

ARCHAEOLOGICAL MONITORING REPORT



REMOVAL OF BRANDYWINE DAM 6

City of Wilmington

New Castle County, Delaware 19899

(DHCA Project Review No. 2020.06.22.06)

PREPARED FOR:

Brandywine River Restoration Trust And Kleinschmidt

PO Box 1689

Wilmington, Delaware 19899

141 Main Street

Pittsfield, Maine 04967

January 2026



RICHARD
GRUBB &
ASSOCIATES

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EXECUTIVE SUMMARY

Richard Grubb & Associates, Inc. (RGA) conducted archaeological monitoring during construction activities for the removal of Brandywine Dam 6 (also known as the Lower Hagley Yard Mill Dam) in the City of Wilmington, New Castle County, Delaware. In 1816, a dam was built at or near Dam 6, which was destroyed by a flood and rebuilt in 1839 by E. I. du Pont de Nemours to power several mills situated along this portion of Brandywine Creek. The project involved removing substantial portions of Dam 6 to provide suitable water depths, velocities, and variability to facilitate upstream fish passage. The undertaking required a federal permit from the United States Army Corps of Engineers (USACE), which necessitated compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. According to Section 106, archaeological resources eligible for listing in the National Register of Historic Places (NRHP) must be identified in order to determine if the project will have an effect on such resources.

RGA completed a Phase IA archaeological survey for the project in December 2021. The Phase IA archaeological survey indicated that Brandywine Dam 6 was originally an early nineteenth-century structure with several subsequent major repairs and recommended Phase IB archaeological testing in upland areas of the project's Area of Potential Effects (APE) along Brandywine Creek, which were assessed with a moderate to high archaeological sensitivity. The report also recommended archaeological monitoring of the dam removal. A separate, 2021 Phase II architectural investigation completed by University of Delaware Center for Historic Architecture & Design (CHAD) recommended Brandywine Dam 6/Lower Hagley Yard Mill Dam (SHPO Opinion 5/5/2022) individually eligible for inclusion in the NRHP. Despite subsequent renovations, the dam largely retains integrity of location, setting, design, materials, workmanship, feeling, and association. In correspondence dated January 2022, the Delaware Division of Historical & Cultural Affairs (DHCA) State Historic Preservation Office (i.e., the DE SHPO) concurred with these recommendations and required the completion of archaeological monitoring during construction at Brandywine Dam 6. The purpose of the archaeological monitoring was to document portions and profiles of the existing dam and any remnants of legacy dam elements exposed during construction. In September 2022, RGA completed the Phase IB archaeological survey and did not identify intact archaeological deposits in upland portions of the project APE. As such, no further archaeological survey (i.e., Phase II evaluation) was recommended within that portion of the APE.

Archaeological monitoring during the removal of Brandywine Dam 6 was conducted by RGA between July 23, 2025, and October 15, 2025. While mostly submerged in moderate to high velocity flowing water, visible portions of the dam were documented in plan and profile during removal. Monitoring also resulted in the recovery of representative metal fasteners used in various stages of the dam's construction and maintenance. Observed dam elements reveal that the dam was likely originally composed of a wedge or “<”-shaped timber crib structure fastened with large, wrought ferrous metal spikes and infilled with large stones and boulders to stabilize the structure. The crib structure was composed of both logs likely placed parallel to the stream flow, as well as hewn square timbers. No evidence of mortis and tenon or lap joint construction elements were identified. No temporally diagnostic material was found to accurately date the submerged and buried timber cribbing dam elements, though the wrought iron spikes could coincide with an early nineteenth-century

construction date. The earlier submerged dam is of a design typical to that recorded at other archaeologically documented dams, such as the circa-1807 Finesville Dam in Pohatcong and Holland Townships New Jersey (see Richard Grubb & Associates, Inc. 2012). At an undetermined time, though likely during the early twentieth century, this original structure was modified and/or repaired with a poured concrete top and additional, milled wooden elements. The concrete top was poured directly over the original crib structure in long segments that spanned the Brandywine Creek. Each concrete segment was separated by upright milled boards. On the dam's upstream side, a cover of milled wooden planks was laid over the structure's spillway and fastened into the upright boards below with ferrous metal fasteners. Additional large rocks and boulders were placed or intentionally left directly up and downstream of the structure. During the removal process, 25 feet of the existing Brandywine Dam 6 structure at the northern and southern abutments were left intact within the river.

Based on the results of archaeological monitoring, updated cultural resource survey (CRS) forms for Brandywine Dam 6/Lower Hagley Mill Yard Dam were submitted to the DHCA and uploaded to Delaware's Cultural and Historical Resources Information System (CHRIS). The forms included new mapping and information on the structure and condition of the dam determined during archaeological monitoring. An archaeological site form (CRS04) was also submitted to document the dam's present condition and the retained artifact assemblage, and the dam was assigned an archaeological site number (7NC-B-083).

Brandywine Dam 6/Lower Hagley Mill Uard Dam was previously determined eligible for the NRHP under Criterion A for its association with industrial development along Brandywine Creek and under Criterion C as an example of a vernacular dam structure consisting of an ascending ramp and curved stone body (CHAD 2021b; SHPO Opinion 5/5/2022). The results of archaeological monitoring support these determinations, and RGA recommends that the historic property is also eligible under Criterion D for its ability to provide new data on early nineteenth-century dam construction in the Brandywine Creek associated with the early industrialization of northern Delaware.

No evidence of other former legacy structures were identified adjacent to or near Dam 6 during or after its removal. No pre-Contact or intact historic period deposits or non-dam-related cultural features were identified during archaeological monitoring. As such, this report has fulfilled the requirements set forth for archaeological monitoring, and no further work is recommended for the proposed project.

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1.0 INTRODUCTION

RGA conducted archaeological monitoring during construction activities for the removal of Brandywine Dam 6 (i.e., the Lower Hagley Yard Mill Dam) in the City of Wilmington, New Castle County, Delaware (Figures 1.1 and 1.2). Prior research indicates that a dam of unknown type was likely present near the location of Dam 6 as early as 1816; however, it is unknown if this former dam was still extant or was replaced by 1839, when flooding destroyed part of a contemporary dam at the location of Dam 6. This partially destroyed dam was subsequently rebuilt and formed the original structure of the present-day Brandywine Dam 6. While the dam appeared to retain much of its original design since its 1839 reconstruction, it has undergone multiple repairs over its lifespan (University of Delaware Center for Historic Architecture and Design [CHAD] 2021b).

The current project involved removing substantial portions of Dam 6 to provide suitable water depths, velocities, and variability to facilitate upstream fish passage. The undertaking required a federal permit from the United States Army Corps of Engineers (USACE), which necessitated compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. According to Section 106, archaeological resources eligible for listing in the National Register of Historic Places (NRHP) must be identified in order to determine if the project will have an effect on such resources.

Prior to construction, a Phase IA archaeological survey, a Phase IA reconnaissance-level historic architecture survey, a Phase II architectural investigation, and a Phase IB archaeological survey were conducted as part of the proposed project, and an archaeological monitoring protocol was prepared (CHAD 2021a, 2021b; Richard Grubb & Associates, Inc. 2021, 2022, 2023). Based on the results of these surveys, the Brandywine Dam 6 was determined individually eligible for the NRHP under Criteria A and C (SHPO Opinion: 5/5/2022), and no further archaeological work (i.e., Phase II evaluation) was required within the project's Area of Potential Effects (APE) beyond construction monitoring. The purpose of the archaeological monitoring during construction was to document portions and profiles of the existing dam and any remnants of legacy dam elements exposed during construction activities.

Archaeological monitoring and reporting were conducted by archaeologist Jonathan E. Dernbach, MSc, RPA, who served as the Principal Investigator and meets the requirements of 36 CFR 61 set forth by the National Park Service (Appendix A). Background research was conducted by archaeologist Richard P. Adamczyk, MA, RPA, during the previous Phase IA and Phase IB archaeological surveys and has been reproduced in this report. This research included a review of the report completed by CHAD for the Phase II architectural investigation. Patricia McEachen and Olivier Vansassenbrouck, MSc, MA, RPA, produced the report graphics. Principal Senior Archaeologist Michael J. Gall, MA, RPA, served as report editor, and Emma Durham, PhD, RPA, served as technical editor for the report. Copies of this report and all field notes, photographs, and project maps are on file at the RGA offices in Cranbury, New Jersey. Upon review and acceptance of this report, recovered artifacts will be offered to the Delaware State Museum.

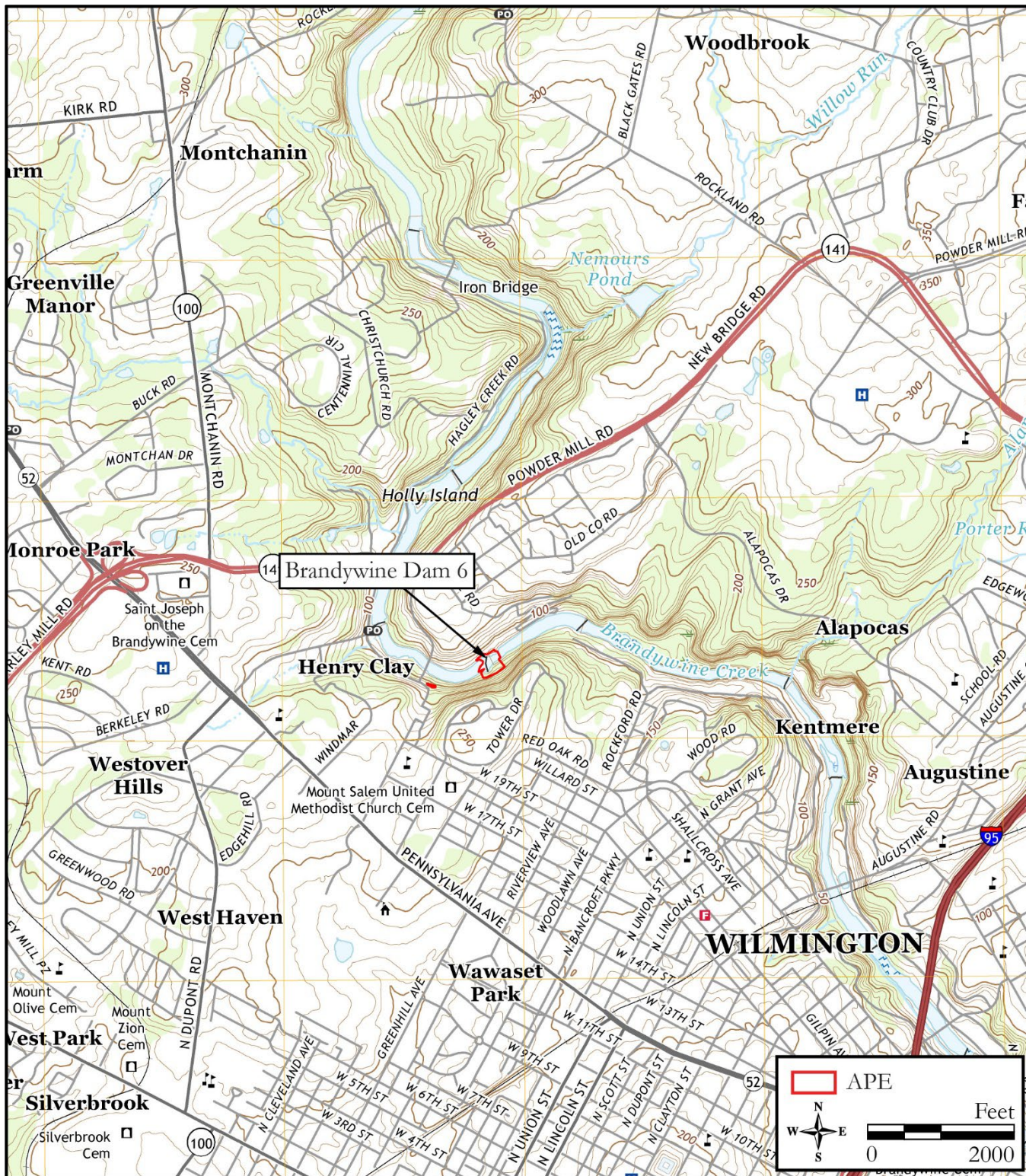


Figure 1.1: USGS map showing the project location (from 2023 USGS 7.5' Quadrangles: Wilmington North, DE).

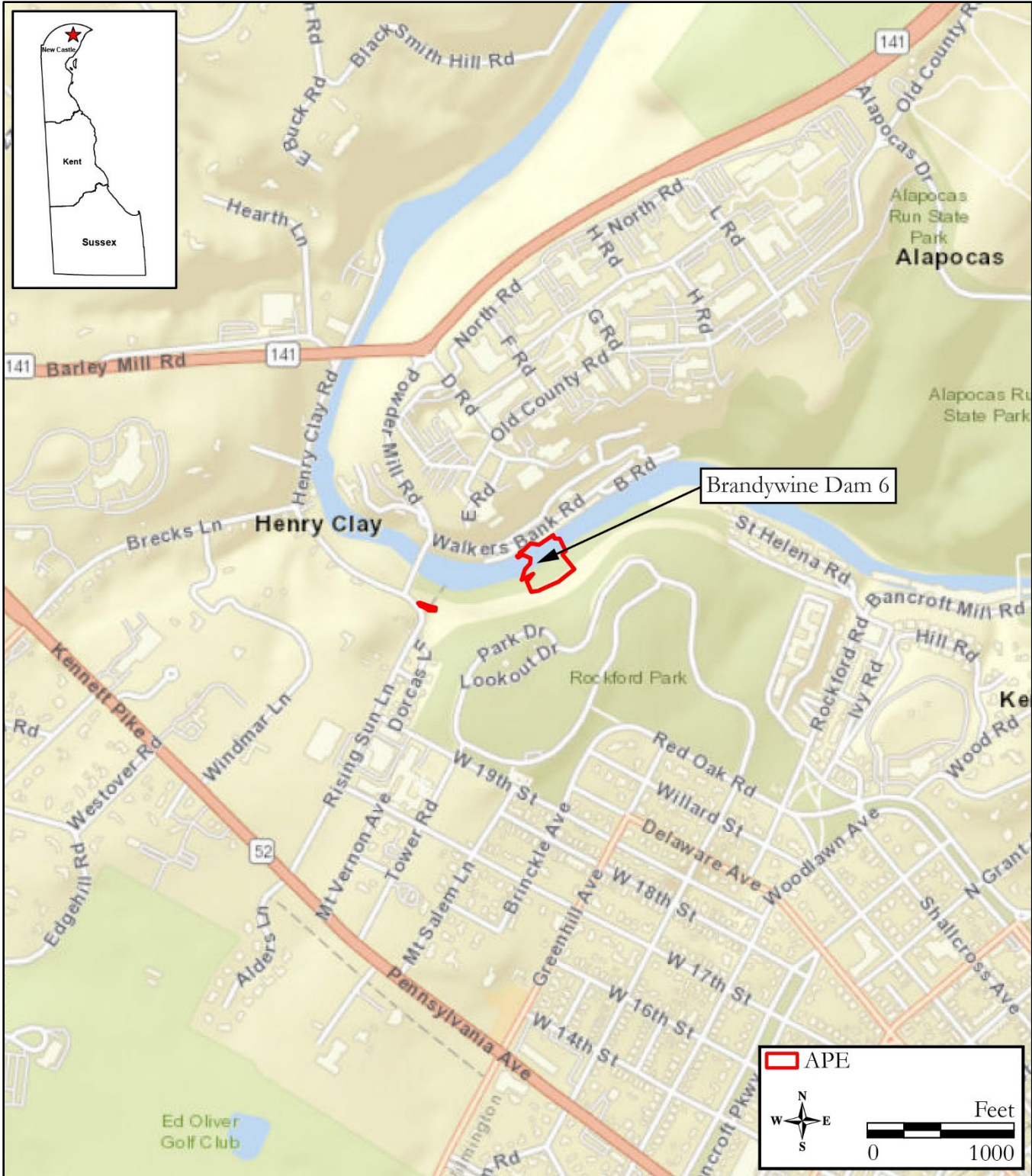


Figure 1.2: Road map showing the project location (Esri 2023a).

1.1 Regulatory Context

The project required a federal permit from the USACE, which necessitated compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. Accordingly, archaeological and historic resources listed in the NRHP or eligible for listing in the NRHP must be identified to determine if the project will have an effect on such resources.

Based on the results of the 2021 Phase IA archaeological survey and Phase II architectural investigation for the project, Brandywine Dam 6 was identified as a historic resource greater than 50 years old and recommended eligible for inclusion in the NRHP, and portions of the APE for the project were assessed with a high sensitivity for archaeological resources (CHAD 2021b; Richard Grubb & Associates, Inc. 2021). Archaeological monitoring during the removal of Brandywine Dam 6 was recommended to record early nineteenth-century dam construction techniques, and a Phase IB archaeological survey was recommended in archaeologically sensitive portions of the project APE.

In correspondence dated January 2022, the DE SHPO concurred with these recommendations and required the completion of Phase IB archaeological testing and archaeological monitoring during construction at Brandywine Dam 6 (Appendix B). In September 2022, RGA completed the Phase IB archaeological survey and did not identify intact archaeological deposits within sensitive portions of the project APE. As such, no further archaeological survey (i.e., Phase II evaluation) was recommended for that portion of the APE; and the recommendation for monitoring during the removal of the dam structure was reiterated (Richard Grubb & Associates, Inc. 2022). Following the submission of the Phase IB archaeological survey report, a memorandum of agreement among the USACE, the DEHPO, the Brandywine River Restoration Trust, and the City of Wilmington signed between September 19, 2023 and January 22, 2024 concurred with this recommendation and required the submission of an archaeological monitoring protocol for review and the completion of archaeological monitoring as previously outlined (see Appendix B). An archaeological monitoring protocol dated October 11, 2023, was prepared by RGA for the proposed project, submitted for review by the Brandywine River Restoration Trust on March 27, 2025, and approved by the DE SHPO via email correspondence dated April 3, 2025 (Richard Grubb & Associates, Inc. 2023; see Appendix B).

This monitoring report was prepared in compliance with the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (1983) and the archaeological survey guidelines of the DE SHPO (DHCA-SHPO 2015).

1.2 Project Description

The project involved removing a substantial portion of Brandywine Dam 6 to provide suitable water depths, velocities, and variability to facilitate upstream fish passage (Figures 1.3 and 1.4). The project activities for Dam 6 included the removal of the circa-1839 dam through demolition of the existing dam crest from an elevation of 79.4 feet above sea level to an elevation of approximately 70 feet above sea level and filling the area around the dam with the materials from the dam removal. The northern and southern 25 feet of the dam where it intersects with the creek banks were left intact to mark the dam's historic location. Boulders and stone from the dam's removal were placed to stabilize the creek's

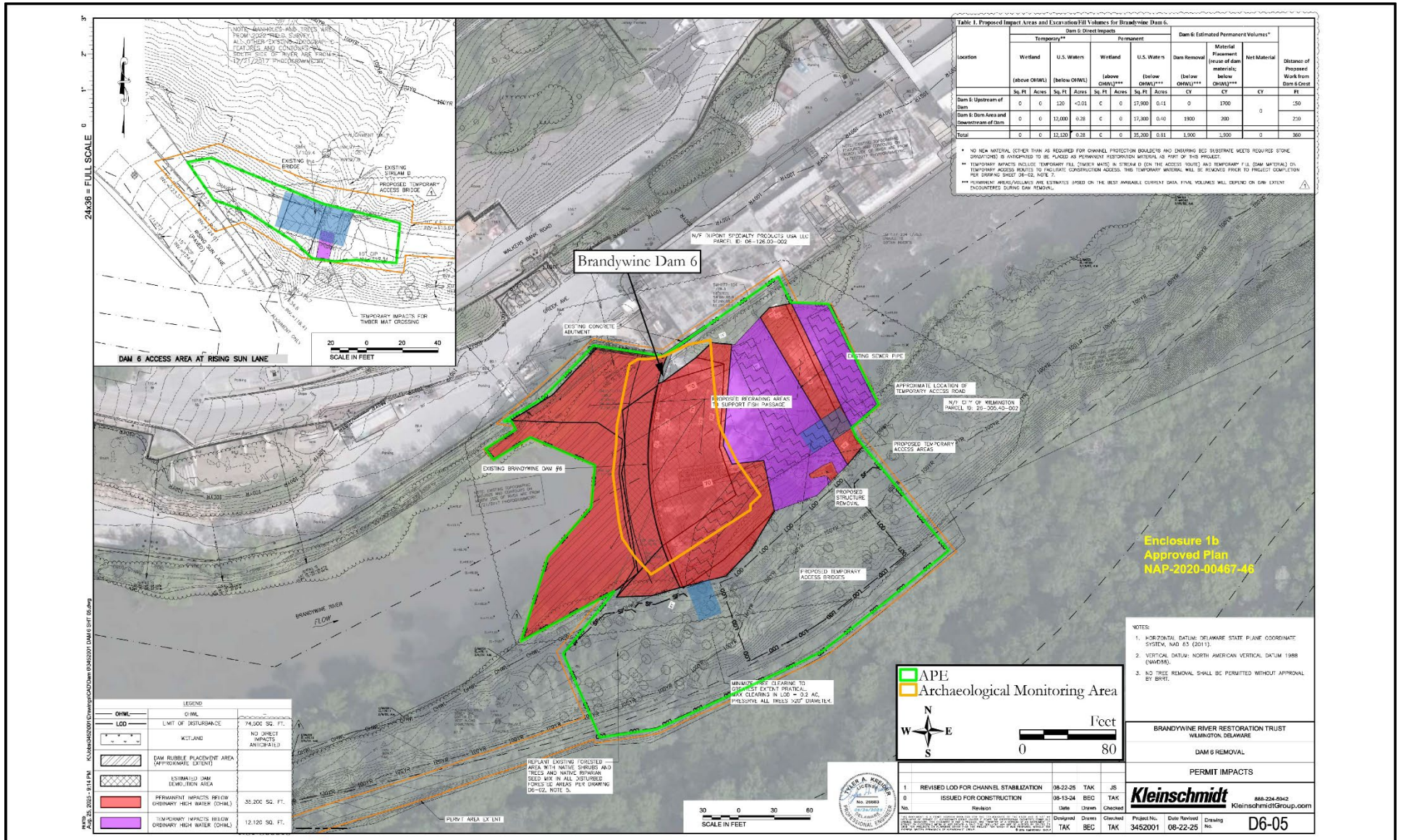


Figure 1.3: Proposed construction plan showing the APE and Archaeological Monitoring Area (from Kleinschmidt 2025).

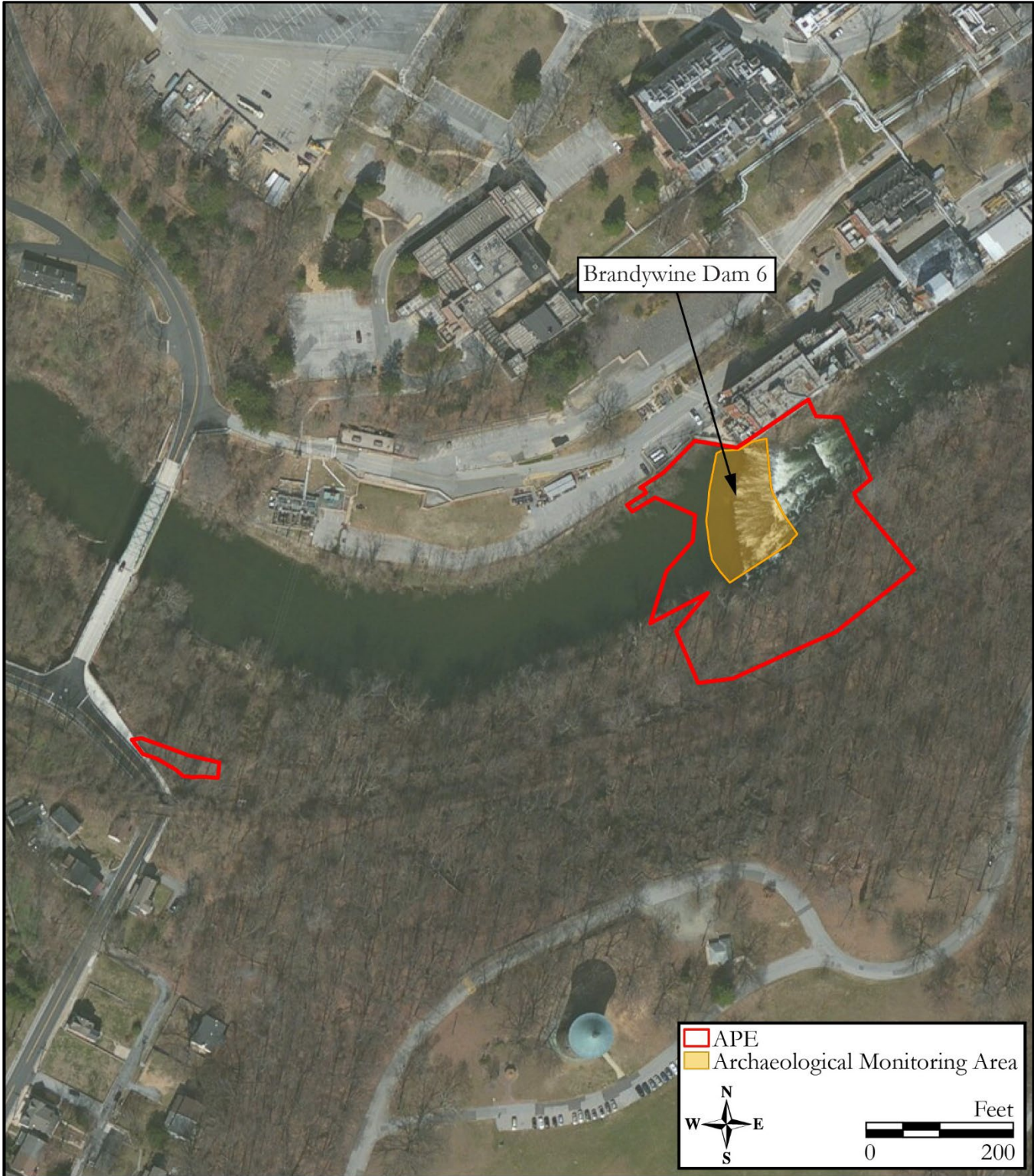


Figure 1.4: Aerial image of the APE and the Archaeological Monitoring Area (Estri 2023b).

north and south banks at their intersection with the dam. These construction activities largely took place within Brandywine Creek, which exhibited rapidly flowing water during dam removal, though a small upland area was used for equipment staging. Upland areas will be replanted with vegetation following the construction work.

1.3 Area of Potential Effects/Archaeological Monitoring Area

The APE is defined in 36 CFR 800.16(d) as “the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking.” The APE includes areas where the proposed project may generate ground disturbance, potentially affecting archaeological resources. Ground disturbances include, but are not limited to, excavation or deep grading, wetlands mitigation sites, subsurface utility installation, and construction staging areas.

During archaeological monitoring, the project’s initial limits of disturbance/APE were revised. These revisions are shown on construction plans dated August 22, 2025, which were provided to RGA following completion of archaeological monitoring (see Figures 1.3 and 1.4). This LOD encompasses the dam structure and additional staging and access areas for construction/removal activities and is considered the project’s APE for this report. Archaeological monitoring was required for an approximately 0.35-acre (15,306-square-foot) portion of this revised APE as shown in Figures 1.3 and 1.4.

1.4 Summary of Prior Cultural Resource Work for the Project

In 2021, a Phase IA reconnaissance-level historic architecture survey was conducted by CHAD to assess the proposed project’s effects on Brandywine Dam 6 (CHAD 2021a). Due to the dam’s age and its proposed removal, an intensive-level historic architectural survey was recommended. The Phase II intensive-level historic architecture survey was conducted by CHAD in 2021 to assess the proposed project’s effects on and evaluate the NRHP-eligibility of Dam 6 (CHAD 2021b). The Phase II report concluded that Dam 6 is individually eligible for listing in the NRHP under Criteria A and C, and the DE SHPO concurred with this recommendation (SHPO Opinion: 5/5/2022).

In December 2021, RGA completed a Phase IA archaeological survey for the provision of fish passage at Brandywine Creek Dams 2, 4, 5, and 6. The survey included background research, an assessment of archaeological sensitivity, and management recommendations. Background research revealed that the APE includes the Brandywine Dam 6 (i.e., Lower Hagley Yard Mill Dam) constructed in 1839 by E. I. du Pont de Nemours and associated with the nineteenth- through early twentieth-century DuPont Company of black powder manufacturers. The Brandywine Creek’s southern bank within the APE for Dam 6 was assessed with a high sensitivity for pre-Contact archaeological resources due to its environmental setting and a moderate sensitivity for historic archaeological resources due to its proximity to the DuPont complex and its location adjacent to the historic dam. A stone retaining wall is present in the western portion of the APE for Dam 6, and the area containing the retaining wall was also recommended as having a high sensitivity for historic archaeological resources (Richard Grubb & Associates, Inc. 2021). Archaeological testing was recommended in archaeologically sensitive areas along the southern bank of Brandywine Creek; however, no further testing was recommended in sensitive areas in the western portion of the APE for Dam 6 as ground disturbance was not

proposed in this area. Due to the map-documented presence of the Brandywine Dam 6/Lower Hagley Yard Mill Dam in the early nineteenth century, archaeological monitoring of the dam's removal was recommended to record dam construction techniques.

In September 2022, RGA completed a Phase IB archaeological survey within the recommended portion of the APE for Dam 6 along the southern bank of Brandywine Creek. Subsurface testing included the excavation of 18 STPs and recovered a total of six (6) artifacts dating to the late nineteenth through twentieth centuries (Richard Grubb & Associates, Inc. 2022). The artifacts, which include lime green beer bottle glass, window glass, ferrous metal, a bolt, and a spike, had no clear spatial patterning and were determined to be the result of secondary deposition and not considered to represent an intact archaeological site. The results of the Phase IB archaeological survey determined that no archaeological resources are present in the area adjacent to the dam, and no further archaeological survey (i.e., Phase II evaluation) was recommended for that area. The survey reiterated the recommendation for archaeological monitoring during the removal of the dam structure (Richard Grubb & Associates, Inc. 2022). In a letter dated September 13, 2022, the DE SHPO concurred with these recommendations. RGA prepared an archaeological monitoring protocol dated October 11, 2023, which was submitted to the Brandywine River Restoration Trust for review on March 27, 2025, and approved by the DE SHPO via email correspondence dated April 3, 2025 (Richard Grubb & Associates, Inc. 2023; see Appendix B).

2.0 ARCHAEOLOGICAL MONITORING PLAN AND METHODS

The goals of archaeological monitoring were to document portions and profiles of the existing, NRHP-eligible dam and any remnants of legacy dam elements exposed during construction activities. Determinations of potential significance and integrity are based on the NRHP Criteria for Evaluation (Appendix C). The monitoring for the project adhered to the archaeological monitoring protocol dated October 11, 2023, and approved by USACE and the DE SHPO (Richard Grubb & Associates 2023; see Appendix B). All archaeological monitoring was conducted by an archaeologist who meets 36 CFR Part 61 for on-site excavation activities.

2.1 Archaeological Monitoring Protocol

The protocol for on-site archaeological monitoring was as follows:

- 1) A pre-construction start-up meeting will be held between Brandywine River Restoration Trust, Kleinschmidt, RGA, and the Contractor to discuss the intent of the monitoring and documentation and the procedures that will be implemented to record existing dam profiles and possible legacy dam features, if present. The Contractor will be notified that the identification of archaeological resources may necessitate halting construction so that archaeological documentation can proceed. The start-up meeting may be held on the first day of on-site monitoring.
- 2) A designated representative from the Contractor, Kleinschmidt, and/or Brandywine River Restoration Trust will inform the archaeological consultant by phone or e-mail at least three (3) working days in advance of construction activities.
- 3) The Contractor will be responsible for ensuring that excavations will be secured, and that excavations meet OSHA standards for safe entry into confined space, if appropriate. RGA will work closely with the Contractor to ensure that a suitable, near-shore section of exposed dam profile can be recorded via digital photography and scaled line drawings that is not obscured by high velocity, rushing water. Entry into excavations is not anticipated. No entry into the river will be conducted.
- 4) A designated representative from the Contractor should be on-site at all times during archaeological monitoring. Decisions to temporarily halt work to document archaeological resources will be communicated to representatives of Brandywine River Restoration Trust, Kleinschmidt, and the Contractor.
- 5) An archaeological monitor(s) will be on site during representative portions of the mechanical excavation (e.g., initial breach of dam, 50% breached, and fully breached points of work) within areas of required archaeological monitoring as shown on Figures 1.3 and 1.4 until sufficient representative documentation of dam profiles has been obtained and observation has been conducted to identify and document up-river legacy dam remains in the monitoring areas, if present, that may be exposed following a decrease in the elevation of river water.

- 6) The archaeological monitoring will include photographic and scaled line drawing recordation of up to two (2) profiles of each dam dependent upon accessibility, water level, water turbidity, and worker safety conditions along the river.
- 7) Where documentation of dam structures is necessary, construction demolition work will cease in proximity of the find, and the feature(s) will be documented to the extent permissible by site conditions and the parameters of project-related ground excavations. Work may continue in other parts of the project location subject to the monitoring protocol. Identified cultural features will be documented using photography and scaled line drawings. All identified cultural features will be plotted on project base maps. In the event legacy dams are identified, their potential significance will be assessed. Following on-site monitoring, an archaeological site registration form will be prepared for each dam and/or artifact collection, if applicable. If identified, a representative sample of the waterlogged wooden structural timbers for legacy dams will be recorded and mapped if brought to the shore by the Contractor. No samples of wooden timbers will be taken for dendrochronology analysis.
- 8) If artifacts (such as nails or spikes) are found embedded in wooden elements of a legacy dam, an attempt will be made to take a representative sample of such artifacts during the recordation process; artifacts will be placed in polyethylene bags with an accompanying tag that lists the appropriate provenience information. All collected artifacts will be logged, washed, and cataloged. A catalog will be appended to the monitoring report and all artifacts recovered will be offered to the Delaware State Museum following agency review of the archaeological monitoring report.
- 9) In the very unlikely event human burials or human skeletal remains are encountered, all ground-disturbing activities in the vicinity shall cease immediately and the DE SHPO will be contacted at 302-736-7400. Any appropriate legal officials, such as the local law enforcement department, or the County or State Medical Examiner, will also be contacted immediately. The possible human remains shall be left in place unless imminently threatened by human or natural displacement. Excavation and other activities in the vicinity will resume with approval from applicable parties, which may include the DE SHPO, the State Medical Examiner's office, and site managers, depending on the nature of the remains.

2.2 Background Research Methods

RGA conducted background research during the prior Phase IA and Phase IB archaeological surveys, which has been reproduced below (Richard Grubb & Associates, Inc. 2021, 2022). Background research identified previously registered archaeological sites and historic properties within the APE and assessed the potential for unidentified archaeological resources within the APE. Research included a search of the Delaware DHCA's Cultural & Historical Resource Information System (CHRIS) database to identify registered archaeological sites within a 1-mile radius of the APE, a review of historic resources listed or determined eligible for listing in the NRHP within or adjacent to the APE, and a review of previously completed cultural resources surveys conducted within and adjacent to the APE. Additional background research to author a land use history of the APE included a review of environmental data, archaeological literature, and pertinent primary and secondary historical sources,

including historic maps and atlases, aerial imagery, and local and county histories. In particular, the 2021 Phase II architectural investigation completed by CHAD was reviewed for information on the history of Brandywine Dam 6 (CHAD 2021b).

2.3 Laboratory Methods

Retained artifacts were processed and cataloged at RGA's laboratory in Cranbury, New Jersey. Artifact processing consisted of cleaning and hand washing non-friable cultural material. Durable artifacts (i.e., ceramic, glass), if recovered, were washed to remove residual soil and to facilitate identification. Less durable artifacts (i.e., metal, organic materials) were carefully dry brushed to remove residues prior to identification. Artifacts were placed in archival, 4-mil polyethylene zip lock bags with the appropriate contextual information. All artifacts were analyzed and cataloged according to provenience, artifact group, material, artifact type, decorative or surface treatments(s), and period of manufacture (when applicable). An effort was made to identify and date all temporally and functionally diagnostic artifacts, if present. An artifact catalog is presented in Appendix D. Standard references for historic period artifact classification were consulted (see Appendix D).

The artifact assemblage, project documents, field notes, and photographs are temporarily stored at the RGA headquarters in Cranbury, New Jersey. All artifacts recovered will be offered to the Delaware State Museum following agency review of this report.

3.0 BACKGROUND RESEARCH

Background research was conducted during the prior Phase IA and Phase IB archaeological surveys to provide appropriate environmental and cultural contexts and to identify any previously documented archaeological resources within or adjacent to the Dam 6 APE. A review of environmental data, archaeological literature, historic maps, local and county histories, selected primary documents, and historic and modern aerial imagery was completed to develop a land use history for the archaeological monitoring area. The results of this research are reproduced below and include information on the environmental setting of the archaeological monitoring area, its pre-Contact and historic context, documented cultural resources in the vicinity, and cultural resources surveys conducted nearby.

3.1 Environmental Setting

The APE is located within the Interior Swamps near the boundary of the Piedmont and Fall Line Physiographic Provinces (Figure 3.1; Grettler et al. 1996). The geology of the APE is composed primarily of Ordovician-age (approximately 485.5 to 443.8 million years ago) Brandywine Blue Gneiss, a formation that consists of medium- to coarse-grained granulites and gneisses composed of plagioclase, quartz, orthopyroxene, clinopyroxene, brown-green hornblende, magnetite, and ilmenite (Ramsey 2005). In addition to the prevailing Brandywine Blue Gneiss of the region, small portions of the APE are underlain by Ordovician-age Rockford Park Gneiss (Ramsey 2005).

The APE is situated at the base of a steep hillslope, with upland portions consisting of relatively level topography along the south side of Brandywine Creek (see Figure 1.1). Soils mapped within the APE consist of Neshaminy Montalto silt loams, 25 to 45 percent slopes, very stony (NvE). These soils are typically well drained and are located on hillslopes (Figure 3.2; Table 3.1; Natural Resources Conservation Service [NRCS] 2024).

The APE includes and lies along the banks of the Brandywine Creek. The Brandywine Creek drains into the Christiana River, which flows into the Delaware River. The Delaware River eventually empties into the Delaware Bay and the Atlantic Ocean. Currently, the APE is sparsely vegetated with deciduous trees and short, herbaceous underbrush near the creek banks. Dirt and gravel walkways pass through the area.

Table 3.1. Soil types mapped within the APE.

Name	Soil Horizon: Depth in Inches	Texture, Inclusions	Slope	Drainage	Landform
Neshaminy Montalto silt loams, 25 to 45 percent slopes, very stony (NvE)	A: 0–6 BE: 6–17 Bt1: 17–32 Bt2: 32–59 BC: 59–80	Silt loam Silt loam Silt loam Channery Silt Loam Very Channery Loam	25–45%	Well- drained	Hillslopes

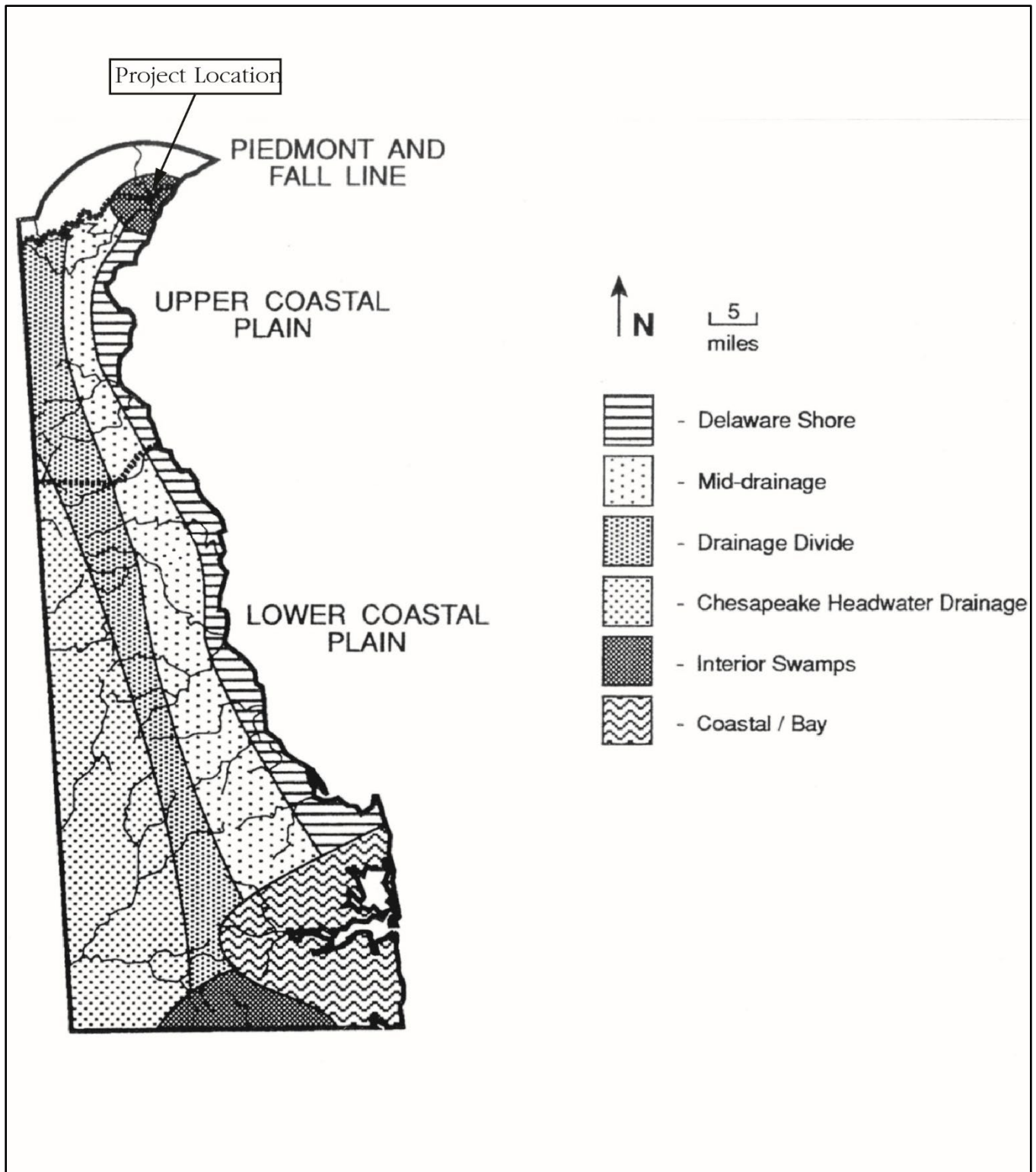


Figure 3.1: Physiographic provinces map showing the project location (adapted from Grettler et al. 1996).

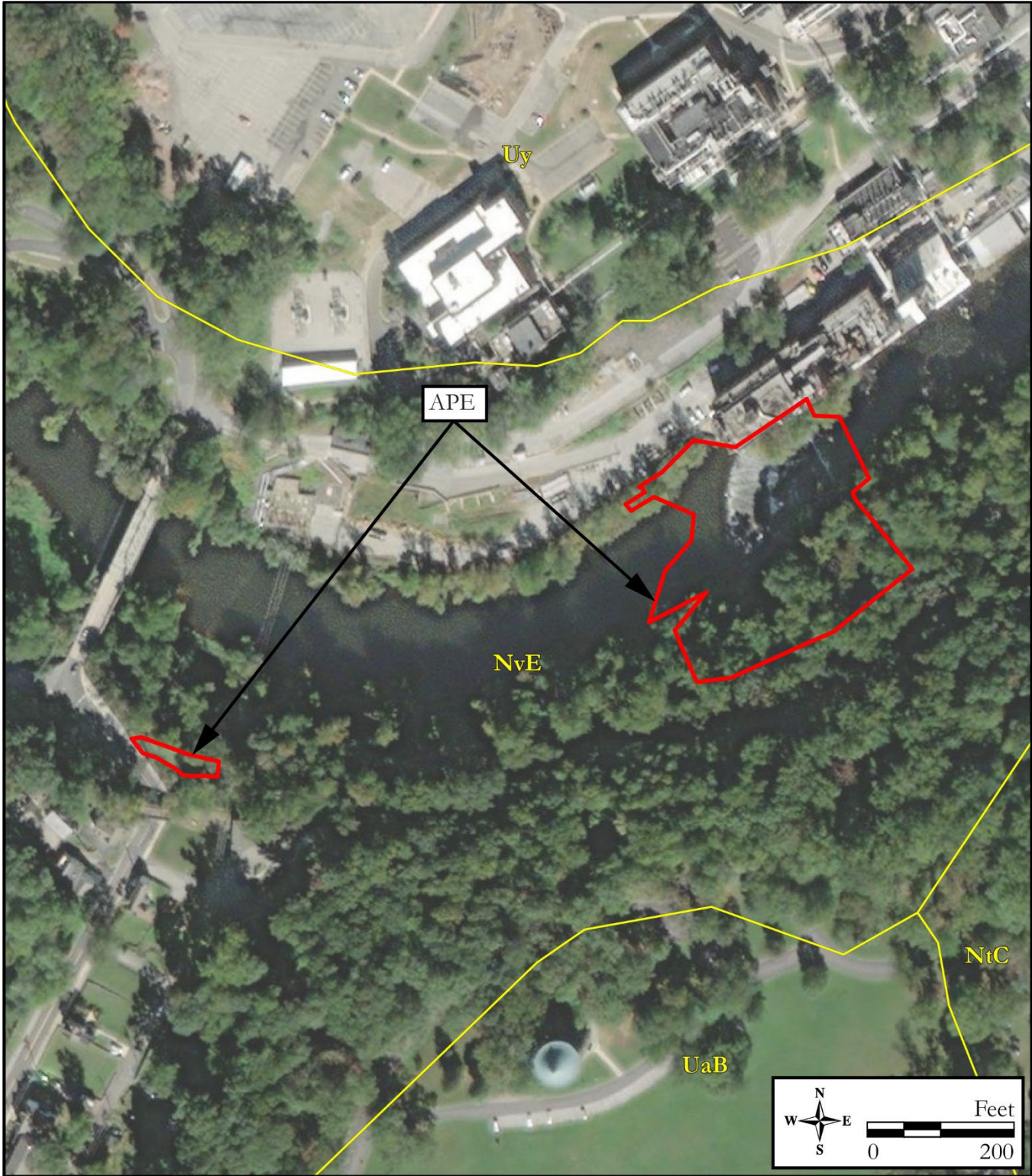


Figure 3.2: Soils map showing the archaeological monitoring area (from 2024 Soil Survey Staff, NRCS, United States Department of Agriculture. Soil Survey Geographic [SSURGO]).

3.2 Pre-Contact Context

The pre-Contact history of Delaware is generally divided into the Paleoindian (12,000–6500 BC), Archaic (6500–3000 BC), Woodland I (3000 BC–AD 1000) and Woodland II (AD 1000–1650) chronological periods based on a system devised by Custer (see, for example, Custer 1984, 1989). The following discussion summarizes information regarding Delaware pre-Contact archaeology from a variety of sources (Blume et al.1990; Custer 1984, 1989, 1996; Custer and DeSantis 1985; Custer et al. 1986, 1996; Eveleigh et al. 1983; Louis Berger Group 2005; Lowery 2002; Petraglia et al. 1998, Riley et al. 1994; Weslager 1972).

The Paleoindian period extends from 12,000 BC to 6500 BC and is considered the earliest documented human occupation of the Delmarva Region. Subsistence patterns during this time included large game hunting and generalized foraging. People were highly mobile, lived in small groups, and made distinctive fluted projectile or spear points and a variety of other tools favoring high-quality jasper or chert obtained from quarry or cobble sources. Later in this period, Kirk and Palmer and other corner-notched and stemmed projectile point types were favored and there was increased use of other lithic materials such as rhyolite. Paleoindian site settings within the Piedmont are typically associated with upland knolls adjacent to swamps and bogs and poorly drained areas near the confluences of streams and rivers, limestone sinkholes or valleys, and sources of high-quality lithic materials such as the northern Delaware Chalcedony Complex or outcroppings of quartz in northwestern Delaware and Iron Hill (Custer 1989, 1996; Custer and DeSantis 1985; Lowery 2002).

Paleoindian and Early Archaic sites in northern Delaware are small procurement sites situated on uplands near swampy or poorly drained areas, floodplains, and springheads. Examples include the Gabor Prehistoric Site 2 (7NC-D131[B]); site 7NC-D-70; and the Mitchell Farm site (7NC-A-2) (Custer 1989:104; Custer and DeSantis 1985).

The Archaic period (6500–3000 BC) was a time of adaptation to Holocene environments. Tools used by Archaic people included bifurcated base and stemmed points, ground-stone and plant processing tools, and more generalized toolkits, all produced from a wider variety of lithic materials than previously. Archaic peoples were hunter-gatherers who increasingly utilized resources including shellfish and estuarine resources, forest foods (such as nuts and fruit), and small game. Archaeological sites for this period may include both large base camps where many people lived and worked and small camps where specific activities took place or where small groups lived as part of an overall stratified riverine settlement system.

Archaic period sites are found in association with newly emergent freshwater interior swamps and marshes, such as Churchman’s Marsh in northern Delaware, upland slopes near streams and bogs, springheads, and knolls near swampy floodplains (Custer 1996:158; Custer and Wallace 1982). In the Piedmont, there is little evidence for the presence of Archaic period people but what is available includes small procurement sites and find spots of bifurcate points (circa 6000 BC), considered diagnostic of the Archaic period (Custer 1996:158). Cobble resources and use of a wider variety of lithic sources have been noted during the Archaic period.

The Woodland I period (3000 BC–AD 1000) was a time of dramatic social and technological change. Possibly due to a warmer climate, populations in the area increased. Tools used during this period include broadspear points or knives; narrow-stemmed, fishtail, and other stemmed points; and plant-processing tools. New types of vessels were invented, including soapstone bowls and ceramics. During this time, indications of social change, religious ideas, and possible social ranking can be found on archaeological sites in the Delmarva Peninsula. These include mortuary ceremonialism, extensive trade networks for exotic raw materials, and intensive harvesting of wild plant, marine, and game foods, along with the use of a wide variety of environments and settlement of large base camps along major streams. No fish weirs to suggest shad harvesting in the Brandywine Creek have been archaeologically identified during this time period (Lutins 1992).

The Woodland I period is divided into complexes with diagnostic artifacts. During the early part of the Woodland I period, the Clyde Farm Complex (named for the Clyde Farm site [7NC-E-6]) near Churchman's Marsh) is defined by the use of diagnostic early ceramics, steatite vessels, broadspears, and the prevalence of argillite (Custer 1989:185). Later complexes of the Woodland I period include the Delmarva Adena Complex which is defined by the presence of Adena points, Flint Ridge chert from Ohio, Coulbourn ceramics, grave goods and exotic Adena-related artifacts, including copper, tubular pipes, and shell beads; the Wolfe Neck Complex is defined by the presence of Wolfe Neck/Susquehanna Series ceramics, argillite, and rhyolite artifacts; and the Delaware Park Complex is defined by the presence of Hell Island ceramics and Jack's Reef points. Large base camp sites were located on the floodplains of major rivers, such as the Conowingo site on the Susquehanna River (Custer 1989:216), while smaller micro-band sites or procurement sites are found on the slopes of knolls adjacent to low order streams, in headwater settings, near bays/basins, and upland settings (Custer 1989:216–217; Custer and Wallace 1982). While fish resources were likely important to the diet of Woodland I period inhabitants, no fish weirs to suggest shad harvesting in the Brandywine Creek have been archaeologically identified (Lutins 1992). The frequency of water impoundment along the creek resulting from eighteenth-, nineteenth-, and twentieth-century dams may be preventing us from identifying weirs.

During the Woodland II period (AD 1000–circa AD 1650), people were living fairly settled lives, characterized by unfortified hamlets and camps. They made more use of local resources, including cobble cherts and jasper, and hunting tools included bows and arrows tipped with small, triangular projectile points. The Woodland II people can be linked to the historically known groups collectively referred to as the Lenape. They continued to use wild foods in addition to cultivars such as maize, beans, squash, and others, though this is poorly documented in the northern Delmarva. The Minguannan Complex, named for diagnostic incised ceramics, is found in the northern part of the Delmarva Peninsula. Large base camps are noted in portions of the Piedmont, such as the Mitchell Farm site near Hockessin (Custer and DeSantis 1985) and the Webb Site in Chester County (Custer 1989:312; Custer and Wallace 1982). Smaller procurement sites have been found in the Piedmont on the edges of knolls and adjacent to ephemeral streams.

The Contact period (ca. AD 1650–1750), is the time of the first European contact with Native Americans in Delaware (Custer 1989; Custer and Wallace 1982). This period is further subdivided by Custer (1989) into the pre-1675 Early Contact Complex and post-1675 Refugee Complex. The Contact period began with the arrival of primarily Dutch and Swedish settlers in the early and mid-

seventeenth century. Large numbers of English settlers arrived beginning in the late seventeenth century. Early Native American contact with European explorers and settlers has been documented for the Chesapeake Bay and the Delaware Bay near Lewes, Delaware. The Upper Chesapeake Bay was visited by Captain John Smith during his second voyage in 1608 and he mapped the area and made notes about his visit (Smith 1608, 1612). Based on ethnographic accounts, Native American groups in the vicinity of the APE included bands who spoke a similar language, called the Southern Unami (Goddard 1978). They were likely to have been somewhat settled in villages at this time, relying on horticulture and continued hunting and gathering for subsistence.

Native American use of the Brandywine was certainly robust, and a large settlement was documented along the river near the present-day boundary of Pennsylvania and Delaware, approximately 5 miles to the north of the project location. This settlement, named “Queonemysing”, existed in the late seventeenth century, and possibly earlier. The name “Queonemysing” translates as “place where there are long fish,” and is now spelled “Kwënamèsink” by the federally recognized Delaware Tribe of Indians (Martina K. Thomas, personal communication, January 8, 2026). This suggests the village, in part, focused on seasonal fishing (Reed et al. 2019:26). Indeed, the Swedes referred to the Brandywine Creek as Fiskekylen or Fish Creek, suggesting its abundant supply of fish at the time of the Contact period (Reed and Wallace 2019:26). The archeological data for Native American occupation and settlement sites near the lower portions of the Brandywine are sparse, due in part to the early European colonization and subsequent landscape development as the area in and around present-day Wilmington became increasingly populated. In 1725, the Lenape of Kwënamèsink, who were earlier, in 1705, able to retain land for 1 mile on each side of the Brandywine Creek from its mouth to its West Branch, complained of Europeans illegally settling on and selling their land, stating: “We are molested and our Lands surveyed out, and settled before we can reap our Corn off and to our great Injury the Brandy-wine Creek is so obstructed with Dams, that the Fish cannot come up to our Habitation” (Reed and Wallace 2019:28). Clearly, by 1725, the European settlement and landscape modification greatly affected the natural resources earlier used by the Lenape inhabitants during the Contact period.

Dunlap and Weslager (1960) report that seventeenth-century documents highlight Native inhabitants’ use of the Brandywine Creek, not only for settlement and as a transportation route, but also as part of an annual gathering that focused on fish harvesting and processing. The gatherings may have been as extensive as those that resulted in the formation of the Abbott Farm National Historic Landmark along the Delaware River and Crosswicks Creek in New Jersey that date from the Middle and Late Woodland periods. There, archaeology reveals evidence of intensive, annual harvesting, processing, and preserving of sturgeon to provide a longevity of available food stores. The full range of fish species exploited by Native American inhabitants along the Brandywine and in the vicinity of the project location during the pre-Contact period is unclear, as the modification of the river for industrial purposes during the historic period, as well as historic and modern fishing practices have impacted the species able to navigate the river. It is possible that during the pre-Contact period, the Brandywine Creek supported larger, anadromous fish species such as shortnose sturgeon, which have been rarely documented in the lower reaches of the Brandywine Creek and Christine River as late as the 1980s (Jim Shanahan, personal communication, January 12, 2026; Hal Brundage, personal communication to Jim Shanahan, December 19, 2025). Currently, there is no pre-Contact period archaeological

evidence in the vicinity of the project location to corroborate the direct fishing and processing of sturgeon species; however, the presence and exploitation of species such as shortnose sturgeon is suggested by the place name “Kwënamèsink”, which was located a short distance upstream of the project location.

Seasonal villages and fishing along the Brandywine by the Lenape and earlier cultures would likely have resulted in the creation of several fish weirs that, if still extant, may be submerged within areas of impounded water behind extant dams that began to be created during the eighteenth and nineteenth centuries. Members of the Van der Veer family who had owned land since the 1660s along the Brandywine, reported a village of 200 to 300 Native Americans who, for a five- to six-week period during the spring months, gathered on the property to establish a seasonal encampment for the purpose of processing, cooking, and preserving fish and turtles gathered from the Brandywine Creek near its confluence with the Christina River (Dunlap and Weslager 1960:2). It is unclear if the village of which Van der Veer spoke was related to the occupation of Kwënamèsink 5 miles to the north, or if it was a later village occupied by a different group further downstream. By the 1730s, the Lenape who inhabited the Brandywine drainage area had largely relocated to the Susquehanna and Ohio rivers (Reed and Wallace 2019:29).

3.3 General Historic Overview

In accordance with state guidelines, the following historic overview was divided into chronological periods as set forth in the Delaware Comprehensive Historic Preservation Plan (DeCunzo and Catts 1990; Herman et al. 1989). In this section, the previously described APE is referred to as the “project location” due to the imprecision of locating the exact APE boundaries on historic maps of various scales.

Exploration and Frontier Settlement, 1630–1730 ±

The vicinity of the project location was settled in the early seventeenth century with occupations concentrated along the Delaware River. There, European inhabitants relied on hunting, fishing, and trade for subsistence. In 1638, the New Sweden Company built Fort Christina in what is now part of the City of Wilmington to the south, and the Dutch West India Company built Fort Casimir in present-day New Castle (De Cunzo and Catts 1990:29). After 1680, William Penn made land grants to primarily Quaker and Presbyterian immigrants from England, Wales, and Ireland who began farming the area and established some of the early roads (DeCunzo and Catts 1990; Herman et al. 1989:1–2). Mills, including saw and gristmills, were established during this period, but they were infrequently erected (Goodwin 1986; Herman et al. 1989:3). In the 1720s, Samuel Kirk purchased an old barley mill and the surrounding lands from the family of Swedish colonist Tymon Stidman. The Stidham family owned the land on the south side of the Brandywine Creek and, there, constructed a barley mill sometime prior to 1687. The lands on the opposite side of the creek were owned by a Dutchman, Jacob Vandever. Samuel Kirk formed the Kirk Company to raise funds to build a new dam and mill.

Intensified and Durable Occupation, 1730–1770 ±

During this period, farmers in the area increased agricultural production for subsistence and for sale in local village markets and markets in Wilmington, Philadelphia, and Baltimore. New and expanded

roads enabled farmers to move their crops to local and regional markets. Development in and around Wilmington increased during this period and, prior to the city receiving its charter in 1740, Wilmington was known as Willingtown (Goodwin 1986). The construction of the Brandywine Bridge in 1760 led to development along the north bank of the Brandywine Creek, an area that previously had been relatively undeveloped (Hoffecker 1974:26). This growth included the excavation of mill races and the establishment of flour mills along the north bank of the creek by Joseph Tatnall who, along with his sons-in-law Thomas Lea and James Price, bought land from Tobias Vandever in 1770. In addition to mills, Tatnall and others invested in shipping and shipbuilding, which were important commercial activities in the area along with milling and coopering (Goodwin 1986:70, 75; Hoffecker 1974; Kruse 1970; Kruse and Norton 1976; Scharf 1888).

Early Industrialization, 1770–1830 ±

In 1777, the Continental Army set up an encampment in Wilmington, along Lovering Avenue near Broom Street, before the Battle of Brandywine. After the Continentals lost the battle, the British Army formed an encampment on the lands that currently contain the Wilmington Cemetery (Goodwin 1986; von Wangenheim 1777).

By the early nineteenth century, Wilmington's economy became increasingly reliant on grain milling and grist sale and transportation. In just 100 years, from 1730 to 1830, the population of Wilmington grew from 600 people to over 5,000 (Goodwin 1986). By 1802, Wilmington was well established, and several mills existed along the Brandywine Creek in Brandywine Village (Jones and Moore 1802). Early nineteenth-century population growth, spurred by early industrialization, led to an increased need to supply Wilmington's citizens with an adequate water supply. Prior to 1805, all water was acquired through the use of wells and water redirected from nearby springs. This proved to be inadequate to supply the growing population, and pipes were installed to draw water from the Brandywine Creek. In 1827, a pumping station was established on the south side of Brandywine Creek to draw larger quantities of water and combat the growing water shortage issues (McVarish et al. 2014:18–25).

Industrialization and Early Urbanization, 1830–1880 ±

Between 1830 and 1880, Wilmington's population exploded from just over 6,000 to almost 43,000 (Goodwin 1986) and the city continued to expand across the Brandywine Creek. In addition to milling, four major industries that thrived in Wilmington during this time were shipbuilding, rail car building, carriage making, and tanning (Goodwin 1986). Another important development was the construction of the Wilmington and Baltimore Railroad to the southeast of Wilmington. During the 1830s, businessmen from Philadelphia, Wilmington, and Baltimore began the process of connecting the three large cities by rail. Each city believed that the creation of the railroad would increase the business and production within their respective cities. A company, called the Wilmington and Susquehanna Railroad, was subsequently formed and granted a charter to lay track in Wilmington. The Wilmington and Susquehanna Railroad later merged with the Philadelphia, Wilmington, and Baltimore Railroad (Hoffecker 1974). Based on a circa-1850 railroad map, the earlier Wilmington and Susquehanna Railroad likely corresponds with the abandoned rail corridor that runs along the south side of Brandywine Creek, crosses present-day Rising Sun Lane approximately 840 feet west of the project location, and continues through the project location adjacent to dam 6 (Trautwine c. 1850).

Urbanization and Early Suburbanization, 1880–1940 ±

During the late nineteenth and early twentieth centuries, the population of Wilmington and surrounding hundreds continued to increase. Polish, Italian, Russian, and Greek immigrants, who clustered together in small communities, each brought new customs to the area (Goodwin 1986). The new immigrant population provided a steady supply of labor to old and new businesses. Wilmington became one of the largest manufacturers of Moroccan leather and railroad cars. Shipbuilding remained an important part of the economy through World War II; however, Wilmington became best known for its chemical companies led by the DuPont Company (Goodwin 1986).

During the 1880s, the population of Wilmington continued to spread northeast. Between 1883 and 1895, the Wilmington Park system was created along the Brandywine Creek and included the present-day Brandywine Park (Goodwin 1986). Originally called Brandywine Glen, the banks of the Brandywine Creek had long been an area used by the residents of Wilmington and neighboring hundred as a respite from the crowded city streets (DHCA-SHPO 1979). In 1886, the first land purchases were made, and Samuel Canby was hired to design the park layout. Although Fredrick Law Olmstead, the prominent landscape architect who designed New York City's Central Park, was not hired to help with the design of Brandywine Park, Olmstead was consulted about the project. Many of Olmstead's ideas were incorporated into the park's design and included a curved, landscaped parkway. Roads, paths, and walks were created that blended into the natural park surroundings with primary importance being the preservation of the creek and the mill races (DHCA-SHPO 1979).

Beginning in the 1890s, the mill races that ran parallel to Brandywine Creek delivered water to Wilmington's Waterworks. By the twentieth century, polluted water from Rattlesnake Run that drained into the Brandywine Creek was inadvertently transferred to the waterworks via the former mill races (Chase 1999). This problem was solved in 1902 when a new drainage system was created that collected the runoff and released it into the Brandywine, below the mouth of the mill race (Chase 1999). Polluted groundwater was also abated by the construction of new sewer systems between 1895 and 1915, which resulted in the closure and filling in of the city's privies. Many of the major streets were paved during this period and a new trolley system was constructed in 1912 that connected many parts of the city (Goodwin 1986).

Industry in Wilmington and nearby areas was based on a system in which the industries were locally owned and laborers resided in nearby dwellings. During the early twentieth century, however, industry shifted to big businesses, such as the DuPont Company, staffed by highly educated workers who lived in and commuted from the nearby suburbs (Goodwin 1986).

Suburbanization and Early Ex-urbanization, 1940–1960 ±

After World War II, the population of Wilmington and nearby areas began to decline. Service jobs in industries, such as financial services, insurance, corporate management, and research and development, began to increase. During this time, Interstate 95 was constructed, which bisected Wilmington and divided neighborhoods (Goodwin 1986).

3.4 Site-Specific Historic Map, Atlas, and Aerial Review

In this section, the previously described “APE” is referred to as the “project location” due to the varied scales used on historic maps and atlases.

During the mid- to late eighteenth century, the project location was likely owned by Job Harvey, who operated a gristmill along the western bank of the Brandywine Creek in the vicinity of the Rockford mill site (CHAD 2021b). A dam shown within the project location on an 1816 map of mill seats in Wilmington is situated upstream of several mills that existed on both sides of the creek (Figure 3.3; Fairlamb & Read 1816). The text displayed on the parcel adjacent to the dam reads: “One third of the Water/ of Brandywine with a fall of 9 feet 4 in./ a. r. p./ 13.0.33.” The dam depicted on the 1816 map (not extant) was of an unknown construction style. It appears to have powered six waterwheels on the north bank and three waterwheels on the south bank. At that time, Caleb Kirk owned the land and water rights in the area and also operated Rockland Mills further upstream with his brothers. Kirk entered into a partnership with James Jeffries, E. I. du Pont de Nemours, John Warner, William Warner, and John Torbet to form the Brandywine Mill Seat Company. The area outlined in green on the map depicts the property owned by the company. Although it disbanded in 1825, the Brandywine Mill Seat Company allowed for the collective purchase of land and water rights to diffuse the cost of milling operations and allow for the construction and repair of dams that supplied multiple mills under different ownership (CHAD 2021b). On an 1822 map of Delaware, the project location is shown near the mill complex along that portion of the creek (Figure 3.4; Carey 1822).

In 1830, E. I. du Pont de Nemours purchased the mill seat from Kirk, and the Lower Hagley Yard became part of the DuPont Company of black powder manufacturers that had been founded in 1802. In 1839, flooding of the Brandywine destroyed the stone dam embankments and part of the dam, while also forcing open the headgates and sweeping away the entire race bank. The dam was rebuilt following the flood, and it is likely that the rebuilt dam is the same dam that is extant within the project location (Dam 6). It is estimated that the Lower Hagley Yard produced more than half of the total black powder manufactured by DuPont and allowed the company to supply over 40 percent of the ammunition used by the Union Army during the Civil War (CHAD 2021b).

An 1849 map of the county shows the eastern portion of the project location situated across the creek from the industrial buildings of the DuPont Company’s Lower Hagley Yard (Figure 3.5; Rea and Price 1849). The western side of the project location is situated next to present-day Rising Sun Lane, which was extant by this period. Little change is shown on an 1868 atlas, which depicts the DuPont power mills on the northern bank and slightly increased development along Rising Sun Lane to the west (Figures 3.6 and 3.7; Beers 1868). A photograph of the dam was taken in 1870, which shows a building associated with the Lower Hagley Yard on the northern bank (Figure 3.8; Anonymous 1870). The picture depicts a railroad between the armoring/stone retaining wall and the building that stood in 1870. The creek appears to be lined with stone armoring and the curving dam is similar to its present-day form. A separate photograph from the same year was taken looking at the dam from downstream, with more DuPont buildings visible among the trees in the background (Figure 3.9; Maybin 1870).

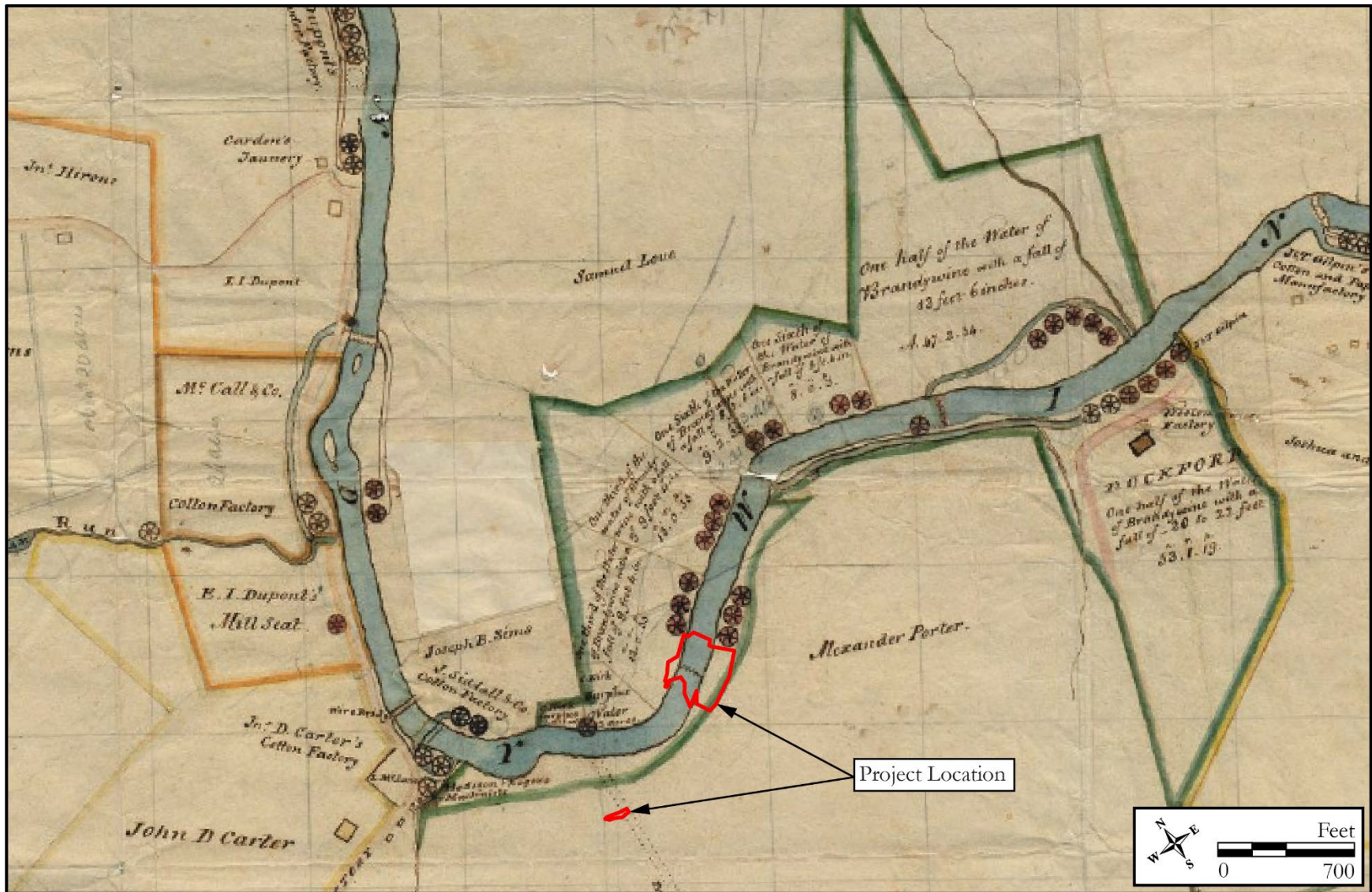


Figure 3.3: 1816 Fairlamb & Read, *Mill Seats on the Brandywine River*.

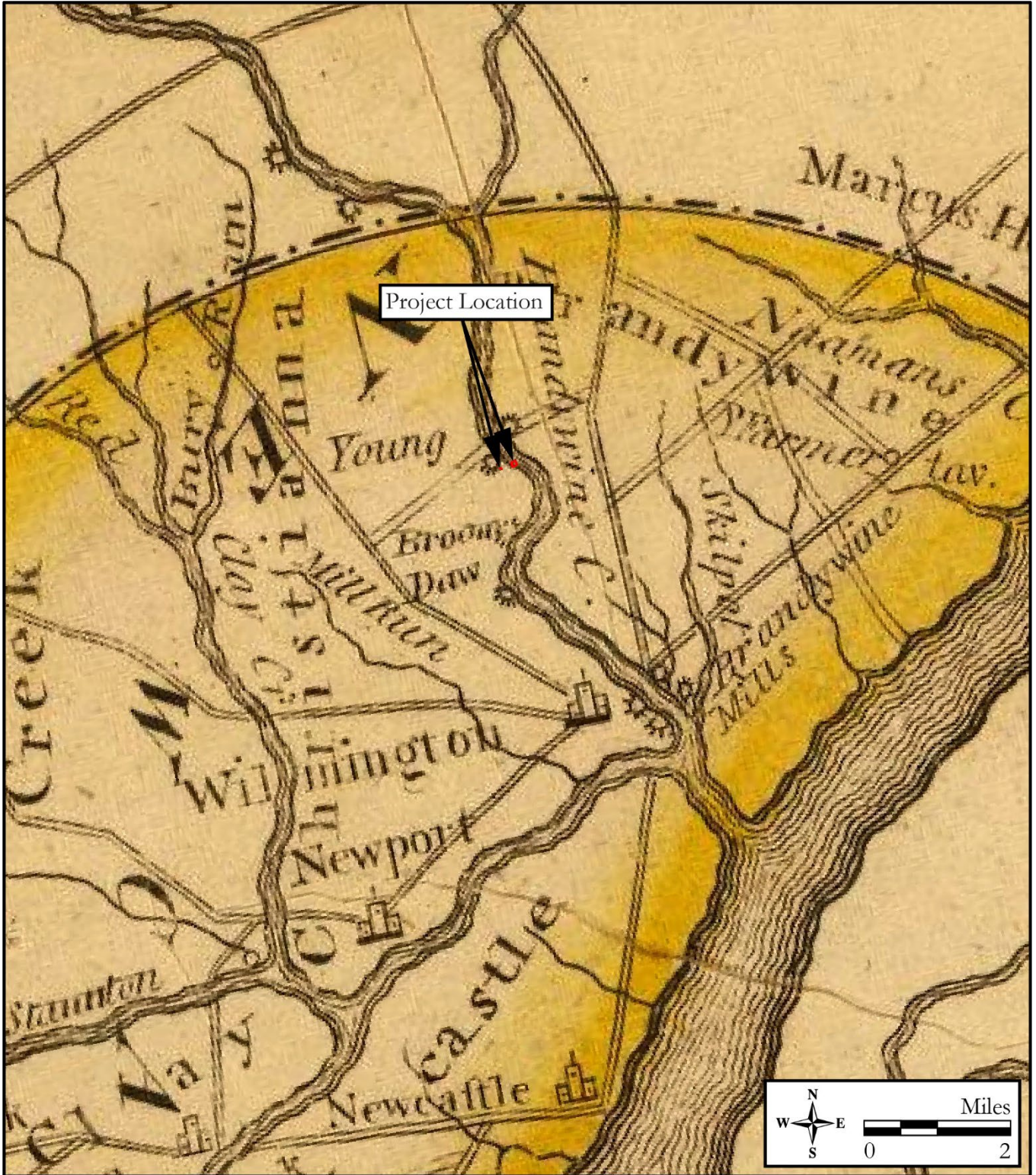


Figure 3.4: 1822 M. Carey, *Delaware, from the Best of Authorities.*



Figure 3.5: 1849 S. Rea and J. Price, *Map of New Castle County, Delaware*.

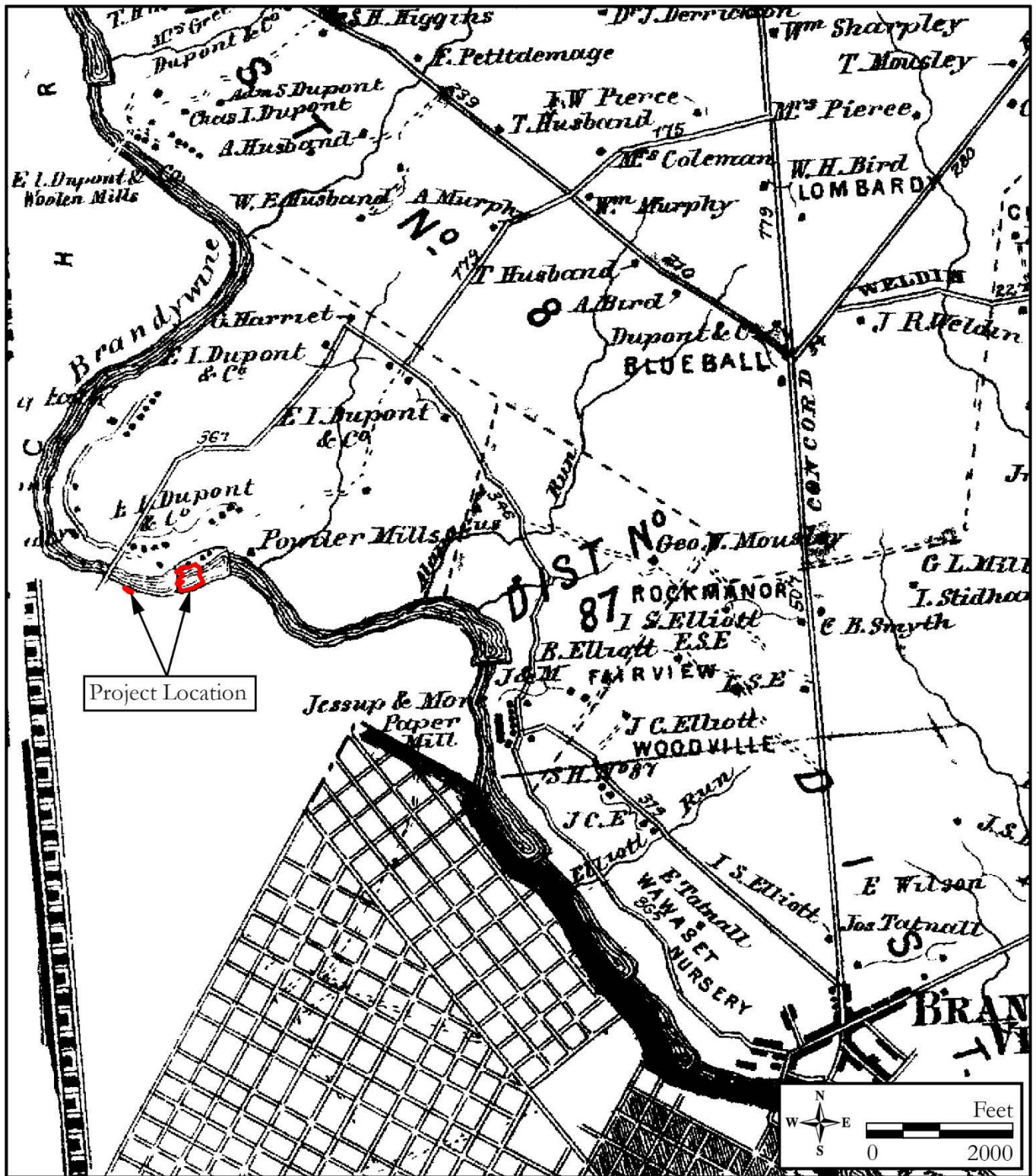


Figure 3.6: 1868 D. G. Beers, Brandywine, New Castle Co Del., in *Atlas of the State of Delaware*.

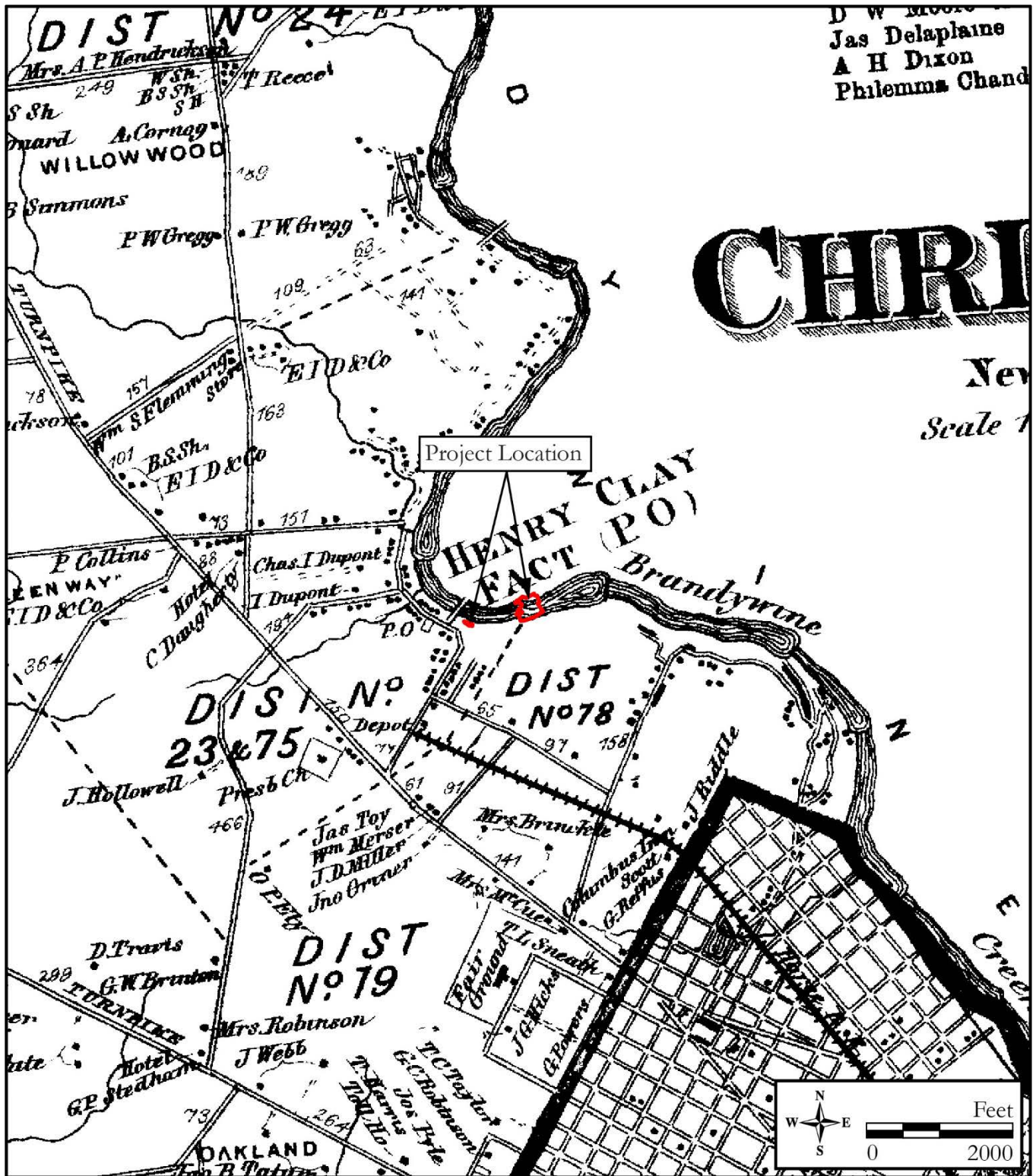


Figure 3.7: 1868 D. G. Beers, Christiana, New Castle Co Del., in *Atlas of the State of Delaware*.

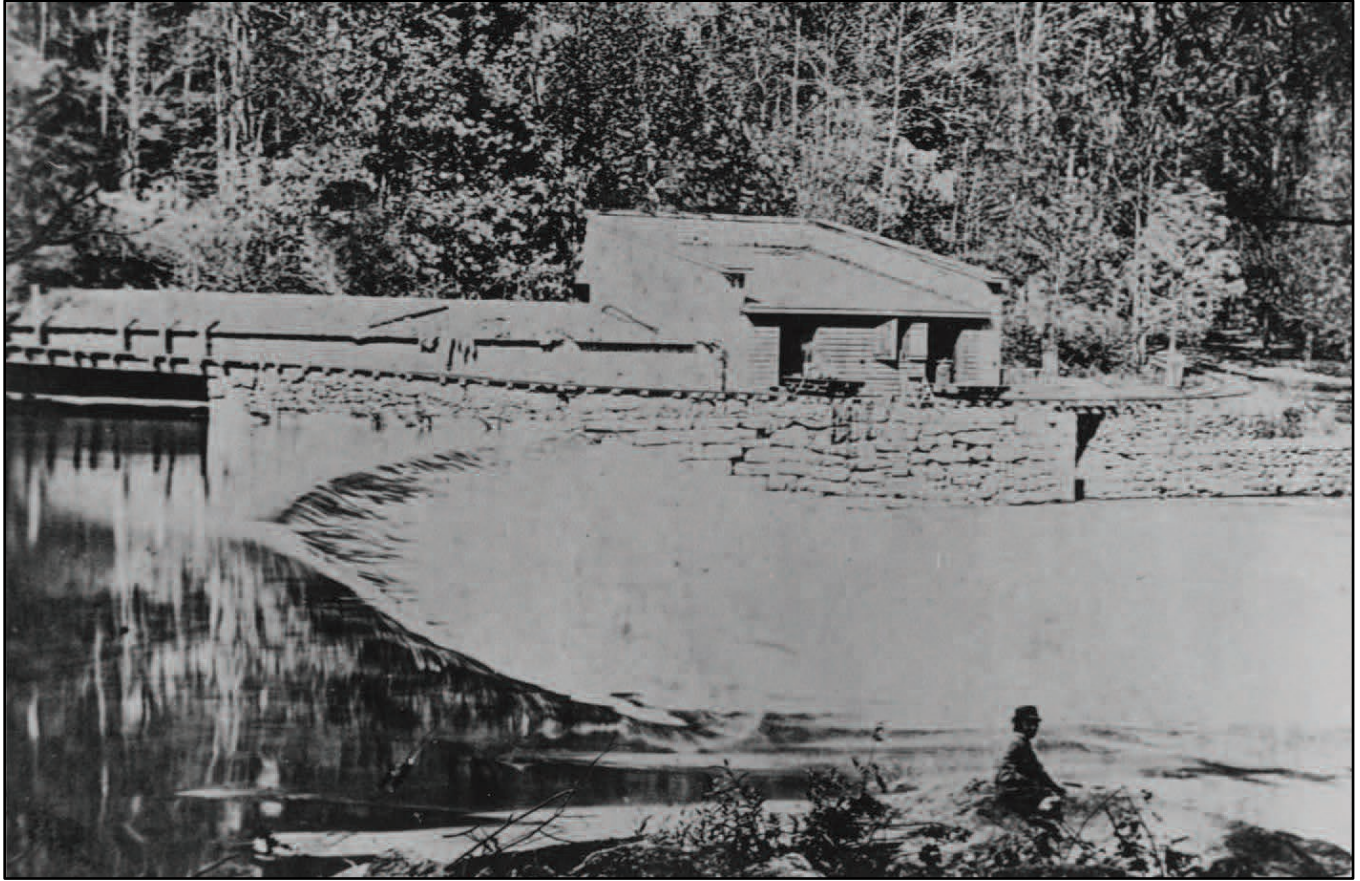


Figure 3.8: Glaze mill, Lower Yard (with view of Dam 6) in 1870.
(Anonymous 1870).



Figure 3.9: Dam, Lower Hagley Yard in 1870.
(Maybin 1870).

The 1881 county map shows the Lower Hagley Yard is part of the E. I. DuPont & Co. Powder Mills, with present-day Creek Road now passing through the complex (Figure 3.10; Hopkins 1881). A photograph of the Lower Hagley Yard Dam (Dam 6) taken in 1896 shows that a gabled dormer addition had been built onto the building adjacent to the dam on the northern bank since it was photographed in 1870 and the stone armoring was in a greater state of disrepair (see Figure 3.8; Figure 3.11; Anonymous 1870; 1896). A map of the Lower Powder Yard from 1902 depicts the project location in relation to the Lower Hagley Yard Dam, the DuPont complex adjacent and to the north, and Rising Sun Lane adjacent and to the west (Figure 3.12; E. I. du Pont de Nemours & Company 1903). The Wilmington and Northern Railroad – Kentmere Branch passed to the south of the project location. In 1903, the DuPont Company constructed an Experimental Station to facilitate their new commercial endeavor of researching and developing chemicals. Due to a diminished demand for black powder, the powder mills ceased operation entirely in 1921, and it is unlikely that the Lower Hagley Yard mill dam has been used since (CHAD 2021b).

Little change is visible within the project location in twentieth- and twenty-first-century aerial photography (National Environmental Title Research 1937, 1950, 1953, 1954, 1965, 1970, 1981, 1982, 1992, 2002, 2006, 2007, 2009, 2010, 2011, 2012, 2013, 2015, 2017, 2018). The project location is primarily wooded, situated just north of Rockford Park. The industrial Lower Hagley Yard north of the project location did not see any major additions or alterations, and residential development to the west of the project location remained the same.

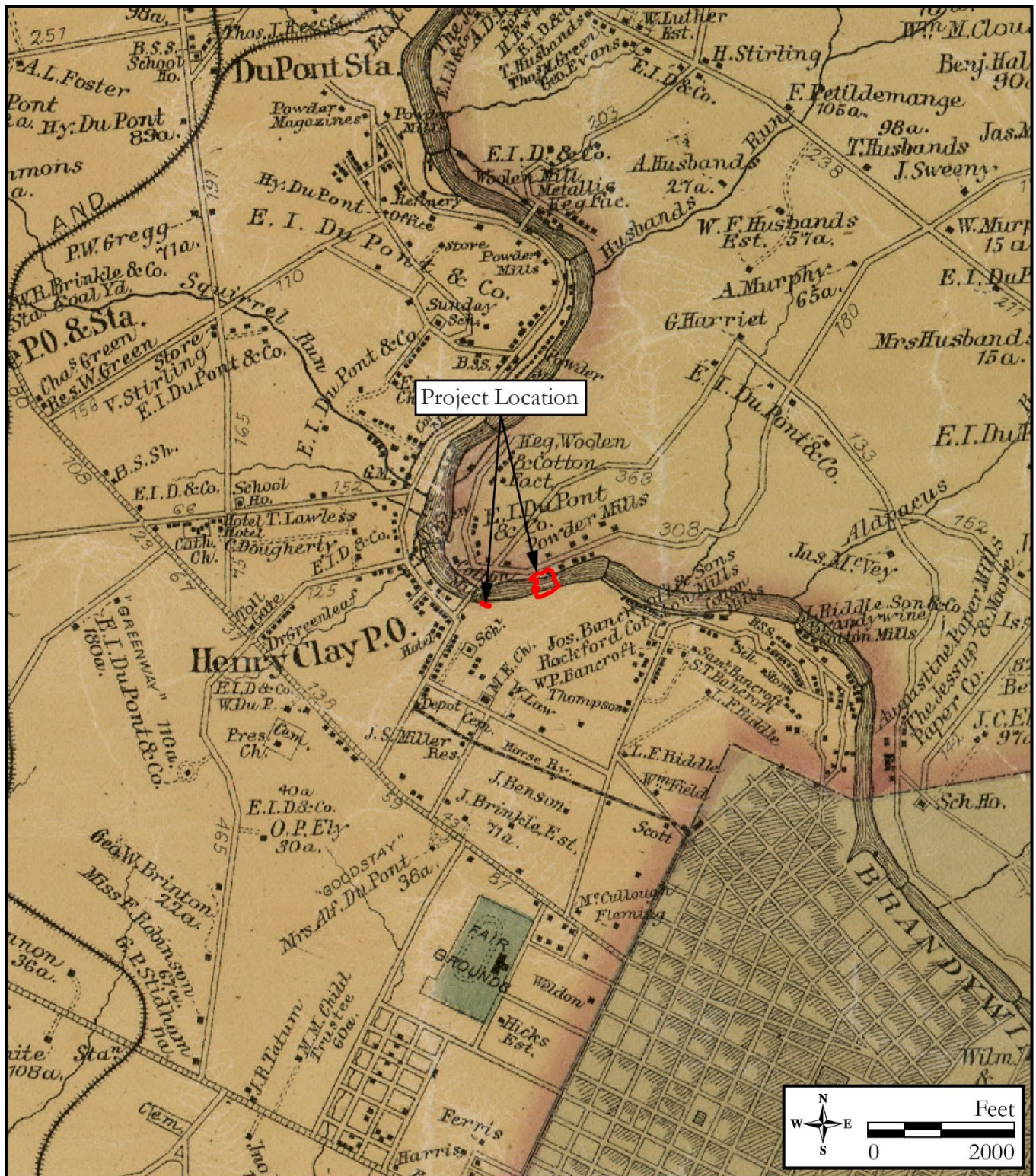


Figure 3.10: 1881 G. M. Hopkins & Co., *Map of New Castle County, Delaware*.



Figure 3.11: Dust mill, rolling mills, Lower Hagley Yard (with view of Dam 6) in 1896.
(Anonymous 1896).

3.5 Registered Archaeological Sites

No registered archaeological sites are present within a 1-mile radius of the APE.

3.6 Prior Cultural Resource Surveys

In 2021, a Phase IA reconnaissance-level historic architecture survey was conducted by CHAD for the proposed project's effects on Brandywine Dam 6 (CHAD 2021a). The survey concluded that the APE contained three previously unidentified aboveground resources: the Brandywine Dam 6/Lower Hagley Yard Mill Dam, a bridge, and a culvert. Due to the dam's age and the fact that it was going to be partially removed, an intensive-level historic architectural survey was recommended. Because no alterations were proposed for the bridge and culvert, a reconnaissance-level survey was recommended for each.

In December 2021, CHAD completed the Phase II architectural investigation for the proposed project (CHAD 2021b). This report recommended the Brandywine Dam 6 as eligible for listing in the NRHP under Criteria A and C.

Also in December 2021, RGA completed a Phase IA archaeological survey for the project (Richard Grubb & Associates, Inc. 2021). The southern bank of the Brandywine Creek within the APE for Dam 6 was assessed with a high sensitivity for pre-Contact archaeological resources due to its environmental setting and a moderate sensitivity for historic archaeological resources due to its proximity to the DuPont complex and its location adjacent to the historic dam. Additionally, the area around a stone retaining wall identified in the western portion of the APE for Dam 6 was assessed with a high sensitivity for historic archaeological resources (Richard Grubb & Associates, Inc. 2021). Archaeological testing was recommended for sensitive, upland portions of the APE on the southern bank of the Brandywine Creek, though no further archaeological testing was recommended in the sensitive area in the western portion of Dam 6 as ground disturbance was not proposed near that location. Due to the map-documented presence of the Brandywine Dam 6/Lower Hagley Yard Mill Dam during the early nineteenth century, archaeological monitoring of the dam's removal was recommended to record dam construction techniques.

In September 2022, RGA completed a Phase IB archaeological survey within the upland portions of the Dam 6 APE along Brandywine Creek (Richard Grubb & Associates, Inc. 2022). Subsurface testing within the Dam 6 APE included the excavation of 18 STPs and recovered a total of six (6) artifacts dating to the late nineteenth through twentieth centuries. The artifacts, which include lime green beer bottle glass, window glass, ferrous metal, a bolt, and a spike, had no clear spatial patterning and were determined to be the result of secondary deposition and not considered to represent an intact archaeological site. The results of the Phase IB archaeological survey determined that no archaeological resources are present in the upland areas adjacent to the dam, and no further archaeological survey (i.e., Phase II evaluation) was recommended for this portion of the Dam 6 APE. The survey reiterated the recommendation for archaeological monitoring during the removal of the dam structure (Richard Grubb & Associates, Inc. 2022).

3.7 National Register of Historic Places Eligible and Listed Properties

One historic property individually eligible for the NRHP is located within the APE: the early nineteenth-century Brandywine Dam 6/Lower Hagley Yard Mill Dam (SHPO Opinion 5/5/2022; Figure 3.13).

Two additional historic properties listed in the NRHP are located adjacent to the APE: The Rockford Park Historic District (N012446) (NR: 6/23/1976) and the Breck's Mill Area-Henry Clay Village Historic District (N00333) (NR: 6/28/1971) (see Figure 3.13). The Rockford Park Historic District (N012446) is located directly south of the APE and consists of land donated in 1899 by William P. Bancroft for a public park. The park represents the first effort made by an individual citizen to create a Wilmington-area park, and William P. Bancroft became known as the father of the Wilmington Park System. The property is significant in the areas of Landscape Architecture and Social/Humanitarian history and has a period of significance of 1800–1899 and from 1900 to the mid-twentieth century.

The Breck's Mill Area-Henry Clay Village Historic District (N00333) is located directly west of the APE and consists of the remains of an early nineteenth-century industrial village. The village developed during the early nineteenth century around the 1813 Breck's Mill, which is situated upstream of the APE and adjacent to Brandywine Dam 7. Contributing elements to the historic district include a track of the Wilmington and Northern Railroad (N00333.039) and an associated railroad cover (N00333.038) which are located in proximity to the APE on the west side of present-day Rising Sun Lane (see Figure 3.13). A stone wall (N00333.040) is also adjacent to the APE but not considered a contributing element to the district (see Figure 3.13). The historic district is significant in the areas of Architecture and Industry as an excellent example of an early nineteenth-century industrial village and has a period of significance spanning the nineteenth century.

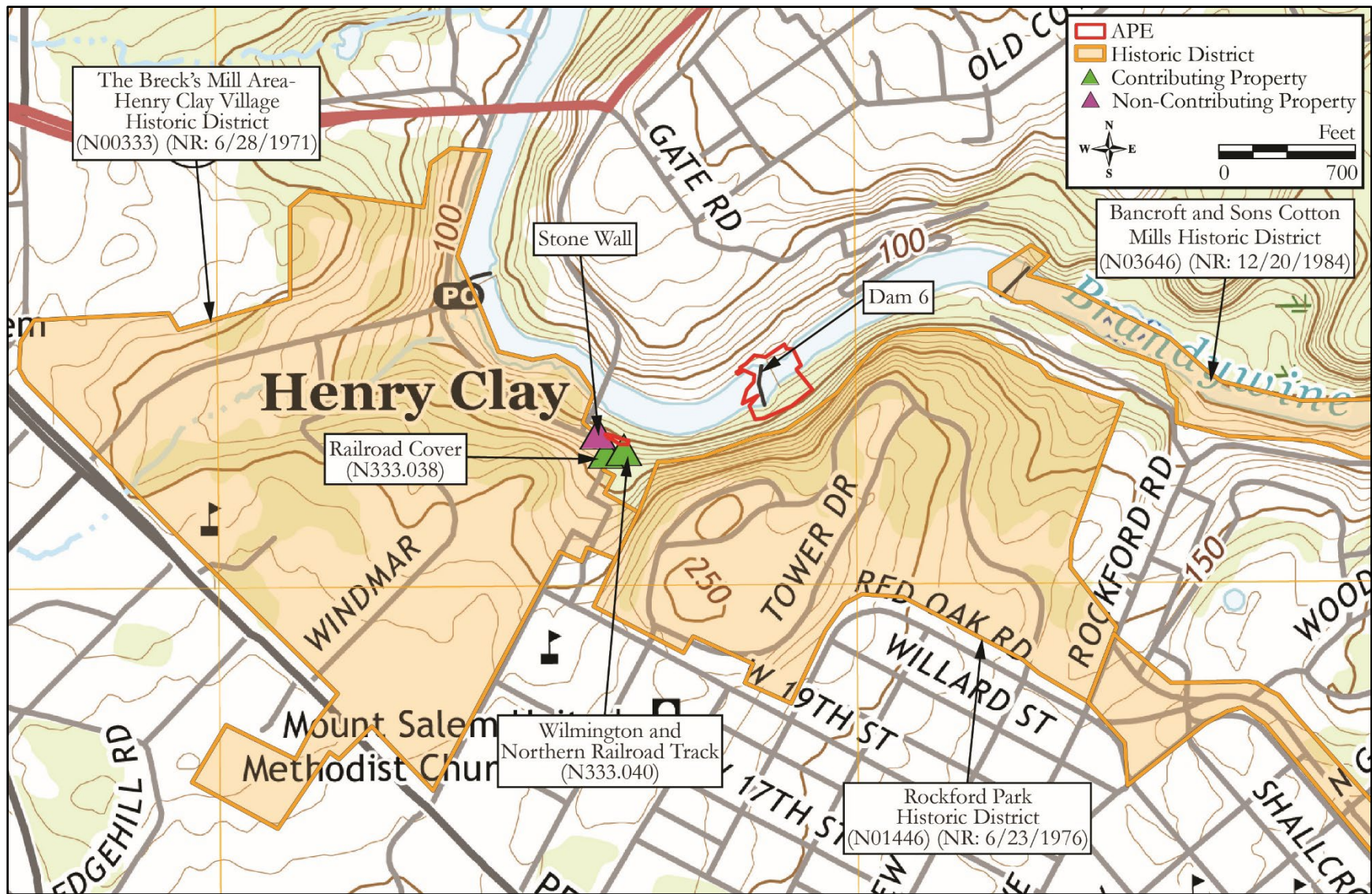


Figure 3.13: Historic properties within and adjacent to the APE (from 2023 USGS 7.5' Quadrangle: Wilmington North, DE).

4.0 RESULTS

4.1 Results of the Archaeological Monitoring

RGA conducted archaeological monitoring during the removal of Brandywine Dam 6 between July 23 and October 15, 2025, to record representative dam profiles (Figure 4.1; Plates 4.1–4.20). Monitoring took place after the initial dam breach, at the approximately 50 percent dam breach, and following 100 percent dam breach /removal completion. During this process, water flow velocity remained high and the dam structure was largely submerged. Based on background research, observations of the visible dam structure, and portions of the dam exposed and/or removed during excavations, representative plan and profile drawings were prepared to reflect Brandywine Dam 6's known structure and construction/repair sequence prior to its removal. These representative drawings are included as Figures 4.2–4.5. Additionally, a representative sample of artifacts was retained during monitoring (see Appendix D). These artifacts consist of ferrous metal fasteners recovered from removed portions of the dam and are shown in Figure 4.6 with reference to the structural elements from which they were recovered.

Following the initial dam breach, the structure was largely intact within the archaeological monitoring area and was documented via digital photography (see Plates 4.1–4.4). The present-day dam consisted of a concrete-topped structure with an ascending “<”-shaped ramp on its upstream side and a relatively level crest on its downstream side (see Figures 4.2–4.4; see Plate 4.2). The upstream ramp was covered with milled wooden planking in the direction of stream flow, while the visible portions of the downstream crest were composed of relatively level strips of concrete varying from approximately 0.7 feet to 3.1 feet in width (see Figures 4.2 and 4.3). These strips were separated by rectangular, milled boards vertically placed within the concrete (see Plates 4.2 and 4.3). The boards were approximately 0.25-foot by 0.6-foot (roughly 3 × 7 inches) in cross section and varied in length depending on where in the structure they were located, but relatively intact samples were about 10 feet long (see Figure 4.5; see Plates 4.5 and 4.6). Approximately 0.5 feet of overlap was present between boards where they ended within the concrete structure (see Figure 4.2; see Plate 4.7). This, along with exposed concrete sections removed from the dam's upper portion during excavations (see Plates 4.8–4.10), indicates that the milled boards were installed with the concrete cap sometime during or following the early twentieth century, and were likely intended as partial forms/joints as well as attachment points for upper planking. The dam's downstream face was not fully visible during excavations but its upper portion appeared to consist of rough concrete and/or milled boards abutted by piles of loose boulders (see Plates 4.1, 4.3, 4.4, 4.11, and 4.12). A representative profile of the dam's downstream face as reconstructed from field observations is shown in Figure 4.4. Large, square timbers with ferrous metal spikes were removed from the dam's downstream portion during the initial breach, and suggest that the underlying, original 1839 dam structure was a wedge or “<”-shaped timber crib structure with a facing of square-cut timbers (see Figures 4.3 and 4.4; Plates 4.13–4.15). An example of this type of dam is shown as Figure 4.7.

The dam's upstream, sloped section was composed of additional strips of concrete poured in the same fashion, with upright milled boards placed in approximately 2- to 3.1-foot intervals (see Figure 4.3; see Plate 4.16 and 4.17). The dam's upstream face appears to have consisted of a rough concrete termination that descended at least 2 feet to the stream bed and was abutted by loose boulders (see

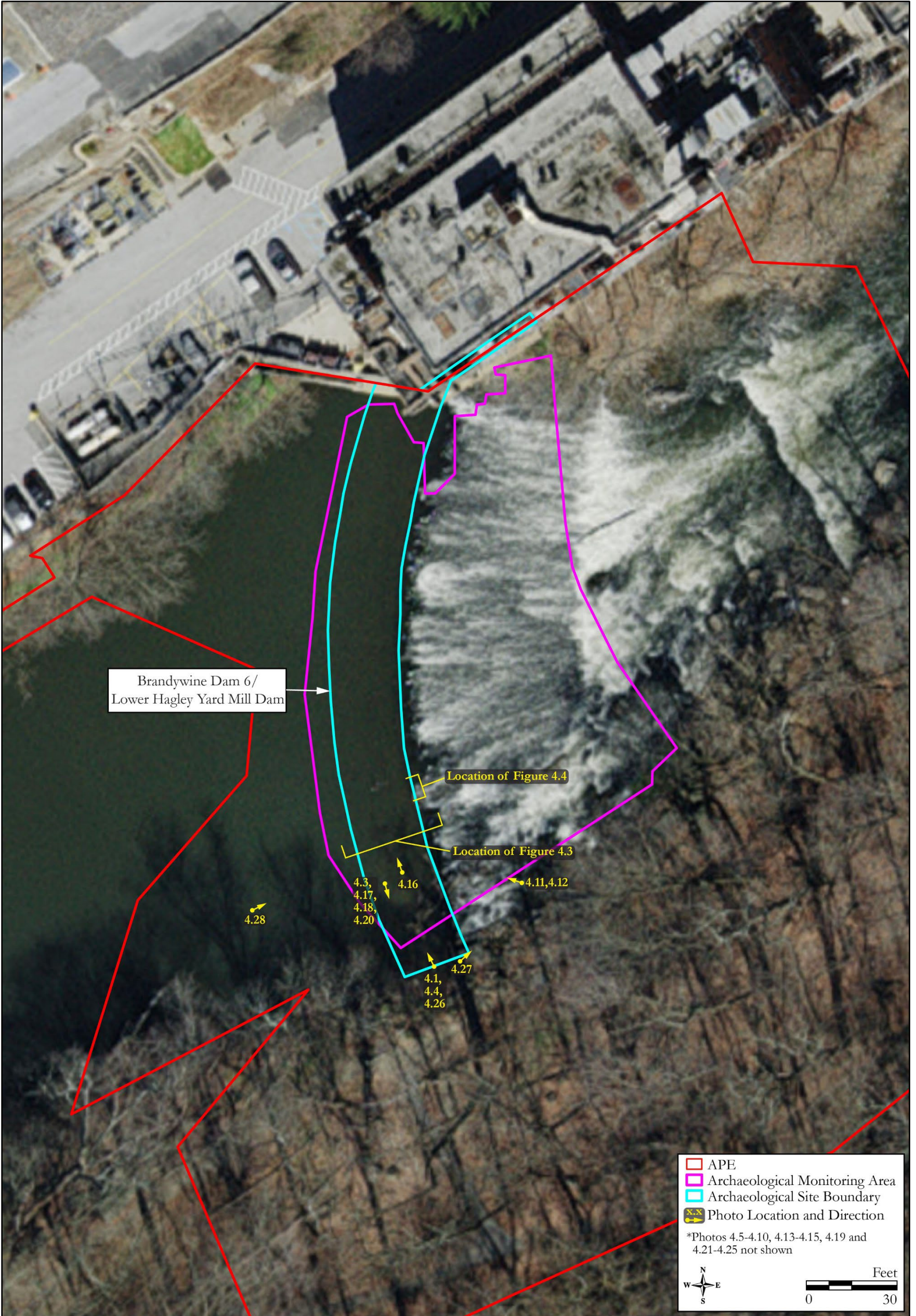


Figure 4.1: Aerial image showing the APE, the Archaeological Monitoring Area, Brandywine Dam 6, sections and profiles, and photograph locations and directions (Esri 2023).



Plate 4.1: Overview of Brandywine Dam 6 from its southern abutment after the initial breach.

Photo view: Northwest; Photographer: Jonathan E. Dernbach; Date: July 23, 2025.



Plate 4.2: Closeup view of the top of Brandywine Dam 6 following the initial breach.

Photo view: Northwest; Photographer: Jonathan E. Dernbach; Date: July 23, 2025.



Plate 4.3: View of the southern abutment of Brandywine Dam 6 showing concrete strips with milled timbers and wooden planks on the upstream side of the dam. Photo view: Southeast; Photographer: Jonathan E. Dernbach; Date: July 23, 2025.



Plate 4.4: View of the removal work in progress at Brandywine Dam 6. Photo view: Northwest; Photographer: Jonathan E. Dernbach; Date: July 23, 2025.



Plate 4.5: View of an intact milled board removed from the upper dam structure.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.



Plate 4.6: View of the end of an intact milled board removed from the dam structure.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.



Plate 4.7: View of overlapped, milled boards on the upper surface of the concrete top .
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.8: View of the cross section of a portion of the concrete top removed from the dam.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.9: View of the cross section of a portion of the concrete top removed from the dam showing milled boards.

Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.10: View of a milled board embedded upright in a removed portion of the concrete top of the dam.

Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.11: View of the loose boulders stacked in front of the downstream portion of the dam and the visibility conditions at approximately 50 percent breach progress.
Photo view: West; Photographer: Jonathan E. Dernbach; Date: September 4, 2025.



Plate 4.12: View of the cross section and front of the dam at approximately 50 percent breach.
Photo view: Northwest; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.13: View of large, square timbers removed from the downstream portion of the dam during the initial breach.

Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: July 23, 2025.



Plate 4.14: View of large, square timbers with ferrous metal spikes removed from the downstream portion of the dam during the initial breach.

Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: July 23, 2025.



Plate 4.15: View of a large, square timber with ferrous metal spikes removed from the downstream portion of the dam during the initial breach.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: July 23, 2025.



Plate 4.16: View of the upper concrete face of the dam at 50 percent breach showing the concrete strips and upright, milled boards.
Photo view: Northwest; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.17: View of top of the dam at its southern abument showing wooden planking covering the upstream, sloped portion of the dam.
Photo view: South; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.

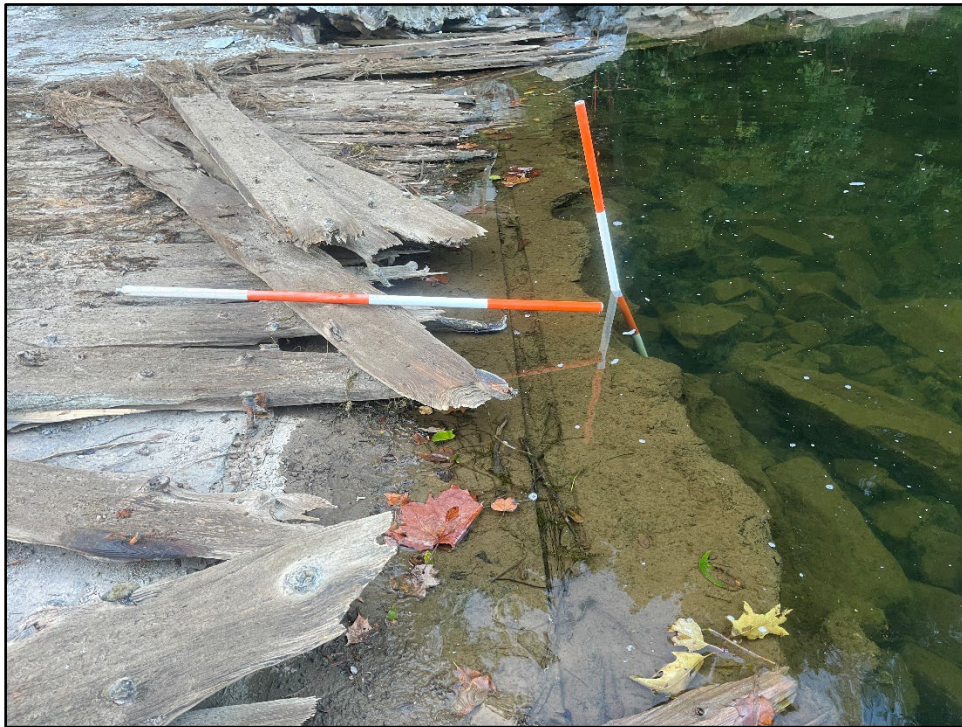


Plate 4.18: View of the upstream end of the dam showing rough concrete and submerged, loose boulders.
Photo view: South; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.19: View of the upper surface of a wooden plank removed from the downstream, sloped portion of the dam.

Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.20: View of planks and fasteners on the upstream portion of the dam.

Photo view: South; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.21: View of the upper surface of a portion of the concrete dam topvshowing fasteners used to attach the wooden planking to the upright, milled boards on the upstream side of the dam.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: August 2, 2025.



Plate 4.22: View of a large, square timber with a 2-foot ferrous metal spike removed from the lower portion of the dam structure near 100 percent breach.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.



Plate 4.23: View of a large, square timber with 2-foot ferrous metal spikes removed from the lower portion of the dam structure near 100 percent breach.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.



Plate 4.24: View of a log removed from the lower portion of the dam structure near 100 percent breach.
Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.



Plate 4.25: View of a circular log removed from the lower portion of the dam structure near 100 percent breach.

Photo view: N/A; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.



Plate 4.26: View of the remaining portion of the dam at the southern abutment following the completion of excavation/removal.

Photo view: North; Photo provided by Jim Shanahan on January 12, 2026.



Plate 4.27: View of the stone and concrete debris placed along the southern side of Brandywine Creek during the removal process
Photo view: Northeast; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.



Plate 4.28: View of the location of Brandywine Dam 6 following the completion of excavations/dam removal.
Photo view: Northeast; Photographer: Jonathan E. Dernbach; Date: October 15, 2025.

Brandywine Dam 6 Representative Plan Near Southern Abutment

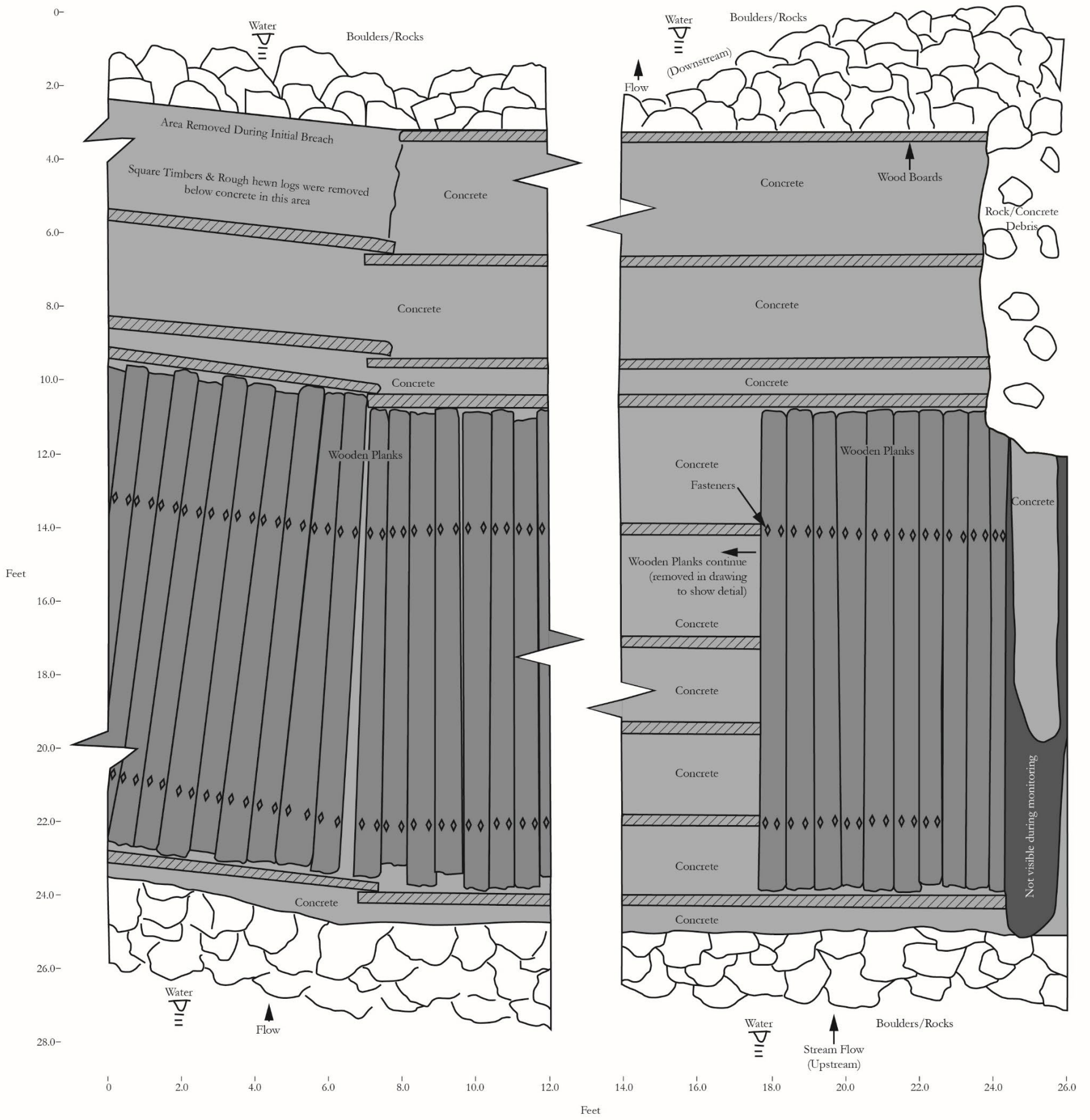


Figure 4.2: Representative plan view of Brandywine Dam 6/Lower Hagley Yard Mill Dam near its southern abutment.

Brandywine Dam 6 Representative Profile Near Southern Abutment

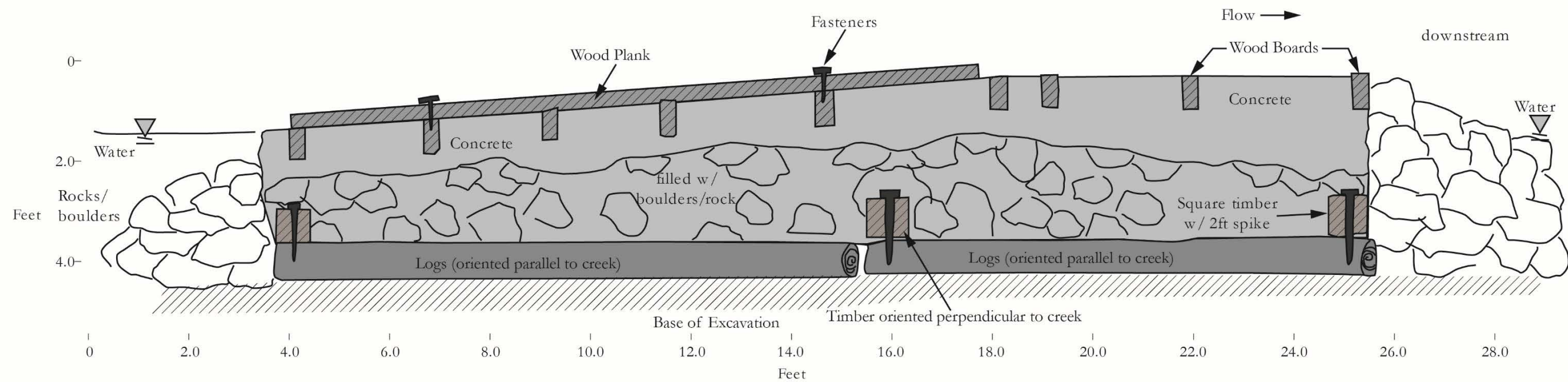


Figure 4.3: Representative north profile of Brandywine Dam 6/Lower Hagley Yard Mill Dam near its southern abutment.

Brandywine Dam 6 Representative Profile Facing Upstream

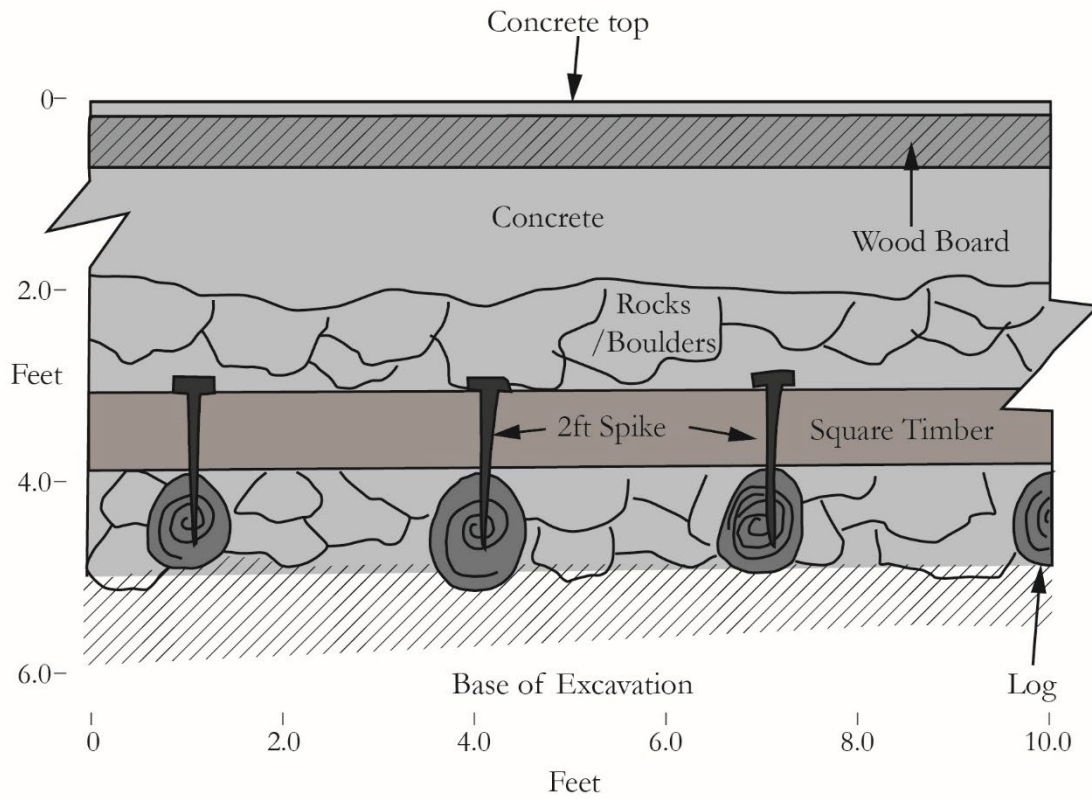


Figure 4.4: Representative west profile of Brandywine Dam 6/Lower Hagley Yard Mill Dam showing its downstream face.

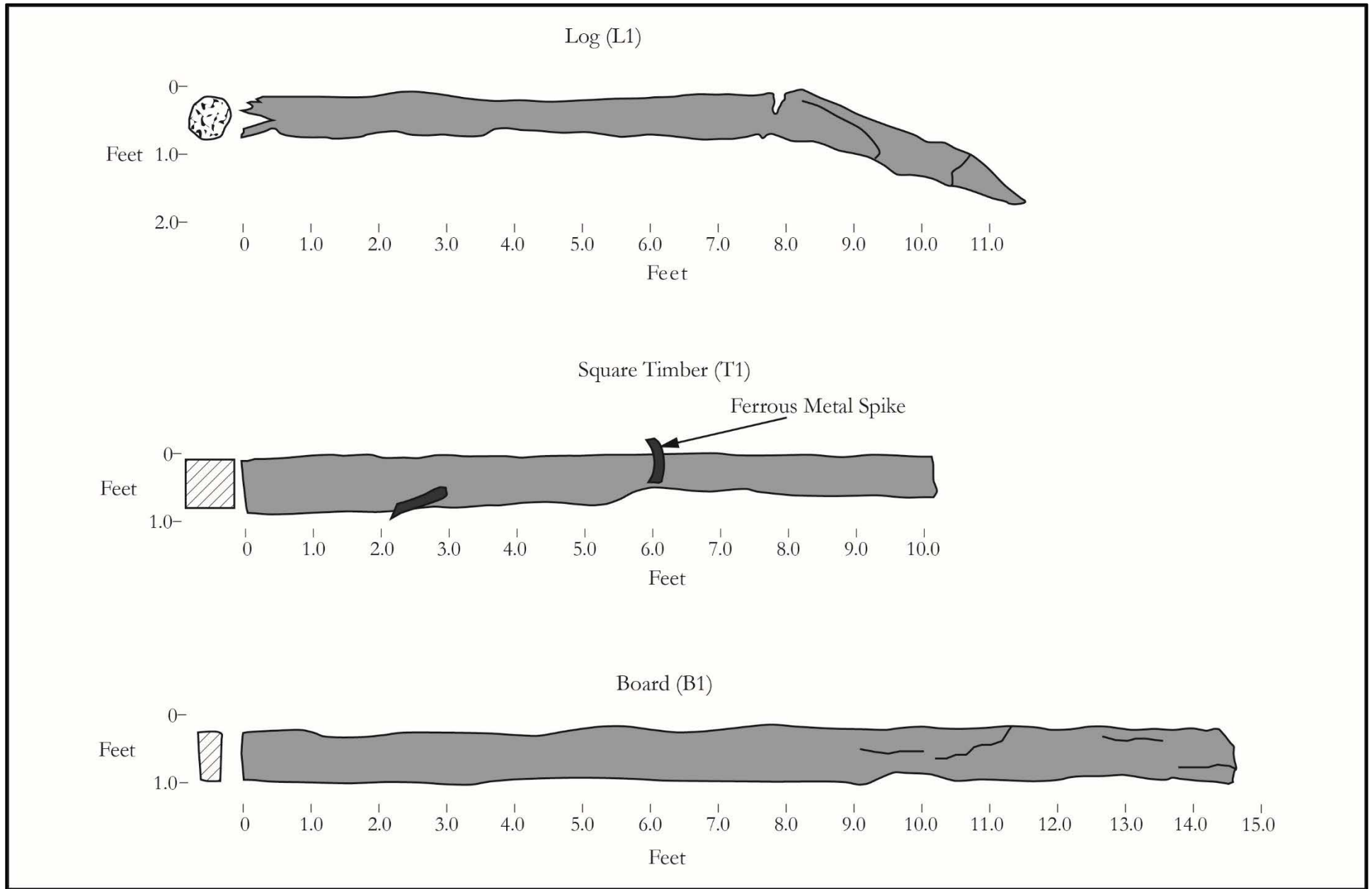


Figure 4.5: Representative structural elements removed from Brandywine Dam 6/Lower Hagley Yard Mill Dam during construction activities.



Figure 4.6: Representative artifacts sampled during the removal of Brandywine Dam 6.

1. Ferrous Metal Spike (Cat. #1) recovered from square timbers.
2. Ferrous Metal Spikes (Cat. #1) recovered from square timbers.
3. Square nail (Cat. #3); Square nail (Cat. #3) Square nail (Cat. #3); Cut nail (Cat. #2);
Cut Nail (Cat. #2); Cut Nail (Cat. #2) recovered from milled boards and planks.



Figure 4.7: A photograph of a typical timber crib dam in Redridge, Michigan that is similar to observations of the underlying structure of Brandywine Dam 6.
Note the large ferrous metal spikes at joints.
(Rexp2 2013).

Figures 4.2 and 4.3; see Plate 4.17). A series of long, milled wooden planks were present on the upper surface of the sloped portion of the dam that served as a covering for the upstream ramp (see Figure 4.2 and 4.3; see Plates 4.2, 4.17–4.19). Intact, representative samples measured approximately 0.65 feet by 0.3 feet (8×3.5 inches) in cross section and up to 15 feet in length. They were fastened to the dam with ferrous metal nails that were driven into the upright, wooden timbers below (see Figures 4.2 and 4.3; see Plates 4.20–4.21). As with the milled boards, these planks were installed at the same time as the concrete cap. Removed portions of the upper concrete cap indicated that it varied between approximately 1 and 2 feet thick across the dam, and was likely poured directly over a rough, underlying structure of large rocks and boulders, which were partially embedded into the lower surface of the concrete (see Figure 4.3; see Plates 4.8 and 4.9).

In addition to the aforementioned elements, square wooden timbers measuring approximately 0.4 feet by 0.5 feet (5×6 inches) to 0.7 feet by 0.8 feet (8.5×9.5 inches) in cross section and at least 10 feet in length, as well as logs measuring 0.5–1 foot in diameter and approximately 5–10 feet in length were also removed from the dam structure during excavations (see Figure 4.5; see Plates 4.13–4.15, 4.22–4.25). The wooden timbers were hewn and contained large, ferrous metal spikes up to 2 feet in length

and set at around 3-foot intervals (see Figure 4.3 and 4.4; see Plates 4.14, 4.15, and 4.23). The logs were largely unmodified except for the removal of branches. In some cases, bark remained and in others the bark was partially removed. The dam structure below the concrete top appeared to consist of a platform of boulders and rock with the square timbers arranged along the dam's long axis, which were fastened into the underlying, perpendicular logs by the ferrous metal spikes (see Figure 4.3 and 4.4). The logs were placed at intervals and ran from the upstream to the downstream end of the dam parallel to the creek (John Hupfl, personal communication, October 15, 2025). Based on the large, wrought metal spikes observed in the square timbers, it is likely that the logs were spaced approximately 3 feet apart (see Figure 4.4).

Altogether, this information suggests that the original portions of the circa-1839 reconstructed dam consisted of a wooden “<”-shaped timber crib structure composed of regularly placed logs and square timbers infilled with large rocks and boulders similar to that shown in Figure 4.7. It appears that significant repairs were previously made that entailed the addition of the concrete top with milled wooden timbers and planks sometime during or after the early twentieth century. Prior to the installation of the concrete spillway cap, some timbers and rock infill may have been removed.

No evidence of a separate, earlier legacy dam structure was visible up or downstream of the circa-1839 dam during archaeological monitoring, and no additional structural elements or archaeological deposits were identified within the archaeological monitoring area. Approximately 25 feet of the Brandywine Dam 6 structure at both the northern and southern abutments were left intact within the river (see Plates 4.26–4.28).

Updated Brandywine Dam 6/Lower Hagley Yard Mill Dam Cultural Resource Survey Forms

Based on the archaeological monitoring and background research results, updated cultural resource survey (CRS) forms for Brandywine Dam 6/Lower Hagley Mill Yard Dam were submitted to the DHCA. The forms included new mapping and information on the structure and condition of the dam determined during archaeological monitoring. Additionally, an archaeological site form (CRS04) was submitted for Brandywine Dam 6/Lower Hagley Mill Yard Dam to document its current, partially removed and buried condition and list the artifacts sampled from the dam structure as part of this monitoring effort. As a result, the Brandywine Dam 6/Lower Hagley Yard Mill Dam was provided with an archaeological site number (7NC-B-083). All updated forms and files are attached as Appendix E and are on file with the DHCA and on CHRIS. The boundaries of the dam have been updated to show its known extent as depicted in Figure 4.1.

5.0 CONCLUSIONS AND RECOMMENDATIONS

RGA completed archaeological monitoring during construction activities for the removal of NRHP-eligible Brandywine Dam 6 (also known as the Lower Hagley Yard Mill Dam) in the City of Wilmington, New Castle County, Delaware. The dam was originally constructed in 1839 by E. I. du Pont de Nemours to rebuild a damaged dam following a flood event and to provide power to several mills situated along this portion of Brandywine Creek. Background research determined that the dam has been repaired several times since its initial construction. Though an exact date is not available for the installation of the concrete top/crest, CHAD (2021b) suggests that this portion of the dam was likely constructed during or after the early twentieth century.

Archaeological monitoring successfully documented the extant dam conditions and major structural elements observed during excavations via representative plan and profile drawings. Based on archaeological monitoring observations and background research, it was determined that the original circa-1839 dam consisted of a timber crib structure composed of hewn square timbers resting on logs and fastened with large ferrous metal spikes. This structure was infilled with large boulders and rock. At some time during its history, likely during the early twentieth century, a major repair was conducted at the dam that entailed the installation of a poured concrete spillway sheathed in wooden planks. The spill way capped the earlier wood timber and rock structure dam. Large rocks and boulders were either left in place or placed against this new structure on the dam's up- and downstream sides. The monitoring effort provides insight into early nineteenth-century dam construction methods along the Brandywine Creek, revealing that the construction methods were similar to those used at other small dams of the same period.

Following the completion of the project, portions of the Brandywine Dam 6 structure within approximately 25 feet of its northern and southern abutments were left intact and in place. Updated CRS forms for Brandywine Dam 6/Lower Hagley Mill Yard Dam were submitted to the DHCA, and the dam was given an archaeological site number (7NC-B-083) due to its current, partially demolished and buried/submerged condition. All updated forms and files are on file with the DHCA and uploaded to CHRIS.

Archaeological monitoring revealed new information regarding the early nineteenth-century dam structure, its construction methodology, and its construction sequence. As such, the site provides new data on early nineteenth-century dam construction in the Brandywine Creek associated with early industrialization of northern Delaware. Therefore, Brandywine Dam 6/Lower Hagley Yard Mill Dam is also recommended as eligible for the NRHP under Criterion D.

No evidence of a former legacy structure was identified beneath or near the dam during or after its removal. No pre-Contact or intact historic period deposits or features were identified during archaeological monitoring. As such, this report has fulfilled the requirements set forth for archaeological monitoring and no further work is recommended for the proposed project.

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- 2021b *Mid-Atlantic Buildings and Landscapes Survey, Phase II Architectural Investigations for the Fish Passage at the Lower Brandywine River, Dams 2, 3, 4, 5, and 6*. Prepared for Brandywine Shad 2020.

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Appendix A: Qualifications of the Principal Investigator

YEARS OF EXPERIENCE

With this firm: 2019-Present

With other firms: 0

JONATHAN E. DERNBACH

ARCHAEOLOGIST (36 CFR 61)

EDUCATION

MSc 2019

University of Bradford
Archaeological Sciences

BA 2017

William Paterson University
Anthropology

BS 2015

New Jersey Institute of Technology
Civil EngineeringPROFESSIONAL AFFILIATIONSRegister of Professional
ArchaeologistsArchaeological Society of New Jersey
Conference-2025Archaeological Society of New Jersey
(Member-at-Large)Cumberland County Historical
Society

Jonathan E. Dernbach is an Archaeologist with experience conducting all phases of archaeological field investigations and specializes in the pre-Contact period. He has worked on archaeological projects in New Jersey, New York, Pennsylvania, Delaware, North Carolina, Romania, and Scotland. Mr. Dernbach's experience includes field excavation, construction monitoring, laboratory artifact analysis and processing, and report writing. He has worked on cultural resource surveys prepared in accordance with Section 106 of the National Historic Preservation Act and other municipal and state cultural resource regulations, and his educational and professional background meet the Secretary of the Interior's Professional Qualification Standards for Archaeology [36 CFR 61]. Mr. Dernbach also serves as an assistant curator at the Alan Ewing Carman Museum of Prehistory in Cumberland County, NJ.

REPRESENTATIVE PROJECT EXPERIENCE:

Improvements to Openaka Lake Dam, Archaeological Monitoring, Township of Denville, Morris County, NJ (Sponsor: Morris County) Principal Investigator during archaeological monitoring of improvements to Openaka Lake Dam, a contributing resource to the NJR- and NRHP-eligible Ninkey Forge Historic District (SHPO Opinion 5/10/2016). Archaeological monitoring identified redeposited soils within the stone and concrete dam structure related to the late nineteenth-century reconstruction of the Openaka Lake Dam and the 1903 construction of the Openaka Road Bridge. Monitoring also identified re-used wooden timbers possibly related to the original, circa-1757-1780 dam structure. No intact eighteenth-century structural elements were identified. Profiles of the dam spillway were recorded within the limits of construction to document the existing structure, and no further archaeological work was recommended.

Fort Mott State Park Seawall Rehabilitation and Sluice Gate Repair, Archaeological Monitoring Report, Pennsville Township, Salem County, New Jersey (Sponsor: The New Jersey Division of Property Management) Principal Investigator during archaeological monitoring for the rehabilitation of the seawall and repairs to the sluice gate at Fort Mott State Park. Monitoring documented two structural features related to the circa 1897 reconstruction of the battery at Fort Mott. Both structures were documented via digital photography and scaled line drawings within excavations, and a construction sequence was proposed. This indicated that although major repairs and additions to these structures were conducted during the mid-twentieth-century creation of Fort Mott state park, portions of the original features were still intact. These features were registered as the Fort Mott Seawall and Sluice Gate Site (28-Sa-254). No further archaeological work was recommended for the project, and the NJHPO concurred.

Rehabilitation of Longwood Lake Dam Phase IA, Jefferson Township, Morris County NJ (Sponsor: Jersey City Municipal Utilities Authority) Principal Investigator for the Phase IA archaeological survey for the proposed rehabilitation of Longwood Lake Dam. The survey included background research, consultation with interested parties, pedestrian reconnaissance, and archaeological sensitivity assessment of the APE. Undisturbed portions of the APE were assessed with a high sensitivity for pre-Contact period Native American archaeological resources, and the entire APE was assessed with a high sensitivity for historic period archaeological resources related to the period of significance of the NJR- and NRHP-eligible Upper Longwood Forge Historic District. Background research also identified an unregistered archaeological site, the Upper Longwood Forge site, in the immediate vicinity of the APE. A Phase IB archaeological survey and archaeological monitoring during construction activities at the dam and auxiliary spillway were recommended, and the NJHPO concurred.

Appendix B: Project Documents

January XX, 2022

James B. Shanahan
Co-Director
Brandywine Shad 2020
27 Brandywine Falls
Wilmington, Delaware 19806

**Subject: Brandywine River: Dam 4 and Dam 6 Submission of Phase II Architectural Report and Phase IA Archaeological Reports
State Contract No. T201912201, Federal Aid No. NH-S014(21)
SHPO Project Review # 2020.05.07.04**

Dear Mr. Shanahan,

This Office is in receipt of the draft reports *Phase IA Archaeological Survey, Fish Passage at Brandywine Creek Dams 2, 4, 5 and 6* and *Phase II Architectural Investigations for the Fish Passage at the Lower Brandywine River Dams, 2, 3, 4, 5, and 6*. Thank you for providing us with the opportunity to comment on the Phase IA archaeological report prepared by Richard Grubb Associates (RGA) and the Phase II architectural evaluation report prepared by the University of Delaware Center for Historic Architecture and Design (CHAD) for the Brandywine Dams projects. We appreciate the immense amount of work needed to cover the scope of the project. Both reports do an excellent job coordinating their approach for the historic context and providing a detailed examination of the dams. We have reviewed these documents and would like to offer the following comments.

RGA's report found high archaeological potential for both historic and prehistoric sites at all dams. We agree with the conclusions laid out in the report. Please see below for technical comments.

The architectural evaluation report did an excellent job providing detailed background regarding different types of dams and the history of dams as it relates to industrialization on the Brandywine River. CHAD's report recommended Dam 2 and Dam 5 to be eligible for the inclusion in the National Register of Historic Places (NRHP) as individual resources outside of their respective historic districts. CHAD also recommended Dams 3, 4, and 6 to be eligible for inclusion in the NRHP. We concur with these conclusions.

At this time, there is not enough information regarding the other historic resources addressed in the evaluation for us to concur with the recommendations. These resources need to be evaluated in an appropriate context to provide justification as to why they are not eligible for inclusion in the NRHP. Please see below for technical comments. Additionally, while the level of detail in the history of the dams and industrialization is excellent, it would be helpful for the report to further evaluate the dams as a system on the Brandywine River. While the scope of work is still somewhat in flux, the dams should be evaluated to allow for an understanding of the impacts to the system

of dams if one is altered. We are also asking for clarification regarding if associated historic features (ex. mill races) are considered eligible as part of the dams.

We have several comments directed to the applicant and USACE to ensure consultation moves forward with the project as plans advance. As a reminder, consultation for the projects being considered for Dam 2 and Dam 5 have not yet been initiated. We recommend the applicant rectify this regarding Dam 5 as soon as possible. We understand that work on Dam 2 is now being considered as a mitigation action for the proposed Edgemoor redevelopment, and the initiation will come through USACE separately. Both reports make reference to existing technical fishways at Dams 2 and 4. Brandywine Shad 2020 and the USACE should be aware that documentation for any finding of effect should address consideration and feasibility of alternate plans, including the use and/or adaptation of the existing technical fishways (see 36 CFR 800.11(e) for effect documentation requirements). Finally, please ensure all consulting parties are given the opportunity to review and comment on these reports.

We look forward to receiving the finalized version of both reports and continuing consultation. If you have any questions I can be reached at (302) 736-7431 or sarah.carr@delaware.gov.

Sincerely,



Sarah Carr
Cultural Preservation Specialist

c: Gwen Davis, Deputy SHPO
David Caplan, USACE
Todd Schaible, USACE
Michael Gall, RGA
Jerry Kauffman, Brandywine Shad 2020

Debra Martin, City of Wilmington
Nicole Minnichbach, USACE
Catherine Morrissey, CHAD
Hunter Lott, Brandywine Shad 2020
Tyler Kreider, Kleinschmidt



DE SHPO Technical Comments on Reports

Phase IA Archaeological Survey

- Please review all tables, figures, and images for accuracy and consistency.
- Please revise for consistency in references to CHAD's identification and evaluation reports for the undertaking
- While we understand the intent, it is premature for a Phase IA Identification to make recommendations regarding potential effects on historic resources.
- Review Figure 1.4 for accuracy and consistency. There are repeat CRS numbers for different historic resources.
- Please revise language regarding "contexts were developed" (pg. 2-1). Developing context refers to a specific aspect of evaluating and nominating properties for the NRHP, and is not appropriate here.
- As per *Archaeological Survey in Delaware (2015)*, The APE "post-1940" should be referred to as "Suburbanization and Early Ex-urbanization, 1940-1960."
- Please provide confirmation regarding the location of the Continental Army encampment (pg. 4-14). The location is more ambiguous than suggested.
- Clarify description for Figure 4.9, as it refers to the third dam on the Brandywine but is within the section describing Dam 2.
- Provide further clarification regarding figure 4.10. There needs to be more description and further evidence to support the eastern corner of the APE having no archaeological potential due to surface disturbance.
- Please review all tables for accuracy and consistent site information. For example, Table 5.2 includes incorrect information regarding the Blue Ball Tavern Site (currently under a roadway). If additional information is needed, please reach out to the Research Center for information not made available through CHRIS.
- Please clarify which dam is being referred to on page 6-4.
- Clarify image description for Plate 6.8, as it shows the former Bancroft and Sons Cotton Mills complex.

Phase II Architectural Survey

- The report needs to provide further explanation regarding resources not recommended eligible that goes beyond listing the four criteria.
 - Stone walls, culverts, and bridges should be evaluated in the context of transportation. We strongly recommend, referencing "Delaware's Historic Bridges" by Lichtenstein Consulting Engineers, Inc. (2000) to assist in providing background and context to then justify a recommendation regarding eligibility.
 - A brief context is needed regarding the USGS monitoring station to evaluate eligibility. Please review for consistency regarding naming conventions.
- Please provide specific details regarding associated features with the dam and if they are considered part of the dam or are separate contributing factors.
- As mentioned above, please provide further analysis of the dams as a system in relation to each other on the Brandywine River. This historical background starts to get into this, but they should be considered as they relate to each other in their evaluation. As the recommendation includes

eligibility under Criterion A, it is crucial to look at the system of the Brandywine Dams as a whole.

- Please review and rephrase the recommendations regarding the duPont Experimental Station. These buildings have potential to be eligible as a system, but there is also an argument to be made for individual eligibility. We agree these buildings need further research beyond the scope of this undertaking, and eligibility may not be determined for this project.
- Please review first paragraph of the Introduction (pg. 8) for sentence clarity.
- Please check the first reference, as we do not have a record of a 1996 report entitled, “Delaware Department of Transportation Historic Bridge Survey SR 141 (Tyler McConnell Bridge) Over Brandywine Creek and Road 260 (Brecks Lane).”



MEMORANDUM OF AGREEMENT
AMONG THE UNITED STATES ARMY CORPS OF ENGINEERS AND THE DELAWARE
STATE HISTORIC PRESERVATION OFFICE
PURSUANT TO 33 CFR § 325, APPENDIX C, 1, (g)(1) AND 36 CFR 800.6(b)(1) REGARDING
MODIFICATION OF DAMS 4 & 6 ON BRANDYWINE CREEK
CITY OF WILMINGTON, NEW CASTLE COUNTY, DELAWARE

WHEREAS, Brandywine River Restoration Trust (the “Applicant”) is proposing to remove a substantial portion of Dam 4 (Alapocas or Bancroft Mills Dam) and Dam 6 (DuPont Experimental Station or Rockford Park Dam) (the “Project”), located on Brandywine Creek in the City of Wilmington, New Castle County, Delaware; and

WHEREAS, the Project involves: (1) removing a substantial portion of Dam 4 and Dam 6 to provide suitable water depths, velocities, and variability to facilitate upstream fish passage; (2) placement of rock adjacent to Dam 4 and Dam 6; and (3) temporarily transporting, driving, and storing equipment and materials near the banks of the Brandywine Creek to facilitate construction; and

WHEREAS, the Project requires a Department of the Army, Nationwide Permit 27 (“NWP 27”), pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344), and the U.S. Army Corps of Engineers (USACE) is the responsible Federal Agency for issuing the permit; and the Philadelphia District, U.S. Army Corps of Engineers (“USACE”) is the responsible Federal Agency for issuing the permit; and

WHEREAS, the Project is considered an undertaking as defined in Section 106 of the National Historic Preservation Act (54 USCS § 300320), and is therefore subject to that law; and

WHEREAS, the USACE must demonstrate compliance with Section 106 of the NHPA prior to issuing any Department of the Army Permits, and is considering the effects of the Project on historic properties for the purposes of compliance with Section 106 of the NHPA as part of the overall permitting process; and

WHEREAS, pursuant to 36 CFR § 800.4(a) and 33 CFR § 325, Appendix C, 1, the USACE has established in consultation with the Delaware State Historic Preservation Office (DESHPO) that the Permit Area for the Project includes the limits of disturbance for all of the Project components and in this instance is equivalent to the Area of Potential Effects (APE); and

WHEREAS, the Applicant, in coordination with the USACE and the DESHPO, has executed cultural resources studies to identify properties listed in or eligible for listing in the National Register of Historic Places (NRHP); and

WHEREAS, the USACE pursuant to 36 CFR § 800.4 and in consultation with the DESHPO has determined that there are resources listed on or eligible for the NRHP within the APE and permit area for the Project; and

WHEREAS, Dam 4 (also known as the Kentmere/Bancroft II Dam) is a contributing resource to the Bancroft and Sons Cotton Mills Historic District (N03646) (NR: 12/20/1984), which is listed in the

NRHP, and has also been determined individually eligible for listing in the NRHP under Criteria A and C with significance at the local level (DESHPO Letter: 5/5/2022); and

WHEREAS, Dam 6 (also known as the Rockford Park Dam) has been determined eligible for listing in the National Register of Historic Places under Criteria A and C with significance at the local level (DESHPO Letter: 5/5/2022); and

WHEREAS, the Applicant, in coordination with the USACE and the DESHPO, has executed a Phase IB Archaeological Survey and determined that there are no sites within the APE and no further archaeological survey is needed in the upland section of the APE at both Dam 4 and Dam 6; and

WHEREAS, the USACE has contacted the Delaware Nation, the Delaware Tribe of Indians and the Stockbridge-Munsee Community, hereafter referred to as the Federally Recognized Indian Tribes (Tribes) to determine their interest in being a consulting party for this project; and

WHEREAS, the USACE has invited The City of Wilmington Historic Preservation Planning Office (the "City"), Delaware Greenways, the Wilmington State Parks within the Delaware Department of Natural Resources and Environmental Control (DNREC), Friends of Wilmington Parks, the Delaware Historical Society, Old Brandywine Village, Preservation Delaware Inc., the Lenape Indian Tribe of Delaware, and Wilmington City Council to be consulting parties for this Project, and, into formal consultation; and

WHEREAS, the USACE has consulted with the DESHPO, the Tribes, and other Consulting Parties regarding the scope and effects of the Project on historic properties and afforded them the opportunity to comment on the proposed Project and mitigation; and

WHEREAS, pursuant to 36 CFR § 800.5(a) and 33 CFR § 325, Appendix C, 7, the USACE has determined in consultation with the DESHPO, the Tribes and other Consulting Parties that the Project will result in adverse effects to Dam 4 and Dam 6; and

WHEREAS, the USACE has consulted with the DESHPO, the Tribes and other Consulting Parties in accordance with Section 106 of the NHPA, its implementing regulations (36 CFR § 800) and the USACE implementing regulations (33 CFR § 325 Appendix C, 8-10) to resolve the adverse effects of the Project at Dam 4 and Dam 6; and

WHEREAS, the USACE has notified the Advisory Council on Historic Preservation (ACHP) of the adverse effects determination on July 21, 2023 and invited the ACHP to participate in the consultation in accordance with 36 CFR Part 800.6(a)(1) and Appendix C, but declined to participate in the consultation pursuant to 36 CFR 800.6(a)(1)(iii) as indicated in their communication dated August 7, 2023; and

WHEREAS, the Applicant has participated in the consultation, has responsibilities for implementing stipulations under this Memorandum of Agreement (MOA), and has been invited to be a signatory to this Agreement.

NOW, THEREFORE, the USACE, the Applicant and the DESHPO agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

Stipulations

The APPLICANT will ensure that the following stipulations are implemented:

I. Stipulations

A. Archaeological Monitoring Protocol

The archaeological monitoring effort will be preceded by the preparation of an archaeological monitoring protocol that will outline the methods of dam documentation and reports and specify the contacts for the construction, engineering, and archaeological monitoring firms, the USACE, DESHPO, DNREC, and the City. The archaeological monitoring protocol must be reviewed and approved prior to implementation of archaeological monitoring during construction. Monitoring protocol must be sent via email to the USACE, DESHPO, DNREC and the City 45 days prior to construction for review and comment with final revisions completed within 30 days.

B. Construction Monitoring

Applicant will allow and fund archaeological monitoring during construction in accordance with the approved Archaeological Monitoring Protocol, particularly during any dewatering that may expose portions of the structure that are typically below the waterline. Monitoring will include photographic and scale-line drawing recordation of up to two (2) profiles of each dam dependent upon accessibility, water level, water turbidity, and worker safety conditions in the river; the completion of an archaeological site registration form for each dam, and artifact collection, if applicable. Monitoring will commence during dam removal and will continue until dam removal excavation activities have been completed in order to document sample profiles of the dam structures and any currently submerged archaeological structures in the river, such as former historic dams on the upriver side of Dams 4 and 6, that may be exposed and require removal. Applicant will provide a monitoring summary to the USACE, the DESHPO, the Tribes, and other Consulting Parties for review and comment within 6 months of construction completion.

The Applicant will ensure its contractors are aware of the historic nature of the Dam 4 and Dam 6 structures and the surrounding Historic District, will take steps to ensure no damage is done to elements of Dam 4 and Dam 6 that are not to be affected by the substantial removal.

C. Education and Outreach

1. Interpretive Panels

The Applicant will fund and oversee the placement of two or more permanent interpretive panels, at Dam 4 and at Dam 6, within the existing APE-Archaeology, explaining the historical significance of the dams with

reference to the portion of the dams still extant to inform passersby of the site's historical importance and the nature of the dams' construction. The Applicant will coordinate with DNREC and the City concerning the location and manner of installation. Applicant shall coordinate with the DNREC Division of Parks to ensure uniformity of signage with existing signage in the park and determine the number and size of the panels in order to maximize exposure to the public and contain required information.

The Applicant, in coordination with the USACE, will develop specific text and graphics for the interpretive panel in consultation with the DESHPO, the Tribes, DNREC and the City of Wilmington. The Applicant will submit, prior to or concurrent with commencement of construction of the Project, draft designs for the panel to the parties for a 30-calendar day review. The Applicant will finalize design of the interpretive panels once it has been approved by the parties and will install the panel within 3 months of the approval.

The panels will contain a QR Code that will link to a more detailed description of the historical significance of the Dams as part of the website being developed under Stipulation C.2 below.

2. Website

The Applicant will add information to its website (www.BRRT.org) that will reference and build upon the onsite interpretive panels developed under Stipulation C.1. The website will include information collected as part of the cultural resource surveys and contextual studies completed for the Project, addressing the historic industrial development of the Brandywine Creek and its many dams, as well as the importance of American Shad to pre-Contact period Native American groups and historic colonial/post-colonial communities. The website will also contain digital copies of the cultural resource reports completed for the Project, as well as a copy of the booklet to be developed under Stipulation C.3. All information relating to the location of archaeological sites shall be redacted from the reports before they are made available to the public. The Applicant will submit a draft of the content to consulting parties for a 30-calendar day review. The USACE will also host this information on a website within 6 months of receipt of final website design.

3. Booklet

The Applicant will develop a public-oriented booklet that examines the broad historical contexts within which the series of dams on the Brandywine were constructed. The booklet will utilize information developed for the Project's cultural resource surveys and explore topics such as colonial and post-colonial milling operations and the early importance of the creek to Native Americans for resource acquisition and trade/travel. A minimum of 100 copies of the booklet will be printed. The booklet will be posted on the BRRT

website (www.BRRT.org) and the USACE website. The Applicant will submit a draft of the content to consulting parties for a 30-calendar day review. Deliverables will be submitted within 6 months of final design approval.

4. Tours of Dams

The Applicant will offer and conduct a minimum of 1 educational tour per year of Dam 4 and Dam 6 in coordination with Delaware State Parks and free of charge for the public for a term of five (5) years. The tours will explain the mission of Brandywine River Restoration Trust, the historical significance of the dams, and the benefits of dam removal in restoring native fish passages. The Applicant will submit a draft of the content to consulting parties for a 30-calendar day review. First tour will take place within 6 months of the final design approval.

5. Public Presentation

The Applicant will organize a public presentation, in cooperation with other historical and/or preservation organizations in Delaware, to share historical information about the Lower Brandywine dams, including historical, architectural, and/or archaeological contexts and findings. The Applicant will submit a draft of the content and presentation plan to consulting parties for a 30-calendar day review. Public presentation shall be conducted within 6 months of final design approval.

II. Unanticipated Discoveries

If any unanticipated discoveries of historic properties or archaeological sites are encountered, or unanticipated effects to known historic properties occur during the implementation of this undertaking, the Applicant shall immediately (within 48 hours) notify the USACE. The USACE shall comply with 36 CFR § 800.13 and 33 CFR § 325, Appendix C, 11 by consulting with the DESHPO, the Tribes, and other Consulting Parties to develop and implement appropriate treatment of the discovery.

III. Review of Project Plans

Applicant shall provide copies of the final design plans of the Project to the DESHPO and the Other Consulting Parties. The USACE shall provide copies of the final design plans to the Tribes. The parties will have thirty (30) days from the receipt of materials to provide comments on the plans. The USACE and Applicant shall take into account any comments provided. Design will be finalized within thirty (30) days of review comments.

IV. Subsequent Changes to the Project

If Applicant proposes any changes to the Projects affecting location, design, methods of construction, materials, or footprint of the Projects, Applicant shall provide the

DESHPO, and other consulting parties identified later in time, with information concerning the proposed changes. The DESHPO and consulting parties will have thirty (30) days from the receipt of this information to comment on the proposed changes. Applicant shall take into account any consulting party comments prior to implementing such changes. Should changes occur, Applicant and the USACE, in consultation with the DESHPO, may need to redefine the Permit Area/APE beyond the areas defined in this MOA. The USACE shall consult with the DESHPO to identify and evaluate historic buildings, structures, sites and/or districts in any newly affected areas, and assess the effects of the Project thereafter, as applicable under 36 CFR 800.13. Changes will not be applied until the Applicant receives final approval email.

V. Administrative Conditions

A. Personnel Qualifications

The USACE shall ensure that all work conducted by the Applicant pursuant to Stipulations A and B of this MOA is approved by a person or persons meeting at a minimum the *Secretary of the Interior's Professional Qualification Standards* (48 FR 44738-9), and that all historic preservation work is approved by a person or persons meeting at a minimum the *Secretary of the Interior's Professional Qualification Standards for Historic Archaeology and Prehistoric Archaeology* (48 FR 44738-9). A copy of the selected professional's Curriculum Vitae shall be submitted to the USACE and the DESHPO prior to the completion of all stipulations.

B. Survey and Data Recovery Standards

The Applicant and USACE shall ensure that any and all cultural resource surveys conducted pursuant to this Agreement are done in accordance with the *Secretary of the Interior's Standards and Guidelines for Identification* (<https://www.nps.gov/articles/sec-stds-identification-guidelines.htm>), *Evaluation* (<https://www.nps.gov/articles/sec-stds-evaluation-guidelines.htm>), and for *Archaeological Documentation* (<https://www.nps.gov/articles/sec-standards-archaeo-doc-guidelines.htm>), as applicable, and in accordance with the DESHPO's *Architectural Survey in Delaware* (2015, or its successor) and *Archaeological Survey in Delaware* (2015, or its successor).

The Applicant and the USACE shall ensure that all draft and final cultural resource reports are provided to the DESHPO within two (2) years of the completion of any fieldwork. Draft and final cultural resource reports relevant to Native American Sites will also be provided to the Federally Recognized Indian Tribes.

VI. Amendments

Any party to this MOA may propose to the USACE that this MOA be amended, whereupon the USACE shall consult with the other parties to this MOA to consider such an amendment in accordance with 33 CFR § 325, Appendix C, 8 and 36 CFR § 800.6(c)(7).

VII. Resolving Objections

- A. Should any party to this MOA object in writing to the USACE regarding any actions carried out or proposed with respect to the Project or implementation of this MOA, the USACE shall consult with the objecting party to resolve the objection. If after initiating such consultation the USACE determines that the objection cannot be resolved through consultation, the USACE shall forward all documentation relevant to the objection to the ACHP including the USACE proposed response to the objection. Within 30 days after receipt of all pertinent documentation, the ACHP shall exercise one of the following options:
1. Advise the USACE that the ACHP concurs in the USACE proposed response to the objection, whereupon the USACE shall respond to the objection accordingly;
 2. Provide the USACE with recommendations, which the USACE shall take into account in reaching a final decision regarding its response to the objection; or
- B. Notify the USACE that the objection will be referred for comment pursuant to 36 CFR § 800.7, and proceed to refer the objection and comment. The resulting comment shall be taken into account by the USACE in accordance with 33 CFR § 325, Appendix C, 10(a), 36 CFR § 800.7(c)(4), and Part 110(1) of NHPA. Should the ACHP not exercise one of the above options within thirty (30) days after receipt of all pertinent documentation, the USACE may assume the ACHP's concurrence in its proposed response to the objection.
- C. The USACE shall take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; the USACE responsibility to carry out all actions under this MOA that are not the subjects of the objection shall remain unchanged.

VIII. Review of Implementation

Applicant shall provide the USACE and DESHPO a written review of the project annually, to monitor progress of the implementation of the terms of this Agreement.

If the stipulations have not been implemented within ten (10) years after execution of this MOA, the parties to this agreement shall review the MOA to determine whether revisions are needed. If revisions are needed, the parties to this MOA shall consult in accordance with 36 CFR § 800 and 33 CFR Part 325, Appendix C to make such revisions.

IX. Duration

This MOA shall remain in force until its stipulations have been fulfilled. This time period shall not exceed ten (10) years from the date of the final signature. Within six (6) months prior to the end of this ten-year period should any stipulations remain

unfulfilled, the parties to this MOA will consult to determine if extension or other amendment of the MOA is needed. No extension or amendment will be considered in effect unless all the signatories to the MOA have agreed to it in writing.

X. Termination

- A. If the USACE determines that it cannot implement the terms of this MOA, or if the DESHPO determines that the MOA is not being properly implemented, the USACE or the DESHPO may propose to the other parties to this MOA that it be terminated.
- B. The party proposing to terminate this MOA shall so notify all parties to this MOA, explaining the reasons for termination and affording them at least thirty (30) days to consult and seek alternatives to termination. The parties shall then consult.
- C. Should such consultation fail, the USACE or the DESHPO may terminate the MOA by so notifying all parties.
- D. Should this MOA be terminated, the USACE shall either:
 - 1. Consult in accordance with 33 CFR § 325, Appendix C, 8 and 36 CFR § 800.6(a)(1) to develop a new MOA; or
 - 2. Request the comments of the ACHP pursuant to 33 CFR § 325, Appendix C, 8 and 36 CFR § 800.7(a)(1). The ACHP shall have forty-five (45) days to respond with comments.
- E. The USACE and the ACHP may conclude the Section 106 process with a MOA between them if the DESHPO terminates consultation in accordance with 36 CFR § 800.7(a)(2).

Execution of this MOA by the USACE, APPLICANT and the DESHPO and implementation of its terms evidence that the USACE has taken into account the effects of the undertaking on historic properties and APPLICANT'S Section 106 requirements for permitting the Project will be fulfilled.

MEMORANDUM OF AGREEMENT
AMONG THE UNITED STATES ARMY CORPS OF ENGINEERS
AND THE DELAWARE STATE HISTORIC PRESERVATION OFFICE
PURSUANT TO 33 CFR § 325, APPENDIX C, 1, (g)(1) AND 36 CFR 800.6(b)(1)
REGARDING MODIFICATION OF DAMS 4 & 6 ON BRANDYWINE CREEK
CITY OF WILMINGTON, NEW CASTLE COUNTY, DELAWARE

UNITED STATES ARMY CORPS OF ENGINEERS

By: LANDIS.MICHAEL.A.1 229059188 Digitally signed by
LANDIS.MICHAEL.A.1229059188 Date: 2023.09.19 15:46:20 -04'00' Date: 19 September 2023

Name: Mr. Michael A. Landis, Chief, Operations Division

MEMORANDUM OF AGREEMENT
AMONG THE UNITED STATES ARMY CORPS OF ENGINEERS
AND THE DELAWARE STATE HISTORIC PRESERVATION OFFICE
PURSUANT TO 33 CFR § 325, APPENDIX C, 1, (g)(1) AND 36 CFR 800.6(b)(1)
REGARDING MODIFICATION OF DAMS 4 & 6 ON BRANDYWINE CREEK
CITY OF WILMINGTON, NEW CASTLE COUNTY, DELAWARE

DELAWARE STATE HISTORIC PRESERVATION OFFICE

By: Suzanne Savery, Director Digitally signed by Suzanne Savery,
Director Date: 2023.09.20 11:25:45 -04'00' Date: 09/20/2023

Name: Suzanne Savery, State Historic Preservation Officer

MEMORANDUM OF AGREEMENT
AMONG THE UNITED STATES ARMY CORPS OF ENGINEERS
AND THE DELAWARE STATE HISTORIC PRESERVATION OFFICE
PURSUANT TO 33 CFR § 325, APPENDIX C, 1, (g)(1) AND 36 CFR 800.6(b)(1)
REGARDING MODIFICATION OF DAMS 4 & 6 ON BRANDYWINE CREEK
CITY OF WILMINGTON, NEW CASTLE COUNTY, DELAWARE

BRANDYWINE RIVER RESTORATION TRUST

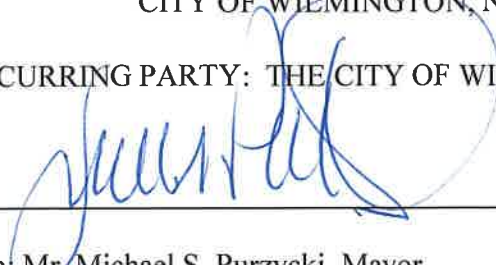
By: **James B Shanahan** Digitally signed by James B Shanahan
Date: 2023.09.22 14:59:23 -04'00'
Adobe Acrobat version: 2023.006.20320 Date: 9/22/2023

Name: Mr. James B. Shanahan, Executive Director

MEMORANDUM OF AGREEMENT
AMONG THE UNITED STATES ARMY CORPS OF ENGINEERS
AND THE DELAWARE STATE HISTORIC PRESERVATION OFFICE
PURSUANT TO 33 CFR § 325, APPENDIX C, 1, (g)(1) AND 36 CFR 800.6(b)(1)
REGARDING MODIFICATION OF DAMS 4 & 6 ON BRANDYWINE CREEK
CITY OF WILMINGTON, NEW CASTLE COUNTY, DELAWARE

CONCURRING PARTY: THE CITY OF WILMINGTON

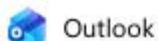
By: _____



Date: _____



Name: Mr. Michael S. Purzycki, Mayor



Fwd: Archaeological Monitoring Protocol for Removal of Dam 6 on Brandywine River



From: Jim Shanahan <jim@brtt.org>

Subject: Re: Archaeological Monitoring Protocol for Removal of Dam 6 on Brandywine River

Date: November 7, 2025 at 11:27:44 AM EST

To: Jim Shanahan <jim@brtt.org>

Jim Shanahan
Executive Director
Brandywine River Restoration Trust

On Apr 3, 2025, at 12:51 PM, Minnichbach, Nicole C CIV USARMY CENAP (USA)
<Nicole.C.Minnichbach@usace.army.mil> wrote:

I have been in consultation with the DESHPO, and they also approve of the plan.

Please keep us informed.

Nikki Minnichbach
Cultural Resource Specialist and Tribal Liaison
USACE Philadelphia District
1650 Arch Street
Philadelphia, PA 19103
(o) 215-656-6556
(m) 215-834-1065

Appendix C: Summary of National Register Criteria

Significant historic properties include districts, structures, objects, or sites that are at least 50 years of age and meet at least one National Register criterion. Criteria used in the evaluation process are specified in the Code of Federal Regulations, Title 36, Part 60, National Register of Historic Places (36 CFR 60.4). To be eligible for inclusion in the National Register of Historic Places, a historic property(s) must possess:

the quality of significance in American History, architecture, archaeology, engineering, and culture [that] is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

- a) that are associated with events that have made a significant contribution to the broad patterns of our history, or
- b) that are associated with the lives of persons significant in our past, or
- c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components lack individual distinction, or
- d) that have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

There are several criteria considerations. Ordinarily, cemeteries, birthplaces, or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register of Historic Places. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

- a) a religious property deriving primary significance from architectural or artistic distinction or historical importance, or
- b) a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event, or
- c) a birthplace or grave of a historical figure of outstanding importance if there is no other appropriate site or building directly associated with his/her productive life, or
- d) a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events, or
- e) a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived, or
- f) a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own historic significance, or

- g) a property achieving significance within the past 50 years if it is of exceptional importance. (36 CFR 60.4).

When conducting National Register evaluations, the physical characteristics and historic significance of the overall property are examined. While a property in its entirety may be considered eligible based on Criteria A, B, C, and/or D, specific data is also required for individual components therein based on date, function, history, and physical characteristics, and other information. Resources that do not relate in a significant way to the overall property may contribute if they independently meet the National Register criteria.

A contributing building, site, structure, or object adds to the historic architectural qualities, historic associations, or archeological values for which a property is significant because a) it was present during the period of significance, and possesses historic integrity reflecting its character at that time or is capable of yielding important information about the period, or b) it independently meets the National Register criteria. A non-contributing building, site, structure, or object does not add to the historic architectural qualities, historic associations, or archeological values for which a property is significant because a) it was not present during the period of significance, b) due to alterations, disturbances, additions, or other changes, it no longer possesses historic integrity reflecting its character at that time or is incapable of yielding important information about the period, or c) it does not independently meet the National Register criteria.

Appendix D: Artifact Catalog

APPENDIX D: ARTIFACT CATALOG

Bag #	Context	Ct.	Group	Artifact Material	Artifact Class	Artifact Type	Description	Dates	Measurements Wt. (g)
Brandywine Dam 6/Lower Hagley Yard Mill Dam site (7NC-B-083)									
1	General Finds: Square Timbers	1	HRDW	Ferrous Metal	Fastener	Spike	Whole spike, square shaft, possibly wrought, heavily corroded		21.0" L.
1	General Finds: Square Timbers	2	HRDW	Ferrous Metal	Fastener	Spike	Shaft fragments, square shaft, heavily corroded		
2	General Finds: Upper Planking	2	HRDW	Ferrous Metal	Fastener	Spike	Shaft fragments, square shaft, heavily corroded		
3	General Finds: Milled Boards	3	ARCH	Ferrous Metal	Nail	Cut Nail	Head and shaft fragments, heavily corroded	ca. 1790-1893 (Nelson 1968; Wells 1998:92)	
3	General Finds: Milled Boards	3	ARCH	Ferrous Metal	Nail	Square Nail	Head and shaft fragments, adhered remnant wood, heavily corroded	Pre-1893 (Nelson 1968; Wells 1998:92)	

7NC-B-083 Total Monitoring Artifact 11

Key

ARCH = architectural

g = grams

HRDW = hardware

L = length

APPENDIX D: ARTIFACT CATALOG REFERENCES

Nelson, Lee H.

1968 Nail Chronology as an Aid to Dating Old Buildings. *History News* Technical Leaflet 48. Nashville, TN.

Wells, Tom

1998 Nail Chronology: The Use of Technologically Derived Features. *Historical Archaeology* 32(2): 78-99.

Appendix E: Updated Cultural Resource Survey Forms



DELAWARE DIVISION OF HISTORICAL AND CULTURAL AFFAIRS
STATE HISTORIC PRESERVATION OFFICE
29 NORTH STATE STREET, DOVER, DE 19901

CULTURAL RESOURCE SURVEY
SURVEY UPDATE FORM

CRS # N14789

1. HISTORIC NAME/FUNCTION: Brandywine Dam 6/Lower Hagley Yard Mill Dam

2. ADDRESS/LOCATION: South of 256 Creek Road, Wilmington Delaware 19803 in Brandywine Creek

3. CURRENT CONDITION: excellent [] good [] fair [] poor [] demolished [x]

4. MAIN FUNCTION OF PROPERTY:

5. INTEGRITY:

6. SETTING INTEGRITY: Original Buildings adjacent to the site have been modified since the nineteenth-/ early twentieth-century

7. PROJECT TITLE/ REASON FOR SURVEY (if applicable): Archaeological Monitoring Report, Removal of Brandywine Dam 6, City of Wilmington, New Castle County, Delaware 19899

8. FORMS ADDED (give number of forms completed for each):

Table with 2 columns: #, Form, List property types. Rows include CRS 2 Main Building Form, CRS 3 Secondary Building Form, CRS 4 Archaeological Site Form, CRS 5 Structure (Building-Like) Form, CRS 6 Structure (Land Feature) Form, CRS 7 Object Form, CRS 8 Landscape Elements Form, CRS 9 Map Form, CRS 13 Photographs Form, CRS 14 Proposed District Form, CRS 15 Structure (Bridge) Form, CRS 16 Site (Ruins) Form, and OTHER.

9. SURVEYOR INFORMATION:

Surveyor name: Richard Grubb & Associates, Inc.

Principal Investigator name: Jonathan E. Dernbach, MSc, RPA

Principal Investigator signature:

Richard Grubb & Associates,
Inc.

Organization:

Date: 11/13/2025

N14789

CRS#

10. OTHER NOTES, OBSERVATIONS, NAMED SOURCES REFERENCED:

Previously surveyed by:

Richard Grubb & Associates, Inc.

2021 Phase IA Archaeological Survey, Fish Passage at Brandywine Creek Dams 2, 4, 5 and 6, City of Wilmington, Brandywine and Christiana Hundreds, New Castle County, Delaware. Prepared for Brandywine River Restoration Trust and Kleinschmidt.

2022 Phase IA and IB Archaeological Survey, Fish Passage at Brandywine Creek Dam 4, 5, and 6, City of Wilmington, New Castle County, Delaware. Prepared for Brandywine River Restoration Trust and Kleinschmidt.

University of Delaware Center for Historic Architecture & Design (CHAD)

2021a Mid-Atlantic Buildings and Landscapes Survey, Mid-Atlantic Historic Buildings and Landscapes Survey: Brandywine Dam #6, Lower Hagley Yard Mill Dam, Phase 1 Identification Level Report. Prepared for Brandywine Shad 2020.

2021b Mid-Atlantic Buildings and Landscapes Survey, Phase II Architectural Investigations for the Fish Passage at the Lower Brandywine River, Dams 2, 3, 4, 5, and 6. Prepared for Brandywine Shad 2020.

11. STATE HISTORIC CONTEXT FRAMEWORK (check all appropriate boxes; refer to state management plan(s)):

a) Time period(s)

- Pre-European Contact
- Paleo-Indian
- Archaic
- Woodland I
- Woodland II

- 1600-1750± Contact Period (Native American)
- 1630-1730± Exploration and Frontier Settlement
- 1730-1770± Intensified and Durable Occupation
- 1770-1830± Early Industrialization
- 1830-1880± Industrialization and Early Urbanization
- 1880-1940± Urbanization and Early Suburbanization
- 1940-1970± Suburbanization and Early Ex-urbanization

- Piedmont
- Upper Peninsula
- Lower Peninsula/Cypress Swamp
- Coastal

b) Geographical zone

Urban (City of Wilmington)

c) Historic period theme(s)

- | | |
|--|--|
| <input type="checkbox"/> Agriculture | <input type="checkbox"/> Transportation and Communication |
| <input type="checkbox"/> Forestry | <input type="checkbox"/> Settlement Patterns and Demographic Changes |
| <input type="checkbox"/> Trapping/Hunting | <input checked="" type="checkbox"/> Architecture, Engineering and Decorative Arts |
| <input type="checkbox"/> Mining/Quarrying | <input type="checkbox"/> Government |
| <input type="checkbox"/> Fishing/Oystering | <input type="checkbox"/> Religion |
| <input checked="" type="checkbox"/> Manufacturing | <input type="checkbox"/> Education |
| <input type="checkbox"/> Retailing/Wholesaling | <input type="checkbox"/> Community Organizations |
| <input type="checkbox"/> Finance | <input type="checkbox"/> Occupational Organizations |
| <input type="checkbox"/> Professional Services | <input type="checkbox"/> Major Families, Individuals and Events |
| <input type="checkbox"/> Military | <input type="checkbox"/> Recreation and Cultural Arts |



DELAWARE DIVISION OF HISTORICAL AND CULTURAL AFFAIRS
STATE HISTORIC PRESERVATION OFFICE
29 NORTH STATE STREET, DOVER, DE 19901

CULTURAL RESOURCE SURVEY
ARCHAEOLOGICAL SITE FORM

CRS # N14789
Site # 7NC-B-083

1. INFORMANT: Jonathan E. Dernbach, MSc, RPA

2. SURFACE CONDITION: submerged [x] cultivated [] wooded [] fallow []
marsh [] beach/shoreline [] urban []

other:

integrity: Partially demolished with approximately 25 feet at the northern and southern abutments left in place.

3. SOIL TYPE: N/A

4. DESCRIPTION OF FIELD WORK (check all that apply): surface collection [] visibility 0 %
shovel test [] measured unit [] mechanical stripping []
remote sensing [] walkover [x] informant collection []

5. COLLECTIONS:

a) Repository Accession #

Collector/consultant Richard Grubb & Associates, Inc.

Date 7/2025-10/2025 Surface [] Excavation [x]

b) Repository Accession #

Collector/consultant

Date Surface [] Excavation []

c) Repository Accession #

Collector/consultant

Date Surface [] Excavation []

d) Repository Accession #

Collector/consultant

Date Surface [] Excavation []

6. ARTIFACTS: List material and types

CRS # N14789
Site # 7NC-B-083

- 1 Ferrous Metal Spike - 21 inches long (Sampled from Square Timbers)
- 2 Large Ferrous Metal Fasteners (Sampled from Square Timbers)
- 2 Ferrous Metal Fasteners (Sampled from Upper Planking)
- 3 Cut Nails (Ca. 1790-1893; Nelson 1968; Wells 1998:92) (Sampled from Milled Boards)
- 3 Square Nails (pre-1893; Nelson 1968; Wells 1998:92) (Sampled from Milled Boards)

7. FEATURES:

The structural remains of the early nineteenth-century to twenty-first-century Brandywine Dam 6. These remains, consisting of approximately 25 feet of the dam at the northern and southern abutments, were left in place after removal of part of the dam in 2025 for a fish passage project sponsored by Brandywine River Restoration Trust.

8. DOCUMENTATION:

Publication/report title	Year
Phase IA Archaeological Survey, Fish Passage at Brandywine Creek Dams 2, 4, 5, and 6, City of Wilmington, Brandywine and Christiana Hundreds, New Castle County, Delaware (Richard Grubb & Associates, Inc. 2021)	2021
Phase IA and IB Archaeological Survey, Fish Passage at Brandywine Creek Dam 4, 5, and 6, City of Wilmington, New Castle County, Delaware (Richard Grubb & Associates, Inc. 2022)	2022
Archaeological Monitoring Report, Removal of Brandywine Dam 6, City of Wilmington, New Castle County, Delaware (Richard Grubb & Associates, Inc. 2025)	2025

Supporting documentation on file: (Mark the appropriate boxes)

Field notes	yes <input checked="" type="checkbox"/>	no <input type="checkbox"/>
Maps	yes <input checked="" type="checkbox"/>	no <input type="checkbox"/>
Drawings	yes <input checked="" type="checkbox"/>	no <input type="checkbox"/>
Photographs	yes <input checked="" type="checkbox"/>	no <input type="checkbox"/>
Lab Analysis	yes <input checked="" type="checkbox"/>	no <input type="checkbox"/>



DELAWARE DIVISION OF HISTORICAL AND CULTURAL AFFAIRS
 STATE HISTORIC PRESERVATION OFFICE
 29 NORTH STATE STREET, DOVER, DE 19901

CULTURAL RESOURCE SURVEY
 STRUCTURE (LAND FEATURE) FORM

CRS # N14789

1. ADDRESS/LOCATION: South of 256 Creek Road, Wilmington Delaware 19803 in Brandywine Creek

2. FUNCTION: Industrial Dam

3. YEAR BUILT: 1839 CIRCA?: ARCHITECT/BUILDER: Unknown, Commissioned by E.I. du Pont de Nemours

4. INTEGRITY:

<u>list major changes with years (if known)</u>	<u>year</u>
a. Construction of initial dam at location (pre-1839)	
b. Reconstruction of heavily damaged dam (timber crib structure)	1839

5. CURRENT CONDITION: excellent good fair poor

6. DESCRIPTION:

a) Circulation system

b) Spatial subdivisions

c) Retaining wall/lining material(s)

The 1839 reconstruction appears to have been a timber crib dam constructed of large, rough hewn square timbers run perpendicular to the Brandywine Creek and logs run parallel to the creek. These were fastened with large, ferrous metal spikes/fasteners and infilled with boulders and rock.

At some point, likely during or shortly after the early twentieth-century, the dam was repaired/modified with a concrete top - this appears to have been poured directly onto the underlying structure, and consisted of strips of concrete with milled, upright wooden boards in between. The dam thickness was approximately 22 feet, with the upstream portion composed of a sloped ramp covered with wooden planks fastened into the milled boards, and the crest a relatively level, exposed concrete surface.

Associated infrastructure was infilled sometime during the late nineteenth to mid-twentieth-century according to CHAD (2021b).

d) Other

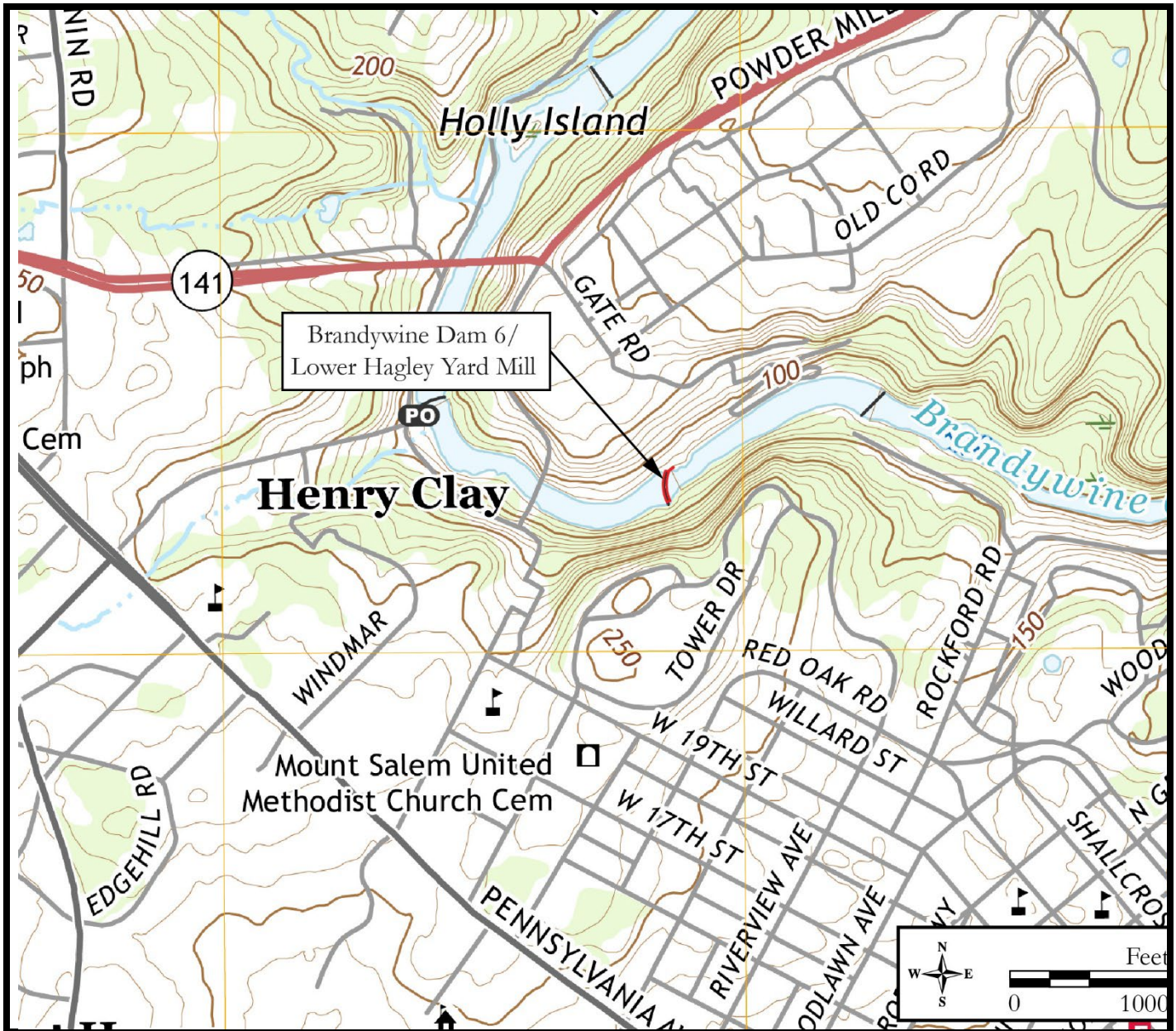
Following its partial removal in 2025 for a fish passage project sponsored by Brandywine River Restoration Trust, portions of the dam were left in place. These consist of approximately 25 feet of the dam structure at both its northern and southern abutments, in proximity to the banks of Brandywine Creek.

**CULTURAL RESOURCE SURVEY
 MAP FORM**

CRS # N14789

1. **ADDRESS/LOCATION:** South of 256 Creek Road, Wilmington Delaware 19803 in Brandywine Creek
2. **NOT FOR PUBLICATION** **reason:** _____
3. **LOCATION MAP:**
 Indicate position of resource in relation to geographical landmarks such as streams and crossroads.
 (insert section of USGS quad map or aerial photograph with location marked)

INDICATE NORTH ON SKETCH



4. SITE PLAN:

(insert aerial photograph or map showing relationship of buildings, driveway, outbuildings, fences, etc., to each other; label elements as needed; add other pages as needed)

INDICATE NORTH ON PLAN



Appendix F: Annotated Bibliography

Author: Jonathan E. Dernbach, MSc, RPA

Title: Archaeological Monitoring Report, Removal of Brandywine Dam 6, City of Wilmington, New Castle County, Delaware (DHCA Project Review No. 2020.06.22.06)

Date: January 2026

RGA Database Title: Brandywine Dam Monitoring

RGA Project No.: 2024-096DE

State: Delaware

County: New Castle County

USGS Quad: Wilmington North, DE

Drainage Basin: Brandywine Creek, Christina River, Delaware River, Delaware Bay, Atlantic Ocean

Regulation: Section 106 (National Historic Preservation Act of 1966, as amended)

Project Type: Government

Project Sponsor: Brandywine River Restoration Trust

Client: Kleinschmidt

Level of Survey: Construction Monitoring

Cultural Resources: Brandywine Dam 6/Lower Hagley Yard Mill Dam (SHPO Opinion: 5/5/2022; 7NC-B-083)