V. SITE FORMATION PROCESSES AND CULTURAL COMPONENTS

This section discusses the origins, development, and approximate ages of the soils at the Whitby Branch Site and their relationship to the artifacts and cultural features they contain. The chapter begins with an examination of the natural and cultural processes that have altered the archaeological record. The concluding section describes the site's prehistoric cultural components, based on the identification of diagnostic artifacts.

A. SOILS AND STRATIGRAPHY

The Whitby Branch Site is located on a coastal upland landform, occupying the higher elevation (summit and shoulder) near U.S. Route 13 to the east, and the lower elevation (backslope and toeslope) along the wetland margins to the west. The landform continues for several hundred meters to the east of the site and is largely truncated by the dualized highway. The site landscape consists of Pleistocene-age alluvial deposits composed of gravelly sandy loam on the upper (eastern) surface, and sandy loam on the lower (western) portion of the upland terrain (Wagner 1996a). The juxtaposition of coarse-textured and fine-textured horizons indicates that the area was probably formed by lateral accretion caused by migrating stream meanders, as is found in channel or point-bar deposits.

The archaeological excavations revealed differences in the soil stratigraphy between the eastern and western portions of the site. Figure 5 illustrates the major soil horizons found in the East Block Excavation. Surface soils here exhibit evidence of very limited agricultural cultivation. The shallow depth of the plowzone probably reflects non-mechanized plowing undertaken during the nineteenth or early twentieth century. The remainder of the profile consists of a thin, weakly eluviated soil (BE-horizon) overlying a highly weathered, or argillic, subsoil (Bt-horizon).

In contrast, the soil profiles observed in the western portion of the site record an absence of historic plowing activities (Figure 6). Very gradual soil boundaries separate the organic (A-), eluviated (E-), and well-developed argillic (Bt-) horizons, an indicator of the very slow accumulation of sediments on the site surface, and the generally intact, undisturbed nature of the soils. Only minimal slopewash buildup can be detected in the stratigraphic profile, supporting the impression that the higher elevation to the east has been subject to only very limited plowing.

Wagner (1996a) (see Appendix A) has shown that the highly weathered argillic horizon had its origin in Pleistocene-age deposits which, at a depth of about 30 centimeters, represent the occupation surfaces of all subsequent prehistoric site visitors. Burial of these surfaces was extremely gradual, averaging approximately 0.2 centimeter per century during the course of the Holocene. The mechanism of this sedimentation is probably a combination of aeolian processes and the incorporation and development of localized organic material from on-site vegetation.

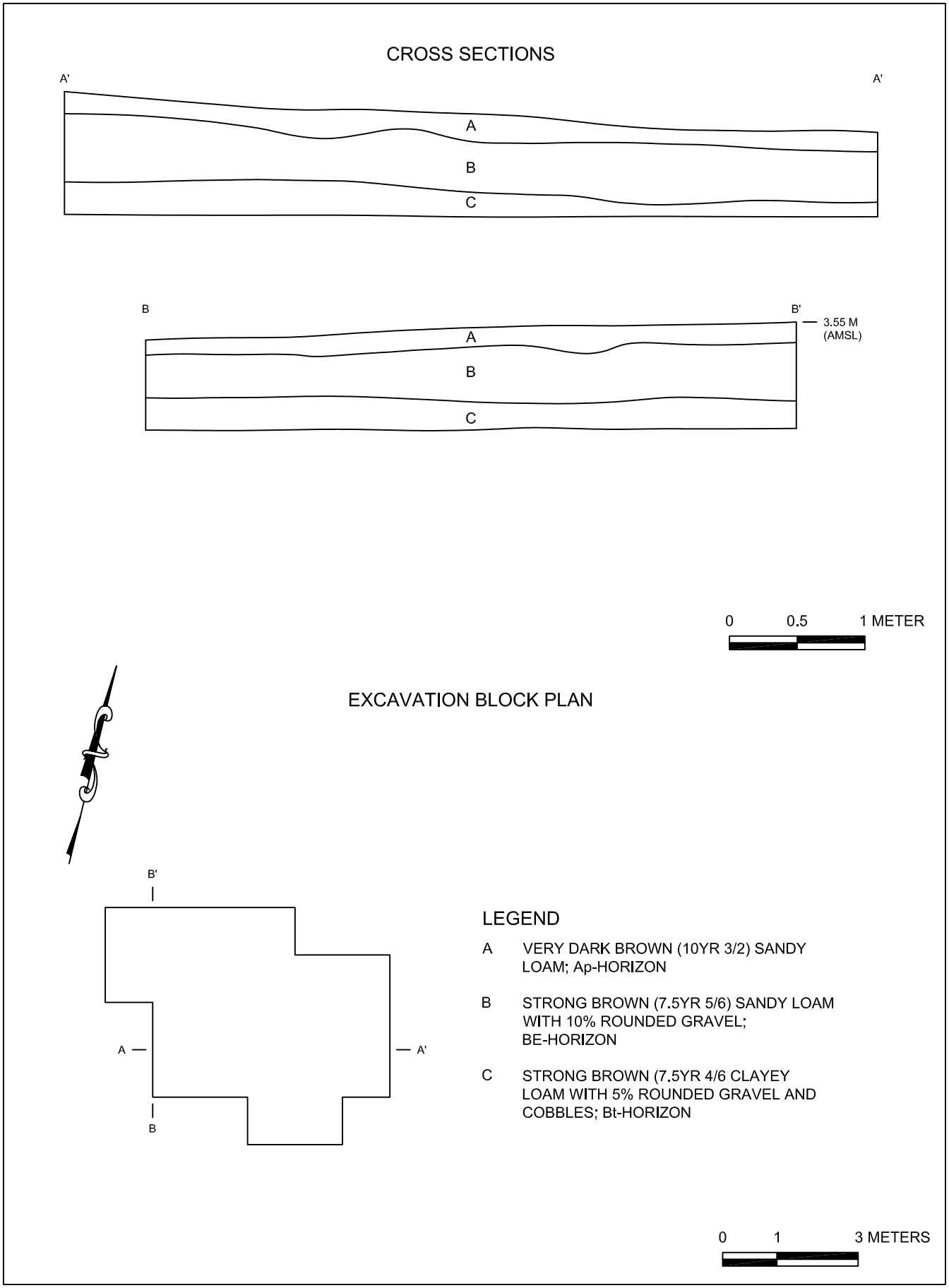

FIGURE 5: Stratigraphic Soil Profiles, East Block Excavation, Site 7NC-G-151

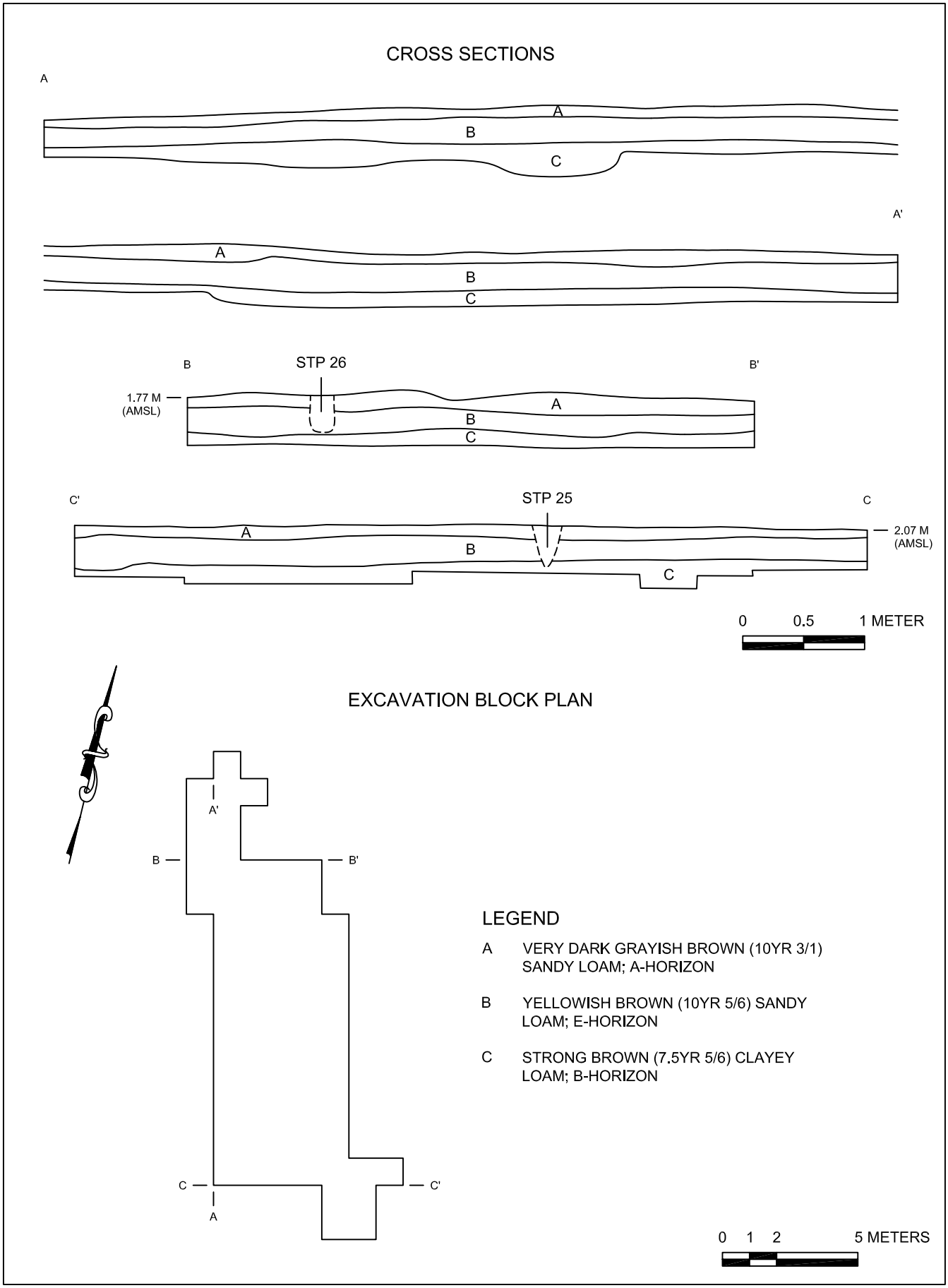

FIGURE 6: Stratigraphic Soil Profiles, West Block Excavation, Site 7NC-G-151

Soil chemistry tests were completed for 10 samples, including sample locations from general excavation contexts, features, and an off-site location. The standard battery of tests used for agricultural purposes included organic matter, phosphorus, potassium, magnesium, soil acidity, and calcium. One additional test, total phosphorus as measured in milligrams per kilogram, was added, and the results are shown in Table 2. In some situations, soil acidity has been used to successfully delineate activity areas within archaeological sites and assist in environmental reconstruction. Elevated phosphorus levels may be indicative of high amounts of fertilizer, ash, and animal and human waste, and archaeological occupation sites frequently exhibit a higher concentration of phosphorus than adjacent, unoccupied areas. Calcium levels may be related to a variety of factors, including soil fertilizers that contain oyster shell and lime.

The tested samples include one column consisting of Levels 1-4 in a general excavation context within the principal excavation area (Excavation Unit 37), a group of samples from the suspected prehistoric pit house (Features 19, 21, and 22), and an off-site sample. The cluster of samples from the suspected pit house were specifically taken in an attempt to clarify the cultural as opposed to the natural origin of that feature. The samples taken from the suspected pit house differed most markedly from the remainder of the samples in their elevated levels of total phosphorus. The pH values show strongly acidic soils throughout the site and in the off-site area, with a mean value of 4.4. Within the soil column taken from Excavation Unit 37, organic matter values decline with increasing depth, as do a number of the chemical constituents, such as potassium and magnesium.

B. RADIOCARBON DATES

Seven wood charcoal samples derived from various contexts were submitted for radiocarbon assay. Table 3 lists these samples and provides information on their context, associations, weights, and dates.

Five radiocarbon dates appear to be in good context, and two are from disturbed, or modern, contexts. With regard to the latter, the sample from Feature 17 returned a conventional radiocarbon date of 50 years BP ± 70 (Beta-100756). Feature 17 is a small organic-stained parabolic pit identified beneath the plowzone. On the basis of the radiocarbon date and the stratigraphic position of the feature, it is reasonable to interpret the feature as a remnant historic posthole. Sample No. 7 (Beta-100758) was collected from excavation levels that were heavily disturbed by root stains. The conventional radiocarbon date of 230 years BP ± 70 (Beta-100758) is considered too late to be associated with the prehistoric material recovered from these levels.

The remaining samples yielded results clustering around two date ranges: 2600-2490 BP, and 880-730 BP. Sample No. 2 (Beta-100753) was recovered from Feature 19, a large pit feature interpreted as a possible semi-subterranean house structure. The radiocarbon date of 2470 years BP ± 50 (Beta-100753) falls within the Black Rock I complex of the Woodland I period (Custer 1994), and is consistent with the regionally accepted date range of circa 2500-1 BC (Custer 1996a) for the contracting-stemmed projectile point (Catalog No. 96/33/456) recovered from the feature. A date of 2600 years BP ± 60 was obtained for Sample No. 3 (Beta-100754), and a date of 2540 years BP

Table 2. Soil Chemistry Test Results, Site 7NC-G-151

CAT. NO.	CONTEXT	ORG. %	ORG./ENR	P1	P2	K	Mg	pH2	pH
80	EU 37, Lv. 1	7.6	140	6	8	81	51	6.4	4.3
86	EU 37, Lv. 2	2.1	90	3	5	43	13	6.9	4.3
91	EU 37, Lv. 3	1	69	3	5	23	5	6.9	4.2
110	EU 37, Lv. 4	1	66	4	6	28	7	6.7	4.2
486	Ft. 21, A1W	0.5	54	6	12	39	44	6.6	4.5
488	Ft. 21, A3W	0.2	49	4	7	33	47	6.7	4.6
538	Ft. 22, Flv. 2	0.9	64	7	11	67	38	6.8	4.4
542	Ft. 19, Lv. 1	1.3	71	3	5	39	31	6.7	4.4
549	EU 139, Lv. 2	1.2	71	2	4	33	25	6.8	4.3
563	Off-site #3	1.1	67	6	11	37	30	6.7	4.4
Min.		0.2	49	2	4	23	5	6.4	4.2
Max.		7.6	140	7	12	81	51	6.9	4.6
Mean		1.7	74	4	7	42	29	6.7	4.4
St. Dev.		2.1	26	2	3	18	17	0.1	0.1

CAT. NO.	CONTEXT	Ca	H	Cat.	% K	% Mg	% Ca	P mg/kg	% H
80	EU 37, Lv. 1	210	4.9	6.6	3.2	6.5	16	700	74.4
86	EU 37, Lv. 2	40	0.8	1.2	8.9	8.8	16.2	1,300	66.1
91	EU 37, Lv. 3	30	0.6	0.8	7	5	17.9	600	70.1
110	EU 37, Lv. 4	30	2.6	2.9	2.5	2	5.2	900	90.3
486	Ft. 21, A1W	100	3	4	2.5	9.2	12.6	2,300	75.6
488	Ft. 21, A3W	110	2.6	3.6	2.3	10.8	15.2	1,700	71.7
538	Ft. 22, Flv. 2	100	1.6	2.6	6.5	12.1	19.1	2,200	62.3
542	Ft. 19, Lv. 1	100	2.3	3.2	3.2	8.2	15.8	1,000	72.8
549	EU 139, Lv. 2	70	1.3	1.9	4.5	11	18.5	400	66.1
563	Off-site #3	60	2.6	3.2	2.9	7.7	9.2	800	80.1
Min.		30	0.6	0.8	2.3	2	5.2	400	62.3
Max.		210	4.9	6.6	8.9	12.1	19.1	2,300	90.3
Mean		85	2.2	3	4.4	8.1	14.6	1,190	73
St. Dev.		54	1.3	1.6	2.3	3	4.4	667	8

Key: ORG: organic matter; ENR: estimated nitrogen release; P1: Phosphorus (Weak Bray); P2: Phosphorus (Strong Bray); K: Potassium; Mg: Magnesium: pH: soil acidity; pH2: buffered acidity; Ca: Calcium; H: Hydrogen; Cat.: Cation Exchange Capacity; % K: percentage potassium base saturation; % Mg: percentage magnesium base saturation; % H: percentage hydrogen saturation; P mg/kg: total phosphorus (milligrams per kilogram).

± 70 was obtained for Sample No. 4 (Beta-100755), placing all three assays within the Black Rock I complex.

The second cluster of radiocarbon dates corresponds to the Woodland II cultural horizon, a period that is not well represented by diagnostic artifacts at the Whitby Branch Site. Wood charcoal samples were removed from Feature 20 and Feature 22, two closely spaced pit hearths near the eastern margin of the site. Feature 20 (Sample No. 1) yielded a date of 740 years BP ± 40 (Beta-100752), while Feature 22 (Sample No. 6) was dated to 880 years BP ± 60 (Beta-100757).

Table 3. Radiocarbon Dating Analyses, Site 7NC-G-151

Sample Number	Context	Weight (g)	Radiocarbon Years	Calibrated Date Range
1/Beta-100752	Feature 20	2.1	740 ± 40	AD 1235-1300
2/Beta-100753	Feature 19	1.4	2470 ± 50	790-400 BC
3/Beta-100754	Unit 66, Level 4	21.9	2600 ± 60	835-540 BC
4/Beta-100755	Unit 65, Level 3	96.7	2540 ± 70	820-410 BC
5/Beta-100756	Feature 17	13.0	50 ± 70	AD 1675-1945
6/Beta-100757	Feature 22	34.8	880 ± 60	AD 1020-1275

C. POSTDEPOSITIONAL DISTURBANCES

The vertical distribution of site artifacts and cultural features is chiefly influenced by three factors: point of deposition, rate of burial by sedimentation, and postdepositional disturbances (Schiffer 1983). In a hypothetically stable system, the accumulation of sediment will impose a positional age grid on artifacts, sealing older specimens in deeper contexts than younger ones. This "law of superposition" is a fundamental principle in establishing the sequence of cultural horizons at archaeological sites spanning more than one occupation. However, both natural and cultural processes can alter the orientation and position of cultural remains in ways not always apparent to archaeologists who investigate a site centuries or millennia later. Natural processes include erosion, animal burrowing, root growth, tree falls, and freeze/thaw cycles, actions which can lead to soil loss or soil mixing, resulting in the compression of multiple cultural horizons into one undifferentiated stratum or the blending and pollution of disparate horizons. Given sufficient time, the natural weathering of soils may succeed in masking these disturbances, leading to false interpretations of the archaeological record. Cultivation, digging, and soil redeposition are some of the cultural activities responsible for postdepositional disturbances.

At the Whitby Branch Site, rodent burrowing, root growth, cultivation, and subsurface digging were all in evidence to varying degrees. Observations of downed trees were also made during the Phase II and III investigations, and it is reasonable to assume that tree growth and tree uprooting were a nearly continuous factor in the development of the site landscape. Analysis of debitage distributions may help demonstrate to what degree soil mixing (i.e., pedoturbation) has occurred.

D. PREHISTORIC COMPONENTS

Various diagnostic lithic and ceramic artifacts in the artifact assemblage indicate prehistoric use of the Whitby Branch Site over a lengthy period of time. The Woodland I period is well represented by typologically distinct hafted bifaces, covering early (Clyde Farm complex), middle (Black Rock I complex), and late (Webb complex) phases of the period. Fragments of container vessels also help to distinguish different periods of prehistoric occupation. The Woodland II period occupation of the site is evident, though not as well represented as the Woodland I period. The following sections discuss the data relevant to establishing specific cultural horizons found at the Whitby Branch Site. Table 4 summarizes the site chronology.

Table 4. Site Chronology, Site 7NC-G-151

	Calendar Years							
	6000	5000	4000	3000	2000	1000	BC/AD	1000
								WOODLAND II
Levanna Point (N=1) (c. AD 1000 to contact)								
Feature 20 (AD 1235-1300)								—
Feature 22 (AD 1020-1275)								—
						WOODLAND I		
Webb Complex (AD 500-1000)								9999
Jack's Reef Corner Notched Points (N=7) (c. AD 600-900)								
Black Rock I Complex (500-1 BC)						9999		
Contracting Stem Points (N=27) (c. 2500-1 BC)								
Wolfe Neck Ware (N=2) (c. 700-400 BC)								
Feature 6 (430-300 BC)						–		
Feature 21 (675-505 BC)						–		
Feature 19 (790-400 BC)						—		
Unit 65 (820-410 BC)						—		
Unit 66 (835-540 BC)						—		
Clyde Farm Complex (3000-700 BC)				9999999999999999				
Steatite Bowl (N=1) (c. 1700-1200 BC)								
Contracting Stem Points (N=27) (c. 2500-1 BC)								
Susquehanna Broadspear Point (N=1) (c. 2000-1500 BC)								
Pequea Point (N=1) (c. 5500-2000 BC)								

Key: - temporal duration for diagnostic artifact; 9 - duration of cultural complex; — - C14 date; – - OCR date.

1. Container Assemblage

The container assemblage is small, consisting of two ceramic sherds and a steatite bowl fragment (Plate 5). The ceramics are crushed-quartz-tempered body sherds and are derived from different vessels. Catalog No. 96/16/6 exhibits a fabric-impressed exterior and plain interior. Catalog No. 96/33/482 is interior-exterior cordmarked; the interior is cordmarked with some smoothing apparent. Both sherds are identified as Wolfe Neck (Vinette I variant). Wolfe Neck ware is dated to circa 700-400 BC (Custer 1984, 1989, 1994).

The steatite fragment is a rimsherd with some pitting and scraping on the interior (Catalog No. 96/33/382). The limited curvature of the fragment indicates that it comes from an extremely large vessel. Estimated dates for steatite use on the Delmarva Peninsula are 1700-1200 BC (Custer 1989:173).

2. Biface Assemblage

Differential hafting techniques provide one of the most useful markers for grouping finished bifaces by temporal or cultural units. The modifications made to biface stems for the purpose of hafting them to spears, arrows, or handles are not only reflections of a group's (or individual's) technical mastery of toolmaking, but also can be viewed as stylistic indicators of group affiliation and behavior (Cross 1983:100). Encoded within stone-tool forms, colors, and raw materials may be the transmitters of social information relating, for example, to boundary maintenance, affiliation, and status.

Excavations at the site produced more than 140 bifaces, including more than 40 projectile points. Of these, 28 specimens are complete enough to be typed and assigned to a cultural component. All but two are definitively included in the Woodland I period. Table 5 lists the projectile points according to type and raw material.

Possibly the oldest typed biface in the assemblage is a quartz expanding-stem Pequea point, datable from Archaic contexts well into the Woodland I period (Custer 1996a). Custer notes that the Pequea point enjoyed a long period of popularity spanning the era from 5500 to 2000 BC.

Eleven contracting-stemmed bifaces form the largest group of typed points recovered from the site. These points correspond to the Poplar Island type, a narrow, tapered projectile point dating from the Archaic period through most of the Woodland I period (Custer 1996a). In the Upper Delaware River Valley, Kraft (1990) has bracketed Lackawaxen/Poplar Island contexts between circa 2600 and 2000 BC. A Poplar Island component at Site 28GL111 in the Lower Delaware River Valley was radiocarbon-dated at 1880 BC ± 90 [reported as BC] (Beta-43291) (Berger 1992). Poplar Island points at the Area B Site (28ME1-B) of the Abbott Farm National Landmark near Trenton, New Jersey, were found in Levels 1-6, suggesting a fairly broad temporal spread from the early Woodland I to the mid-Woodland I subperiods (Cavallo 1987:99). Cavallo states, however, that the evidence

PLATE 5: Vessels, Site 7NC-G-151. Top row: Wolfe Neck Vessels (Cat. Nos. 96/16/6 and 96/33/482); Bottom: Steatite Vessel (Cat. No. 96/33/382)

Table 5. Point Types by Raw Material, Site 7NC-G-151

	RAW MATERIAL						
POINT TYPE	Jasper	Quartz	Quartzite	Chert	Rhyolite	Argillite	TOTAL
Poplar Island	.	6	4	.	.	1	11
Jack's Reef	7	.	.	.	.	.	7
Levanna	.	.	.	1	.	.	1
Susquehanna Broadspear	.	.	.	.	1	.	1
Pequea	.	1	.	.	.	.	1
Untyped	3	1	6	3	1	1	15
Fragments	2	3	.	2	1	.	8
TOTAL	12	11	10	6	3	2	44

for Poplar Island persistence into the mid-Woodland I (Early Woodland) is at best ambiguous (Cavallo 1987:99). At the Leipsic Site (7K-C-194A) in Kent County, Delaware, Poplar Island-like points (Point Type "B") are assigned to the 2500-500 BC time frame within Woodland I (Custer, Riley, and Mellin 1996:62). Type "B" points were not found in association with ceramics, however, suggesting a more restricted timing of circa 2500-1000 BC for this variety. The Whitby Branch Site set of Poplar Island points was manufactured primarily from quartz, with smaller numbers made of quartzite, and a single example of argillite.

Three contracting-stemmed points are similar in appearance to Poplar Island, but terminate in flat bases much like Bare Island types. They are presumed to be coterminous with Poplar Island.

Three quartzite specimens with contracting stems fall between Poplar Island and a larger broadspear variety akin to the Lehigh/Koens-Crispin type (Custer 1996a). This variant may represent hafted knives. Their temporal placement is unclear.

Rhyolite was used for the manufacture of a hafted biface identified as a Susquehanna Broadspear (Catalog No. 96/33/166). These large-bladed bifaces have been described as both spearpoints and knives, and are datable between 2000 and 1500 BC (Custer 1989; Turnbaugh 1975). At Site 28ME1-A in the Abbott Farm National Landmark, a radiocarbon date of 1800 BC ± 160 [reported as BC] (Beta-11777) was obtained from a context directly beneath a Susquehanna Broadspear component (Stewart 1986:108). On the North Branch of the Susquehanna River at Site 36CO17, a Susquehanna Broadspear component was associated with radiocarbon dates of 3900 years BP ± 80 (Beta-84321), 3630 years BP ± 120 (Beta-84325), and 3430 years BP ± 140 (Beta-84323) (Jacoby et al. 1999). In Delaware, Susquehanna Broadspears are often found in association with steatite bowls in Clyde Farm complex occupations (Custer 1994).

The late phase of the Woodland I period, or Webb complex, is represented by seven jasper Jack's Reef Corner Notched points. Datable to AD 600-900, this type is thought to have been the first true arrow point in the eastern United States (Justice 1987:217). In the Delmarva Peninsula, Jack's Reef Corner Notched points exhibit a high degree of uniformity in manufacturing technique, being well thinned and deeply notched, with edges finished by fine pressure flaking. Importantly, the utilized raw material is almost entirely restricted to jasper (Custer 1996a). The appeal of a single raw material type and its application by a prehistoric group to a specific lithic industry may be tied to physical properties of the material that make it especially appropriate for certain tool functions. Such criteria as superior flaking qualities, sharpness, and edge retention may have endowed a raw material with a special attractiveness to the prehistoric flintknapper for specific, or even generalized, tasks. A tendency of this sort might, over time, be transformed into a cultural value, restructuring the preference for a raw material from the purely technical to the socially normative.

Hafted bifaces from the Woodland II period are limited to a single chert Levanna triangular point (Catalog No. 96/33/293) (Ritchie 1971). Small and well thinned, this point is common in Delaware post-AD 1000 (Custer 1996a).