with the site's residential community make it a possibility worthy of further archaeological investigation.

CHAPTER 3: SETTLEMENT PATTERNS

The Palenque Mapping Project marks Palenque's induction into the growing body of settlement pattern data being collected on the Ancient Maya. Though much data remain to be collected, we can now begin to compare Palenque's settlement to other major Classic Period centers and add it to our knowledge of overall Maya settlement patterns. Palenque has been known for its distinctive character among Maya sites. Unique architectural forms, acceptance of not one but two women as dynastic rulers, lack of stelae, and innovations in astronomy are but a few of Palenque's known distinctions. As this chapter will demonstrate, Palenque's settlement pattern is no exception to the site's status as an enigma among Maya cities.

During the course of this chapter Palenque will be placed in the historical context of Maya settlement studies and compared to other sites for which we have sufficient data. Settlement statistics obtainable from the new map will be presented and the methods upon which those statistics were derived will be described and evaluated. Finally, Palenque will be compared and contrasted against a variety of models forwarded to explain the nature of ancient Maya settlement patterns.

Historical Context of the Research

Dr. Gordon Willey first popularized investigations of the areas outside of the ancient Maya city centers. After establishing a survey and sampling methodology in Peru's Viru Valley (Willey 1953) Willey shifted his Peabody Museum supported research to the Belize Valley (Willey et al. 1965). After over a half century of Maya archaeology, Willey's was the first research program focused solely outside of the large-scale architectural zones of the ceremonial centers. His research was designed to understand land use strategies, population densities, chronological development, social stratification, agricultural systems, and the function of peripheral structures. Willey's survey efforts revealed an unexpectedly large amount of small stone platforms in the Belize Valley, most of which were arranged in patio groups.

Selected archaeological testing indicated residential use for the majority. Through his analysis, Willey gave the academic community their first archaeologically tested population estimates for an area within the Maya region.

News of Willey's success and the strength of his research methods spread quickly. Within just a few years after the start of his Belize Valley project two of the largest settlement studies ever conducted in Mesoamerica had begun, the surveys of Tikal and Teotihuacan. In Teotihuacan, Rene Millon's survey covered 20 sq km and documented a grid-based settlement with over 2000 apartment compounds, each capable of housing 50-100 people (Millon 1967, 1974). While Teotihuacan's large extent had been known for some time, Millon's project provided the first undeniable evidence that urbanism and state level society had developed in ancient Mesoamerica.

Conventional anthropological wisdom had dictated that major civilizations could not and would not have developed in swampy, tropical regions. The Tikal survey, covering 16 sq. km, contradicted that assumption and began a paradigm shift in ancient Maya studies. Their initial population estimates suggested as many as 62,000 people lived in Tikal during the Late Classic (Haviland 1969). Estimates have only risen since. The hypothesis that Maya sites were ceremonial centers supported by farmers practicing swidden agriculture could no longer explain Tikal's settlement pattern. The Tikal survey marked the end of our view of Maya cities as minimally populated ceremonial centers and the beginning of the search for evidence of Maya urbanism.

The 1970's saw the expansion of settlement studies all across the Maya region. Willey, joined by William Sanders and a group of Harvard graduate students, moved his research again, this time to the Copan Valley (Willey, Leventhal and Fash 1978). A wide survey of the areas surrounding Copan's center provided evidence of extremely dense settlement. Just as in Tikal and the Belize Valley, a pattern of patio groups organized within larger clusters was found spreading across the entire valley floor. Other sites surveyed during the 1970's discovered the same kind of evidence. Yaxha (Rice 1978), Quirigua (Ashmore 1980), and Siebal (Tourtellot 1976), all

Classic Period lowland centers, were found to have dense settlements surrounding their centers. Wherever surveys of sufficient area were conducted the conclusion turned out the same. These ruins were not of isolated ceremonial centers but instead represented the remains of densely populated urban centers.

Settlement patterns studies picked up even more steam in the 1980's becoming almost a standard research component at any actively studied site. Evidence in the Peten of densely settled areas well outside of the ceremonial centers became so extensive that the question became where did one center's sphere of influence end and the next one begin. A transect survey from Yaxha to Tikal discovered settlement evidence the entire way (Ford 1986). While the least densely settled areas were found in between the two sites a clear line of demarcation between the two was not detected. During the author's four years as part of the UT Programme for Belize his and other graduate student's surveys encountered similar results (Barnhart and Hargrove 1995; Barnhart and Ross 1996; Barnhart and Barry 1997; Barnhart 1997; Barnhart, Eckhardt, and Cackler 1998). Seemingly continuous settlement was documented between the centers of Dos Pilas, La Milpa, and Ma'ax Na. Preliminary evidence also suggested that the settlement zone continued west all the way to Rio Azul.

All of the aforementioned areas of the Maya region have one important characteristic in common; their urban core and peripheral settlements were located on the same kind of topography. Their ancient inhabitants could use the same land use strategies in any given part of the settlement zone. As the next section will discuss, such was not the case at Palenque.

Settlement Density

Palenque's geographic location makes the sampling strategies used in valleys and the gently rolling lowlands difficult to emulate. The city is located on a 2x1 sq km plateau 100 meters above the seasonally inundated plains to the north (Figure 3.1). According to today's Palenque residents, the plains below the ruins were

swamp-like half the year until the 1960's when modern drainage constructions were installed. To the immediate south the mountainside rises sharply to 300 meters above the site providing little to no inhabitable land along the way. To the east and west of Palenque the mountainside becomes more karstic and areas of habitable land appear only in isolated pockets. With these radically different landforms surrounding Palenque, an outer settlement estimate based on the plateau's survey would be false. Thus, for the purposes of this evaluation, sites compared to Palenque will be compared using only their central or core zones.

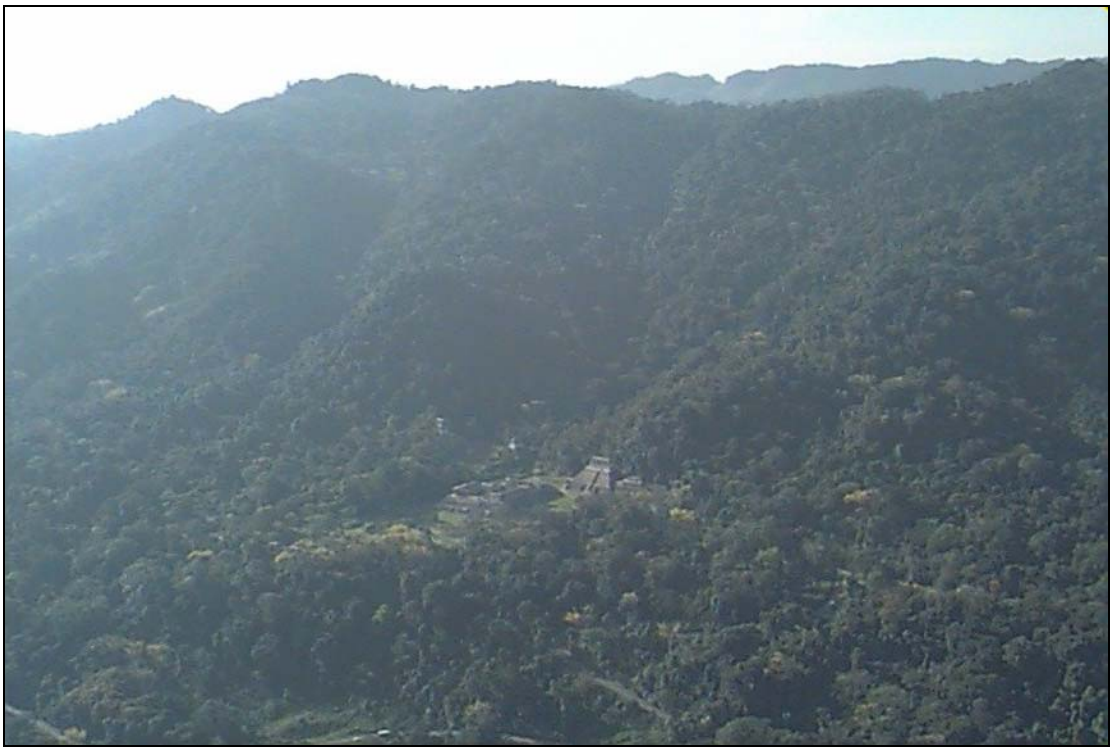


Figure 3.1 Aerial Photo of Palenque in 1998

The issue of how to define a site's boundaries can only be settled on a site-by-site basis. While concentric circle models for site interaction spheres have been proposed (Adams 1981), they are acknowledged as generalizations made for the purposes of overall region analyses. For Copan (Webster and Freter 1990) and

Quirigua (Ashmore 1980), the alluvial valleys they occupy were assumed to be their boundaries. At Sayil (Tourtellot et al. 1988) and Komchen (Ringle and Andrews 1990) a sharp drop-off in peripheral settlement densities served as boundary markers. A defensive wall surrounding the community of Mayapan clearly delineates its boundary (Shook 1952).

In the Peten, boundaries have been more difficult to determine. Tikal's initial 16 sq km, bounded by bajos east and west and massive earthworks north and south, was determined to be the site's core settlement. Further investigations outward made it clear that settlement, though less dense, continued out even further. Based on topography and the locations of neighboring major sites, Tikal's periphery was judged to cover 120 sq km (Haviland 1969).

Given the evidence at many sites of a settlement density drop-off at a certain distance out from the center, population estimates for these sites have been broken up into two parts; core and periphery. The information presented here should be considered as "core" data. Palenque's location on an elevated plateau gives it a boundary almost as clear as Mayapan's wall. The peripheral settlement of Palenque, to the extent it exists, lies on different landforms than Palenque's plateau-top core. In order to properly assess Palenque's periphery one would need to conduct separate surveys of the mountains above and the plains below. The plains were sampled in the 1990's and found to have extremely little settlement evidence. Agricultural evidence, however, was abundant (Liendo 1999). Surveys of the mountainsides around the plateau have yet to be conducted. From the viewpoint of current evidence and informal reconnaissance, a very low settlement density for the mountainsides can also be predicted. It is not until roughly 10 km outside of Palenque that the small satellite sites of Nunutun and Santa Isabel appear to the east and west, respectively. While Palenque's apparent isolation seems contradictory when compared to other Classic centers, one should bear in mind that the same plateau location that made Palenque naturally defensible may have made it difficult to militarily defend and/or subjugate a wide peripheral area.

Based on the documentation of 1481 structures over a 2.2 sq km area, we can now say Palenque's urban core has an average of 673 structures per sq km. As Table 3.1 illustrates, Palenque's urban settlement density is the second highest ever recorded for a Classic Maya city. If we include the Post Classic as well Palenque's rank drops to third overall, behind Mayapan (986 structures/km^2) and Copan. Given Palenque's geographic confinement to a 2x1 sq km plateau such a high settlement density is not entirely unexpected.

TABLE 3.1

Core Area Urban Settlement Densities at Selected Classic Maya Sites

site	core area (km^2)	Structures / km^2
Copan	0.6	1449
Palenque	**2.2**	**673**
Dzibilchaltun	19.0	442
Caracol	2.2	300
Siebal	1.6	275
Tikal	9.0	235
Becan	3.0	222
Sayil	2.4	220
Quirigua	3.0	128
Belize Valley	5.0	118
Uaxactun	2.0	112
Nohmul	4.0	58

(Adapted from Sharer 1994 and Rice and Culbert 1990b)

Population Estimates

Based on survey and building counts, the Carnegie Institution of Washington studies at Uaxactun (Wauchope 1934) and Mayapan (Bullard 1952) were among first to suggest the ceremonial centers may have been more densely populated than previously assumed. In the following decades similar high population densities were reported from the surveys of the Belize Valley (Willey et al. 1965), Dzibilchaltun (Andrews IV 1965), Tikal (Haviland 1985), and Copan (Webster and Freter 1990).

As of the 1990's we had population data for many areas of the Maya world, the Peten and the Yucatan being the most thoroughly covered regions. Rice and Culbert (1990b) noted that no data were yet available for the Usumacinta and Palenque regions. The new map of Palenque, combined with previously disconnected ceramic studies, provides our first real opportunity to estimate Palenque's population.

Total structure counts and population estimates for most ancient Maya cities were arrived at based on sampling strategies. At Tikal, for example, four wide transects were surveyed out from the center and a fifth continued further north towards Uaxactun. Test excavations were done on selected groups within the transects in order to determine chronology and building function. Finally, an estimated total structure count for 9 sq km was extrapolated from the sample. Located in the lowlands of the Peten, it was reasonable to project the same settlement pattern for the surrounding areas of like topography. After subtracting a percentage area for uninhabitable bajos, a total estimated structure count was converted into a maximum population. Based on ethnographies of modern Maya communities, an estimated 5 people per structure was used to calculate 8,300 inhabitants of Tikal's city center during its Late Classic peak (Haviland 1972).

In the Copan Valley a similar strategy was employed. Starting with a thorough survey of the ceremonial center, selected areas of the valley floor were surveyed and test pitted. Based on sample building counts, an estimate for the entire 162 sq km valley was projected. Based again on an estimated 5 people per residential structure, a total maximum population of, including peripheral settlement, 24,828 during its Late Classic peak (Webster and Freter 1990).

One of the key factors in estimating Palenque's population is how many people we believe occupied the average residential structure. Traditionally, researchers have relied on ethnographic studies of modern Maya communities from which to draw their comparisons. Though Thompson (1954) among others suggested numbers as high as 10 family members per household based on contact period information, most researchers agree on a number between 4 and 6 for the Classic

period. An average of 5 persons per structure was used for many sites including Tikal (Haviland 1965, 1969, 1970), Siebal (Tourtellot 1976), Mayapan (Smith 1962) and Copan (Willey and Leventhal 1979). Following the standard, 4-6 persons per structure will be used to calculate the range of estimates for Palenque.

Equal in importance to people per household is the question of site chronology. How many structures were occupied at a given period of time? Considering most major Classic Period centers had an occupation span of 200-400 years test pitting and ceramic studies are essential to an accurate population assessment. Almost every Classic center for which we have data exhibits the same chronological pattern; peak population in the Late Classic and fast decline during the Terminal Classic. Ceramic studies at Palenque up to this point have supported a similar conclusion (Gonzalez 1993, Rands 1974). Rands' early work determined the Late Classic ceramic phases were the most abundant at Palenque. Those phases were found in the fill of most central precinct structures and sporadically throughout the site. Even in the site's western region, where Rands also found earlier period ceramics, Late Classic sherds were found. His evidence supports the conclusion that Palenque was relatively small until Pakal's reign. During the INAH excavations of the 1980's and 90's outer groups I-II, IV, B, C and Murcielagos produced almost exclusively Late Classic period ceramics (Gonzalez 1993). For the purposes of this study the conclusions of previous research are followed; Palenque reached its peak population in the Late Classic.

The above discussion of contemporaniety leads us to the nebulous topic of estimate adjustment. In almost every population estimate put forth for an ancient Maya city the researcher has altered the results by a percentage from the simplistic 5 per structure count. Some would have the raw numbers reduced based on the accepted fact that not all peripheral mounds could be residential. Haviland's (1965) studies at Tikal led him to suggest 16.5% were non-residential. For Copan, Webster and Freter (1990) suggested 20-30%. Others would suggest further reductions to account for abandoned structures. Certainly the Classic Maya tradition of residential

burial and its processes of converting home to tomb would produce a percentage of non-inhabited, but culturally functional, residential structures (Barnhart 1999).

On the flip side, there are those who would have the raw numbers increased based on the undetectable presence of perishable structures. For the sites of Santa Rita (D. Chase 1990) and Tayasal (A. Chase 1990) the population estimates accounted for perishable and undetected structures, raising the surveyed structure count by 37-50%. Studies at Nohmul also factored in for hidden structures (Pyburn 1990). As carefully as these adjustments are determined, we must acknowledge they are essentially arbitrary. They are based on current evidence and in that regard validated. Does one adjustment factor cancel out another? As noted earlier, the topic becomes nebulous. In the case of Palenque, with its extremely high building density, it is hard to imagine adding much more for perishable structures. Palenque's lack of small mound excavation data further begs conservative estimates. Percentage reductions also have to be factored in for gaps in our chronological data. Given these limitations, Palenque's estimate presented here will go with the consensus figures compiled by Rice and Culbert (1990b); a flat 30% reduction from the raw structure count.

TABLE 3.2 – Comparison of Population Estimates in the Maya Region

site	core area (km^2)	peak population	population/km^2
Copan	0.6	5797 – 9464	9662 – 15,773
Sayil	3.4	8,148 – 9,900	2,396 – 2,912
Palenque	**2.2**	**4,147 – 6,220**	**1885 – 2827**
Komchen	2.0	2,500 – 3,000	1250 – 1500
Siebal	1.6	1,644	1028
Santa Rita	5.0	4,958 – 8,722	992 – 1744
Tikal	9.0	8,300	922
Tayasal	8.0	6,861 – 10,400	858 – 1,300
Caracol	2.2	1,200 – 1,600	545 – 727

(Adapted from Sharer 1994 and Rice and Culbert 1990b)

Having now established the methods to be used, we may now present Palenque's first quantitative population estimate. Palenque has 1481 structures over 2.2 sq km area. At 4-6 persons per structure we arrive at 4147 – 6220 people. That translates to a population density of 1885 – 2827 people per sq km. Table 4.2 shows those figures compared to the core areas of other Classic period Maya sites.

Palenque and Maya Settlement Pattern Models

In the first half of the 20th century studies focused mainly on the temples and stelae. The conclusion was that the centers were sparsely occupied by time worshipping elite and priestly classes supported by swidden agriculture. Agrarian peasantry who tended the maize crops were thought to live some distance out from the center in accordance with the vast areas of land required by swidden agriculture (Morely 1946,Thompson 1954). Then, starting in the 1960's with the results of the Tikal survey, evidence of very dense settlements close in to the centers began to emerge. Tikal's settlement study not only dispelled the notion of "vacant" ceremonial centers, it also called Maya subsistence on swidden agricultural techniques into question. A population as large as indicated at Tikal would have required massive areas of land dedicated to swidden farming. Within Tikal's 16 sq km core settlement no such evidence was found. Instead, first at Tikal and later at other sites (Adams 1980, Turner and Harrison 1983), the presence of raised fields in bajo areas was discovered. Raised fields or "chinampas" are a much more intensive method of farming, one that could feed many people with minimal land requirements. Their documented presence in the Peten helped fuel the paradigm shift from socio-religious ceremonial centers to socio-economic cities.

Palenque, like every other extensively mapped ruins in the Maya area since the 1960's, does not fit the "vacant ceremonial center" model. In fact, Palenque's 673 structures per sq km make it one of the most densely settled centers of the Classic Period. Though more study of Palenque's subsistence strategies is needed, it seems clear that the land demands of swidden agriculture would not have been practical for

a community of Palenque's now confirmed size. Studies conducted in the late 1990's suggest the plains below Palenque were instead farmed using small, numerous irrigation canals (Liendo 1999). In sum, Palenque was not an isolated religious center. Evidence indicates a population living close in to the center. Architectural diversity strongly suggests multiple levels of socio-economic status interspersed throughout the plateau upon which the city was built.

Feudalism

Feudalism is one of the still prevailing models for ancient Maya settlement patterns. As the name suggests, this model draws heavily upon the better-documented settlement patterns of medieval Europe. Feudal is also the term used to describe ancient settlement patterns in Japan and Western Africa. In this model, the ancient Maya are likened to the lord-vassal-serf relationship in which few owned great tracts of land upon which a mass of peasant farmers lived in exchange for labor. Adams and Smith (1981) were the first to propose this model for the ancient Maya. While they acknowledged that some of the major cities like Tikal and Calakmul evolved beyond feudalism into centralized bureaucratic systems, they asserted that they had developed from a feudal base.

Does feudalism fit the documented settlement patterns of the ancient Maya? A discussion of the elements of feudalism will help us to evaluate. Both in Europe and Japan, an era of feudalism was precipitated by the fall of strong, wide-reaching empires. In Europe it was the fall of Rome. For Japan, it was the end of a similar imperial dynastic rule centered in Heian–kyo (modern day Kyoto). As for the ancient Maya, our current state of knowledge does not allow us to securely evaluate whether or not similar circumstances created the autonomous centers in the Peten and elsewhere. The sparse nature of documented Pre-classic ruins in comparison to the hundreds of ruins assigned to the Classic Period does not support origins from a single fallen empire.

In Europe and Japan feudalism rose as wealthy lords gained autonomy over their own land holdings, expanding and defending them through military means (Duus 1993). Warrior class defenders of the lands were honored by the lords through gifts of land and elite titles. In Europe the knights were this warrior class. In Japan it was the samurai. Both had a code of honor and were often recruited from the peasant classes. Did the ancient Maya have such a warrior class? Hieroglyphic and iconographic evidence would seem to indicate so. Possible recruitment from the peasant classes is less clear. In terms of written texts, the recordations of battles waged one city against another are well documented (Chase and Chase 1989, Freidel 1986, Webster 1977). Alliances during times of war are also mentioned in hieroglyphic texts. Many scholars believe that Tikal and Calakmul were the two major powers of the Classic Period and that all other centers sided with one or the other (Adams 1981, Martin and Grube 2000). Whatever the overarching alliance structure was, it is clear that Maya influence spheres were defended and expanded primarily through military means.

Was there a knighthood or shogun among the ancient Maya? The various titles of *sahals*, or secondary lords, definitely suggest so. Many of those titles have been suggested to hold a military connotation. Though evidence of these secondary lords is found at many classic centers (Villela 1993), the story of Chac Zutz' of Palenque will be cited here to illustrate the point. Hieroglyphic texts from the Tablet of the Slaves and the newly discovered Temple XIX throne speak of a man named Chak Zutz', warlord to Lord Ak'al Mo Nab III (Morales 1999). The Tablet of the Slaves names him repeatedly and the tablet's location has been inferred to be his residential compound, Group IV. In testimony to Chak Zutz''s allegiance, the Tablet's central image is not of Chak Zutz' but rather his king. Chak Zutz' certainly meets the feudal definition of a vassal in terms of his military title and his self proclaimed subordination to the king. Group IV's proximity to the central palace, however, does not fit the feudal model. At less than 300 meters away, Chak Zutz''s residence has no large tracts of land with which it is clearly associated. The key gift

that a feudal lord gives to his vassals is land in which to run their own fiefdoms. Group IV, surrounded by smaller structures and so close to Palenque's palace, suggest that Chak Zutz' reward for loyalty was something else than land holdings. Even if he was granted land in some outer area it would appear his responsibilities required him to live in the city center. This Chak Zutz' example demonstrates that while using a feudal model to understand ancient Maya social hierarchies can be a useful analogy, using feudalism to describe land use strategies and the relationships between sahals and ahaws does not work. The minor foci of building complexes, identified at other sites as elite residential compounds, are simply too close in to the site centers to be gifts of land for loyalty and service to the ahaw.

Another aspect of Old World feudalism with which the ancient Maya had a link was the tradition of intermarriage to foster alliances between cities. Maya intermarriage between cities has been well documented in hieroglyphic texts (Martin and Grube 2000, Schele and Freidel 1990) and was assumably going on at the intra-site level as well.

The final important aspect of the feudal model to consider is its land use strategies. In Europe and Japan the primary gift between lord and vassal, as well as vassal to serf, was land. The result was a dispersed settlement pattern. While settlements sometimes clustered around the residences of lords and vassals, the majority of the territories were occupied areas of croplands. The distance between the residences of lords and their vassals were sometimes days travel apart. In between were the croplands, sparsely populated by serfs who lived on them in exchange for tending the fields. The settlements documented in the Maya region were far too densely clustered to have functioned under a strictly feudal social system. For the Ancient Maya, while we do identify the equivalent of vassals (individuals or families who have the favor of the royal family), they all appear to live in contiguous communities, not semi-autonomous fiefdoms like European or Japanese vassals did. In most Classic Maya cities the urban core radiated out from a central plaza a certain distance and then converted to smaller, more dispersed settlement clusters.

In sum, while the Feudal Model seems to have many connections with the ancient Maya social hierarchy and the inter-relationship between major centers, it is not a good model to use for explaining intra-site settlement patterns.

Galactic Polities Model

In 1987 Arthur Demarest presented a model he termed the "Galactic Polities" Model (Demarest 1987). Citing similarities with Japanese feudalism, he suggested the Maya centers grew and declined based on the charisma and influence of the ahaws who ruled them. In his view, popular ahaws inspired people to be part of his community and thus expanded their city's boundaries and stimulated their economies. Though this model is difficult to test archaeologically, it should be noted that many of the investigated Maya cities have indicated periods of building expansion happening during the reigns of popular and powerful ahaws. At the cities of Copan (Schele 1989), Tikal (Schele 1992) and Piedras Negras (Schele 1991), the deeds of Maya kings were recorded for generations after their rule. In Palenque, archaeological evidence points to the times when Pakal and Kan Balam were in power being the city's time of greatest expansion and population density (Gonzalez 1993, Rands 1974). While Demerast's Galactic Polities Model is difficult to confirm archaeologically, its point of the charismatic ahaw's ability to inspire site expansion is one to always keep in mind when considering Classic Maya social processes.

Pilgrimage – Fair Model

David Freidel (1980) presented another model, one based on ethnographic analogy. Called the Pilgrimage-Fair Model, it suggested that there were frequent religiously sanctioned pilgrimages between cities involving large groups of visitors filling up the plaza areas during fairs. At these fairs, in conjunction with religious activities, trade goods were exchanged. Modern day pilgrimages among the Highland Maya occur in which patron saint idols are carried from one community to another. Upon arrival religious ceremonies occur in conjunction with fairs offering all manner

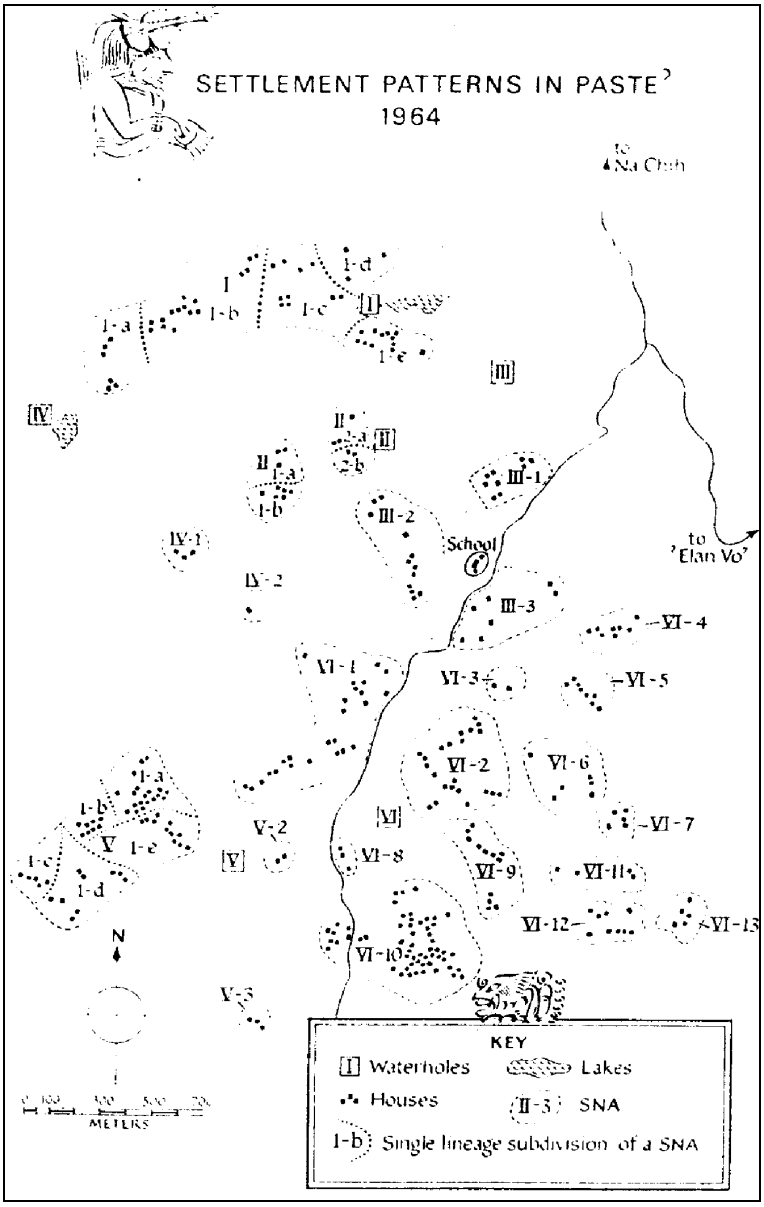
of goods and services. Like Demarest's model, this model is difficult to test archaeologically. Until we can consistently identify artifacts as originating from specific cities it will be difficult to detect the existence of these mass pilgrimages. In regards to Palenque, the site definitely has the open area to have accommodated fairs of large size. In terms of access, however, investigations have thus far yet to discover any formal entryways to the site center, from below or above. For now, the evaluation of Pilgrimage-Fair Model at Palenque may be premature.

The Cargo Model

First forwarded by Evon Vogt (1983), the Cargo Model draws comparisons between modern and ancient Maya settlement patterns. The Cargo System, still in practice in the Highlands of Guatemala and Chiapas, involves headmen of extended families trading off the responsibility of hosting ceremonial events in their community centers. Affluent members of the community are chosen to be the "cargo holders" and to pay for all the expenses incurred during the event. In return they gain status and prestige. The system fosters a focus on the community center and the extended family compounds of both cargo holders and the less wealthy event participants tend to be clustered tightly around those centers. This kind of tight settlement pattern with interspersed socio-economic levels fits nicely with the land use pattern we now have for Palenque. It could also be applied to the settlements of most other Classic Maya cities.

Willey (1980) first stated that the "patio group" is the primary building block of ancient Maya settlement. Most settlement studies would concur. Willey named 2-6 structures as the average patio group size and noted that patio groups are generally found in clusters of 5 to 15. He went on to note that each cluster typically has a patio group larger than the rest; groups Willey suggested were loci for small group authority compatible with lineage organization. According to Vogt (1983), the exact same settlement pattern exists at Zinacantan and other modern Maya communities of

the Highlands. In Zinacantan the community has a center surrounded by *Sna*s, patrilocally organized groups living clustered together.



Map 3.1 Map of *Sna* formations in Paste' (After Vogt 1983)

The Snas typically include 12-15 patio groups and one larger patio group where the patrilocal leader resides. It is those patrilocal leaders who trade off the

burden of cargo holder. Permanent religious posts are also present in Maya cargo systems. Priests live in the center and maintain the grounds upon which cargo events occur. Vogt suggests that these priests correlate to the priestly class long believed to have lived in small numbers in Classic Maya city centers. The map of Paste' (Map 3.1) illustrates the settlement pattern of snas and the center around which they formed. In terms of land use and settlement patterns, Vogt's Cargo Model fits the archaeological evidence well. Vogt also demonstrated that the spacing (12-13 meters) between structures of an average patio group in Zinacantan was also the standard in the ruins of Tikal, Mayapan, and Copan. Vogt correctly pointed out that the settlements of Copan, Tikal and Mayapan are all in a formation similar to the modern Maya Snas of the Highlands.

The primary problem with the Cargo Model, acknowledged by Vogt himself, is the presence of dynastic rulers among the Classic Maya. The kind of group power sharing necessitated by the Cargo System is incompatible with despotic rule. However, a cargo system that incorporated homage to the ahaw and the public praise of the cargo holder by the ahaw and priests could produce much the same settlement pattern. Palenque, with its patio group clusters and minor foci amongst them closely resembles the Zinacantan settlement pattern. We cannot yet say that a cargo system existed at Palenque. We can, however, say that its settlement formation would have accommodated one.

Summary

Palenque's settlement pattern is different than that found at most Classic Maya cities. Its core settlement density is greater than most of its contemporaries and its peripheral density appears to be much lower. For the most part, these differences can be explained by Palenque's geographic location. Its high urban density (673 structures per sq km) can be attributed to the limited expansion areas provided by its narrow plateau. In the Peten and the Copan Valley, uniform topography allowed dense peripheral settlements to develop adjacent to urban cores. Palenque's choice of

location disallowed such a settlement pattern. In the plains immediately below the city only isolated hilltops were high enough not to be seasonally inundated. The swamp-like majority, much like the bajos of the Peten, was ideal for agriculture but impractical for residential use. The mountainsides to the south, east and west presented another type of settlement obstacle. Isolated ridge tops were built upon, but the majority of the terrain was too steep for construction.

As for population estimates, Palenque's urban core is not unlike other centers of the Classic Period. Its urban core population numbers fall, like most Classic Maya cities, between 2,000 and 10,000 inhabitants at its Late Classic peak. It is when we include Palenque's periphery that it begins to deviate from the norm. While much survey and data collection is still needed, the very nature of Palenque's surrounding topography disallows numbers as large as those calculated for Tikal, Copan, or Siebal. Dense settlement clusters do begin some 10 km distance from Palenque but it is unclear whether they should be considered "peripheral Palenque" or independent satellite communities.

Of the settlement pattern models discussed in this chapter, Palenque's pattern holds the most points in common with the Cargo System Model (Vogt 1983). If ethnographic analogy must be used, analogies from the same culture area are generally preferable. Palenque's city center, surrounded by minor community foci (Group C, Group IV, Moises' Retreat, etc.), matches the *sna* pattern of the modern Chiapas highlands quite closely. The same pattern of patio groups, 2-6 structures per patio and 12-15 patio groups in a cluster, also exists in both. In modern cargo systems, wealthier cargo holders live in larger compounds outside of, but close to, the community center and permanently appointed priests live in the center itself. Again, Palenque seems to exhibit this same pattern; a central precinct with limited residential space surrounded by a housing district clustered around larger than average compounds.

Unlike many of the models forwarded for the ancient Maya, the Cargo System Model can be tested through a well-planned excavation program. The purpose of a

cargo system is to redistribute wealth within an economically unbalanced community. Archaeological testing should be able to determine whether or not wealth was distributed throughout the site or concentrated in the center and elite compounds. If artifacts of high value were found throughout the site, one could argue that wealth was redistributed throughout Palenque's community. Added to the settlement pattern similarities listed above, such evidence would strongly support the presence of a cargo system at Palenque.

CHAPTER 4: URBANISM

Previous Literature

In his publication *Maya Placemaking and Urbanization*, George Andrews (1975) asserted that the only reason urbanism had not been fully accepted as part of Classic Maya social formation was lack of survey data. At that time, only Tikal, Dzibilchaltun, and Mayapan had been conclusively shown to have been urban cities. Consequent surveys around other centers have validated his assertion, evidence of urbanism has consistently been found at sites at which extensive surveys have been done. The isolated ceremonial center hypothesis is a thing of the past and Classic Maya centers may now be confidently categorized as urbanized cities.

The criteria used to determine the presence of urbanism in Mesoamerica has varied from one researcher to the next. Mesoamerican urbanism has traditionally been evaluated against a checklist of characteristics thought to define urbanism. Though the checklist varies in length and specificity, three components are consistently evaluated; 1) population size, 2) nucleation, and 3) social diversity. All three have been demonstrated to have existed within Ancient Maya communities. Populations in the thousands have been estimated at every site for which we have settlement pattern data. Many cities had populations in the tens of thousands. Nucleation can be confidently categorized as standard within city centers; ancient Maya cities typically formed with a core area much more densely settled than its periphery. Social diversity has been the most contested of the three criteria for the Maya. Compared to the evidence found in Teotihuacan and other Central Mexican cities, the Maya are said to have reached an inferior level of social diversity (Sanders and Webster 1989). While that may be true, it should not be used to downplay the fact that social diversity did indeed exist among the ancient Maya. From workshops discovered at Tikal (Haviland 1970), Sayil (Smyth and Dore 1994), and Caracol (Chase, Chase and Haviland 1990) to the murals of Bonampak, many lines of evidence point to a social system much more complex than the elite / peasant farmer

two-tier system hypothesized at the turn of the 19th century. The sheer diversity of artifacts collected from Maya region, each made outside of the realm of food production, attests to a wide range of social roles. If craft specialization can be used as evidence of social diversity then the Classic Maya have been clearly demonstrated as socially diverse.

V. Gordon Child (1950) would add a few more criteria to this base list of three. For what he called "prehistoric urbanism", food surplus collection, public buildings, writing, artistic expression and trade were also essential characteristics. Again, the Maya Classic Period cities exhibit these characteristics, albeit to varying degrees. In terms of food supplies, centers like Tikal and Dzibilchaltun are simply too densely filled with buildings to have had milpas mixed in, their maize must have come from surplus grown outside of the city centers (Andrews 1975). Public buildings are obviously present in every city's central precinct. Though access to their interior chambers may have been restricted to priestly classes, their functions were oriented towards public ceremony. Writing and artistic expression need not be elaborated upon; evidence of their presence in Maya cities is overwhelming. Trade, though difficult to argue as a driving social force, was also clearly present.

Trade among the Classic Maya has been clearly demonstrated. Trade evidence comes primarily from intra-site contexts but trade on a regional scale has also been well documented. In Belize, whole communities dedicated to commercial exportation of chert (Hester and Shafer 1984) and agricultural products (Turner and Harrison 1983) have been discovered. Multiple coastal sites in the Yucatan were determined to have been major exporters of salt (Andrews 1983, Sharer 1994). Also in the Yucatan, a network of roads (more of which are being discovered every year) connecting major cities together denotes intercity interactions. The non-material level is where we see the most abundant evidence of regional exchange. While some would still argue against it, most scholars today recognize that the unified writing system and calendrical calculations among the Classic Maya indicated a high degree of intellectual interaction on a regional scale.

Few scholars today would argue against the urban nature of Classic Maya centers. Discussion has since turned to defining the degree of urbanism they achieved. In their 1989 paper "The Mesoamerican Urban Tradition", Sanders and Webster applied an urban classification system developed by Fox (1977) to Mesoamerican cities. Fox's model defines three types of pre-industrial cities: 1) Regal-ritual, 2) Administrative, and 3) Mercantile. Sanders and Webster categorized all Classic Maya centers, without exception, as regal-ritual. The criteria cited to support their assertion were; obtrusive ideological functions, low populations, consumption-based economies (with the central district consuming and the periphery producing), kinship based, inherited power, and only minor social differences between city core and peripheral inhabitants.

Only a handful of Mesoamerican cities reached the "Administrative City" level according to their interpretation of Fox's model. Sanders and Webster cited Tenochtitlan and Teotihuacan as the best examples. Both cities were said to have exceeded their Maya counterparts via stronger centralized authority, more social diversity and more trade activities as evidenced by craft workshops and large marketplaces. Sanders and Webster also mentioned Tula and Cholula as potentially having reached the administrative city level. Applying Fox's "Mercantile City" criteria to Mesoamerica, they did not identify a single example.

Sanders and Webster concluded that most cities in Mesoamerica were of the regal-ritual type; low population, consumption based and focused primarily on ritual activities occurring within their central precincts. They attributed this lower degree of urbanism typically achieved in Mesoamerica to the region's dependence on manpower for transport, a condition they said classifies the Ancient Maya as a "low-energy" culture group.

Chase, Chase and Haviland (1990) published a rebuttal to Sanders and Webster's "Mesoamerican Urban Tradition". They strongly disagreed with the lumping of all Maya cities into this "regal-ritual" category and call it an attempted to revive the long-ago discounted theory that Maya cities were isolated ceremonial

centers with weak centralized authority. Citing craft workshops, long causeways and massive public work constructions they asserted that the term regal-ritual city is "a caricature of the actual situation" (Chase, Chase and Haviland 1990:499). Specifically, they presented an argument for trade networks and strong centralized leadership within Tikal and Caracol. In conclusion, they asserted that Fox's model is based on Western European examples and cannot properly assess cities built within the mind-set of ancient Mesoamerica.

Before this debate had begun, a paper by Joyce Marcus (1983) had covered its main points from a different perspective, one focused on the forms and functions of Mesoamerican cities. She cited three models as capable of describing all variations of city layout patterns in Mesoamerica. The first, the Concentric Model (Burgress 1925), involves a primary center with settlement zones radiating outward in economic status descending order. This central core and homogenous peripheral zones formation she believed, with a little flexibility, describes most cities in the Maya area.

The second model, the Sector Model (Hoyt 1939), she explained as a variation of the Concentric Model. The Sector Model begins with the same primary center but instead of being surrounded by radial settlement zones it is surrounded by discrete sectors or city districts. Teotihuacan, due to its market sector, administrative sector lining the Avenue of the Dead and entire barrios dedicated to specific craft-type production, was cited as a good example of sector formation. Monte Alban, Xochicalco and Tenochtitlan were mentioned as other "sector" city layouts.

The third model, the Multiple-Nuclei Model (Harris and Ulman 1945), was of particular interest to Marcus. Multiple-nuclei cities are cities containing multiple central places, none of which can be securely identified as primary. Though she had yet to arrive at a socio-political explanation for the pattern, she found that only subordinate cities exhibited a multiple-nuclei pattern. Cities including Tikal, Copan, Calakmul and Palenque were specifically mentioned as *not* exhibiting a multiple-nuclei pattern.

At the end of her discussion of these models Marcus pointed out that all three were created in order to classify cities in Europe and Asia. She then proceeded to discuss the ancient Mesoamerican's concept of "city". Through an analysis of the terms used to describe "city" in Mesoamerican languages, Marcus suggested that the concepts of ruler's residence, city and region were tightly intertwined. In Yucatec Maya, *Cah* is city, *Cacaob* is region, and *Cacique* is governor. Nahuatl and Zapotec have similar terminological continuums. She concluded her discussion of form by cautioning that while applying Western European models can be useful for settlement pattern analyses, those models likely do not conform to the reality of the Mesoamerican Indian world view.

After discussing form, Marcus moved on to city function by comparing the evidence from three cities; Teotihuacan, Monte Alban and Tikal. She evaluated three functions they all exhibit in one way or another; commercial, administrative and religious. Starting with Fox's regal-ritual, administrative or mercantile city classificatory system, Marcus conceded it has value but also pointed out its limitations when applied to Mesoamerica. Though she found evaluating ritual, administrative and mercantile functions of cities productive, she cautioned that pigeonholing cities as one type or another could be misleading and oversimplifying. She notes, "...the longer one attempts to devise a scheme for the ancient city, the more one is forced to ignore important "exceptions"." (Marcus 1983:198)

While Monte Alban fits the "regal-ritual" category well, to classify it as such is to ignore its strong centralized leadership and mercantile elements. In the case of Teotihuacan "mercantile city" seems the appropriate designation. However, to classify it so would be to ignore its ritual and administrative functions. Fox's (1977) model speaks of city types as if they were mutually exclusive and a continuum of development within which communities departed one type and evolved into the next. As Marcus points out, Teotihuacan was not only the most mercantile city in Mesoamerica; it also achieved the highest degree of centralized authority. Though it would not be defined as regal-ritual, it none-the-less had the most temples of any city

in Mesoamerican history. Clearly it did not evolve out of its ritual-religious functions. To Marcus, all three functions exist within all Mesoamerican cities. To define which function was primary is useful at one level, but myopic and Euro-centric on another. If one accepts the logic of Marcus's assertions about the Mesoamerican view of "city", categorizing a Mesoamerican city's function as ritual, administrative or mercantile center may be quite far from the thinking employed by its ancient inhabitants.

One of the more recent and innovative studies of Maya urbanism was conducted in the ruins of Sayil (Smyth and Dore 1994). Employing an extensive surface sampling strategy, ceramics and other material types were collected from all parts of the site. Extensive soil studies, focused on identifying agricultural land, were also conducted. The result was data on chronological development and social status at a scale rarely achieved in Maya archaeology.

Soil studies results provided clear evidence of garden plots, or "in-fields", within the residential units of the site core. Unlike previously believed, the inhabitants of the center were not entirely dependent on the periphery for agricultural products. Based on their evidence, Smyth and Dore coined the term "Garden City" to describe Sayil.

The distribution of ceramic types across Sayil also produced unexpected results. Only 5% of the over 50,000 sherds collected were of elite wares. Of that 5% virtually all were found in the periphery, not near the elite housing groups of the center. Smyth and Dore may have also identified a ceramic production sector of Sayil located next to a market place. Over fired ceramics, possibly evidence of pottery workshops, were found primarily in Sayil's "Southwest Elite District". An adjacent area called "The Flat" has been suggested to have been Sayil's market place. If their interpretations are solid, they have succeeded in demonstrating commercial activity at a level rarely evidenced in ancient Maya cities.

In conclusion, they attributed their project's success to their broad-scale surface collection strategy and asserted that it added a previously unattainable

behavioral dimension. For at least Sayil, they suggested a social formation much like the historically documented Aztec *Capulli* (Caso 1963), a complex hierarchical ranking system based on political power sharing between competing, kinship based factions.

The above discussion of past literature and investigations was intended to demonstrate that urbanism existed among the ancient Maya and that many of their now ruined community centers are properly regarded as cities. Though comparisons to Western European examples of urbanization are productive, Marcus (1983) properly cautioned that the Mesoamerican concept of "city" is different than that of Western European thinkers. In Mesoamerica, the ruling family residence, the city and its outlying territories are a single, indivisible unit.

Most studies of Maya urbanism have focused on morphological criteria; community size, transportation routes, public buildings, etc. At this point, it is the functions of Maya urbanism that we need to learn more about. How did the inhabitants of a given city interact with one another? How were resources distributed and redistributed? What motivated people to live in cities? While questions of social process like these are difficult to answer, archaeologically innovative studies like those of Smyth and Dore's (1994) at Sayil are beginning to find approaches. At Palenque, the new map allows us to focus mainly on questions of urban form. A proper discussion of urban function at Palenque will have to wait for data from future excavations.

Urban Characteristics

Traditionally, urbanism has been assessed on the presence or absence of certain traits said to make up the "urban" setting. The extent to which those traits are present is then used to evaluate the degree of urbanization achieved. This current analysis of Palenque will go through a list of traits said to be indicative of urbanism. Each trait will be discussed separately in terms of its presence or absence at Palenque. Then, the degree to which that trait is present at Palenque will be evaluated through

comparison to evidence found at other Classic Maya cities. Finally, taking all of Palenque's urban traits as a whole, I will discuss the relative level of urbanism achieved at Palenque.

Population Size

Urbanism studies in Mesoamerica have thus far been focused on the largest of known sites. Teotihuacan had over 200,000 inhabitants (Millon 1974). Tikal (Haviland 1970), Caracol (Chase and Chase 1996), and Calakmul (Martin and Grube 1995) have all been said to have had populations in excess of 100,000 inhabitants. Palenque, in comparison, had a very small population size. Current evidence of settlement at Palenque supports no more than 7500 people at its peak population. Though continued survey will doubtless increase that number, it will never rise to the levels known to have lived within sites like Tikal, Caracol and Copan. The limiting factor, again, is geography. There is simply a lack of habitable land around Palenque's center. Blom and La Farge (1926-27) estimated Palenque's settlement to extend 16 square kilometers around its center. While it is true that ruined structures are found that far outside the center, they are so infrequent that it would be misleading to call them peripheral settlement. Base on informal reconnaissance of the surrounding mountainside I would predict a maximum of 10-20 structures per square kilometer. A recent survey of the plains directly below the city and the immediate surrounding foothills reported only 10 residential groups (Liendo 1999). Compared to 673 structures/km sq on the plateau, the immediate outlying population seems negligible. Thus, in terms of population size, Palenque has enough to indicate urbanism but its population is extremely small when compared to other major Classic Maya cities (see Table 3.2).

Nucleation and Population Density

Urbanism is a condition in which people settle in a tightly clustered, or nucleated, pattern. Population density has a direct relationship with the level of

organization needed to maintain social order and quality of life. Without well-organized allocation and reallocation of available resources population density cannot be maintained. Further density increase requires greater organization and/or larger resource bases. The more tightly nucleated a community is, the greater their level of cooperative living and the strength of their centralized authority. The more an area is occupied, the more important the management of available resources becomes. Cooperative living requires organization. Organizing thousands of people in turn requires hierarchy and centralized leadership. Thus, population density is directly correlated to centralized leadership and resource management.

Palenque, at its Late Classic period peak, had the second highest population density in the Maya world (see Table 3.1). Though not as wide an area as the Peten sites, Palenque's extreme settlement density indicates a high level of social organization, unified thinking, and management of available resources.

Social Diversity

In Mesoamerica, evaluations of social diversity have generally been focused on socio-economic variety and the extent of craft specialization. Are there differences in economic status? How many occupation types beyond that of the farmer were there? What percentage of the community was involved in non-agricultural production? These are the primary lines of questioning through which Mesoamerican social diversity has been judged.

In the view of this author, the very existence of Mesoamerican cities indicates a certain level of social diversity. As pointed out by Andrews (1975), the scale of city center constructions undeniably necessitated full-time surveyors, architects, engineers and masons. The obtrusive nature of ritual functions indicated by the ubiquitous presence of temples and the abundance of iconographic representations indicate a priestly class existed. The level of sophistication achieved in art and writing could not have been reached by anything less than full-time artisans and scribes. The presence of warfare, as indicated in art and text, points to the existence of a full-time

warrior class. Clearly, it took more than an subjugated group of farmers to create and maintain cities on the scale that existed in Mesoamerica.

Teotihuacan was clearly more socially diverse than any city of the Classic Maya period. Over 400 craft workshops, military barracks, hundreds of temples and a gigantic market place are but some of the better indicators of Teotihuacan's social diversity (Millon 1974). Social diversity at Tikal was evidenced by the presence of craft workshops, great variation in burial goods and variability in wealth as indicated by house mound trash midden excavations (Haviland 1970).

Much data has yet to be collected for a clear understanding of Palenque's degree of social diversity. Never the less, the evidence that is available supports the presence of social diversity. Palenque's many burials excavated in the 1920's, like Tikal, showed great diversity in accompanying goods (Blom and La Farge 1926-27). Craft workshops, to be discussed in the next section, have also been found at Palenque. Distribution of wealth and resources cannot yet be discussed for Palenque due to lack of house mound excavation data.

Craft Workshops

Rands (1974) identified a ceramic incensario workshop approximately one kilometer east of the city's central precinct. In 1998, a masonry workshop was located at the south end of Group H (Map 2.6). A nearby quarry (less than 100 meters away) was clearly the workshop's source of stone. Thus far, those are the only two documented examples of workshops identified at Palenque. Though two workshops seem insufficient evidence to argue craft production as significant, the reality is that little more than that has been reported for most Maya ruins. At Tikal, Haviland (Chase, Chase and Haviland 1990) identified only two ceramic workshops. Though Haviland noted Tikal's abundance of local chert, he did not mention that any lithic production areas were found. At Sayil, only one ceramic workshop has been identified. Copan, even with its ambitious survey coverage, reported similar scant evidence of workshops (Fash 1991). Notable exceptions to this pattern have been

documented in Belize where the sites of Colha (Hester and Shafer 1984) and Pulltrowser (Sharer 1994, Turner and Harrison 1983) seem to have been dedicated to the mass production of a single trade item, stone tools and agricultural products respectively.

Markets

To date, not a single market place has been securely identified within an ancient Maya city. While market functions have been suggested for many Maya sites, no archaeological evidence strongly in favor of those suggestions has been obtained. Palenque, like most major centers of the Classic Period, has wide-open plaza areas. Until a secure method of archaeologically testing for market activities is developed the possibility of markets at Palenque must be qualified like the rest – probably so. Even in the case of Teotihuacan, identification of its market was secured by inference. Due to the great number of craft workshops at Teotihuacan it was concluded that there must have been a market. A wide-open area named "the Great Compound" was chosen as the obvious candidate. Though the logic is solid and almost universally accepted, the truth is that no "market activities" have been archaeologically documented within Teotihuacan's "Great Compound". This little cited fact should be considered when evaluating the existence of markets at not just Palenque but any ancient Maya city.

Public Works

The monumental architecture found at all major Classic sites required a large, organized labor force. None would argue this point. For the purposes of this discussion we need to distinguish between different kinds of monumental architecture. Temples, plazas and palaces within a city center, while requiring organized labor forces, are built in the service of, and directly for, the benefit of the elite members of the community. What this section will focus on are "public works" that are not clearly for the benefit of the city's elite. In other words, monumental

constructions that seem to serve the needs of the general population or the community at large.

At Tikal there are the earthworks bounding the north and south ends of the city's outer boundary. They are massive and no doubt required a large labor force to construct. These earthworks, in conjunction with bajos to the east and west, enclosed not just the homes of the elite but all the residences within a 16 sq km area. These are prime examples of public works. The site of Caracol contains probably the strongest examples of public works yet documented in the Maya area. Wide areas of agricultural terracing were found along the causeways leading out from the center to outlying zones. The size, scale and peripheral locations of these terraces led the Chases to convincingly argue that they held crops designated for public surplus. Caracol's causeways, to be discussed more in the next section, also appear to have been public transportation routes rather then ceremonial processional routes (Chase, Chase and Haviland 1990).

Even from just the surface examination recently preformed on Palenque's exterior, it is clear that public works pervade the site's settlement pattern. One of Palenque's largest settlement obstacles must have been erosion. Placed half way up a mountainside with six perennial arroyos and over fifty natural springs, flooding was a constant possibility, especially during the rainy season. Without proper control features in place, rain run-off coming down the mountainsides could have easily overflowed the arroyos washed out construction. For Palenque, the solution appears to have been terracing and arroyo canalization. The Otulum Aqueduct and the great terraces holding the city's main plazas in place are features that protect the elite-controlled central precinct from erosion processes and flooding. The PMP discovered that those same kinds of features were built all across the plateau and were, in fact, concentrated in the residential zones. Terracing encountered outside of Maya city centers is typically determined to be agricultural. At Palenque, terracing appears instead to have been employed to stabilize hillside residential sectors. Groups both east and west of Palenque's center contain residential terracing, most at least two

meters in height. Most group's contain multiple terraces running over 100 meters in length. In total, over sixteen linear kilometers of terraces have now been documented at Palenque. The Xinil Pa' Group alone, shown in Map 2.12, contains over a kilometer of interconnected terracing. The scale of these terraces clearly required organized labor of a size beyond extended family numbers as well as the supervision of skilled engineers. The sophistication of their erosion control building techniques is testified to by the fact that the terraces have remained in place against over a millennium of rainy seasons. The important point to note here is that these hundreds of terraces were neither ritual nor agricultural in function. They were put in place to allow residential settlement of Palenque's hillsides and to protect structures on the plateau from soil erosion. Whoever controlled Palenque's workforce decided to expend community labor resources to increase habitable land for the city's general population.

Water Management

The other large category of public works at Palenque was water management. This aspect of Palenque's public works is essential to our assessment of its degree of urbanization. Due to the fact that this topic will be extensively covered in Kirk French's upcoming thesis at the University of Cincinnati, this discussion will confine itself to the overall pattern of Palenque's water management and how it compares to that of other ancient Maya cities. Each of Palenque's six perennial arroyos contain evidence that they were once lined, at least in segments, with canal walls. This canalization, like the terraces, would have provided essential protection against flooding and contributed to opening habitable land.

Availability of water is one of the most important requirements for a community to establish and maintain an urban settlement pattern. The amount of available water is directly proportional to the degree of nucleation a pre-industrial city can achieve. In the Peten, gigantic, elite controlled reservoirs were constructed in city centers (Scarborough and Gallopin 1991). In the Yucatan chultuns and cenotes were

also primarily in the control of the elite (McAnany 1990). For most Maya centers water was a resource to be conserved and reallocated in a carefully controlled fashion. Palenque's year-round abundance of water created a strikingly different urban environment.

During the course of the PMP survey evidence of drains, running both into and out of the exterior residential zones, was encountered. Even with the arroyos in such close proximity, extra effort was expended to bring water directly to houses, an apparent basic form of city plumbing. Though the extent to which these drains exist will remain unclear without excavation, their existence site-wide has been well documented and will be specifically discussed in French's upcoming thesis.

One of the essential resources needed in an urban environment, water, was apparently not solely under the control of Palenque's elite. It appears to have been publicly accessible everywhere on the plateau. Palenque's very location had an inherent reallocation of that important resource. Further, community labor forces built canal walls not only to prevent flooding but also to allow Palenque's residents greater ease in obtaining potable water. The possession of this important resource was shared relatively equally around the city and labor resources were expended to facilitate public access. The name by which the city identified itself, *Lakam Ha* or "Big Water", undoubtedly denoted their pride in the abundance of this resource.

Subsistence

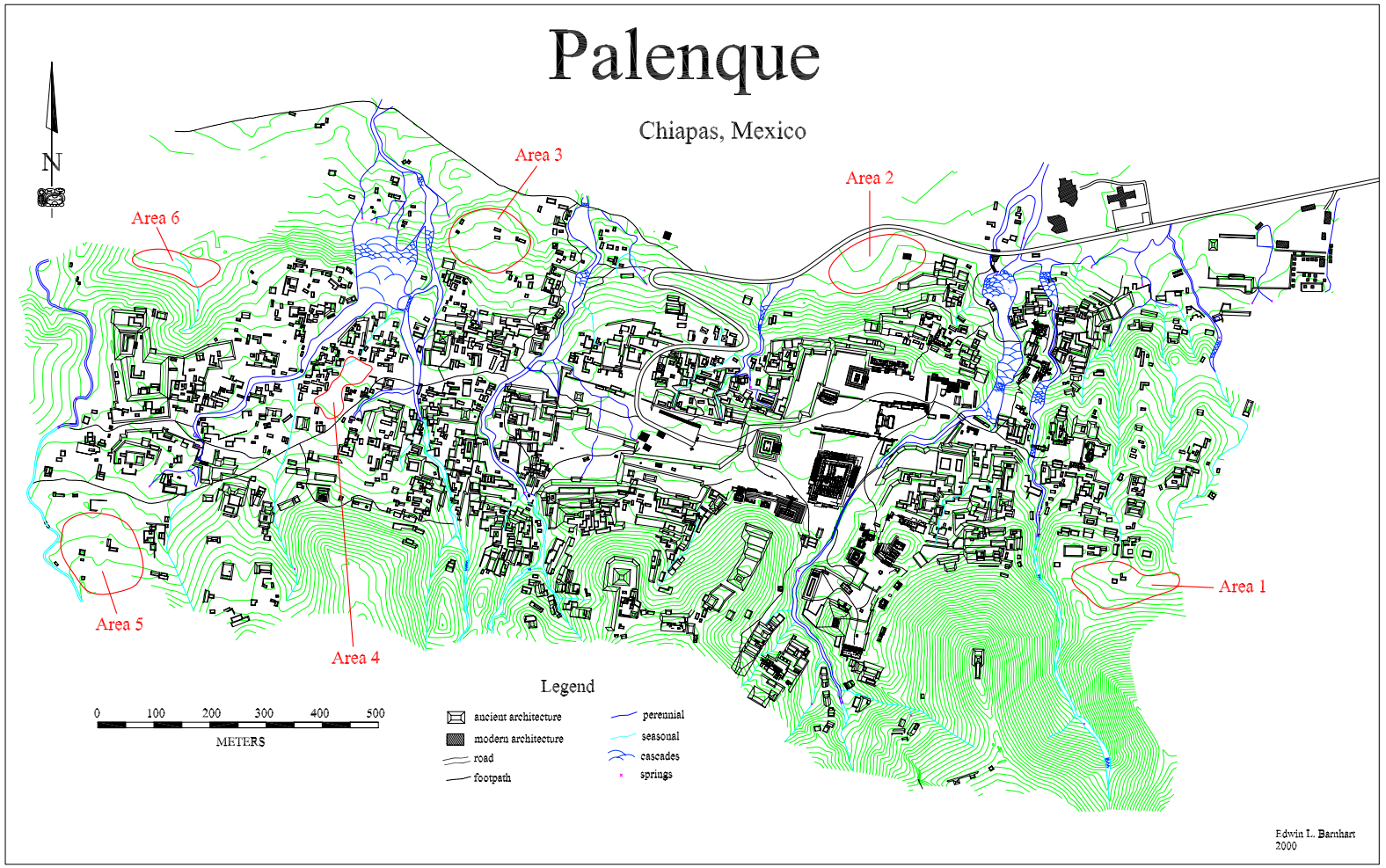
Just like available water resources, subsistence resources are also directly proportional to how closely a community can successfully nucleate. The lack of milpa lands within Tikal's densely settled immediate periphery baffled investigators until the discovery of raised fields in the bajos (Haviland 1970). Caracol was found to have constructed hundreds of hillside agricultural terraces throughout its immediate periphery (Chase and Chase 1996). The shear size of the population estimates for each of those cities demanded massive and reliable food sources. At Palenque, while

the population estimate is much smaller, the need for subsistence resources was still of first-order importance.

Palenque's agricultural methods are still in need of investigation. Rodrigo Liendo (1999) has identified what he believes to be irrigation canals in the plains directly below the city's plateau. While he identified many fields around the Michol River, they alone would not have been capable of feeding a population of the size now believed to have lived within Palenque's core settlement. Liendo also identified limited areas of agricultural terracing. Some of those terraces, the ones within and to the east of Mayabell Campground, were mapped during the PMP survey. They are wide, gently sloped and do not have structures built upon them. Those terraces connect to the only off-plateau public plaza at Palenque (Map 2.23). The "Maya L", the dominant structure of that 80x80 meter plaza, was distinctly public in architectural form (Figure 2.10). Its 30-meter wide staircase leads six meters up to a 50-meter long, L-shaped superstructure. Its roof was perishable, as demonstrated by the 50 column stubs visible on the superstructure surface. Its front face had fourteen entry points into the structure. Looking north out over lands in which Liendo found irrigation canals and connected to agricultural terracing, it is logical to propose that the Maya L and its plaza were also involved in agricultural activities – perhaps a farmers market, co-op or surplus redistribution center.

In-fields and Tree Groves

Like Tikal, Copan and other major Classic centers, there is no space within Palenque's core settlement for maize fields. Building density is simply too high. There may, however, have been smaller in-fields like those discovered at Sayil (Smyth and Dore 1994). Map 4.1 demonstrates six areas within Palenque's plateau settlement that are uncharacteristically free of construction. It is proposed here that these potential in-fields were not only garden plots as concluded at Sayil but also tree groves. Area 2 is covered with a mango grove. Area 4 is covered with lemon and lime trees.



Map 4.1 Potential in-field locations

Area 3, though mostly burned and cleared for a milpa in the 1960's (Robertson 1983) has a small grove of cacao trees on its southern side. Some of the Lacandon who sell tourist goods in the parking lot know the location of this secluded grove and harvest it during the summer months. Area 5, though primarily maize, has orange trees growing on its western side. The rest of the areas noted in Map 4.4 are currently maize fields tended by nearby families. Many of the fruiting trees now growing in these potential in-field areas are not indigenous to the New World and this hypothesis is not implying that those groves have been there since ancient times. Rather, the hypothesis notes that the areas, all of which were left suspiciously free of architecture, have confirmed tree grove potential.

In modern and historic times, Tabasco and Northern Chiapas have been centers for the arboriculture industry. The region is known for its cacao in particular. Today, the site of Comalcalco in Tabasco is adjacent to cacao groves. Andrews believed that Comalcalco's architecture held great similarities to that found at Palenque. He also believed that Comalcalco was a cacao producer in the Classic period (Andrews 1975).

Figure 4.1 Lakam Ha Emblem Glyph

At Tikal, Haviland (1970) proposed that its inhabitant's diets were supplemented by breadfruit trees grown within and around patio groups, not unlike the in-fields described at Sayil. It is proposed here that a similar subsistence strategy was employed at Palenque. Palenque's ancient name (the city, not the polity) was *Lakam Ha* translating "Big Water". The glyph translated as *Lakam*, however, is actually an iconographic representation of a tree (Figure 4.1). Its translation is based

on phonetic substitutions found at other sites. If Palenque, as hypothesized here, was using fruiting trees for subsistence than an alternate translation of its name, "Tree Water" would be at least as appropriate as "Big Water". It would reference their two greatest natural resources.

One final point in support of this hypothesis comes from the carvings on Pakal's tomb. Wrapping around his sarcophagus are relief carvings representing all the ajaws that that came before him (Figure 4.2). Each ajaw is depicted emerging from a tree.

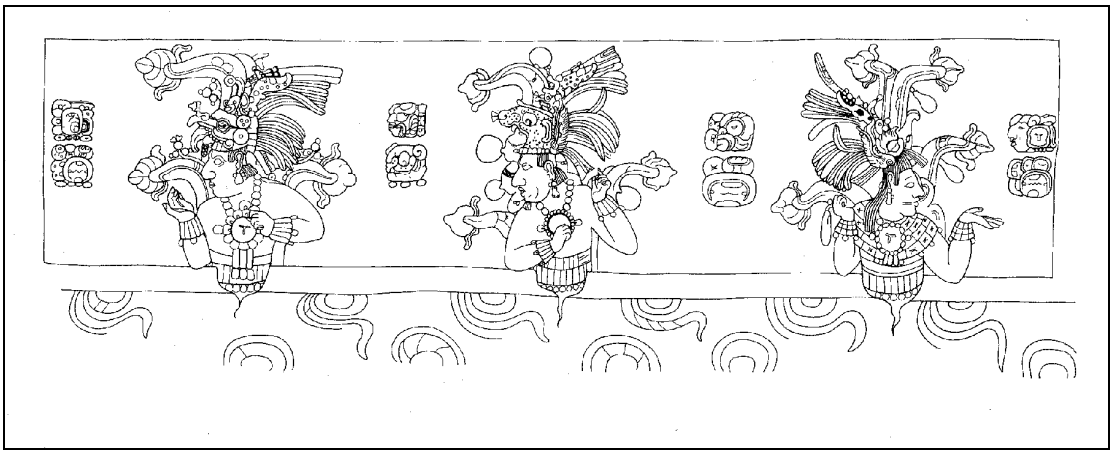


Figure 4.2 The west side of Pakal's Tomb (Schele and Freidel 1990)

As noted by McAnany (1995) each tree is a different kind of fruiting tree. In McAnany's interpretation the trees symbolize the longevity of the royal lineage. It is suggested here that the trees, while also symbolizing the lineage, were emphasizing the resource at the base of their wealth, fruiting tree groves.

This aboriculturist hypothesis is archaeologically testable. Testing house mound trash middens can provide information about dietary practices. Concentrations of fruit residues in the middens could indicate how prevalent fruit was in the city's diet. High concentrations found around the suspected in-fields would

create a strong case for identifying them as having held tree groves. Testing methods such as these will be further discussed in Chapter 5.

Roads

Not a single road or causeway was found during the course of the PMP survey. The only locations that have even the potential for containing causeways are now overlapped by tourist trails. The two bridges crossing the Otulum and the Murcielagos seem likely to have been linked by a causeway but, again, that area is now covered by a prepared tourist trail. Unlike most major sites in the Peten and in the Yucatan, Palenque's core settlement seems bereft of formal transportation architecture. Perhaps Palenque's karstic topography made smaller, winding footpaths more appropriate.

Two potential roads or *sacbes* have been located outside of Palenque's core. The first, identified but not investigated by Liendo (1999), runs roughly east-west along a series of low hills in the plains below the city. The INAH Site Director Juan Antonio Ferrer located the second roughly three kilometers east of the city. This second example was in the foothills and tracked approximately 300 meters before surface evidence in either direction disappeared. Neither of these hypothesized roads have been tested archaeologically or shown to lead into Palenque's urban core. As a result they will not be considered confirmed in this discussion. In sum, while intra-site transportation undoubtedly occurred at Palenque, no archaeological evidence has been found attesting to it.

Summary

Palenque's geographic circumscription makes placing it in one of the form models discussed by Marcus (1983) difficult. Of the three, the Sector Model seems the best fit. Even if Palenque's ancient planners desired a more Concentric Model form, topography prevented it from happening. Palenque clearly had a single primary center, at least during the Late Classic. Areas including the Picota Complex (Map

2.14) and the Maya L Plaza (Map 2.23) are two of the more evident "sectors" of the city. While still very little is known about their natures, they were clearly public activity zones. Current evidence favors the Picota Complex having been an earlier center of the city that was eventually replaced by the larger complex one kilometer to the east. Another possibility is that it functioned as a secondary center of the city concurrently with the Palace's plaza. If this latter hypothesis proves true, then there would be room to suggest that the Multiple-Nuclei Model fit Palenque at some point during its evolution as an urban center. In Marcus' estimation, that would indicate Palenque was a subsidiary center under the direct control of a larger urban center. Since there is no evidence of Palenque being subordinate to any other polity, the conservative stance would regard the Picota Plaza as another "sector" of the city and to refrain from assuming its function or place within Palenque's chronology.

In taking the previously discussed elements of Palenque's urbanism as a whole, the conclusion drawn here is that Palenque was one of the most highly urbanized cities of the Maya Classic Period. While its population, based on current evidence, is very low when compared to other major Classic sites, its settlement density is the second highest ever documented in the Maya region. Of the two, population size or density, density is far and beyond the more indicative of urban living. Tikal, for example, is commonly regarded as having achieved a much lower degree of urbanism than Teotihuacan. While Tikal had perhaps three-fourths of Teotihuacan's population size its settlement was spread out over an area six times as large (Sanders and Webster 1989). Clearly Teotihuacan's degree of settlement nucleation was integral to the degree of urbanism they achieved. In short, the more people that live in a defined area the more they must share available resources and live in a cooperative manner. This, in its most basic terms, is the condition of urbanism. For Palenque, extreme settlement density indicates a high level of cooperative living was in practice by at least the Late Classic.

Palenque's apparent lack of roads may be real or it may be an impression created by insufficient data. Within the city's core there is little space for causeways

to have existed. If causeways were existent they were neither as long nor as wide as those encountered in Tikal and Caracol. Outside of the city's core, there have been suggestions of two ancient roads but no architectural documentation. To say there was no travel within and around Palenque based on lack of roads would be ludicrous. For now, it must be surmised that Palenque's traffic was handled by modest foot trails. Admittedly, lack of roads could be viewed as a shortcoming of Palenque's degree of urbanization.

Palenque's apparent isolation needs to be addressed. As noted earlier, off-plateau settlement density drops so low as to be negligible. Its identification as contiguous peripheral settlement is in doubt. There are satellite communities of greater settlement density but they are located at a distance of ten kilometers or more from Palenque's center. Again, while they are widely believed to be within Palenque's "sphere of influence" whether they should be considered Palenque's periphery is in doubt. Until continued survey and excavation prove otherwise, evidence indicates Palenque was geographically isolated from its sphere of influence not unlike the settlement pattern documented in Monte Alban (Marcus 1983).

It is in public works that Palenque shows its strongest evidence of urbanism. The importance of Palenque's public works cannot be overstated. Major city resources were expended not on the glorification of the polity and not in the central precinct of the site. Great amounts of labor and resources were spent on terraces and canals outside of the center. These major constructions seem to have focused on opening and securing habitable land within the city. This denotes a civic-mindedness at Palenque akin to that documented at Teotihuacan. At Teotihuacan, most architecture in the city center was finished by AD 225. From AD 225-650 the city's construction efforts were focused almost exclusively on building residential compounds for its dwellers (Millon 1974). While the sequence in which Palenque's terraces and canals were built is still unknown, their very existence puts Palenque on a different urban par from most other major Maya Classic cities.

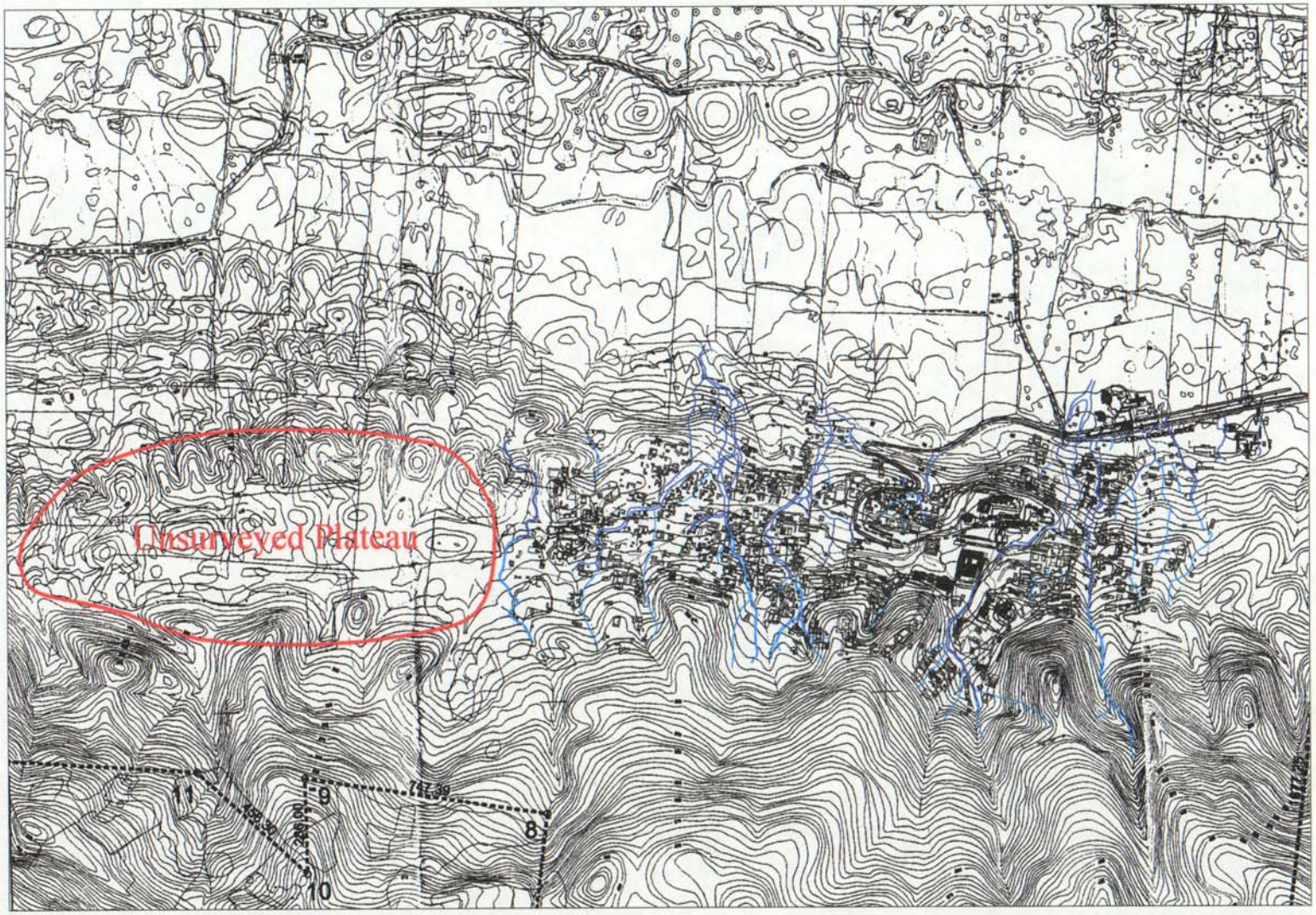
CHAPTER 5: FUTURE INVESTIGATIONS

The mapping work done by the PMP in 1998-2000, while extensive, should be considered the initial phase of an ongoing process to better understand Palenque's community as a whole. It is the foundation from which excavation strategies can now be devised. In late 1999 the National Park surrounding Palenque announced plans to finally buy all privately owned lands within the park's boundaries and to establish a network of tourist trails leading to the outer regions of the ruins. The purchase of the surrounding lands, scheduled for completion by 2002, should end the ownership disputes and allow survey access to the currently restricted areas to the west and north of Palenque.

If the Palenque Mapping Project is to continue into a second phase its approach should be two-fold – survey expansion coupled with the initiation of an excavation testing program. With plans in the works to expand the boundaries of the tourist accessible sections of the park, the need for establishing the chronology of the outer regions has become a priority for Palenque. This information can be retrieved through the implementation of a testing program, accomplished with a few test pits in each one of Palenque's outer groups. The collection of a sufficiently large body of ceramic data would be key to the success of such a strategy.

Continued Survey

Continued survey at Palenque should focus on three main goals. The first is to confirm the entire core settlement of the city has indeed been documented. Reconnaissance to the east, north, and south of Palenque's plateau, though not covered in this dissertation's map, was sufficiently thorough to say with confidence that settlement density in those direction drops off sharply. The last area in question lies to the west. During the year 2000 season land disputes prohibited investigations in that direction. According to topography maps generated from aerial photos, Palenque's plateau continues approximately one more kilometer to the west as it



Map 5.1 Topography map with PMP map overlain

becomes increasingly more karstic and narrow (Map 5.1). While settlement density appears to decrease in that direction as well, the area has enough potentially habitable land to merit the continuation of the 100% survey coverage out to the plateau's westernmost tip. The remaining plateau area totals less that one square kilometer and could be completely surveyed within a single field season of four to six months.

The second goal of continued survey should be better estimating Palenque's immediate peripheral settlement. To achieve this, a transect strategy is suggested. Eight transects in total would be surveyed; three south up the mountainsides, three north extending down into the plains and two along the foothills, one east and one west from the plateau edges. These transects would be linked to points within the current map, extend one kilometer out from its present limits and be 250 meters in width. The resultant data should be sufficient to estimate the percentage decrease of settlement density off the plateau. It would also provide information regarding building strategies in those markedly different environmental zones.

The third goal of continued survey should move out to Palenque's closest satellite sites, Nunutun and Santa Isabel. Both sites have been investigated but accurate maps of their core settlement zones are as yet unavailable. Due to their small size, the 100% survey coverage strategy could again be employed. With Palenque's immediate periphery being so sparsely settled, these satellite sites take on a special significance. The strength of Palenque's influence over them should be better defined. To do so will ultimately require excavations. As with Palenque's core settlement, excavation strategies cannot be effectively developed until maps of their extents can be analyzed and evaluated.

Surface Collection

Excavation by its very nature is a destructive process. Artifacts and architecture lose their sealed contexts and become exposed to the elements. Responsible archaeology involves taking measures to minimize these harmful processes and to reseal exposed areas while still collecting needed data. Based on the

goals of the test pit program to be outlined in the next section, all possible surface evidence should be collected prior to excavations. Tree-falls have and will continue to expose ceramics and other artifact types at Palenque. As noted during the PMP survey, tree-falls have ripped away portions of hundreds of house mounds. Identifying those areas and collecting artifacts from exposed tree roots can provide huge amounts of chronological data before a single shovel penetrates the ground. Vertical provenience would be lost but horizontal provenience would remain. Artifact association with individual buildings could be reliably maintained. Dating ceramic sherds, thanks to the seriation system developed by Dr. Robert Rands (1974), can be done without the aid of stratigraphic context. This process is quick, requires only one or two field personnel, and is completely non-invasive. Ceramic sherd collection would be the primary goal of this strategy. Lab analysis could define time periods for sherds collected and their frequencies could be plotted on the map. Without a single excavation, the results of this "surface" collection strategy would increase our knowledge of Palenque's overall occupation history exponentially.

Test Pitting

The program proposed here would include 50-100 test pits focused mainly on small mounds in patio groups. Carefully chosen locations can achieve multiple data goals at once. Each residential mound chosen for investigation would first be probed with a 2 meter wide trench excavated across the structure's mid-section, from its patio side outward (Figure 5.1). The trenches would only be brought down to building surface contact. Artifacts collected at or just above structure contact have potential to produce final occupation period data. Plans and profiles of architectural form could be drawn from the exposed cross section. Many Ancient Maya households previously investigated have exhibited a pattern of trash middens located on their off-patio sides (Tourtellot 1983). If the trenches are extended out a meter or two beyond the limits of the structures' backsides, they may encounter data-rich refuse piles.

Organic remains revealing dietary practices could potentially be found in such middens.

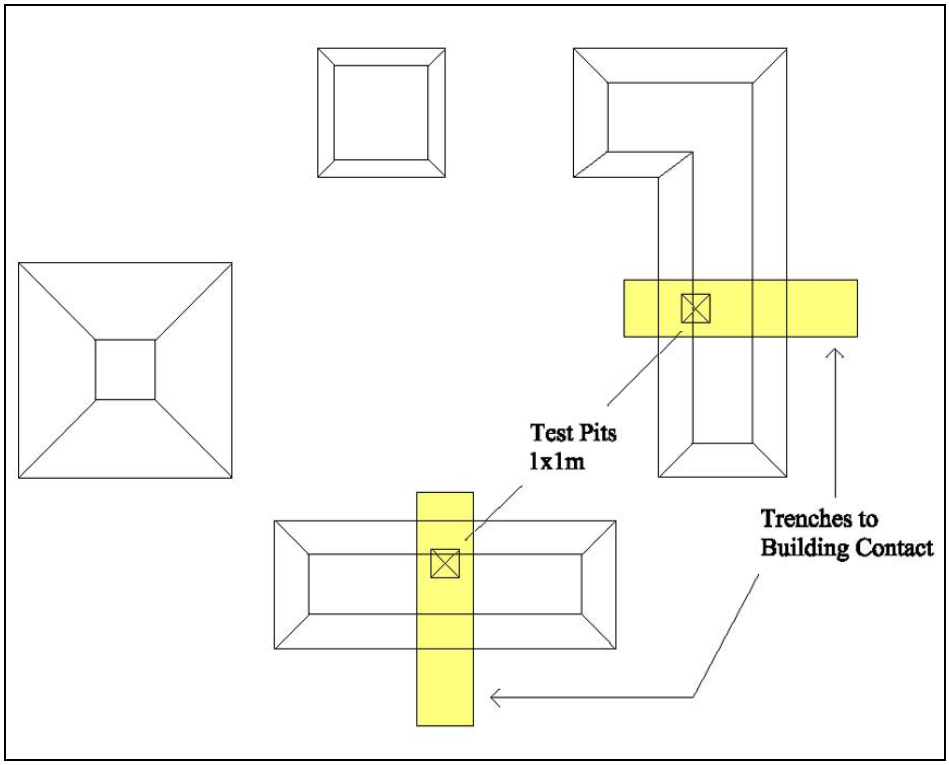


Figure 5.1 Example of house mound trench and test pit placement

Once the trenches to building contact were in place, a single location for a test pit could be chosen. The preservation state and architectural character of the structure should help inform the choice of specific location. The test pit would be small, 1x1 meter in most cases, and excavated down to bedrock wherever possible. Bedrock in most areas of Palenque is less than one meter from ground surface. These pits would focus on collecting diagnostic artifacts and recording the presence of any previous building phases. Artifacts within the building fill should establish a rough date of construction and, depending on the assemblage, provide information on socio-economic status. Located purposefully along the structure's centerline, these test pits

would also have the potential of contacting residential burials. Analysis of skeletal material would provide health status information and burial goods would provide yet more chronological and socio-economic data.

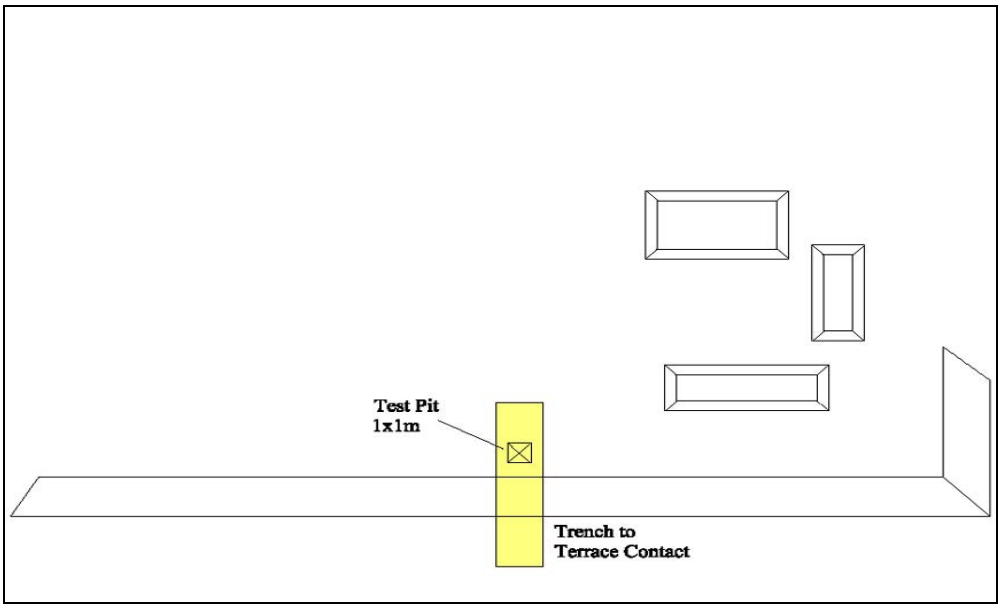


Figure 5.2 Example of terrace trench and test pit placement

Residential terracing would be a secondary focus of the test pit program. Many terraces seem to have been built to stabilize hillside residential areas. How did they serve their apparent function? Two methods are hypothesized and can be archaeologically tested. One, the terraces were completely paved and rainwater ran across their tops into the surrounding arroyos or two, rainwater was allowed to penetrate the surfaces of the terraces and ultimately joined Palenque's extensive subterranean watercourses.

In the first scenario water would run across the terrace tops and careful terrace canting would direct it back into the arroyos, possibly with the help of drains like the ones found draining out to the Piedras Bolas in the Xinil Pa Group (Map 2.12). One would expect to find stone paving on the terrace tops and dense, relatively

impermeable soils in the fill. Terrace sections with interiors of carved bedrock would also be congruent with this first hypothesis.

In the second scenario terraces would have less complete paving and more permeable, sand-like soils as interior fill. Planting of terrace top trees and other vegetation would be key to this kind of ground penetration strategy. Their roots would help to soak up ground water and stabilize soil types vulnerable to erosion. Permeable soils would facilitate rainwater passage underground to subterranean watercourses known to flow beneath Palenque's plateau. Excavations on terrace tops revealing a lack of paving might indicate such a strategy. Soil testing in terrace sections without paving could be employed to test the related theory that landscaping was used to enhance the terraces' ability to protect against erosion.

Either scenario, a combination of both, or the presence of neither could all be investigated with an excavation strategy similar to that suggested for Palenque's house mounds. An initial 2-meter wide trench to architectural surface contact could be excavated into the face of selected residential terraces. The trenches would extend to include 1-2 meters of the flat sections above and below the terrace faces (Figure 5.2). Once drawn in plan and profile, a 1x1 meter test pit would probe into the terrace fill and search for earlier building phases. As with the house mounds, chronological and architectural data could be collected simultaneously.

Soil Testing

A soil sampling strategy such as the one employed at Sayil (Smyth and Dore 1994) could provide information on subsistence-related activities within Palenque's core settlement. If in-fields existed at Palenque, chemical analysis of soil phosphates and pH levels should be able to detect their locations. Since soil types change from region to region in the Maya world, soil studies are only effective when a sufficiently large sample has been collected from the specific site under study and its surrounding area. At Sayil over 3000 samples were collected for analysis. In order to clearly detect areas in which intensive agriculture was practiced, one must develop a baseline

data set against which to compare them. For Palenque, soil samples from the test pits already discussed could provide ample soil data on non-cultivated areas. Soil samples collected from terrace tops and the suspected in-fields discussed in Chapter 4 could then be analyzed for unusually high pH levels and phosphate content.

Summary

Archaeological investigation can and should be viewed as a continuum, starting with generalizations and theory and striving towards details and facts. Moving from the known into the unknown drives archaeological investigation. The first step in any archaeological investigation is to identify the location of the site. In the case of Palenque, that was done by Spanish priests hundreds of years ago. The second step, and the first quantifiable data to be assessed, should be mapping. The researchers should accurately assess the extent of the site they are attempting to investigate. Especially when dealing with a site the size of a city, a map can provide an initial understand of the general settlement pattern. Chapters 2 through 4 of this dissertation have attempted to present just that kind of data for Palenque.

Once a good map has been created and analyzed a myriad of excavation options become available to the archaeologist. Dependent upon the kinds of questions they seek to answer, excavation strategies that maximize time, efforts and available resources can be developed. In the case of Palenque, your author believes that citywide chronology should be the next important question to be answered. The validity of the population estimates and settlement densities forwarded in this dissertation are hinged upon site chronology. While they were appropriately based upon available excavation evidence from multiple sections of the site, too great an area of the site remains untested. The same excavations proposed to collect chronological data could also be used enhance our understanding of citywide socio-economic status, subsistence strategies and social organization.

As the excavation strategies outlined here were made possible by the mapping work that came before, so would they lay the groundwork for more extensive

excavation projects. Perhaps they would identify areas of the early time periods about which we know very little. Perhaps they would reveal new evidence regarding the complexity of Palenque's water management system. Whatever they produced, they would define future excavation priorities and identify areas in need of further investigation. Given the beauty of Palenque's central precinct, it is not surprising that the vast majority of previous investigations have occurred within its boundaries. The result, however, is that scholarship has presented an unbalanced, elite heavy picture of Palenque as a community. It is now time to move from that known into an unknown, the nature of Palenque's urban settlement. The author believes that the map and subsequent analyses presented in this dissertation are the first steps in that direction.

APPENDIX A

DIMENSIONS OF ALL STRUCTURES LOCATED DURING THE PMP

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
Group A	
A1	13x4x2
A2	(22x5)(22x5)x2
A3	(20x5)(18x5)x3.5/0
A4	13x8x3.5
A5	4x3x.5
A6	11x7x.5
A7	11x6x3.5/1.5
A8	13x1x1.5/.5
A9	(16x3)(11x5)x2/1
A10	(7x3)(7x4)x1
A11	7.5x6x2/.5
A12	4x3.5x2/.5
A13	4x3.5x2/.5
A14	22x4x1
A15	20x5x2.5/1
A16	13x6x2.5/1
A17	14x13x3.5/2
A18	10x5x.5
A19	16x9x2/.5
A20	5x5x.5
A21	11x6x1/.5
A22	(15x3)(14x4)x.5
A23	5x5x.5
A24	17x11x3/.5
A25	(10x4)(10x4)x1
A26	11x10x3/1
A27	11x5x.5
A28	13x13x.5
A29	8x8x1
A30	9x3x.5
A31	6x6x1
A32	10x10x1.5
A33	10x5x1
A34	8x4x.5
A35	13x7x3/1
A36	16x7x3/1
A37	18x13x2/1
A38	13x6x1
A39	8x8x1
A40	8x5x2/1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
A41	17x5x1.5/1
A42	9x8x2
A43	8x5x1.5/1
A44	25x8x1
A45	5x5x.5
A46	13x13x2/1
A47	6x5x2/.5
A48	15x12x2/1
A49	12x12x1
A50	25x10x2/0
A51	25x20x4/0
Group E	
E1	19x9x3
E2	(11x5)(8x5)x2.5/1.5
E3	18x3x1.5/.5
E4	6x6x.5
E5	12x9x2.5/2
E6	(24x4)(13x10)x1.5/.5
E7	6x4x1
E8	5x5x1
E9	13x8x3
E10	(10x3)(8x3)x.5
E11	8x5x.5
E12	7x4x1
E13	8x4x.5
E14	5x3x.5
E15	20x4x1.5
E16	34x10x1.5
E17	16x16x4.5
E18	28x12x1
E19	(29x10)(25x13)x4/2
E20	(22x11)(20x9)x2.5
E21	43x6x1
E22	20x10x3
E23	(20x6)(13x5)x1
E24	12x6x.5
E25	12x9x2
E26	15x12x3/0
E27	(14x4)(7x7)x.5
E28	16x9x1
E29	23x11x3/2.5/2
E30	20x9x1
E31	11x5x.5
E32	9x9x2.5
E33	9x8x1.5
E34	9x4x1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
E35	12x5x.5
E36	15x9x2/1
E37	12x6x1
E38	10x5x.5
E39	20x20x2/.5
E40	20x6x2/.5
E41	13x5x1
E42	12x4x1
E43	8x5x.5
E44	12x10x1
E45	5x2x1
Group H	
H1	30x30x10
H2	8x4x1
H3	12x9x3/1.5
H4	(15x8)(10x9)x1.5
H5	8x4x.5
H6	(13x3)(6x3)x1
H7	9x5x2
H8	(20x4)(11x4)x1.5
H9	13x13x4
H10	11x9x2/0
H11	12x5x1/0
H12	(10x4)(7x3)x1
H13	6x4x1/0
H14	10x7x2/0
Group J	
J1	30x13x4/1
J2	8x4x1
J3	12x9x3/1.5
J4	9x7x2
J5	(19x6)(9x5)x2
J6	8x8x3.5
J7	10.5x8.5x3.5
J8	6x5x1
J9	9x4.5x2/1
J10	9x4x.5
J11	13x7.5x1.5
J12	5x3.5x1
J13	5x3.5x1
J14	5x3.5x1
J15	8.5x3x.5
J16	25x12x2
J17	(14x4)(9x4)x2/1
J18	13x9x4.5
J19	18x4x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
J20	13x7x1.5
J21	16x7x2/.5
J22	10x7x1
J23	(18x6)(8x5)x1.5
J24	6.5x4.5x.5
J25	8x6.5x1.5
J26	7x4.5x.5
J27	10x6x2/1.5
J28	7x4x1.5
J29	6x4.5x1.5/.5
J30	9x5x2/.5
J31	10x7x2/.5
J32	(14x6)(14x6)x1
J33	11x6x3/.5
J34	10x6x3/.5
J35	3x3x.5
J36	13x10x2
J37	(16x5)(8x5)x2/.5
J38	(15x11)(15x8)x1
J39	9x7x2/.5
J40	6.5x4x.5
J41	10x7x1
J42	11x7.5x1.5
J43	9.5x5x1
J44	10x3x.5
J45	17x9x1
J46	9x7x.5
J47	14x10x4/1
J48	25x14x4/1.5
J49	9x6x2.5/.5
J50	12x2x.5
J51	11x5x1
J52	9x4x1
J53	20x6.5x1
J54	8x4x1/.5
J55	8x6x2/.5
J56	10x5x1
J57	9x5x1
J58	14x7x1
J59	23x8x3
J60	14x13x5/2
J61	10x8x2/.5
J62	8x6x3/1
J63	8x7x.5
J64	25x8x2/0
J65	10x7x2

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
J66	14x5x1
J67	15x5x.5
Galindo Group	
GG1	13x8x3/.5
GG2	(13x4)(12x7)x1
GG3	13x10x3
GG4	9x4x1
GG5	8x4x.5
GG6	18x13x2/1
GG7	8x5x.5
GG8	8x3x.5
GG9	7x4x1
GG10	5x3.5x.5
GG11	4x4x.5
GG12	12x5x1
GG13	15x5x1
GG14	12x5x1
GG15	15x15x2.5/0
Encantado Group	
EC1	18x6x1.5
EC2	19x8x1.5
EC3	(11x6.5)(13x5)x3/.5
EC4	30x7x1
EC5	9x6x1
EC6	10x5x.5
EC7	4x3x.5
EC8	7x4x1.5
EC9	(15x5)(13x7)x1.5
EC10	27x18x7
EC11	7x5x1
EC12	(29x8)(20x7)x2
EC13	12x7x.5
EC14	12x4x1.5/.5
EC15	11x8x1.5
EC16	8x8x.5
EC17	14x4x.5
EC18	8x5x1
EC19	23x10x1.5
EC20	13x9x1
EC21	11x10x1.5
EC22	10x4x1
EC23	10x5x1
EC24	12x5.5x.5
EC25	12x5.5x.5
EC26	7x6x1.5
EC27	20x7x2.5/.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
EC28	9x4x.5
EC29	10x5x.5
EC30	12x6x.5
EC31	9x4x1.5/.5
EC32	15x7x1
EC33	(18x3)(10x3)x.5
EC34	11x7x1
EC35	14x6x1
EC36	8x5x2/1
EC37	(21x5)(9x7)x1
EC38	6x6x1
EC39	16x3x1
EC40	32x15x9/7/5
EC41	(9x8)(9x6)x2
EC42	6x3x.5
EC43	8x4x.5
EC44	7x5x1
EC45	12x6x1
EC46	(11x5)(8x5)x1
EC47	(12x5)(11x5)x1
EC48	(15x5)(8x5)x.5
EC49	11x4x.5
EC50	56x14x3/0
EC51	10x6x1
EC52	21x5x.5
EC53	9x5x1/.5
EC54	40x14x2
EC55	12x6x1
EC56	(20x8)(16x12)x1
EC57	17x6.5x2.5/.5
EC58	12x5x1
EC59	15x6x1.5
EC60	9x5x.5
EC61	8x4x.5
EC62	(19x7)(13x6)x1
EC63	9x3x1.5
EC64	15x10x1.5
EC65	7x5x.5
EC66	15x4x.5
EC67	17x12x2
EC68	25x13x2.5
EC69	(19x7)(12x7)x1.5
EC70	6x5x1
EC71	10x4x.5
EC72	15x4x.5
EC73	65x10x2/0

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
EC74	7x4x1.5
EC75	13x7x2
EC76	10x7x2
EC77	10x8x.5
EC78	8x6x.5
EC79	20x8x2
EC80	10x5x2.5
EC81	22x10x3/1
EC82	21x4x1.5
EC83	12x5x3/1
EC84	12x4x.5
Encantado South	
ES1	18x10x2
ES2	23x12x2
ES3	50x10x3/1
ES4	8x3x1
ES5	26x7x2.5/0
ES6	13x5x1.5
ES7	10x9x2
ES8	8x5x1
ES9	20x11x4
ES10	20x5x1
ES11	23x4x1
ES12	24x10x4/2
ES13	8x4x1
ES14	20x8x2
ES15	(13x4)(9x5)x1.5
ES16	11x10x1
ES17	(14x10)(16x5)x4/1.5
ES18	10x9x1
ES19	12x4x4
ES20	11x5x1
ES21	11x6x2
ES22	13x7x2/0
ES23	12x7x.5
ES24	12x12x4/.5
ES25	7x6x1
ES26	(27x7)(17x8)x4/3/.5
ES27	19x10x1
ES28	23x14x1.5
ES29	10x6x1
ES30	13x5x.5
ES31	23x15x.5
ES32	17x12x2
ES33	9x8x1
ES34	17x11x1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
ES35	18x8x1.5
ES36	10x5x1/.5
ES37	8x6x1
ES38	37x8x1.5
Blue Wood Group	
BW1	(28x22)(45x15)x2
BW2	12x5x1.5
BW3	10x5x1
BW4	4x4x1
BW5	15x11x2
BW6	15x8x1.5
BW7	12x5x2/1
BW8	12x4x1
BW9	5x4x1
BW10	10x5x1.5/1
BW11	17x9x3/1.5
BW12	5x5x1
BW13	5x4x1
BW14	10x5x1.5
Schele Terraces	
ST1	35x27x5/0
ST2	25x5x4
ST3	27x12x5
ST4	11x4x.5
ST5	27x11x4
ST6	30x12x6
ST7	5x3x.5
ST8	15x10x3
ST9	25x15x2
ST10	7x3x.5
ST11	7x5x1
ST12	17x5x3
ST13	12x10x1
ST14	6x6x2
ST15	34x10x5
ST16	6x5x.5
ST17	5x3x.5
ST18	10x5x.5
ST19	17x6x2
ST20	17x6x1
ST21	15x12x2
ST22	6x5x.5
ST23	6x5x.5
ST24	6x5x.5
ST25	12x4x1.5/.5
ST26	12x10x2

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
ST27	14x9x2
ST28	16x10x2
ST29	7x5x4
ST30	15x4x6
ST31	4x4x1
ST32	12x10x4
ST33	12x9x2/1
ST34	10x6x1.5/.5
ST35	10x6x2/0
XXXIIIa	13x10x3
XXXIIIb	15x15x7
XXXIIIc	30x18x10/2
Temple of the Inscriptions Group	
TI1	9x4x1
TI2	20x9x2/1
TI3	14x9x1.5/1
TI4	14x6x1
TI5	9x5x2
Camp Group	
CP1	10x7x1
CP2	42x4x1
CP3	13x9x2
CP4	13x5x2/1
CP5	30x5x1
CP6	10x4x1
CP7	21x5x1
CP8	12x6x1
North Group	
NG1	6x5x2
NG2	(55x10)(16x8)x2.5/1
NG3	22x8x3/1
NG4	(57x6)(12x10)x3/1
NG5	5x4x1
NG6	12x7x1
NG7	7x4x1
Motiepa East Group	
ME1	12x5x1.5
ME2	8x6x1.5
ME3	12x6x1.5
ME4	11x6x3.5/.5
ME5	8x5x1.5
ME6	10x5x1
ME7	5x5x.5
ME8	10x4x.5
ME9	6x4x1
ME10	8x5x1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
ME11	8x6x1
ME12	18x6x2/1
Group J West	
JO1	12x4x1.5/.5
JO2	12x5x1/0
JO3	20x5x1
JO4	13x4x.5
JO5	5x5x.5
JO6	22x7x2
JO7	(14x6)(10x5)x2/1
JO8	11x4x.5
JO9	11x5x.5
JO10	9x4x.5
JO11	12x5x2/1
JO12	(31x10)(27x11)x3/2
JO13	10x7x1
JO14	4x4x1
JO15	18x5x1
JO16	7x5x1
JO17	12x6x2/0
JO18	15x7x1
JO19	29x14x3.5
JO20	10x5x1
JO21	24x4x.5
JO22	19x9x3/1
JO23	15x10x5/3
JO24	(12x8)(12x5)x2
JO25	10x10x1
JO26	18x8x2/.5
JO27	8x5x2/1
JO28	10x10x4
JO29	13x4x1
JO30	13x10x2/1
JO31	13x5x.5
JO32	8x8x1
JO33	(22x8)(17x15)x2/1
JO34	9x6x1/.5
JO35	(12x4)(9x4)x.5
JO36	12x7x1/.5
JO37	19x8x1
JO38	8x4x1/.5
JO39	5x5x.5
JO40	12x6x1
JO41	9x4x1/0
JO42	9x5x.5
JO43	7x2x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
Motiepa Group	
M1	10x5x1
M2	(25x9)(20x15)x5/3/2
M3	9x6x2/.5
M4	18x4x.5
M5	13x7x3/2
M6	9x6x1/0
M7	10x6x2/1
M8	(20x16)(7x6)x2/.5
M9	14x10x3/.5
M10	11x7x2
M11	(18x7)(17x7)x3/2/1
M12	9x7x2/1
M13	6x5x2/1
M14	8x5x2/1
M15	18x4x.5
M16	(13x4)(8x3)x.5
M17	12x9x3/2
M18	12x9x2/1
M19	8x5x1
M20	7x4x.5
M21	14x6x2/1
M22	9x5x1/0
M23	10x5x2/0
M24	14x8x3/0
M25	12x7x2/0
M26	(12x4)(8x4)x4/3/2/1
M27	9x5x1
M28	10x4x.5
M29	6x6x2/1
M30	19x8x3/2
M31	12x8x2/1
M32	22x9x1
M33	7x7x2
M34	18x10x2/1
M35	10x5x1
M36	12x7x1.5/.5
M37	10x4x1
M38	10x5x1
M39	10x5x1
M40	12x5x1
M41	9x5x1
M42	10x5x1
M43	12x5x1
M44	4x2x.5
M45	4x2x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
Group G	
G1	12x12x1/.5
G2	12x5x.5
G3	16x8x5/2
G4	7x5x2/.5
G5	12x4x.5
G6	12x7x1
G7	6x4x2/1
G8	8x5x1
G9	10x5x1/.5
G10	6x4x2/1
G11	10x5x1
G12	28x24x4/2
G13	8x4x.5
G14	7x4x.5
G15	19x5x1
G16	(27x12)(12x12)x.5
G17	6x4x.5
G18	4x3x1
G19	15x7x.5
Moises' Retreat	
MR1	13x5x1
MR2	10x6x2/1
MR3	16x7x3/1
MR4	25x13x3/2/1
MR5	9x5x1
MR6	(15x6)(12x4)x1
MR7	18x10x5x.5
MR8	(26x12x5)x1
MR9	25x10x1.5/.5
MR10	20x5x1
MR11	(25x10)(16x7)x2/1
MR12	16x6x1
MR13	7x4x.5
MR14	26x6x1/.5
MR15	10x4x1
MR16	15x6x1/.5
MR17	(10x4)(8x5)x1
MR18	12x5x1
MR19	13x6x1
MR20	13x5x1
MR21	9x9x5/4
MR22	(14x5)(7x4)x1.5/.5
MR23	10x5x1
MR24	18x18x10/6
MR25	27x14x2/0

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
MR26	12x9x2
MR27	21x11x1.5
MR28	5x5x1
MR29	15x7x2/.5
MR30	13x6x2/1
MR31	10x5x.5
MR32	26x7x1.5
MR33	(14x10)(19x7)x1.5
MR34	8x6x2/1
MR35	9x9x1
MR36	12x7x1/.5
MR37	10x5x1.5/1/.5
MR38	8x4x.5
MR39	8x4x1
MR40	8x5x1/0
MR41	21x8x1/.5
MR42	10x8x1/0
MR43	13x10x.5
MR44	8x6x1
MR45	7x4x.5
MR46	9x4x1
MR47	13x5x.5
MR48	14x5x.5
MR49	12x7x1.5/.5
MR50	(12x6)(9x5)x2/1
MR51	12x5x1
MR52	25x15x1/.5
MR53	15x6x.5
MR54	16x6x1.5
MR55	13x5x1
MR56	12x5x1/.5
MR57	19x10x.5
MR58	11x5x1
MR59	20x6x1
MR60	12x4x.5
MR61	10x7x.5
Xinil Pa' Group	
XP1	20x16x6/5
XP2	20x13x5/3
XP3	13x8x3/1.5
XP4	7x4x.5
XP5	12x5x.5
XP6	10x5x.5
XP7	(13x5)(11x7)x2/1
XP8	(8x5)(8x5)x.5
XP9	18x6x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
XP10	6x5x1.5/1
XP11	8x5x1.5/1
XP12	(18x4)(9x5)x1/.5
XP13	14x7x1.5
XP14	14x7x2/.5
XP15	18x8x1
XP16	5x5x.5
XP17	9x6x1
XP18	32x18x2
XP19	5x4x1.5
XP20	7x7x.5
XP21	7x3x1.5
XP22	8x5x.5
XP23	17x8x1.5
XP24	8x5x1
XP25	15x7x.5
XP26	(10x4)(8x4)x.5
XP27	8x4x.5
XP28	14x9x.5
XP29	(12x5)(9x4)x.5
XP30	13x6x1.5
XP31	(17x5)(16x5)x1
XP32	10x6x.5
XP33	30x10x2/1.5
XP34	8x5x1/.5
XP35	16x8x2
XP36	13x11x3.5
XP37	(13x5)(12x9)x1
XP38	13x7x1.5/.5
XP39	11x9x3
XP40	20x5x1
XP41	13x5x.5
XP42	11x4x1/.5
XP43	14x6x1
XP44	9x9x3/.5
XP45	14x6x1
XP46	9x4x.5
XP47	5x4x.5
XP48	8x5x.5
XP49	8x5x.5
XP50	15x10x4/2
XP51	9x4x1
XP52	5x4x1.5
XP53	14x4x.5
XP54	7x5x1
XP55	15x7x2/1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
XP56	5x5x.5
XP57	11x11x1
XP58	(22x8)(17x12)x2.5
XP59	(19x5)(11x7)x2
XP60	13x7x3/2
XP61	26x13x3/2/1
XP62	5x4x.5
XP63	8x5x2/.5
XP64	8x6x.5
XP65	(14x6)(9x6)x1
XP66	10x10x2/1
XP67	(25x4)(9x4)x1
XP68	9x4x.5
XP69	(24x8)(14x9)x2/0
XP70	10x10x1.5/0
XP71	9x4x1
XP72	(22x9)(16x10)x3/0
XP73	(21x4)(11x8)x.5
XP74	9x5x.5
XP75	8x5x.5
XP76	7x5x1/0
XP77	12x6x1.5/0
XP78	14x7x2/0
Piedras Bolas Group	
PB1	15x10x4/2
PB2	17x5x1
PB3	9x6x1.5/.5
PB4	12x10x3/1
PB5	10x10x2/0
PB6	6x4x.5
PB7	12x6x2
PB8	15x3x1
PB9	(19x10)(15x13)x2/1
PB10	7x6x1
PB11	6x6x1.5
PB12	(23x6)(20x6)x2/1
PB13	15x7x.5
PB14	14x10x2/.5
PB15	8x6x1.5
PB16	8x5x1
PB17	9x6x1/.5
PB18	14x7x2/1
PB19	8x6x.5
PB20	9x5x.5
PB21	12x9x.5
PB22	26x5x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
PB23	13x9x2/0
PB24	6x6x1.5/0
PB25	20x7x1/0
PB26	20x13x2/1
PB27	10x7x1/0
PB28	(16x8)(9x6)x3/2/1
PB29	31x10x1
PB30	9x8x1
PB31	7x5x.5
PB32	(13x9)(10x7)x2/1
PB33	15x8x1.5
PB34	20x20x2/.5
PB35	16x6x3/2/1.5
PB36	5x3x1
PB37	14x8x2/.5
PB38	20x12x2/0
PB39	20x10x2
PB40	7x4x.5
PB41	7x4x.5
PB42	11x3x1
PB43	7x5x.5
PB44	10x5x.5
PB45	21x6x1
PB46	10x9x1
PB47	26x12x3/1
PB48	8x7x1
PB49	12x9x2/1
PB50	7x6x1/0
PB51	(27x8)(16x12)x2/1/0
PB52	11x5x1/0
PB53	18x9x1.5/0
PB54	8x8x1/0
PB55	17x5x1/0
PB56	(10x5)(12x5)x1
PB57	13x8x1.5/.5
PB58	10x6x2/.5
PB59	16x11x2/.5
PB60	24x7x1
PB61	10x5x1
PB62	4x4x.5
PB63	12x6x1
PB64	10x5x1
PB65	14x8x2/0
PB66	9x4x1.5/0
PB67	35x9(7)x1.5/0
Olvidado Group	

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
O1	5x5x1
O2	11x5x1
O3	8x6x2/1.5
O4	6x4x.5
O5	9x6x1.5/.5
O6	17x10x2/1
O7	12x7x2/.5
O8	16x6x2/.5
O9	7x5x1
Lemon Group	
L1	14x10x3/2
L2	8x6x2/1.5
L3	6x6x1.5
L4	(21x6)(13x6)x1
L5	7x4x.5
L6	11x7x1/.5
L7	(17x5)(15x8)x2/1
L8	9x5x1
L9	9x4x.5
L10	6x4x.5
L11	13x6x1
L12	8x4x.5
L13	14(13)x6x1
L14	8x4x.5
L15	12x4x.5
L16	10x8x.5
L17	13x6x2/.5
L18	5x4x1.5/.5
L19	9x7x3/2/1
L20	17x14x2/1
L21	13x6x1
L22	7x7x1
L23	5x3x.5
L24	7x4x.5
L25	5x3x.5
L26	(28x8)(22x21)x3/2/1
L27	9x6x1
L28	10x5x1/.5
L29	13x5x.5
L30	11x6x.5
L31	15x5x1
L32	12x4x.5
L33	15x10x1/.5
L34	8x5x.5
L35	10x4x.5
L36	12x6x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
L37	10x6x1/0
L38	20x5x.5
L39	5x4x.5
L40	9x5x1
L41	7x5x1
L42	9x5x1/.5
L43	12x5x1
L44	10x5x1
L45	10x4x.5
L46	(15x4)(7x5)x.5
L47	4x2x.5
L48	7x4x.5
L49	7x5x1
L50	10x5x1
L51	13x5x1
L52	10x5x.5
L53	14x7x.5
L54	10x7x1.5
L55	(6x4)(10x4)x1.5
L56	11x5x1
L57	7x4x.5
L58	(17x5)(17x5)x.5
L59	10x7x.5
L60	12x8x1
L61	(18x5)(5x4)x.5
L62	11x7x1.5/1
L63	13x7x1.5
L64	10x7x1
L65	8x5x.5
L66	13x5x.5
L67	28x14x4
L68	28x10x1
L69	12x4x.5
L70	6x4x.5
L71	4x4x.5
L72	13x10x2
L73	13x5x1
L74	15x10x1.5
L75	6x4x1
L76	10x7x1/.5
L77	(19x6)(16x6)x1.5
L78	8x8x1
L79	9x7x1
L80	10x5x1
L81	15x8x1
L82	5x5x1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
L83	27x4x.5
Picota Group	
P1	16x9x1.5
P2	16x8x3.5
P3	14x12x5/2
P4	7x7x1.5
P5	15x9x2/1
P6	9x5x.5
P7	5x4x.5
P8	22x12x2/1/0
P9	9x8x1.5x.5
P10	16x5x1/0
P11	14x9x2/1
P12	17x5x1
P13	14x14x4/2
P14	15x14x8/3/1
P15	20x10x2/1
P16	11x7x1.5/0
P17	9x9x2/0
P18	18x5x1/0
P19	9x5x.5
P20	12x10x1
P21	6x4x.5
P22	10x5x.5
P23	17x9x2
P24	12x8x1.5
P25	20x12x1
P26	(40x15)(26x17)x3/1
P27	21x12x2/1
P28	11x5x1
P29	9x4x1
P30	12x10x1.5/0
P31	15x10x2
P32	12x7x1
P33	25x12x2/1
P34	10x6x1/.5
P35	(8x3)(6x3)x1
P36	16x7x1
P37	18x6x2/1
P38	15x12x3/0
P39	(15x8)(11x5)x3/2/1
P40	15x15x3/2/1
P41	6x4x.5
P42	9x6x1
P43	10x5x1/.5
P44	12x4x3/1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
P45	(19x10)(35x9)x2.5/1.5
P46	10x6x1
P47	17x7x1
P48	13x4x.5
P49	13x4x.5
P50	15x5x1/.5
P51	14x7x1.5/.5
P52	12x6x.5
P53	9x6x1
P54	5x5x1
P55	6x3x.5
P56	13x6x1/.5
P57	15x5x.5
P58	12x5x1
P59	12x8x1
P60	16x10x2
P61	9x5x2/.5
P62	12x11x1
P63	12x5x3/1
P64	12x6x.5
P65	(8x4)(10x4)x1
P66	15x5x1
P67	8x6x2/1
P68	33x28x1.5
P69	9x5x.5
P70	11x5x.5
P71	6x5x.5
P72	7x4x.5
P73	6x4x1
P74	11x7x1
P75	11x4x1.5/.5
P76	12x4x1.5/.5
P77	13x4x1
P78	10x8x1
P79	6x5x1.5
P80	12x7x1
P81	16x14x1
P82	16x10x2/1
P83	11x7x1
P84	11x4x1
P85	11x4x1
P86	12x7x1.5
P87	10x7x2/1/0
P88	11x8x1.5/0
P89	12x8x1/.5
P90	15x7x1.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
P91	9x5x.5
Escondido Group	
ED1	(20x7)(13x7)x1.5
ED2	16x8x1.5
ED3	9x5x1
ED4	11x6x1
ED5	(30x5)(28x5)(15x6)x.5
ED6	15x5x1
ED7	8x7x2/1
ED8	7x6x1
ED9	10x8x1
ED10	9x6x2/1
ED11	12x8x2/1
ED12	6x4x.5
ED13	4x3x.5
ED14	10x5x1.5
ED15	(31x12)(21x8)x2/1
ED16	6x4x1
ED17	(14x10)(19x7)x1
ED18	12x5x1
ED19	10x9x1
ED20	22x10x1
ED21	8x4x.5
ED22	15x12x.5
ED23	(18x5)(11x7)x1
ED24	11x5x1
ED25	(12x7)(12x4)x1
ED26	6x4x.5
ED27	9x5x.5
ED28	10x3x.5
ED29	13x10x1
ED30	(13x4)(15x9)x2/1
ED31	5x3x2/1
ED32	12x6x1
ED33	12x6x2/.5
ED34	8x7x.5
ED35	8x5x1
ED36	8x6x1
ED37	13x11x2/1
ED38	(12x8)(8x4)x2/1
ED39	31x9x2/0
ED40	18x5x1
ED41	20x12x2/1
ED42	12x7x1
ED43	9x5x.5
ED44	5x4x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
ED45	(25x5)(10x7)x2/1
ED46	7x5x1.5
ED47	(16x7)(14x9)x1
ED48	16x6x2/1
ED49	10x5x1.5/.5
ED50	10x10x.5
ED51	12x10x1
ED52	(30x8)(10x5)x2/1
ED53	(13x7)(11x5)x1.5
ED54	(18x5)(14x5)x1.5/1
ED55	9x5x1
ED56	17x5x.5
ED57	(14x6)(10x5)x2/1
ED58	11x5x1
ED59	5x5x1
ED60	9x2x.5
ED61	5x5x1
ED62	8x5x1
ED63	10x5x1
ED64	15x8x1.5
ED65	5x6x1
ED66	8x4x1
ED67	6x4x1
Nauyaka Group	
N1	10x5x.5
N2	10x5x.5
N3	12x6x.5
N4	15x5x2/1
N5	12x5x.5
N6	16x7x2/1/.5
N7	12x8x3
N8	(12x5)(8x4)x1.5
N9	12x6x1.5/.5
N10	12x6x1/.5
N11	15x6x1
N12	14x5x1.5/1
N13	(17x8)(14x8)x2/1
N14	10x6x1
N15	12x6x2/1
N16	8x6x2/.5
N17	9x7x2/1
N18	17x12x3/1
N19	16x5x2/.5
N20	8x5x.5
N21	12x5x.5
N22	14x7x2/1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
N23	12x5x.5
N24	16x12x2/1
N25	(33x10)(25x19)x3/1
N26	14x6x2
N27	8x5x.5
N28	7x7x2.5/1.5
N29	17x8x2/1
N30	14x6x2/1
N31	14x5x2/.5
N32	10x4x.5
N33	14x8x1.5
N34	5x3x.5
N35	7x5x1
N36	14x5x.5
N37	12x8x1.5
N38	(20x6)(10x10)x2/1
N39	13x7x2/1
N40	10x6x.5
N41	12x10x2
N42	16x12x3/2/1
N43	18x7x2.5/1
N44	10x6x.5
N45	12x7x1.5
N46	16x5x2.5/.5
N47	18x18x2
N48	12x10x1
N49	15x9x1.5
N50	5x4x1
N51	6x3x.5
N52	13x10x1.5
N53	10x5x.5
N54	10x5x.5
N55	10x5x.5
N56	10x5x.5
N57	12x5x1/.5
N58	9x4x.5
N59	6x6x.5
N60	10x7x1
N61	13x5x.5
N62	13x5x1
N63	9x5x.5
N64	10x10x1
N65	15x6x1
N66	19x10x3/1
N67	4x4x1
N68	13x5x1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
N69	13x5x1
N70	22x7x2.5/1
N71	13x5x1
N72	15x10x2/0
N73	10x5x2/.5
N74	5x5x1
N75	12x6x1
N76	7x5x1
Group B	
B1	10x5x1
B2	35x12x4
B3	12x7x2
B4	18x8x2.5/2
B5	8x5x2
B6	14x6x2
B7	(25x12)x(14x6)x3/2
B8	(25x12)x(13x6)x3/2
B9	12x5x2
B10	16x12x2.5
B11	7x5x1.5
B12	15x6x1.5
B13	(14x7)x(14x5)x2
Murcielagos Group	
M4	13x6x3/1
M5	11x6x3/1.5
M6	5x4x1
M7	16x9x2/1
M8	10x5x2.5/1
M9	(27x7)x(12x9)x1.5/0
M10	27x6x1.5/0
M11	27x9x3/1
M12	9x7x1
M13	10x7x3/2/0
M14	10x6x2/1
M15	10x8x2/1
M16	20x9x2/1
M17	19x6x2/1
M18	16x5x2/1
M19	10x6x1/0
M20	13x6x2/1
M21	20x4x1
M22	6x5x1
M23	25x10x3
M24	12x10x2/0
Cascades Group	
CS1	8x6x1/.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
CS2	8x7x3/2
CS3	5x4x.5
CS4	13x6x2/1
CS5	7x5x.5
CS6	10x5x1/1.5
CS7	10x4x2/1
CS8	(29x7)x(11x5)x1.5
CS9	19x10x2
CS10	17x8x4/2
CS11	17x5x4/1.5
CS12	(29x18)x(12x6)x2
CS13	24x6x1
CS14	10x6x.5
CS15	9x4x.5
CS16	10x5x2/.5
CS17	28x9x1
Otulum Group	
OT1	43x7x2
OT2	27x5x1.5
OT3	19x7x.5
OT4	9x6x1
OT5	9x6x1.5
OT6	11x6x1.5
OT7	10x7x.5
OT8	10x5x1
OT9	11x6x1.5
OT10	8x4x1
OT11	(40x10)x(21x18)x2/1
OT12	15x7x1
OT13	10x4x.5
OT14	20x6x1
OT15	17x4x1
OT16	11x5x.5
OT17	18x4x1
OT18	5x5x.5
OT19	(25x7)x(19x7)x2
OT20	5x5x.5
OT21	14x7x2
OT22	15x5x.5
OT23	(5x3)x(5x3)x.5
OT24	(18x4)x(13x5)x2
OT25	19x19x1.5
OT26	7x5x1
OT27	12x12x5
OT28	12x10x2
OT29	15x7x2/1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
OT30	9x4x.5
OT31	13x5x1
OT32	20x20x4/1/0
OT33	18x9x3/0
OT34	16x9x1.5
OT35	(25x9)x(11x10)x1
OT36	20x8x2/0
OT37	13x10x2
OT38	(22x10)x(13x12)x3/1
OT39	6x4x.5
OT40	6x4x1
OT41	12x5x2
OT42	16x9x2/1
OT43	12x8x2/0
OT44	12x5x2
OT45	14x6x2/.5
OT46	14x3x.5
OT47	23x19x3/.5
OT48	9x4x1
OT49	8x6x2
OT50	9x4x.5
OT51	22x16x2/0
OT52	11x6x1.5/0
OT53	12x6x1.5/0
OT54	18x7x2/0
OT55	12x4x1
OT56	12x5x2
OT57	22x10x2
OT58	24x10x2
OT59	9x7x.5
OT60	14x10x4
OT61	4x3x1
OT62	9x5x.5
OT63	(18x8)x(13x10)x1
OT64	5x5x1
OT65	45x7x2/0
OT66	40x3x2/0
OT67	15x11x1
OT68	10x4x.5
OT69	20x5x1.5
OT70	8x4x.5
OT71	10x9x1
OT72	10x6x3/0
OT73	11x4x2/1
OT74	42x20x1.5
OT75	25x21x2/0

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
OT76	10x7x1/0
OT77	45x12x3/0
OT78	23x11x6/0
OT79	22x8x1
OT80	20x17x1
OT81	21x10x1
Museum Group	
MS1	11x5x.5
MS2	8x4x.5
MS3	9x9x1
MS4	8x4x1
MS5	12x11x1
MS6	(10x4)x(7x5)x1
Group D	
D1	13x10x4
D2	30x12x4
D3	22x8x2
Tok Group	
TK1	5x5x1
TK2	9x9x2.5
TK3	12x3x2.5
TK4	16x2x1
TK5	22x7x3/0
TK6	12x5x.5
TK7	13x8x3
TK8	15x8x2/0
TK9	7x5x1
Leon Group	
LE1	8x4x.5
LE2	6x4x.5
LE3	8x4x2/1
LE4	7x4x1
LE5	4x4x1
LE6	10x3x.5
LE7	9x5x2/.5
LE8	8x4x.5
LE9	8x5x1
LE10	7x4x1
LE11	12x5x2/.5
LE12	7x5x2/.5
LE13	7x5x2/.5
LE14	8x5x1
LE15	10x3x1
LE16	14x12x2/0
LE17	8x4x1
LE18	6x4x1

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
LE19	12x8x2/1
LE20	8x4x1
Zutz' Group	
Z1	12x8x1.5
Z2	10x6x2/1
Z3	11x6x2/.5
Z4	18x8x2/1.5
Z5	5x5x1
Z6	25x9x2/1
Z7	10x5x1.5
Z8	(12x4)x(6x4)x.5
Z9	10x5x1.5
Z10	10x4x.5
Z11	4x4x1
Z12	14x5x1.5
Z13	22x6x1.5
Z14	16x6x2/.5
Z15	15x4x1
Z16	17x7x1
Z17	17x7x1
Z18	21x4x1
Z19	14x5x2/.5
Z20	(33x10)x(22x10)x4/3
Z21	24x10x2.5/2/1.5
Z22	(26x8)x(19x12)x3/1
Z23	(33x5)x(16x7)x2/1
Z24	6x4x.5
Z25	5x3x.5
Z26	24x8x1
Z27	33x27x3
Z28	12x8x1.5
Z29	12x8x1.5
Z30	13x5x.5
Z31	7x2x.5
Z32	3x3x.5
Z33	28x8x2/0
Group C	
C1	20x13x3
C2	23x15x4.5
C3	15x12x5
C4	15x10x4.5
C5	17x15x6
C6	47x24x5/3
C7	13x5x1
C8	8x5x1
C9	21x3x1.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
C10	16x7x2
C11	11x7x2
C12	(26x11)x(15x7)x4
C13	(23x9)x(16x9)x3
C14	9x7x1.5
C15	7x5x2/.5
C16	25x10x3
C17	21x18x1.5
C18	(25x13)x(19x18)x3/0
C19	8x5x.5
C20	7x5x1
C21	10x4x1
C22	12x6x.5
C23	(28x10)x(22x14)x1.5/1
C24	18x6x2/0
C25	15x9x.5
C26	11x5x1
C27	18x9x2/1
C28	10x10x1
C29	11x3x.5
C30	10x4x.5
C31	4x3x.5
C32	7x6x1
C33	10x8x2/1/0
C34	8x8x1.5/0
C35	22x7x2
C36	11x5x1
C37	10x4x.5
C38	13x11x3/1
C39	9x4x.5
C40	3x3x1
C41	7x5x.5
C42	9x5x.5
C43	12x6x.5
C44	8x4x.5
C45	20x5x1.5
C46	10x6x.5
C47	7x4x.5
C48	19x11x3/1/0
C49	18x4x1
C50	10x10x1/0
C51	25x12x2/0
C52	12x6x1
C53	12x7x1/0
C54	25x6x1.5
C55	23x9x3.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
C56	24x9x2.5
C57	15x7x1/0
C58	(19x5)x(15x8)x2
C59	15x6x1.5
C60	6x6x1.5
C61	10x5x1
C62	(16x5)x(8x7)x2/0
C63	19x10x3/0
C64	6x6x1/0
Xaman Group	
X1	24x11x4/0
X2	17x4x1
X3	(22x9)x(15x10)x3
X4	24x5x2/0
X5	14x8x1.5
X6	8x5x.5
X7	11x7x2/0
X8	20x9x1
X9	16x3x.5
X10	16x3x.5
X11	11x5x2/0
X12	21x12x3.5
X13	8x4x1
X14	10x5x1
X15	15x7x1.5/0
Ch'ul Na	
CN1	3x3x.5
CN2	4x3x.5
CN3	(15x10)x(11x9)x2.5
CN4	20x10x1.5/.5
CN5	9x9x.5
CN6	16x9x2
CN7	12x5x2/.5
CN8	12x7x2.5/1
CN9	48x22x2
CN10	10x8x2/.5
CN11	10x7x2/0
CN12	7x4x.5
CN13	9x5x1
CN14	17x9x2
Lik'in Group	
LK1	30x26x3/2/1
LK2	15x3x.5
LK3	5x4x.5
LK4	10x5x.5
LK5	6x5x.5

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
LK6	(10x5)x(7x4)x2.5/.5
LK7	16x5x.5
LK8	10x7x.5
LK9	10x4x.5
LK10	7x4x1/.5
LK11	14x8x3/0
LK12	10x5x1
LK13	6x5x1
LK14	25x6x1.5
LK15	14x6x1.5
LK16	8x6x1.5/0
LK17	5x5x1.5/0
LK18	17x13x2
LK19	19x11x3/1/0
LK20	33x19x3
LK21	18x10x2
LK22	10x6x.5
LK23	8x4x1.5/.5
LK24	6x4x.5
LK25	39x33x2
LK26	11x7x.5
LK27	12x7x1.5
LK28	5x4x1
LK29	(12x7)x(12x4)x3
LK30	7x5x1
LK31	(15x6)x(15x6)x2/1
LK32	8x5x1
LK33	5x4x1.5/0
LK34	35x20x3/1.5
LK35	14x5x1
LK36	11x5x.5
LK37	14x7x2/.5
LK38	5x4x1
LK39	7x4x1.5
LK40	7x6x2/1
LK41	36x14x2.5
LK42	8x5x.5
Ach' Group	
AC1	(65x17)x(26x15)x5/3/2
AC2	37x13x1/0
AC3	22x14x5
AC4	62x8x2.5/1
AC5	31x6x2/0
AC6	15x11x2/.5
AC7	12x10x1
Yax Group	

STRUCTURE	DIMENSIONS IN METERS (lengthxwidthxheight)
Y1	9x9x2.5/1
Y2	10x8x2/1
Y3	(11x7)x(11x5)x1.5/.5
Y4	20x6x2
Y5	37x20x2.5
Y6	17x8x3/2
Y7	20x5x.5
Y8	8x4x.5
Y9	8x4x.5
Y10	6x4x.5
Y11	8x6x1/.5
Y12	7x4x1
Y13	12x4x2/.5
Y14	8x5x.5
Y15	7x6x2/1
Y16	8x8x2.5/1.5
Y17	14x10x1.5/1
Y18	12x6x2/1
Y19	10x6x1/0
Y20	12x5x1
Y21	12x4x3/.5
Y22	(17x5)x(13x10)x3/2/1
Y23	6x5x1.5/1
Y24	10x10x3/1
Y25	20x7x3/.5
Y26	16x7x2/1
Y27	11x4x1.5/0
Y28	15x10x1.5/0
Y29	15x10x1.5/.5
Y30	11x8x1.5
Y31	6x4x.5
Y32	8x4x.5
Y33	8x4x.5
Y34	10x5x1
Y35	10x10x1.5
Y36	14x7x1.5/1
Y37	32x8x2/1

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