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Searching for Governor Daniel Tucker's 'Mansion': The First Season of Excavation

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ABSTRACT: In February 2004, an archaeological investigation at the Port Royal Golf Course, Bermuda, was conducted by a team from Wilfrid Laurier University, Ontario, Canada. This investigation was designed to locate and assess the integrity of archaeological remains associated with the 17th-century residence known as the 'Mansion' constructed by Governor Daniel Tucker in 1617. Analysis of stratigraphy and preliminary analysis of more than 7,000 artifacts recovered during the excavation suggest that the area investigated may be the site of the 'Mansion' and a later residence known as the 'Grove', constructed in the early 18th century. Integration of historical and archaeological information provides a unique insight into aspects of 17th- and 18th-century life at a site occupied by members of an elite Bermudian family for almost 200 years.

INTRODUCTION

Over the last two decades the Bermuda Maritime Museum, in association with various agencies and institutions, has been involved in numerous archaeological investigations aimed at uncovering different aspects of Bermuda's past. These excavations augment the documentary record and, more importantly, provide new insight into aspects of the island's history that are not recorded in writing. However, with a few notable exceptions, the focus of the preceding work has been on fortifications and shipwrecks to the exclusion of domestic sites.[1] In this sense, the current investigation of a 17th-century residence assumes significance not only as the earliest archaeological site outside St. George's, but as one of only a small number of excavations that has the potential to provide information on everyday life as well as elucidating

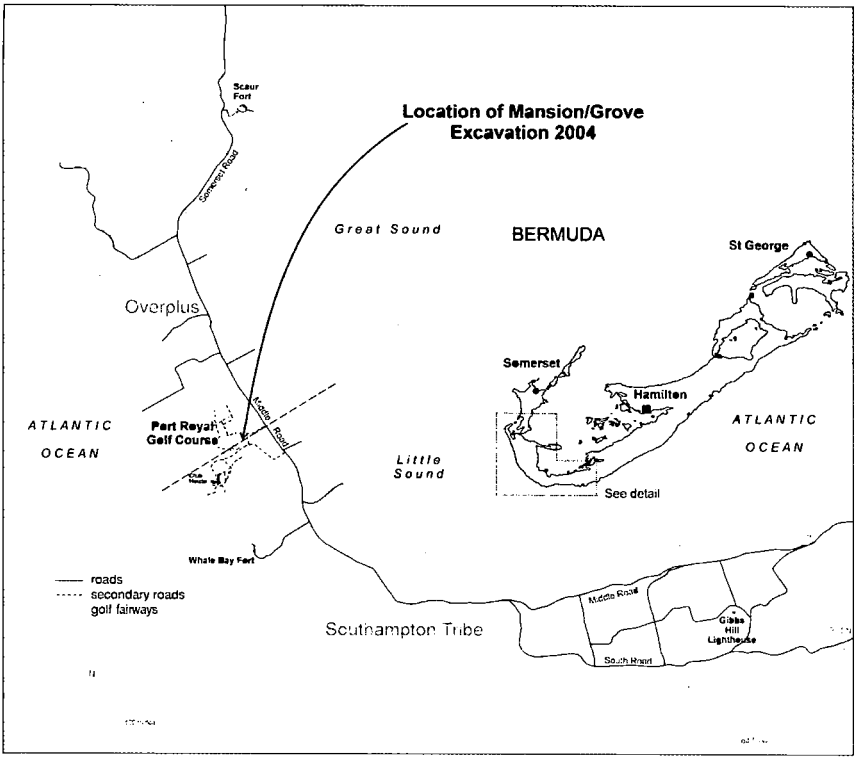

Fig. 1: Plan of Bermuda showing Port Royal Golf Course located within the 'overplus' as indicated on the Smith map [1622/26] based on Richard Norwood's survey

aspects of what is considered historically to be an elite household during this early period in Bermuda's history. Although the current project was designed as an exploratory excavation aimed at confirming the location of the 'Mansion', analysis of stratigraphy, architectural remains and artifacts provides information about activity at the site from the 17th century to the present.

HISTORICAL BACKGROUND

Today the Port Royal Golf Course encompasses land formerly situated on the 'Overplus', the controversial parcel of 207 acres at the western end of Southampton parish (Fig. 1). Surveyed by Richard Norwood in 1616, this land consisted of seven shares of 25 acres each of which Captain Daniel Tucker, Bermuda's second governor, was allotted three shares.[2] Against the advice of many of his contemporaries, Governor Tucker was quick to act on the grant and in 1617 began to "frame and erect a very substantial and brave cedar house upon this piece of delicate ground."[3] Contemporary descriptions of the residence are few

although those that do survive provide a vignette of the residence known as the 'Mansion.' Based on contemporary construction techniques and styles, the house itself was probably a half-timbered structure with the spaces between the timbers filled with wattle and daub which may have been plastered over.[4] Similar early 17th-century construction techniques were employed at Jamestown, Virginia (Fig. 2). Another historian has suggested that the building may have resembled a small manor house of two storeys with an overhang.[5] In 1617, Governor Tucker himself described the work in progress as the land was "cleared on all hands; the frame of the house fitted and raysed, some are sett to their task in digginge of cellars, others in burning of lime and making of mortar; others in shingles: some five or six of the best experienced in that kind are employed to make search and triall for fresh water, the which to their much content is hapely and plentifully obtained."[6] The end result was "a large and hansome, and well contrived house (yet by farr the best in the islands) ...erected and in good part finished."[7] A further reference to the 'search and triall' for water is of particular interest as regards the archaeological evidence discussed below. "Sir, I placed 4 men upon the Overplus who in 20 dayes found fresh water 44 feete Deepe."[8] In addition to these structural references contemporary descriptions of the landscape complete the picture. "He hath all soe caused my people to make a path to the sayd Overplusse some thirty foote broade and in length way a mile quite throughout planted with figg trees, which ... required greate labour ... onely for a prospect [approach] to his howse."[9] Finally, both the house and the approach to this were situated within "a most delicate enlarged valley [with] a fat and lusty soil" of which 50 acres were fenced and two acres were cleared and planted in fig trees with a vinyard.[10]

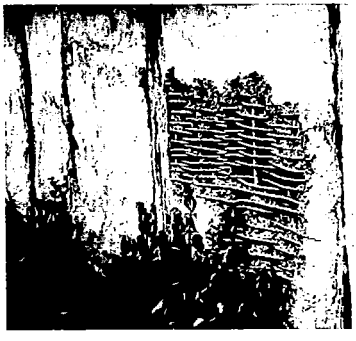

Fig. 2: Wattle and daub construction, Jamestown

Daniel Tucker lived at the Mansion from 1618, when he retired as Governor, until his death in 1627.[11] Having no descendants, the estate was willed to his brother George's children.[12] Unfortunately, the documentary record for the ownership of the property is silent for the remainder of the 17th century until the early 18th century. At this time, *circa* 1720,[13] a second residence called the 'Grove' was built by Captain Henry Tucker (1683–1734) who married Frances Tudor (1681–1772) in 1707.[14] Although the actual construction date is unable to be confirmed in the documentary record, it is believed that

the Grove may have been built on the site of the 'Mansion.'[15] The property was later inherited by the third son, Col. Henry Tucker (1713–87), who married Anne Butterfield (1722–97) in 1738. In 1789 the property, consisting of 18 3/4 acres, was assessed for £225 and the house itself at £333.6.8.[16] After this date the Hon. Henry Tucker transferred the dwelling house, outhouses and 19 acres to widow Mary Burrows. In 1813, the house was assessed for £700 and the 19 acres of timber and pastureland for £570. Mary Burrows died in 1844 and left the house to her daughters, one of whom, Elizabeth, did not marry and remained living at the Grove for another 30 years. During the third quarter of the 19th century the Grove is described as having "all the appearance of a snug English cottage. The approach is shaded by an avenue of fine tall forest trees; and scattered clumps of cypress, lime, orange and magnificent West India locust trees, grow on the smooth verdant lawn."[17] Subsequent transfer of the property occurred in 1875 when Robert Bishop Munro was assessed for the house and 9 1/2 acres. The property known as the Grove remained in the Munro family until it was sold in the 1960s to the Port Royal Golf Course.

RECONSTRUCTING THE PAST ENVIRONMENT

Documentary evidence of the changing environment of Bermuda is also available in several documents. Early descriptions are important sources of information because they describe not only the indigenous plant and animal life at the time of settlement, but also the introduced species of fauna and flora. When such evidence is found on an archaeological site in the form of plant remains, pollen or animal bone, analyses are possible that allow the rate of proliferation of certain species to be calculated. Particularly with regard to the investigation of an early 17th-century site, this information is crucial for reconstructing the conditions of the local environment and measuring the scale and scope of the impact that humans had on flora and fauna at various times from the 17th century to the present. Additionally, the recovery of this type of information allows for a better understanding of the context of the archaeological remains. An increase or decrease of certain classes of material culture, for example, might be related to changes in food-related activities at the site reflecting a change from a rural, agricultural-based self-sufficiency to greater reliance on the local market economy characterised by imported foods/goods. Future research at the site includes the implementation of a sampling strategy aimed at recovering environmental data from dated archaeological contexts.

One of the earliest descriptions of the island flora in 1619 is also the most detailed account available of the native and introduced species at the time of settlement:

> The countrey when we first began the plantation was all over-grown with woods and plants of several kinds ... Such kinds as were unknowne to us (which were the most part) we also gave names: as in cedars, palmettoes, blackwood, whitewood, yellow wood, mulberrie-trees, stopper trees, yellow bery weed, red-weed: These and many others wee found naturally growing in the countrey ... But since it hath beene inhabited there hath beene brought thither, as well as from the Indies as from other parts of the world, sundry other plants, as vines of several kinds, sugar canes, figge-trees, apple-trees, oranges, lemons, pomegranates, plaintains, pines, parsnips, raddishes, artichokes, cassivi, indico and many other. In so much that it is now become as it were some spacious Garden or Nourcerie of many pleasant and profitable things.[18]

Other food crops mentioned in early descriptions of Bermuda are corn, wheat, beans, melons, "cowcumber" and "many other good things."[19] Another commodity, tobacco, was of considerable importance during the first decade of settlement.[20]

Native fauna, also described in early accounts, include eels in fresh water ponds, a variety of fish[21] (mullets, breames, hog-fish, rock-fish, lobsters), turtles, seafowl called 'Cabouze' and 'Pimlicoes,' hogs and wildcats.[22] Species introduced to the islands include calves, lambs, cocks and hens, all of which were present by 1614.[23] As with the flora described in these early records, the remains of fauna found in dated archaeological contexts can yield important information on the rate of introduction, proliferation and relative contribution of these species to diet in the 17th and 18th centuries.

RESEARCH OBJECTIVES

The combined archaeological and historical investigation of the 17th-century Tucker family residence(s) represents the first study of its kind to examine in detail one of Bermuda's oldest, continuously occupied, residential sites. The fact that the earlier Mansion, and the later Grove, were occupied for almost two centuries by one of Bermuda's most influential families during the 17th and 18th centuries presents a unique opportunity to examine an 'elite' response to emerging British colonialism and capitalism using a materialist perspective. It is hoped that artifacts and ecofacts recovered from the site will elucidate aspects of the Tucker family's response to the changing social, political and economic conditions over a period of two centuries. Moreover, on a larger scale, these results may prove useful for comparative studies (historical or archaeological) directed towards examining how other members of Bermudian society, elite and non-elite, reacted to the same changes. Other long-term goals of the project concern comparison of the findings at Governor Tucker's residence with other Bermudian elite and non-elite sites.[24] Evidence of status differences and socio-

economic disparity will form the focus of subsequent study as comparisons are made between Bermudian and other 17th-century sites in North America. Evidence for these differences may be found in the ceramic, glass, and faunal assemblages, for example, as well as the ecofacts recovered from dated stratigraphic contexts.

Setting aside these long-term research objectives for the moment, the goals of the first season of excavation at the Port Royal Golf Course were specific and limited in scope. The immediate objectives were to locate and identify archaeological remains of the 17th-century Mansion and the 18th-century Grove by excavating selected areas of the site using modern stratigraphic excavation and recording techniques; assess the integrity of the below-ground features and deposits; recover an adequate sample of material useful for dating contexts on the site; and plan for further excavation based on an analysis of these findings. One measure of the success of the project is that all of these goals were realised, at least in part. Features documented during the excavation include a wall, plastered floor, two cellar pits, two middens, and evidence of a possible burnt structure. These were found in an undisturbed state below the ground surface at depths ranging from only a few centimetres to more than 50 centimetres. Application of the Harris matrix allowed for the temporal ordering of 22 distinct phases in the history of the site and the identification of several periods of occupation.[25] Preliminary analysis of smoking pipes and ceramics from the collection of 7,049 artifacts serves to date the various archaeological contexts to the mid-17th to the early-18th centuries and, by association, the two residences known as the Mansion and the Grove. As well, spatial analysis of various artifact classes provides evidence of activities occurring on the site during these two periods of occupation. It must be noted, however, that definitive evidence for the early 17th-century occupation of the Mansion has yet to be discovered.

FIELD WORK

Prior to beginning archaeological fieldwork, several features were visible suggesting that this was the location of Captain Tucker's 'Mansion.' A preliminary survey of the area by Edward C. Harris and Kate Meatyard a few years earlier tentatively identified the well, described by Daniel Tucker in 1617, which today is located between two fairways on the Port Royal Golf Course. This measures about 42 feet deep and seven feet in diameter at the top narrowing to about four feet at the bottom (Fig. 3).[26] Timbers visible at the wellhead are undoubtedly a later framing addition although the well itself appears not to have been altered since construction, its irregular shape indicating that it was hand-excavated rather than drilled. Both the construction technique and the close correspondence between the existing well and the written description provide convincing, but admittedly circumstantial, evidence

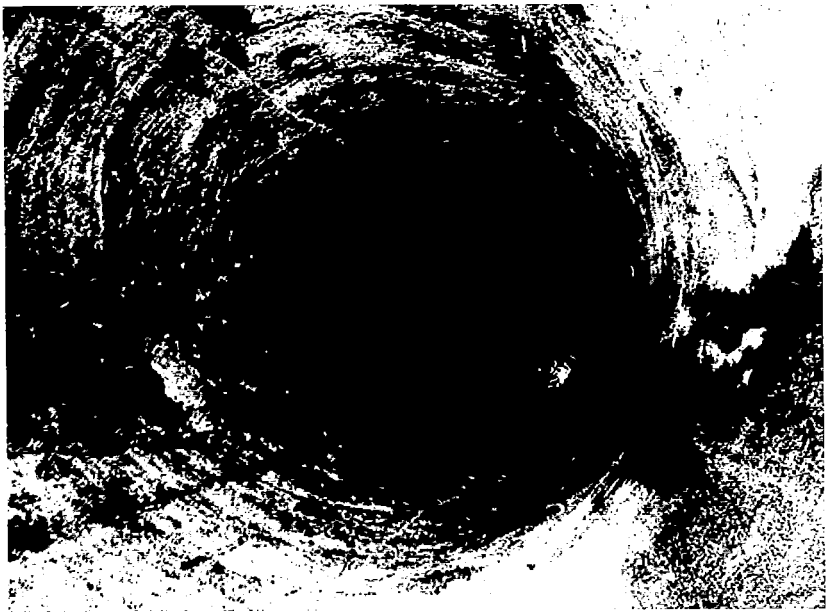

Fig. 3: Photograph of the well described in 1617, which is today located on the Port Royal Golf Course

Fig. 4: Overview of site showing ridge indicating location of buried wall found during excavation

that this is the well referred to in 1617. Another feature, visible to the southwest of the well, is a slight ridge running across the site in an east-west direction dividing the open area into two terraces to the north and south of the ridge. During the initial reconnaissance of the area, the straight alignment of the ridge and the topography suggested the presence of a wall foundation in close proximity to the well (Fig. 4).

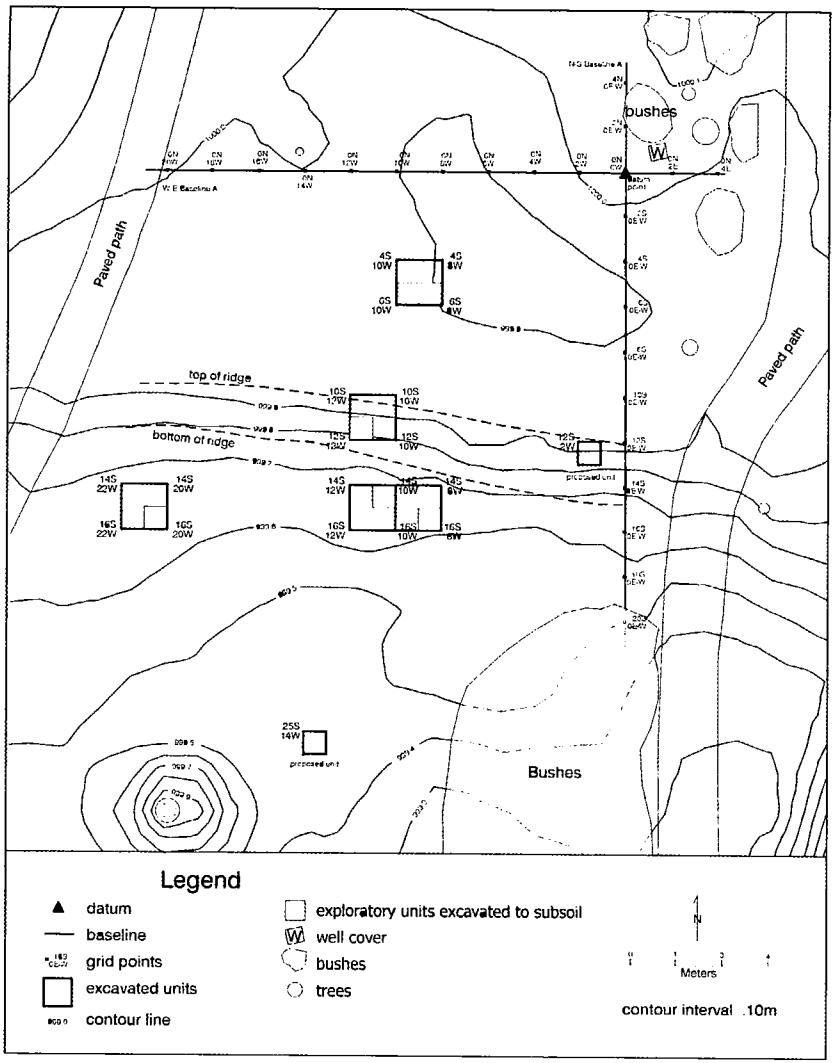

Fig. 5: Site plan showing location of excavation units

An excavation strategy was decided upon whereby five 2-metre-square units were laid out to sample the area on both sides of the ridge; investigate the ridge itself; and also to investigate an area on the west section of the site where soil probing indicated a deep deposit (Fig. 5). The team, led by Dr. Clifford Smith of the Bermuda Maritime Museum and the author, consisted of seven students from Wilfrid Laurier University, two graduate students, and two staff members. Over a period of 10 days the squares were excavated to subsoil with two exceptions where suspected cellar features remain to be investigated during the 2005 season. A stratigraphic excavation methodology was employed

and information for each stratigraphic unit or 'lot' was recorded on pre-formatted recording sheets.[27] Screening of sediment through 1/4-inch mesh ensured 100 percent artifact recovery above this size.

The Harris matrix, a diagram that shows the superpositional relationships between all lots in all units, was employed in the field to record stratigraphy for each excavation unit. The site matrix (Fig. 6), constructed after the fieldwork, forms the framework for the subsequent artifact analysis and the interpretation of the site chronology.

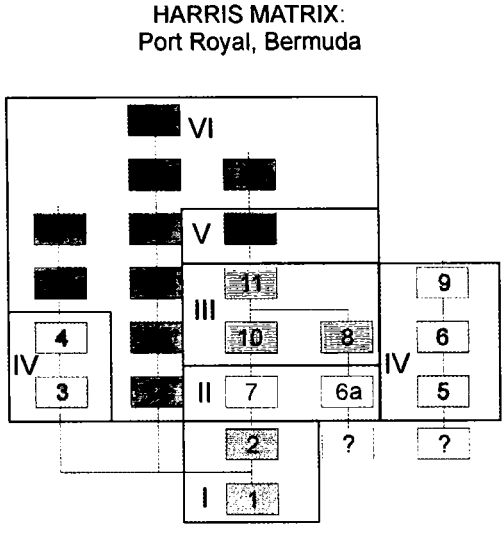

Fig. 6: Harris matrix for Port Royal site

Additional fieldwork included the topographic mapping of all excavation units and the larger site environment using a surveyor's total station. This component of the project was carried out by Jonathon Haxell, Department of Archaeology and Classical Studies, and Pamela Schaus, Department of Geography and Environmental Studies, Wilfrid Laurier University (*see Appendix A*).

CONSTRUCTING A CHRONOLOGY USING THE HARRIS MATRIX

The occupational history of the site is represented by 21 different phases (Fig. 6) that have been organised into six periods:

VI Golf Course and 1960s Destruction of the 'Grove'
V Ground Surface 18th to 20th Century
IV Construction and Occupation of Grove *circa* 1720
III Destruction of the Mansion
II Mansion Construction and Occupation, 1617–*circa* 1720
I Geological (Pre-settlement)

Periods, defined on the basis of available historical documentation and stratigraphy, represent the author's interpretation of the sequence of events at the site for which there is archaeological evidence. The periodisation of events presented here differs from an historical chronolo-

gy in that, although the archaeological chronology is based on certain 'facts'; *i.e.* superpositional relationships of the stratigraphic units, archaeological stratigraphy does not allow for a single, linear sequence of events to be constructed in most instances. Instead, a 'multilinear sequence' is more common on archaeological sites.[28] The interpretative value of the matrix is twofold: it depicts the relative temporal ordering of events on a site, and it also reveals the limitations inherent in the construction of a relative chronological sequence using the principle of superposition. Namely, only in instances where a layer is in contact with a contiguous layer is it possible to state unequivocally the temporal relationship; *e.g.* if a layer is superimposed by another it must be earlier. However, in instances where layers are not in physical contact, it is not possible to define an immutable relative temporal ordering.[29]

On the matrix superposition is indicated by a vertical line where, for example, [10] overlies (is later than) [7]. In situations where a vertical line does not join boxes on a matrix; e.g., [17] and [4] (both occurring on separate linear sequences), there is no means of determining the relative temporal ordering using the principle of superposition alone. What this means in terms of constructing a chronology for the site is that other interpretations are possible. This is because the different linear sequences of events as represented on the matrix allow for the phases to be arranged (moved up and down the vertical lines) in different ways, *as long as the principle of superposition is not violated.* In other words, a box on the matrix cannot change position on a vertical line if there are other boxes above or below it.[30] To position these boxes in relative time the archaeologist must resort to other means to date the contexts, namely, some type of absolute dating technique using artifacts, documentary evidence or an independently dated material (*e.g.* organic substances dated using the C14 technique). It is important to realise, however, that even in situations where independent dating information is available in one form or another, it is still possible to have more than a single interpretation of the relative ordering of events.

As a tool for documenting and interpreting site stratigraphy, the Harris matrix has witnessed widespread application since its introduction some 30 years ago. The method does assume, however, that a stratigraphic excavation process be applied and that surface interfaces of layers be visible to the archaeologist during excavation. In cases where surfaces are indistinct or not visible because of local soil/sediment conditions the excavator may be forced to excavate in arbitrary levels rather than by natural layers. Whenever possible this is to be avoided for reasons laid out in introductory textbooks on excavation methods, but it still must be recognised as being a necessary approach in some situations. Where excavation by level is required it is incumbent upon the excavator to document as completely as possible the sur-

Fig. 7: Photograph of S10W12, showing mortared wall foundation (top) and cellar pit (lot 13) in progress (lower left)

face of levels below a vertical datum with the hope that these *levels* can be correlated with *layers* at some later date when, for example, the stratigraphic sections may exhibit layer boundaries not visible in plan. This is not a limitation of the matrix but rather a limitation of our ability to see or detect surfaces during excavation. In many cases experience will prevail and clues such as compaction, sediment particle orientation, and topography will be readily recognised as indicators of surfaces.

SITE PERIODISATION

Period I, the geological layers on the site, is represented by the uneven surface of soft bedrock ([1] on the matrix) covered by 5 to 10 centimetres of naturally deposited grey sand [2]. The latter deposit is found in two units and probably represents the *in situ* weathering of the bedrock.

Period II, is defined as the occupation period associated with the Mansion. The only archaeological evidence possibly relating to the Mansion itself is a cellar pit, adjacent to the south side of the wall in unit S10W12 [6a] (Fig. 7, lot 13), which was revealed on the last day of excavation. No other direct evidence for the Mansion was found although the stratigraphic and artifact analyses support this interpretation and indicate the presence of a 17th-century structure. Additional evidence for Period II is represented by a layer [7] that appears in all excavation units to the south of the wall. This layer is thought to

Fig. 8: Photograph of S4W10, excavation of plaster floor in progress, edge of cellar pit visible as dark soil visible on left side of photo

be the original soil horizon present on the site before settlement and exposed for over a century, from 1617 to *circa* 1720, before being covered with another layer. Artifacts found within the deposit are assumed to have been introduced into the layer through any number of natural and cultural agencies such as trampling, plant and animal activity (discussed below).

In Period III the Mansion, or possibly outbuildings associated with the structure, were demolished. The first phase in Period III is represented by the filling in (hence discontinued use) of the cellar, [8] on the south side of the wall foundation in S10W12. Probing indicated that the feature was over one metre in depth. Unfortunately, time constraints prevented further investigation and only a small sample of artifacts was recovered from the surface of this feature. Excavation of the cellar pit is planned for next season. In unit S14W22, a burned timber and layer of charcoal [10] suggests further destruction activity possibly occurring at the same time. Overlying the burned feature in the same unit, and also adjacent to the mortared limestone wall in unit S10W12, a layer of stone rubble and mortar [11] marks the destruction of the Mansion and/or associated outbuildings.

Period IV is defined by the construction of the Grove and the occupation of this structure. Evidence for the construction of this building was found in unit S10W12 where a cut in the bedrock [3] had been made for the construction of a mortared limestone wall [4].[31] The wall

foundation measures about 55-60 cm wide and runs across the unit at a slight angle to the east-west grid line (Fig. 7). This wall defines the ridge seen before excavation and divides the site into north and south sections. On the north side of the wall in unit S4W10, a plastered floor was found [5] and the edge of what is presumed to be a cellar pit cut into the floor [6] (Fig. 8). Time constraints prevented further investigation of the cellar and more work on this feature is planned for the next season. It is clear, however, that because the cellar cut is parallel to the masonry wall both features are related and represent a single structure. During the time that the Grove was occupied, the cellar pit in unit S4W10 was infilled with a dark loam [9], signalling the disuse of this feature.

In Period V, the site was covered with a layer of medium brown sandy loam that served as a new ground surface [12]. This 10-cm thick layer is found in all units with the exception of S10W12 where the wall is located. Analysis of artifacts found in this deposit suggests that this layer, in the vicinity of the Grove, was exposed to human, animal and natural agencies for over 240 years from *circa* 1720 to the 1960s.

The destruction of the Grove in the 1960s defines Period VI. This event is marked by the razing of the wall [13] and the deposition of a layer of crushed mortar, [14] and [15], overlying the wall and bedrock in the original excavation trench for the wall (Fig. 7). Several other events associated with landscaping activities at the Port Royal Golf Course between the late 1960s and the present complete the sequence. Fortunately, landscaping in the study area did not involve grading and the site remains protected below layers of fill [16] and topsoil/sod [20]/[21] that served to cover, rather than eradicate, below-ground archaeological features. However, the installation of a concrete kerb [17,18,19] only a few centimetres away from the masonry wall serves as a reminder that buried archaeological resources on the site are vulnerable to any type of modern ground disturbance.

ARTIFACT ANALYSIS

A total of 7,049 artifacts was recovered during the 10-day excavation of five 2 x 2 metre squares. Phases 7 and 12 together comprise almost 80 percent of the total number of artifacts recovered (Table 1). As discussed above, these layers represent the two principal ground surfaces exposed for varying durations of time from the 17th to the 20th century, and as such form the focus of much of the analysis.

For the following analysis, artifacts were classified into Groups and Classes designed to reflect past human behaviour.[32] The distribution of material among the various Groups (Table 1) is clearly disproportionate with food-related items making up the majority of the total assemblage at 71.4 percent, most of this comprised of food bone (47.2 percent) and shell (12.8 percent). Architectural items are the second most

Artifact Group	Class	S4W10		S10W12		S14W10		S14W12		S14W22		Row totals
Architectural	Wrought nails	21	0.3	24	0.3	65	0.9	60	0.9	80	1.1	250
	Window glass	30	0.4	26	0.4	47	0.7	82	1.2	19	0.3	204
	Mortar/plaster	97	1.4	24	0.3	45	0.6	136	1.9	194	2.8	496
	Daub	27	0.4	21	0.3	111	1.6	146	2.1	55	0.8	360
	Brick							1	0.01			1
	Roofing slate	1	0.01					1	0.01	2	0.03	4
	Cast brass hinge					1	0.01					1
Arms/Military	Lead shot					1	0.01					1
	Gunflint					1	0.01	1	0.01			2
	Brass cartridge									1	0.01	1
Activities	Fishing sinker			1	0.01							1
	Scrap lead	1	0.01			3	0.04	7	0.1	8	0.1	19
	Scrap sheet brass/copper							5	0.1	2	0.03	7
	Triangular file	1	0.01									1
Clothing	Buttons	1	0.01	3	0.04					3	0.04	7
Domestic activities	Pins									3	0.04	3
	Barrel hoop					3	0.04					3
Faunal/floral	Bone	176	2.5	98	1.4	789	11.2	1209	17.2	1049	14.9	3321
	Shell	159	2.3	138	2.0	187	2.7	259	3.7	161	2.3	904
Foodways	Tableware ceramics	77	1.1	47	0.7	81	1.2	106	1.5	93	1.3	404
	Ceramic utilitarian wares	12	0.2	7	0.1	21	0.3	43	0.6	50	0.7	133
	Container glass	41	0.6	115	1.6	10	0.1	16	0.2	74	1.1	256
	Tableware glass					3	0.04	3	0.04	2	0.03	8
	Utensils									1	0.01	1
Furnishings	Hinge/escutcheon			2	0.03							2
	Small hook									1	0.01	1
	Brass tacks	1	0.01			1	0.01			2	0.03	4
	Milk glass/ornamental glass					10	0.1	2	0.03			12
Medical hygiene	Vial									1	0.01	1
	Bone toothbrush			1	0.01							1
Personal	Coins							1	0.01	3	0.04	4
	Clay marble					1	0.01					1
	Glass marble							1	0.01	5	0.1	6
Smoking	Pipes/bowls	10	0.1	5	0.1	83	1.2	97	1.4	122	1.7	317
Unassigned/unidentifiable	Sheet/scrap iron	58	0.8	13	0.2	30	0.4	7	0.1	18	0.3	126
Modern materials	Plastic/rubber	1	0.01	31	0.4	15	0.2	20	0.3	14	0.2	81
	Modern electrical			4	0.1	15	0.2					19
	Modern wire nails	24	0.3	24	0.3	2	0.03	7	0.1	20	0.3	77
		738		584		1525		2210		1983		7040

Table 1: Artifact Groups and Classes by Unit

significant class in terms of abundance (18.7 percent) with almost equal numbers of nails and window glass and slightly higher frequencies of plaster and clay daub. Smoking pipes are the next most numerous artifact Group comprising 4.7 percent of the total assemblage. The remaining five percent of material consists of a variety of items found in several Groups and Classes indicating a wide range of activities.

Artifact distribution among the units is highest on the south side of the wall where over 81 percent of all material was recovered (Table 1). While this distribution reflects the overall pattern of discard, a more detailed examination of several artifact categories through time provides additional insight into the types of activities that occurred on the site in the past. For this purpose, two Periods are of particular interest: Periods II and V, represented by Phases 7 and 12, the 17th century and 18th to 20th century ground surfaces, respectively. These contexts also contain 79.6 percent of the total artifact sample recovered (Table 2).

Phase	Freq.	Percent
21	8	0.1
20	383	5.4
19	237	3.4
18	0	0.0
17	0	0.0
16	404	5.7
15	39	0.6
14	21	0.3
13	2	0.0
12	4934	70.0
11	255	3.6
10	0	0.0
9	4	0.1
8	57	0.8
7	675	9.6
6	0	0.0
5	0	0.0
4	0	0.0
3	0	0.0
2	30	0.4
1	0	0.0
	7049	100

Table 2: Artifact Frequencies by Phase

'Surfaces' are perhaps the most important unit of study on an archaeological site because they are a primary record of past human, plant and animal activity.[33] Period II represents the original ground surface, present before European occupation, exposed, used and walked upon, up until the time it was superimposed with another layer in the early decades of the 18th century. As such, the deposit, and its associated surface, identified during excavation as a change in colour and compaction, contain evidence of the natural environment before occupation as well as the detritus of human activity which became incorporated into the sedimentary matrix through any number of natural or cultural agencies (see below) between 1617 and *circa* 1720. Dates for the layer are based on documentary evidence for the construction of the Mansion and the Grove. Period V (represented by Phase 12 deposits found in 4 of 5 excavation units) is a layer associated with the period after demolition of the Mansion and the construction/occupation of the Grove. In contrast to the earlier Phase 7 deposit, exposed for about a century, this new ground surface contains evidence of human, plant and animal activity from *circa* 1720–1960s.

As described above, the association of Periods II and V with the

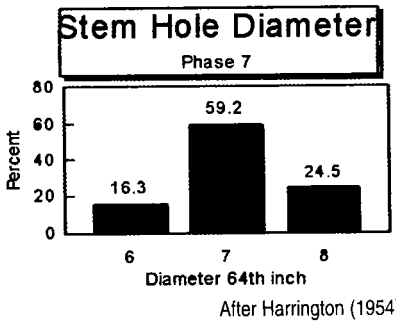

Fig. 9: Histogram showing pipestem bore diameters, Phase 7

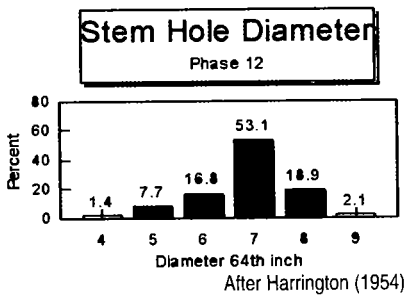

Fig. 10: Histogram showing pipestem bore diameters, Phase 12

Mansion and the Grove, is based on a combination of stratigraphic analysis and available historical documentation from which construction dates for each were derived. As a means of corroborating these dates, an analysis of pipestems and ceramics was conducted. Pipestem dating is a method originally advocated by J. C. Harrington and is based on the observation that pipestem bore diameter decreases in size through time.[34] This change in diameter may have occurred because pipestems became longer through time, requiring a smaller bore. Harrington's observations, based on an analysis of 330 pipestems, was later reduced to a linear regression equation by Lewis Binford which provided a 'date' of occupation for any given sample of pipestems.[35] After its introduction, Binford's method was subject to much criticism chiefly because it reduced a complex set of data to a single number supposedly representing a 'date' of occupation, ignoring the temporal span of the site.[36] Despite these criticisms the method has been applied to many sites dating between *circa* 1590 and 1780, the point at which the correlation between bore diameter and age begins to break down. A later refinement of the statistical method by Hanson took note of the fact that the relationship between bore diameter and age is not linear but curvilinear.[37] Pipebowl style is also chronologically sensitive and, although fewer in number than the pipestems, the small number of complete bowls recovered are stylistically similar to those dating to the mid-17th century.

As shown on Fig. 9 the data for Period II (Phase 7) match almost exactly a similar diagram presented by Harrington for sites dating between 1650–80. This analysis suggests a tightly dated deposit unlike the Period V deposit discussed below. The Binford method provides a date of 1661 using the formula $y = 1931.85 - 38.26 * 7.08$ (the mean stem diameter) for a sample of 49 pipestems. The Hanson method provides a date of 1659 for the same sample.[38] For Period V (Phase 12) a date of 1650–80 is suggested based on Harrington's histograms although the wide range of pipe bore diameters, from 4/64 to

9/64 of an inch stands in contrast to the data for Period II (Fig. 10). This implies that the deposit spans a greater period of time, supporting the same interpretation based on the stratigraphic and historical analysis. The Binford method provides a date of 1669 using the formula $y = 1931.85 - 38.26 * 6.87$ (the mean bore diameter) for a sample of 143 pipestems. The Hanson method provides a date of 1666.

The results of this analysis support the stratigraphic analysis in that the regression formula methods clearly date Phase 7 earlier than Phase 12 by as much as a decade. Also, the wide range of bore stem diameters in Fig. 10 support the idea that the duration of exposure is probably greater for the later phase. However, while this analysis supports the thesis that the archaeological remains found at the Port Royal site may be attributed to the mid-17th century Mansion, it fails to provide information on the temporal span of the site. An analysis of ceramics, however, does provide this additional piece of the puzzle.

Ceramic Types	Freq.	Percent
White earthenware with yellow glaze	1	5.9
Red earthenware, light brown, dark brown and green glazed	8	47.1
Salt-glazed stoneware, grey fabric	1	5.9
Tin glazed earthenware, blue on white and purple manganese sponged	7	41.2
	17	100.0

Table 3: Phase 7 Ceramic Types

Ceramics comprise another Class of diagnostic material recovered in relatively large quantities from Phase 12 and lesser amounts from Phase 7. In Phase 7, 10 sherds representing at least five different earthenware and stoneware vessels could potentially date from the second half of the 17th century to the early 18th century (Table 3). A lack of diagnostic features (vessel form or decoration type), unfortunately, precludes a more refined date for these items. The recovery of seven tin-glazed sherds, however, does provide information useful for this purpose. Tin-glazed wares, also known as faience, delft, and majolica depending on the country of origin, were produced in England throughout the 17th and 18th centuries in a wide variety of vessel forms.[39] These are found beginning in the early 17th century on sites in Virginia (*e.g.*, Jamestown and Martin's Hundred), and their presence in a mid-17th century context in Bermuda is not surprising. Unfortunately, the small size of many of the sherds recovered during excavations in 2004 prohibits identification of specific vessel types, although during cata-

loguing sherds were classified as either holloware or flatware. Decorative technique and motif are two other diagnostic attributes useful for dating and the recovery of purple sponged ware (1708–86) and blue painted varieties (post–1680) provides some dating information for this phase.[40] Although not present in significant quantities to allow for

Ceramic Types	Freq.	Percent
Earthenware (examples with blue, yellow, green, light and dark brown glazes, marbled)	13	3.1
Creamware (feather edge and undecorated)	28	6.5
Coarse red earthenware (examples incl. dark and light brown, lustre, green, grey and yellow glazes)	88	20.4
Slipware (yellow/brown on salmon colored fabric)	5	1.2
Coarse grey stoneware (grey glazed, red slip, moulded designs, cobalt blue painting)	5	1.2
Porcelain (blue painted, overglaze and underglaze, chinoiserie and floral motifs)	29	6.7
Pearlware (blue banded, green edged, brown printed geometric)	10	2.3
Refined red stoneware (rosso antico)	1	0.2
Refined white earthenware (blue painted, blue transfer, purple transfer printed)	26	6.0
Grey-bodied stoneware (Westerwald, combed body, moulded checked pattern, blue painted, brown salt glazed exterior)	15	3.5
Tin-Glazed (blue, green, brown, yellow painted, floral motifs, purple sponged, green glazed, brown banded)	192	44.7
White salt-glazed stoneware (moulded floral and beaded edge)	18	4.2
	430	100

Table 4: Phase 12 Ceramic Types

a more refined date range for the Phase 7 deposit, the purple sponged tin-glaze and the blue painted varieties do provide a tentative date that is in agreement with the historical date for the construction of the Grove in the early 18th century.

The ceramic assemblage from Phase 12 also includes a wide variety

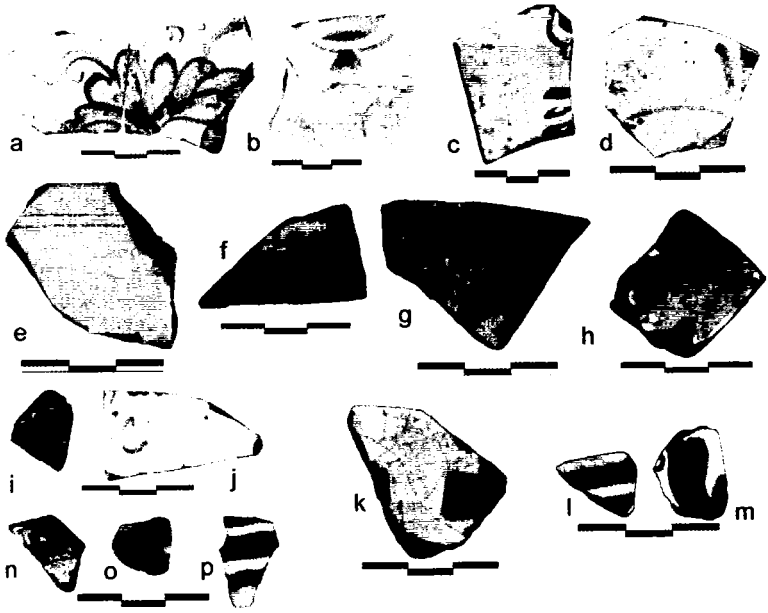

Plate 1: Tin-glazed wares: blue painted floral, a–d, g, j; edge lined, e; possible Chinoiserie style, f; green painted, h; polychrome, k (blue/purple on white), l (blue/green/yellow on white), m (green/brown on white); geometric pattern, n, p; purple sponged, i, o

of tablewares and utilitarian wares dating from the 17th to the mid-19th centuries (Table 4; Plates 1–5). Tin-glazed varieties are by far the most numerous and provide some of the most useful dating information. These occur in a wide variety of decorative types. Aside from the undecorated, blue or turquoise-coloured glazes, blue painted floral and geometric motifs are the most common decorative style (Plate 1; a, b, c, d, g, j) although landscape, human figures and Chinese designs (Plate 1; f, possible example) are also found on late 17th century types beginning about 1680.[41] Lesser amounts of polychrome green, red, yellow and brown painted designs were also found (Plate 1; k, l, m). Polychrome decorations were common, particularly on early 17th-century vessels and again after ca. 1690.[42] The brightly coloured sherds that are found in the collection are probably from the latter part of the 17th century since the colours on early polychrome pieces tend to be less vibrant than those on later vessels. A few examples of sponged decoration in purple manganese were also found (Plate 1; i, n, o). This is an 18th-century type common from 1708–86.[43]

Red earthenwares are the next most abundant type found in Phase 12. These are less diagnostic than the tin-glazed wares but a thorough analysis has yet to be conducted on this category. A wide variety of glazes and slips, hence number of individual vessels, is found on these

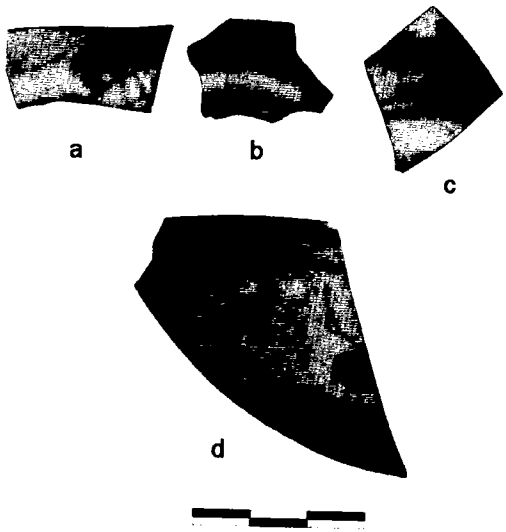

Plate 2: Chinese export porcelain: floral/geometric, a, d; possible Kraak porcelain footring, b; possible Chinoiserie scene, c

wares including dark, light brown (caramel coloured), grey, green and yellow glazes, and one dark brown example with an iridescent or lustre appearance.

Twenty-nine sherds of Chinese export porcelain were recovered from contexts in Phase 12. A comprehensive analysis of the porcelain assemblage has yet to be carried out although there is potential for dating contexts more precisely through a detailed analysis of style and fabric.[44] For example, the delicate blue painted porcelain from the first half of the 17th century is rare on early 17th-century sites in the Chesapeake region although a coarser ware known as Kraak porcelain, manufactured especially for the export market, is found on sites dating to this period.[45] The rough appearance of one footring sherd, a common characteristic of Kraak porcelain due to its being fired on a bed of sand, suggests the presence of this type in the Phase 12 assemblage (Plate 2; b).[46] During the middle of the 17th-century porcelain was not exported due to internal wars in southern China, however, by the end of the 17th century, Chinese porcelain was again traded to Europe in the ubiquitous 'blue and white' and also overglaze enamelled.[47] Other examples recovered from Phase 12 include blue painted floral or geometric motifs (Plate 2; a, c, d), a small number with overglaze painting but mostly underglaze, and a few with Chinoiserie motifs, common on sites dating to the early to mid-17th century and again from the late 17th century onward.[48]

Other types include earthenwares and stonewares found in smaller numbers. A few sherds of Westerwald stoneware (Plate 3; d) provide additional evidence for a 17th-century date. This variety, with its characteristic moulded decoration in cobalt blue, and after 1665 blue and occasionally purple manganese, occurs most commonly as jugs and cylindrical mugs.[49] Chamber pots are rare in the 17th century but are very common on Chesapeake sites in the 18th century.[50] The few sherds recovered from the 2004 excavations are too small to conduct a detailed analysis of vessel form, unfortunately, as changes in style and

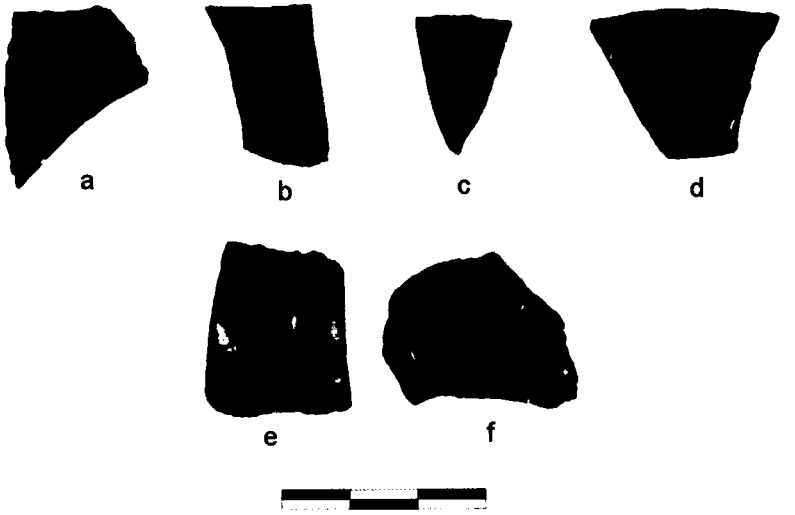

Plate 3: Stonewares: possible Fulham-type, a-c, e, f; Westerwald, d

decoration are well-documented.[51] Other decorated stonewares include a brown glazed variety, possibly Fulham-type brown stoneware, a few examples having a raised, combed and checked pattern (Plate 3; a, b, c). Nearly all Fulham-type stoneware found on American sites date between *circa* 1690 and 1775.[52] Earthenwares are few in number but include sherds with blue, yellow, green, and brown glazes. Diagnostic varieties include a brown and yellow wavy line motif (Plate 4; a, b) and a single sherd with a marbled design (Plate 4; c). Both may be representative of the many types of Staffordshire-type slipwares produced from the mid-17th to the last quarter of the

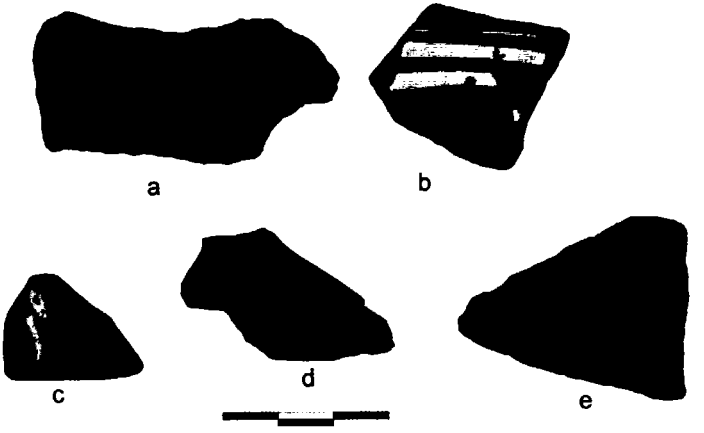

Plate 4: Earthenwares: Staffordshire-type slipwares, a, b; marbleized, c; unglazed lid fragment, d; green glazed, e

Plate 5: White salt-glazed stoneware: floral border, a; beaded edge, b

18th centuries. The wavy line motif was common by the second half of the 18th century.[53] Marbled designs, sometimes called 'agateware,' were manufactured throughout the 17th and 18th centuries. Marbling entailed the twisting, or 'joggling' of a vessel coated with wet trailed slip, which caused the slip trails to run across the piece and form abstract patterns.

All of the above varieties of ceramics have beginning dates of manufacture in the 17th century, although all were manufactured into the 18th century. In addition to these types, there are other types whose beginning dates of manufacture are in the 18th century and a few in the 19th century. The inclusion of these in Phase 12 contexts again points to a long duration of exposure for this ground surface. One example of a later type is a refined red stoneware known as 'rosso antico.' This type was common in the last quarter of the 18th century and continued in production into the 19th century.[54] White salt-glazed stoneware is another variety whose beginning date of manufacture is the early 18th century although it continued to be made until the 1760s.[55] White salt-glazed was a durable thinly potted stoneware that quickly replaced tin-glazed wares in the 18th century. Eighteen sherds were recovered from Phase 12 contexts, two of which are decorated rim sherds (Plate 5; a, b). The moulded relief on these rims is elaborate and may date to the period between 1730 and 1740 when block press-moulded and slip cast forms became prevalent.[56] The motifs are not the styles popular between 1740 and 1760 known as 'dot, diaper and basket,' 'bead and reel,' and 'barley.' Creamware, invented by Josiah Wedgwood in 1762, was a lead-glazed, refined earthenware that essentially replaced white salt-glazed stoneware in popularity by 1780. Of the few sherds recovered two are the 'feather edge' motif, one of the most common styles introduced in 1765.[57] Pearlware, a refined, blue-tinted, lead-glazed earthenware is also found in limited numbers in Phase 12. This type eventually replaced creamware in popularity. It was manufactured from about 1780 until the 1830s when a whitening of

the glaze resulted in the first true refined white earthenware. This latest type is found decorated in blue transfer-printed, together with lesser numbers of purple printed and blue painted.

Overall the ceramic assemblage from Phase 12 contains a majority of types that appear to date from the mid-17th century to the early decades of the 18th century. The fact that tin-glazed wares comprise 45 percent of the assemblage suggests that most of these items were deposited before the 1720s–30s when white salt-glazed stoneware had largely replaced tin-glazed in popularity. Other 17th century and early 18th century types comprise as much as 35.7 percent of the assemblage. The presence of fewer numbers of white salt-glazed stoneware and other 18th and later 19th century types (19.3 percent of the total Phase 12 assemblage) would seem to support the idea that the layer/ground surface was exposed for a considerable period of time although the activity on the site, from perhaps the mid-18th century on, was not as intensive as in the earlier period. If so, then it seems likely that the majority of items within the deposit, including other classes of material discussed below, relate to the latter decades of the Mansion's occupation, *circa* 1660s to *circa* 1720, rather than the period associated with the 18th-century occupation of the Grove. Other evidence, discussed below, suggests that most of this material may have been deposited during the demolition of the Mansion and the construction of the Grove.

SPATIAL ANALYSIS

A distributional analysis was carried out in an attempt to discern the spatial organisation of activities on the site during Phases 7 and 12. As it is commonly applied to archaeological contexts, spatial analysis assumes that minimal disturbance has taken place since deposition, and that artifact distribution, at least in a gross sense, reflects human behaviour. The caveat to this premise is that it is well recognised that natural agencies act to disrupt patterns created by human activity by dispersing artifacts from their original location of deposition. However, while it is clear that natural processes do play some role in where artifacts are recovered during excavation, it is assumed, until demonstrated otherwise, that these types of disturbance/dispersal processes have had a minimal effect on buried material remains. Before proceeding to the results of the spatial analysis a brief review of the potential sources of disturbance acting on the Mansion/Grove is presented below.

Following the work of Michael B. Schiffer,[58] archaeological site modification is now recognised as an issue which must be considered in the interpretation of stratigraphic contexts and the analysis of the contained material remains. Schiffer identified two sets of processes resulting in transformations to the archaeological record: (a) cultural activities that remove the residual materials from their original behav-

ioural context, and (b) environmental factors that modify these cultural residues through erosion or burial, destruction and selective preservation and vertical or horizontal disturbance. Termed 'c-transforms' and 'n-transforms' (cultural and non-cultural), Schiffer regarded these as experimental 'laws' that could be used to predict and explain the interaction between culturally deposited materials and environmental variables.

Following Schiffer's lead, subsequent studies have analysed surface artifact scatters and the post-depositional factors affecting the distributions of surface materials in an attempt to correlate the mechanics of dispersal with observed patterns.[59] These studies suggest that specific processes will manifest predictable artifact displacement in both the pre-burial and post-depositional context. For example, pre-burial dispersal agents such as running water, gravity and wind all result in horizontal displacement of surface materials or n-transforms. Running water, in particular, in the form of surface runoff from rainwater has been identified as a primary agent of dispersal.[60] Interestingly, many of the artifacts found on the surface of Phase 12 exhibit aspects of edge-rounding suggesting that water may have played some part in the dispersal of these materials following discard/deposition. Trampling or 'scuffage,'[61] the horizontal displacement of artifacts by the action of human feet during walking, is also a potentially significant c-transform resulting in pre-burial artifact displacement. Experimental studies have demonstrated that scuffage can result in the horizontal movements of artifacts for distances up to 85 cm.[62] Still another study has shown that dispersal of archaeological materials may be time-dependent. Concentration of artifacts in occupation floors is assumed to represent the latest activities conducted on a site, while dispersed assemblages are the result of prolonged trampling on the same depositional surface.[63] Horizontal displacement due to animal trampling is another factor to consider given the agrarian character of the Mansion and the Grove.

Aside from horizontal displacement of artifacts, vertical displacement of materials— c-transforms must also be considered— as a result of various trampling, human or animal, contributes to vertical displacement of artifacts and disturbance to sediments. This process is dependent on several properties relating to the permeability of the sediment (*e.g.* size and shape of the sedimentary particles, moisture content, chemical constituents, and vegetation) but cultural components of a sediment (artifacts) can also reduce permeability.[64] Many studies on the specific effects of trampling have been conducted and involve consideration of the form and location of objects, the nature of the surface sediment permeability, intensity of trampling and the formal properties of the artifacts themselves. These studies have shown that artifact modification resulting from trampling can include such features as striation, chipping and reduced size.[65] Disturbance due to burrowing rodents is another n-transform resulting in vertical displacement of

artifacts[66] which over prolonged periods of time can result in homogenisation of artifact distributions. Also, floralturbation, disturbance through root action, is another factor that can be effective in lateral displacement of buried artifacts.[67] Although a detailed study of the physical attributes of artifacts from Phases 7 and 12 has yet to be conducted, apparent patterned edge modification has already been noted on tin-glazed wares and smoking pipes. Further systematic study along these lines may provide clues as to the specific c- or n-transforms to which these materials have been subjected.

Until such time as a study of this type is carried out, the results below suggest that the observed artifact distribution does reflect human activity as indicated by the non-random distribution of materials seen in Phases 7 and 12. The following simplistic spatial analysis uses only artifact frequencies within each excavation unit as the data set. As an effective means of displaying these data, proportional pie graphs are used for five artifact Classes: Ceramics, Food bone, Smoking pipes, Window glass and Nails.

Phase 7: Ceramics and food bone, by far the most numerous artifact Classes, are found in almost equal quantities in units located to the south of the foundation wall and in the centre of the study area (Table 5; Fig. 11). Similarly, smoking pipes are found in the same area although a slightly higher frequency is found to the east in unit S14W10. This contrasts sharply with the west section of the study area where only a single pipestem was recovered. Architectural items (nails and window glass), equal in number to ceramics, are also found

Table 5: Phase 7 Proportions of selected artifact groups used in spatial analysis

Phase 7*	***S14W10***	***%***	***S14W12***	***%***	***S14W22***	***%***	**Frequency *Row Totals***
Bone	920	87.5	1028	87.4	37	97.4	1985
Ceramics	32	3.0	36	3.1	0	0	68
Smoking pipes	84	8.0	60	5.1	1	2.6	145
Nails	16	1.5	44	3.7	0	0.0	60
Window glass	0	0.0	8	0.7	0	0.0	8
	1052	100.0	1176	100.0	38	100.0	2266

* In order to create comparable sampling areas for the spatial analysis, artifact frequencies for some layers in units S14W10, S14W12 and S14W22 were multiplied by a factor of four. This was done for units that were divided into quadrants such that only a $1m^2$ area within each 2 x 2 metre unit was sampled due to time constraints on the final day of excavation. Actual artifact frequencies for each Class of artifact within each unit are found in Table 1.

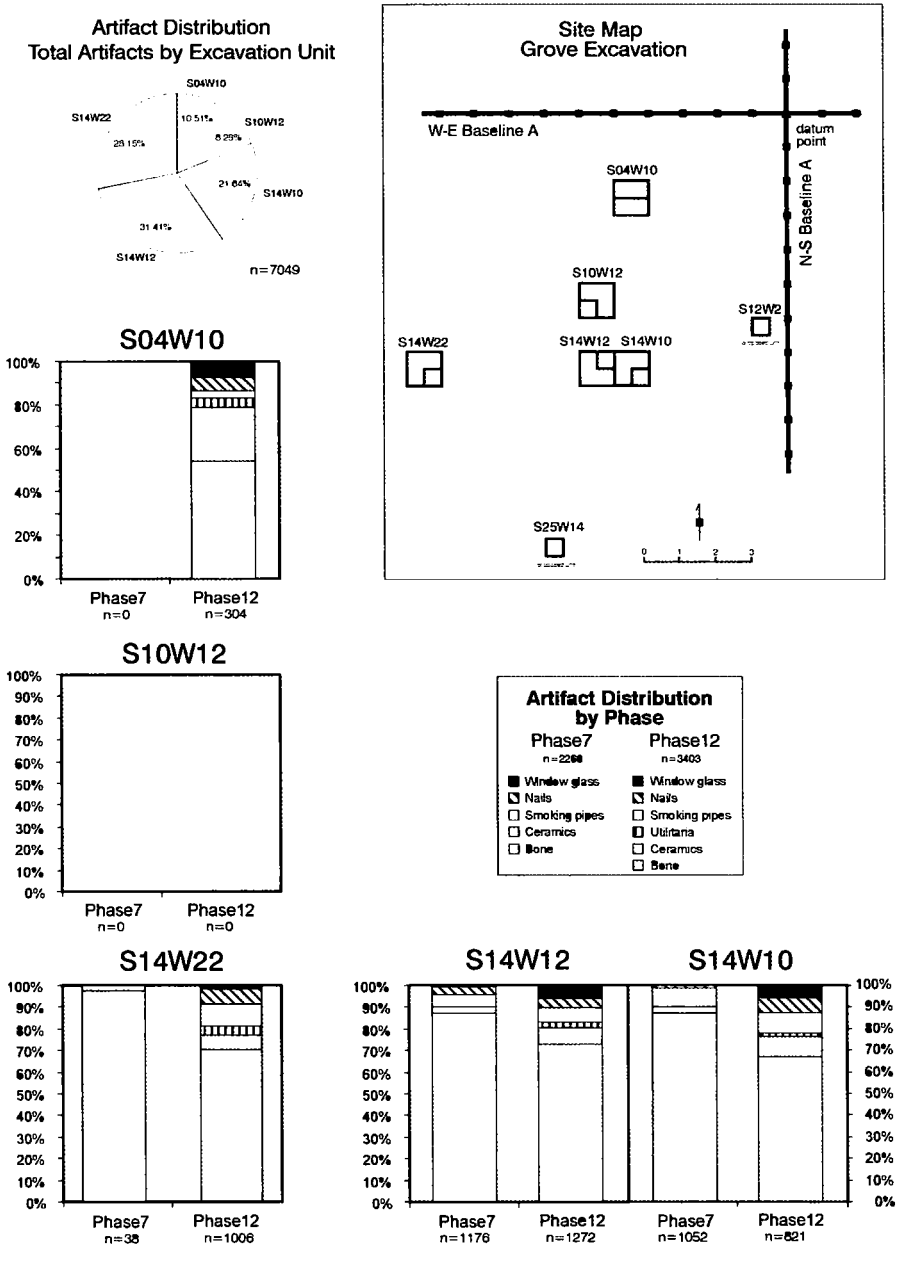

Fig. 11: Proportional pie-graphs for phases 7 and 12 showing distribution of artifact categories

to the south of the foundation wall. The more abundant nails are concentrated to the west where they are more than two and a half times as numerous, although these are completely absent in the extreme western section of the site.

Phase 7	*Freq.*	*Percent*
Mortar/plaster		
S14W10	8	20.0
S14W12	32	80.0
S14W22		0.0
	40	100.0
Clay daub		
S14W10	56	42.4
S14W12	74	56.1
S14W22	2	1.5
	132	100.0

Table 6: Phase 7 Proportions of daub, mortar/plaster used in spatial analysis

The distribution of nails and window glass, in addition to building materials represented by mortar/plaster and clay daub,[68] suggests the presence of a structure perhaps located to the west of S14W12 between this unit and S14W22 (Table 6). Also, the presence of mortar/plaster and clay daub in this early period provides support for the idea that the Mansion was constructed as a wattle and daub structure with plastered interior walls similar to contemporary dwellings found at Jamestown.

A more even distribution of food-related items, ceramics and bone, suggests a concentration of domestic activity in the south-central portion of the study area to the exclusion of the western section. These items can often be found in concentrations near domestic structures either as secondary sheet middens or within refuse pits (none of which were identified during the investigation). The presence of ceramics and bone in this context not only serves to identify the building as a residence, as opposed to an outbuilding, but also as a verification of the location of the structure to the south and west of the centre of the study area. Smoking pipes tend to be distributed to the south and east of the study area and may indicate the differential use of the space around the structure.

Phase 12: In this phase, architectural items exhibit a different distribution than in the earlier period (Table 7; Fig. 11). Nails and mortar/plaster fragments are found in the greatest quantities to the extreme west of the study area, south of the wall foundation, while window glass and clay daub tend to be concentrated in the south-central section (Table 8). The inclusion of both mortar/plaster and clay daub in proximity to the wall foundation in unit S10W12 also provides evidence of the style of the dwelling identified as the Grove, constructed in a manner similar to the Mansion. Food-related items (bone, tableware, utilitarian wares) are found in greatest quantities in the area to the south and west of the centre of the site, although a significant

Phase 12	*S 4W10*	*%*	*S14W10*	*%*	*S14W12*	*%*	*S14W22*	*%*	*Frequency Row Totals*
Bone	166	54.6	550	67.0	924	72.6	703	69.9	2343
Tableware ceramics	74	24.3	75	9.1	99	7.8	76	7.6	324
Utilitarian wares	12	3.9	18	2.2	38	3.0	38	3.8	106
Smoking pipes	10	3.3	72	8.8	82	6.4	101	10.0	265
Nails	20	6.6	60	7.3	49	3.9	70	7.0	199
Window glass	22	7.2	46	5.6	80	6.3	18	1.8	166
	304	100.0	821	100.0	1272	100.0	1006	100.0	3403

Table 7: Phase 12 proportions of selected artifact groups used in spatial analysis

quantity of bone is found in unit S14W10 to the east. Interestingly, the proportion of tableware ceramics is highest in unit S4W10 where these comprise almost 25 percent of the unit assemblage. Smoking pipes tend to be distributed in the south and west part of the site with the smallest number in unit S4W10 on the north side of the foundation wall.

The evidence from Phase 12 differs from Phase 7 in the greater quantity of material recovered and also the tendency for materials to be distributed towards the west part of the study area, including unit S14W22 in the extreme west. In Phase 7 the extreme west section of the site was largely devoid of artifacts. That being said, the greatest quantity of material recovered in both phases 7 and 12 was from unit S14W12 suggesting that this location may have served the same function, as an area for refuse disposal, for the entire duration of occupa-

Phase 12	*Freq.*	*Percent*
Mortar/plaster		
S14W10	42	12.1
S14W12	116	33.3
S14W22	100	28.7
S4W10	90	25.9
	348	100
Clay daub		
S14W10	97	33.0
S14W12	126	42.9
S14W22	44	15.0
S4W10	27	9.2
	294	100.0

Table 8: Phase 12 proportions of daub, mortar/plaster used in spatial analysis

tion. The fact that the Grove was located just a few metres to the north, and the evidence for the earlier Mansion points to a structure in the same general location, suggests that this location is on the exterior of a building where refuse might have accumulated as a sheet midden over a prolonged period of time.

FUTURE RESEARCH

Plans for the next season at the Port Royal Golf Course include the further investigation of several features revealed during the first season of work in an attempt to answer questions raised by this analysis. Bringing new data to bear on these questions, or working hypotheses, will either support the interpretations offered here or perhaps provide new information that will alter the current interpretation. These hypotheses are enumerated below:

Hypothesis 1: According to the current interpretation of the stratigraphic sequence, artifacts found within the cellar pit in S10W12, phase [6a] (south of the foundation wall) should date before 1720. The current interpretation is that the cellar pit is associated with either the Mansion or an outbuilding dating from the Mansion occupation from 1617–1720. This pit was presumably filled in when the Mansion/outbuilding was destroyed for the construction of the Grove.

Hypothesis 2: The cellar pit in unit S4W10 (located north of the foundation wall) is associated with the Grove and was filled in while the building was still occupied. Material in this cellar pit should post-date the artifacts found in the cellar pit to the south of the wall; *i.e.* date after 1720.

Hypothesis 3: The distribution of Period II building materials and other artifacts found in high concentrations in unit S14W12, and the dearth of these in unit S14W22, suggests that structural evidence of the Mansion or an associated outbuilding may be found in the intervening space.

Hypothesis 4: The foundation wall exposed in unit S10W12 is thought to be that of the Grove. This is based upon the current interpretation of the site stratigraphy while being cognisant of the fact that other interpretations are possible given the multilinear nature of the stratigraphic sequence. Further delineation of the wall coupled with renewed excavation adjacent to the feature may provide additional information to bear on this question.

Hypothesis 5: Regarding the distribution of artifacts, the different patterns evident for Classes of material in Phases 7 and 12 suggest that

disturbance processes on the site are limited and that the observed spatial patterns reflect past human behaviour. Refitting of artifacts found in these deposits is to be employed in future analyses aimed at identifying the degree of horizontal and vertical displacement of buried materials.

In addition to raising certain questions about the occupation of the site, it is also true that the current investigation has served to answer questions posed at the outset of the project. Chief among these is the evidence of two construction/destruction events, both of which very likely are associated with the later occupation of the Mansion and the construction of the Grove. This is supported with dates derived from the pipestem bore analysis and ceramics. Moreover, the discovery of the stone foundation running east-west across the site serves as confirmation of observations made concerning the ridge visible on the site prior to excavation. Taken together the evidence also supports the hypothesis about the identification of the existing well as being the same well described in the 1617 account. In view of these findings it can now be stated with some certainty that the archaeological remains on the Port Royal Golf Course are, in fact, evidence of a domestic occupation dating from the mid-17th century through to the 19th century. The mid-17th century date suggests the occupation is related to the Mansion although conclusive evidence for the early 17th-century occupation of this structure has yet to be found.

The second season of fieldwork, planned for February 2005, will seek to recover additional materials for dating and environmental analyses. Charcoal samples, recovered but not yet analysed, have been recovered from the context in Phase [10]—presumably marking the destruction of either the Mansion or an associated outbuilding. Wherever possible additional samples from other contexts, including the two cellars, will be collected for the purpose of deriving an independent date for these contexts. Collection of soil samples for pollen analysis and macro-botanical remains is also planned for the upcoming season. These have the potential to provide as yet unavailable data on the nature and rate of environmental changes that have taken place due to human intervention from the beginning of settlement to the recent past. In this regard, an analysis of faunal material recovered from the excavation has yet to be carried out but will be a priority for future research.

Continued mapping of the site using the surveyor's total station will serve many purposes. As a continued approach to data collection, mapping in this way allows for the graphical presentation of the site in a number of ways that will aid not only in interpretation, but also in subsequent analyses. This is essentially the first step in the generation of a Geographical Information System (GIS) that will serve to display the data collected as a series of 'layers'.[69] Generating maps showing vegetation,

topography, and historical features is the first step in placing the site in a larger regional context. On a smaller scale, mapping in this way provides a means of displaying the site stratigraphy in an understandable way by generating 'period' maps showing changes in topography and vegetation (based on the collection of pollen and plant macro-fossils) through time. Visually representing artifact distribution is another aspect of GIS that holds great promise for understanding the cultural dynamics on the site in the past.[70]

As with any archaeological project the objectives of the research should go beyond the site level and inform about issues in a larger context. In this sense, the long-term goals of the project are to provide insight into such topics as the nature of adaptation to the New World in the era of early colonisation. Aspects of 17th-century life such as subsistence economy, diet, reliance upon domestic and imported materials, are of interest because they can be expected to vary from place to place and through time. For example, circumstances of life in Bermuda during the early 1600s were similar in many ways to the settlement in Jamestown, Virginia owing to the connections between the two. However, differences between the two colonies must be examined within the context of the local conditions at each settlement and the exigencies imposed on each as a result of these conditions. Trade and communication with England, other European countries, the Caribbean and indirectly, China, during the 17th century, were also factors in how Bermuda developed at this time. Artifacts, particularly ceramics, are especially useful for delimiting trade networks, an aspect of Bermuda's 17th-century economy that has not been explored archaeologically. Also, additional research might involve examining the rise of slave labour after 1640 in Bermuda[71] and the role this played for the smaller agricultural estates in Bermuda compared to the larger plantations established in the New World at the same time.

As this research project evolves, it is certain that other questions will be raised. This is the exciting aspect of archaeology. Uncovering new evidence through excavation serves to answer questions posed before commencing fieldwork, but, at the same time, new information inevitably raises more questions that can often lead research in new directions.

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The success of this project is due to the involvement of many people. I would first like to thank the Board members of the Port Royal Golf Course for supporting the project and allowing the team access to the site. As Co-director of the project, Dr. Clifford Smith was instrumental in its success by attending to the many administrative details and, more importantly, by providing his archaeological expertise. The staff at the Bermuda Maritime Museum was helpful as always and very tolerant of

the archaeologists who invaded the Keep for two weeks. I would particularly like to thank Dr. Clarence V. H. Maxwell, Linda Abend and Charlotte Andrews for their help with the historical research and archival assistance. As with this project and others, I am grateful for the opportunity to work with Dr. Edward C. Harris who provided the original impetus for the project, and who always serves as a source of intellectual inspiration to the students and myself. Of course, the work could not have been completed without the hard work and dedication of the students: David Barker, Meagan Brooks, Victoria Brooks, Harley Brown, Amelia Ferguson, Rebecca Knapp, Shan Ling, Christine Morgan, and Melissa Novak. Thanks are also extended to my colleagues from Wilfrid Laurier University, Jonathon Haxell and Pamela Schaus, both of whom worked tirelessly on the mapping component of the project and who continue to contribute to the research. Figs. 5, 6, 11, 12 in the article were produced by Pamela Schaus.

APPENDIX A: SURVEY METHODOLOGY

by Jonathon Haxell

Spatial data for the Port Royal excavation were collected using a surveyor's total station. Though excavation units were established using traditional analog methods, the horizontal and vertical provenience of much of the project's observations was recorded digitally. The accuracy of the resulting data set, and the speed with which data could be collected, allowed the generation of a very detailed representation of the site and its immediate environs, even in the limited time available.

Collection of data in this way allowed for the generation of a topographical plan for the site (Fig. 12) and recording of subsurface features and architecture. As well, archaeological lots defined during excavation in each unit were richly represented by data points in order to allow their representation as three-dimensional surfaces. The digital nature of the site's spatial record lends itself well to storage and communication—despite the size of the data set. The ease with which the data can be replicated and manipulated also provides valuable opportunity for different graphical or statistical analyses. It is further anticipated that the digital spatial record of the 2004 Port Royal excavation may assist with accurate placement of the site on modern Ordnance Survey maps as well as historical documents depicting the property from the 17th through to the 19th century.

Horizontal provenience for the 2004 test excavation was established using a series of two-metre square units. These were established prior to the arrival of the total station survey equipment in the traditional manner using a transit and tapes. As the site was located on manicured grounds between fairways of the Port Royal Golf Course, unit corners

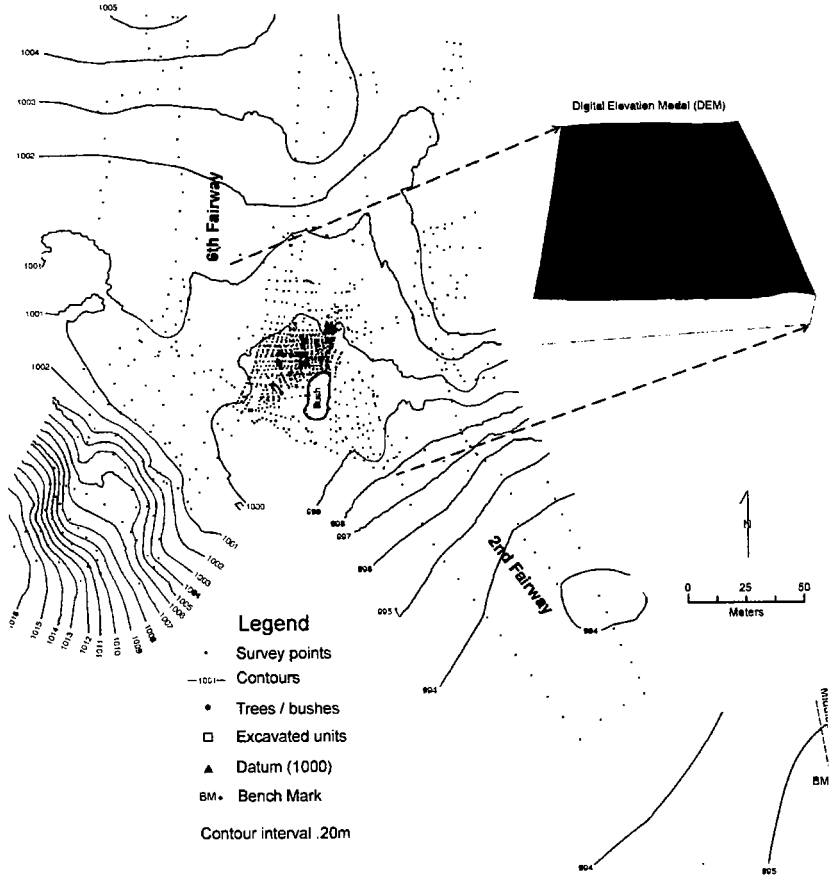

Fig. 12: Topographical plan of Port Royal Golf Course showing excavation area

were marked with 6-inch spikes and flagging tape. The electronic survey equipment was erected over a point on the site grid at 0N/18W. This station provided an unimpeded view of the excavation. The site datum (0N/ 0E) was used as a back-site in order to orient the instrument's horizontal scale to grid north.

Although the immediate environs of the Port Royal Site had clearly been modified by modern land-use practices, a number of subtle landscape features of the study area were identified. Immediately to the south and west of the well a flat area was in turn bounded to the south by a slight ridge, running generally east/west, and an associated drop in elevation of 50 cm or more. Yet further south a subtle swale suggested an erosional event of unknown origin. In order to capture these features of the landscape a detailed topographical plan of the study area was generated. To the north of the well, and thus outside the scope of

the 2004 excavation, elevation points were collected on a four metre interval. This was reduced to approximately a two-metre interval from the well south to a tree line separating the study area from the golf-course road. The cartways flanking the site were used as eastern and western boundaries of the detailed study area, respectively.

The placement of the site within its topographical context was also taken to be of analytical significance on a larger scale. Liberally distributed within contemporary written accounts of the Tucker Mansion are references to its relationship to natural landforms. In particular, the house was described as artfully located to take advantage, not just of an available water source, but also of level ground and a 'prospect,' improved at some considerable labour, connecting the property to the coast. In order to place the Port Royal Site in its wider geographical context, topographical data collection was extended well beyond the boundaries of the 2004 study area. Elevation points were recorded on a paced 10-metre grid from the top of the ridge line south and west of the study area to approximately 100 metres north of the site. Data points were also collected over the gently sloping fairway to the east to the associated tee some 200 metres southeast of the immediate study area. All topographical data collection was accomplished through a combination of systematic and intuitive methods. Although the survey team was instructed to base their collection regime on a grid of varying interval, every attempt was made to augment systematic data collection with strategic placement of points to capture visible features of the landscape. Both obviously artificial elements of the golf course as well as natural landforms were recorded.

The surveyor's total station was also employed to control horizontal and vertical provenience for the 2004 Port Royal excavation. Architectural or other archaeological features were collected as polygons for the purpose of generating topographic plans for each excavation unit. At the same time all lots, derived from either natural or cultural events, were treated as surfaces in order that they might be realistically displayed in a three-dimensional space. In essence, a topographical plan was generated for the top, and sometimes the bottom, of each new archaeological lot as it was encountered. Once again, these data were collected using a combination of systematic and intuitive techniques in order to ensure a high-resolution representation of each surface. It is anticipated that a combination of three-dimensionally represented surfaces and a Harris-matrix based analysis of the site stratigraphy will provide a sophisticated and visually intuitive understanding of the subsurface environment of the study area.

The last task required of the survey crew was to place the study area in relation to other recorded surface features. A number of permanent fixtures of the Port Royal Golf Course, including in-ground sprinklers, underground utility conduit covers and like features, were added

to the site map, obviating the need for a permanent datum for future expeditions. At the same time, 19th-century historical documents suggested the presence of a surveyor's benchmark at the intersection between Middle Road and the entrance to the Port Royal Golf Course. There remains a modern benchmark set into the concrete curb at that location. A temporary station was established within sight both of this point and elements of the site grid. The instrument was thus moved to the temporary station and the location of the modern benchmark was added to the site map. At present, use of this observation to place the site on historical maps depends on a number of assumptions. The most pressing of these is the proposal that the modern government benchmark has remained unchanged since its appearance on maps dating to the 19th century. It must also be assumed that historical documents made use of modern magnetic north, or that cardinal directions used by past surveyors can be reconstructed for given times. At the same time other benchmarks somewhat more distant from the site are represented in the document collection housed at the Bermuda Maritime Museum. Future expeditions will attempt to locate these and add them to the Port Royal Site excavation map. Triangulation from two or more points represented on historical maps will serve to place the site in relation to recorded elements of Governor Tucker's 17th-century residence, as well as evaluate the accuracy of these past representations of the landscape.

NOTES

1 The first modern excavation of a domestic dwelling, Tucker House in St. George's, was undertaken in 1973 by Bermudian archaeologist, David Fleming and, beginning in 1988, by Marley Brown, Director of Archaeology, Colonial Williamsburg, Virginia. See Marley Brown, "Review of the Archaeological Work at the Henry Tucker House," *Bermuda Journal of Archaeology and Maritime History*, vol. 6 (1994), pp. 168–93; Dwayne Pickett and Marley Brown, "Archaeology of the Tucker House Kitchen Revisited: Recent Excavations of the Kitchen," *BJAMH*, vol. 10 (1998), pp. 107–23. Other excavation on domestic sites in Bermuda has been carried out, and reported on, by Jonathon W. Bream, "Historical and Archaeological Investigations of the Stanley House, Flatt's Village, Bermuda," *BJAMH*, vol. 3 (1991), pp. 89–113; and Anna Agbe-Davies, "The Ceramic Assembly at the 'Hill House' Site. Hog Bay Park, Sandy's, Bermuda," *BJAMH*, vol. 6 (1994), pp. 129–44.

2 *The Journal of Richard Norwood, Surveyor of Bermuda*, (New York: Scholars' Facsimiles & Reprints, reprinted 1945 [1663]), pp. 64–6.

3 Nathaniel Butler, *Historye of the Bermudaes*, edited by J. H. Lefroy (London: Hakluyt Society, 1882), pp. 102–3.

4 *The Rich Papers. Letters from Bermuda 1615–1646*, edited by Vernon Ives (Toronto: University of Toronto Press, 1984), p. 96. Archaeological evidence of this construction technique was found in the form of hundreds of frag-

ments of clay daub, plaster and lime-based mortar.

5 *Ibid.*

6 Butler, *Historye of the Bermudaes*, p. 111.

7 *Ibid.*

8 Letter from Governor Daniel Tucker to Sir Nathaniel Rich, March 10, 1617/1618, *Rich Papers*, p. 98.

9 Letter Feb. 22, 1617/1618 Robert Rich, *Rich Papers*, p. 52.

10 Edward C. Harris and Kate Meatyard, *Earliest Archaeological Site on Mainland Bermuda*, unpublished notes on file at the Bermuda Maritime Museum, (n.d.), 2.

11 *Rich Papers*, p. 36.

12 Genealogical research cited in the paper was conducted by Linda Abend, Registrar, Bermuda Maritime Museum.

13 It has been suggested that the destruction of the Mansion and subsequent construction of the Grove may be related to the devastation caused by one of two hurricanes known to have visited Bermuda in 1712 and 1715.

14 In 'Grove' research notes on file at the Bermuda Maritime Museum. W12b:252 made 1734 proved 1736.

15 William Zuill, *Bermuda Journey: A Leisurely Guide Book* (Hamilton: Bermuda Book Stores, 1965), p. 345. Zuill believes that the Grove was built on the site of the former Mansion. The fact that this has never been firmly established must however be acknowledged. Additional historical research on the property is necessary to fully document the history of ownership and the structural evolution of the residences.

16 Interestingly, the Grove was not assessed as high as other houses in the area at that time. See the unpublished research notes on the Grove on file at the Bermuda Maritime Museum.

17 In 'Grove' research notes on file at the Bermuda Maritime Museum.

18 M. Richard Norwood, *The Description of the Sommer Islands Once Called the Bermudas*, Introduction by Wesley Frank Craven and Walter B. Hayward (New York: Scholars' Facsimiles & Reprints, 1945), pp. lxxxi–lxxxii.

19 Silvester Jourdan, *Plaine Description of the Barmvdas*, in *The English Experience: its record in early printed books*, facsimile no. 394 (New York: Da Capo Press, 1971), p. F.

20 *Ibid*, p. C6; Lewes Hughes, *A Letter From the Summer Ilands*, in *The English Experience: its record in early printed books*, facsimile no. 391 (New York: Da Capo Press, 1971), p. B1. Norwood comments that tenant farmers worked the land and grew tobacco. Norwood, *The Description of the Sommer Islands*, p. xlvi.

21 See Norwood, *The Description of the Sommer Islands*, p. lxxxi; Jourdan, *Plaine Description*, p. C1.

22 Hughes, *A Letter from the Summer Ilands*, p. B2. According to Hughes, the cats may have been introduced from shipwrecks. Over-hunting of the wild hogs quickly reduced their numbers after only a few years.

23 *Ibid.*

24 See Brown, "Review of the Archaeological Work at Tucker House";

Pickett and Brown, "Tucker House Kitchen"; Bream, "Stanley House"; and Agbe-Davies, "Hill House".

25 Edward C. Harris, *Principles of Archaeological Stratigraphy*, 2nd edition (London and New York: Academic Press, New York, 1989).

26 An on-site inspection by a government hydrologist confirmed that in order for the water table to be at 42 feet the well would have to be situated at this precise elevation above sea level. Constructing a well elsewhere in the hilly topography of the area would mean either a deeper well if it were situated at a higher elevation, or conversely, a shallower well at a lower elevation.

27 Edward Harris uses the term 'stratigraphic unit' to denote layers, features and interfaces, the fundamental elements of archaeological stratigraphy. 'Layer' or 'deposit' is sometimes substituted here in place of the term 'stratigraphic unit.' Lot is a term used by Parks Canada for the excavation of archaeological sites. The term is equivalent to Harris' 'stratigraphic unit,' *Parks Canada Archaeology Manual Volume 1: Excavation Records System* (Canada: Parks Canada, Department of Indian and Northern Affairs, 1977).

28 This aspect of archaeological stratigraphy was first made explicit by Edward C. Harris, in "The Stratigraphic Sequence: A Question of Time," *World Archaeology*, vol. 7 (1975), pp. 109–21.

29 Harris graphically illustrates all possible relationships of stratigraphic units in Fig. 9, p. 36.

30 This is Harris' 4th law of archaeological stratigraphy, the law of 'Stratigraphic Succession'; see Harris, *Principles*, p. 34.

31 It is also possible, given the multilinear sequence shown on the matrix, that phases [3] and [4] are associated with the Mansion. This interpretation was rejected by the author as unlikely because it would have meant that the Grove was constructed on the older foundations of the Mansion. The wall in S10W12 almost certainly relates to the Grove since this was demolished in the 1960s and the destruction surface of this foundation was found just below the sod.

32 The classification scheme used here is adopted from Stanley South, *Method and Theory in Historical Archaeology* (New York: Academic Press, 1977). J. W. Joseph provides a succinct summary of problems identified by other researchers in regard to South's use of artifact Groups to discern patterning in the archaeological record. Yet, despite all of the potential pitfalls, the idea of artifact patterning still has its proponents who point to the utility of the classification scheme as a means of organising and presenting otherwise unwieldy data for comparative study. See J. W. Joseph, "Pattern and Process in the Plantation Archaeology of the Lowcountry of Georgia and South Carolina," *Historical Archaeology*, vol. 23, no. 1 (1989), pp. 55-68.

33 Surfaces are also important in terms of the stratigraphic sequence on a site because they represent as much as 50 percent of the stratigraphic units recorded. As units of study these have been neglected in the past and it is only recently that they have received attention as important analytical units. Edward Harris, personal communication (2004).

34 J. C. Harrington, "Dating Stem Fragments of Seventeenth and Eighteenth Century Clay Tobacco Pipes," *Quarterly Bulletin of the Archaeological Society of Virginia*, vol. 9, no. 1 (1954), pp. 9–13.

35 Lewis R. Binford, "A New Method of Calculating Dates from Kaolin Pipe Stem Samples," *Southeastern Archaeological Conference Newsletter*, vol. 9, no. 1 (1962), pp. 19–21.

36 For an early critique of the method see Iain C. Walker, "Some Thoughts on the Harrington and Binford Systems for Statistically Dating Clay Pipes," *Quarterly Bulletin, Archaeological Society of Virginia*, vol. 20, no. 2 (1965), pp. 60–4.

37 Lee H. Hanson, Jr., "Kaolin Pipe Stems — Boring in on a Fallacy," *The Conference on Historic Site Archaeology Papers*, vol. 4, no.1 (1971), pp. 2–15.

38 Using the Hanson method one applies formula 7 where the date of occupation is unknown (1620–1800) and then substitutes the resulting value into the formula that has the narrowest date range into which this date falls, in this case formula 1 (1620–80).

39 Delft commonly refers to tin-glazed wares produced in Holland and England, although in England the term delft was not even in common use until the 18th century; before then, tin-glazed earthenware was referred to as galley ware. See Frank Britton, *English Delftware in the Bristol Collection* (London: Sotheby, 1982). Majolica wares were produced in Spain, Portugal and Italy; faience denotes French manufacture. Distinguishing the country of origin for delftwares found on early 17th century sites in America is difficult and for this reason the term Anglo-Netherlandish is suggested when these are clearly not majolica originating from Portugal. See Ivor Noël Hume and Audrey Noël Hume, *The Archaeology of Martin's Hundred*, (Charlottesville and London: University Press of Virginia, 2001), p. 161.

40 See Ellen Shlasko, *Delftware Chronology: A New Approach to Dating English Tin-Glazed Ceramics*, M.A. thesis, Department of Anthropology, the College of William and Mary, Williamsburg, Virginia (1989).

41 See Shlasko, *Delftware Chronology*; Michael Archer, *Delftware: The Tin-Glazed Earthenware of the British Isles: A Catalogue of the Collection in the Victoria and Albert Museum* (London: Stationery Office, 1997); John Black, *British Tin-Glazed Earthenware* (Buckinghamshire: Shire Publications, 2001).

42 Shlasko, *Delftware*.

43 *Ibid.*

44 Andrew David Madsen, *"All Sorts of China Ware ... Large, Noble and Rich Chinese Bowls": Eighteenth Century Chinese Export Porcelain of Virginia.* Unpublished M.A. thesis, Department of Anthropology, the College of William and Mary, Williamsburg, Virginia (1995); George L. Miller, Telling Time for Archaeologists, *Northeast Historical Archaeology*, vol. 29, (2002), pp. 1–22.

45 Julia B. Curtis, Perceptions of an Artifact: Chinese Porcelain in Colonial Tidewater Virginia, *Documentary Archaeology in the New World*, Mary C.

Beaudry, editor, (Cambridge: Cambridge University Press, 1988), pp. 20-31; also Christopher I. Sperling and Laura J.Galke, *Phase II Archaeological Investigations at 18ST233 and 18ST329 Aboard Webster Field Annex Naval Air Station, Patuxent River, St. Mary's County, Maryland.* Report to the Department of Public Works, Naval Air Station Patuxent River, St. Mary's County, MD (2001).

46 Maura Rinaldi, *Kraak Porcelain: A Moment in the History of Trade* (London: Bamboo, 1989), p. 66.

47 Jean McClure Mudge, *Chinese Export Porcelain in North America* (New York: Clarkson N. Potter, 1986), pp. 33–4, 87.

48 Overglaze painted porcelain is rare on 17th century sites. See Ivor Noël Hume, *A Guide to Artifacts of Colonial America* (Philadelphia: University of Pennsylvania Press, 1970), p. 261.

49 *Ibid.*, p. 218.

50 John G. Hurst, David S. Neal, and H. J. E. van Beuningen, "Pottery Produced and Traded in North-West Europe 1350-1650," *Rotterdam Papers*, vol. 6 (1986), p. 224.

51 David R.M. Gaimster with contributions by Robin Hildyard, John A. Goodall, Judy Rudoe, Duncan R. Hook, Ian C. Freestone and Mike S. Tite, *German Stoneware 1200–1900: Archaeology and Cultural History*, (London: British Museum Press, 1997), p. 225; Ann B. Markell, *44PG92 — Flowerdew Hundred Site Report* (Virginia: Flowerdew Hundred Foundation, 1990), p. 72; Gisela Reineking-von Bock, *Steinzeug*, 3rd edition (Cologne: Kunstgewerbemuseum Köln, 1986), p. 348.

52 Hume, *A Guide to Artifacts*, p. 114.

53 Michelle Erickson and Robert Hunter, 'Dots, Dashes and Squibbles: Early English Slipware Technology,' in *Ceramics in America 2001*, edited by Robert Hunter (New Hampshire: University Press of New England, 2001), p. 111; Hume, *A Guide to Artifacts*, p. 135.

54 David Barker and Pat Halfpenny, *Unearthing Staffordshire: Towards a New Understanding of 18th Century Ceramics* (Stoke-on-Trent: City of Stoke-on-Trent Museum and Art Gallery, 1990), p. 44; Hume, *A Guide to Artifacts*, p. 121; Julia E. Poole, *English Pottery* (Cambridge: Cambridge University Press, 1995), p. 68.

55 Ivor Noël Hume, *If These Pots Could Talk: Collecting 2000 Years of British Household Pottery* (Milwaukee: Chipstone Foundation, 2001), p. 199.

56 Arnold R. Mountford, *The Illustrated Guide of Staffordshire Salt-Glazed Stoneware* (London: Barrie & Jenkins, 1971), p. 60.

57 Hume, *If These Pots Could Talk*, p. 125.

58 Michael B. Schiffer has written extensively on the subject of archaeological site formation. The reader is referred to the following articles: archaeological context and systemic context, *American Antiquity*, vol. 37 (1972), pp. 156–65; Towards the identification of site formation processes, *American Antiquity*, vol. 48 (1983), pp. 675–706; *Formation Processes of the Archaeological Record* (Albuquerque: University of New Mexico, 1987).

59 Studies on site formation processes with the field of historical archaeology are limited and are concerned for the most part with behavioural implications of privy or trash pit deposit formation on urban sites. Two notable studies dealing with site formation processes in a broader context are contained in Edward Staski, "Surface and subsurface patterns of archaeological materials at Fort Filllmore, New Mexico," *North American Archaeologist*, vol. 10, no. 3 (1989), pp. 205–25; and Site formation processes at Fort Fillmore, New Mexico: First interpretations, *Historical Archaeology*, vol. 24, no. 3 (1990), pp. 79–90. The reader is also referred to two experimental studies examining sherd dispersal: Charles A. Bollong, "Analysis of site stratigraphy and formation processes using patterns of pottery sherd dispersion," *Journal of Field Archaeology*, vol. 21, no. 1 (1994), pp. 15–28; and Alan P. Sullivan, "Artifact scatters and subsistence organisation," *Journal of Field Archaeology*, vol. 22, no.1 (1995), pp. 49–64.

60 Karl W. Butzer, recognized as a pioneer in the field of geoarchaeology, presented an agenda for classifying a wide range of disturbance processes on archaeological sites in *Archaeology as Human Ecology* (Cambridge: Cambridge University Press, 1982).

61 'Scuffage' seems an apt term to describe the type of horizontal displacement that may have occurred on a regularly trodden surface exposed for several decades. See E. D. Stockton, "Shaw's Creek Shelter: human displacement of artifacts and its significance," *Mankind*, vol. 9 (1973), pp. 112–7.

62 P. Villa, and J. Courtin, "The interpretation of stratified sites: a view from underground," *Journal of Archaeological Science*, vol.10, pp. 267–81.

63 Mark G. Stevenson, "The formation of artifact assemblages at workshop/habitation sites: models from Peace Point in Northern Alberta," *American Antiquity*, vol. 50 (1985), pp. 63-81.

64 Schiffer, *Formation Processes of the Archaeological Record*, p. 126.

65 Randomly oriented striations and chipping on the surface of glass, high fired ceramics and lithics have been noted in the following studies: L. H. Keeley, *Experimental Determination of Stone Tool Uses: A Microwear Analysis* (Chicago: University of Chicago Press, 1980); R. Knudsen, "Inference and imposition in lithic analysis," in *Lithic Use-wear Analysis*, edited by Brian Hayden (New York: Academic Press, 1979), pp. 269-81; and J. J. Flenniken & J. C. Haggarty, "Trampling as an agency in the formation of edge damage: an experiment in lithic technology," in *Northwest Anthropological Research Notes*, vol.13, no. 2 (1979), pp. 208–14. For an interesting study on modal artifact size see Justice in H. Pyszczyk, "Site Occupation Length as a Factor in Artifact Assemblage Variability and Frequency," in *Archaeology in Alberta*, compiled by D. Burley, Archaeological Society of Alberta, Occasional Paper 23 (1983) pp. 60–76.

66 J. M. Erlandson, A case study in faunalturbation: delineating the effects of the burrowing pocket gopher on the distribution of archaeological materials, *American Antiquity*, vol. 49 (1984), pp. 785–90.

67 Schiffer, *Formation Processes of the Archaeological Record*, p. 210.

68 These were collected in the field and were counted in the lab. A better measure of the quantity of each material would be weight although this has not yet been done.

69 For a recent exposition of GIS using ArcView see Thomas L. Cuddy, "Appendix: Creating a GIS Project in ArcView," *Northeast Historical Archaeology*, vol. 32 (2003), pp. 107–21.

70 Artifact density plots are discussed in Thomas L. Cuddy, "Spatial Analysis and Archaeological Resources in the Finger Lake National Forest," *Northeast Historical Archaeology*, vol. 32 (2003), pp. 95–100.

71 See James E. Smith, *Slavery In Bermuda*, (New York: Vantage Press, 1976); Virginia Bernhard, *Slaves and Slave Holders in Bermuda 1616–1782* (Columbia: University of Missouri Press, 1999).