3.0 ENVIRONMENTAL BACKGROUND

3.1 Physiography and Hydrology

The U.S. 301 Orange Section 4 archaeological APE is situated within the Mid-peninsular Drainage Divide Zone of the Upper/High Coastal Plain Physiographic Province (Custer 1984:24; Delaware Geological Survey 2008) on a broad upland area with low relief. The Mid-peninsular Drainage Divide is defined as an area of "low rolling topography that separates the headwaters of streams that drain into the Delaware River from streams that drain into the Chesapeake Bay" (Custer 1984:26). The Upper/High Coastal Plain is characterized by rolling topography with elevational differences between the headlands bordering the larger streams and the adjacent floodplain marshes (Custer 1984:25). Even though the elevational differences are not great, they do affect seasonal differences in plant communities (Braun 1950:246-247). The Upper/High Coastal Plain is underlain by a series of layers of sediments, younger in age than those found in the Piedmont, and ranging in age from the Cretaceous Period (approximately 120 million years ago) to relatively recent (holocene) (Delaware Geological Survey 2008). These have been slightly tilted through geologic time, with very minor faulting or folding in places. Elevations in the archaeological APE range from approximately 12.2 to 24.4 m (40.0 to 80.0 ft) above mean sea level. The ground surface within the archaeological APE displays slope values well below 15 percent, which is generally recognized as the threshold for the location of most pre-contact period archaeological sites. Due to the relatively little ground slope variation in the Mid-peninsular Drainage Divide, and for the U.S. 301 predictive model a more conservative slope value of eight percent was used as a minor variable in the determination of high, moderate, and low probability areas (Baublitz 2006:49; Lothrop *et al*. 1987).

The majority of the Orange Section 4 archaeological APE has been in the past and continues to be comprised of agricultural lands with occasional adjacent farm building complexes and suburban development. With the exception of the construction and maintenance of buildings, roadways, utilities, and drainage ditches, no extensive disturbances to the soils/sediments located in the archaeological APE are present. All of the agricultural fields have been plowed in the past. Residential development in the archaeological APE has increased dramatically since 1984 to the present (Delaware Department of Natural Resources and Environmental Control 2001).

The archaeological APE is located within the Chesapeake Bay Basin, Chesapeake & Delaware Canal and Bohemia Creek watersheds (Delaware Department of Natural Resources and Environmental Control 2001; Environmental Protection Agency 2008). The C&D Canal, constructed

in 1829 and currently operated by the U.S. Army Corp of Engineers, is located in the Back Creek watershed. Of course since the C&D Canal is manmade, it would not have played a role in the lives of pre-contact period peoples using the area. The Chesapeake Bay Basin, located along the western border of the state, is the largest drainage basin in Delaware encompassing approximately 1,991.6 km^2 (769.0 mi^2) (Delaware Department of Natural Resources and Environmental Control 2001:5). Hummocky topography with more deeply incised streams characterize the portion of the basin containing the archaeological APE. Topography in the Chesapeake Basin is gently sloping in the northern portion with subtle differences in elevation affecting the drainage of the soil (Delaware Department of Natural Resources and Environmental Control 2001:14). Surface water runoff either collects in depressions or flows towards watercourses.

The archaeological APE is drained by several streams including unnamed tributaries to Back Creek and Back Creek. The Back Creek watershed is located in both Maryland and Delaware and encompasses approximately 3,532.6 ha (8,729.0 ac) (Maryland Department of the Environment 2005:2). Higher elevations and hummocky topography in the inner coastal plain region like that in the archaeological APE result in a lower seasonal-high water table. In addition, land along major stream corridors is often better drained and tends to have lower water tables. The water table within the archaeological APE ranges from 15.0 to 21.0 m (50.0 to 70.0 ft) below mean sea level (Delaware Department of Natural Resources and Environmental Control 2001). Compared to areas within the Chesapeake Bay Basin located north of the C&D Canal and south of Middletown, the archaeological APE does not exhibit many wetlands; therefore, there are not many artificial drainage ditches to control flooding and provide drainage present in the agricultural fields. With the exception of the nearby C&D Canal, there are no 100-year floodplains mapped in the Orange Section 4 archaeological APE (FHWA and DelDOT 2007:III-163).

3.2 Geology, Soils, and Lithic Resources

Sediments of the Coastal Plain include unconsolidated sediments of Early and Late Cretaceous age (Potomac Formation) unconformably overlain in most places by sediments of Pleistocene age (Columbia Formation) and/or Holocene age (Woodruff and Thompson 1972). The sedimentary Potomac Formation is fluvial, probably deltaic, in origin and is composed primarily of clays and silts with some interbedded sands. It was formed during the Early to Late Cretaceous (Pickett and Spoljaric 1971). From the Upper Cretaceous to the Middle Eocene, Delaware was covered by seas (Pickett and Spoljaric 1971). At the end of the Eocene, the seas receded, but returned during the Miocene. The Columbia Formation sediments (Pleistocene age) were

deposited in stream channels, floodplains, meander cutoffs, and levees on an erosional surface of Upper Cretaceous and Tertiary sediments (Pickett and Spoljaric 1971). The Pleistocene stream channels were shallow and frequent melt water flooding deposited large amounts of coarse gravelly sediment to the area. The Columbia Formation is primarily comprised of poorly sorted fluvial sands with some interbedded gravels, silts, and clays. The Columbia Formation comprises the surficial geology in the archaeological APE. Fossil plant remains including leaves, twigs, bark, and nuts, have been found in the Columbia Formation near Middletown to the south of the Orange Section 4 archaeological APE (Pickett and Spoljaric 1971). The C&D Canal is one of the most prolific fossil locations in the Atlantic Coastal Plain because it cuts through and exposes many of these prehistoric sedimentary layers (FHWA and DelDOT 2007:III-120).

Due to incomplete soils data for the archaeological APE on the Web Soil Survey (United States Department of Agriculture-Natural Resources Conservation Service [USDA-NRCS] 2005) and the *Soil Survey for New Castle County, Delaware* (Matthews and Lavoie 1970), other sources were used to compile the following soils information for this Phase IA report. It is anticipated that the project soils information will be available on the web site at a later date and will be used for future research once available. The Orange Section 4 archaeological APE is mapped within the Matapeake-Sassafras Soil Association. This association is characterized by nearly level to steep, mostly well-drained soils on uplands. The Matapeake soils have a silt loam surface layer and silty clay loam subsoil. Sassafras soils have a sandy loam surface layer and sandy loam and sandy clay loam subsoil. Based on the typical profiles for the mapped soil association, the excavations of any potential cultural soils should not exceed 70.0 cm (27.6 in); therefore, deep testing is not anticipated for the majority of the Orange Section 4 archaeological APE. However, it must be kept in mind that soils mapping does not account for smaller localized variations in soils, and if deeper deposits occur as a localized condition, they will be thoroughly tested to ensure that no cultural remains are present.

Specific soil types mapped within the Orange Section 4 archaeological APE include: Fallsington, Keyport, Matapeake, Mixed Alluvial Land, Othello, and Woodstown. Despite the characterization of the soil association in the archaeological APE as mostly well-drained, hydric soils are mapped in all portions except the central portion of the APE (Delaware Department of Natural Resources and Environmental Control 2001) (Figure 3). Of the mapped archaeological APE soils, Fallsington, Othello, and Mixed Alluvial Lands are considered to be hydric (Delaware Department of Natural Resources and Environmental Control 2001:15). Most of the soils (95%) within the Chesapeake Basin are not highly erodible; however, soils contained within the southern

portion of the archaeological APE are mapped as “very high” with regard to erodibility (Delaware Department of Natural Resources and Environmental Control 2001:15) (Figure 4). The soils mapped in the northern portion are mostly rated “medium” with regard to erodibility (Delaware Department of Natural Resources and Environmental Control 2001:15).

In general, primary (i.e., bedrock) sources of lithic raw materials are uncommon in the vicinity of the project area, as the majority of the Coastal Plain physiographic province is covered by a thick mantle of Pleistocene sediments. While this situation virtually excludes surficial bedrock exposures of raw material, the same processes that resulted in the deposition of these sediments also transported a variety of knappable stone from primary outcrops located to the north. Thus, Native American knappers could have selected from a variety of lithic raw materials, including chalcedony, chert, quartz, and quartzite from secondary deposits (e.g., stream terraces, lag deposits, gravel bars), for stoneworking (Catts *et al*. 1988:14). Common in Delaware lithic assemblages is quartz, a tenacious stone of variable flaking quality. While quartz is suitable for the manufacture of flaked stone tools, its ubiquity in the region and its propensity to shatter when struck during plowing or other earth moving activities makes the attribution of some quartz specimens as pre-contact period artifacts problematic.

In many areas of the eastern United States, the precise definition of chert or other raw material types can be used to pinpoint the procurement location (outcrop) and allow for a rough approximation of the territorial range of a group to be determined. In Delaware, however, most artifacts of chert, quartzite, and chalcedony consist of materials derived from secondary deposits; thus, many regional specialists do not assign the raw material to a specific named type (e.g., Jacoby *et al*. 1997; Petraglia *et al*. 1998). However, a large outcrop of cryptocrystalline lithic material known as the Delaware Chalcedony complex is present in northwestern New Castle County (Custer 1984:56). The cryptocrystalline outcrops (i.e., jasper, chert, chalcedony) of the Delaware Chalcedony Complex are unique to the Upper Delmarva Peninsula and provided pre-contact period peoples with excellent quality lithic raw material to make stone tools. Iron Hill jasper is part of the Delaware Chalcedony Complex (Custer *et al.* 1986) with its source, Iron Hill, located at the southernmost point of access to the Delaware Chalcedony complex region. This material was used by aboriginals during the Paleoindian period.

Sources of Iron Hill jasper are located near Newark and were the focus of Paleoindian/Early Archaic settlement patterns (Custer and Galasso 1980). This distinctive material varies in color from yellow to dark brown and ranges in quality from excellent to poor. When good to excellent quality jasper is found, a wide variety of lithic tool forms are easily made (Petraglia and Knepper 1996). Iron Hill jasper is part of the Delaware Chalcedony Complex (Custer *et al.* 1986). In addition

to being found in primary outcrops, jasper cobbles can be found as secondary sources in certain streams on the Delmarva Peninsula. The Iron Hill jasper sources are considered local to the archaeological APE.

Primary sources of ironstone, an iron cemented sandstone, are located along the Elk River and Herring Island at the upper end of the Chesapeake Bay (Ward 1988:7). This material is noted with some frequency from Delaware site assemblages, especially those in the vicinity of Churchman's Marsh in the northeastern portion of the state. Exotic raw materials occasionally encountered on archaeological sites in Delaware include argillite and rhyolite, both with primary outcrops located in northern Delaware and the Blueridge physiographic province in Maryland and Pennsylvania, respectively (Custer 1984:108). Steatite from the Piedmont in Pennsylvania is also present in Delaware archaeological sites such as Barkers Landing, Coverdale, and other sites located in the Murderkill drainage (Custer 1984:110).

3.3 Climate, Flora, and Fauna

The state of Delaware is located within a transitional zone between a humid subtropical climate, which is characterized by hot, humid summers and chilly to mild winters and a continental climate, which is characterized by winter temperatures cold enough to support a fixed period of snow cover each year with relatively moderate precipitation occurring mostly in summer. All parts of Delaware have relatively hot, humid summers. While Sussex and Kent counties are considered to have humid subtropical climates, New Castle County is considered closer to a warm continental climate. Three large bodies of water, including the Atlantic Ocean, the Delaware Bay, and the Chesapeake Bay, exert modifying influences on the climate of the state. The average annual precipitation for New Castle County is 1,124.5 cm (49.0 in), which is distributed fairly evenly throughout the year. The mean annual temperature in the county is 13.3° C (56.0° F) with average daily temperature ranges from 3.3° C (38.0° F) in the winter to 24.4° C (76.0° F) in the summer (New Castle County Delaware 2008). The warmest part of the year in Delaware is late July, while the coldest is late January into February. The frost-free growing period for the archaeological APE is 175 to 180 days and would have been sufficient for late pre-contact period peoples to grow corn and other crops (Matthews and Levoie 1970).

The floral and faunal distributions across Delmarva can be described as a mosaic with a high variety of species present in a small area (Custer 1986:46-47). Forests have always been important to the people of Delaware as hunting grounds and resource gathering places, as well as for the wood itself. At the time of Euro-American settlement in the 1600s, the area was a vast,

unbroken forest of oak and pine trees. However, the virgin stands were eliminated when timber was cut to be sold and the land was cleared for farming (Barbour and Christensen 1993). As the area was settled, forests on most productive and well drained soils were removed and replaced with agricultural crops (Delaware Department of Agriculture Forest Service 2002:2). Delaware experienced its lowest amount of forest cover around the year 1900, with only 141,645 ha (350,000 ac) of forest (Delaware Department of Agriculture Forest Service 2002:4). The modern vegetation in New Castle County is typical of that of the northeastern United States. Since 1984, much of the forest and agricultural lands have been converted to residential and other urban uses (Delaware Forest Service 2003). Delaware's forests presently cover 149,739 ha (370,000 ac) in fragmented parcels (Delaware Forest Service 2003). Oak/hickory is the dominant forest cover in New Castle County, occupying 64 percent of the timberlands, with the Loblolly/shortleaf group occupying 13 percent (U.S. Department of Agriculture, Forest Service 1999). "Forests continue to provide a variety of important services to the people of Delaware, such as aesthetic benefits, recreation, timber and other forest products, wildlife habitat, and protection of water quality" (Delaware Department of Agriculture Forest Service 2002:2).

The greatest variety of animals in Delaware would have been found in the grass/woodlands settings and in perennial and seasonal water sources. It is estimated that 377 animal species, including amphibians, reptiles, birds, fish, mammals, and insects, are native to Delaware (Delaware Department of Agriculture Forest Service 2002:10). Principal mammal species, which served as potential resources for the aboriginal inhabitants of the area, were mastodon, mammoth, musk ox, vole, lemming, mouse, white-tailed deer, caribou, elk, giant beaver, river otter, porcupine, cottontail rabbit, gray squirrel, and opossum. Important fur-bearing mammals included beaver, muskrat, raccoon, and red and gray foxes. Avian fauna of aboriginal importance would have included wild turkey and ruffed grouse, as well as various species of waterfowl. Numerous species of fish and shellfish were available in freshwater streams, the brackish waters of the Chesapeake Bay, and the salt waters of the Atlantic Ocean. Wetland areas specific to the archaeological APE would have been the home of diverse fauna.