

PHASE IB/II SUPPLEMENTAL ARCHAEOLOGICAL SURVEY, GEOMORPHOLOGICAL ASSESSMENT, AND REPORT CLARIFICATION SugarHouse Casino Site (36Ph137)

941-1025 North Delaware Avenue, City of Philadelphia,
Philadelphia County, Pennsylvania

ER# 07-0722-101

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June 2008

DRAFT

**Phase IB/II Supplemental Archaeological Survey,
Geomorphological Assessment, and
Report Clarification**

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ABSTRACT

The following report details the methods and findings of a Supplemental Phase IB/II archaeological and geomorphological study conducted in May 2008 by A.D. Marble & Company of Conshohocken, Pennsylvania, on the proposed HSP Gaming L.P.-SugarHouse Casino project in the city of Philadelphia, Philadelphia County, Pennsylvania. In November and December 2007, A.D. Marble & Company conducted an identification and evaluation-level archaeological survey on the 22.6-acre development parcel that is situated on the bank of the Delaware River in the Kensington section of Philadelphia. A Phase IB/II report was submitted in February 2008 to the archaeological staff at the Pennsylvania Historical and Museum Commission (PHMC) for review. Comments from the PHMC were distributed in a March 26, 2008, letter addressed to the U.S. Army Corp of Engineers, Philadelphia District. That letter outlined several issues that the PHMC thought were not fully addressed during the Phase IB/II field work or fully explained within the February 2008 Phase IB/II report. Additional work was requested to include a more focused Phase IB/II archaeological investigation and a more comprehensive geomorphological study. A.D. Marble & Company responded by developing a work plan strategy based upon the PHMC guidance and implementing it in May 2008. Daniel Wagner, Ph.D., conducted additional geomorphological analysis at the same time on certain areas of the property. In addition to the field work, the PHMC asked for clarifications regarding the evaluation process for features and for specific additional information. This additional information appears in this report as do the results from the additional archaeological and geomorphological studies.

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1.0 INTRODUCTION

1.0 INTRODUCTION

1.1 Project Background

In May 2008, A.D. Marble & Company of Conshohocken, Pennsylvania, conducted a supplemental identification and evaluation-level archaeological survey within specific locations on property proposed for the HSP Gaming L.P.-SugarHouse Casino project located in the city of Philadelphia, Philadelphia County, Pennsylvania (Figure 1). The ongoing archaeological study took place within specific locations of the subject property based on guidance from the Pennsylvania Historical and Museum Commission. The following report presents the results of the supplemental investigation within the approximate 22.0-acre parcel.

The purpose of this supplemental archaeological investigation is to identify any remains associated with a 1777 British Redoubt, the eighteenth-century shoreline to the Delaware River, and potentially buried prehistoric ground surfaces. The request for additional investigation of specific targets was based on analysis by the archaeological staff at the PHMC, who took into account commentary from consulting parties in regard to A.D. Marble & Company's report of February 2008, *Phase IB/II Archaeological Investigation SugarHouse Casino Site (36Ph137)*. A.D. Marble & Company of Conshohocken, Pennsylvania, performed this Phase II Investigation during November and December 2007 at the request of HSP Gaming L.P., Philadelphia, Pennsylvania. A.D. Marble & Company project staff included Jason Vendetti (Project Manager), Judson Kratzer (Principal Investigator), and Richard White (Field Supervisor/Secondary Author). Both Mr. Kratzer and Mr. White led the supplemental investigation and have authored this report. The supplemental work was designed to either identify the existence of significant archaeological resources or demonstrate that certain potential resources no longer exist as significant archaeological deposits based on Section 106 criteria of the National Historic Preservation Act of 1966, as amended. An extensive geomorphological study was conducted in conjunction with the archaeological investigation by Dr. Daniel Wagner.

The supplemental work was conducted in accordance with the requirements set forth by the Pennsylvania Historical and Museum Commission, Bureau for Historic Preservation (PHMC-BHP) in *Cultural Resource Management in Pennsylvania: Guidelines for Archaeological Investigations* (2001).

The investigation was performed in accordance with federal and state laws that protect cultural resources. These mandates include: Section 106 of the National Historic Preservation Act of 1966, as amended, 49 U.S.C. § 470f: *Protection of Historic and Cultural Resources*, 36 CFR 800; Executive Order 11593: Pennsylvania History Code of 1970, as amended, 37 Pa.C.S.A. §§ 507, 508, and 510; the National Environmental Policy Act of 1969, 42 U.S.C. §§ 4331 (b) (4) and 4332; and the Archaeological and Historic Preservation Act of 1974, 16 U.S.C. § 469 et seq.

1.2 Project Location and Description

The 22.6-acre development parcel is located along the Delaware River waterfront in the Kensington section of Philadelphia (Figure 2). Currently an open lot, the parcel last served as an expansive area of industrial and railroad activity. No buildings are currently standing on the parcel, but the remains of large expanses of concrete surfaces, roadways, railroad tracks, and piers/slips are still present (Figure 3; Photographs 1 to 4).

The physical Area of Potential Effect (APE) has experienced an extensive array of historical development and change. Eighteenth-century developments included residential settlement, construction of piers into the Delaware River, and shipbuilding as well as the erection in 1777 of Redoubt No. 1, part of the British Northern Line of Defense of Philadelphia. Wharf, pier, and business expansion along the Delaware's banks continued in the early and mid-nineteenth century (Figure 4). Residential development within the APE was heaviest in the second half of the nineteenth century (Figure 5).¹

By the late nineteenth century and the early twentieth century, most of the residential structures within the APE were razed to make way for rail yards and warehouses, expanded pier facilities, and industrial enterprises. One of the major industrial operations within the APE at that time was the Pennsylvania Sugar Company's factory complex located on the east side of Penn Street. Another industrial complex, the Beach Street Power Station, stood at the south end of the project area (Figure 6; Photographs 5 and 6).

¹ Refer to Figures 4-25 in Appendix B of Volume II of A.D. Marble & Company's February 2008 report, *Phase IB/II Archaeological Investigation SugarHouse Casino Site (36Ph137)* for a full understanding of the historical development along the Kensington shoreline.

1.3 Review of Previous Investigations

The earliest archaeological and historical investigation conducted on the subject property included a Geographic Information System-based (GIS-based) historic map survey and a geomorphological assessment. This study identified potential locations of precontact (Native American) and historic archaeological resources within the APE (A.D. Marble & Company 2007a). The subsequent Phase IB survey (A.D. Marble & Company 2007b) defined areas of heavy disturbance and confirmed areas of potentially intact archaeological remains (A.D. Marble & Company 2007b).

Due to the nature and extent of the potential archaeological resources identified within the APE, coordination and consultation with the Pennsylvania Historical and Museum Commission (PHMC) was recommended and an on-site meeting between the archaeological consultants, the PHMC staff, and the applicant was held on October 25, 2007. It was agreed that a Phase II study of identified resources in four specific areas should be conducted.

The next stage of field work included additional identification-level investigation in specific areas of the subject property where the locations of shaft features and remains of the Revolutionary War redoubt have been surmised. The purpose of the Phase II Archaeological Investigation is to determine the extent and integrity of the yard areas of late-eighteenth- and nineteenth-century residential lots, shaft features, alleyways, and courtyards that were identified during the Phase I Survey. Phase II testing occurred in the rear yards of the houses that once lined Delaware Avenue, Laurel Street, and Penn Street in the nineteenth century. Phase II testing also included a large scale stripping exercise of fill soils. The stripping exercise attempted to locate any archaeological remains of the redoubt from the British Line of Defense in 1777 when English army and Hessian soldiers occupied Philadelphia during the winter of 1777-78 during the Revolutionary War (Figure 7). Although no remains of the redoubt were found at that time, six of 19 identified shaft features were determined to possess significant archaeological information. In addition, a small Native American site likely dating to the Late Archaic period (ca. 3000-1000 B.C.) was identified and determined potentially eligible for National Register listing.

A report was prepared entitled *Phase IB/II Archaeological Investigation, SugarHouse Casino Site (36Ph137)* (A.D. Marble & Company February 2008) and distributed to the U.S. Army Corps of Engineers (USACE), the archaeological staff of the PHMC, and to consulting parties identified by USACE. The February 2008 Phase IB/II report recommended that the six significant shaft features and the precontact site be subjected to an archaeological data recovery study to mitigate the adverse effects to these resources by the proposed project.

As per the Section 106 process and the USACE's request, the archaeological staff at the PHMC reviewed the report to assess its conformity with federal and state guidelines and its adequacy of methodology, as well as to scrutinize the results and recommendations. The PHMC provided consultation commentary in a letter dated March 26, 2008 (Appendix A). PHMC outlined eight separate aspects of the project that needed to be further resolved. They requested additional identification-level archaeological investigation focused on remains of British Redoubt No. 1 and the 1777 Delaware River shoreline, additional geomorphological analysis of the fast land and the river shoreline, additional supporting documentation of several interpretations in the report, and editorial corrections. They were particularly concerned that Items 1 to 5 from their letter needed immediate attention in order to construct a Memorandum of Agreement between the applicant and the USACE (Appendix A). The requested steps include

- 1) Additional mechanical stripping in the area where British Redoubt No. 1 most likely stood during the Revolutionary War;
- 2) Additional mechanical trenching aligned with the landward side of the shoreline based on the 1797 Hills map shown in the February 2008 Phase IB/II report;
- 3) Additional mechanical trenching to the north and east of Trench 16 as depicted in Figures 12 and 45 of the Phase February 2008 IB/II report;
- 4) Additional geomorphological investigation within the former locations of the Pennsylvania Sugar Refining Company and the Beach Street Power Station; and
- 5) Clarification as to evaluations of specific shaft and building features and yard areas.

1.4 Proposed Supplemental Work

The additional archaeological field work and geomorphological studies requested by the PHMC were carried out by A.D. Marble & Company staff and Dr. Daniel Wagner, Ph.D., Pedologist, of Geo-Sci Consultants, Inc. in May 2008. This document reports on the supplemental field studies and addresses the pertinent concerns in Items 1 to 5 of the March 26, 2008, PHMC letter. The other issues listed in the letter will be addressed within the final report, which will detail the data Recovery Program and other mitigation procedures, in the near future.

A Scope of Work and a plan depicting the proposed archaeological and geomorphological field work (Figure 8) was compiled by A.D. Marble & Company based on the PHMC requests that were submitted to the USACE and the PHMC before field work began. The scope addressed each of the five items of concern to the PHMC prior to compiling a Programmatic Agreement. The scope included (see Appendix A):

- 1) mechanical stripping of the overburden through the excavation of at least three ten-foot-wide trenches west of Trench 17 in order to identify features or artifacts possibly associated with British Redoubt No. 1;
- 2) excavation of four 20x10-foot trenches along the landward edge of the 1787 shoreline of the Delaware River;
- 3) excavation of a long trench along the eastern edge of Penn Street and west of Trench 16 and the excavation of two trenches positioned perpendicular to Penn Street, extending 100.0 feet to the east; the long trench enabled archaeological documentation of any disturbances from various historical and modern construction and destruction events, particularly those associated with the buildings of the former Pennsylvania Sugar Refining Company and additional assessment for possible portions of British Redoubt No. 1; the two perpendicular trenches enabled additional archaeological assessment for possible portions of the British Redoubt No. 1.
- 4) excavation of a trench within the footprint of the Beach Street Power Station in the southern end of Historic Area H-1;

- 5) addition of information and details about the evaluation process of specific shaft features, a group of archaeological features, and yard areas identified during the February 2008 Phase IB/II investigation;
- 6) production of an addendum report detailing the methodology, results, and conclusions drawn from the supplemental study.

2.0 ENVIRONMENTAL SETTING

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2.1 Environmental Setting

The project area is situated within Pennsylvania's relatively small Coastal Plain Physiographic Province. Elevations within the APE range from sea level at the river to approximately 16 feet above mean sea level (AMSL) near Delaware Avenue. This province is characterized by geologic materials composed of variously textured, unconsolidated deposits that range widely in age and were derived mostly from fluvial or estuarine forms of sedimentation. Confined to the southeastern corner of the state, the coastal plain is distributed as a narrow belt aligned generally parallel to the Delaware River and typically extending to distances of no more than approximately two to nine miles from the river. In the vicinity of the APE, Coastal Plain deposits range landward approximately three miles; of this area, only about a one-mile swath adjacent to the river is not within the mixed geological setting known as the fall zone. This zone, in which elements of both the Coastal Plain and Piedmont are intermingled, contains the mica schist rocks of the Paleozoic Age Wissahickon Formation typically found at lower levels of incised valleys. The Coastal Plain also contains the variegated and texturally diverse sediments of the Lower Cretaceous Potomac Group at higher positions.

The predominant geologic material in the investigation area consists of Quaternary Age deposits episodically amassed in response to the sea level fluctuations of Pleistocene glacial cycles. According to the Pennsylvania State Geological map, the APE is underlain by the Quaternary Trenton Gravel Formation (Qt) (Socolow 1980). This consists of gray to pale reddish brown, very gravelly sand interstratified with cross-bedded sand and clay-silt deposits. This formation also includes areas of Holocene alluvium and swamp deposits (Socolow 1980). Existing tidal estuarine conditions represent only the latest stage in this cycle of rising and falling sea level. With much lower sea stands during most of the Holocene, what is now the Delaware River estuary was simply an inland stretch of a strictly riverine valley. This now-drowned valley probably contained a sequence of floodplain and river terrace landforms that have long since been destroyed or inundated by the marine transgression. Gradually progressing up the Delaware Valley through the Holocene, encroaching brackish conditions would not have reached the nearby stretch of the Delaware River until about the second half of the Holocene. Actual

breaching of the channel to form the broader estuary probably occurred a few thousand years after this, and it is therefore only relatively late inhabitants of the region who would have been familiar with the project location as a near-shoreline tidal setting. For groups predating the Woodland period, the project area would simply have been an interior position several hundred yards removed from the river. Assuming that the river has always been a focus for human activity, the project area may have been remote to earlier populations whose primary occupation centers were concentrated closer to the river.

3.0 FIELD METHODOLOGY

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From May 13 to May 21, 2008, archaeological survey and additional geomorphological field work was carried out in Historic Areas H-1, H-2, and H-3 during the supplemental survey. The field work followed the work plan discussed above and depicted in Figure 8 to the best possible extent. Modifications to the plan were made in the field based on conditions exposed by the field work. All areas where actual subsurface excavation (Photograph 7) took place are shown on Figure 9. The particular areas where excavation took place were designated Beach Street Power Station numbers 1, 2, 3, and 4 (ex. BSPS 1; Figure 10); GeoTrenches 1 to 9 (Figure 11); and Sugar Refinery Trenches 1 to 6 (ex. SRT 1; Figure 12).

3.1 Geomorphological Investigation

A broader and more comprehensive geomorphological study was conducted during the supplemental survey. Four trenches (GeoTrenches 1 to 4), measuring approximately 20x10 feet, were excavated on the landward edge of the 1787 shoreline for the Delaware River. Their locations within Historic Areas H-1 and H-2 are shown on Figure 9.

In addition to these specific trenches excavated for soil analysis, the geomorphological consultant (Photograph 8) also inspected trenches positioned within the former locations of the Pennsylvania Sugar Refining Company and the Beach Street Power Station (Photograph 6). He inspected BPS 1 and 4, GeoTrenches 6 and 7, and SRT-2, 3, and 5 (Figure 9).

3.2 Archaeological Investigation

The archaeological supplementary survey has several goals, most notably to investigate a larger area for the location of remains belonging to the Revolutionary War period British Redoubt No. 1. This was done by additional mechanical trenching to the north and east of Trench 16 as depicted in Figures 12 and 45 of the February 2008 Phase IB/II report and additional trenching west of Trench 17, which ran parallel to Penn Street and was excavated during the February 2008 Phase IB/II study.

Another goal was to assess whether any historic ground surfaces remain in the southern half of Historic Area H-1 where the Beach Street Power Station once stood. A 150x10-foot-wide linear trench, positioned 30 feet west of and parallel to Penn Street, covering the area where the Beach Street Power Station once stood was proposed. The plan was altered when it was learned during the early excavation of this trench that the power station construction had reached depths of nine feet and that massive pieces of building demolition extended from the surface to the nine-foot-deep basement floor of the former building. Smaller trenches were excavated in order to demonstrate the extent of destruction.

A third goal was to document disturbances or note intact soils along the eastern edge of Penn Street and west of Trench 16. A 300-foot trench was proposed to enable archaeological documentation of any disturbances from various historical and modern construction and destruction events, particularly those associated with the buildings of the former Pennsylvania Sugar Refining Company. This trench was to provide additional assessment for possible portions of British Redoubt No. 1. Two perpendicular trenches, extending up to 100 feet to the east, were proposed and excavated. This proposed excavation was modified in the field when it became apparent that the sugar refinery demolition was extensive and extended deep below the current ground surface. Therefore, smaller areas were excavated within the general concept of the proposed trenching.

Where practical and safe, areas that were trenched or stripped mechanically of modern overburden were cleared of debris by hand to expose any foundation ruins, shaft features, alleyways, yards or pits possibly associated with former redoubts, other historic buildings, or structures. Newly identified features were recorded by planview and/or profile drawing, as well as photographic documentation. Subsurface testing was undertaken when it was necessary to establish a feature's archaeological integrity and to determine the National Register eligibility of newly identified feature(s).

4.0 RESULTS OF INVESTIGATIONS

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4.1 Historic Area H-1 – GeoTrench 1

Historic Area H-1 is located in the southwest portion of the proposed Sugar House Casino site between Delaware Avenue and Penn Street south of Laurel Avenue. The northern portion of Historic Area H-1 had undergone extensive Phase I investigation and a Phase II evaluation in 2007 at which time a pre-contact site and a number of historic shaft features were identified within what would have been residential back yards. The southernmost portion of the area was not subjected to investigation due to the perceived amount of destruction caused by the former Beach Street Power Station that stood from the late nineteenth century into the twentieth century (Photograph 6). The construction of such a large, pile-supported structure of concrete, iron, and brick undoubtedly had a severe and detrimental impact on surface horizons to a depth exceeding the era of pre-contact occupation in the Middle Atlantic Region.

However, given the presence of intact soil horizons within the northern portion of the historic area and the overall paucity of pre-contact sites within the city limits of Philadelphia, it was determined that some type of investigation should take place in the southern section of the area. In response to suggestions made by representatives of PHMC, a single GeoTrench and a single linear trench were proposed for Historic Area H-1 to investigate the possibility of intact artifact-bearing ground surfaces. Each trench was thought to have the ability to show the industrial evolution of the southern portion of Historic Area H-1 and to provide information on the extent of destruction caused by construction of the power station.

GeoTrench 1, measuring 12x20 feet, was mechanically excavated between two concrete pads near Delaware Avenue (Figure 10). Nearly eight feet of demolition debris was removed from the trench and a number of construction features associated with the power station were identified, including iron reinforced concrete pillars and a poured concrete floor that covered the entire base of the GeoTrench (Photograph 9). Remains of the power station, including all the construction features, were given the single feature number 172. No intact historic or prehistoric soil horizons were noted anywhere in GeoTrench 1.

A single linear trench, designated Beach Street Power Station 1, was started between the eastern-most concrete pad and Penn Street at the southern end of Historic Area H-1. However, as mechanical excavation proceeded, it was determined in the field to alter the original plan of a long trench and proceed with an interstice methodology. The result was that four individual blocks were mechanically excavated along the proposed line separated by arbitrary intervals (Photograph 10; Figure 10). They have been labeled BSPS 1 to 4.

BSPS 1, measuring 12x15 feet, was excavated at the very southern end of Historic Area H-1 to a depth of 6.5 feet below the present ground surface. Trench fill consisted of demolition debris, bricks, mortar, iron scraps, and decaying machinery. Excavation proceeded to the top of a poured concrete floor (Photograph 11). BSPS 2 was excavated approximately 40 feet north of BSPS 1.

BSPS 2, measuring 10x17 feet, was excavated to a depth of four feet below ground surface to a layer of impenetrable iron-reinforced concrete (Photograph 12). Similar to BSPS 1, fill consisted of demolition rubble, mortar and bricks, and cables and wire. A concrete construction that appears to be a foundation wall was located along the southern edge of the trench.

BSPS 3, measuring 11.5x18.5 feet, was excavated 33.0 feet north of BSPS 2 to a depth of 2.9 feet below the ground surface due to a layer of impenetrable iron rebar reinforced concrete (Photograph 13). A second concrete block, similar to the one identified in the previous trench, was located at the northern edge of the trench. Again, fill was similar to that observed in previous trenches.

BSPS 4, measuring 10x12.5 feet, was excavated 30 feet north of BSPS 3. Mechanical excavation revealed a deep profile of rubble and disarticulated earthen fill north of what appears to be a brick foundation wall (Photograph 14). The trench was excavated to gray colored clay subsoil 9.5 feet below the present ground surface.

Due to the depth of disturbance as shown by all five trenches excavated within the southern portion of Historic Area H-1, it is highly likely that intact ground surfaces, with the potential to contain pre-contact resources, are no longer present within the foot print of the former Beach

Street Power Station. Therefore, no further archaeological consideration in this area is recommended.

4.2 Historic Area H-2 – GeoTrenches 2, 3, 4, 5, 6, 7, 8, and 9

Historic Area H-2 spans the northwestern section of the proposed SugarHouse Casino site from Delaware Avenue, Penn Street, and Laurel Avenue to the south to Shackamaxon Street to the north. A total of eight GeoTrenches (2 to 9) were mechanically excavated and the majority was subjected to geomorphological evaluation by Dr. Daniel Wagner of Geo-Sci Consultants, Inc. Fifteen features were identified during the mechanical investigation of Historic Area H-2. Seven were defined as shaft features, two were brick walkways, five were associated with rubble-filled foundations, and one was a modern utility line.

GeoTrench 2 (Photograph 15; Figure 13) was located in the southeastern corner of Area H-2. Measuring approximately 15 feet square, it was excavated to a depth of 6.2 feet. Disturbed cinder fill capped the entire trench excavation through the first two feet. Distinctly different deposits were then identified; essentially the north half of the trench exposed natural soils while the southern half consists of mottled demolition back-fill that covered the wooden sub-structure of one of the railroad bumper blocks that exists at the south end of Historic Area H-2.

GeoTrench 3 was excavated approximately 210.0 feet north of Laurel Street and 100 feet west of Penn Street in Historic Area H-2 for the purpose of geomorphological investigation by Dr. Wagner. GeoTrench 3 was excavated as a rectangular block through fill horizons and nearly two feet of banded, modern alluvium exposing Pleistocene-aged subsoil. The south wall profile of GeoTrench 3 (Figure 14; Photograph 16) shows a thin layer of coal ash and cinder fill overlying 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil. A band of dark 7.5 YR manganese infused soil is present between bands of subsoil.

GeoTrench 3 began as a simple rectangle similar in size to GeoTrenches 1 and 2. At the request of Dr. Wagner, the trench was expanded to the west and south to expose a larger area for investigation. The westward trench expansion extended 15.0 more feet when it encountered

disturbance caused by the construction and demolition of the Shackamaxon Freight Station. The trench expansion that went in a southward direction exposed Feature 173, a brick lined shaft feature. The soil profiles in the two expanded trenches were similar to the south wall profile shown in Figure 16.

GeoTrench 4 was excavated 570.0 feet north of the intersection of Laurel and Penn Streets and 40.0 feet west of Penn Street. The trench measured 20.0 feet long and ten feet wide for investigation and evaluation by Dr. Wagner. The west wall profile (Figure 15 and Photograph 17) consisted of modern fill horizons overlying 10 YR 6/6 brownish yellow mottled with 10 YR 6/2 light brownish gray, 10 YR 3/6 dark yellowish brown and 10 YR 5/6 yellowish brown loamy sandy bands of recent alluvium overlying 10 YR 5/3 brown loamy sand with cobbles and 7.5 YR 4/4 brown compact loamy sand Pleistocene-aged subsoils.

The southern edge of GeoTrench 4 cut into a coal ash, cinder, and demolition debris filled foundation hole that had been identified as Feature 54 during the earlier Phase IB investigation (A.D. Marble & Company 2007b). Fifteen historic artifacts were recovered from the demolition fill during the excavation of GeoTrench 4. Artifacts consist of bottle glass, ironstone ceramic fragments, a single piece of whiteware, and a bathroom tile fragment. All the recovered artifacts date to the nineteenth century and came from disturbed contexts. No further investigation of the feature was carried out.

GeoTrench 5 was mechanically excavated along the western edge of February 2008 Phase IB/II Trench 17, approximately 190.0 feet from the corner of Laurel and Penn Streets to investigate the unexcavated area between Trenches 6 and 17 (Figure 21). Geo Trench 5 measured 75 feet in length and varied between 10.0 and 12.0 feet in width (Photographs 18 and 19). The first 28 to 30 feet of the trench consists of Feature 183, a rubble filled foundation. Feature 186 was also identified in the base of the trench excavation at the interface between the alluvial soils and the Pleistocene cobble soils. The soil stain, considered a possible part of the moat surrounding the Redoubt, was treated as a feature. It was sampled by shovel test after cleaning, drawing, and photographing its configuration, (Figure 16; Photograph 20). This procedure helped determine that the stain was merely a deeper pocket of the alluvial soil and not a cultural feature. The

remainder of the trench consisted of 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand modern alluvium (banded sands) over 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged soils with a considerable amount of cobbles and gravels beneath several fill horizons. GeoTrench 5 excavation was halted when it reached the juncture of Trench 5 (A.D. Marble & Company 2007b) and Trench 17, which were excavated during the February 2008 Phase IB/II investigation.

Overlying fill horizons extended below the present grade at varying depths between 1.5 and two feet. Feature fill depths extended more than five feet below the present grade and terminate within Pleistocene-aged subsoil.

GeoTrench 6 (Figure 17) was excavated approximately ten to 12.0 feet west of GeoTrench 5 and 160.0 feet north of the northern edge of Laurel Street. The trench measured 225.0 feet in length and varied from ten to 12.0 feet in width. From south to north, the first 35.0 to 40.0 feet consisted of rubble fill associated with Features 175 and 183 over 7.5 YR 5/6 strong brown sandy clay loam with cobbles and gravels (Photographs 21 to 27). The rubble fill was comprised of cinders, ash, brick, and mortar rubble with occasional foundation stones throughout. A portion of modern alluvium, consisting of 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand separated Features 175 and 173.

From 40.0 feet to approximately 160.0 feet, going north, the trench profile consisted of several layers of ashy and cindery fill overlying 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil. Modern, banded sand alluvium was exposed between 1.5 and two feet below present grade and extended approximately three to four feet below surface.

From 160.0 to 182.0 feet, the trench profile depicted the remains of a foundation that had been demolished and filled with architectural rubble and cindery, ashy soil. At 182.0 feet, a column of Stratum V soil, 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand, separated Feature 184 and 185. Feature 185 was very similar to Feature 184 in content. Feature 185 was truncated by Trench 6 during Phase II evaluations in Historic Area H-2.

GeoTrench 7 (Figure 18) was excavated parallel to GeoTrench 6. It measured 210.0 feet in length and varied between ten and 12.0 feet in width. The first 27.0 feet, from south to north, consisted of Features 175 and 183, which are described in various locations within this text and shown in Photograph 28.

From 27.0 to 140.0 feet, the east wall profile of the trench depicted the soils as several layers of dark modern fill overlying 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil (Photographs 29 and 30).

Features 184 and 185, rubble-filled foundations, were present from 140.0 to 190.0 feet within the trench (Photographs 31 and 32). At the 170.0-foot mark, a column of 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil separated the two features. The typical soil profile identified at the center of the trench was present north of Feature 185 and consisted of 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil (Photograph 33).

GeoTrench 8 was excavated approximately ten to 12.0 feet west of GeoTrench 7. The trench, which began even with GeoTrench 7 along that trench's southern end, extended north 225.0 feet and measured between ten and 12.0 feet wide. Figure 19 shows the west wall profile of the trench, of which the first 12.0 feet consisted of the remains of Feature 175, a rubble-filled foundation (Photograph 34). Feature 183, present within GeoTrenches 5 to 7, was not present within the west wall profile as it terminated just west of the east wall of GeoTrench 8.

From 15.0 to 30.0 feet, the profile consisted of fill horizons over 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil (Photograph 35).

Beginning at approximately 27.0 feet and extending to 60.0 feet, remains of Trench 5, excavated and backfilled during Phase II evaluations, were present overlying 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil.

From 55.0 to 155.0 feet, the profile consisted of 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil. The backfilled soil profile of Feature 174 was present in the west wall of the trench from 145.0 to 150.0 feet.

From 155.0 to 225.0 feet, the soil profile consisted of a fill horizon over slightly different soils from those identified within previous trenches. Beneath the fill horizons, a 2.5 YR 6/4 light reddish brown fine sand mottled with 7.5 YR 5/6 strong brown coarse sand sat above a slightly darker subsoil of 2.5 YR 5/3 reddish brown loamy sand. A pocket of ash and coal fill combined with unconsolidated brick and mortar had collapsed down into the profile at approximately 175.0 and 195.0 feet respectively (Photographs 37 to 39).

GeoTrench 9, shown in Figure 20, was excavated just north of the Trench 5 location, approximately 12.0 to 15.0 feet west of GeoTrench 8 and extending north 155.0 feet. The trench measured approximately ten feet wide. The west wall profile, from 0.0 to 11.0 feet, showed fill over 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil just south of Feature 176 shaft feature fill.

The west wall profile of GeoTrench 9, from 18.0 to 155.0 feet, consisted of fill horizons over 7.5 YR 5/6 strong brown sand mottled with 10 YR 5/6 yellowish brown sand above 7.5 YR 5/6 strong brown sandy clay loam Pleistocene-aged subsoil. The typical soil profile was broken up by a number of shaft feature fill profiles, two brick wall and walk features, and a few pockets of cindery ash fill (Photographs 40 to 45).

4.3 Shaft Features

A total of seven circular, brick-lined, shaft features were identified during the supplemental work within Historic Area H-2 (Figure 21). A single brick-lined shaft feature was identified within GeoTrench 3, a wood-lined rectangular shaft feature was identified in GeoTrench 8, and five brick-lined shafts were identified within GeoTrench 9. The brick-lined shafts were all unmortared, devoid of flooring, and appeared to have been cleaned out and refilled during the nineteenth century. Shafts varied in diameter and depth and appeared to be associated with eighteenth- and nineteenth-century lot divisions located along the eastern side of Delaware Avenue. Shafts appeared to fall in a relatively straight line, parallel to the street, and along the rear border of the lots. Each feature showed evidence of demolition of its upper portions.

Preliminary investigation of the brick-lined shaft features was conducted using a trackhoe to bisect the feature and determine if intact soil deposits were present. This method was also conducted during the initial Phase IB/II excavation (A.D. Marble & Company February 2008). Recording of features, including planview drawings and photography, preceded the mechanical bisection of the shafts. The shafts were bisected along the exposed trench edges to a depth below the feature terminus, profiles were drawn, and photography was completed. Shaft features that contained intact deposits were evaluated in the field and consideration for future investigation, based on artifact presence, stratigraphic separation, and temporal designation, was determined.

Of the six circular brick lined shaft features, one (#1) contained a shallow, intact deposit that contained a number of nineteenth century artifacts 11 to 12 feet below the surface. Controlled hand excavations were used to determine the significance of Feature 174, a wood lined shaft feature, exposed during GeoTrench 8 excavation. The feature was bisected within a 4.0x4.0-foot-square test unit to a depth of one foot below its initial identification. The feature was covered and preserved for future archaeological consideration.

Feature 173 (Photograph 46) was a brick-lined shaft feature located during the excavation of GeoTrench 3 in Historic Area H-2. The surface of the feature originated beneath three layers of modern fill and appeared to have been excavated through the modern alluvium or bands of sandy soil. Evidence of the shaft surface was present approximately one foot below the present ground

surface; however, the brick lining was not evident until mechanical excavation exceeded two feet below the present grade.

The shaft feature measured approximately 5.2 feet in circumference and was relatively round in shape. Figure 22, a planview of the feature surface as it was exposed within the GeoTrench, is representative of the majority of circular brick-lined shaft features exposed during this phase of the investigation. Feature 173 was mechanically bisected along its eastern edge, exposing the interior fill. Feature fill consisted of unconsolidated cinders, ash, 10YR 2/1 black sandy ash mottled with 10YR 6/4 gray sandy soil and brick rubble. The shaft extended into and past modern alluvium horizons, through a thick layer of coarse sand and cobbles, and into a grayish sandy Pleistocene soil before it terminated (Photograph 47). There was no cultural material observed during the mechanical investigation. The shaft appeared to have been cleaned out and filled some time during the later nineteenth century.

Feature 174 (Photograph 48) was a unique shaft feature within the project's APE in regard to its composition. Its wood rather than brick-lining, and its rectangular rather than circular shape, distinguish it from the other shaft features in Historic Area H-2. Its function remains unknown. There was a cylindrical post approximately two inches in diameter located in each of the corners and a 1.5-inch-wide builder's trench surrounding the exterior of the shaft. The feature measured 3.9 feet by 3.2 feet with the wooden framing and round posts becoming more defined as excavation continued downward (Figure 23). The feature was cleaned, profiled (Figure 24), and initially investigated with a 4.0x4.0-foot-square test unit.

Feature 174 was initially identified directly below two layers of modern fill and appeared as a typical shaft feature in profile that extended more than four feet below the present ground surface. No feature lining was observed during initial trench excavations. The feature was bisected north and south and fill was removed in two 6-inch levels. Based on the artifact material recovered and the unique nature of the shaft feature construction, it was determined that enough data had been generated to conclude that this feature was a significant archaeological entity and should be included in future mitigation studies. Feature fill consisted of 10YR 5/1 gray sandy clay mottled with 10YR 5/3 brown sandy clay with chunks of brick. Artifacts were recovered

throughout the feature and included flat glass, bottle glass, and fragments of whiteware (Photograph 49). A pocket of dark, ashy, coal yielded several pieces of knitted or woven cloth. Samples of brick, wood, and charcoal were retained from each half of the excavation. No artifacts were recovered from the builder's trench or surrounding subsoil.

Attempts to determine the depth of the feature were unsuccessful. The rocky nature of the subsoil surrounding the exterior and the brick-laden matrix of the interior feature fill prevented auger and split-spoon probe attempts to determine how deep the shaft continued below the controlled excavation. A shovel test pit was attempted along the exterior of the feature but displacement of cobbly soils greatly threatened the integrity of the wood lining and jeopardized the potential for future investigation.

Feature 174 is likely associated with Lot 41/43 near what would have been the location of a long building in the eastern corner of the lot (Feature 184). Lot 41/43 appears to be a single lot that extends the length of the block between Beach Street and Delaware Avenue (Figure 21). The lot contained a single building along Beach Street and the aforementioned building along Delaware Avenue. It is unknown if Feature 174 is associated with either of the buildings.

Due to the nature and type of construction of the feature, and its potential to yield intact artifact deposits, it is our opinion that the feature is significant and can add new information to the archaeological record.

Feature 176 (Photograph 50) is a large circular brick-lined shaft feature identified during the excavation of GeoTrench 9 in Historic Area H-2, the trench closest to Delaware Avenue. The feature was identified in profile beneath three modern fill horizons to a depth of approximately five feet below the present ground surface. The shaft fills at five feet below ground surface measure approximately eight feet in circumference. Bricks lining the exterior of the shaft were present below six feet from the present ground surface and extended to the shaft's termination. The interior of the shaft was filled with sloping layers of unconsolidated fills including cinders, ash, slag, brick fragments, and building mortar. Mechanical investigation of the shaft revealed its

termination within sandy Pleistocene age soils at approximately 9.5 feet below the ground surface (Photograph 51; Figure 25).

The vast majority of observed artifacts from Feature 176 consist of demolition rubble and a few fragments of redware, whiteware, and stoneware ceramics scattered throughout the demolition fill. Feature 176 did not contain any intact or significant artifact deposits that will require further archaeological consideration.

Feature 177 (Photograph 52) was a circular brick lined shaft feature located in the east wall of GeoTrench 9 in Historic Area H-2. The feature was identified in profile directly below layers of modern fill. The first four feet of the feature consisted primarily of unconsolidated fills and contained a few fragments of whiteware and ironstone. Brick, lining the southern part of the feature, was present at 3.5 feet below ground surface but not present in the northern part of the feature until five feet below ground surface. Fills consisted of layers of unconsolidated coal ash, cinders, brick fragments, and building mortar. Mechanical bisection of the feature revealed its termination at approximately nine feet below present ground surface (Photograph 53; Figure 26). No intact cultural deposits were identified within this shaft feature.

Feature 178 (Photograph 54; Figure 26) was a circular, brick-lined shaft feature located in GeoTrench 9 within Historic Area H-2. Feature 178 was identified in profile approximately 1.5 feet below the ground surface beneath modern fill horizons down to a depth of five feet, where a brick lining became evident. The shaft measured approximately six feet in diameter and extended through modern alluvium into Pleistocene soils. Mechanical bisection of the feature revealed its termination at approximately 12.5 feet below the ground surface. Fill comprised the first 11.0 feet of the feature overlying what appeared to be the remnants of nineteenth-century deposits. Fill horizons consisted of unconsolidated layers of soil interspersed with pockets of coal ash and cinders (Photograph 55). Artifacts recovered from intact deposit included an aqua colored blob-top bottle, a few fragments of a stoneware bottle, and window glass. The intact artifact deposits represent mid- to late-nineteenth-century deposition beneath re-deposited fill.

Feature 179 (Photograph 56) was a circular, brick-lined shaft feature located in GeoTrench 9. The brick lining the shaft was encountered at approximately 1.5 feet below the ground surface within this feature. The brick lining encountered in the rest of the shaft features was not discovered until much deeper in their respective profiles (Figure 26). Feature 179 was approximately 5.3 feet in diameter and extended to ten feet below the present ground surface. Mechanical investigation revealed layers of unconsolidated fills within the feature. No significant artifact concentrations were observed and no intact horizons were identified within Feature 179.

Feature 182 (Photograph 57; Figure 27) was a circular, brick-lined shaft feature located at the northern end of GeoTrench 9. Brick lining the exterior of the shaft was encountered at approximately two feet below the present ground surface and extended to the termination of the feature at 13.0 feet. The circumference of the shaft and brick lining measured approximately 5.5 feet in diameter. The fill within the shaft was very unconsolidated and consisted primarily of demolition fill with a considerable amount of brick fragments. During mechanical bisection of the shaft feature, the unconsolidated fill collapsed into the excavation (Photograph 58). The small amount of soil within the shaft consisted of 10YR 4/4 dark yellowish brown clay loam. No significant artifact concentrations were observed and no intact horizons were identified within Feature 182.

4.4 Shaft Feature Discussion

The landscape evolution of Historic Area H-2 is well documented in the February 2008 Phase IB/II report, both textually and cartographically. The most important maps with regards to discussion of shaft features identified within the area are the Hopkins 1873 map (Figure 5) and the Bromley 1887 map (A.D. Marble & Company 2007b: Figure 21). The Hopkins map depicts the residential nature of the block especially along Delaware Avenue, and the Bromley map shows the dramatic change to the area from neighborhood to paved rail lot. Bromley shows six active rail lines and no residential architecture in his 1887 edition. It is also likely that the fire that swept through the Kensington area in 1876 hastened the transition of Historic Area H-2 (A.D. Marble & Company 2008:79-80).

Six circular, brick-lined shaft features were identified during the supplemental investigation. They likely date to the mid-nineteenth to late nineteenth century when the area functioned as a residential neighborhood. Shaft feature locations were recorded using Global Positioning System (GPS) technology and geo-referenced in a GIS program to determine where the features may have been located during the time of their use. It is possible to tie each individual feature to associated lots. The information on the Hopkins 1873 map (Figure 21) is used in the text that follows to describe the locations and their associations.

Feature 173 is located at the western end of lot 25 between two long buildings. The western building fronting Delaware Avenue, according to the Hopkins map, is associated with a ship smith.

Feature 174, a wooden-lined shaft feature, is discussed previously.

Features 176 and 177 are located at the western edge of Lot 33. Lot 33 is an oddly shaped lot with two sections of the lot protruding into Lot 35. Features 176 and 177 are located within the western protuberance.

Features 178 and 179 are located in Lots 37 and 39. Lots 37 and 39 appear to be a single property with two individual buildings separated by an open walkway. Feature 178 appears to be associated with Lot 37 and Feature 179 appears to be associated with Lot 39.

Feature 182 is located in Lot 45. Lot 45 extends the length of the block from Beach Street to Delaware Avenue with two buildings standing on either end. Feature 182 is located almost directly between the two.

It appears as if the demolition of the buildings, to make way for the rail lines and freight station, extended to the destruction of the upper portions of the shaft features and may have included the cleaning and refilling of the features themselves. Shaft feature fills are similar to fills discovered within foundations during Phase I and II excavation in Historic Area H-1.

4.5 Non-Shaft Features

Feature 175 (Photograph 21) was a brick, cinder, and ash-filled foundation discovered in the south end of GeoTrenches 5 to 7. Remains of a stone foundation wall were present within GeoTrenches 5 and 6. No artifacts were recovered from the feature fill. Study of the Hopkins 1873 map suggests Feature 175 may be the filled remains of a building associated with a ship smith.

Feature 180 (Photograph 59) was exposed in GeoTrench 9 directly below a layer of ash and cinder fill. The feature was identified by a brick walk bordered on its north and south edges by other brick walls that extended five courses below the exposed surface. The extent of the wall above the exposed surface is unknown. However, the walls did not appear to extend higher than the exposed surface. The southern brick wall was five courses thick, two courses wide, and extended only two courses from the west wall of GeoTrench 9. The northern wall was made up of bricks laid in both soldier and common style, was three and one half courses wide, and extended into the eastern wall of GeoTrench 9. However, it was not in evidence within GeoTrench 8 directly to the east. Bricks located between the foundation walls were heavily worn and in poor condition. They were a single course thick and lying directly on banded sands (Figure 28).

Removal of the central bricks and excavation of the underlying soil revealed the depth of the foundation wall (Photograph 60). No artifacts were recovered other than brick samples associated with this feature.

Feature 181 (Photograph 61) was exposed in GeoTrench 9 directly below a layer of ash and cinder fill and consisted of a brick walk bordered on its north and south edges by brick walls that extended five courses below the exposed surface. The extent of the wall above the exposed surface is unknown. The south wall of the feature was a mismatched brick construction protruding from the west wall of GeoTrench 9 terminating approximately half way across the trench, where three large stones appeared to have been placed to complete the wall. A builder's trench was visible along the southern edge of the wall and measured less than 4 inches wide. Nine rows of crumbly and heavily worn bricks separated the north and south wall. The north

wall consisted of three rows of bricks set side by side and end to end. Where the wall extended into the eastern wall of GeoTrench 9, the bricks were a single course set side by side in a north to south direction (Figure 29).

No artifacts were recovered in association with this feature. Based on its configuration, it appears that the feature consisted of a brick walkway that lay between two buildings and likely dated to the mid-nineteenth century.

Feature 183 (Photograph 62) was a stone foundation filled with brick, ash, mortar, and cinder rubble. The west or rear wall of the foundation was present within GeoTrench 8. The foundation was made of sizable stone, ranging between 1.5 and two feet in width, suggesting that the building had an industrial function (Figure 30). No artifacts were recovered from the feature fill other than what was previously mentioned. Study of the Hopkins 1873 map suggests Feature 183 is the filled remains of the building foundation for a ship smith located at 26 Delaware Avenue (Figure 21).

Feature 184 (Photograph 21) was a rubble, cinder, and ash-filled foundation. No evidence of the actual foundation wall remained within the backfilled foundation hole. The edges were clear cut and relatively vertical. The feature began just below the layers of modern fill. No artifacts were recovered from the feature fill. Study of the Hopkins 1873 map suggests Feature 184 may be the filled remains of a building once located at the western end of Lots 41/43. It is very possible that a relationship exists between Feature 184 and Feature 174, the wood-lined shaft feature, which is located just south of the building's rear corner.

Feature 185 was the backfilled Trench 6, excavated and analyzed during Phase IB investigations of Historic Area H-2 (A.D. Marble & Company 2007b).

Feature 186 (Photograph 19) was a soil anomaly identified within GeoTrench 5. This feature was essentially a large pocket of the modern alluvium soil that extended into the cobbly Pleistocene-aged soils in a manner that suggested it might be the filled-in trench that surrounded Redoubt No. 1. The feature surface was troweled clean, photographed, and drawn (Figure 17). It

was noted that the soil of the feature did not extend across the floor of the entire trench, which would have been expected if it were the filled-in moat. A shovel test excavated into the soil found that the anomaly was nothing more than a one-foot-deep depression, about six feet wide, filled with the alluvial soils overlying the Pleistocene soils. No artifacts were recovered from the feature soil. No additional features, natural or cultural, were identified next to or beneath the anomaly. Feature 186 simply appears to be a natural depression.

Feature 187 (Photograph 45) was a modern, ceramic utility line found protruding from the west wall profile at the northern end of GeoTrench 9. Portions of this utility line were identified in Trench 14 during the Phase IB study (A.D. Marble & Company 2007b). The utility appears related to the warehouse that occupied the area along Delaware Avenue during the late nineteenth and twentieth centuries.

4.6 Historic Area H-3

Historic Area H-3 is the location of the former Pennsylvania Sugar Refining Company and piers 45, 46, and 48. It starts just east of Penn Street and extends to the Delaware River edge.

Six exploratory trenches were mechanically excavated by trackhoe in order to gain a better understanding of the location of the historic shoreline and further assess the potential for maritime-related resources and/or buried historic or pre-contact surfaces. A methodology similar to that used in Historic Area H-1 was employed in Historic Area H-3. Each location was identified as Sugar Refinery Trench 1 through 6, shown below in their abbreviated form, SRT 1 through 6.

SRT 1 was excavated approximately 25.0 feet from the eastern edge of Penn Street and approximately 170.0 feet north of the intersection of Laurel Avenue and Penn Street (Figure 12). The trench measured 26.0 feet long by 11.0 feet wide. SRT 1 was excavated to a depth of 7.5 feet from the present ground surface to a poured concrete floor. The trench fill consisted of brick and mortar rubble mixed with ash and cinders. Immediately upon the exposure of the concrete floor the base of excavation filled with muddy water (Photograph 63). Excavation revealed a foundation and the presence of trapped water not identified in the remaining SRTs, suggesting

the possibility of the foundation being a storage facility related to the sugar refinery. Rushing water pooling over a concrete floor was also identified in Trench 16 during the Phase II evaluation survey (A.D. Marble & Company 2008: Volume II, Appendix A, Photograph 95).

SRT 2 was excavated approximately 100.0 feet north of STR 1 and 15.0 feet from the east edge of Penn Street. The trench measured 10.0 feet wide by 19.0 feet long and was excavated to a depth of more than 15.0 feet. Fill consisted of highly unconsolidated brick and mortar rubble with concrete, iron reinforcement bars, other pieces of industrial building materials, and demolished equipment fragments mixed with cinders, coal ash, and soil (Photograph 64). A brick foundation wall was exposed along the western edge of the trench and likely represents the front foundation wall of the sugar refinery. Rubble filled the trench from the brick wall to the eastern edge of the trench down to a dark gray riverine sandy soil that was evaluated by Dr. Wagner. Gray colored, gley soil was encountered at approximately 12.0 to 13.0 feet below the present ground surface (Photograph 65). According to Dr. Wagner, these soils were formed in an estuarine environment.

SRT 3 was excavated approximately 70.0 feet north of STR 2 and 15.0 feet from the eastern edge of Penn Street. The trench measured 12.0 feet wide by 18.0 feet long and was excavated to a concrete floor 7.50 feet below present ground surface (Photograph 66). Fill consisted of brick, mortar, concrete, twisted metal, and soil down to the concrete floor. A brick wall was exposed at the south end of the trench.

SRT 4 was excavated on a southeast by northwest direction, slanting off the northwest corner of SRT 2. The trench was excavated between SRT 2 and Penn Street in an attempt to reach as deep as possible and as far west as possible without tearing up Penn Street and disturbing the active utility lines running beneath it. As noted above, the brick wall, exposed in SRT 2, may represent the front of the sugar refinery; therefore, a trench west of the building was excavated to examine if intact soils existed there and were not disturbed by building construction. Excavation of the trench, however, revealed similar deep fill overlying greenish-gray, gleyed riverine soils. The trench was excavated to a depth of 13.0 feet and measured 30.0 feet in length by 8.0 to 9.0 feet wide. A large, cast iron utility line running parallel to Penn Street was exposed at 5.0 to 6.0 feet

below present grade during the excavation of this trench and excavation was halted (Photograph 67). Trench fill was similar to fills removed from all the other Sugar Refinery trenches excavated in Historic Area H-3.

SRT 5 was excavated perpendicular to Penn Street, beginning at the south corner of SRT 2 and extending east toward the river for a total length of approximately 85.0 feet. The trench measured 20.0 feet wide at the western end and narrowed to 8.0 to 12.0 feet wide as the excavation progressed eastward. A concrete floor was exposed at the western end of the trench and gave way to a series of concrete footers buried in greenish-gray, gleyed riverine soils (Figure 31 and Photograph 68). Individual footers were approximately six feet in width and extended into the walls of the trench and to an unknown depth. The concrete floor was approximately eight feet below present grade, the footers were exposed at nine feet below the surface, and the gray soils were excavated to a depth of 14.0 feet below present grade. Fill consisted of architectural rubble similar to that exposed in other trenches.

SRT 6 was excavated perpendicular to Penn Street, starting at the southwest corner of SRT 3 and extending east toward the river for approximately 40.0 feet. A concrete floor and brick foundation were exposed at 7.0 feet below present grade along the northern edge of the trench (Photograph 69). Excavation of fill and gray soil, between the foundation and the south edge of the trench, continued to 14.0 feet below present grade.

4.7 Historic Area H-3 Discussion

The amount of destruction due to construction of large industrial buildings is clearly obvious within all six trenches excavated in Historic Area H-3. Large foundation walls, deeply buried concrete footers, and numerous poured-concrete floors are testament to the former industrial landscape throughout the entire area. No intact cultural soil surfaces were encountered in these trenches. Greenish-gray, gley soils were encountered in several instances at depths of 12.0 to 14.0 feet below surface but it is not known if this particular soil horizon was actually higher in the profile before construction of the Sugar Refinery foundations. What is apparent is that development and subsequent demolition activities of the industrial complexes within Historic

Area H-3 had been extensive and wide-ranging in both horizontal and vertical extent and massive in scale.

4.8 Geomorphological Investigation

The project area was subjected to a comprehensive geomorphological study. Daniel Wagner, Ph.D., conducted the initial investigation as well as the supplemental study. His firm, Geo-Sci Consultants, Inc., is located at 4410 Van Buren Street, University Park, Maryland 20782. Dr. Daniel P. Wagner has worked as a consulting pedologist throughout Eastern North America, Central America, and the Caribbean for 32 years. During this time he has either directed or contributed to some 1,300 projects. Dr. Wagner has participated in nearly 500 Pedoarchaeological studies, most of which involved paleogeographic analyses of prehistoric sites emphasizing Holocene depositional and soil weathering sequences, as well as evolving environmental conditions. He has also worked on a number of historic sites interpreting landscape modifications for settings ranging in diversity from eighteenth-century tidewater plantations to the altered shorelines and core areas of major East Coast cities. Dr. Wagner has presented numerous papers at both professional soil science and archaeological meetings, and has authored or co-authored 44 publications. He has also served on the part-time faculty of Johns Hopkins University where he taught an environmental soils course for 14 years. His report was submitted to A.D. Marble & Company in early June 2008 and is attached below.

GEOARCHAEOLOGICAL INVESTIGATIONS AT THE SUGARHOUSE CASINO SITE IN PHILADELPHIA, PENNSYLVANIA

Submitted to
A.D. Marble, Inc.

By Daniel P. Wagner, Ph.D.
Pedologist

June 2008

Introduction

This report discusses supplementary geoarchaeological investigations of the SugarHouse Casino Property intended to refine the results of a preliminary study made in March 2007. The initial effort identified widespread areas of severe disturbance, extensive filling of the adjacent Delaware River, and a limited area of a mostly intact natural landscape near the southern end of the property. Based on the location of the intact landscape and apparent ubiquitous disturbances identified elsewhere by multiple trench examinations, patterns displayed on an 18th Century map (1797, John Hills) were interpreted for speculation about the original site topography. A suggestion was made that south of what was formerly Maiden Street the original pre-disturbance shoreline was mainly along Penn Street, but that north of Maiden Street it possibly arced landward along Frankford Avenue. This speculation was brought into question by subsequent archaeological scrutiny of additional historical archives. Several historical maps showed that the shoreline was unlikely to have arced landward away from Penn Street, and that indeed a 1777 British redoubt could well have been positioned at least partially on the east side of this street. The purposes of this investigation were therefore to assist archaeological field efforts attempting to identify any persisting remnants of the redoubt, as well as to gather other field data that might shed further light on the original shoreline configuration.

To address the above concerns further testing of the site was undertaken by means of several more backhoe trench excavations. In conjunction with archaeological evaluation of the historical mapping, trenches were located both to intercept the predicted location of the former redoubt as well as to better assess degrees of disturbance across the property, particularly with respect to identifying the original shoreline.

Depending on the materials encountered, soil profiles were described in varying detail. Where only artificial fill was present, only cursory notes were recorded. In most instances where natural strata were encountered, detailed descriptions were compiled in accordance with standard pedological techniques and nomenclature for the field description of soils. These descriptions and other notes are attached at the end of the report.

Results and Discussion

Four general deposit types were identified in the study. These consisted of widespread deposits of earthen and rubble fill, truncated Coastal Plain soils, historic era alluvium, and estuarine sediments of the Delaware River. Rubble materials derived from an assortment of razed structures that previously occupied the property are, of course, a significant component of the artificial fill. They are typically the predominant material within former basements and are also often variably mixed with the upper earthen and cindery materials that mantle the entire property. An example of deep rubble fill is provided by Trench GT 1 where near the southern end of the property the trench intercepted no natural strata at all. Other examples are Trenches SRT 2 and SRT 4 located in the central portion of the property just east of Penn Street. These nearly abutting trenches each encountered 11 to 12 feet of rubble fill atop grayish and variably organic sediments amassed under estuarine conditions. These lower deposits will again be discussed in an ensuing portion of the report relating implications about the original shoreline.

Terrestrial Landscape

The majority of the trenches excavated for geomorphological examinations (GT Trenches) were made north of the former Maiden Street. These revealed a repetitive soil sequence not encountered by the two trenches made on this portion of the property in the initial study. Whereas the earlier examinations both encountered deep fill (~8 ft) deposits atop coarse-textured, natural substrata, the more comprehensive efforts of this study identified truncated Coastal Plain soils as well as deep substrata. The exposures along Trench GT 3 are representative of the sequence and are shown in Figure 1. As depicted in the photo, the stratigraphy consists of a roughly 1-ft surficial veneer of cindery fill atop stratified and young, fine-sandy deposits extending to contact with natural Coastal Plain strata at about the depth of 41 in. The depth to natural strata varies somewhat across this portion of the property, ranging from as much as 44 in at the location of Trench GT 4 to as little as 27 in at Trenches GT 2 and GT 7. Undulations in the depth to natural strata were also noted along the length of Trench GT 6.



Figure 1. Example of typical deposit sequence west of Penn Street. The truncated soil remnant consists only of lower transitional subsoil horizons (BC). Dark coloration near the trench floor is due to manganese staining.

Several traits of the above deposits offer important clues about the nature of historic changes to the property. The surficial cindery fill is of little interpretive consequence but the underlying stratified fine-sandy sediments lead to a specific interpretation with significant implications about the original landscape and its modification. As shown in Figure 2 these deposits occur as lamina clearly differentiated by color, and in the field were also noted to commonly undergo minor textural shifts between lamina. Also having little or no consistence, such loose deposits are characteristic of recent alluvium or wash that was amassed fairly rapidly and have existed for such a brief time frame that soil forming processes have not altered them. In contrast, as recognized in Trench 3 as well as in portions of Trenches GT 2, GT 4, GT 6, and GT 7, the upper several inches of the Coastal Plain strata just beneath the young alluvium displayed weak subsoil development consistent with transitional horizons (BC) that would be expected in the lower levels of more strongly developed terrestrial soils.



Figure 2. Closer view of the stratified recent alluvium atop the lower subsoil remnant of a truncated Coastal Plain soil. Each Band in the recent alluvium likely represents a single depositional event.

Two artificial actions are indicated by the above properties. First, most of the area between Penn Street and the former Beach Street underwent grading that resulted in complete destruction of both the original surface horizon as well as upper subsoil horizons, thus also destroying any pre-Contact cultural material. Assuming the original soils were similar to the intact ones observed at the southern end of the property, this grading removed roughly the upper three to four feet of the original Coastal Plain soil. Secondly, the grading also produced a shallow borrow pit that subsequently filled in with local wash or alluvial deposits probably derived from erosion of adjacent roads and uplands. Assuming that each layer within the recent sediments resulted from a single depositional episode, and employing an average layer thickness of about 0.25 in estimated from the range (0.1-1.0 in) exhibited in Trench GT 4, the roughly 2 ft of material filling the pit would have been amassed in about 100 storm events. This suggests the process may have spanned no more than two or three decades. Of course, some truncation of the upper levels of recent sediment through surface grading and introduction of the surficial fill is also possible, but the fact that modern surface elevations are similar to those of the original pre-disturbance surface indicates any losses would have been relatively minimal.

Some speculations can be offered about the purpose and timing of the grading. Given the site location and a known history of filling along the shoreline, a logical reason for the grading could simply have been to provide a source of fill for extending the shoreline outward. With an original height on the order of 11 to 12 ft above the Delaware River, removal of three to four ft would still have left the remnant landscape well above the river and perhaps even have produced a working level more conveniently accessible to the river. With regard to timing, it apparently occurred fairly early on in the property's history. This is demonstrated by several observed structures where foundation excavations extended through the pre-existing deposit. In one case in Trench GT 6 the stratified recent alluvium was even observed on both exterior and interior sides of a foundation wall.

With the consideration of an early origin the possibility arises that the borrow pit grading was related to construction of the British redoubt. Since none of the remains of the redoubt were identified to establish any relationship between it and the borrow pit/recent alluvium, such a possibility can only be consigned to speculation. However, if the approximated location of the redoubt is reasonably accurate then the redoubt's northwest corner would have extended some 50 ft or so into the borrow pit. This would have entailed an improbable construction program of first excavating and then refilling. Additionally, since no indications of this type of effort were observed in Trenches GT 6 and GT 7, the greater likelihood therefore is that the borrow pit is of a later date than the redoubt.

Original Shoreline

The findings of this study strongly suggest that the Delaware River shoreline was originally just east of the present (and historical) Penn Street alignment. Although massive concentrations of rubble, including a concrete floor intercepted in both Trenches SRT 1, and SRT 3 prevented examinations across most of the area east of Penn Street, sufficient observations were made to demonstrate stark differences between natural strata on opposing sides of the street. Unlike the mostly brownish and often gravelly nature of the terrestrial soils west of Penn Street, natural strata intercepted beneath the rubble in Trenches SRT 2 and SRT 4 were very fine-sandy to silty, dark gray color, and variably organic (Figure 3). These properties are typical of estuarine sediments and are strong evidence that fast land did not exist immediately east of Penn Street. In addition to displaying properties characteristic of estuarine sediments that are not remotely similar to natural strata observed west of Penn Street, the top layer of the estuarine sediments contained discarded historic wood fragments and bricks as deep as 12 ft. This depth corresponds to an elevation 8 ft below the top of natural strata west of Penn Street. Furthermore, by restoring the original upper portion of the graded soils west of the street, within a relatively short distance the elevation would have plunged some 12 ft from the Coastal Plain upland west of Penn Street to probable tidal mud flats immediately to its east.



Figure 2. Dark gray, variably organic estuarine sediments excavated from beneath 11.5 feet of rubble fill in Trench SRT 2.

Some possibility exists that estuarine deposits could have been introduced via an excavated dock facility that was later allowed to fill in; however, most indications from Trench SRT 2 are of almost wholly natural strata. Only the uppermost level of these deposits was subject to modification by the incorporation of debris and some mixing with the overlying fill material. Below this upper level, unadulterated deposits extended beyond the maximum 21.5-ft depth of excavation, demonstrating a trait again consistent with a natural estuarine setting. Considerable thickness for such deposits is often the case as over the millennia sediment accumulation kept pace with the rising Holocene sea level.

Summary

This study was undertaken as a follow-up to an initial investigation made in March of 2007. The considerably more comprehensive effort of this investigation has generated greater understanding of aspects of the property's landscape history. Among these is a clearer picture of the original shoreline configuration. In disagreement with speculation from the previous study that suggested a more landward location for a portion of the shoreline, this study's detailed scrutiny of soils in the vicinity of Penn Street strongly supports historical

mapping showing the street's alignment originally corresponded to the edge of fast land.

Whereas weathered strata indicative of terrestrial soils were not encountered in the earlier study's two trench excavations west of Penn Street, this investigation found remnants of terrestrial soils to be both widespread and ranging essentially to contact with the west side of the street. On the opposing side of the street only deep deposits of rubble fill atop buried estuarine sediments were found. These sediments were likely accumulated in a tidal flat setting, and would have been about 12 ft below the original land surface delineated by Penn Street. Such a drop in height over so short a distance translates to a steep, probably scarp-like bank for the original shoreline.

Although terrestrial strata were found to be extensive west of Penn Street, only truncated remnants of the original soils remain. Across a broad area lower subsoil horizons and underlying substrata are all that still exist, and truncations estimated to be on the order of three to four feet would long since have destroyed any pre-Contact cultural materials. Grading of the soil appears to have been mainly for borrow purposes, and the resultant pit then served as a sink to trap local alluvial or wash materials eroded from adjacent land areas and roads. Unless removed by later construction activities, these loose deposits of finely stratified recent alluvium form an almost ubiquitous mantle above the truncated soil remnants.

Since a number of building foundations were observed to penetrate through the stratified alluvium, the borrowing and subsequent infilling of the pit must have occurred relatively early in the property's history. Excavation of the pit was possibly related to construction of the British redoubt known to have been located on the property; however, the location of the redoubt projected from historical mapping indicates that part of it would have been over the pit. As digging and refilling would seem to be a peculiar construction practice, and with no evidence of intentional filling before accumulation of the recent alluvium, the greater likelihood is that the borrowing activity post-dated the redoubt.

Soil Profile Descriptions and Notes

GT 2

Horizon	Depth (in)	Properties
C1	0-11	Earthen and gravelly fill; abrupt, smooth boundary
C2	11-23	Cindery fill; abrupt, smooth boundary
2C	23-27	Yellowish brown (10YR 5/4) banded with strong brown (7.5YR 4/6) fine sandy loam; weak, coarse platy structure; very friable consistence; abrupt, wavy boundary; fill or recent alluvium
3BC	27-38	Dark yellowish brown (10YR 4/4) with minor brown (10YR 4/3) sandy loam; common, coarse distinct mottles of yellowish red (5YR 4/6); weak, coarse platy structure; nearly gravelly; friable consistence; clear, wavy boundary
4BC	38-50	Dark brown (7.5YR 3/4) and dark yellowish brown (10YR 3/4) gravelly loamy sand; weak, coarse subangular blocky structure; very friable consistence; gradual, wavy boundary
4C	50-53+	Dark yellowish brown (10YR 3/4) very gravelly sand; structureless, single grain; loose consistence

Other comments: Graded and filled Coastal Plain landscape; described 5/14/08

GT 3

Horizon	Depth (in)	Properties
C	0-13	Black (N 2.5) cindery and earthen fill; abrupt, smooth boundary
2C	13-41	Dark yellowish brown (10YR 4/4) fine sand stratified with brown (10YR 4/3) very fine sandy loam, and brown (7.5YR 4/4) fine sand; moderate, medium to coarse platy sediment structure; loose and very friable consistence; abrupt, smooth boundary; recent alluvium
3BC	41-51	Brown (7.5YR 4/4) fine sandy loam to loam; weak, medium subangular blocky structure; few gravel and cobble floaters; friable consistence; clear, wavy boundary
4BC	51-57	Dark brown (7.5YR 3/4) gravelly sandy loam; weak, coarse subangular blocky structure; very friable consistence; clear, wavy boundary
4C	57-66+	Dark yellowish brown (10YR 3/4) very gravelly sand; structureless, single grain; loose consistence

Other comments: Graded and filled Coastal Plain landscape; described 5/14/08

GT 4

Horizon	Depth (in)	Properties
C1	0-6	Earthen and cindery fill; abrupt, smooth boundary
C2	6-14	Black (N 2.5) cindery fill; abrupt, smooth boundary
2C	14-44	Dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), and strong brown (7.5YR 4/6) fine sand stratified with grayish brown (2.5Y 5/2) very fine sandy loam; weak, medium to coarse platy sediment structure; loose and very friable consistence; clear, wavy boundary; recent alluvium
3BC	44-53	Brown (7.5YR 4/4) fine sandy loam; weak, coarse subangular blocky structure; few gravel and cobble floaters; friable consistence; clear, wavy boundary
4C	53-72	Dark yellowish brown (10YR 3/4) very gravelly sand; structureless, single grain; loose consistence
5Cg	72-80	Grayish brown (2.5Y 5/2) fine sand; structureless, single grain; loose consistence
6Cg	57-66+	Olive brown (2.5Y 4/3) and dark yellowish brown (10YR 3/4) very gravelly sand; structureless, single grain; loose consistence

Other comments: Graded and filled Coastal Plain landscape; lamina forming the stratified recent alluvium of the 2C horizon range in thickness from about 1/8 to 1 inch, with an average of ~1/4 inch; described 5/14/08

GT 5

Mixed fill to 77 in; dark yellowish brown (10YR 4/4) gravelly sandy loam to 90 in; stratified reddish brown (5YR 5/4) and olive gray (5Y 5/2) mostly sandy Coastal Plain sediments to 150 in

GT 6

Similar to GT 3 until north end where recent alluvium undergoes thinning