3.0 Research Design and Methodologies

3.0 RESEARCH DESIGN AND METHODOLOGIES

3.1 Research Design

The purpose of the Phase IB Archaeological Survey of the SR 141 Centre Road Corridor Improvements project was to assess the presence or absence of potentially significant cultural resources within the project APE. In this effort, research aimed to determine: 1) the sedimentary/pedological sequences within the section of the APE comprising the floodplain of Little Mill Creek; 2) the range of historic and precontact-era activities that occurred within the APE and the broader project area; and 3) the presence and relative integrity of archaeological deposits within the APE. To achieve these determinations: 1) geomorphologic fieldwork was conducted within the APE; 2) archaeological fieldwork was conducted within the APE; and 3) the cultural material from the excavations was processed and analyzed.

To achieve the goal of the survey, each parcel was ranked for prehistoric and historic archaeological sensitivity and a testing strategy formulated based on the level of archaeological sensitivity. The assessment of archaeological sensitivity is based on two allied concepts: the *potential* for archaeological sites to exist or to have been formed in a given area, and the *sensitivity* of that area for intact cultural resources. In areas where no sites are documented, the potential presence of prehistoric resources is based primarily on environmental setting (i.e., topography, proximity to water, and soil quality). The potential presence of historic resources is usually determined through documentary research. In addition, the potential for prehistoric or historic cultural resources to exist in a given area is measured on an ordinal scale as low, medium, or high.

For the purposes of this survey, sensitivity is defined as a measure of probability that *intact* cultural resources (prehistoric or historic) exist within the archaeological APE. Sensitivity is derived by measuring the potential presence of prehistoric resources against known modifications of naturally occurring landscapes (i.e., human or natural transformational processes) that may have destroyed (or be in the process of destroying) the archaeological value of those resources. As with measuring the potential for cultural resources, sensitivity is also ranked on an ordinal scale as low, medium, or high. A hypothetical illustration of the relation

between these two measures would be a property located in a certain environmental setting that is assessed as having a high probability for prehistoric cultural resources. This assessment is based on the knowledge that archaeological sites are frequently found in those settings. Although a high probability exists, the property may have a low sensitivity to prehistoric resources because modern activities specific to that property (e.g., grading and filling) have destroyed the original context of the cultural resources beyond the possibility of any meaningful reconstruction by the archaeologist.

3.1.1 Measuring Prehistoric Archaeological Site Probability

The criteria used to evaluate the probability that prehistoric archaeological sites may be present in a given APE are twofold. The first criterion is whether any prehistoric sites have been documented within the APE. This is minimally ascertained through a review of archaeological site files archived at the DESHPO, and may include other sources, such as oral informants and published or unpublished documents. If a prehistoric archaeological site has been documented in or adjacent to the APE, the APE is said to have a high probability of containing prehistoric cultural resources. The second criterion is to establish the potential of the APE to contain undocumented prehistoric materials. The potential of the APE to contain undocumented prehistoric archaeological deposits is determined through background research. Background research involves using previous surveys of cultural resources, published site reports and regional syntheses, and settlement pattern (or predictive) models to derive an understanding of the prehistory of the region in which the APE is located.

Predictive models for undocumented prehistoric site locations are generated from the analysis of the non-random distribution pattern of documented sites across the landscape. Environmental and topographic variables are typically used for predicting prehistoric site locations, and these variables are discussed in several sources pertinent to the current investigation (Custer 1984, 1989a, 1989b; Custer and DeSantis 1986). In general terms, archaeological sites are predicted in areas of slightly elevated, well-drained soils in relatively close proximity to water sources. This empirical association of prehistoric sites with well-drained soils and water appears to be true of all time periods, but has been explicitly linked to the Archaic period settlements in and around the Delaware River Valley (Custer 1984:40). Regionally, village sites were also located at the

intersection of prehistoric transportation routes, and at the mouths of mountain gaps (Philhower 1925:33-35).

The pattern of prehistoric site settlement is compared to geomorphologic variables to generate empirical generalizations associating prehistoric sites with the physiographic settings in which they are found. Predictive models will thereby make predictive statements on the location of undocumented prehistoric sites by the strength of association of known sites with physiographic variables such as topography, hydrology, and pedology. Comparing the topographic, hydrologic, and pedologic settings in the APE with those discussed in pertinent settlement pattern studies can aid the assessment of the potential for undocumented prehistoric sites within a given APE. The potential for undocumented prehistoric cultural resources is ranked on an ordinal scale as low, medium, or high.

3.1.2 Measuring Historic Archaeological Site Probability

The physiographic variables used to model prehistoric site locations are less useful in predicting the presence of historic sites. Instead of using physiographic variables, analyses of primary and secondary historic sources and historic cartographic materials provide a much more useful method for predicting the presence of historic cultural resources, often with great accuracy. The use of text and cartographic documents usually permits a presence or absence evaluation for historic sites, rather than the ordinal scaling of probabilities (i.e., low, medium, high) typically used for predicting prehistoric sites.

To determine the presence or absence of historic cultural resources within a given APE, a variety of cartographic references are consulted. Large-scale historic maps are utilized to determine the potential presence of early (i.e., pre-industrial) historic materials. Small-scale atlases, topographic maps, and insurance maps can be used for more detailed analyses of streetscapes beginning in the third quarter of the nineteenth century.

3.1.3 Measuring Prehistoric or Historic Archaeological Site Sensitivity

The project APE is located in an area that was subjected to significant development during the first three-quarters of the twentieth century. Not only did the development likely destroy many

prehistoric and historic archaeological sites, it often modified the landscape to an extent that complicates the evaluation of where intact prehistoric (or historic) archaeological sites may be found. Furthermore, the potential presence of prehistoric resources in densely populated urban or suburban areas must be measured against known modifications of naturally occurring landscapes. The environment and land surfaces of today are not necessarily those of the prehistoric past. Therefore, an assessment of the overall sensitivity of an APE to undocumented prehistoric sites must evaluate the disruptive effects of historic activity in settings that exhibit the potential for prehistoric sites.

The potential presence of historic cultural resources within an APE must also be weighed against ground moving activities that may destroy the contextual integrity of the site. As with prehistoric cultural resources, the sensitivity for historic period cultural resources involves ascertaining the probable location of potentially significant historic sites and comparing those locations with areas of documented ground disturbance. Overall sensitivity to historic sites is a measure of the potential for intact cultural resources to be present within the APE.

Several sources of information may be consulted for a given area to determine the overall sensitivity to intact prehistoric or historic archaeological resources. A site reconnaissance of the APE is the first step in determining the extent to which the landscape has been altered since the prehistoric or historic past. Visual inspection of the APE is necessary for establishing the existing conditions within the APE and evaluating the possibility that the area has been comprehensively disturbed by construction or other activities. Historic maps, photographs, and any other source(s) of information detailing subsurface utilities in or adjacent to the APE should also be reviewed to determine the extent to which the APE has been disturbed.

When assessing archaeological sensitivity, it should be kept in mind that the advent of the internal combustion engine not only liberated the potential for growth almost any place accessible by road, but also affected how that growth would be physically accomplished. Not only did the internal combustion engine lead to the development of cars, it also helped produce bulldozers, backhoes, and other large, earth moving equipment that can transform the landscape rapidly. This is an important fact for the archaeologist to bear in mind when considering the

sensitivity for intact cultural resources in an area that has been subject to modern development. Whereas older forms of development may have simply built on top of previously existing archaeological sites, modern construction techniques typically call for topsoil stripping, soil stockpiling, and later re-contouring of the land with bulldozers over extensive areas prior to building. The potential for archaeological sites (historic or prehistoric) to remain at least partially intact after these operations is considered slight.

Recommendations for Phase IB testing are typically based on the overall sensitivity, not probability, of the APE to either prehistoric or historic archaeological resources. The combination of background research, site reconnaissance, and the resulting sensitivity assessment ideally provides sufficient information to determine not only whether archaeological testing is recommended, but also what cultural resources are expected to be found in the APE and what testing strategy or strategies should be employed to find them.

3.2 Archaeological Sensitivity for Parcels 1 through 8

Parcel 1 consists of an approximately 35.0-meter long by 35.0-meter wide area of grassy land situated at the northeast corner of Cedar Avenue and SR 141 (Figure 2). This parcel of ground contains moderate potential for prehistoric archaeological resources, as nineteenth- and early-twentieth-century maps do not depict any structures on this lot (Figures 3 to 6). In addition, the *circa*-1950s DelDOT contract map of the Boxwood Road to Lancaster Pike project lists the lot as a garden, with no standing structures (Appendix B). A series of STPs were placed at 22.9-meter intervals across this parcel.

Parcel 2 comprises a 67.0-meter long by 18.3-meter wide plot of grassy land situated north of Lehigh Avenue and south of the wooded ground bordering Little Mill Creek (Figure 2). Parcel 2 exhibits high potential for prehistoric and historic archaeological resources. The upland setting overlooking Little Mill Creek would have provided a dry, prominent position close to a water source for Native American occupation. The 1868 Beers *Atlas of Delaware* depicts a structure situated along the east side of SR 141 within the general area of Parcel 2 (Figure 4). The 1893 Baist *Map of New Castle County* illustrates two structures within or in proximity to Parcel 2, likely a house and a barn, identified on the property of Edward Woodwa (Woodward) (Figure 5).

The *circa*-1950s DelDOT contract maps of SR 141 indicate that several structures along the east side of SR 141 were removed as part of the road improvement project, including the removal of foundation remains, buried utilities, and other subsurface features (Appendix B). Much of this building demolition took place in an 18.3-meter wide corridor adjacent to SR 141. For this reason, no archaeological excavations in Parcel 2 were conducted within 18.3 meters of SR 141. A series of STPs placed at 15.2-meter intervals were excavated outside the disturbed portion of this parcel to identify subsurface remains associated with Native American activities and historic domestic residences.

Parcel 3 consists of an approximately 76.2-meter long by 39.6-meter wide area east of SR 141 comprising the wooded uplands adjacent to the south side of Little Mill Creek (Figure 2). Parcel 3 contains moderate to high potential for historic archaeological resources associated with two mid- to late-nineteenth-century structures as noted in Parcel 2, as well as moderate to high potential for prehistoric archaeological resources. The *circa*-1950s DelDOT road contract maps of SR 141 indicate that no structures were present along the east side of SR 141 in the wooded ground, suggesting that the structures were removed prior to DelDOT's recordation of standing structures along SR 141, or that the structures were located outside of the area of impact (Appendix B). A series of STPs placed at 15.2-meter intervals were excavated across this parcel to identify if subsurface remains associated with the two mid- to late-nineteenth-century structures, such as foundations, trash pits, and privies, or Native American activities, reside below the surface.

Parcel 4 comprises a 83.8-meter long by 167.6-meter wide area east of SR 141 comprising the wooded uplands adjacent to the north side of Little Mill Creek (Figure 2). This section of ground lies just north of a large sanitary sewer line running parallel to Little Mill Creek. Parcel 4 contains moderate to high potential for prehistoric and historic archaeological resources. The close proximity to Little Mill Creek, as well as the higher elevation of the landform, presents an opportune setting for the preservation of cultural remains associated with temporary or long-term Native American occupations, as well as historic farmsteads. The 1868 Beers and 1893 Baist maps depict a structure in the general area of Parcel 4, identified as part of the A. Hollingsworth or Hollingswood property (Figures 4 and 5). The *circa*-1950s DelDOT road contract maps of SR

141 indicate that no structures were present along the east side of SR 141 in the wooded ground, although a macadam driveway was present at one time, suggesting that the structure was removed prior to the DelDOT survey, or that it did not reside within the area of construction and was not recorded as part of the earlier survey (Appendix B). A series of STPs were placed at 15.2-meter intervals across this parcel to identify if subsurface remains associated with this structure, such as foundations, trash pits, and privies, or Native American activities, reside below the surface.

Parcel 5 consists of a 126.5-meter long by 18.3-meter wide parcel of ground comprising the backyards of several structures in Eton Court (Figure 2). Parcel 5 contains moderate potential for historic archaeological resources associated with the mid-nineteenth-century structure described in Parcel 4, as well as moderate potential for prehistoric resources. A series of STPs placed at 22.3-meter intervals were excavated across this parcel to identify if subsurface remains associated with this structure, such as foundations, trash pits, and privies, or Native American activities, reside below the surface.

Parcel 6 is comprised of an approximately 487.7-meter long by 30.5-meter wide parcel of ground bordered by SR 141 to the east, Faulkland Road to the south, a line of trees to the west, and the Ferris Center grounds to the north (Figure 2). This section of ground is considered to have low potential for prehistoric and historic archaeological resources due to ground disturbance associated with the development of the Ferris Center infrastructure and proximity of Faulkland Road. A series of STPs placed at 30.5-meter intervals were excavated in Parcel 6.

Parcel 7 consists of an approximately 167.6-meter long by 30.5-meter wide corridor along the north side of Faulkland Road extending from the east side of SR 141 to an unnamed drainage (Figure 2). This section of ground is considered to have low potential for prehistoric archaeological resources due to ground disturbance associated with the development of the Du Pont facility and proximity of Faulkland Road. A series of STPs placed at 30.5-meter intervals were excavated in Parcel 7.

Parcel 8 consists of an approximately 121.9-meter long by 30.5-meter wide corridor along the south side of Faulkland Road extending from the east side of SR 141 to an unnamed drainage (Figure 2). This section of ground is considered to have low potential for prehistoric and historic archaeological resources due to ground disturbance associated with the development of Faulkland Road and an adjacent commercial property. A series of STPs were placed at 30.5-meter intervals in Parcel 8.

A section of floodplain along the north and south sides of Little Mill Creek, situated between Parcel 3 and Parcel 4 and east of SR 141, was assessed for archaeological potential as part of the current archaeological survey. The geomorphologic survey of the floodplain identified evidence of extensive, high-energy alluvial deposition associated with historic and modern development of the landscape within the Little Mill Creek drainage. An area of swampy, low-lying ground was noted to the southeast of the project APE, near the current meander in the creek, suggesting that the creek course has shifted laterally across the floodplain. The introduction of a sanitary sewer line on the north side of Little Mill Creek further negated the integrity of soil deposits. Overall, the floodplain soils were determined to be of a young age, unstable, and not capable of supporting prehistoric occupation (Wagner 2005:2). Based on these observations, no archaeological investigations were conducted within the floodplain of Little Mill Creek.

3.3 Methodologies

The geomorphologic investigation focused on assessing the depositional history and archaeological integrity of the floodplain and adjacent upland settings along Little Mill Creek in the APE. Daniel Wagner of Geo-Sci Consultants, Inc., conducted the geomorphologic investigation on January 18, 2005. The analytical methods used were designed to assess the potential for cultural resources based on the understanding of soil age and stability, as well as how human utilization of the landscape has affected environmental conditions. This study included assessments of general surface topography and a review of a core log for soil cores taken in the area of the existing bridge that carries SR 141 over Little Mill Creek. The geomorphologic report and the soil core report are presented in Appendices C and D, respectively.

The Phase IB Archaeological Survey included the systematic excavation of STPs. The archaeological survey focused on an assessment of the archaeological potential and content of project landforms. For the purposes of this Management Summary, the methodology for establishing test excavation locations in each parcel in the APE will be discussed separately.

3.3.1 Parcel 1

Using a transit and a 100.0-meter reel tape, Transect A was established along the eastern edge of SR 141 using two utility poles, designated Pole #1 (south) and Pole #2 (north), as fixed reference points. Transect B was established perpendicular to SR 141 from Pole #1, set approximately 6.1 meters north of Cedar Avenue. To avoid any ground disturbance associated with SR 141, a pin flag was placed on Transect B approximately 3.0 meters east of Transect A. Additional pin flags were placed at 15.2-meter intervals north and east from this initial pin flag (Figure 7). An STP was excavated at each pin flag location on the grid. Each STP was given a numerical designation to record its provenience.

3.3.2 Parcel 2 and Parcel 3

Parcel 2 and Parcel 3 were evaluated as having moderate to high potential for prehistoric and historic archaeological resources. An 18.3-meter wide by 65.5-meter long section of ground adjacent to SR 141 in Parcel 2 was excluded from the archaeological survey, as this section of ground had been extensively impacted through the demolition of several residential structures.

A series of STPs placed at 15.2-meter intervals were imposed over Parcel 2 and Parcel 3 (Figures 7 and 8). To facilitate the grid layout, a transect was established along SR 141 using several utility poles as fixed reference points, beginning with Pole #1 at the intersection of SR 141 and Lehigh Avenue. A second transect perpendicular to SR 141 was extended from Pole #1, approximately 6.1 meters north of Lehigh Avenue. Pin flags were placed on the two transects every 15.2 meters. Two reel tapes were used to fill in the remaining pin flags located on the grid. A STP was excavated at each pin flag location on the grid. Each STP was given a numerical designation specific to its own particular parcel to record its provenience.

3.3.3 Parcel 4

Parcel 4 contains moderate to high potential for prehistoric and historic archaeological resources. Based on this sensitivity factor, a 15.2-meter-interval grid of STPs was placed over the landform to test for archaeological resources. The test grid was created by establishing a transect between two utility poles in Parcel 4 on the east side of SR 141 (Figure 8). A series of pin flags were set on this transect at 15.2-meter intervals, beginning at Pole #1, the southernmost pole. From Pole #1, a second transect was drawn to the east, perpendicular to SR 141. Pin flags were placed on the second transect at 15.2-meter intervals as well. Two reel tapes were utilized to plot the remaining pin flags across Parcel 4. A test pit was excavated at each pin flag location on the grid. Due to the proximity of SR 141 and subsurface utility impacts, no excavations were conducted on the first transect adjacent to SR 141. To record the provenience of the test pits in Parcel 4, each column was assigned a letter designation, while each row was given a numerical label. Each STP was recorded by its row and column association (i.e., 10C, 6AA).

3.3.4 Parcel 5

The first transect in Parcel 4 was extrapolated across Parcel 5, following a series of utility poles along the roadway (Figures 8 and 9). Pin flags were established at 22.9-meter intervals on the transect, as Parcel 5 was assessed as having moderate potential for prehistoric and historic archaeological resources. A row of pin flags were stepped back 15.2 meters to the east of the transect to avoid impacts from the SR 141 roadway and subsurface utilities. Each STP was given a numerical designation to record its provenience.

3.3.5 Parcel 6

A transect was established 10.7 meters north of a line of utility poles along Faulkland Road (Figures 10 and 11). A pin flag was placed on this transect directly north of Utility Pole 46868, located near the intersection of SR 141 and Faulkland Road. From this pin flag, additional pin flags were placed on the transect to the west at 30.5-meter intervals. An STP was excavated at each pin flag location on the transect. Each STP was given a numerical designation to record its provenience.

3.3.6 Parcel 7

In Parcel 7, a 1.2-meter high fence along Faulkland Road was used as a baseline from which a series of STPs were established over the APE (Figures 10 and 12). A metal fence pole located 44.2 meters east of the right-angle turn in the fence line was designated as the datum point. From the datum point, a series of pin flags were set at 30.5-meter intervals along the fence, with three flags placed to the east and one flag placed to the west. From these pin flags, test pits were set 7.6 meters north of the fence. A second pin flag was placed 38.1 meters west of the datum. Two test pits were established at 61.0 meters and 30.5 meters, respectively, north of the fence from this flag. Each STP was given a numerical designation to record its provenience.

3.3.7 Parcel 8

A single transect was established across Parcel 8 from Utility Pole 46891, found in the southwestern corner of the parcel (Figures 10 and 12). The transect maintained a 12.2-meter distance from the edge of pavement of Faulkland Road. A pin flag was placed on the transect 15.2 meters east of the utility pole, with subsequent pin flags placed every 22.9 meters thereafter. A test pit was excavated at each pin flag location on the transect. Each STP was given a numerical designation to record its provenience.

All STPs measured approximately 0.3 meter in diameter and were excavated using round-nosed shovels and pointed trowels. All sediments were screened through 0.64-centimeter mesh hardware cloth. Changes in color or sediment type were measured and recorded on standardized STP forms and kept on file at the offices of A.D. Marble & Company. All STPs were immediately backfilled following documentation. All artifacts recovered from shovel testing were retained regardless of age or cultural affiliation. Each artifact collected was bagged and removed to an off-site laboratory for processing. Complete photographic documentation of the project area and surrounding environs was performed using black-and-white, color slide, and digital formats during the archaeological field investigation.

Artifacts recovered from the field were cleaned, labeled, and inventoried in the laboratory. A catalog database that contained a complete description of every artifact and its known cultural affiliation and dating was created for all artifacts recovered from the Phase IB survey. All of the necessary laboratory analysis conformed to the *Curation Guidelines* established by the Delaware State Museums.