ARCHAEOLOGICAL PREDICTIVE MODELING ANALYSIS FOR THE GREATER SPRINGFIELD RELIABILITY PROJECT, 345-kV SYSTEM AND ADDITIONAL 115-kV SEGMENTS, HAMPDEN COUNTY, MASSACHUSETTS

Municipalities of Agawam, Chicopee, East Longmeadow, Hampden, Longmeadow, Ludlow, Springfield, West Springfield, and Wilbraham

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CHAPTER 1.0 INTRODUCTION

Scope of the Modeling Study

Western Massachusetts Electric Company (WMECO) is leading a continuing effort to improve the reliability of its transmission systems. The Greater Springfield Reliability Project (GSRP) will include the rebuilding of existing overhead transmission and distribution lines, and the construction of underground networks. Through its partners, WMECO is performing engineering and environmental assessments of its Rights-Of-Way (ROWs) and potential work zones in multiple communities. The GSRP includes both 115-kV and 345-kV overhead and underground networks. In some locations, the 115-kV and 345-kV overhead lines use the same ROW.

Burns & McDonnell, Inc. is directing the planning and design studies for the GSRP on behalf of WMECO. Because the GSRP will involve undertakings that are federally permitted by FERC, regulations require that consideration must be given to possible impacts to significant archaeological and cultural resources located within the Area of Potential Effect (APE) of the overall project. An initial step in pursuit of regulatory compliance for cultural resources is completion of an archaeological study that applies a predictive model to the areas that may be affected by the GSRP. Burns & McDonnell, Inc. retained Archaeological Services at the University of Massachusetts-Amherst to conduct predictive model studies for the GSRP.

The present report covers the 345-kV network of the GSRP, as well as referenced 115-kV segments. This study also considers overhead lines and underground alternatives in multiple municipalities, and a separate network of underground alternatives in the southern part of Springfield.

The main objectives of the study have been to perform background research in order to determine the known cultural resources within the study area, and to assess the archaeological sensitivity within the ROWs and other possible work areas of the GSRP. Because this study is being conducted at an early, conceptual phase of the overall project, its findings are preliminary and are not equivalent to a Phase 1A Reconnaissance survey, to be conducted once design plans and work areas are more fully developed. Rather, the present study is intended to assist in planning by showing which parts of the GSRP 345-kV network and additional 115-kV segments are most likely to contain unrecorded archaeological resources (either pre-Contact Native American or historical), and which areas are of lesser concern because of low sensitivity. This information will help indicate the necessity for future archaeological survey and testing in specific locations, and will assist in the future evaluation of design alternatives for the GSRP.

Authority for the Modeling Study

The archaeological predictive modeling study for the GSRP was conducted by Archaeological Services at the University of Massachusetts-Amherst, who were retained by Burns & McDonnell, Inc. on behalf of WMECO. The study was conducted in consultation with the Massachusetts Historical Commission (MHC) and the office of Brona Simon, the Massachusetts State Archaeologist.

Project Location and Description

The GSRP is located in Western Massachusetts (Figure 1), in multiple municipalities that are in the vicinity of the City of Springfield in Hampden County (Figure 2). The predictive model study area for this report includes locations in Agawam, Chicopee, East Longmeadow, Hampden, Longmeadow, Ludlow, Springfield, Wilbraham and West Springfield. The objective of the GSRP is to create and/or improve the linkage between a network of substations, junctions and switching stations within the overall transmission system (Figure 3).

For the 345-kV system:

- Selected new and/or Existing Overhead ROWs were assessed in the municipalities of Agawam, Chicopee, East Longmeadow, Hampden, Ludlow, West Springfield, and Wilbraham.

- One Overhead Alternative segment was assessed in Hampden.

- Multiple Underground Alternatives were assessed in East Longmeadow and Longmeadow.

(Note: The Massachusetts portion of the 345-kV Project contains no Underground Primary segments.)

For the additional (previously un-surveyed) 115-kV ROWs and underground alternatives:

- Existing Overhead ROWs were assessed in the municipalities of Agawam, Chicopee, Ludlow, and West Springfield.

- Alternative Overhead ROWs were assessed in the municipalities of Agawam, Chicopee, and Ludlow.

- Underground Alternatives were assessed in the municipalities of Agawam, Chicopee, Ludlow, Springfield, and West Springfield.

Underground Alternatives in Southern Springfield:

- A network of potential underground alternatives to link the West Springfield Substation to the Breckwood Substation were assessed in southern Springfield. This report provides findings for the Noticed Alternative Route and the Preferred Route among this potential network.

The study area includes zones that are centered upon overhead transmission line easements, or ROWs, where rebuilding or construction-related activities may eventually occur as part of the electric reliability improvement project. While primary concern has been given to

archaeological resources that may be located within the ROWs and possible work areas, application of the predictive model entailed consideration of a broader area to assess overall archaeological sensitivity.

CHAPTER 2.0 METHODOLOGY

The predictive model study for the GSRP used multiple avenues of research to assess the archaeological sensitivity within the ROWs of the 345-kV network, the additional 115-kV segments, and the network of underground alternatives in southern Springfield. The Massachusetts state archaeological site files and the Massachusetts Cultural Resource Information System (MACRIS) were consulted for previously recorded sites located in and near the study area. The ROWs and potential work areas were plotted on historical maps of the municipalities in the study area. Archaeological staff visited all the overhead ROWs, and conducted visual inspection of all of the underground alternatives.

Background Research

In the course of conducting the background research, multiple methods were employed. These included:

1. Researching historical documents, such as town, county, and state histories and maps, and state or federal records, to determine the location of reported Native American sites of the Contact period, and historic structures and industrial sites within the area of investigation. The archaeological literature was researched to determine the characteristics of the types of sites that might be expected to occur within the project area. Sources consulted during background research are cited in the references section.

2. Researching archaeological site files and the Massachusetts Cultural Resource Information System (MACRIS) maintained by the Massachusetts Historical Commission (MHC).

3. Researching archaeological site data maintained by the Department of Anthropology at the University of Massachusetts-Amherst.

4. Stratifying the project area using environmental factors known to be associated with ancient Native American settlement patterns.

5. Conducting a preliminary on-site visual inspection of the project area, including those areas predicted to have low likelihood to contain Native American and historic archaeological sites.

Criteria for Assessing Archaeological Sensitivity

Numerous environmental attributes were considered in predicting zones of elevated sensitivity for archaeological sites. Reviewing previous studies in landscape environments similar to those encountered in the project area identified these attributes. The following is a list of the major criteria used during the investigation to assess the archaeological sensitivity within the project area:

1. The presence of known Native American or historic sites within or adjacent to the project area.

2. Proximity to a National Register property.

3. Proximity to a supply of fresh water.

4. Proximity to seasonal or perennial subsistence resources.

5. Soils characteristics such as drainage, texture, suitability for cultivation.

6. Topographic features such as slope, aspect, elevation, and barriers to prevailing winds.

7. Proximity to sources of raw materials.

8. Proximity to topographic features conducive to industrial development such as hydrologic features.

9. Proximity to areas known to have been early historic settlement clusters, or that may have been early settlement areas.

10. Proximity to transportation routes.

11. Proximity to industrial, commercial, and agricultural markets.

The project area was stratified prior to field survey in order to eliminate those areas requiring no further survey and to delineate those having the sensitivity to contain archaeological resources. Areas subjected to previous ground disturbance were eliminated from consideration.

In the current study, a combined finding of archaeological sensitivity was made for each Overhead ROW or Underground Alternative, which includes the likelihood for Native American and/or historical resources to be affected.

Predictive Model for Native American Site Sensitivity

Documentary evidence of pre-Contact Native American sites rarely exists. Therefore, the likelihood of encountering Native American sites is predicted on the basis of an environmental model which uses geological, soil, and climatic data; known site locations in the southern New England region; and expected Native American site locational patterns.

Studies of foraging peoples in many parts of the world have shown that, at a general level, populations tend to adopt a least-effort strategy in the procurement of resources. The assumption is that they tend to choose the most energy-efficient means of procuring the maximum resource yield, without sacrificing group well-being (Jochim 1976). One of many ways to reduce energy expenditure is to minimize the distance between the place where a given resource is available and the locale where it is to be consumed. Consequently, one may predict that sites located with resource proximity in mind would be situated in those areas that are within the range of acceptability for human comfort and are also close to the resource being exploited.

The most important micro-climatic factors adversely affecting human physical comfort in New England are excessive moisture and cold temperature. Dry, well-drained, and level areas with the warmest available exposure would, therefore, meet the major criteria in the aboriginal site selection process. One can predict that level areas with well-drained soils and level to slightly sloping areas with a southern exposure would contain the highest aboriginal site density. Well-drained, workable soils were also important site selection factors for both Native American and Euro-American horticulturists. Perhaps the most critical resource to be considered, regardless of site function, is water. In inland situations, sites are likely to be located near a source of fresh water, such as a spring, a lake, or a stream. Lakes and streams also provide access to fish, waterfowl, and other game.

In order to stratify the proposed project area effectively (thereby eliminating areas of low sensitivity from consideration, as a cost-effective measure), topographic maps compiled by the U.S. Geological Survey and soil data compiled by the Soil Conservation Service were used to delineate all areas with well-drained soils and minimal slope. Level, well-drained soils in close proximity to water sources were considered to be areas of high sensitivity. Those farther from a water source are considered to have lower sensitivity. It was possible to stratify (rank) a project area into zones of high, moderate, and low sensitivity to contain archaeological properties, according to soil matrix and distance to water:

High Sensitivity. Undisturbed areas less than 300 m (1,000 ft) from water, on level, dry, well-drained soils were considered areas of high sensitivity.

Moderate Sensitivity. Areas more than 300 m (1,000 ft) from water, but on well-drained soils are considered to have moderate sensitivity.

Low Sensitivity. Areas that are poorly drained, in excess of 15 percent slope or that have been disturbed are considered to have low sensitivity.

During the reconnaissance, evidence of disturbance of the landscape was used to eliminate areas from consideration. The reconnaissance was also used to verify the evaluation of any area previously assigned low sensitivity on the basis of historic maps and documentary research.

Predictive Model for Historical Site Sensitivity

Because documentation exists concerning historic land use, an environmental model was not used in stratifying the project area for its sensitivity to contain historic sites.

Field stratification for historic site location is based upon documentary research. Identification of important time periods in local history, and recognition of places and people who were significant on the local, regional, or national scales, help to identify the kinds of archaeological resources expected during fieldwork.

Census figures provide an indication of the patterns of population change, often reflecting periods of economic growth, decline, or stability. These patterns identify time periods in local history when significant events are likely to have occurred and to have left archaeological evidence.

Map research frequently reveals the infrastructure that developed historically within a project area, and the types of land use which occurred there over time. Since map-making

methods have improved continuously over the centuries, and the level of detail on maps consequently increased, information from earlier maps is used with caution. Prior to 1850, structures, rivers and boundaries were often depicted schematically. Nonetheless, maps indicate the relative importance of a project area to transportation networks, and suggest its relationship to centers of commerce, manufacturing, and habitation.

The model for the historic period is based upon background research concerning the project area, found in written histories, historic maps, and interviews with local residents. Predictive assessments of the types of archaeological information likely to be encountered are drawn from such information. The historic period model is based much more heavily on local documentary resources than is the model for Native American sites, and is based on a larger set of shared assumptions about the timing and significance of events in the past.

Some of the factors considered in each case are:

1. The position of the project area in a transportation network;

2. The proximity of the project area to commercial, manufacturing, or resource production sites;

3. Periods of economic growth, stability, or decline measured primarily from the census; and

4. Unique or local events that affected land use or reputation of the project area.

The assessment of archaeological sensitivity can be used to evaluate the need for management strategies in programmed work areas, and to suggest appropriate future testing strategies for areas where construction will take place.

Field Reconnaissance

The predictive model study included field visits to the overhead ROWs and underground alternatives, in order to refine the sensitivity assessment. In general, the objective of the field visits was to confirm previous disturbance and/or preservation of landforms within the overhead ROWs and potential underground work areas.

Because of the preliminary nature of this study, it was not possible to conduct a 100% walkover of all possible work areas, as would occur for a formal Phase 1A reconnaissance when design plans are finalized. However, all of the potential underground routes were inspected visually, and all of the overhead ROWS were visited.

CHAPTER 3.0 SUMMARY OF ENVIRONMENTAL AND CULTURAL CONTEXTS

Environmental Context of the Greater Springfield Area

The environmental context of the GSRP study area was researched to identify natural resources that may have been important to ancient and historic populations. Using geological, soil, and climatic data, the environmental context and natural landscape that may have existed during the ancient period were reconstructed. According to the predictive model used for locating Native American sites, the likelihood for prehistoric sites to be present in an area is primarily based on the environmental context of the area. Bedrock geology helps to identify where Native American groups could obtain raw materials for stone tool making. Fresh water sources and transportation routes directly influence the location of Native American sites. The variety and quantity of available natural resources are dependent on soil composition and drainage, which also play a significant role in determining wildlife habitats and forest and plant communities. Although the predictive model for the historic site sensitivity is primarily based on historic maps and documentation, the settlement patterns of the Euro-American were strongly rooted in the environment as well.

Geology and Geomorphology. Springfield and the surrounding municipalities are located in the Connecticut River Valley section of the New England Upland physiographic region (Fenneman 1938). The western boundary of the New England Upland is defined by the Taconic Mountains, which formed when a volcanic arc, which collided with the edge of the continent, caused the Taconian Orogeny in the Middle Ordivician Period. The eastern boundary is defined by the Worcester Plateau, which gives way to the New England Seaboard Lowlands. The Connecticut River Valley section is a strip of floodplain that is approximately 153 km (95 miles) in length, stretching from southern Vermont and New Hampshire to southern Connecticut, and is 32 km (20 miles) in width.

The region was altered by the advancement and retreat of glaciers. As the glaciers advanced they scoured sandstone, conglomerate, and shales formed during the Triassic period, broadening the valley. These sedimentary rocks are softer and more easily eroded than the metamorphic and igneous rocks of the uplands to the east and west. The scouring and erosion resulted in a valley surrounded by ridges of basalt and diabase. Melt-water from the retreating glaciers inundated the area forming glacial Lake Hitchcock (MHC 1984:16). According to Hartshorn (1969), glacial Lake Hitchcock occupied a large area of lowlands from Middletown Connecticut to the northern border of Massachusetts. Deposits of glacial sand and silt, carried by meltwater, formed deltas and flat topped terraces at the margins of the lake (Lackey and Sacchi 1985:5). The Chicopee River formed such a delta as it drained into glacial Lake Hitchcock, where the Springfield is located today.

Soils. Soils develop over time through processes of erosion and the accumulation and decomposition of organic matter within deposits of parent material. Consequently, the characteristics of the soil depend on many factors including topography, drainage, climate, and the composition of the parent material, as well as the flora and fauna in the area. As a result of glaciation in the region, many soils develop from glacial related deposits such as glaciolacustrine (glacial lake) deposits, outwash and till deposits.

The advancing glaciers acquired sediment loads, including soil materials and rock debris, from abrasion and plucking of material from the bedrock and adjacent valley walls as they made their descent. Much of the debris was carried at the base of the glacier with other rock debris concentrated along the margins of the glacier. As the glacier melted, running melt-water deposited sorted materials called glacial outwash deposits (Boggs 1995:334). These deposits became parent material for the formation of soils.

Water Resources and Drainage Patterns. The Connecticut River, New England's principal drainage, originates in the Connecticut Lakes in Canada, and flows between Vermont and New Hampshire, through Massachusetts and Connecticut before it drains into the Long Island Sound (MHC 1984:12). Many tributaries join the river as it flows south. The Chicopee, Westfield, Fort, Sawmill, Deerfield, Millers, Falls, and Green Rivers are major tributaries to the drainage system. The Chicopee River, largest tributary of the Connecticut, is located north of Springfield. The Mill River and Watershops Pond were the primary source of Springfield's water powered industries (MHC 1982:1).

When the Connecticut River flows through Massachusetts it broadens, creating a wide valley floor or floodplain bordered by low flat terraces giving rise to uplands to the east and west (MHC 1984:14). The valley is subject to periodic flooding and other erosional and depositional processes, which over time have changed the course of the river and created alluvial terraces. Flooding may expose and erode, or bury and preserve cultural deposits and living surfaces. Urban centers such as Springfield, Northampton and Greenfield were established on the elevated terraces above the floodplain to avoid flooding (MHC 1984:15).

Flora. After the glaciers retreated, the local vegetation progressed from tundra to spruce forest, then pine forest, and now deciduous forests of various compositions (Ritchie et al. 1973). The urban character as well as the variations in temperature, moisture and soils ultimately determines what type of vegetation will grow in the area. In general, the Springfield area is located in the Central Hardwood forest classification. The forest classifications are based on climatic differences at different altitudes and latitudes. The Central Hardwood region is classified as having a variable climate, rich soils, and regular precipitation (Brockman 1986:18). However, the original forest cover of much of the region was cleared historically for agricultural and other pursuits. As the settlement of the area increased, Springfield became industrialized and much of the area was developed.

Fauna. The wildlife populations in the Connecticut River Valley have been altered as urban development transformed the wildlife habitat, including the amount and distribution of food, cover, and water. The fauna of the region, like the vegetation, has evolved through time. The large mammals that roamed the tundra soon after the glacial period, including caribou, musk ox, mammoth, and dire wolf, gave way to smaller mammals. Moose, elk, and deer inhabited the area when the pine forests were prevalent, and as the forests became deciduous, the black bear, white-tailed deer and elk became dominant. Although distribution and number varied, smaller mammals remained present throughout the varying flora changes. The beaver, muskrat, raccoon, woodchuck, bobcat, timber wolf, red and gray fox, otter, fisher, and other small rodents would have been present throughout the post-glacial period, to the time of European contact. Migratory birds and turkey were numerous in season. Because of the rivers and lowlands in the valley, the

environment was ideal for amphibians and reptiles such as different species of turtle, snake, and frogs. Shellfish and fresh water fish such as trout, bass, pike, and sturgeon as well as shad, herring and salmon were available seasonally from major watercourses (Funk 1976).

Native American Context of Southern New England

Paleoindian Period (11,00 – 9,000 Years Before Present). The Paleoindian period witnessed the earliest human occupation of New England. The Paleoindian populace of the region evidently was organized in small bands that were equipped with a sophisticated and specialized lithic technology. Artifacts associated with this period include fluted projectile points, Eden and Plano points, scraping tools, gravers, and drills. Occupying the formative landscapes of post-glacial New England, the highly mobile Paleoindians practiced a diversified seasonal hunting and gathering subsistence, and ranged over great distances to exploit emergent floral and faunal resources associated with glacial lake margins. Paleoindian archaeological sites are very rare in New England, as the rapid rate of environmental change and landscape formation in the Early Holocene worked against the preservation of Paleoindian archaeological deposits.

Evidence from the greater Northeast indicates that the first Paleoindians entered the region shortly after the retreat of the Wisconsin glacier, which occurred approximately 11,000 years ago in western Massachusetts. This initial human settlement took place approximately 10,000 years ago, somewhat later than in the western part of North America (Haynes et al. 1984).

A tundra environment succeeded the Wisconsin glacier, and was, in turn, replaced by a spruce-parkland community (Davis and Jacobsen 1985). Paleoindians living in these post-glacial ecological contexts have traditionally been characterized as hunters and gatherers who subsisted primarily on several species of large animals known to have herded in the Northeast, including mastodon and mammoth. Little evidence of human interaction with these megafauna has been identified in the Northeast, however, and more recent interpretations have focused on smaller species such as caribou and elk as primary food sources (Curran 1987; Dincauze 1990). In southern New England, Paleoindian evidence has generally consisted of surface finds in plowed fields, with few intact habitation sites recorded. However, excavations at the Hidden Creek Site in Connecticut have provided significant data concerning a Paleoindian occupation that occurred next to an extended wetland system (Jones 1997).

Early Archaic Period (9,000 – 8,000 B.P.) During the Early Archaic Period, profound environmental changes continued in New England. Rising sea levels inundated coastal plain areas. The regional climate became warmer and drier, and a mixed pine-hardwood forest came to dominate the landscape. The diagnostic artifacts most closely associated with the Early Archaic Period are the Bifurcate-based projectile points, and stemmed or corner-notched points of the Palmer and Kirk types.

In the Northeast region generally, archaeological sites from the Early Archaic Period are very rare. The social and technological adaptations devised by the indigenous populations of New England at the time are not yet well understood. Research indicates that Early Archaic social groups moved within established territories, practicing an increasingly generalized subsistence strategy based on river and lake systems and wetland mosaic physiographic zones. The megafauna of the late Pleistocene had disappeared, leaving smaller mammalian species such as moose, deer and beaver. Environmental conditions would have made seasonally available

natural food resources more predictable and abundant, allowing human populations to exploit a wider range of territories.

Evidence from the greater Northeast indicates that hilltop locations did not factor as importantly in the settlement system of the Early Archaic people, in comparison to the previous period. Early Archaic period sites are generally smaller, indicating that people were not organized in large bands. The extensive herds of game present in the preceding millennium were apparently gone by this period, explaining the lesser importance of hilltop sites. As in the Paleoindian period, tool styles were uniform across the Northeast region, although implements were manufactured from materials that were available locally (Braun and Braun 1994). It is possible that a smaller, localized population structure developed.

Recent research suggests that a second cultural tradition of the Early Archaic featured a quartz cobble lithic industry, represented by steep-edged unifacial scrapers and a distinct lack of projectile points in artifact assemblages (Robinson and Petersen 1993). Ongoing research in eastern Connecticut continues to provide important new information concerning seasonal, complex habitation sites of the Early Archaic Period (Forrest 1999).

Middle Archaic Period (8,000 – 6,000 B.P.) The Middle Archaic Period in southern New England witnessed a climatic warming trend and the diversification of ecosystems. During the Middle Archaic, environmental conditions in the region became similar to those of the modern period. The deciduous forest became established, providing a diverse array of plant and animal foods (Dincauze 1976; Dincauze and Mulholland 1977). Archaeological data indicate a Middle Archaic settlement system of planned seasonal movement, oriented around major rivers and streams. Subsistence was based upon plant gathering, hunting, and the harvesting of anadromous fish. Middle Archaic artifact assemblages are characterized by projectile points belonging to three types: Neville (8000-7000 B.P.), Stark (7700-7200 B.P.), and Merrimack (7200-6000 B.P.).

Ground stone technology and new varieties of tool types were introduced, including grooved axes, net sinkers, gouges, adzes, plummets, and atl-atl weights (Dincauze 1976). The distribution and moderate frequency of Middle Archaic sites in New England indicate that a multi-seasonal settlement system was established by this period. Recent investigations at the Annasnappet Pond Locus 1 site in Carver, Massachusetts have revealed the largest assemblage of Middle Archaic artifacts in association with radiocarbon dates in New England (Doucette and Cross 1997). Six radiocarbon dates ranging from 7,880 to 7,290 B.P. were obtained from human burial, hearth and storage pit features, in addition to more than 170 Neville and Stark projectile points.

Late Archaic Period (6,000 – 3,000 B.P.) Archaeological sites of the Late Archaic Period in southern New England are much more numerous than those of preceding periods. Throughout southern New England as a whole, sites dating from the fifth and fourth millennia (5000-3000 B.P.) are the greatest in number of any pre-Contact time period (Mulholland 1984). This is reflected in the records of professionally excavated sites and in the inventories of artifact collections. Settlement systems identified for the Late Archaic Period indicate a population increase and a continued trend toward generalized exploitation of resources. A wide variety of ecological niches were occupied by the people of the Late Archaic Period. This varied pattern is manifest in southeastern Massachusetts, where Late Archaic sites have been recorded in

proximity to swamps, marshes, streams, and rivers, and in varied topographic zones, such river terraces and wetland margins. Sites of the Late Archaic Period tend to contain multiple components, having witnessed frequent reoccupation during various time periods.

Three distinct cultural traditions have been recognized within the Late Archaic Period: the Laurentian Tradition, the Small Stemmed Tradition, and the subsequent Susquehanna Tradition (described below in the Transitional Archaic section). These traditions are generally distinguished on the basis of projectile point types. The Laurentian Tradition, which arose during the end of the Middle Archaic Period, was first identified in New York and Martha's Vineyard (Ritchie 1969). The tradition is characterized by an artifact complex that contains wide-bladed points with side or corner notches, and stone tools such as gouges, plummets, adzes and atl-atl weights.

While archaeological evidence exists for all three Late Archaic traditions in the Connecticut River Valley of western Massachusetts, the Small Stemmed Tradition is predominant. Artifact assemblages of this tradition are distinguished by small, thick, narrow-bladed, stemmed or notched projectile points. Displaying a preference for quartz and quartzite as materials for tool manufacture, people of the Small Stemmed Tradition made extensive use of marsh and wetland peripheries, perhaps due to the environmental constriction of other resource areas. Settlement patterns entailed large, seasonal camps with small, temporary sites. The larger camps appear to have been base camps, often situated along major rivers. Smaller, more specialized occupations were located in a variety of environmental zones including terrace and upland areas (McBride 1984).

The relationship between the three recognized Late Archaic traditions remains unclear. Laurentian materials are more numerous in central and western Massachusetts, suggesting that this tradition represented an interior, upland adaptation. An alternative interpretation is that the Laurentian, part of the greater Lake Forest tradition which has a distribution that extends from New Brunswick to Wisconsin, represented a form of ethnic identity. Laurentian materials that appeared approximately 4,500 years ago may indicate that a form of population movement occurred, probably originating in the Great Lakes region.

The implications of the more common Susquehanna and Small-Stemmed traditions of the Late Archaic are unclear. It has been suggested that the two traditions consisted of distinct populations, the former having been an intrusive group, which peacefully coexisted with the latter for millennia (Dincauze 1974, 1975). It is considered likely that the technological precedents for Susquehanna tools are found in the southeastern United States, ultimately deriving from Middle Archaic stemmed biface types of that region. In contrast, the Small-Stemmed tradition and its artifacts are widely viewed as having been a phenomenon which originated within the Northeast, having derived from indigenous people of the Middle Archaic period there. It is likely that the presence of Small-Stemmed and Susquehanna artifacts in a single site represents some combination of technological exchange and population mixture, varying by location (Ritchie 1969; Dincauze 1976; Snow 1980; Bourque 1995).

Transitional Archaic Period (3,600 – 2,700 B.P.) The Transitional Archaic Period comprised the development of the Woodland Period adaptive technologies and settlement systems from those of the Late Archaic Period. During the Transitional Archaic in southern New England, evidence for occupations by people of the Susquehanna Tradition became more widespread, although the Small Stemmed Tradition remained prevalent. Sites of the Transitional

Archaic period are commonly marked by Susquehanna broadspears, Orient Fishtail points, Atlantic-Snook Kill variant points, Genesee points, and Wayland Notched points. In the Northeast region, complex burials and the incorporation of steatite (soapstone) vessels into technological assemblages also typify this period. A wide variety of site types have been recorded, including small special-purpose camps, large seasonal base camps, steatite quarries, and cremation burial grounds. Artifact assemblages occasionally include cord-marked and grit-tempered ceramics.

Early Woodland Period (3,000-2,000 B.P.) Technological innovations of the Woodland Period included the manufacture of ceramic vessels and the emergence of the Meadowood and Rossville projectile point types. Woodland Period subsistence patterns were affected by the introduction of horticulture, in which maize, beans and squash were major cultigens. Hunting, fishing and the gathering of wild foodstuffs remained essential subsistence activities, however. Coastal resources weighed heavily in the subsistence regimes of indigenous people, a pattern reflected in the settlement systems of the Early Woodland Period. During this time, an apparent shift in settlement from interior wetlands to large river drainages occurred.

The Early Woodland Period in southern New England is generally under-represented in terms of site frequency. While this has been attributed to a decline in population, it is more likely evidence of difficulty in identification; the manufacture and use of Small Stemmed quartz projectile points continued into the Woodland Period, raising the possibility of confusion between Late Archaic and Early Woodland archaeological components. In many instances where multiple-component sites are involved, distinguishing between Late Archaic and Early Woodland assemblages in the absence of pottery is problematic.

Some changes in subsistence strategy are apparent during this time, probably representing a continuation of the Late Archaic trend toward a more localized, semi-sedentary settlement system. The more permanent types of camps were established along the coast or inland watercourses, where an abundance of waterfowl, fish, and sea mammals could be easily exploited. Shellfish were also taken, although it seems that these were not a major dietary component until the Middle Woodland period. Despite an increasingly localized focus of subsistence, the pattern remained one of hunting and gathering, particularly along water bodies where fish could be included in the daily fare. This period witnessed the first widespread use of ceramics across the Northeast. The advent of ceramic vessel manufacture was previously believed to have coincided with the development of horticultural practices, having provided a means of storing surplus food obtained through purposeful planting. It is now known that in most of New England, cultivated plants were not a major element of human subsistence for at least 1,500 years after ceramics became established in the region.

The rich burial ceremonialism of the Late Archaic period continued into the Early Woodland, with exotic artifacts such as birdstones, pottery pipes, copper beads, and red ocher placed in graves with human remains (Ritchie 1965; Spence and Fox 1986). The presence of such exotic goods at sites in New England provides evidence of established trade routes extending to the Midwest, where the Adena cultural complex flourished.

Middle Woodland Period (2,000 – 1,000 B.P.) In southern New England, archaeological evidence for Middle Woodland occupations is generally more common than that for the preceding period. A higher level of sedentism in settlement patterns is indicated, in

addition to population increase, greater social complexity, horticultural refinements, and engagement in regional trade. Technological diversification expanded, marked by a proliferation of ceramic styles and the emergence of Greene, Fox Creek, Jack's Reef Pentagonal and Corner Notched projectile points. People of the Middle Woodland Period in southern New England obtained exotic lithic materials, including Pennsylvania jasper and New York State chert. Subsistence trends of the Early Woodland continued. In parts of New England, large, semi-permanent, or perhaps even year-round settlements were established by this time (McManamon 1984).

The Middle Woodland period witnessed a development from minimally decorated ceramics to widespread use of elaborately decorated wares. No functional interpretation for this change is suggested. Instead, the increased decoration was likely due to ethnic identification. Another technological adaptation, use of the bow and arrow, also emerged during this period.

Late Woodland Period (1,000 - 450 B.P.) The Late Woodland period in much of the Northeast region saw the aggregation of indigenous populations into large, complex villages. In southern New England, however, evidence suggests that settlements were on a more modest scale. Composed of extended family groups, communities may have moved regularly from inland bases in major river valleys to coastal sites, in order to exploit seasonally abundant resources. While population apparently increased, it became nucleated into villages in defensible locations. River confluence points and the heads of estuaries were often favored, while smaller satellite sites served as special-purpose camps for farming, hunting and harvesting shellfish (Snow 1980). Due to a climatic warming trend after 1000 B.P., conditions for horticulture were particularly favorable; extensive supplies of maize and other foodstuffs were maintained in subsurface pits.

Late Woodland Period artifact assemblages in southern New England are marked by a high volume of artifacts, worked stone implements, diverse pottery styles, textiles, and triangular Levanna projectile points. In coastal areas, extensive shell midden deposits were common. However, as European colonists often settled the Native main village locations of the Late Woodland period intensively in the early historical period, opportunities to examine Late Woodland settlements archaeologically have been few.

The Late Woodland period constituted the close of the Pre-Contact era. It was during this period that the patterns of Native American settlement witnessed by the first European explorers were established. Horticulture, which included such domesticated flora as maize, beans and gourds, became a widespread and significant contributor to subsistence. Additional evidence exists for permanent settlements, or locations that were used for much of the year, especially on the coasts (Carlson 1986).

CHAPTER 4.0 RESULTS OF PREDICTIVE MODELING ANALYSIS

Background Research

The background research for the predictive model study included research at the Massachusetts Historical Commission, where the state archaeological site files are located. Information was obtained concerning all known pre-Contact Native American sites that are located within the project area municipalities. Particular attention was given to those sites located within a distance of 0.5 mile from potential Overhead ROWs and Underground Alternatives.

Information also was obtained at MHC concerning previously recorded historical archaeological sites within the study area. The Massachusetts Cultural Resource Information System (MACRIS) was consulted to gain information about various categories of inventoried historical cultural resources (e.g., areas/districts, burial grounds, buildings, objects and structures) that are located in the sections of the project area municipalities near potential work areas. The locations of potential work areas were plotted on copies of historical maps of the towns/cities that date to ca. 1830 and 1870, in order to assess proximity of potential work areas to zones of historical settlement and land use.

Field Reconnaissance

The predictive model study included field visits to multiple locations where ROWs can be viewed, in order to refine the sensitivity assessment. In general, the objective of the field visits was to confirm previous disturbance and/or preservation of landforms within the overhead ROWs and potential underground work areas. All the Underground Alternative routes were driven and viewed. Archaeological staff who performed the field visits completed safety training prior to visual inspection of overhead ROWs.

Because of the preliminary nature of the study, it was not possible to conduct a 100% walkover of all possible work areas in the GSRP, as would occur for a formal Phase 1A reconnaissance when design plans are finalized. However, all of the overhead ROWS were visited.

Segment Designations, Locations and Archaeological Sensitivity

A primary objective of the GSRP is to update or expand the existing electrical transmission network, which links various substations and junctions (Figure 3). Thus, the consideration of alternatives is oriented around proximity to these facilities in the network. The various OH alternatives, or segments, were assigned numbers that were used in the present study. In some instances, segments traverse portions of multiple municipalities. Consequently, in this study, abbreviations for town names are used both in tables and in the figures that illustrate the locations and archaeological sensitivity of the respective OH segments. The tables in this report also indicate the nearest substations/junctions to each specific OH segment.

The Native American sites that have been recorded previously within the study area vary in size from small encampments and artifact concentrations to large, multi-component settlements. The sites vary in age from the Late Archaic period to the Late Woodland period. The study area includes land along the Westfield River, Chicopee River, and Connecticut River,

where confluence points, floodplains and natural terraces witnessed intensive settlement for millennia. Overall, undeveloped portions of the study area possess moderate to high sensitivity to contain unrecorded or significant Native American archaeological resources.

The relative proximity of the potential Overhead ROWs and Underground Alternatives to areas of historical settlement and land use was examined. The historical sensitivity of the study area is variable.

The archaeological sensitivity within each of the potential Overhead ROWs and Underground Alternatives is summarized in this report.

Archaeological sensitivity within each of the potential Overhead ROWs and Underground Alternatives also is indicated in maps in the present report.

Abbreviations:
OH=Overhead.
UG=Underground.
ROW=Right-Of-Way.
S/S=Substation.
Jct=Junction.

If an OH ROW runs through multiple municipalities, *when shown in the report figures* its numerical designation is followed by an abbreviation of the town name for each section of ROW. ROWs without town abbreviations are located entirely within a single town.

Some ROWs were assessed for the previous 115-kV study, but are listed in this report because they may also be used in the GSRP for larger, parallel 345-kV facilities.

Except where indicated, construction of UG lines will be confined to existing roadways, and possibly sidewalks or adjacent parking lots. Potential lay-down or staging areas near roadways are not addressed by this study.

Archaeological Sensitivity: 115-kV Rebuild
CT Border to Ludlow Substation (see Figures 4-27)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-08 **CT Border/Franconia Jct. and Hampden Jct.** (= western portion of ROW between these points)	East Longmeadow	The ROW designated as OH-08 that is located in East Longmeadow runs from east to west, in the southwestern extremity of the town. It crosses a stream that is associated with Shaker Pond, and is located to the north of a National Register District related to the Shakers in Connecticut.	A combination of **HIGH** (for possible Native American and/or historical resources) and **LOW**.
OH-07 **Franconia Jct. and Hampden Jct.** (= west-central portion of ROW between these points)	East Longmeadow	The ROW that is designated as OH-07 in East Longmeadow runs from east to west, just inside the southern boundary of the town.	A combination of **HIGH** and **MODERATE** (for possible Native American resources) and **LOW**.
OH-06 **Franconia Jct.** and **Hampden Jct.** (= east-central portion of ROW between these points)	East Longmeadow	OH-06 is located in the southeastern part of East Longmeadow, near the Watchaug River.	A combination of **HIGH** and **MODERATE** (for possible Native American resources) and **LOW**.
OH-05 **Franconia Jct.** and **Hampden Jct.** (= eastern portion of ROW between these points)	East Longmeadow	The OH-05 that is located in East Longmeadow is located in the southeastern corner of the town, near the Watchaug River.	A combination of **HIGH** and **MODERATE** (for possible Native American and/or historical resources) and **LOW**.
OH-03 **Hampden Jct. to Ludlow S/S** (=100% of the ROW between these two points)	Hampden, Ludlow & Wilbraham	The section of OH-03 in ***Hampden*** runs from north to south, just inside the western	***Hampden:*** A combination of **HIGH** (for possible Native American resources)

		boundary of the town. It is located near the Mill River and Watchaug Brook. The section in ***Ludlow*** runs from north to south, through the south-central part of town. The Chicopee River and its confluence with the Minechaug River are located to the south, and the Higher Brook wetlands are located to the north. The section in ***Wilbraham*** runs from north to south, through the western part of town. It follows the western edge of the North Branch of the Mill River, which it also crosses. The Cedar Swamp wetland and streams are located to the east.	and **LOW**. ***Ludlow:*** A combination of **HIGH** and **MODERATE** (for possible Native American resources) and **LOW**. ***Wilbraham:*** Mostly **HIGH** (for possible Native American resources).

Archaeological Sensitivity: 115-kV Rebuild
Agawam Substation to West Springfield Substation (see Figures 28-38)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-26 **Agawam S/S to West Springfield S/S** (= 100% of ROW linking these points)	Agawam & West Springfield	The two segments of OH-26 that are located in ***Agawam*** are on the south side of the Westfield River, in the northeastern extremity of the town. The confluence of the Westfield River and the Connecticut River is located to the east.	***Agawam:*** **HIGH** (for possible Native American resources). ***West Springfield:*** **HIGH** (for possible Native American resources).

		The segment of OH-26 that is located in ***West Springfield*** is on the north side of the Westfield River, in the southeastern extremity of the town. Numerous Native American sites have been recorded previously in this vicinity.	

Archaeological Sensitivity: 115-kV Rebuild
Cadwell Switching Station to Shawinigan Substation (see Figures 39-47)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-04* **Cadwell S/S and Shawinigan S/S** (= northern end of ROW between these points)	Chicopee	*This short section of ROW was assessed for the previous GSRP 115-kV study (Ref. Survey Unit EP-2). It is located in the southeastern extremity of the town at Bircham Bend, on the north side of the Chicopee River.	Almost entirely **HIGH** (for possible Native American resources), except for the northern end at Interstate 90/MassPike, which is **LOW**.
UNDERGROUND:			
Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-09 **East Springfield Jct.** to **Shawinigan S/S**	Chicopee	UG-09 is located in the south-central and southeastern part of the town, and follows Fuller Road.	**LOW**.
UG-12 **East Springfield Jct.** area	Chicopee	UG-12 is located in the central part of the town, and is a short cross-country route east of Montgomery Street and north of the Exit 5 interchange on Interstate90/MassPike.	**LOW**.

UG-13 **East Springfield Jct.** to **Shawinigan S/S**	Chicopee	UG-13 is located in the central part of the town, and follows Montgomery Street-Jennings Street-Route 33/Memorial Drive.	**LOW.**
UG-15 **East Springfield Jct.** area	Chicopee	UG-15 is located in the central part of the town, and follows Montgomery Street-Jennings Street-Route 33/Memorial Drive.	**LOW.**
UG-18 **East Springfield Jct.** area	Chicopee	UG-18 is located in the central part of the town, and is a short cross-country route south of Interstate 90/MassPike.	**LOW.**

Archaeological Sensitivity: 115-kV Rebuild
Orchard Substation to Orchard Junction (see Figures 21-27)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-03* **Orchard S/S to Orchard Junction** (=northern portion of ROW between these two points)	Ludlow	*This short section of ROW, designated as OH-03, was assessed for the previous GSRP 115-kV study (Ref. Survey Unit EP-4). It is located in the southwest extremity of Ludlow, north of the Chicopee River.	Mostly **HIGH** (for possible Native American resources).

Archaeological Sensitivity: 115-kV Rebuild
East Springfield Junction to Fairmont (Existing) Substation, and the Location for the Proposed Fairmont (Replacement) Substation (see Figures 39-47)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
Fairmont (Replacement) S/S	Chicopee	The proposed location for the replacement	**MEDIUM** for possible Native

The proposed location is directly northeast from the Fairmont (Existing) S/S, and is on the north side of Prospect Street		substation is directly northeast from the Fairmont (Existing) S/S, and is on the north side of Prospect Street at the intersection with Ingham Street. The location is an open field on a bluff overlooking the Connecticut River from the east.	American resources, due to favorable topography and proximity to the Connecticut River.
OH-10* **Fairmont (Existing) S/S to East Springfield Jct.**	Chicopee	*The OH-10 ROW was assessed for the previous GSRP 115-kV study (Ref. Survey Unit WP-9). It is located in the northern part of Chicopee.	A combination of **HIGH** and **MODERATE** (for possible Native American and/or historical industrial resources) and **LOW**.
UNDERGROUND:			
Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-08 **East Springfield Jct. to Fairmont (Existing) S/S**	Chicopee	UG-08 follows Route 33/Memorial Drive in the central part of the town, and crosses a shopping plaza west of the road.	**LOW**.
UG-10 **East Springfield Jct. to Fairmont (Existing) S/S**	Chicopee	UG-10 is located in the southeastern part of the town, and follows Haynes Circle.	**LOW**.
UG-11 **East Springfield Jct. to Shawinigan S/S**	Chicopee	UG-11 is located in the southeastern part of the town, and follows Baskin Drive.	**LOW**.
UG-14 **East Springfield Jct. to Fairmont (Existing) S/S**	Chicopee	UG-14 is located in the northwest part of the town, and follows Granby Road-Route 33/ Memorial Drive-Irene Street-Ingham Street.	**LOW**.
UG-16	Chicopee	UG-16 is located in the northwest part of	**LOW**.

East Springfield Jct. to **Fairmont (Existing) S/S**		the town, and follows Montgomery Street-Prospect Street.	

Archaeological Sensitivity: 115-kV Rebuild
West Springfield Substation to Breckwood Substation (see Figure 48)

UNDERGROUND:			
Springfield UG: Noticed Alternative Route **Breckwood S/S** and **West Springfield S/S**	Springfield	This underground route is an alternative that would enable linkage between the West Springfield Substation and the Breckwood Substation. Located in densely settled southern Springfield, the route trends west to east and follows Columbus Avenue-Elmwood Street-Main Street-Locust Street-Orange Street-Allen Street-Plumtree Road-Bradley Road. Along Locust Street, the route is in close proximity to both sides of the Mill River. The western end of Plumtree Road passes along the north side of Nathan Bill Park, while further east on Plumtree Road, the route crosses the South Branch of the Mill River.	**HIGH** (for possible deeply buried Native American and/or historical resources) for the sections located along Columbus Avenue, Elmwood Street, Main Street and Locust Street. The portion of the route is located in a former ancient floodplain that was a settlement center for Native American populations, and also was part of the seventeenth-century layout of Springfield at the time of its initial settlement by Europeans. Along Locust Street, the route is in close proximity to both sides of the Mill River. **MODERATE** (for possible Native American and/or historical resources) where the western end of Plumtree Road passes along the north side of Nathan Bill Park. **MODERATE** (for possible Native American and/or

			historic industrial resources) for the section of Plumtree Road that is located east of the South Branch of the Mill River and west of the Bradley Road intersection. **LOW** for all other sections of the Noticed Alternative Route.
Springfield UG: Preferred Route **Breckwood S/S and West Springfield S/S**	Springfield	This underground route is an alternative that would enable linkage between the West Springfield Substation and the Breckwood Substation. Located in densely settled southern Springfield (north of the Noticed Alternative Route), the route trends west to east and follows Columbus Avenue-Union Street-Eastern Avenue-Wilbraham Road. Along Wilibraham Road, the route crosses Lake Lookout on the North Branch of the Mill River.	**HIGH** (for possible deeply buried Native American and/or historical resources) for the sections located along Columbus Avenue, and along Union Street west of the Maple Street intersection. The portion of the route is located in a former ancient floodplain that was a settlement center for Native American populations, and also was part of the seventeenth-century layout of Springfield at the time of its initial settlement by Europeans. **MODERATE** (for possible historical resources) for the section of Union Street that is east of the Maple Street intersection. There are numerous historical structures along this part of the route, including houses that appear to date to the

			early nineteenth century. **MODERATE** (for possible Native American and/or historical industrial resources) for a section of the route that is located along Wilbraham Road, from the west side of the North Branch of the Mill River eastward to the Archie Street intersection. **LOW** for all other sections of the Preferred Route.
UG-BWS **Breckwood S/S** and **West Springfield S/S**	Agawam & West Springfield (& also Springfield; for the latter refer to Noticed and Preferred Alternatives above)	UG-BWS consists of short Underground Alternative segments near the confluence of the Westfield River and the Connecticut River, west of the Connecticut River. (On the east side of the Connecticut River in southern Springfield, the UG Alternatives are part of the Noticed and Preferred Alternatives referenced above.)	***Agawam:*** **HIGH** (for possible Native American resources) for the short cross-country segment that is adjacent to the Connecticut River on the east side of Route 5. **LOW** for the portion of the route that is west of Route 5. ***West Springfield:*** **MODERATE** (for possible Native American resources) and **LOW**.
UG-50 **West Springfield S/S** to **Breckwood S/S**	Agawam & West Springfield	The portion of UG-50 that is located in ***Agawam*** is located in the northeastern extremity of the town, on Big Island, which is on the west side of the Connecticut River just north of the Westfield River confluence. Most of UG-50 is in Route 5, but there is a short cross-country segment	***Agawam:*** **HIGH** (for possible Native American resources) for the short cross-country segment that is adjacent to the Connecticut River on the east side of Route 5. **LOW** for the portion of the route in Route 5. ***West Springfield:*** **MODERATE** (for

		adjacent to the Connecticut River. The portion of UG-50 that is located in ***West Springfield*** is located in the southeastern extremity of the town, on the west side of the Connecticut River and north of the Westfield River confluence. Most of UG-50 is in Route 5/Riverdale Street, but there is a short cross-country segment on the west side of the road.	possible Native American resources) for the short cross-country segment that is on the west side of Route 5. **LOW** for the portion of the route in Route 5.

Archaeological Sensitivity: 115-kV Underground Alternatives
South Agawam Substation to Agawam Substation (see Figures 28-38)

UNDERGROUND			
Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-23 **Agawam S/S to Silver S/S**	Agawam	UG-23 follows Route 75/Suffield Street in the east-central part of the town.	**LOW.**
UG-26 **Franconia Jct.** area	Agawam	UG-26 follows Doane Avenue-Silver Street in the south-central part of the town. At the southern end there is a short cross-country section on the north side of Tarkill Brook.	**HIGH** (for possible Native American and/or historical resources) for short cross-country section at southern end of route, on the north side of Tarkill Brook. **LOW** for the remainder of the route, along Doane Avenue and Silver Street.
UG-27 **Franconia Jct.** area	Agawam	UG-27 follows a short section of Shoemaker Lane in the south-central part of the town.	**LOW.**
UG-28 **Franconia Jct.** area	Agawam	UG-28 follows Shoemaker Lane in the south-central part	**LOW.**

		of the town.	
UG-29 **Franconia Jct.** area	Agawam	The UG alternative designated as UG-29 in Agawam follows Poplar Street-Route 147/Springfield Street in the north-central part of the town.	**LOW.**
UG-30 **South Agawam Jct.** area	Agawam	The UG alternative designated as UG-30 in Agawam follows Pine Street-Shoemaker Lane in the west-central part of the town.	**LOW.**
UG-31 **South Agawam Jct.** area	Agawam	UG-31 follows Barry Street-Pine Street in the southwestern extremity of the town. At the western end, south of Barry Street, there is a short cross-country section that is to the north of an unnamed brook.	**HIGH** (for possible Native American resources) for the short cross-country section that is located at the western end of the route, south of Barry Street, to the north of an unnamed brook. **LOW** for the in-road portion.
UG-32 **South Agawam Jct.** area	Agawam	UG-32 is located in the south-central part of the town. It is almost entirely a cross-country route, which crosses a tributary of Still Brook, Philo Brook, and an unnamed stream.	**HIGH** (for possible Native American resources).
UG-33 **South Agawam Jct.** area	Agawam	The UG alternative designated as UG-33 in Agawam is located in the southeastern part of the town, to the west and east of Route 75/Suffield Street. It follows a gas pipeline corridor on the south side of Worthington Brook.	Mostly **HIGH** (for possible Native American resources).
UG-34	Agawam	The UG alternative	**LOW.**

South Agawam Jct. area		designated as UG-34 that is located in Agawam is located in the south-central extremity of the town. It follows a golf course access road on the south side of Shoemaker Lane.	

Archaeological Sensitivity: 115-kV Underground Alternatives
Agawam Substation to Piper Substation (see Figures 49-55)

UNDERGROUND:			
Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-22 **Piper S/S** to **Agawam S/S**	Agawam & West Springfield	The section of UG-22 in ***Agawam*** follows Walnut Street and Maple Street in the north-central extremity of the town. The section of UG-22 in ***West Springfield*** is located in the east-central part of the town. It follows Pleasant Street-Route 20/Westfield Street-North Boulevard-Piper Road. At the northern end there is a short cross-country section on the south side of Goldine Brook.	***Agawam:*** **HIGH** (for possible Native American and/or historical resources) for the short cross-country section that is located at the northern extremity of the route, next to the Westfield River. **LOW** for the remainder of the route, along Walnut Street and Maple Street. ***West Springfield:*** **HIGH** (for possible Native American resources) for a short cross-country section at the northern end of the route, south of Goldine Brook. **LOW** for the remainder of the route, along Pleasant Street-Route 20/Westfield Street-North Boulevard-Piper Road.

Archaeological Sensitivity: 115-kV Underground Alternatives
Piper Substation to Chicopee Substation (see Figures 39-47 and Figures 49-55)

UNDERGROUND:			
Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-19 **Chicopee S/S to Piper S/S**	Chicopee	The UG alternative in Chicopee that is designated as UG-19 is located in the western part of the town, east of the Connecticut River and north of the confluence with the Chicopee River. It follows Medina Street-Granger Street-Whitin Avenue-Chester Street-Meadow Street-McKinstry Avenue-Grattan Street.	**LOW.**
UG-19 **Piper S/S to Chicopee S/S**	West Springfield	The UG alternative in West Springfield that is designated as UG-19 is located in the northeastern part of the town, west of the Connecticut River. It follows Route 5/Riverdale Street. A short cross-country section is located at the northern extremity, next to the Connecticut River.	**HIGH** (for possible Native American and/or historical resources) for the short cross-country section that is located at the northern extremity of the route, next to the Connecticut River. **LOW** for the remainder of the route, along Route 5/Riverdale Street.
UG-20 **Piper S/S to Chicopee S/S**	West Springfield	UG-20 is located in the northeastern part of the town, west of the Connecticut River. It follows Wayside Avenue. Beyond the eastern end of Wayside Avenue, there is a short cross-country section that is	**HIGH** (for possible Native American and/or historical resources) for the short cross-country section that is located at the eastern extremity of the route, next to the Connecticut River. A

		contiguous to the Connecticut River. A historical bridge abutment is located there.	historical bridge abutment is located there. **LOW** for the remainder of the route, along Wayside Avenue.
UG-21 **Piper S/S to Chicopee S/S**	West Springfield	UG-21 is located in the northeastern part of the town. It follows Brush Hill Avenue and Piper Road. At the southern end there is a short cross-country section on the south side of Goldine Brook.	**HIGH** (for possible Native American resources) for a short cross-country section at the southern end of the route, south of Goldine Brook. **LOW** for the remainder of the route, along Brush Hill Avenue and Piper Road.

Archaeological Sensitivity: 115-kV Underground Alternatives
Chicopee Substation to East Springfield Junction (see Figures 39-47)

Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-17 **Chicopee S/S to East Springfield Jct.**	Chicopee	UG-17 is located in the west-central part of the town, and follows Granby Road.	**LOW.**

Archaeological Sensitivity: 115-kV Underground Alternatives
Orchard Junction to Ludlow Substation (see Figures 21-27)

Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-01 **Ludlow S/S and Orchard Junction**	Ludlow	UG-01 follows Route 21/Center Street, east of the historic town center. Some historical houses are located along the road in this area.	**LOW.**
UG-02	Ludlow	UG-02 follows	**HIGH** (for possible

Ludlow S/S and **Orchard Junction**		Church Street, west of the historic town center. A small cemetery is located at the eastern end of UG-02, south of the roadway. Multiple historical structures are located in this vicinity.	historical resources) for the eastern end of UG-02 on Church Street, directly west of the historic town center. **LOW** for the western remainder of UG-02.
UG-03 **Ludlow S/S** and **Orchard Junction**	Ludlow	UG-03 follows Route 21/Center Street, west of the historic town center. The historic Ludlow Center Cemetery is located at the eastern end of UG-03, south of the roadway. Multiple historical structures are located in this vicinity.	**HIGH** (for possible historical resources) for the eastern end of UG-03 on Route 21/Center Street, directly west of the historic town center. **LOW** for the western remainder of UG-03.
UG-04 **Ludlow S/S** and **Orchard Junction**	Ludlow	UG-04 follows the West-Holyoke-Kendall Streets in the southwest part of the town. A small number of nineteenth-century houses are located along the road in this area.	**LOW**.
UG-05 **Ludlow S/S** and **Orchard Junction**	Ludlow	UG-05 follows Fuller Street in the southwest part of the town.	**LOW**.
UG-06 **Ludlow S/S** and **Orchard Junction**	Ludlow	UG-06 follows Cady Street in the southwest part of the town.	**LOW**.
UG-07 **Ludlow S/S** and **Orchard Junction**	Ludlow	UG-07 follows Cady Street in the southwest part of the town.	**LOW**.

Archaeological Sensitivity: 115-kV Underground Alternatives
South Agawam Junction to CT Border (see Figures 28-38)

Segment Designation & Nearest S/S or Jct.	Town/City	Location and Description	Archaeological Sensitivity of UG Alternative Routes
UG-24 **South Agawam Jct.** area	Agawam	UG-24 follows Route 75/Suffield Street in the southeast part of the town.	**LOW.**
UG-25 **South Agawam Jct.** area	Agawam	The UG alternative that is designated as UG-25 in Agawam follows Shoemaker Lane in the south-central part of the town.	**LOW.**

Archaeological Sensitivity: 345-kV Preferred Alternative (South Agawam to Ludlow)
CT Border to South Agawam Substation (see Figures 28-38)

Segment Designation & Nearest S/S or Jct.	Town(s)	Location and Description	Archaeological Sensitivity of OH ROW and Directly Adjacent Areas
OH-20 **CT Border** and **South Agawam Jct.** (= very small part of the MA portion of the ROW between these two points)	Agawam	The ROW that is designated as OH-20 in Agawam is very short, and is located in the southwestern corner of the town. It is adjacent to the Connecticut border, and is located north of as large wetland.	**HIGH** (for possible Native American resources).
OH-19 **CT Border** and **South Agawam Jct.** (=part of the MA section of the ROW between these two points)	Agawam	OH-19 is located in southwestern Agawam, adjacent to Still Brook and Philo Brook.	Mostly **HIGH** (for possible Native American resources) and **LOW.**

Archaeological Sensitivity: 345-kV Preferred Alternative (South Agawam to Ludlow)
South Agawam Substation to Agawam Substation (see Figures 28-38)

Segment Designation & Nearest S/S or Jct.	Town(s)	Location and Description	Archaeological Sensitivity of OH ROW and Directly Adjacent Areas

OH-02 **Agawam S/S to South Agawam Jct.** (via Silver S/S; =100% of ROW between Agawam S/S and South Agawam Jct.)	Agawam	OH-02 runs from north to south through central Agawam. It crosses several watercourses, including Threemile Brook.	Mostly **HIGH** (for possible Native American resources), except for the northern end.

Archaeological Sensitivity: 345-kV Preferred Alternative (South Agawam to Ludlow)
Agawam Substation to Piper Substation (see Figures 49-55)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-13* **Agawam S/S to Piper S/S** (= 100% of ROW linking these points)	Agawam & West Springfield	*The section of the OH-13 ROW that is in ***Agawam*** was assessed for the previous GSRP 115-kV study (Ref. Survey Unit WP-1). It is located in the north-central extremity of the town, south of the Westfield River. *The section of the OH-13 ROW that is in ***West Springfield*** was assessed for the previous GSRP 115-kV study (Ref. Survey Units WP-2, WP-3 and WP-4). It is located in the central and west-central part of the town, north of the Westfield River and adjacent to Bass Brook and Piper Brook.	***Agawam:*** A combination of **HIGH** (for possible Native American and/or historical resources) and **LOW**. ***West Springfield:*** A combination of **HIGH** and **MODERATE** (for possible Native American and/or historical resources) and **LOW**.
OH-36 Between **Agawam S/S and Piper S/S** (= alternative to avoid a landfill)	Agawam & West Springfield	The segment of OH-36 that is located in ***Agawam*** is on the east side of the Westfield River, in the northeastern extremity of the town. The confluence of the	***Agawam:*** **HIGH** (for possible Native American resources). ***West Springfield:*** **MODERATE** (for possible Native American resources).

		Westfield River and the Connecticut River is located to the east. The segment of OH-36 that is located in ***West Springfield*** is on the west side of the Westfield River, in the southeastern extremity of the town. Numerous Native American sites have been recorded previously in this vicinity.	

Archaeological Sensitivity: 345-kV Preferred Alternative (South Agawam to Ludlow)
Piper Substation to Chicopee Substation (see Figures 39-47 and Figures 49-55)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-12* **Chicopee S/S to Piper S/S** (= 100% of the ROW between these points)	Chicopee & West Springfield	*The section of the OH-12 ROW that is in ***Chicopee*** was assessed for the previous GSRP 115-kV study (Ref. Survey Units WP-6 and WP-7). It is located in the west-central part of the town, east of the Connecticut River and north of the confluence with the Chicopee River. * The section of the OH-12 ROW that is in ***West Springfield*** was assessed for the previous GSRP 115-kV study (Ref. Survey Unit WP-5). It is located in the northeast part of the town, west of the	***Chicopee:*** A combination of mostly **HIGH** and some **MODERATE** (for possible Native American and/or historical resources) and **LOW**. ***West Springfield:*** A combination of **HIGH** and **MODERATE** (for possible Native American and/or historical resources) and **LOW**.

		Connecticut River.	

Archaeological Sensitivity: 345-kV Preferred Alternative (South Agawam to Ludlow)
Chicopee Substation to East Springfield Junction (see Figures 39-47)

Segment Designation & Nearest S/S or Jct.	Town(s)	Location and Description	Archaeological Sensitivity of OH ROW and Directly Adjacent Areas
OH-11* **Chicopee S/S to East Springfield Jct.** (=100% of the ROW between these points)	Chicopee	*The OH-11 ROW that is located in Chicopee was assessed for the previous GSRP 115-kV study (Ref. Survey Unit WP-8). It is located in the central part of the town.	**LOW.**

Archaeological Sensitivity: 345-kV Preferred Alternative (South Agawam to Ludlow)
East Springfield Junction through Exit 6 Junction to Orchard Junction (see Figures 39-47)

Segment Designation & Nearest S/S or Jct.	Town(s)	Location and Description	Archaeological Sensitivity of OH ROW and Directly Adjacent Areas
OH-05* **East Springfield Jct. and Orchard Junction** (via Exit 6 Jct. and Shawinigan S/S; = 100% of the ROW between East Springfield Jct. and Orchard Junction)	Chicopee & Ludlow	*The eastern part of the section of the OH-05 ROW that is located in ***Chicopee***, between the Shawinigan Substation and the Orchard Junction, was assessed for the previous GSRP 115-kV study (Ref. Survey Units EP-2 and EP-3). The Chicopee section is located in the south-central part of the town, north of the Chicopee River. It crosses Colley Brook and another stream. *The very short section of the OH-05	***Chicopee:*** A combination of **HIGH** and **MODERATE** (for possible Native American resources) and **LOW.** ***Ludlow:*** **MODERATE** (for possible Native American resources).

		ROW in ***Ludlow*** was assessed for the previous GSRP 115-kV study (Ref. Survey Unit EP-3). This section is located in the southwest extremity of Ludlow, north of the Chicopee River.	

Archaeological Sensitivity: 345-kV Preferred Alternative (South Agawam to Ludlow)
Orchard Junction to Ludlow Substation (see Figures 21-27)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-01* **Ludlow S/S** to **Orchard Junction** (=100% of the ROW between these two points)	Ludlow	*This section of ROW was assessed for the previous GSRP 115-kV study (Ref. Survey Units EP-5, EP-6 and EP-7). It traverses southwest and west-central Ludlow.	Mostly **HIGH** (for possible Native American resources).

Archaeological Sensitivity: New 345-kV Noticed Alternative (South Agawam to Ludlow)
South Agawam Junction to CT Border (see Figures 28-38)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-17 **Franconia Jct.** and **South Agawam Jct.** (= part of the MA portion of ROW linking these points)	Agawam	OH-17 is located in southeastern Agawam, south of Tarkill Brook and north of Worthington Brook.	**HIGH** (for possible Native American resources).

Archaeological Sensitivity: New 345-kV Noticed Alternative (South Agawam to Ludlow)
CT Border to CT Border in MA, crossing Connecticut River/Longmeadow, MA
(see Figures 56-60)

Segment Designation & Nearest S/S or Jct.	**Town(s)**	**Location and Description**	**Archaeological Sensitivity of OH ROW and Directly Adjacent Areas**
OH-14 **Franconia Junction** to **South Agawam Jct.** (=a short central section of the ROW between these two points)	Longmeadow	OH-14 is a short section of ROW located in the extreme southwest corner of Longmeadow, between the eastern bank of the Connecticut River and the state border with Connecticut.	**HIGH.** ***Note:* The ROW traverses a major pre-Contact Native American burial ground site.**
UNDERGROUND:			
Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-29 **Franconia Jct.** area	Longmeadow	The UG-29 that is located in Longmeadow follows Route 5/Longmeadow Street and Maple Road in the south-central extremity of the town. Numerous historical houses, some dating to the early eighteenth century, are located along Route	**LOW**. The UG-29 that is located in Longmeadow follows Route 5/Longmeadow Street and Maple Road. *Note*: Impacts must be confined to the roadway along Route 5/Longmeadow Street, because numerous historical houses, some dating

		5/Longmeadow Street in this area.	to the early eighteenth century, are located in this area.
UG-30 **Franconia Jct.** area	Longmeadow	The UG alternative that is designated as UG-30 in Longmeadow follows Maple Road just inside the southern boundary of the town.	**LOW.**
UG-33 **South Agawam Jct.** area	Agawam	The UG alternative designated as UG-33 in Agawam is located in the southeastern part of the town, to the west and east of Route 75/Suffield Street. It follows a gas pipeline corridor on the south side of Worthington Brook.	Mostly **HIGH** (for possible Native American resources).
UG-34 **Franconia Jct.** area	Longmeadow	The UG alternative designated as UG-34 that is located in Longmeadow follows the Maple-Frank Smith Roads in the southeastern extremity of the town.	**LOW.**
UG-35 **Franconia Jct.** area	Longmeadow	UG-35 follows Wolf Swamp Road in the southeastern extremity of the town.	**LOW.**
UG-36 **Franconia Jct.** area	Longmeadow	UG-36 is a short off-road segment in the southern extremity of Longmeadow. It follows a gas pipeline easement southward from a power company facility located on the south side of Wolf Swamp Road.	**HIGH** (for possible Native American resources) for the short off-road segment that follows a gas pipeline easement. **LOW** in the previously developed area surrounding the power company facility.

Archaeological Sensitivity: 345-kV Underground Alternatives
CT Border/Franconia Junction to Hampden Junction (see Figures 4-8)

Segment Designation & Nearest S/S or Jct.	**Town/City**	**Location and Description**	**Archaeological Sensitivity of UG Alternative Routes**
UG-25 (Mass. Portion, in East Longmeadow) **Franconia Jct.** area	East Longmeadow	A very short section of the UG alternative designated as UG-25 in the East Longmeadow area is located on the Massachusetts side of the state border, along Shaker Road in southwestern East Longmeadow.	**LOW.**
UG-37 **Franconia Jct.** to **Hampden Jct.**	East Longmeadow	UG-37 follows the Denslow-Pease Roads from east to west in the south-central and southwestern parts of the town. A historical cemetery is located in the southeast quadrant of the intersection of Pease Road and Route 186/Prospect Street. A small number of nineteenth-century houses are distributed along Pease Road.	**HIGH** (for possible historical resources) for the section of Pease Road that passes along the north side of the historical cemetery. **LOW** for the remainder of UG-37 along Denslow Road and Pease Road.
UG-38 **Franconia Jct.** to **Hampden Jct.**	East Longmeadow	UG-38 is a short segment that follows Somers Road in the southeastern part of the town.	**LOW.**
UG-39 **Franconia Jct.** to **Hampden Jct.**	East Longmeadow	UG-39 follows the Meadowbrook-Mill Roads in the southeastern part of the town. (The easternmost extremity of UG-39 crosses the town line into Hampden and the overhead ROW OH-03-HA.)	**HIGH** (for possible Native American resources) for the easternmost extremity of UG-39, which crosses the town line into Hampden and the overhead ROW OH-03-HA. **LOW** for the remainder of UG-39, which follows

			Meadowbrook Rd. and Mill Rd.

Recommendations

Recommendations for cultural resource management in the GSRP work areas are provided based on the findings of the predictive model study.

In general, no further survey is recommended for areas that have been classified as Low Sensitivity through application of the predictive model.

Overhead ROWs. In sections of Overhead ROWs that have been classified as Moderate or High Sensitivity, additional archaeological investigation is recommended once the decision has been made to use those ROWs for construction purposes, and once work locations, Areas of Potential Effect (APEs) and technical designs have been more fully developed for the GSRP project. For each ROW, an archaeological Phase 1A reconnaissance survey is recommended, to include 100% walkover survey and additional archival research. The purpose of the Phase 1A reconnaissance will be to confirm that locations within the ROW actually merit subsurface testing, and to determine the amount of testing that is appropriate. If warranted on the basis of the Phase 1A study, archaeological Phase 1B intensive (locational) subsurface testing should be conducted in order to locate and identify any Native American and/or historical archaeological resources located within the APE of the GSRP.

Underground Alternatives. In sections of Underground Alternatives that have been classified as Moderate or High Sensitivity, additional archaeological investigation is recommended once the decision has been made to use those ROWs for construction purposes, and once work locations, Areas of Potential Effect (APEs) and technical designs have been more fully developed for the GSRP project. The present study considered only in-road work areas. Any appurtenant lay-down areas or staging areas that may be used adjacent to the roadways will have to be assessed in the future, as they may merit archaeological testing.

Some of the Underground Alternatives include cross-country sections, where the likelihood for preservation of archaeological resources may be higher, and archaeological testing may be appropriate.

For certain sections of the Underground Alternatives that have been classified as Moderate or High Sensitivity, archaeological monitoring during the construction phase may be appropriate, in order to identify any archaeological resources that might be disturbed by the GSRP.

REFERENCES CITED

Benton, Jr., J.
1905 *Early Census Making in Massachusetts 1643-1765 with a Reproduction of the Lost Census on 1765 (Recently Found) and Documents Relating Thereto.* The University Press, Cambridge, Massachusetts.

Bickford, W. and U. Dymon
1990 *An Atlas of Massachusetts River Systems, Environmental Designs* for the Future. Massachusetts Department of Fisheries, Wildlife & Environmental Law Enforcement. University of Massachusetts Press, Amherst.

Bourque, B.
1995 *Diversity and Complexity in Prehistoric Maritime Societies: A Gulf of Maine Perspective*. Plenum, New York.

Bragdon, K.
1996 *Native Peoples of Southern New England, 1500-1650*. University of Oklahoma Press, Norman.

Braun, E., and D. Braun
1994 *The First Peoples of the Northeast*. Lincoln Historical Society, Lincoln, Massachusetts.

Carlson, C.
1986 Archival and Archaeological Research Report on the Configuration of the Seven Original 17th Century Praying Indian Towns of the Massachusetts Bay Colony. University of Massachusetts Archaeological Services, Amherst. Report on file with the Massachusetts Historical Commission, Boston.

Commonwealth of Massachusetts
1909 *Census of the Commonwealth of Massachusetts: 1905.* Wright & Potter Printing Co., State Printers, Boston.

Curran, M.
1987 The Spatial Organization of Paleoindian Populations in the Late Pleistocene of the Northeast. Ph.D. dissertation, Department of Anthropology, University of Massachusetts, Amherst.

Davis, R., and G. Jacobsen, Jr.
1985 Late Glacial and Early Holocene Landscapes in Northern New England and Adjacent Areas of Canada. *Quaternary Research* 23:341-368.

Dincauze, D.
1974 An Introduction to Archaeology in the Greater Boston Area. *Archaeology of Eastern North America* 2:39-67.

1975 The Late Archaic Period in Southern New England. Arctic Anthropology 12(2):23-34.

1976 *The Neville Site: 8,000 Years at Amoskeag*. Peabody Museum Monographs No. 4. Harvard University, Cambridge.

1990 A Capsule Prehistory of Southern New England. In *The Pequots in Southern New England: The Fall and Rise of an American Indian Nation*, edited by L. M. Hauptman and J.D. Wherry, pp. 19-32. University of Oklahoma Press, Norman, Oklahoma, and London.

Dincauze, D, and M. Mulholland
1977 Early and Middle Archaic Site Distributions and Habitats in Southern New England. In *Amerinds and Their Paleoenvironments in Northeastern North America*. Annals of the New York Academy of Sciences 288:439-456.

Doucette, D., and J. Cross
1997 *Annasnappet Pond Archaeological District, North Carver, Massachusetts: An Archaeological Data Recovery Program*. PAL Report No. 580. Prepared for United States Department of Transportation, Federal Highway Administration and Massachusetts Highway Department.

Fenneman, N.
1938 *Physiography of the Eastern United States*. McGraw-Hill, New York.

Forrest, D.
1999 Preliminary Results from Recent Excavations at the Sandy Hill Site. Paper presented at the 39th Annual Meeting of the Northeastern Anthropological Association, Rhode Island College, March 20, 1999.

Haynes, C., D. Donahue, A. Jull, and T. Zabel
1984 Application of Accelerator Dating to Fluted Point Paleoindian Sites. *Archaeology of Eastern North America* 12:184-191.

Holland, J.
1855 *History of Western Massachusetts.* Samuel Bowles and Company, Springfield, Massachusetts.

Jennings, F.
1975 *The Invasion of America: Indians, Colonialism, and the Cant of Conquest.* University of North Carolina Press, Chapel Hill.

Jochim, M.
1976 *Hunter-Gatherer Subsistence and Settlement: A Predictive Model.* Academic Press, New York.

Johnson, E.
1984 Prehistoric Overview. In *Historic and Archaeological Resources of the Connecticut Valley*, pp. 19-45. Massachusetts Historical Commission, Boston.

Jones, B.
1997 The Late Paleoindian Hidden Creek Site in Southeastern Connecticut. Report on file at the Mashantucket Pequot Museum and Research Center, Mashantucket, Connecticut.

McBride, K.
1984 Prehistory of the Lower Connecticut River Valley. Ph.D. Dissertation, Department of Anthropology, University of Connecticut, Storrs.

McManamon, F.
1984 *Chapters in the Archaeology of Cape Cod I: Results of the Cape Cod National Seashore Archaeological Survey 1979-1981.* National Park Service, Boston.

Mulholland, M.
1984 Patterns of Change in Prehistoric Southern New England: A Regional Approach. Ph.D. dissertation. Department of Anthropology, University of Massachusetts, Amherst.

Ritchie, W.
1965 The Small Stemmed Point in New England. *Pennsylvania Archaeologist* 35:134-138.

1969 *The Archaeology of Martha's Vineyard.* Second edition. Natural History Press, Garden City, New York.

Robinson, B. and J. Petersen
1993 Perception of Marginality: The Case of the Early Holocene in Northern New England. *Northeast Anthropology* 46: 61-75.

Salisbury, N.
1982 *Manitou and Providence: Indians, Europeans, and the Making of New England, 1500-1643.* Oxford University Press, New York.

Snow, D.
1980 *The Archaeology of New England.* Academic Press, New York.

Spence, M., and W. Fox
1986 The Early Woodland Occupations of Southern Ontario. In *Early Woodland Archaeology*, pp. 4-46. Edited by K.B. Farnsworth and T.E. Emerson. Center for American Archaeology Press, Kampsville, Ohio.

Thomas, P.
1991 *Vermont's Prehistoric Culture Heritage*. Vermont Historic Preservation Plan, State of Vermont. Division of Historic Preservation, Montpelier, Vermont.

Wilkie R., and J. Tager
1991 *Historical Atlas of Massachusetts*. University of Massachusetts Press, Amherst, Massachusetts.