SOUTHEASTERN ARCHAEOLOGICAL RESEARCH, INC.

EXECUTIVE SUMMARY

Phase III Data Recovery Investigations at Archaeological Sites GMI-2, GMI-4, RR-14 and Ceiba 11 Naval Activity Puerto Rico Contract Number: N69450-08-D-0064-0001

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CLIENT: Naval Facilities Engineering Command Southeast
DATE: June 5, 2008

The following Executive Summary has been prepared for the data recovery (Phase III excavations) at four archaeological sites (GMI-2, GMI-4, RR-14 and Ceiba 11) on the grounds of the Roosevelt Roads Naval Facility per the scope of work agreed upon between the Naval Facilities Engineering Command Southeast (NAVFAC SE) and Southeastern Archaeological Research, Inc. (SEARCH). The purpose of these investigations was to conduct sufficient mitigation to offset adverse effects that may be incurred upon conveyance of these parcels out of Navy possession. These three sites have been identified as properties eligible for inclusion in the National Register of Historic Places (NRHP). A Memorandum of Agreement (MOA) guiding this undertaking was entered into on December 15, 2006 between the U.S. Navy and the Puerto Rico State Historic Preservation Officer (SHPO) with concurring party approval from the Local Redevelopment Authority and the Department of Natural and Environmental Resources. The Work Plans for each of these undertakings were approved by the SHPO in correspondence dated November 30, 2007.

Phase III excavations began at the Roosevelt Roads sites on January 23, 2008 and finished on May 12, 2008. These excavations were directed by Dr. Lisabeth Carlson. Dr. William F. Keegan served as an advisor in the area of Caribbean prehistoric archaeology, Christopher Chilton, M.A., served as a soil scientist, and Deborah Mullins, M.A. provided historic archaeology expertise. The field crew included an additional five SEARCH archaeologists, Justin McNesky, Christopher Altes, Travis Couliette, Samuel Blake, and Keith Pickles.

The project goals were specifically laid out in the individual Work Plans and these goals were met in the field through a combination of surface surveys, shovel testing and unit excavation along with archival research and specialized studies. Field methodologies differed depending on the type of site and research goals, however, all methodologies adhered to the highest research standards for the profession. The four sites were mapped in detail using a Topcon GTS-3C total station and FC-100 data collector. This Executive Summary provides a description of the fieldwork completed in the three to four weeks of investigations at each of the sites and includes preliminary results of the excavations, explanations of the directions the research will take as a result of the data collected, and reviews all pertinent information necessary to make decisions on the management of these resources.

GMI-2

Site GMI-2 is located on a small landform adjacent to an area of extensive tidal flats and mangrove south of Puerto Medio Mundo (Figure 1). It was discovered by Geo-Marine, Inc. in 2004 (Sara and McClintock 2005) and Geo-Marine's Phase II work consisted of 70 shovel tests (seven of which were positive), two 1-x-1 meter test units, and a surface collection (Sara and Franz 2006). This yielded an assemblage of 704 Precolumbian artifacts, 98% of which were plain pottery. Geo-Marine determined this to be an Elenan Ostionoid period site with a possible late Saladoid (Cuevas) component based on stylistic variation in the pottery, even though a charcoal sample recovered from 10-30 centimeters below surface (cmbs) yielded a 2-sigma calibrated date of A.D. 1290 to 1420, corresponding to the late Ceramic or Chican Ostionoid period. The site did not contain shell, bone, charcoal or features, but due to the uniqueness of the assemblage and the lack of previous investigations into mangrove edge sites in northeast and eastern Puerto Rico, this site was determined potentially eligible for listing on the NRHP with further work recommended.

The function of these plain ceramic-only sites has not been adequately explained to date. Roe (2000; Roe and Colón 2007) suggests that these are ceramic production areas due to the lack of dietary refuse and proximity to clay deposits. However, the fact that only utilitarian ceramics are found and that many of the ceramics show use-wear and are sometimes extremely worn and exhausted from overuse strongly suggests a site activity that put these pots into service.

Phase III excavations confirmed that the mangrove edge site of GMI-2 was not a place of habitation, but rather a special use area. No griddles or other evidence of food processing was found in these excavations, bone and shell were non-existent, and no structural features were identified. The site matrix commonly contained quartz crystals, however, these crystals were natural inclusions. In addition, the data collected found no evidence to support the ceramic manufacturing site hypothesis. Charcoal was found sporadically in the deposit but not in the amount expected if ceramic firing occurred. A small amount of fire-cracked rock was identified but not enough to suggest that rock was used to create hearth rings, firing stations or kilns. The strongest argument against the pottery manufacturing hypothesis is the use-wear on the vessels.

This combination of site features has led the Principal Investigator to propose that GMI-2 may have been a location where salt was distilled from the highly saline mangrove edge waters. The following is a discussion of the data supporting this proposition and an explanation of the artifact analysis and specialized studies that will be undertaken in hopes of providing further substantiation for this hypothesis.

Methods

Data recovery efforts began on February 18 and finished on March 15 with three weeks spent in the field. Investigations of site GMI-2 were conducted by block excavation with initial shovel testing to isolate the deposits. A total of 52 5-meter interval shovel tests showed that the site measures approximately 55-x-15 meters with an area of higher density deposit that is 45-x-

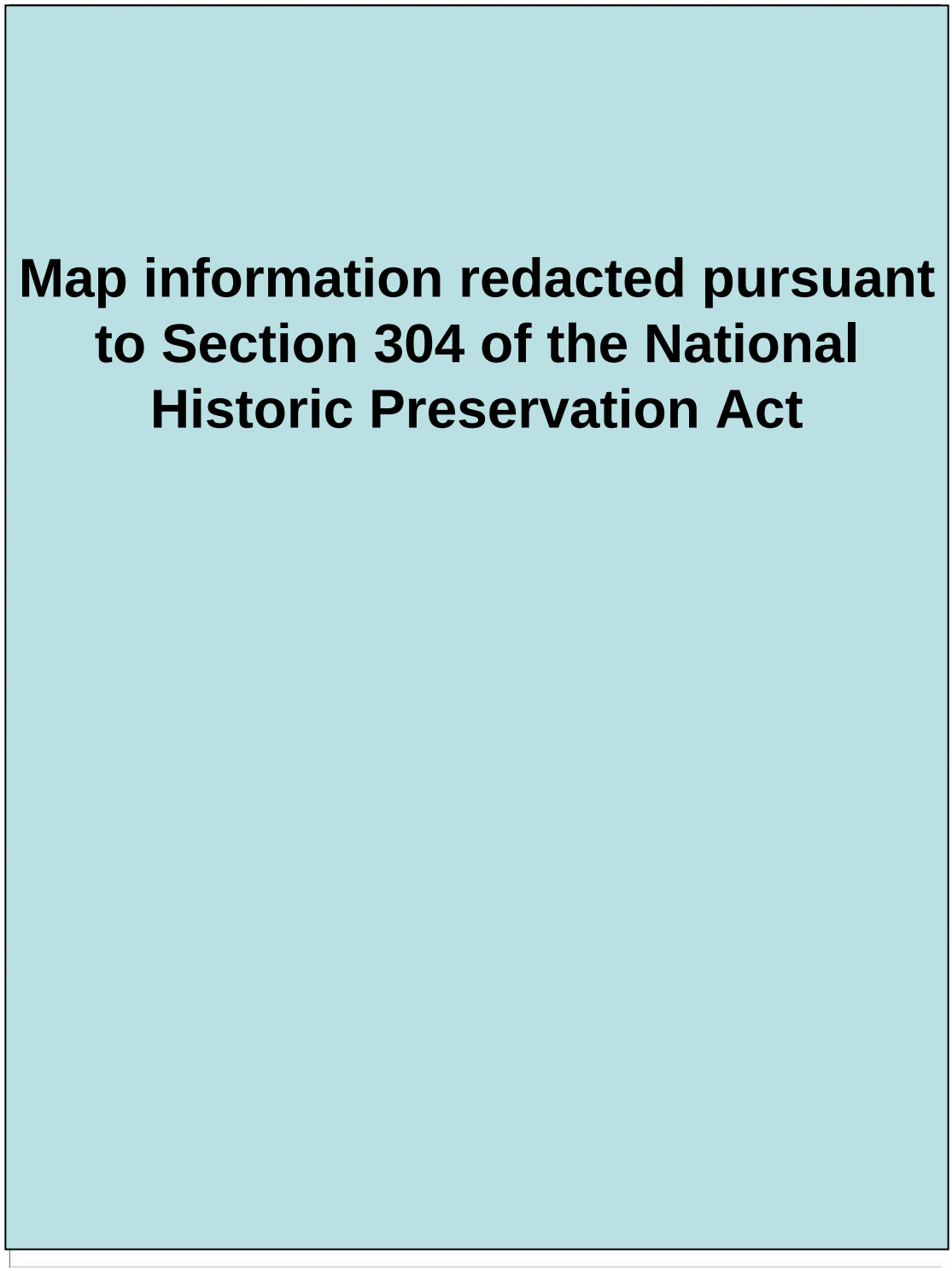

Figure 1. Location of GMI-2 and RR-14. Roosevelt Roads Naval Facility.

10 meters. The site runs parallel and slightly upslope to a relic mangrove edge that is now dry and covered with pangola grass vegetation. There is a significant amount of redeposition of ceramics in this site. The surface of the existing mangrove is covered with sherds brought down to the water's edge and moved up and down the shoreline via the fluctuating water table. Shovel testing showed that the site does not extend into the current mangrove vegetation.

Block unit locations were placed to explore concentrations of ceramics identified in the shovel tests and to test upslope vs. downslope deposits. The upslope areas of the site are very well drained with shallow cultural deposits. The downslope areas have poorly drained soils and thicker deposits that have been significantly bioturbated. Modern glass was recovered as deep as 80 cmbs as a result of crab burrowing. The soils are dotted with black manganese concretions (especially downslope), which is an indication of hydric soils—soils that have been commonly inundated.

In total, 22 square meters of the site were excavated with four areas examined (Figure 2). All block units were excavated and recorded in 1-meter sections, and when feasible, the entire block was taken down simultaneously so any features encountered could be fully exposed. Excavation methods included the use of shovels, hand picks, and trowels in dry sediments. Some of the sediments were softened before excavation by pre-soaking, which allowed hand troweling of the hardest layers of the site. This wet excavation method did not work in the deeper, clayey soils. All sediments were passed through ¼-inch mesh screens except for features, which were processed through 1/16-inch screen. One bulk column sample was collected for fine mesh screening from the area of densest ceramic deposit. It measured 30-x-30 cm and was removed in 5 cm levels. These samples were water screened through 1/16-inch mesh in the field laboratory. No bone or charcoal was noted in the processed bulk column sample.

Site deposit depth varied considerably between upslope and downslope areas. The upslope site was deposited on a layer of quartzite cobbles and boulders encountered between 30 to 40 cmbs. This 15-20 cm thick rocky layer also impeded the burrowing land crabs, which are the main agent of bioturbation at the site. Beneath this rock layer are sterile clay deposits, followed by a layer of granular sediments. The downslope areas along the relic mangrove shoreline exhibit considerably deeper deposits and more complicated stratigraphy.

All units were recorded with plan and profile drawings. One 7-meter long profile was drawn showing the transition from upslope to downslope deposits. All four of the wall profiles in the 1-meter deep 3-x-2 meter block excavation were drawn to illustrate the complex downslope stratigraphy. Detailed soil descriptions were made throughout the excavations and three deep pedogenic profiles recorded the soils to a maximum depth of 1.5 meters below surface. Soil samples of all the exposed cultural and natural strata were taken for further testing.

The ceramics recovered site-wide from the Phase III unit excavations numbered 7185. All these ceramics were initially processed and cleaned in the field laboratory. No decorated sherds were noted. Some samples of the ceramics were left intentionally unwashed for use in future laboratory tests of surface deposition.

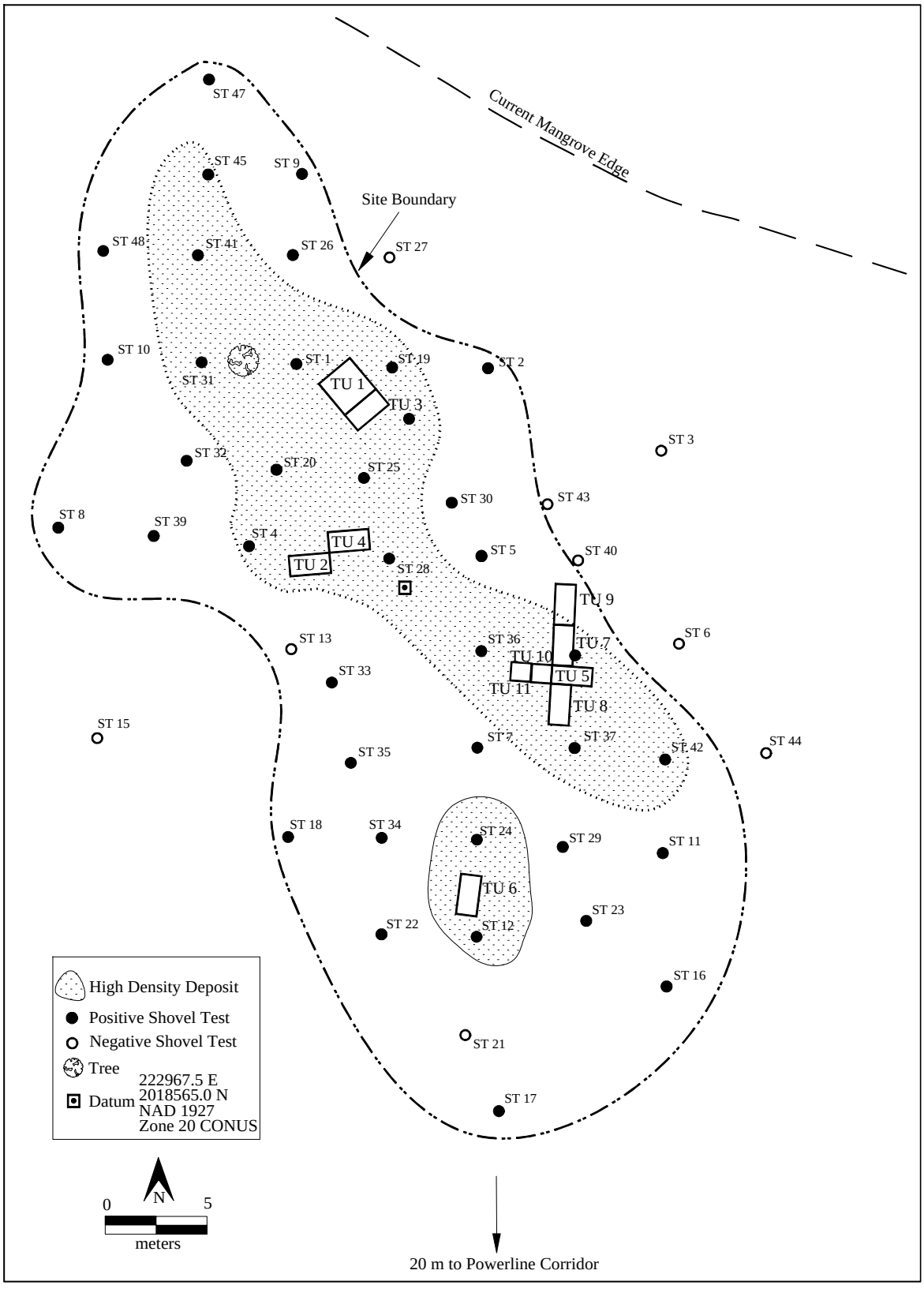

Figure 2. Site Plan for GMI-2.

All recovered modern materials and prehistoric ceramics and lithics (crystals) were washed and air-dried in the field laboratory and returned to the SEARCH Jonesville, Florida laboratory for analysis. In the field, very small plain body sherds (less than 2 cm in any direction) were counted, weighed, and were not saved. In total, 1253 very small sherds were discarded, while 5932 prehistoric ceramics were returned to SEARCH for further work. Soil samples and processed 1/16-inch bulk samples were returned to the SEARCH laboratory for further analysis. The excavations at GMI-2 recorded 203 individual Field Specimen (FS) entries.

Results

Site GMI-2 is a small area with several dense clusters of plain ceramics, which are potential activity areas related to the distillation of salt from salt water. The water would initially be boiled down and the pots would be left upslope to further dry out. The ceramic assemblage is extremely fragmented and worn. The salt itself would have contributed to the friable nature of this assemblage and the act of removing the salt from the pots may have also contributed to the high number of damaged vessels.

One hearth was identified in these excavations (Feature 1), which consisted only of preserved wood charcoal. This feature occurred at approximately 30 cmbs and this depth represents a prehistoric activity surface. Ceramics were clustered around and on top of this feature and burned clay and burned sherds surrounded it. There is no rock associated with this feature. This would have been an open fire consisting simply of a pile of logs. There are no small post molds associated with the hearth to indicate that pots were being suspended over this fire. Site wide, there is a very small amount of fire-cracked rock, and none of it is the local quartzite. These few meta-volcanic rocks would have been imported to this location and they may have been used to lift the pots off of the fire. The excavations produced two cylindrical clay legs and, similarly, these may have been used to raise the pots off the fire. These could have been temporarily attached to the utilitarian, simple, globular vessels with a bit of wet clay and reused.

The hearth was identified in the downslope 3-x-2 meter unit, which also contained dense ceramics as deep as 1-meter below surface. In the upslope areas of the site, the cultural materials were contained within the top 30 cm of the deposit. The depth of these downslope cultural deposits is partially a result of abundant crab burrows that move artifacts to the water table. However, the size and abundance of the sherds in the deepest levels cannot all be a result of bioturbation, as 300 sherds (many quite large) were recovered in Level 8 (85-95 cmbs) of a single 1-x-1 meter portion of this large block unit. In addition to these deep cultural deposits, the stratigraphy in this macroblock has a dark brown, rocky layer (called Stratum D) that underlies the cultural deposit and abruptly stops along the downslope profiles. This Stratum D appears to be the prehistoric mangrove surface and where it stops would have been the old water's edge, perhaps an old channel. This channel could have provided access to this location from deeper, navigable waters, and would have been a source of easily collected water for distillation. The deepest ceramics may have been deposited simply by falling into this channel. The hearth feature is on the edge of this landform.

There is evidence that some of the upslope deposit has been eroded downslope, as the upslope areas have cultural deposits in the surface layer. This erosion also has contributed to the

thickness of the downslope deposit. There is no stratigraphic evidence of site abandonment and reuse; it appears to be a single short-term deposit. No variation in the ceramic types occurs through the deposit. Radiocarbon dating should substantiate a relatively short duration for this activity area.

A cruciform 1-meter wide trench measured 7 meters long and 4 meters across. This formation followed an area of dense ceramics, where the densest 1-x-1 meter test unit contained 1300 sherds in a shallow 30 cm deposit. This area is further back from the prehistoric water's edge and no features or significant pockets of charcoal were encountered here. This area did provide an excellent ceramic sample that will provide valuable vessel shape information. Based on field observations, the majority of the vessels are large with incurving shoulders and restricted orifices. This vessel shape would help retain heat inside the body of the pot. In addition, many large strap handles were recovered, which would help in moving vessels filled with water for distillation. Nearly 4200 pottery sherds were recovered in this trench area.

To give support to the idea that these locations were used to collect highly saline water for distillation of salt, we performed a water salinity survey of various locations around Roosevelt Roads. Using a glass hydrometer, we tested salinity levels of the mangrove waters behind GMI-2 and three similar sites tested during the Phase II investigations (Ceiba 5, Ceiba 9 and RR-SRC-1). These and other mangrove area test sites were compared to the large bay of Ensenada Honda and to the open ocean water surrounding the base. All locations were recorded with GPS. The mangrove edge locations showed salinity levels nearly twice what was tested in the surrounding bay and ocean.

The data collected from excavations at GMI-2 will be used for more in-depth studies in hopes of drawing support for this site function hypothesis. Salt was a primary commodity in the prehistoric West Indies, and it was certainly collected from islands with natural salt forming flats (e.g. The Turks & Caicos Islands) and traded widely. GMI-2 is a small site with a small-scale operation. This is production for local use only, producing salt enough for the needs of a small group.

Future investigations will focus on comparing this site (and the three similar sites excavated during the Phase II investigations) to known salt producing sites. There are archaeological cross-cultural examples of such from the Maya (Andrews 1986; McKillop 2002). Soils will be tested for salt levels. Upon exposure, the soil profiles of the deeper deposits dried with a white crust that looked like salt. Pottery sherds will be cross-sectioned and tested to determine how deeply salt deposits have penetrated the surface of the sherds. If sherds are simply lying in salty water or salty deposits they will have a surface lens of salt, however if these vessels were used to distill salt, salt will have penetrated deeper into the core of the sherd. The surfaces of sherds will also be tested to look for microbotanicals, which should not be present if these vessels were used only for salt production.

One last question to address is where is the habitation site for these people? I would propose that the people using this mangrove edge site were the same ones seen at the site of RR-14, investigated as part of this current multi-site study. RR-14 is 250 meters upslope from GMI-2, and is a short-term occupation or campsite. It was likely used as a place to launch fishing

expeditions. It is not a location of full-time habitation, so the habitation site for both of these small sites is located elsewhere and was not investigated as part of this current work. Radiocarbon dating may help support this hypothesis.

RR-14

Site RR-14 is located on a small upland terrace overlooking the extensive tidal flats area south of Puerto Medio Mundo (see Figure 1). It was discovered by Panamerican Consultants, Inc. in 1992 and R. Christopher Goodwin and Associates, Inc. completed a Phase II evaluation in 1996 (Goodwin and Associates, Inc. 1997). The Phase II work consisted of 105 shovel tests (22 of which were positive), eight 1-x-1 meter test units, and a controlled surface collection. This work yielded an assemblage of 1123 prehistoric artifacts, including Esperanza style ceramics, shells, lithics, and two bones. The site was interpreted as a small habitation site containing in situ midden deposits and features and was determined potentially eligible for listing on the NRHP with further work recommended. Goodwin and Associates did not find either post stains, pits, or hearths to substantiate their assertion that this was a small habitation site.

Goodwin and Associates determined this shallow, small site to be intact with no evidence of agricultural activities. However, they noted evidence of soil stripping and disturbance mounds in the area surrounding the site and recorded two nearby antenna bases on their field map. The Phase III investigations found a significant degree of land alterations in the vicinity of RR-14. The terrace that contains the site is truncated on its south and east edge by an actively eroding 50 degree slope. The height of this eroded slope ranges from 3 to 10 feet. This site appears to have been actively eroding for some time. Shell fragments were visible on the slope, although fewer than 10 examples were noted. In 1996, Goodwin and Associates did surface collections down this slope and collected 479 artifacts (shell and ceramics). It seems that much of what was the shell midden of this site is destroyed.

There is significant land alteration in this area including both deep subsurface and above ground operations that would have required large heavy equipment to construct. There are numerous, large, linear push piles around the site. Below the eroded slope is a flat area that is stripped and furrowed by heavy equipment. The soils here consist of a thin humic layer that sits directly on bedrock; all "A" horizon soils and possible associated cultural materials are gone. The two antenna bases identified and mapped by Goodwin and Associates were revisited, and these were reidentified as guy wires associated with two abandoned power line corridors and some very large wooden power poles. Adjacent to one of the power poles is a water pumping station set 4 feet underground. The pipeline for this station is 12 inches in diameter and extends subsurface along the northeast edge of the site. The former roadways and linear push piles are most likely associated with the installation and maintenance of these relic utilities.

Initial shovel testing was carried out to relocate the site and find any intact deposits. A grid of 5-meter interval shovel tests identified an area of low density artifacts with minor inclusions of shell and ceramic. Some shovel tests showed inverted stratigraphy and some showed intact horizons. This information helped to inform unit placement. The area of positive shovel tests

measures 20-x-40 meters, smaller than recorded by Goodwin and Associates (60-x-120 meters). The site was bound in three directions by excavation units that encountered natural stratigraphy.

Within the site, there appears to be some redeposition of cultural materials to the slightly downslope location on the eastern side of the site. This area had a thicker A horizon and it was the only portion of the site where artifacts were deposited within the A horizon. Site wide, artifacts were typically associated with the B horizon. The natural A horizon in the surrounding area is approximately 5 cm thick. The thicker accumulations of A horizon on the east side of the site are a result of either erosion or the pushing and piling up of the surface deposits mechanically. Therefore, there is some horizontal disturbance within this site. In addition, because the site is so shallow (less than 30 cmbs), there is a significant degree of tree root disturbance. The other source of bioturbation in the site is tarantulas, whose holes are abundant and have an average depth of 20 cm.

Data collected during the Phase III excavations found no evidence to support the hypothesis that this is a habitation site that contained at least one house. All the identified possible posts were very small and more likely related to site activities rather than habitation structures. Except for the shell midden erosion, there is no evidence that the site extended into the area that is today disturbed. It is impossible to say how much of a shell midden was ever deposited here, but based on the size of the activity area, it was probably not significant.

This combination of site features suggests that RR-14 was a short-term campsite and possibly a special use activity area where people prepared for fishing or gathering activities associated with the nearby tidal flats. The following is a discussion of the data supporting this proposition and an explanation of the artifact analysis and specialized studies that will be undertaken in hopes of providing further substantiation for this hypothesis.

Methods

Data recovery efforts began on January 23 and finished on February 15 with of four weeks spent in the field. Investigations of site RR-14 were conducted using a series of interconnected 1-x-2 meter excavation units and an initial grid of 53 5-meter interval shovel tests. In total, 35 square meters of the site were investigated with excavation units; all the units were recorded and collected in 1-meter sections (Figure 3). Excavation methods included the use of shovels, hand picks, and trowels. All sediments were passed through ¼-inch mesh screens except for features, which were sampled for soil and a portion was processed through 1/16-inch screen. Two bulk column samples were collected within the shell midden for fine mesh screening. Each of the column samples measured 50-x-50 cm, and were removed in 2.5 cm levels. These samples were water screened through 1/16-inch window mesh screen in the field laboratory. Some charcoal and a small amount of tiny fish bone were noted in the processed bulk column sample. All shell fragments greater than ½-inch were collected along with any shell fragment that could be recorded as an MNI—Minimum Number of Individuals (e.g., umbos of clams, spires or siphons of gastropods, complete small marine snails).

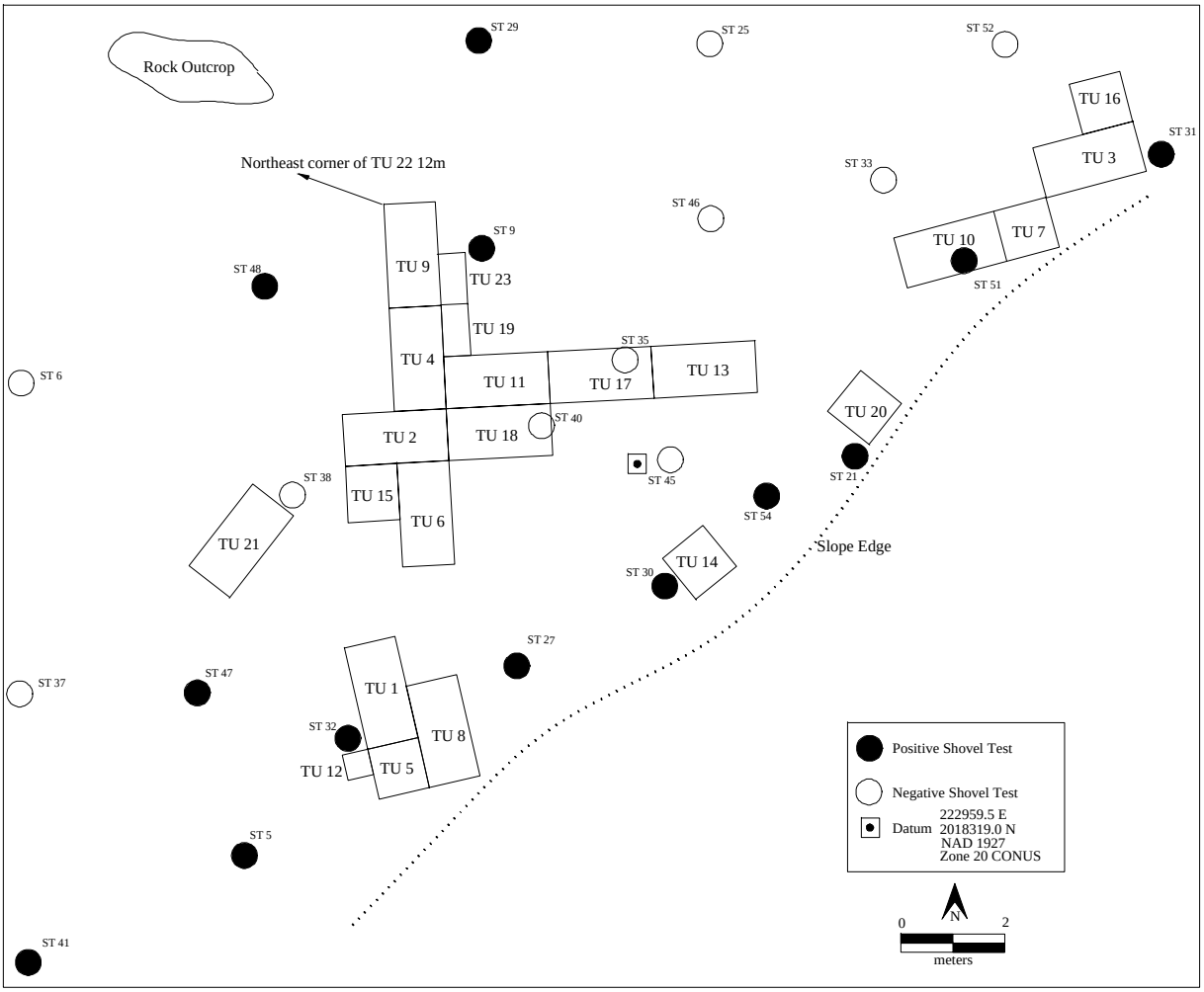

Figure 3. Site Plan for RR-14.

Considering the amount of disturbance surrounding the site, it is surprising that the site contained no modern or historic period artifacts. All units were recorded with plan and profile drawings. Detailed soil descriptions were made throughout the excavations and four deep pedogenic profiles recorded the soil stratigraphy to a maximum depth of 1-meter below surface. The site area is rocky and many units encountered an intermittent rock layer at approximately 20 cmbs. These rocks would have been exposed at the time of the occupation. The area in the very center of the site where activities are presumed to have taken place (from here on referred to as "the activity area"), does not contain this rocky zone. The deep pedogenic profile at the center of the activity area shows that the clay layer is deepest here, with the disintegrating bedrock ("regolith") not encountered until 80 cmbs. In other words, at the time of occupation, this area naturally contained fewer rocks. Elsewhere in and around the site area the regolith occurred by 50 cmbs. Soil samples of all the exposed cultural and natural strata were taken for further laboratory testing.

The number of recovered artifacts included 1535 ceramics, 117 lithics and 7278 shells. All the artifacts were initially processed and cleaned while in the field laboratory. Both Santa Elena and

Esperanza style sherds were noted. Some griddle sherds and vessels with interior residues were left intentionally unwashed to use in future laboratory tests of surface deposits and to test for microbotanical remains. The most common lithic material in this site is quartz crystals. These crystals may have been imported since quartzite matrix is rare in the site. Quartzite is the primary rock seen at the mangrove edge site of GMI-2. As these two sites are only 250 meters apart and possibly related, the quartz found at RR-14 may have been brought here from GMI-2. The bedrock matrix at RR-14 is basalt and there is a component of rhyolite, both of which are igneous rocks.

All recovered prehistoric ceramics, lithics, and shells were washed and air-dried in the field laboratory. All artifacts except for a portion of the shell were returned to the SEARCH Florida laboratory for analysis. In the field, the washed shell was thoroughly analyzed and recorded and only worked shells and some shell samples were saved. In total, 628 shells were returned to SEARCH for further work, while 6,650 shells were recorded and subsequently discarded while in the field. Soil samples and the entire contents of the processed 1/16-inch bulk samples were returned to the SEARCH laboratory for further analysis. Excavations at RR-14 generated 205 individual FS entries.

Results

In general, three different areas of RR-14 were investigated with block unit excavations—a shell midden refuse area, a tool use and/or manufacturing area, and a cleared "activity area" at the center of the site. The shell midden refuse deposit was encountered only in shovel tests along the edge of the eroding slope. The midden curved around to the eastern edge of the site and it was thought that structural features may be encountered on the inside of the midden curve. Each area will be discussed in turn.

Shell Midden

The shell midden along this eroding edge is not a continuous ring of deposits; it occurs in pockets. In total, 8 square meters and two bulk column samples were excavated in the area of densest midden, mostly on the western edge of the midden. Charcoal, shell, ceramics, and fire-cracked rock occurred within a black soil matrix. The midden is shallow and no more than 10 cm thick at any one point. Units placed directly on the southern slope edge did not show a thicker deposit in the southern profiles and, therefore, did not indicate that the midden here was truncated. Even so, the large amount of ceramics in the midden argues for a more intensive use than suggested by the small area of refuse. Ceramics are especially abundant in the upper levels of this midden and many are decorated. No features were noted within or below the midden deposit.

Tool Use/Manufacturing Area

The eastern edge of the site contains a shell and artifact assemblage that is different from the western area shell midden. This east area contains many shell tools and shell tool debitage and most of the conch found in the site. Several stone grinding implements came from this area as did a possible stone mortar. This area looks less like a dumping area for food remains, than a

work area where shell and stone tools were made and/or used. A total of six square meters sampled this area. Another feature of this area was a solid layer of redeposited fist-size cobbles at the base of the deposit. It appears that when the site was first occupied, the residents cleared all the smaller rocks from the prepared "activity area" and threw them to this slightly downslope location. Midden was then deposited on top of these cleared rocks and cultural materials are wedged in between these rocks. Heading east from this rock pile and midden deposit was a compacted, clean, linear zone that contained very few rocks or cultural materials. It is a possible pathway, which leads in the general direction of GMI-2.

Activity Area

The "activity area" was sampled with 18 square meters of contiguous excavation units. The first unit placed north of the shell perimeter encountered a deeper area of the cultural stratum that had a linear shape. Possible initial explanations included pathway or house footer. As this deeper cultural zone was exposed across many units, it failed to achieve a structural shape, so the possibility of it being a house footer was abandoned. Because it does not lead to another destination, it is also not really a path. These are trampled zones that are not uniform enough to be considered a floor but are linear within a small area. This is not a house floor for several reasons: 1) there are no posts on the perimeter, 2) there are several large rocks within the trampled zone, and 3) the area contains too much cultural material (it has not been swept clean as house floors typically are).

Several post molds were delineated within this trampled zone; they are small, shallow, and basin-shaped. Rocks appear to be associated with the post stains. They do not occur within the post holes (as seen in other Puerto Rican sites: Southeastern Archaeological Research 2008a), but they cluster nearby and could have been placed on the ground around the post to give it support. One large rock was intentionally placed in the center of this activity area, sitting in a depression of stratum B soils. It is surrounded by fire-cracked rock and has some evidence of battering on its apex. Artifacts found within the activity area include several spindle whorls and one ceramic foot from a figurine or large vessel.

What we appear to have uncovered is a small activity or work area, which includes shell tools, groundstone tools, and spindle whorls. Even though spindle whorls are typically used to spin cotton, there is no reason that clay disks could not have had a secondary function, perhaps as a net mesh gauge. The standard, rectangular net gauge is an uncommon archaeological item in this area, so spindle whorls or clay disks may have been reused to assist in net making. There are numerous examples in this site of shells modified to be used as net weights, so it is certain that nets were being used here and possibly produced here.

The post remains in this site are small and may have been part of work frames for making nets or processing seafood, or may be the remnants of simple lean-tos that provided shade or temporary shelter. Except for shellfish, the food remains are minimal here. There is a high percentage of shell modified as tools, especially conchs and large bivalves. There is a significant amount of fire-cracked rock in the midden, which suggests that some foods were being cooked. It is possible the bivalves were being cooked here to remove the meat from the shell, but it is still conceivable that the meat was taken elsewhere for consumption. They may be gutting fish here,

as there are some very small fish bones in the site, but nearly all the fish were consumed at another place (the habitation site).

The last argument against this being a habitation site is that the area is not large enough or flat enough to support a substantial structure. Even so, this location is just far enough upslope from the tidal flat edge to be breezy, less buggy, and generally a more pleasant place to prepare to go fishing or to re-group and organize after fishing. Nets would have been prepared for use and maybe even manufactured near the place they would be used, not within ridgetop habitation sites. This sloping hillside is not a great choice for a place to live but it is a perfect location for performing activities related to the exploitation of the tidal flats and nearshore marine environment; close to the mangrove edge but not in the mangrove.

The data collected from excavations at RR-14 will be used for more in-depth studies in hopes of drawing support for this site function hypothesis; these include a shell tool study, a shell catchment area study, a ceramic vessel type study, and chemical and structural analysis of site soils. Mapping of the identified features will provide information on intra-site organization and more detailed mapping of artifact distributions by various classes may provide evidence of discrete activity areas and perhaps inform the types of activities that occurred at this site. Future studies will research how the topography of this area has changed since the prehistoric occupation and especially what activities undertaken by the Navy since 1941 have impacted this site. Lastly, this site will be put into a more regional context of sites within the Roosevelt Roads region and we will explore how this site may have been linked with GMI-2 and propose possible nearby long-term habitation sites for the occupants of RR-14.

GMI-4

GMI-4 is an early 19th century household located on a small hilltop 40 feet above mean sea level. The hill overlooks what is now the Roosevelt Roads airstrip in an area where the Navy has built numerous magazine bunkers (Figure 4). One such magazine is built into the hill containing GMI-4. This site was discovered by Geo-Marine, Inc. in 2004 (Sara and McClintock 2005) and Geo-Marine's Phase II work consisted of 19 shovel tests (ten of which were positive), two 1-x-1 meter test units, and a limited surface collection (Sara and Franz 2006). Geo-Marine concluded that the site consisted of a 95-x-65 meter hilltop scatter of brick, roof tiles (teja), ceramics, glass, and shell, had a refuse midden on the western hill slope, and contained above-ground stone and coral block structure foundations. Their excavations yielded approximately 200 historic artifacts and a minor pre-Columbian element. Both the historic and prehistoric components were deposited within the top 30 cm of the site. Due to the described in situ structure foundation remains and the density and diversity of the associated artifact assemblage, the site was determined potentially eligible for listing on the NRHP with further work recommended.

Phase III excavations confirmed that there was a Colonial structure dating between circa 1820 and 1850 located on the top of this hill. However, no in situ above-ground structural remains were identified. Geo-Marine did not note any disturbances or 20th century activities on this hill and proposed that the site was intact. The current investigations found that there was a significant 20th century construction event that severely damaged the integrity of this site. A

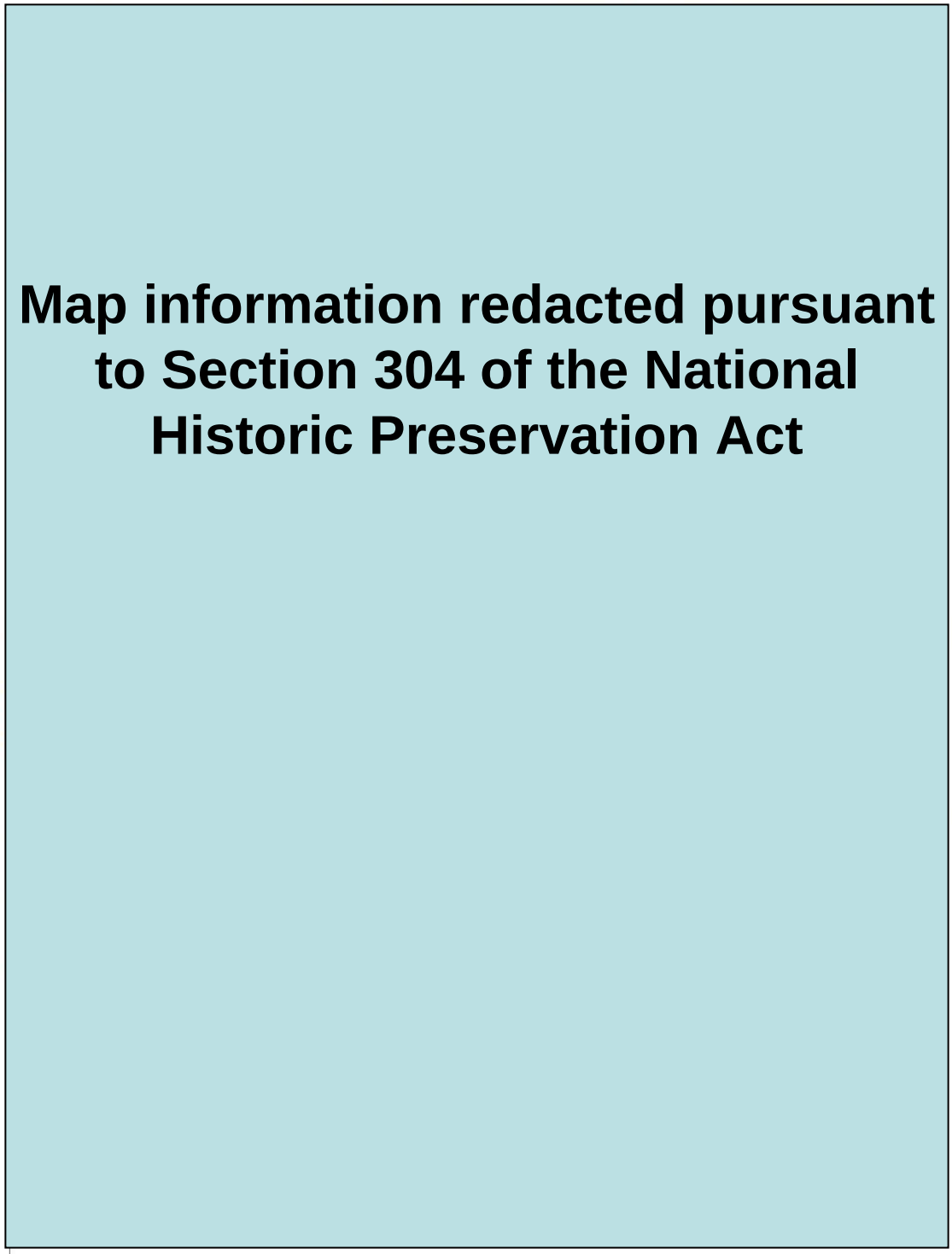

Figure 4. Location of GMI-4 and Ceiba 11. Roosevelt Roads Naval Facility.

road, constructed of dredged shell and coral, was laid across the entire length of the hilltop. During the process of road construction, the remains of the 19th century structure were bulldozed. Much of the hilltop shell and coral recorded during the Phase II work are dredged materials. The "alignments of unmortared building stone and large pieces of coral" (Sara and Franz 2006:138) are actually natural stone and dredged coral that have been pushed to the edges of the road, the dimensions of which measured approximately 5 meters in width. Today, the evidence of this relic road is entirely subsurface and is indicated at the surface only by these alignments of larger debris along its edge. Careful scrutiny of the landscape also reveals a slight elevation associated with the road. Unfortunately, this road runs directly on top of the historic structure so that what was likely a naturally deteriorating structure at the time of the road's placement is now a push pile of brick and teja. The entire length of the road was identified through shovel testing. It was likely constructed at the time the magazine bunker was installed (1950s).

A second small 20th century structure was identified on the northern tip of the hilltop, consisting of tin roofing, wood planks and square glass panes. It covers an area of approximately 5-x-5 meters and there is no other debris associated with the structure, either historic or modern. This structure is about 70 meters away from the Colonial site. Because of the obvious presence of 20th century activity at GMI-4 in terms of the road construction episode, it is all the more surprising that not a single piece of 20th century glass, ceramic or iron was identified during Phase III investigations. The artifact assemblage is intact. In spite of the integrity issues, GMI-4 contains a great deal of useful information on this occupation in terms of the construction material types recovered and the rich, diverse assemblage of refined earthenwares, coarse earthenwares, glass, and unique household items. The following is a discussion of the data recovered through these excavations, an explanation of the artifact analysis, specialized studies and archival research that will be undertaken, and a synopsis of the preliminary conclusions regarding the occupation of GMI-4.

Methods

Three weeks of data recovery efforts began on March 17 and finished on April 4, 2008. Investigations of site GMI-4 had three separate components. Initially, a 5-meter interval shovel test grid consisting of 86 tests was placed over the entire hilltop. This allowed the identification of the relic road, isolated the concentration of historic debris, and gave an indication of how the prehistoric artifacts were distributed. Secondly, controlled surface collections were made on both the east and west slopes of the hill where historic midden had accumulated. On top of the hill, a map was made of surface construction debris and artifacts in order to illustrate how the house ruins had scattered; this information expanded on what could be understood from the shovel test data. Lastly, excavation units were placed in three areas of the site: 1) in the Colonial house structural debris; 2) in the western slope midden; and 3) on the north end of the site where prehistoric materials were clustered (Figure 5). The hilltop Colonial structure units were placed in an area where nails were recovered in the shovel tests and the heaviest brick scatter was noted on the surface. The site is spread across the hilltop, which measures 80-x-25 meters. Including the east and west midden deposited slopes, the site measures 80-x-55 meters. However, much of the horizontal extension of this site is a result of the road disturbance.

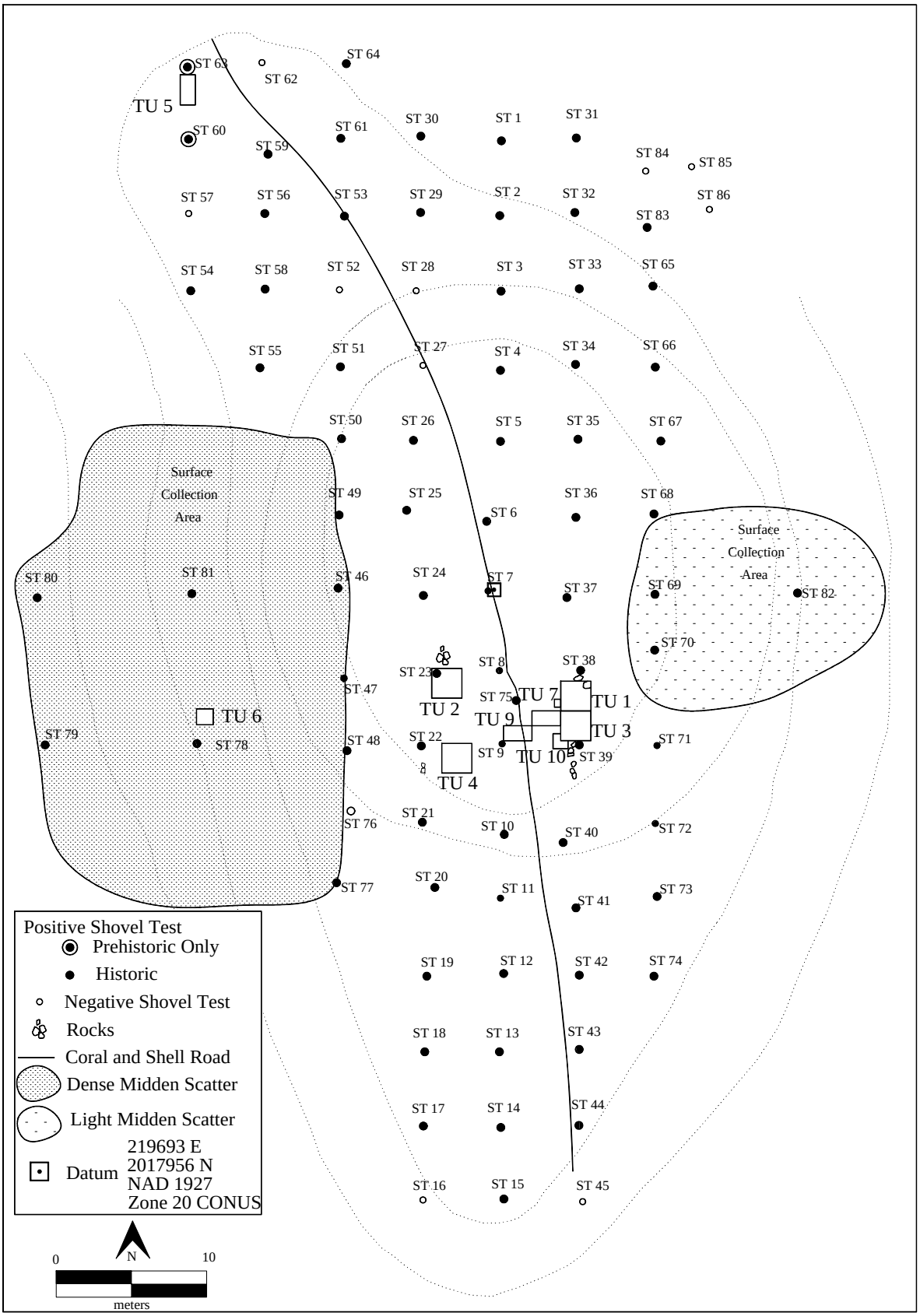

Figure 5. Site Plan for GMI-4.

At GMI-4, 24 square meters of the site were excavated, most often in 2-x-2 meter blocks, which were removed and recorded in quadrants. The units were primarily excavated with trowels due to the density of both construction and personal use artifacts. Even though some of the deposits were modified by the road construction, they were mapped and recorded in situ. It was hoped that by recording how the artifacts were redeposited, some of their original context could be revealed. From these units, four features were identified. All excavated sediments were passed through ¼-inch mesh screens, except for feature matrix, which was processed through 1/16-inch screen. One bulk column sample was collected for fine mesh screening in an area of dense and deep historic deposits and charcoal that had accumulated just outside the structure wall. The column measured 50-x-50 cm, and was removed in 3 cm levels. These samples were water screened through 1/16-inch mesh in the field laboratory.

The road deposit is approximately 20 cm thick and the Colonial deposit is on average only 30 cm thick. Three meters of excavation were placed directly on top of the road in order to explore the sub-road deposits and see if any intact foundations remained. Below the road, between 10 and 15 cm of Colonial deposit was identified, although it appeared mixed to its base. Shovel testing and surface mapping delineated the width of the road as at least 3 meters but less than 5 meters wide, with one edge of the road clearly documented in an excavation unit. This hilltop is extremely rocky with surface outcroppings and the site sits on top of a residual "parent material" layer, which is derived from weathered bedrock. This parent material typically was encountered at 30 cmbs.

All units were recorded with plan and profile drawings. Detailed soil descriptions were made throughout the excavations and one deep pedogenic profile recorded the soil stratigraphy to a maximum depth of 1.7 meters below surface. Soil samples of all the exposed cultural and natural strata were taken for further testing, including examples from the house yard, the slope midden, and the prehistoric area.

Each of the two slope midden areas measured approximately 30 meters across and 20 meters downslope. The western side midden was extremely dense with a layer between 10 and 25 cm thick of artifacts and construction debris. The eastern side midden, although the same size in area, contained a light surface scatter with a minor subsurface component no more than 10 cm thick. This side is rockier than the west with numerous outcroppings. Two intersecting 2-meter wide transects were surface collected within this eastern midden. Artifacts were mapped and collected in 2-meter square blocks. On the denser western slope, the midden had 100% surface collection for the entire 30-x-20 area. Artifacts were mapped in situ and collected in five transects within 10-meter square blocks. In addition, all teja and brick were counted and weighed for each 2-meter square in both midden areas.

All excavated and collected Colonial and prehistoric artifacts were washed and air-dried in the field laboratory. Shell and coral were identified and recorded in the field laboratory and discarded except for representative samples. All other artifacts, soil samples, and processed 1/16-inch bulk samples were returned to the SEARCH Florida laboratory for further analysis. A total of 202 individual FS entries have been recorded for GMI-4.

Results

Excavations and surface collections produced a significant artifact sample that represents a single component occupation of several decades with no earlier or later period deposition. The artifacts collected included 6850 pieces of historic ceramics, 3943 glass (window, hurricane lantern, and bottle), 1197 metal (primarily nails), and 52 bones, mostly large mammals. Construction materials such as brick and teja were counted and weighed and intact surfaces were measured in the field. Both construction brick (measuring approximately 6-x-13-x-27 cm) and brick pavers, which were the same size but half as thick (3.5 cm), were identified. All the measured bricks conformed to these dimensions and representative samples were collected. Some of the teja fragments had a lug-like knob or projection at one end, which may have functioned as an interlocking mechanism. All examples of these knobs were collected and analyzed; a representative sample was saved. All recovered mortar was collected; it was associated with heavy brick debris. In addition, several examples of broken tejas, broken bricks, and pieces of coral with mortar adhered to more than one surface were found and collected. These are possibly pieces of wall fill.

All shell was collected and analyzed in the field including examples of road fill dredged shell. In general, the dredged materials were bivalves especially arks, cockles, and venus clams (*Anadara* sp., *Arca zebra*, *Chione* sp., *Trachycardium* sp.) and shallow reef corals especially elkhorn and staghorn and brain corals (*Acropora* sp., *Diploria* sp.). However, there is shell in this site that is associated with the Colonial occupation. Large gastropods were deposited here, especially West Indian top snails, queen conchs, and turbans or star-shells (*Cittarium pica*, *Strombus gigas*, *Turbo* sp., *Astrea* sp.). A few oysters also appear to be Colonial food debris. The top snails were especially large specimens and were the most common shell refuse item.

Investigations produced only 62 prehistoric ceramic sherds; these were always found in very small numbers scattered mostly across the northern tip of the hill. Esperanza type incision was noted in the sample. The 1-x-2 meter unit placed in the area of concentrated prehistoric materials produced only six sherds and no shell, lithics or bone. This prehistoric component occurred almost entirely in the first level of excavations (0-10 cmbs). It is likely that a small late-period prehistoric activity area occurred here and the historic occupation practices spread the small deposit across the topsoil. The few prehistoric artifacts found in the historic midden and on the center and southern areas of the hilltop may have been collected and redeposited by the Colonial settlers during the course of their daily activities.

One 1-x-1 meter unit was placed in the densest area of the western slope midden. Just one 5 cm level within this unit produced 230 artifacts (not including brick and teja). The midden investigations (both surface and subsurface collections) contributed greatly to the artifact assemblage that will help characterize this homestead.

Less common household items recovered included a complete iron, several thimbles, a hook and eye, a small number of pipestems, a clay marble, a bone fragment from a hand-held woman's fan, a bronze molded bird foot, a glass bead, upholstery hardware, an earthenware doll part, buttons of metal or porcelain, suspender or belt buckles, cast iron pots, and three coins (two copper and one silver real). These items indicate the presence of women and children. Items

more associated with activities that occur outside of the household include several gun flints, a horseshoe, a lead weight (possibly used for fishing), an iron drill bit, a hoe, and a two file types. Other construction materials consisted of a great amount of small cut finishing nails, floor tiles, fire brick from a fireplace or hearth, and a 1.3 meter long by 20 cm diameter wooden house post, hewn from a cedar tree. This post was found on the very edge of the dredged shell/coral road. It extended 1.65 meters below surface and was placed in a post hole that measured 30 cm in diameter. The size and placement of this post leaves little doubt that it was a substantial support post for the Colonial structure.

This Colonial house was a wooden structure, elevated on large posts rather than brick piers. It would likely have been raised up off this ground, not for drainage purposes, but rather because the ground on this hilltop is extremely rocky. The high number of small nails suggests finishing nails for a wood floor or wood plank walls. One 10 cm level of a 1-x-1 meter portion of an excavation unit contained 239 nails. As represented by the large volume of teja, the roof of the house was tile. Surface mapping and unit excavation indicate that when the house originally fell, (prior to its 20th century demolition), it fell to the west and tile was deposited on the western slope. Since then, this debris has mostly washed downslope along with household refuse to the lower half of the hill. The surface brick debris is concentrated on the southern edge of the main house debris pile. One 2-x-2 meter unit was placed in the densest area of pushed brick. This area contained solid brick and rock, mortar, a light scatter of teja, no nails, and surprisingly, only six fragments of bone. This is likely the remains of a brick chimney or cooking hearth that was slightly separated from the main body of the house. It does not appear to have been pushed very far from its original location.

The finding of a large intact post indicated the edge of the house and allowed some thoughts on the spatial layout and composition of the yard midden. There is an area of approximately 2 meters outside of this house edge where the deposit is deeper and denser. It is reasonable to expect more trampling of refuse around the house with a resultant deposit that is more fragmented and pushed deeper then the surrounding deposits outside of this high traffic zone. Water coming off the roof line can also contribute to deeper deposits. Small items that were unintentionally deposited (lost or swept away) can also be found around the house edges. All three coins came from this perimeter area. This area also produced some of the only recovered charcoal, and this may represent sweeping of yard deposits from the hearth area in this direction.

At the site of AR-38 in the Arecibo river valley in northwest Puerto Rico, a similar Colonial house was excavated by SEARCH in 2005 (Southeastern Archaeological Research 2008a). Here, the three exposed corner posts of the house contained preserved wood. This rectangular house measured 5-x-11 meters. It is possible that this preserved post at GMI-4 is a corner post of a rectangular structure with similar dimensions. Both sites have similar date ranges and are both associated with lands that were part of larger sugar cane operations.

Besides the main Colonial structure at GMI-4, no other outbuildings were identified. Further research into the artifacts collected and the archival record of this region will help to determine if this site is associated with one of the numerous sugar *haciendas* in the Ceiba region in the early 19th century. The second sugar boom period (ca. 1780-1840) coincides with the initial settlement of this homestead and the surrounding lands were eventually owned and farmed by the Fajardo

sugar *central.* Background research into the extensive agricultural uses of this region in historic times will help to put the excavations at GMI-4 in a detailed regional historic context and possibly identify a chronology of ownership for this particular parcel of land. Architectural elements and building techniques will be compared regionally for the time period. In addition, detailed artifact analysis may give clues to the spatial layout of this structure, including the locations of doors and windows. Research on the type of artifacts recovered may suggest the economic status of these inhabitants and show the extent to which they participated in a regional trade economy. GMI-4 contains an excellent artifact assemblage from a type of site that is understudied and ill-understood from an archaeological perspective. This investigation can potentially yield a great deal of insight into the lives of the generations of Puerto Rican men, women, and children who settled and developed these lands.

Ceiba 11

Ceiba 11 (Playa Blanca 6) is located on a ridgetop that overlooks the north side of the small Caño de los Indios waterway on the northwestern edge of Ensenada Honda (see Figure 4). Ceiba 11 was first identified by Michael Woods (1977) and investigated by Tronolone and Cinquino (1985), who excavated two units within the western shell midden deposit. They recorded the site size as 50-x-50 meters and the deposit as 35 cm thick. They determined the site to be undisturbed and potentially NRHP eligible.

The Phase II work was undertaken by SEARCH in February of 2007. In total, 58 shovel tests were placed on the ridgetop and downslope, which found evidence of a Taíno settlement, a 1830s small habitation and farm, and a World War II-era presence (Southeastern Archaeological Research 2008b). Twelve square meters of the site were excavated. SEARCH concluded that historic period disturbances had destroyed the integrity of the majority of the prehistoric deposits that once covered this hilltop. The shell midden in the eastern portion of the site had been highly fragmented and dispersed through farming practices and the flat area (habitation area) at the center of the site had been stripped of all prehistoric deposits. However, the western edge of the site contained intact shell midden, up to 45 cm thick, that was deposited slightly upslope against large boulder outcroppings. Because of its proximity to these rocks, this shell midden was undisturbed by later farming practices and all but the surface deposits are intact. Because the midden contains evidence of site activities (sequences of shell dumping episodes are present and two small posts were identified) and contained a wide variety of shell and animal species that inform not only subsistence but past environmental conditions, the site was recommended as being NRHP eligible and further work was recommended in the intact portion of the midden.

The proposed Phase III investigations included clearing the vegetation from the midden and surrounding boulders, mapping the intact surface to produce a topographic map, and excavation of approximately 12 square meters of shell midden. Based on surface indicators, the intact portion of the shell midden was projected to cover an area of 15 square meters. The data recovery efforts from 2008 confirmed much of what was anticipated from the Phase II excavations. This shell midden was intact and no other sources of disturbance were discovered. The area of undisturbed midden was larger than anticipated, approximately 30 square meters, but through a combination of shovel testing and unit excavations, a representative artifact sample

and thorough understanding of the midden formation was obtained. This rich artifact and ecofact assemblage provided a great deal of useful information on this occupation. Subsistence data was enhanced by identifying the shell remains in situ and mapping them as such in plan and profile. Information on which species were deposited together and changes in deposition patterns through time were recorded. The following is a discussion of the data collected and an explanation of the artifact analysis and specialized studies that will be undertaken in hopes of providing further understanding of the occupation at Ceiba 11.

Methods

Both the midden deposit and boulder outcroppings at Ceiba 11 were cleared of surface vegetation, which consisted of a thick layer of thorny vines and dense underbrush. The surface of the midden was raked clean of loose overburden and the rock outcrops were freed from the vegetation. The newly exposed site area measured 20-x-10 meters. Undulating surface elevations were mapped along with all boulder edges, the larger trees, and two of the excavation units from the 2007 work. One benefit of clearing all these rock surfaces was that these large outcroppings could be thoroughly checked for petroglyphs; none were located.

The newly cleared area was shovel tested with judgemental tests placed approximately every 3 meters. This provided information on varying midden depths and densities and helped to delineate the edges of the intact midden. During the Phase II excavations, test unit 7 was the only unit placed fully within the intact midden area. Before backfilling, it was covered with a protective liner in the event of further excavations. Phase III work began by uncovering and re-opening this original unit so that new units could expand from it.

During the Phase III work, 11 square meters of the site were excavated (Figure 6). All units measured 1-x-1 meters and all were hand excavated with trowels. Sediments were passed through ¼-inch mesh screens. Due to the density of the shell, a sampling strategy was developed to efficiently and effectively gather as much shell data from the screening process as possible (Figure 7). Any shell fragment that could be recorded as an MNI (e.g., umbos of clams, spires or siphons of gastropods, complete small marine snails), no matter the size, was collected. Bivalves that did not provide an MNI count were not collected. Since gastropods were less common than the bivalves, all gastropod fragments over 2 cm in length were collected. The Phase II investigations took volume samples of the midden, recorded weights of all discarded shell, and collected a 50-x-50 cm column

Figure 7. Close-up view of typical ¼-inch screen before sampling process begins.

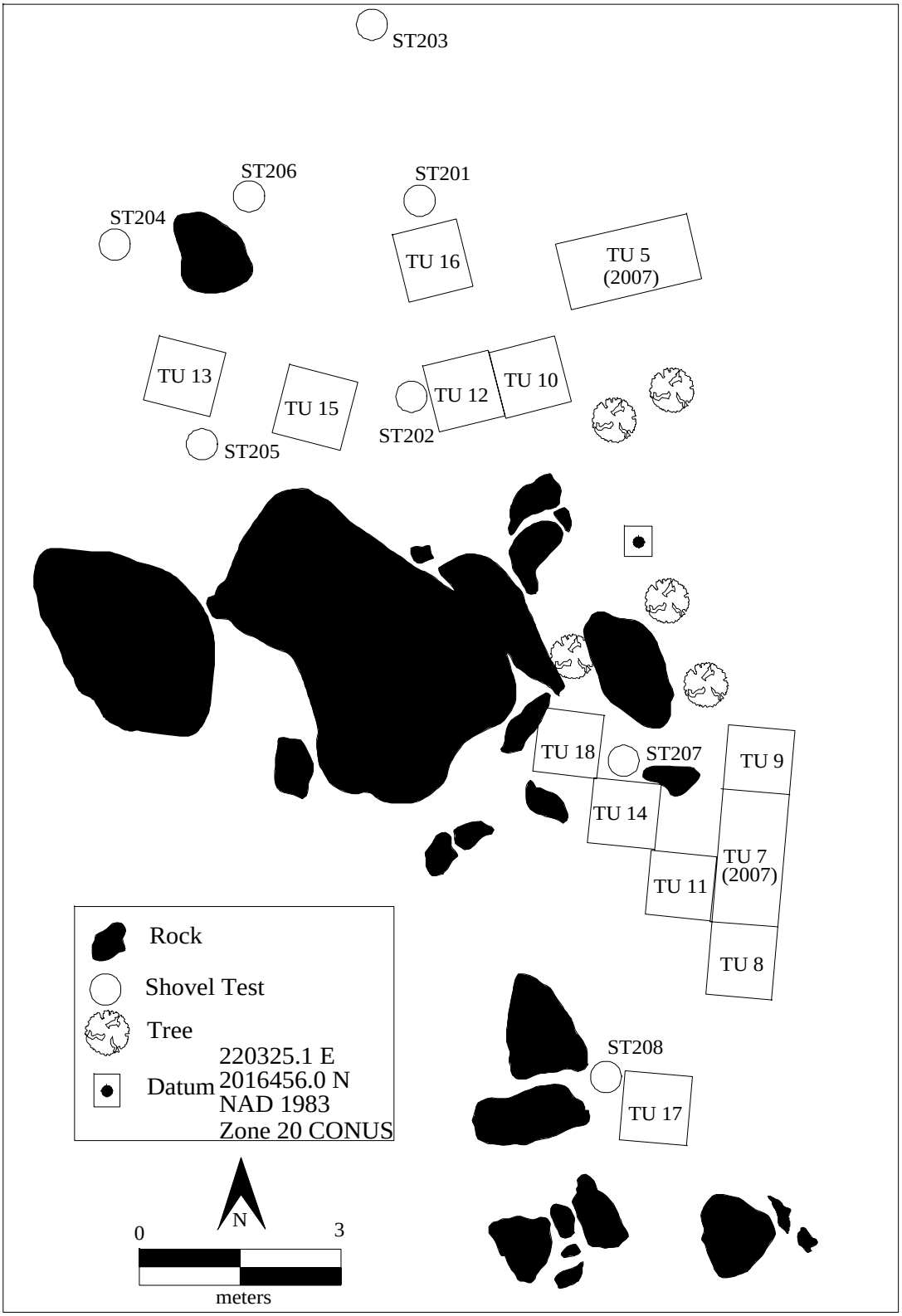

Figure 6. Site Plan for Ceiba 11.

sample. These strategies were not repeated during the Phase III work. Calculations of species MNI is the primary way this midden will be characterized. All field archaeologists were trained in shell identification and analysis and these skills were used in sub-sampling the midden while in the screen. Sub-sampling was necessary due to the density of the shell in this midden, which is suggested by the following numbers. In one 10 cm level of one 1-x-1 meter unit (FS 276), over 10 kg of shell (six gallons) was collected, representing 1361 MNI from 27 different species (this is in addition to 180 pottery sherds and 200 faunal bones).

All features were processed through 1/16-inch screen. Rather than obtaining a second column sample, bulk samples were taken (approximately 4-gallons each) every time we encountered a denser deposit of bone or charcoal. Six proveniences were sampled in this way for fine screening. These samples were water screened through 1/16-inch window mesh in the field laboratory and initially sorted by small and large fractions. Detailed soil descriptions were made throughout the excavations and soil samples of all the exposed cultural and natural strata were taken for further testing. All units were recorded with plan and profile drawings.

The ceramics recovered site-wide from the Phase III unit and shovel test excavations numbered 4814. All these ceramics were initially processed and cleaned in the field laboratory. Ceramic griddles were found along with vessel fragments of both the Esperanza and Santa Elena styles. Each 1-x-1 meter unit contained, on average, 500 sherds. Bone was abundant and the amount recovered only from the ¼-inch screening numbered 5611; fine mesh screening will significantly increase this amount. Only 46 lithics were collected, which included mostly greenstone or other meta-volcanic river cobbles or flakes, along with a few examples of red ochre. One shaped greenstone palette was recovered. In total, 268 nineteenth and twentieth century artifacts were collected, primarily glass with some ceramics, nails, and several bullets and shell casings. These later deposits were not found deeper than 20 cmbs and did not cluster in one area.

All artifacts were washed and air-dried in the field laboratory and returned to the SEARCH Florida laboratory for analysis. Only 22 proveniences had their shell sample fully analyzed in the field laboratory, where they were then discarded except for any tools or tool debitage. Another 31 proveniences of ¼-screened shell were returned, in their entirety, to the Florida laboratory for further analysis. A portion of this midden sample will be curated. Soil samples and processed 1/16-inch bulk samples were returned to SEARCH for further work. Excavations at Ceiba 11 produced 100 individual FS entries.

Results

This midden is all that is left of what likely was a habitation site. The flat saddle in the center of the ridgetop, which measures 25-x-25 meters, would have been an ideal location for structures. When cleared of vegetation, this hilltop has an expansive view of the Ensenada Honda region, plus there would have been easy access to this hilltop via the Caño de los Indios.

The midden depth ranged from 22 to 47 cmbs. Numerous complete shells, especially bivalves, are found in this midden, especially in the areas closest to the exposed rocks. When the midden was first deposited, there were many more exposed surface rocks than there are now and basketloads of shell were thrown in between these rocks (Figure 8). It is here that the shell

midden is thickest and the least fragmented. There did not appear to be any foot trampling of these deposits.

Figure 8. Unit profile showing midden between large subsurface boulders.

The southern sloping edge of the midden, adjacent to the flat area, did not contain rocks. Four units were placed along this edge and these units showed more foot trampling and crushing. These fragmented shells occurred much more in the top half of the deposit than in the bottom. Another difference that was noted along this midden edge is that there were more unique artifacts deposited here, such as a large finished diorite bead that is perforated horizontally and vertically. The only human teeth found in the midden (found during the Phase II excavations) came from these edge units also. No human teeth but several dog teeth were excavated during this data recovery effort. In addition, the only post features came from these edge units. The posts are small and may have been part of work frames for cooking or food processing activities, or may be the remnants of simple lean-tos that provided shade for activities undertaken near the refuse area. They are not the remains of habitation structures. Overall, there is evidence of more activity at the midden's edge, rather than deeper in between the rocks where the refuse was deposited and hardly impacted. Because these rocky areas contained the most undisturbed shell and bone deposits with the cleanest primary context, these areas were the focus of the investigation.

Features consisted of posts, natural root stains, discrete pockets of shell deposits, and one burn feature. This burn event (Feature 7) was a small area of charcoal, burned shell and bone, and a pocket of burned clay, which are the contents of a hearth that was redeposited in this refuse midden. In general, this midden contained a very small amount of burned shell. In the 10 kg of shell analyzed from FS 276, only 15 shells (out of 2557; 0.5%) showed any evidence of burning and that was typical of most of these deposits.

The midden contained a large sample of juvenile conchs (*Strombus gigas*), but very few adults. Harvested adult conchs were not carried into the site except for secondary use as a tool source. This selective processing of large animals also was seen in sea turtle remains and in manatee. Sea turtle is common at Ceiba 11, however, only the interior bones of this species were deposited in this site. The turtles were butchered elsewhere to remove the heavy carapace and plastron shell and only the meat was carried to the site. Although several pieces of sea turtle carapace were recovered, each example has been modified through shaping and one example was shaped and incised. Similarly, the only bone element of the manatee identified in Ceiba 11 was rib. These bones are in the site for a secondary purpose as manatee ribs are extremely dense and were often modified into tools or decorative items. One fragment of manatee rib found in Ceiba 11 has numerous cut marks on two sides.

There are many implements related to fishing deposited in this midden. Numerous examples of shells modified to be used as net weights were identified, so it is certain that nets were being used, and possibly, produced here. In addition, spindle whorls or shell disks are quite common and their function here may relate to something other than only spinning cotton. Many clam shells have edges that show use wear from scraping and all the large conchs and helmet shells (*Cassis* sp.) in the site have been modified as tools or are tool debitage.

Careful excavations of the units allowed the identification and description of single dumping episodes of shell. The accumulation of individual basketloads of shell debris could be recreated particularly in the profiles. Stacks of more than one clam species could be identified to show what species were harvested concurrently. Very large top snails (*Cittarium pica*) were discarded more commonly at the base of the deposit. These may have been overexploited early in the habitation. Large clams (mostly *Lucina pectinata* and *Codakia orbicularis*) and oysters (*Crassostrea rhizophorae*) were commonly deposited together, while basketloads of mangrove oysters (*Isognomen alatus*) were deposited more often by themselves. These thin oysters were common at the base of the midden and often formed a bottom layer to the site. They were typically spread in a lens, and due to their light nature they would have scattered easily upon deposition. These mangrove oysters are always harvested in clumps as they cluster together in bunches on mangrove roots. They may have been the first species harvested from the nearby mangrove/tidal flats because they are not buried in the mangrove sediments and therefore are more visible, as opposed to many of the burrowing clam species.

This type of data was collected from the units in the center of the midden deposit. Units more on the periphery produced shallower deposits, showed evidence of an accumulated "A" horizon that contained little cultural material, and contained very little bone but a relatively high density of ceramics. Beyond what could be seen in the field regarding site formation processes, mapping artifact and ecofact distributions by various classes will provide further evidence of discrete actions and areas of activities.

The types of artifacts recovered here are similar to those excavated by Irving Rouse in 1936 at the nearby habitation site of Ceiba 2. This site is located on the shoreline of Ensenada Honda and was considered the most important site in the Roosevelt Roads region when it was initially reported (Rouse 1952). Both sites contain Santa Elena and Esperanza style pottery with a "limb design" being a common motif. Ceiba 2 also has a small component of Cuevas sherds, which commonly have red painted designs. Red slipped or painted sherds were noted at Ceiba 11. Ceiba 2 also contained numerous clay disks and spindle whorls, a common artifact at Ceiba 11. Helmet "shell chisels", as Rouse called them, were common at Ceiba 2 and two of these chisels were found at Ceiba 11. The shell and faunal assemblages are similar and the large species collected by Rouse (manatee, sea turtle, and nurse shark) were the same ones identified at Ceiba 11.

Lastly, a 40 cm diameter shovel test was re-excavated in one of our unit excavations. It contained no artifacts other than flagging tape, unit string, a waxed paper cup, a plastic container, and a small 4-hole shirt button. These are redeposited artifacts of previous archaeology and may have come from Tronolone and Cinquino investigations of 24 years ago.

The data collected from excavations at Ceiba 11 will be used for more in-depth subsistence studies including a shell and stone tool study and a shell and fauna catchment area study. Research will be undertaken into how the geography of the region changed in the past centuries and identify what activities undertaken by the Navy since 1941 have impacted this region's topography. This will allow comparisons of the paleoenvironment to the present environment. Additional investigations will focus on putting this site into a larger context by comparing this site to others in the Roosevelt Roads region, including the nearby possible salt distillation sites of Ceiba 5 and SRC-RR-1 and the habitation sites of Ceiba 2 and Ceiba 10 (under the Navy Lodge). A series of radiocarbon dates, made possible by the well preserved charcoal at this site, will be carried out to help refine the chronology of the Roosevelt Roads region. These dates will be associated with a sample of more than 4800 pottery sherds, many of which are from decorated vessels. The time period of site occupation and its associated artifact types will be refined. Lastly, an effort will be made to compare the way this midden was deposited to shell middens deposited and excavated elsewhere in the West Indies and in Florida.

CONCLUSIONS AND RECOMMENDATIONS

With the concurrence of historic preservation staff at NAVFAC Southeast, SEARCH concludes that the completed archaeological work described above, the level of analysis to be conducted, and the subsequent submittal of a final technical report will sufficiently mitigate any impacts to the sites of GMI-2, RR-14, GMI-4 and Ceiba 11 that will result from the Base Realignment and Closure (BRAC) of Roosevelt Roads Naval Facility. In this regard, we are requesting agency concurrence with this opinion.

Following agency review of this Executive Summary and the receipt of correspondence bearing formal SHPO concurrence, the BRAC action regarding the property upon which these sites are located will proceed. A final curation location, meeting the standards of 36 CFR Part 79 for the artifacts and associated records, field forms, and photographs from GMI-2, RR-14, GMI-4 and Ceiba 11 will be determined by NAVFAC Southeast in consultation with the Puerto Rico SHPO office.

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