7 COMMUNITY PRACTICES OUTSIDE THE HOUSE: RESULTS OF MAGNETIC ANOMALY GROUND-TRUTHING EXCAVATIONS AT ACTUNCAN, BELIZE

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This article presents the results of ground-truthing excavations undertaken to test the reliability of a gradiometer survey conducted by Chester Walker in the Northern Settlement Zone and Plaza H at Actuncan. More than 140 magnetic signatures were identified on the gradiometer map that may indicate buried natural or cultural features. To test them, we grouped signatures by form into three broad categories: 1) zones of enhanced magnetism, 2) rectilinear, and 3) amorphous. Zones of enhanced magnetism correspond to patio-focused groups visible from the ground surface, and we hypothesized that those without visible architecture were buried domestic groups. Rectilinear signatures were considered to signal buried constructions, while amorphous signatures might be more isolated features. Twenty test excavations sampled anomaly types and confirmed, to some extent, our hypotheses. However, our generalized types did not predict specific archaeological remains. Within each type, excavations revealed a wide range of constructions and features. Nonetheless, one important result of the project was the recognition that while many activities took place on patio-focused groups, specialized activities, such as crafting and intensive gardening, occurred on the edges of the settlement zone on low constructions invisible from the ground surface.

Introduction

The organization of urban settlements has recently become a focus of debate as archaeologists examine the kinds of relationships and practices that bound people together into social and spatial units in Mesoamerican cities (Arnauld et al. 2012; Smith 2010, 2011). Although some Maya cities were densely populated and complexly organized (Feinman and Nicholas 2012; Masson and Peraza Lope 2014), many are notable for their low densities and lack of recognizable neighborhoods. Attempts to reconstruct the organization of urban settlements, however, must be mindful of the fact that what is visible above ground does not "represent the sum total of the settlement at any given point in time" (Hendon 2012:161). Over the years, archaeologists have discovered many Preclassic houses completely buried by Classic-period urban renewal projects at Cuello (Hammond 2009), Cahal Pech (Awe 1992; Healy et al. 2004), Pacbitun (Powis et al. 2009), and other sites (Rosenswig and Kennett 2008). Outside civic centers, domestic mounds and other settlement features also can be buried by colluviation, alluviation and bioturbation, particularly in upland tropical environments (Johnston 2002). Particularly vulnerable are low agricultural terraces, water management features, houselot walls, and small platforms that are important features for understanding the organization of settlements. At Actuncan, we initiated an archaeogeophysical program that will allow us to reconstruct a more complete picture of the urban settlement and its development.

Archaeogeophysical survey programs are "methods of ground-based remote sensing that allow the detection, imaging, and mapping of subsurface features over large areas in potentially great detail" (Kvamme 2003:435). This definition distinguishes ground-based techniques, including gradiometer, magnetometer, and ground-penetrating radar (GPR) from multi-spectral satellite imagery, LiDAR, and aerial photography that map the surface of forested landscapes from the air. In some parts of the world, archaeogeophysics are used to map entire archaeological landscapes providing an image of buried settlements (Gaffney 2008; Kvamme 2003).

The Actuncan Archaeological Project attempted two ground-based remote sensing techniques in different locations—gradiometer in the Northern Settlement Zone and GPR in Plazas F and H—but only had success with the gradiometer (Walker 2012). A gradiometer is a non-intrusive device that measures slight variations in soil magnetism. They have become the primary tool employed by archaeogeophysicists because data can be collected and processed rapidly and efficiently. When soil conditions are right, gradiometers

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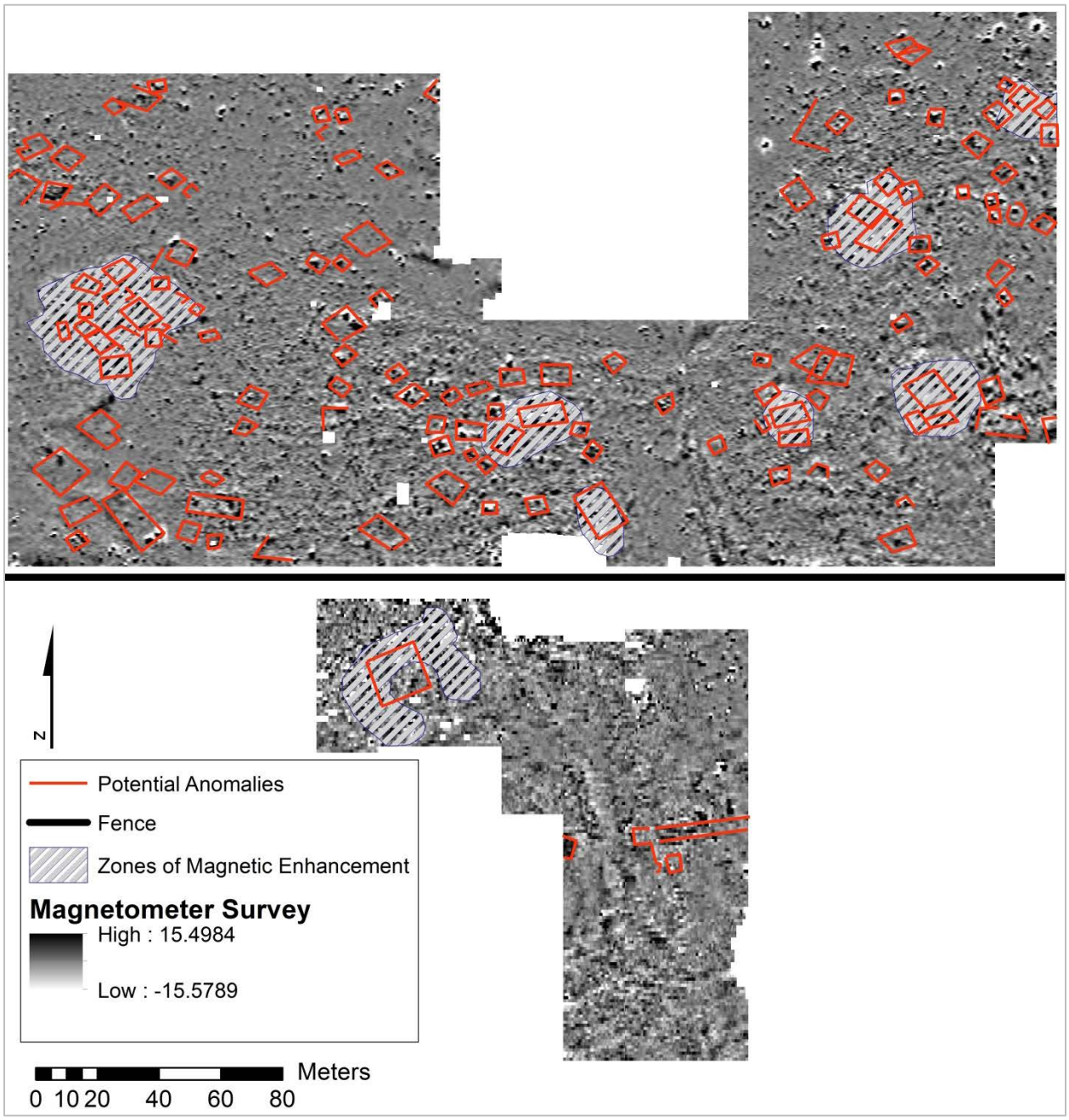

Figure 1. Actuncan's magnetic gradient map overlain with anomalies and zones of magnetic enhancement.

have proven useful in locating cut-and-fill cultural features such as pits, post holes and wall trenches, as well as thermally altered features such as fire hearths and burned structures (Gaffney et al. 2000; Kvamme 2006). In regions that have benefitted from extensive geophysical surveys, magnetic signatures are correlated with specific cultural features to such an extent that unexcavated anomalies can be identified as houses, pits, and hearths with a high degree of probability (Gaffney 2008; Kvamme 2006). However, in the Maya lowlands where remote sensing is still in the experimental stage, ground-truthing excavations are required to identify buried remains. Survey data alone cannot confirm the presence of anthropogenic features, and ground-truthing excavation is necessary to correlate magnetic anomalies with their cultural

manifestations. Overall, surveys in the Maya lowlands have yielded mixed results due to water-logged soils, dense forests, and complex site stratigraphy that impede or confound remote sensing signals (Haley 2006; Halperin 2007; Sweely 1995). Nevertheless, at Actuncan, a gradiometer survey of the Northern Settlement Zone has proved successful in predicting the location of cultural features. Our success is due to the fact that cultural features were cut into the blocky clay substrate of the T3 terrace on which Actuncan sits. The contrast between the low magnetism of the clay substrata and higher magnetic gradients associated with cut-and-fill features or objects that have been thermally altered produce recognizable anomalies.

Gradiometer Survey and Sampling Procedures at Actuncan

At Actuncan, Chester Walker surveyed two areas using a Fluxgate gradiometer: a northern collection area of 48,246m² (11.9 acres) and a southern area of 12,375m^2 (3.1 acres) for a total of 60,621m^2 (15 acres). Walker and Nelson used the resulting magnetic gradient map to identify 141 magnetic anomalies and eight zones of magnetic enhancement (Figure 1). Most zones of magnetic enhancement are associated with patio-focused groups, but some are found in areas with single mounds or lacking visible mounds altogether (Figure 2). Given the close association between zones of enhanced magnetism and patio-focused groups, we hypothesize that zones of enhanced magnetism without substantial architecture represent buried patio-focused groups. Isolated magnetic anomalies are more problematic to interpret because they could represent a wide range of cultural or natural features, although those that are linear or rectangular in shape may be buried platforms or other architectural features. Our ground-truthing program aims to confirm whether or not these areas of interest represent buried archaeological remains.

Currently, we have ground-truthed 20 magnetic signatures over two field seasons (Figure 3). In 2011, nine anomaly locations were chosen for ground-truthing based on anomaly shape and magnetic amplitude (Blitz et al. 2012). Anomalies selected included linear dipoles, complex dipoles, and weak positive

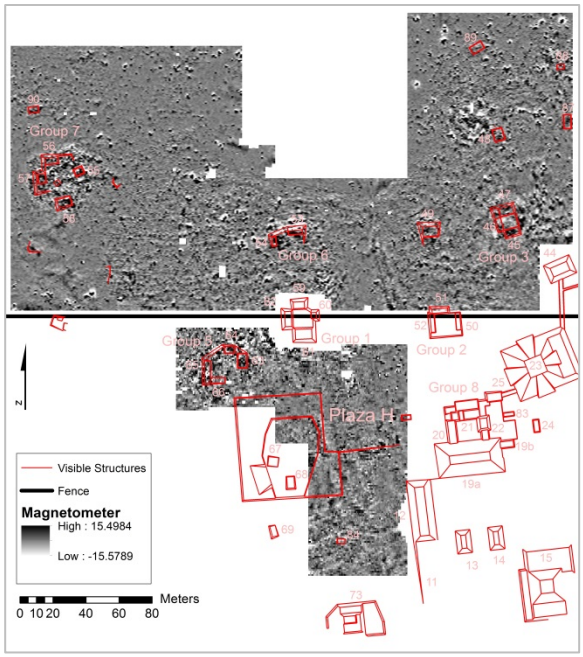

Figure 2. The magnetic gradient map overlain with visible architecture.

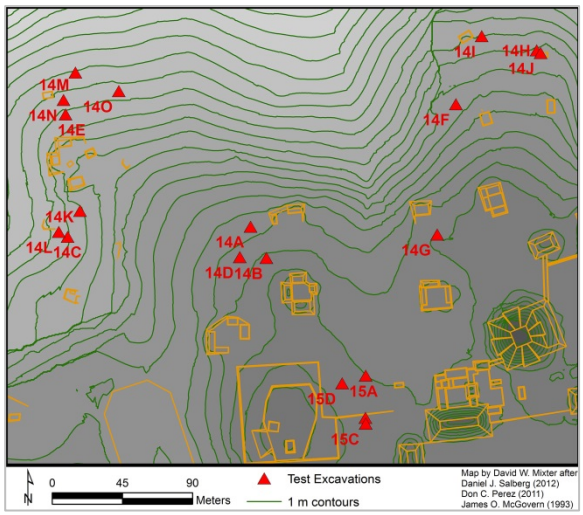

Figure 3. The location of ground-truthing excavations. Map courtesy of David Mixter.

magnetic rectangular patterns with low magnetic centers highlighted by Walker as possible buried structures. In addition, two "quiet" areas with low magnetic gradients were selected for test pitting to serve as control units for comparison. In 2015, we specifically targeted large rectangular patterns. Eight test units were concentrated in the eastern and western sections of the Northern Settlement Zone (Millar 2016). Results of these excavations are summarized

Table 1. Ground-truthing results by unit.

Unit	Anomaly Type	Archaeological Remains	Probable Source	Interpretation
14A	Complex dipoles	Small semi-circular area of wood (pine) charcoal.	Thermal feature	Natural feature.
14B	Complex dipoles	Three layers of Late Classic fill containing refuse and burnt limestone.	Cut and fill event	Probable platform and / or occupation surfaces.
14C	Weak positive rectangular pattern	Burnt Late Classic remains within a fill layer.	Thermal event	Probable agricultural plot.
14D	Complex dipoles	Same as 14B.	Cut and fill event	Probable platform and / or occupation surfaces.
14E	Control unit	Nothing discovered that would be expected to create an anomaly.	None	Minor modification of ancient surface(s).
14F	Area of enhanced magnetism	Classic-period occupation surface resting on fill above a Late to Terminal Preclassic pit dug into sterile clay.	Cut and fill event	Domestic platform associated with Str. 48.
14G	Linear dipoles	Late Classic platform fill layers and possible walls of limestone and chert cobbles.	Cut and fill event	Domestic platform associated with Str. 49.
14H, 14J	Area of enhanced magnetism	Late Classic platform with occupation layer rich in chert and obsidian debris.	Cut and fill event	Non-domestic platform associated with Str. 88.
14I	Weak negative linear dipoles	Two floors and associated features including a red pigment filled pit, postmolds and wall trench.	Cut and fill event	Non-domestic platform associated with Str. 89.
14K	Weak positive rectangular pattern	Terraformed natural white clay strata.	Cut and fill event	Probable agricultural plot.
14L	Weak positive rectangular pattern	No convincing source of anomaly reached after 2 m of excavation through deposits in drainage bottom.	Unknown	Possible agricultural plot.
14M	Weak positive rectangular pattern	Terraformed natural white clay strata.	Cut and fill event	Probable agricultural plot.
14N	Linear dipoles	Sloped wall retaining fill and floor.	Cut and fill event	Terrace between two structures.
14O	Weak positive U-shaped pattern	Burnt daub feature and tree root.	Thermal event	Modern burning and possible disturbed cultural feature.
15A	Control unit	Nothing discovered that would be expected to create an anomaly.	None	Minor modification of ancient surface(s).
15B, 15C	Linear dipoles	Two plaza fill layers and collapsed cobble stone wall.	Differential magnetic susceptibility	Wall construction under civic plaza(s).
15D	Weak positive rectangular pattern	Two plaza fill layers, plaster floor and cobble stone cluster.	Differential magnetic susceptibility	Wall construction under civic plaza(s).
15E	Weak positive rectangular pattern	Late Classic platform with several building stages.	Differential magnetic susceptibility	Str. 93 platform construction.

below and in Table 1. For more details see the Actuncan Archaeological Project's annual reports, all of which can be found on-line at http://llecount.people.ua.edu.

Results of Ground-truthing Excavations

Ground-truthing excavations are summarized below based on location to evaluate the effectiveness of the survey in different segments of the built environment. Plaza H is assumed to have been more complexly stratified than the Northern Settlement Zone which, based on previous excavations, has yet to reveal a plaza surface. Further, different sections of the settlement may correlate with particular kinds of activity areas containing specific architectural features or cultural features.

Plaza H

Given its close proximity to both settlement and civic zones, we hypothesized that Plaza H may contain buried domestic structures. Five 1-x-1m test excavations (Units 15A-E) were dug, none of which yielded evidence of domestic structures. We found that the plaza is covered by a 20 to 30cm thick, black mollisol that has developed since its final use in the Late to Terminal Classic periods (Keller 2012:43). The terminal plaza surface was highly eroded, appearing as dispersed pebble ballast and patches of plaster. It is located at the base of the mollisol, where a structurally recognizable B horizon has developed between the mollisol and underlying cultural layers. Most cultural features rest on earlier plaza surfaces and are not associated with the terminal plaza surface.

Unit 15A was a control unit. Seven strata were uncovered in more than 100cm^3 of matrix, but few artifacts were recovered. Underneath Stratum A (the mollisol) five fill layers were found sitting on two layers of natural soil containing a few Middle and Late Preclassic sherds. As anticipated, there was no indication of anything that would show a magnetic signature in a magnetometer survey.

Units 15B and C were contiguous units placed to intersect a linear-dipole anomaly. Excavations revealed two layers of Late Classic plaza fill underneath the mollisol. These fills sit on a thin layer of compact clay with white mottling that represents a penultimate plaza

Figure 4. Unit 15D's west profile.

surface. Underneath it, we encountered two more layers of fill, the top one containing a cluster of large undressed limestone pieces in the eastern corner of Unit 15B, possibly associated with a collapsed wall. The source of the anomaly is likely due to the cluster of limestone that is oriented in the same direction as the linear-dipole anomaly.

Unit 15D tested a weak positive rectangular pattern. Four visible strata were encountered in 100cm^3 of matrix. Under the mollisol were two plaza fill layers, possibly dating to the Late (top layer) and Early (bottom layer) Classic periods. These rested on a 7cm thick plaster floor, probably Late Preclassic in date. The floor extended across the entire unit, and below it was 30cm of clay fill containing jutes, lithics, some carbon, and ceramics that date to the Middle and Late Preclassic periods. Moderate-sized cobbles were located along the northern portion of the unit in the fill, possibly associated with collapse of a wall (Figure 4). The cobbles are likely the source of the anomaly.

Unit 15E was placed on a platform visible from the ground surface. It was tested because this area was composed of linear dipoles prominently seen on the gradiometer map. As expected, the stratification was quite complex. Six strata were encountered (Figure 5). Beneath the mollisol, we encountered a surface made from limestone cobbles and plaster dating to the Late Classic period. Below it were two fill layers containing jutes, lithics, and redeposited ceramics dating the Terminal Preclassic period. These rested on a plaster floor and associated cobble fill. Below the fill, another thin layer of

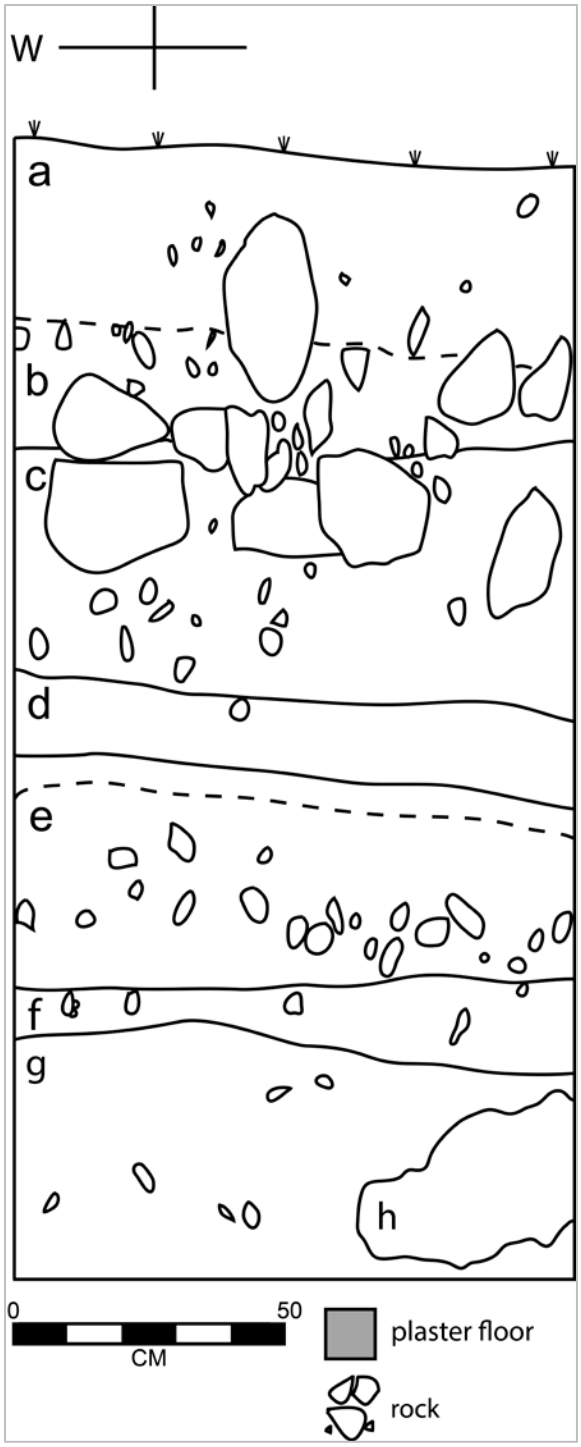

Figure 5. Unit 15E's north profile.

fill was found resting on mottled yellowish clay interspersed with grey silty clay of uncertain origin. Although these lower strata contained Middle Preclassic sherds, they were likely disturbed natural soils. It is unclear what the source of the anomaly is since we did not encounter any retaining walls or platform facades. It is likely that the cultural feature was not precisely located because linear anomalies can appear as shadows of nearby features (Kenneth Kvamme, personal communication 2015).

Figure 6. Unit 14A showing Feature 1, a modern burnt tree trunk.

Northern Settlement Zone: The Central Portion

Three 1-x-1m units were placed on small amorphous anomalies in the interstitial areas between Groups 1, 5 and 6. In general, excavations in this area encountered a thin layer of dark clay loam humus (Strata A) covering clayey occupation or fill layers that are associated with the leveling and use of this heavily modified section of the Northern Settlement Zone.

Unit 14A sampled a complex dipole signature and was excavated to a depth of 78cmbd. Stratum A, a 5cm thick humus layer, contained a few non-diagnostic sherds. Beneath it, we encountered two clayey strata that contained sherds, lithics, obsidian, charcoal, and fired clay that we interpret as occupation surfaces. Feature 1 was found in the first stratum and consisted of charcoal and fired clay (Figure 6). Feature 1 is certainly the anomaly detected by the magnetometer. Unfortunately, it appears to be a recently burned tree trunk.

Unit 14B sampled a complex dipole signature. The unit was excavated to a depth of 90cmbd and encountered four layers of fill containing ceramics, lithics, jutes and burned limestone. The lowest fill layer had the largest quantity of ceramics, which date to the Late

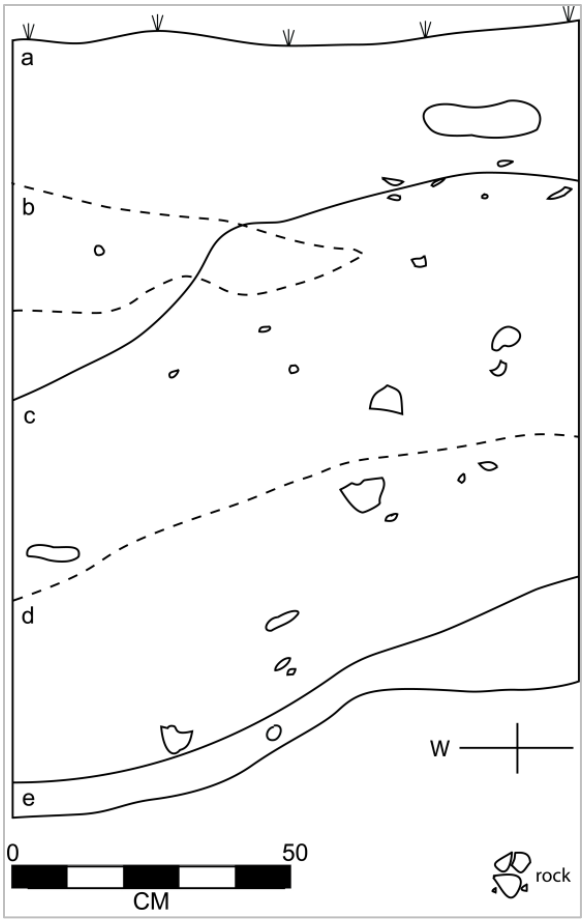

Figure 7. Unit 14F's north profile.

Classic period. Because the lowest fill layer cut into the sterile clay, we interpret the magnetic signature as representing a cut-and-fill event.

Unit 14D sampled a complex dipole signature. Two strata were excavated to 100cmbd. The first layer was a clayey fill containing lithics and Late Classic ceramics, while the second layer contained only five sherds, none diagnostic. A clear color change was noticed between the two layers. The fill stratum may be a continuation of the cut-and-fill event found in Unit B and a possible source of the anomaly.

Northern Settlement Zone: The Eastern Portion

The eastern side of the Northern Settlement Zone is relatively level with a gentle slope to the northwest. In 2011, Dan Salberg and Angela Keller surveyed this area looking for low structures after the pasture was severely burned to the ground. Three new platforms were identified (Structures 87, 88, and 89) north and east of Structure 48 (Salberg 2012). All were quite low, but identifiable as lines of cobble stones forming small rectangles. Five 1-x-1m excavation units (14F-J) were placed on large rectangular-shaped anomalies near isolated structures. The goal of these excavations was to confirm the presence of buried structures.

Unit 14F was placed to intersect a large set of linear and complex dipoles within a zone of enhanced magnetism. We postulated that the enhanced magnetism may be the buried remains of a patio-focused group associated with Structure 48. The unit was excavated to a depth of 155 to 177cmbd and encountered five cultural layers associated with a Terminal Preclassic platform and pit feature (Figure 7).

Stratum A, the humus root zone, extended from roughly 35cmbd at ground surface to 102cmbd in the northwest corner of the unit. It yielded high amounts of lithics relative to ceramics (dating to the Late Preclassic period), as well as daub and very small amounts of jute and obsidian. Keller noted that the lithic assemblage was quite generalized and postulated that it was lithic production debris possibly washed downslope from Structure 48. Stratum B, a small deposit of refuse, contained Late Preclassic ceramics, lithics and jutes, as well as smaller amounts of obsidian, daub, quartz and slate. Below it was clay fill that was a lighter color than the layer above it and contained limestone gravel inclusions, redeposited artifacts (ceramics, lithics, jute, daub, etc.) and a golf ball-sized lump of charcoal. At the base of the lot in the northeast corner, we encountered a cluster of Sierra Red sherds sitting on top sterile clay (Feature 3), while in the northwest corner we encountered the top of a pit feature (Feature 4) dug directly into sterile clay. Feature 4 extended down roughly 25cm until it terminated at stiff mottled yellow clay (Figure 8). Ceramics within the pit were tentatively dated to the Terminal Preclassic period. We have little doubt that the magnetic anomaly was caused by the contrasting soils produced by Feature 4. Given the quantity and diversity of artifacts, we hypothesize that this sequence of strata represents a buried domestic structure and cultural features.

Figure 8. Unit 14F, Feature 4, a Terminal Preclassic period pit.

Figure 9. Unit 14J showing a buried platform.

Unit 14G was chosen to ground truth a large complex dipole signature southeast of Structure 49. Three strata were encountered. Stratum A, the humus root zone, was surprisingly deep at a depth of 25cm. Below it was a thin layer of yellowish-brown clay fill containing small limestone inclusions. Along the eastern side of the unit, a cluster of medium-sized undressed limestone and chert cobbles was found within the fill. Ceramics date the fill to the Late Classic period. This fill and possible wall sat on another Late Classic fill layer containing brown clay, small limestone gravels, limestone and chert cobbles, and large amounts of trash. Several medium-sized chert and limestone cobbles, some burnt, were found clustered in the northeast corner of the unit similar in location to the cluster above it. Although the excavation was terminated before sterile soil was encountered, the fill layers and cobble clusters are indicative of a platform edge. The cause for this magnetic anomaly is a construction event, perhaps associated with a buried domestic structure.

Units 14H and J were 1-x-2m units placed to investigate a large strongly positive dipole signature just off Structure 88. Unit 14H excavations revealed four strata. Stratum A, a thin layer of humus, transitioned to lighter brown clay containing uncut limestone, chert, daub, ceramics, and lithic debitage. We interpret this layer to be an occupation surface due to the moderate density of cultural material including six obsidian blades, a relatively high count when compared to finds in other settlement areas of the site. The only possible architectural element discovered was a low pile of limestone and chert cobbles (Feature 9) sitting at the base of the occupation surface on yellow-clay fill. The unit was excavated another 40cm into hard, mottled, and friable natural clay.

Unit 14J was opened closer to Structure 88 to better understand the source of the obsidian blades and the articulation between the structure and subsurface remains found in Unit 14H. A 1-x-1 m baulk was left between the two units. Just below the surface, the outer edge of a platform was revealed as a single row of large undressed limestone fragments and chert cobbles (Figure 9). Another, smaller retaining wall lay behind the platform's façade. The fills contained mostly lithic materials, but a small concentration of ceramics was found including a large Late Classic rim fragment of a jar. The platform sat on the same occupation layer encountered in Unit 14H, but in 14J, the surface followed the natural topography, sloping gently down to the west. Underneath the occupation surface lay yellow clay with a much lower artifact density. Only three small sherds were recovered in the 15cm thick lot. Artifact densities in the first two strata were much higher, with ceramics, a wide variety of lithic, several jutes, seven more obsidian blades, and other material remains. Overall, the high proportion of chipped stone to ceramics in Units 14H and J indicates lithic workshop activities located on a low platform. The relationship of this low platform to Structure 88 is currently unknown, but given their proximity they were likely attached.

Unit 14I was a 1-x-2m unit about 10 m northeast of Structure 89. Although this area is magnetically quieter than those to the south, LeCount chose to ground truth a weak linear

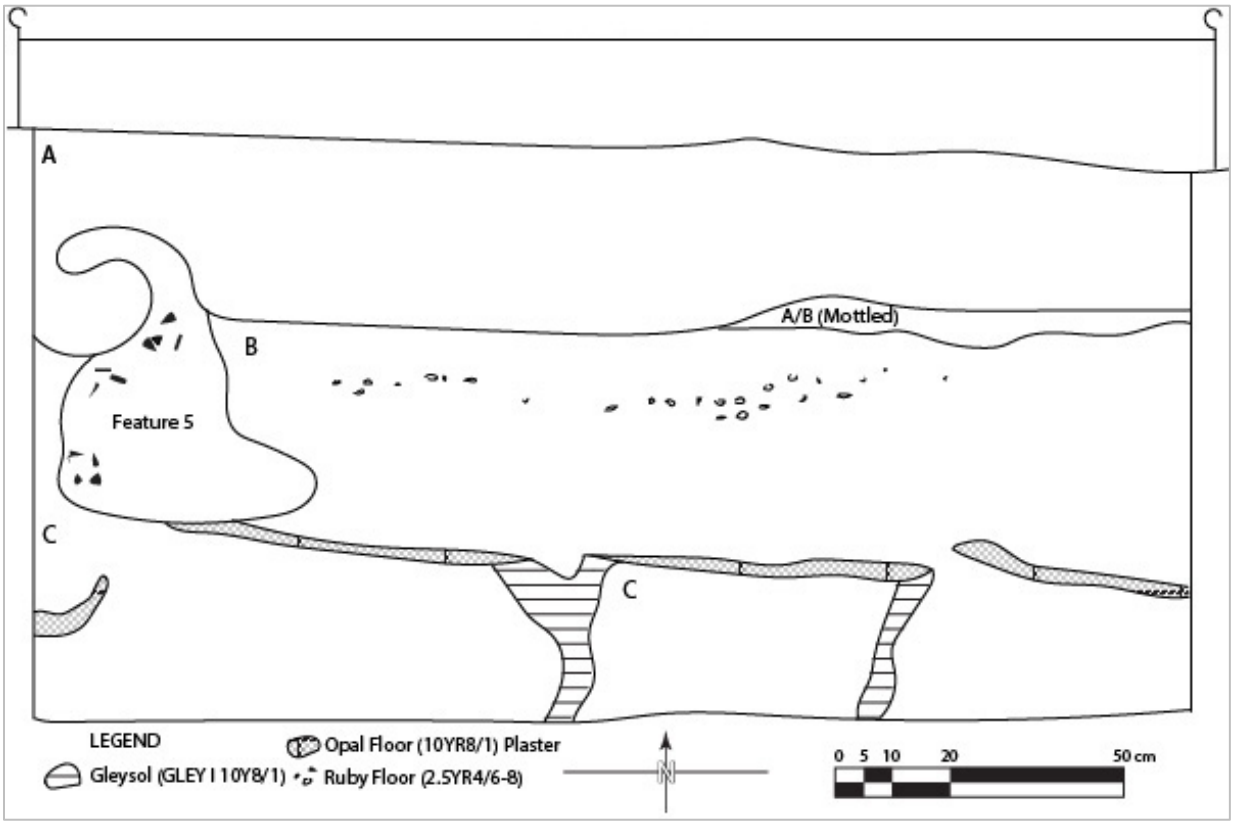

Figure 10. Unit 14I's north profile.

Figure 11. Unit 14I showing Feature 5, a pit filled with red matrix.

anomaly running northeast to southwest from Structure 89. Excavations revealed a more complex stratigraphy than expected (Figure 10). After a 30 to 40cm deep layer of humus and dark brown clay, Stratum A transitioned to yellow clay. As the transition began, Feature 5 appeared. This roughly 50cm deep pit contained red (2.5YR 6/8) clay and charcoal (Figure 11). The feature was analyzed by Tawny Tibbets *in situ* using a pXRF, and based on the instrument readings, the red matrix is probably a locally sourced iron oxide, possibly used for making red paint for stucco or ceramic slip. The upper section of Feature 5 was disturbed by bioturbation. Two possible postholes (Features 6 and 7) and a dark linear stain (Feature 8) were found running northeast-southwest across the center of the excavation. Feature 8 is a shallow trench-like feature that also appeared just below the transition to Stratum B. These features are associated with a compacted clay surface called Ruby Floor and, taken together, may be the remains of a perishable structure. Ruby Floor was poorly defined throughout the unit. The surface was either an intentionally prepared clay floor disturbed by postdepositional processes or

merely spilled pigment unintentionally compacted underfoot. No ballast underlay Ruby Floor, only a thick 30 to 50cm brownish-yellow clay fill was found. This fill capped Opal Floor, which consisted of several layers of plaster. The plaster was 2 to 5cm thick and extended throughout the entire unit, forming a solid but uneven surface. The profile revealed two distinct layers of plaster in places, but postdepositional processes related to groundwater distorted most of the original surfaces. Interestingly, the base of Feature 5, the red pit, sat on Opal Floor, indicating the pit was dug into fill until it reached the plastered surface. No artifacts were found on or in association with the floor surface. Opal Floor has been badly affected by the formation of gley, a sticky grey clay resulting from waterlogged deposits. Across the center of the unit, the floor was broken by a long shear and slump event. Soil below Opal Floor was hard, friable natural clay with reddish mottling (Stratum C). Excavation ceased at 100 to 110cmbs. Artifact density was quite low throughout the unit, especially in fill strata that contained the usual assemblage of eroded ceramics and lithics. A single piece of obsidian was found near Feature 5.

The shear and slump event seems the likeliest source of the magnetic anomaly tested in Unit 14I, although Feature 8 may also account for it. Both cross-cut the unit and are oriented in the same direction as the magnetic signature on the map. Like the buried platform off Structure 88, we think this area was likely used as a workshop, probably for the making of red pigment in the later version of the platform. However, more extensive excavations are needed to test this interpretation.

Ground-truth Excavations in the Far Western Section of the Northern Settlement Area

The western side of the Northern Settlement Zone is more topographically varied than the eastern side. Its most prominent feature is the southeast to northwest trending drainage that originates at the aguada and runs into an unnamed creek that forms the boundary between the Galvez and Requena properties. Christian Wells (personal communication to Lisa LeCount, 2014) noted that the aguada was constructed by damming this drainage. Groups 5 and 7 sit above this drainage on the east. Given the area's exposure and proximity to residential groups, it is likely that the slope was heavily modified to promote drainage and cultivation. LeCount hypothesized that many of the magnetic signatures found in the area may be agricultural features. One particular intriguing set of magnetic signatures can be seen situated south of Group 7. There, weak positive rectangular signatures appear to form an interconnected "field" system of large features running perpendicular to the slope. Interestingly, these magnetic signatures are fuzzier than most, due either to the magnetic subtlety of the features responsible for them or their significant depth below surface. North of Group 7 is another set of complex magnetic features. A linear anomaly runs between Structure 90 and a complex dipole of similar size and magnetic signature, likely another buried structure or platform. Finally, there are many isolated magnetic features that do not appear to be associated with visible structural groups. To test these anomalies, seven units were placed on six magnetic features to determine if the magnetic patterns are associated with agricultural terracing or other non-domestic features.

Units 14C, K and L were positioned to intersect two large rectangular anomalies associated with the proposed field system south of Group 7. In these units, the excavations were deep and we never encountered retaining walls indicative of rock terraces. However, the natural soils of the slope were terraformed, which may account for the fuzzy magnetic signatures in this area.

The most productive unit was Unit 14K, a 1-x-2m unit placed to investigate one of the weak positive magnetic rectangular patterns that make up the proposed field system. There, Millar found that Stratum A transitioned to lighter, more compacted yellow clay around 25cmbs. At about 50cmbs the yellow clay transitioned to dense white clay (Stratum D) called "yeso" by Santos Penados Jr. in the field and later confirmed by Anabel Ford in the lab. In a Spanish dictionary, yeso is defined as 1) plaster material for finishing walls, 2) material used for making plaster casts, 3) a geological

term for gypsum, and 4) chalk. As seen in the south profile (Figure 12), the clay forms low berms perpendicular to the slope, perhaps evidence of terraforming. The clay forming these possible berms was uniformly dense and white, while the natural clay was blocky and mottled yellowish-brown in color.

Modifications to the natural clays by cut-and-fill events could explain the source of the magnetic signature. Artifacts in the upper strata included highly weathered ceramics most likely washed down from Group 7 above, along with lithics and a single piece of obsidian. No artifacts were in the white clay.

In Unit 14C, Nelson excavated to a final depth of 140cmbd and five strata were identified. There, he found that Stratum A, the mollisol, was deep. It contained clay loam with small specks of red mottling interspersed throughout the matrix. Stratum B was the same color but without the red-mottled soil. Stratum C represented a soil color change and contained burned limestone, small limestone inclusions, fired clay and Late Classic sherds. Stratum D was similar but slightly different in color. The last stratum, E, was clay containing only a few small sherds. Due to the lack of artifacts at this depth and time constraints in 2011, the excavation was terminated. The source of the magnetic signal is ambiguous. A close inspection of the magnetic signature map shows that the unit tested the center of the rectangular magnetic signature; therefore, we did not placed the unit on the edge of this anomaly.

In 2015, we returned to this large anomaly by opening up a 1-x-2m unit on the edge of the rectangular feature to try to determine the source of the anomaly. Unit 14L was located near the base of the slope therefore it was highly susceptible to flooding, filling and draining rapidly with runoff after each rain. Overall, Actuncan is well-drained because rainwater percolates down to the clay dome underneath the site and exits onto the lower slopes of the hilltop.

Stratum A transitioned to lighter and more compacted clay (Stratum B) rich in natural and anthropogenic inclusions. Most artifacts were very small and eroded, probably washed downslope from the structures uphill. Like Unit 14C excavated by Nelson, Stratum B in Unit

Figure 12. Unit 14K's south profile showing the cut-and-filling of natural white clay (yeso).

14L revealed small specks of red mottling interspersed throughout the matrix along with burned limestone, fired clay, and small sherds. At the time, the red mottling seemed to be due to a burning event, but it continued to appear in each lot as we excavated downward, fading out entirely around 100cmbs. Stratum C sloped to the west with the natural topography and grew noticeably denser with depth. At nearly 2m below surface, occasional eroded ceramics and lithics continued to appear, but the unit was closed in the interest of moving on to test other anomalies. The white clay at the base of nearby units was never reached, and no convincing source of the rectangular magnetic signature was discovered. It is possible that the white clay was very deeply buried within this upper portion of the drainage.

North of Group 7, we tested 3 rectilinear magnetic signatures that may represent terracing. Unit 14M lay 20m northeast of Structure 90 on a gentle slope north. This 1-x-2 unit was placed to investigate a weakly positive rectilinear magnetic signature. Stratum A, the dark brown clay and humus zone, was 20 to 25cm thick. It transitioned to lighter yellow clay (Stratum B). Excavations struck greyish-white clay or yeso (Stratum D) at varying levels throughout the unit. It first appeared just 35cmbs in the northeast corner, but in areas of the south it lay as deep as 55 to 60cmbs. This dense, impermeable stratum appears to have been cut and redeposited. The morphology is best defined in the west side wall, which shows a swale filled with mottled white and yellow clay (Stratum C) and a berm of solid white clay (Stratum D) with no inclusions (Figure 13). The latter was easily identifiable from the

Figure 13. Unit 14M's west profile showing the terraforming of natural white clay (yeso).

Figure 14. Unit 14N, Cedar Wall. Note the slope of the wall and its construction.

surrounding natural soil by its homogeneity and clear profile morphology, which contrasted with the mottled, blocky sterile clays found in other excavations nearby. Dense, sticky gley soils (Stratum E) appeared around 90cmbs, and excavation ceased at 130cmbs because similar strata proved sterile in other units.

Artifacts in upper strata included ceramic, lithic, obsidian, and jute, probably washed down from the structures uphill. Once the excavations encountered yeso, only a single utilized flake was recovered. The manipulation of the yeso could account for the magnetic anomaly.

Unit 14N was a 1-x-1m unit laid to investigate a linear dipole signature running between Structure 90 and a strong positive rectangular magnetic signature. The signature ran east to west perpendicular to the slope, and we hypothesized that it represented a wall between the two structures.

Below the 20 to 25cm thick humus and dark brown clay zone (Stratum A) lay compacted and mottled clay rich in natural and anthropogenic inclusions (Stratum B). Stratum B, a possible occupation surface, was only 5 to 15cm thick, and beneath it soil transitioned to yellow fill (Stratum C). Just below the transition between Strata B and C, a zone of reddish mottled fill, possibly representing a burning event or occupation surface (Stratum D) appeared in the north and east. Strata A, B, and the top 20cm of C yielded ceramic, lithic, jute, and a single piece of marine shell, but most of the yellow fill was sterile. Cedar Wall, a terrace wall made of large cut-limestone blocks covered in plaster and tilting noticeably with the slope, appeared about 1m below surface, buried by Stratum C and sitting on natural deposits (Stratum E). Its outer face—the side facing downhill—met the unit profile at a 40˚ angle, sloping in the same direction as the natural topography but much steeper, the natural slope being between 10˚ and 25˚. The wall ran east-west across the unit and was constructed of one to three courses of stone stacked end-to-end so that their largest faces created the wall façade (Figure 14). A small patch of tamped sascab named Pearl Floor (Stratum D) lay on the south side of the wall. The floor was 7cm thick at most, with another 3cm of darker soil underneath, but no discernable ballast. A single obsidian blade was recovered. The excavation ceased when sterile, friable greyish-white clay was reached on both sides of the wall. Therefore, the wall sits on yeso. The source of the linear magnetic signature is most certainly

the digging and filling event associated with Cedar Wall.

Unit 14O was a 1-x-1m unit laid to investigate an inverted U-shape in the gradiometer map. A concentration of daub, burned clay, and charcoal appeared within Stratum A. The layer of daub extended downward through Stratum A in the form of an oval-shaped feature (Feature 18). Excavators sectioned it, revealing a burned root running out the base of Feature 18. Inclusion-rich mottled brown clay (Stratum C) extended 30 to 40cmbs throughout the unit. It transitioned to mottled white and yellow clay (Stratum D), which grew denser and lighter in color with depth, making the gradual transition to natural mottled white clay (Stratum D) around 105 to 125cmbs. Excavation ceased about 130cmbs in the natural clay. Artifact densities decreased dramatically after the first two strata. The burnt feature is the most likely source of a magnetic anomaly. Further investigation would be needed to see if it extends further and could account for the entire U-shaped anomaly, of which Unit 14O merely caught the northeast corner.

Unit 14E was a 1-x-1m unit located 10 m north of Group 7. It was excavated as a control unit for ground truthing an area with normal magnetism. Stratum A was a relatively undisturbed humus layer of dark grayish brown clay loam contained typical amounts of artifacts for an off-structure context at Actuncan. The layer's slope reflects the general topography of the hillside. Stratum B was a 20cm deep layer of brownish-yellow clay matrix with small limestone gravel-sized inclusions, ceramics, lithics and jute. The slope of the stratum suggests these materials may have washed down slope from Group 7. No diagnostic ceramics were recovered from this stratum. Stratum C consisted of white sterile clay (yeso), with the exception of a single sherd. This stratum was excavated to a depth of roughly 92cmbd. The findings in Unit 14E are consistent with the magnetometer data and nothing recovered here would be expected to create a magnetic anomaly.

Conclusions

Overall, the magnetic gradient map was more reliable in predicting buried deposits in the Northern Settlement Zone than Plaza H. In the settlement, platforms and features were dug into the clay of the ridgetop and created magnetic anomalies of variable sizes, shapes and intensities. Plaza H, on the other hand, was raised more than 100cm above the natural clay by both cultural and natural processes. Plaster floors were laid down to raise and level the plaza, and most features rest upon them or fill layers. Therefore, Plaza H features do not cut-and-fill sterile clays that are the source of differential magnetic gradients in the Northern Settlement Zone. In Plaza H, the platforms encountered do not appear to have been residential because they lacked trash and other domestic features.

A gradiometer survey can be considered reliable on a given site when extensive ground truthing results in a positive correlation between digitally mapped anomalies and the presence of burning events, architectural features, or cut-and-fill features that produce discrete magnetic signatures. Of the units tested, 12 were attributed to cut-and-fill events associated with ancient Maya constructions, three as burning events, and three were ambiguous (Table 1). Two control units discovered nothing that would be expected to create a magnetic anomaly. Taken together, Actuncan's ground-truthing has made a convincing case for the efficacy of magnetometer survey within its settlement zone. We found that 1) zones of enhanced magnetism correspond to patio-focused groups visible from the ground surface, 2) zones of enhanced magnetism not associated with visible patio-focused groups correspond to buried architecture and cultural features, 3) large rectangular patterns are often indicative of substantial cultural features such as low platforms or terracing, 4) strongly positive linear signatures are indicative of limestone and/or cobble stone walls, and 5) small amorphously shaped anomalies are highly variable and may be either natural or cultural features.

In Actuncan's Northern Settlement Zone, cultural features associated with magnetic signatures appear to be spatially patterned. Along the eastern edge of the settlement, large rectangular signatures were found to have been low platforms or occupational surfaces associated with relatively high quantities of

obsidian blades and a wide variety of lithic material indicative of workshops. In the case of Unit 14I, a red-clay pit possibly used in the production of red pigment for ceramic or plaster surface treatments also indicates specialized production activities. Close by, excavations into zones of enhanced magnetism yielded buried platforms and cultural features more indicative of domestic platforms, possibly associated with informal patio groups. On the other hand, excavations on the western side of the settlement revealed terraforming of natural white clay and an agricultural terrace that were likely used to control the movement of water on the hillside or retaining soil. Therefore, our data lend evidence to suggest that specialized activities, such as crafting and intensive gardening, occurred beyond patio groups in peripheral locations. These investigations hint at the organization of houselots and location of specialized activities at Actuncan, patterns that will be the focus of future excavations.

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