

# Capital Improvements Plan Provincetown Municipal Airport

Final

December 17, 2011

Appendices





## **APPENDICES**

- 1. Wetland Reports and Documents**
- 2. Wildlife and Rare Species Habitat Assessment Reports**
- 3. NPDES Plans**
- 4. Traffic and Parking Study Reports**
- 5. NPS Agreements and other Documents**
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- 7. Glossary**
- 8. CCC DRI Application Elements**



**APPENDIX 1**  
**Wetland Reports and Documents**

1. DEP Wetland Restriction Map, 1977
2. Summary of wetland Resource Areas, Horsley Witten Group, April 2007



Appendix 1.1 DEP Wetland Restriction Map, 1977

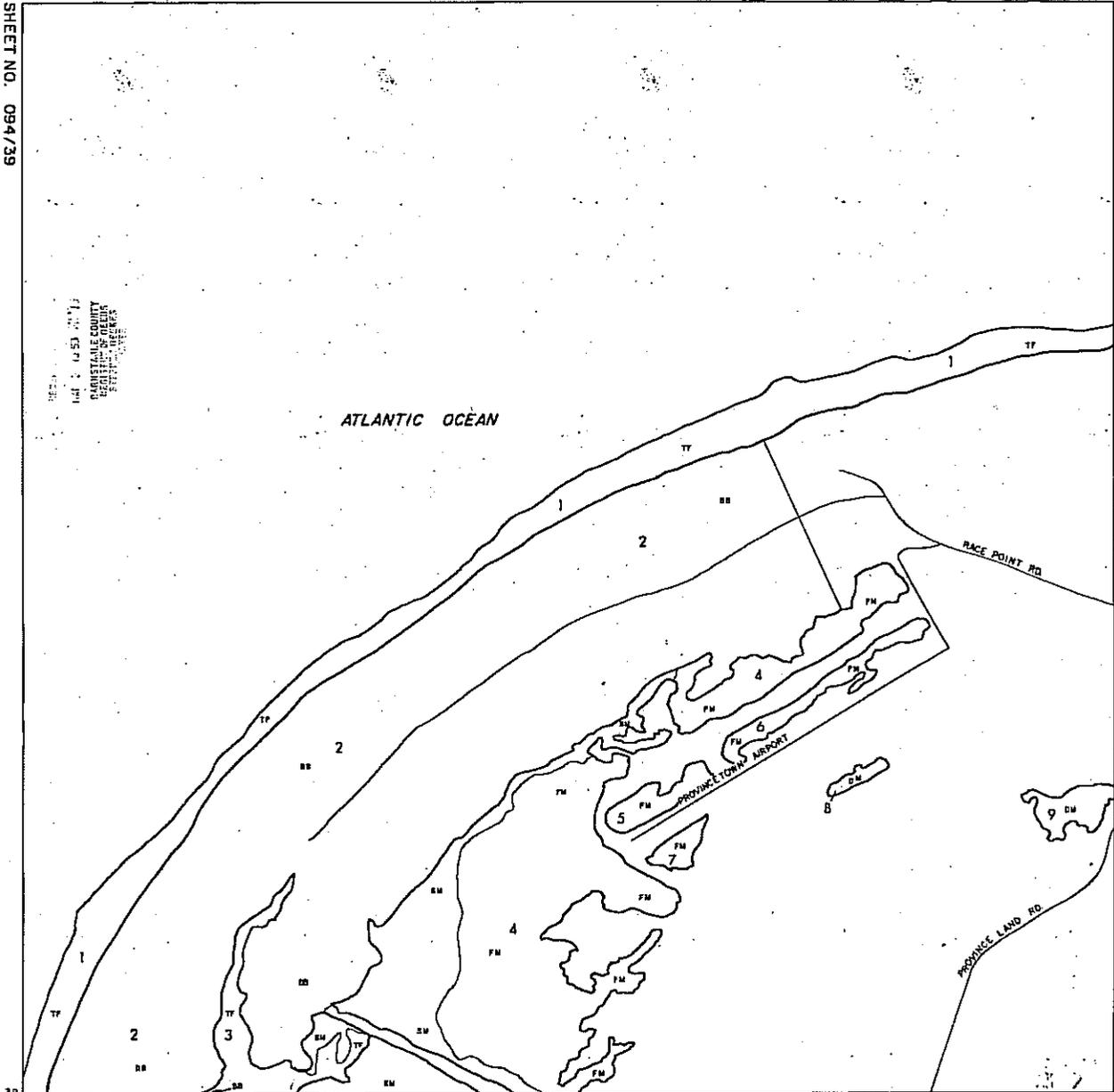


322-23

SHEET NO. 094/39

095

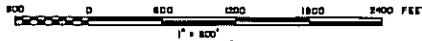
BARNSTABLE COUNTY  
OFFICE OF RECORDS  
PROVINCETOWN, MASSACHUSETTS



322-23

COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

SCALE 1:7200



AREA (S) OF RESTRICTION UNDER  
G. L. c. 130 s. 105  
G. L. c. 131 s. 40A

LEGEND					
TIDAL FLAT	TF	FRESH MARSH	FM	SEASONALLY FLOODED FLAT	FF
BARRIER BEACH	BB	DEEP FRESH MARSH	DM	CULTIVATED CRANBERRY BOG	CB
SALT MARSH	SM	SHRUB SWAMP	SS	POND	P
		WOODED SWAMP	WS	STREAM	
		DAM	D	NATURAL BANK	
				POLITICAL BOUNDARY	

SHEET NO. 094/39  
COUNTY BARNSTABLE  
MUNICIPALITY PROVINCETOWN  
WETLAND AREA (S) 1-9 INCL.  
HEARING DATE JULY 11, 1977

APPROVAL DATE DEC. 1, 1977 c.131-41  
APPROVAL DATE NOV. 3, 1977 c.130-1

ADOPTED AND APPROVED  
*Ronald E. Kennell*

COMMISSIONER  
DEPT. OF ENVIRONMENTAL MANAGEMENT



## Appendix 1.2 Summary of Wetland Resource Areas, Horsley Witten Group, April 2007



# Horsley Witten Group

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## Summary of Wetland Resource Areas

Provincetown Municipal Airport  
Provincetown, Massachusetts

April 2007



Prepared for:

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Boston, Massachusetts  
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**Summary of Wetland Resource Areas  
Provincetown Municipal Airport  
Provincetown, Massachusetts**

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## 1. INTRODUCTION AND BACKGROUND

The Provincetown Airport Commission recently filed an Environmental Notification Form (ENF) under the *Massachusetts Environmental Policy Act* (M.G.L. c. 30 §§ 61 through 62H, inclusive, or MEPA). The ENF was based on the Provincetown Municipal Airport's 2005 Master Plan. The Master Plan was the initial step toward developing a Capital Improvement Project (CIP) program for the Airport facilities. An integral component of this planning process involves identifying the existing conditions and facility needs, while also identifying various alternatives to meeting those needs. The various improvement projects, as well as alternative project footprints, were outlined in the ENF.

The surveyed wetlands presented in the ENF were supplemented with available DEP wetlands data from MassGIS. The Certificate of the Secretary of the Executive Office of Environmental Affairs (EOEA) on the ENF (EOEA No.13789; May 26, 2006) specifically requested that the Airport definitively quantify the potential impacts for each of the proposed projects and the alternative footprints, which necessitated additional field surveys. As a result, additional wetland delineations have been completed since the ENF.

Wetland resource areas, including isolated and bordering vegetated wetlands that are protected and regulated under the *Massachusetts Wetlands Protection Act* (M.G.L. Ch. 131 § 40), its implementing Regulations (310 CMR 10.00), the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*), the Town of Provincetown *Wetlands Protection Bylaw* (Chapter 12 of the Provincetown General Bylaws), and/or the Cape Cod Commission (CCC) Regional Policy Plan (RPP), were reviewed and approved by the Provincetown Conservation Commission under an Order of Resource Area Delineation ("Order") issued January 25, 2007. Figure 6 depicts the approved wetland areas.

Identification and delineation of all wetland areas is important to future permitting, thus additional wetland areas were identified and delineated within the Airport lease area that extend beyond the jurisdiction of State and local statutes due to their diminutive size. While shown on the existing conditions plans and discussed in the following narrative, the Airport Commission did not specifically seek State or local approval of those wetland boundaries. For clarification, these small isolated areas are identified in the table of Wetland Resource Areas at the end of this narrative. Please note that only those wetlands that occur within or near the various CIP footprints (and alternatives) have been delineated.

Additionally, the Army Corps of Engineers (ACOE), who participated in the site walk for the Abbreviated Notice of Resource Area Delineation (ANRAD), issued a separate Preliminary Jurisdictional Determination (NAE-2006-4281) indicating that "*there appear to be 'waters of the United States' and/or 'navigable waters of the United States' on the project site,*" which would be regulated under the federal *Clean Water Act*.

A summary of all wetland resource areas delineated at the Airport is provided below, including a general site description, a general regulatory overview, broad descriptions of the various types of wetland resource areas encountered, a discussion of field methodologies, and a description of each wetland area encountered within or near any identified CIP project footprint. This *Summary of Wetland Resource Areas* report incorporates all information previously reported in the *Wetland Resource Area Report* (HW, October 2005) referenced in the ENF, as well as the information presented in the ANRAD report (HW, December 2006) that was submitted to the Provincetown Conservation Commission and the Massachusetts Department of Environmental Protection (DEP).

## 2. GENERAL SITE CHARACTERISTICS

The Airport is situated within the bounds of the Cape Cod National Seashore (CCNS), occupying approximately 322 acres of land (Figures 1 and 2). Race Point Road and the Coast Guard Station at Race Point are located to the immediate northeast. Areas within the Airport lease area that are maintained for Airport operations include a terminal and other buildings, a paved runway and taxiways, auto parking, and navigation equipment. Additional areas are mowed to maintain various aviation safety areas and navigational surfaces. In general, the areas at the Airport that are not actively maintained as part of Airport operations are either wetland/palustrine habitats or coastal dune habitats.

The Airport contains diverse wetland resource areas, including isolated freshwater wetland areas, Bordering Vegetated Wetlands (BVW), salt marsh, and a coastal dune system. Portions of the Airport are located in the coastal floodzone. Wetland habitats present typically demonstrate physical and biological characteristics of a Coastal Interdunal Marsh/Swale, as described in the *Classification of the Natural Communities of Massachusetts* (Swain and Kearsley, 2001; “the *Classification*”). Dune habitats observed at the Airport can be classified as either Maritime Dune, Maritime Shrubland, or Maritime Pitch Pine on Dunes as described in the *Classification* depending on their individual characteristics.

## 3. REGULATORY OVERVIEW

Wetland Resource Areas found within the Airport lease area are subject to jurisdiction pursuant to the *Massachusetts Wetlands Protection Act*, the *Federal Clean Water Act*, the *Provincetown Wetlands Protection Bylaw*, and the CCC RPP and implementing regulations. Any activity proposed within a jurisdictional wetland or within 100 feet of certain wetland areas will require review and permitting by Federal, State, regional, and/or local regulatory authorities. A brief description of the jurisdictional definitions is provided below. Specific descriptions of individual wetland resource areas are provided in the following section.

### 3.1 Freshwater Wetlands

#### 3.1.1 Bordering Vegetated Wetland

BVWs are defined under Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.55(2)(a) as “*freshwater wetlands that border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The boundary of Bordering Vegetated Wetland is defined at 310 CMR 10.55 (2)(c) as the line within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist.*” Freshwater wetlands meeting this definition are also regulated as waters of the United States under Section 404 of the *Federal Clean Water Act* (see below), and as freshwater wetlands under the *Provincetown Wetlands Protection Bylaw* (Chapter 12).

#### 3.1.2 Isolated Vegetated Wetlands

Isolated Vegetated Wetlands are regulated under Section 404 of the *Federal Clean Water Act*, as well as under the *Provincetown Wetlands Protection Bylaw* and the CCC RPP.

Freshwater wetlands are defined by the Army Corps of Engineers (Federal Register 1982) and the U.S. Environmental Protection Agency (Federal Register 1980) as “*those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under*

*normal circumstances so support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”*

Chapter 12 of the Provincetown General Bylaws regulates Isolated Vegetated Wetlands, defined as “*any area where surface or ground water or ice at or near the surface of the ground and greater than 500 square ft. which supports a plant community (cover) comprised of 50% or greater of wetland species, or which in the judgment of the Commission supports a significant community of wetland vegetation.*”

Vegetated Wetlands: A Vegetated Wetland is defined by the Provincetown Conservation Commission Bylaws as “*any area of at least 300 square feet where surface or groundwater, or ice, at or near the surface of the ground support a plant community dominated (at least 50 percent) by wetland species or have created hydric soils.*” The local wetlands bylaw specifically defines bogs and marshes as follows.

- **Bog:** A Bog is defined by the Provincetown Conservation Commission Bylaw as “*a freshwater wetland characterized by peat accumulation usually dominated by moss. Receives only direct precipitation; characterized by acid water, low alkalinity, and low nutrients.*”
- **Marsh:** A Marsh is defined by the Provincetown Conservation Commission Bylaw as “*a freshwater or coastal wetland permanently or periodically inundated characterized by nutrient-rich water.*”

Unvegetated Wetlands: An Unvegetated Wetland is defined by the Provincetown Conservation Commission Bylaw as “*coastal areas, such as flats and unvegetated intertidal areas; coastal and freshwater beaches, dunes, and banks; and land subject to flooding. Also, inland areas subject to flooding which do not support wetland vegetation or contain hydric soils, but which store at least 1/8 acre feet of water to an average depth of six inches at least once a year, or the statistical equivalent, and land areas two feet or less vertically above the high water mark of any lake or pond defined by Chapter 12 of the General By-Laws of Provincetown; regulations promulgated by the Provincetown Conservation Commission or 310 CMR. Does not include swimming pools, artificially lined ponds or pools, wastewater lagoons, or stormwater runoff basins, the construction of which may be regulated but do not themselves constitute regulated areas.*”

The CCC RPP regulates impacts to all wetlands greater than 500 square feet whether they border water bodies or not, as well as the associated 100-foot buffer zone.

### 3.1.3 Isolated Land Subject to Flooding

Isolated wetlands are regulated under the Massachusetts Wetlands Protection Act only if they meet a volumetric criteria as specified under the Regulations at 310 CMR 10.57(2)(b). Isolated Land Subject to Flooding (ILSF) is defined at 310 CMR 10.57(2)(b)1 as “*an isolated depression or closed basin without an inlet or an outlet. It is an area which at least once a year confines standing water to a volume of at least ¼ acre-feet and to an average depth of at least six inches.*” Chapter 12 also regulates ILSF under the definition of “Unvegetated Wetlands” (see above).

## 3.2 Coastal Resource Areas

### 3.2.1 Coastal Flood Zone

Land Subject to Coastal Storm Flowage (LSCSF) is defined in the Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.04 as “*land subject to any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, which ever is greater.*”

The Airport is situated within a low-lying area between parallel dune ridges. According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (Community Panel 255218 00001 C), this low area is within the 100-year flood zone (Zone A2, elevation 10 feet above sea level, and Zone A4, elevation 11 feet above sea level; shown as zone AE on Figure 3). The Airport facility and the immediate surrounding area are therefore located within LSCSF, a jurisdictional resource area under the *Massachusetts Wetlands Protection Act* and the local wetlands bylaw. Small pockets of Flood Zone B (X500; Areas between the 100-year flood and the 500-year flood) are located within the A flood zone. The extreme tip of the runway approach lights is located within the velocity Zone V4 (VE, elevation 13 feet above sea level). The surrounding elevated dune system is located within areas of minimal flooding. The 100-year flood zone includes flood zones A and V, but not B or C.

### 3.2.2 Coastal Dune and Barrier Beach

Coastal Dune is defined in the *Massachusetts Wetlands Protection Act* Regulations at 310 CMR 10.28(2) as “*any natural hill, mound or ridge of sediment landward of a coastal beach deposited by wind action or storm overwash. Coastal dune also means sediment deposited by artificial means and serving the purpose of storm damage prevention or flood control.*”

The *Massachusetts Wetlands Protection Act* Regulations at 310 CMR 10.29 defines Barrier Beach as “*a narrow low-lying strip of land generally consisting of coastal beaches and coastal dunes extending roughly parallel to the trend of the coast. A barrier beach is separated from the mainland by a narrow body of fresh, brackish, or saline water or a marsh system.*”

The coastal dune habitats located to the north and northwest of the Airport occur within the boundaries of the Race Point barrier beach system and consist of both primary and secondary dune habitats. There are no primary dunes located within the Airport lease area. The coastal dune habitats located to the southeast of the Airport are secondary coastal dune habitats that are not within the barrier beach system.

### 3.2.3 Salt Marsh

The Regulations at 310 CMR 10.28(2) define a salt marsh as “*a coastal wetland that extends landward up to the highest high tide line, that is, the highest spring tide of the year, and is characterized by plants that are well adapted to or prefer living in, saline soils. Dominant plants within salt marshes are salt meadow cord grass (*Spartina patens*) and/or salt marsh cord grass (*Spartina alterniflora*). A salt marsh may contain tidal creeks, ditches and pools.*”

The Hatches Harbor salt marsh system represents an area of former salt marsh that developed brackish to freshwater characteristics over time due to the construction of the Hatches Harbor dike in 1930. The dike was constructed in an attempt to eradicate the problem of a flourishing mosquito population. However, the resultant near monoculture of common reed, and severe reduction of wildlife habitat values prompted the Hatches Harbor Salt Marsh Restoration Project, initiated by National Park Service (NPS) in 1998. Subsequent improvements to the tidal flushing in this area have begun to restore brackish and freshwater wetlands to salt marsh that is contiguous with undisturbed salt marsh areas located seaward of the dike.

The lands on and in the vicinity of the Airport support a barrier beach marsh system. This marsh system consists predominantly of isolated wetland habitats of various sizes that are forested, shrub-dominant, herbaceous, or some combination of these plant community habitat types. Figure 4 depicts wetland resource areas identified by MassGIS and regulated by the State.

#### 4. SOILS CLASSIFICATION AND GEOLOGIC CHARACTERISTICS

The Natural Resources Conservation Service (NRCS) has mapped the Airport as consisting of four primary soil types (Figure 5). Soils are typically very deep and consist of loose, coarse sands according to information obtained from the Barnstable County Soil Survey (Fletcher, 1993). A brief description of the soil types is provided below.

- The marshy BVW located southwest of the Airport facilities and north of the Hatches Harbor dike is mapped as **Berryland mucky loamy coarse sand**, 0 to 2 percent slopes (BmA). This very poorly drained, hydric soil is found in depressions, swales, and low areas adjacent to streams and ponds on outwash plains and in areas of glacial lake deposits. Elsewhere, isolated wetland areas are mapped as **Pipestone loamy coarse sand**, 0 to 3 percent slopes (PeA). This poorly drained soil type is found in depressions, at the base of swales, and low areas bordering streams, ponds, and swamps.
- The dune complexes are mapped as either **Hooksan sand, rolling** (HoC), **Hooksan sand, hilly** (HoD), or **Hooksan –Dune land complex, hilly** (HxC). These excessively drained sandy soils along the vegetated dunes are distinguished primarily by the range of slope.
- **Deerfield loamy fine sand**, 0 to 5 percent slopes (DeA). This well-drained soil type is found in depressions, swales, and low areas adjacent to streams and ponds on outwash plains and in areas of glacial lake deposits. This soil type is found at the southeastern corner of the Airport. Small areas of other hydric soil types are included within mapped areas of this soil.
- **Udipsamments, smoothed** (Ud). This map unit consists of nearly level soils in areas that have been excavated or filled during construction. Commonly rectangular in shape, these areas are generally associated with roads, highways, schools, housing developments, or athletic fields.

The geologic characteristics of the Airport, combined with a fluctuating, seasonally high groundwater table, result in seasonal saturation of the upper portion of the soil profile for significantly long periods of time during early portions of the growing season. Rainfall during storm events also contributes to saturated soil and inundated land conditions. Inundated and/or saturated soil conditions favor the establishment of a hydrophyte-dominant plant communities and the deposition of organic material, which are typical of wetland habitats.

#### 5. WETLAND DELINEATION METHODOLOGY

HW field biologists conducted field surveys and wetland delineations in August and September 2004 to support the Airport's master planning effort. At that time, HW identified and delineated 14 wetland areas, Wetlands A through N, each corresponding to an established series of sequentially numbered wetland boundary flag stations. These surveyed wetland areas are shown on Figure 6.

HW resumed field surveys in the summer and fall of 2006 (approximately August through early December), delineating and field surveying an additional 51 wetland areas that correspond to the approximate footprints of the CIP projects described in the ENF. HW assigned a two letter code to these wetland areas to distinguish these wetlands from those identified in the ENF. In some instances, wetland area boundaries that were previously partially established were expanded upon during the second round of field work.

To facilitate our field efforts, the Airport Lease Line was survey-located and marked in the field at 50- or 100-foot intervals with labeled wooden stakes. Wetland areas along the lease line were delineated in

approximately four series: AA through AM [excluding AH]; BA through BC; CA through CV; and DA through DM. These wetland areas range in size from only a few hundred square feet to expansive wetland areas associated with the Hatches Harbor salt marsh system. As stated above, some of the two letter code wetland boundaries are contiguous with and expand upon previously identified (i.e., single letter code) wetland areas. Each wetland was marked using sequentially-numbered pink wire “pin” flags and/or pink flagging tape. All recently established wetland areas were field-surveyed using a hand-held GPS (global positioning system) with sub-meter accuracy (i.e., within a 3-foot radius).

HW made all wetland boundary determinations in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1) and the DEP handbook entitled *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act* (March 1995) with consideration given to the local *Provincetown Wetlands Protection Bylaw* and the implementing regulations. The State and Federal methodologies for determining the limits of a jurisdictional wetland generally require the use of three parameters of vegetation, hydrology, and soils. The local wetlands bylaw determines the boundary of BVWs and Isolated Vegetated Wetlands that are greater than 500 square feet, by the presence of a plant community of 50% or greater of wetland species, and “soil hydrology may provide secondary criteria where necessary.” HW completed *DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Forms* within representative wetland areas, which are included within the Appendices to this document.

Each wetland area observed and delineated (partially or entirely) was classified according to the *Classification of Wetland and Deepwater Habitats of the United States* (Cowardin, et al., 1979) with respect to plant community cover types and water regime. As an example, shrub-dominant interdunal wetland marsh, which is the predominant type of wetland habitat at the Airport, is classified as palustrine scrub-shrub (or PSS) with a non-tidal, seasonally- or temporarily-flooded water regime.

## **6. OVERVIEW OF WETLAND AREAS**

The Airport exhibits a low and flat topography and the fluctuating groundwater table elevations are relatively close to the ground surface. The wetland areas range in size from isolated areas of less than a few hundred square feet, to extensive wetland areas associated with and connected directly to the Hatches Harbor wetland system.

The Coastal Interdunal Marsh/Swale community type appears to be one of the predominant, if not the predominant, type of wetland habitat existing at the site. According to the *Classification* (Swain and Kearsley, 2001), this community type is a “*graminoid [grass-like species]- or shrub-dominant coastal community occurring in shallow basins (swales) between sand dunes.*” *With respect to environmental setting, “Interdunal swales are low, shallow depressions that form between sand dunes along the coast. They occur as part of a dune system, and the best examples are complexes of numerous swales. Soils generally have a thin, about one centimeter, organic layer over coarse sand. The water regime ranges from seasonally flooded to permanently inundated.”*

Within this Coastal Interdunal Marsh/Swale community type, HW generally encountered three basic variations: a graminoid-dominated palustrine emergent marsh (PEM), a shrub-dominated palustrine shrub swamp (PSS), and a palustrine forested swamp (PFO). Emergent marshes and shrub swamps were generally encountered north of the Airport facilities and in low-lying areas to the immediate south and west of the runway, where the wetlands are either connected to the Hatches Harbor wetland system, or else are part of the Airport-managed areas where vegetation is maintained at lower heights for Airport safety purposes. Dominant vegetation within the emergent marshes includes woolgrass (*Scirpus*

*cyperinus*), twig rush (*Cladium mariscoides*), black grass (*Juncus gerardii*), and soft rush (*Juncus effusus*).

Vegetation within shrub swamp communities encountered included bayberry (*Myrica pensylvanica*), willow (*Salix* spp.), winterberry (*Ilex verticillata*), arrowwood (*Viburnum dentatum*), shadbush (*Amelanchier canadensis*), Virginia rose (*Rosa virginiana*), and poison ivy (*Toxicodendron radicans*) with a diversity of herbaceous species including Joe-Pye weed (*Eupatorium* spp.), various goldenrods (*Solidago* spp.), various asters (*Aster* spp.), and ferns in more open areas within the outer dunes closest to the ocean. Within more inland areas dominant wetland vegetation includes highbush blueberry (*Vaccinium corymbosum*), swamp azalea (*Rhododendron viscosum*), and dwarf huckleberry (*Gaylussacia dumosa*) among large patches of American cranberry (*Vaccinium macrocarpon*) interspersed with clumps of woolgrass, ferns, and sphagnum moss (*Sphagnum* spp.).

Forested wetlands (PFO) are located primarily to the south of the runway beyond the managed areas. HW considered all areas conforming to a pitch pine (*Pinus rigida*), cranberry, and highbush blueberry-dominant, forested wetland habitat type (also referred to here as “cranberry-pine swales”) to be a local variant of the shrub-dominant Coastal Interdunal Marsh/Swale, where pitch pine appears to have become well adapted to seasonally wet conditions, and was considered to be a local wetland indicator species.

## 6.1 Descriptions of Isolated Wetland Areas

Below we provide a brief description of the vegetative and soil characteristics of each wetland area identified and delineated, beginning with those areas delineated prior to the development of the Master Plan (i.e., those wetlands delineated in 2004 and 2005), followed by areas delineated more recently (i.e., in 2006), and any updated information regarding the initial wetland delineation efforts. Wetland areas with similar characteristics have been grouped together within these descriptions as appropriate. These areas are presented on the enclosed *December 2006 Wetland Resource Area Map* prepared by HW (Figure 6). Table 1 summarizes the wetland areas, their jurisdictional status, and the functions and values of each area.

### 6.1.1 Wetland A

**Wetland A** is an isolated wetland habitat nearest the northern corner of the Airport terminal and hangar building and adjacent to the terminal parking lot. Dominant canopy species include willow and pitch pine. Plant community species including winterberry, red maple (*Acer rubrum*), meadowsweet (*Spiraea latifolia*), quaking aspen (*Populus tremula*), bayberry, poison ivy, and chokeberry (*Aronia* sp.) comprise the relatively dense shrub-dominant understory of this wetland plant community. Wetland A is a scrub-shrub/forested palustrine habitat (PSS/PFO) with a non-tidal seasonally- or temporarily-flooded water regime. While inundation within this wetland was not directly observed, indicators of past surface water inundation, specifically blackened leaves, were observed.

### 6.1.2 Wetland B

**Wetland B** is an isolated wetland habitat located to the southeast of the Airport terminal and hangar building. A gravel path traversing this wetland serves as access to the localizing transmitter. This wetland is characteristic of a Coastal Interdunal Marsh community and can also be classified as a scrub-shrub/emergent palustrine habitat (PSS/PEM). Plant species frequently observed within this wetland included American cranberry, highbush blueberry, dangleberry, meadowsweet, winterberry, pitch pine, and willow. Herbaceous plant species including various sedges (*Carex* spp.), rushes (*Juncus* spp.), and some common reed (*Phragmites australis*) were also frequently encountered. Wetland B likely has a

non-tidal seasonally- or temporarily-flooded water regime. While inundation within Wetland B was not directly observed, hydrologic indicators such as water marks were observed on the trunks of mature shrubs, indicating that this wetland had recently experienced inundation.

### 6.1.3 Wetlands D, E, G, and L

**Wetlands D, E, G, and L** are examples of the Coastal Interdunal Marsh community and can be further classified as isolated forested (PFO) and scrub-shrub palustrine (PSS) habitats. These delineated areas and other similar areas identified by MassGIS, form a wetland mosaic within the extensive pitch pine-forested habitats to the southeast of the runway. While pitch pine is the dominant tree species in these wetland areas, the typical plant community in the understory is composed primarily of highbush blueberry, American cranberry, and woolgrass. While inundation within these isolated wetlands was not directly observed, indicators of surface inundation, specifically blackened leaves and watermarks on the trunks and stems of mature woody vegetation, were observed. These non-tidal wetland habitats likely experience a seasonally- or temporarily-flooded water regime. According to the soil survey, these wetland areas are mapped within Pipestone loamy coarse sands (0-3% slopes), Deerfield loamy fine sands (0-5% slopes), and Hooksan sands, rolling map units.

While Wetlands D and G are fully contained within the pitch pine-forested dune habitat, portions of both Wetland E and Wetland L extend beyond the limit of the pitch pine forest and into the runway vegetative maintenance areas. This maintenance is necessary for safety purposes to remove woody vegetation above a certain height. In these areas, a combination of graminoid- and shrub-dominant plant communities exist. Graminoid refers to grass and grass-like plants such as sedges and rushes. Shrub species including highbush blueberry, winterberry, chokeberry, arrowwood, and bayberry are common. Herbaceous vegetation in these areas consists primarily of sedges and rushes as well as an abundance of American cranberry. Areas adjacent to these wetland areas that are at slightly higher ground elevation are low-profile coastal dune habitats dominated by a coastal heath community including scrub oak (*Quercus ilicifolia*), beach plum (*Prunus maritima*), bearberry (*Arctostaphylos uva-ursi*), American beachgrass (*Ammophila breviligulata*), bayberry, poison ivy, common hairgrass (*Deschampsia flexuosa*), and various lichens.

### 6.1.4 Wetlands F, M, and N

**Wetlands F, M, and N**, each isolated wetlands, are emergent marsh palustrine (PEM) habitats that likely have temporarily-flooded water regimes. Located to the east of the Airport runway, these freshwater wetlands are relatively small and are located in close proximity to one another. Herbaceous plant species including various sedges (*Carex* spp.) and rushes (*Juncus* spp.) comprise the plant community in Wetland F, while Wetlands M and N support American cranberry as well as sedges and rushes. Wetland N may be non-jurisdictional because of its small size. Areas adjacent to these wetland areas that are at slightly higher ground elevations are low-profile coastal dune habitats dominated by American beachgrass, scrub oak, beach plum, bearberry, bayberry, and common hairgrass. These wetlands are non-tidal and probably have a seasonally- or temporarily-flooded water regime.

### 6.1.5 Wetlands H and I

**Wetlands H and I** are isolated scrub-shrub palustrine habitats (PSS) confined by the runway and taxiway. Plant community members consist primarily of red chokeberry (*Aronia arbutifolia*), winterberry, meadowsweet, steplebush (*Spiraea tomentosa*), highbush blueberry, American cranberry, bayberry, and poison ivy. Commonly observed plant species at and upslope of the wetland margin include winged

sumac (*Rhus copallinum*), bayberry, and little bluestem (*Schizachyrium scoparius*). These wetlands are non-tidal and probably have a seasonally- or temporarily-flooded water regime.

#### 6.1.6 Wetland K

**Wetland K** is a Coastal Interdunal Marsh community supporting a characteristic freshwater emergent marsh habitat (PEM). While American cranberry provides nearly 100 percent cover, other species including wide-leaf cattail (*Typha latifolia*), soft rush, St. John's-wort (*Hypericum* sp.), and other graminoids are also relatively abundant. Two separate, relatively small common reed communities were observed within Wetland K. The boundary of this wetland includes a portion of the pitch pine-forested (PFO) interdunal marsh habitat. This non-tidal wetland likely experiences a seasonally- or temporarily-flooded water regime. Measurable inundation was observed in Wetland K, which makes this wetland unique as compared to other observed wetland habitats at the Airport in which no inundation was directly observed at any time during the field observation period. The soil survey depicts this wetland as lying within the Pipestone loamy coarse sands (0-3% slopes) map unit.

#### 6.1.7 Wetlands AA, AB, AC, AD, AG, and AJ

**Wetlands AA** and **AB** are each small isolated wetlands consisting of clumps of woolgrass, twig rush, soft rush, and black grass. **Wetlands AC** and **AD** are also small isolated wetlands with a slightly greater vegetative diversity, including clumps of woolgrass, pilewort (*Erechtites hieracifolia*), and slender-leaf goldenrod (*Euthamia tenuifolia*) interspersed with patches of bayberry and willow (*Salix* sp.). Each of these wetlands is located along the outer Airport lease line. **Wetland AG** is a larger isolated wetland that extends well beyond the northern lease line. The vegetation within this wetland includes bayberry, twig-rush, woolgrass, black grass, and hyssop-leaved boneset. **Wetland AJ** is a very small, linear wetland, located adjacent to AI. The vegetation is limited to black grass and twig-rush, with obvious surficial indicators of hydrology (soil staining), indicating a seasonally- or temporarily-flooded water regime.

#### 6.1.8 Wetland AE

**Wetland AE** is a somewhat larger isolated wetland that meanders along the northern lease line. This densely vegetated wetland consists of a large, central patch of common reed with clumps of willow, woolgrass, Gray's Flatsedge (*Cyperus grayii*), hyssop-leaved boneset (*Eupatorium hyssopifolium*), bayberry, pilewort, and black grass.

#### 6.1.9 Wetland AF

**Wetland AF** is an isolated wetland consisting of large clumps of willow dominating the wetland interior with large clumps and patches of American cranberry, bayberry, hyssop-leaved boneset, slender-leaf goldenrod, common reed, poison ivy, twig-rush, black grass, and woolgrass. Scattered pitch pine seedlings were observed within the wetland interior.

#### 6.1.10 Wetland AI

**Wetland AI** is an isolated wetland containing a small island of coastal dune within its interior. The vegetation is dominated by bayberry and poison ivy, both species extending beyond the boundary of the wetland itself. Additional vegetation includes willow, twig-rush, woolgrass, black grass, and patches of hyssop-leaved boneset.

#### 6.1.11 Wetland AK

**Wetland AK** is a larger isolated wetland which displays two different types of vegetative communities: the western half of the wetland is dominated by willow (*Salix* sp.) and dwarf huckleberry with the remaining areas dominated by Virginia rose, bayberry, poison ivy, spotted Joe-Pye weed, meadowsweet, woolgrass, twig-rush, and steeplebush. Individual winterberry, arrowwood, and shadbush were observed in the eastern half of this wetland.

#### 6.1.12 Wetland AL

**Wetland AL** is also a large isolated wetland consisting of large clumps of pussy willow and winterberry. There is a dense low shrub community of Virginia rose, bayberry, and poison ivy interspersed with clumps and patches of woolgrass, marsh fern (*Thelypteris palustris*), twig-rush, and black grass. Dense patches of American cranberry were observed in the wetland interior. A small stand of poplar seedlings (*Populus* sp.) was observed in the southeast corner of this wetland.

#### 6.1.13 Wetland AM

**Wetland AM** is a smaller isolated wetland in the northern corner of the Airport lease area. This densely vegetated wetland is dominated by clumps and patches of American cranberry along with bayberry, winterberry, woolgrass, slender-leaf goldenrod, twig-rush, poison ivy, reed canary-grass, sea myrtle (*Baccharis halimifolia*), Virginia rose, marsh St. Johns wort (*Triadenum virginicum*), and New England aster (*Aster novae-angliae*).

#### 6.1.14 Wetlands BA, BC, CA, CB, CD, CE, CG, CH, CI, CO, CP, CQ, and DB

Wetland areas described below generally are larger isolated areas consisting of transitional shrub swamp to forested swamp communities (PSS/PFO) found largely east and south of the Airport facilities. Frequently, these areas contain small “islands” of coastal dune within interior portions.

**Wetland BA** is an isolated wetland located in the southeastern corner of the Airport lease area. The vegetation in this transitional shrub-swamp/forested swamp wetland includes woolgrass, twig-rush, American cranberry, English plantain (*Plantago lanceolata*), black grass, and highbush blueberry, with scattered pitch pine throughout.

**Wetland BC** also consists of a transitional shrub swamp/forested swamp with small patches of emergent marsh along the wetland exterior in more open areas that are dominated by twig-rush, black grass, and woolgrass. The vegetative community within the interior consists of a canopy of pitch pine with clumps and patches of highbush blueberry, American cranberry, sphagnum moss, and bayberry. Wetland BC is an extensive wetland with a meandering wetland boundary encompassing a large portion of the southeastern corner of the Airport lease area. Four coastal dune islands were located within the interior of Wetland BC. Wetland BC is contiguous with Wetlands F and G, which were previously identified by HW in 2004/2005.

**Wetland CA** is an isolated wetland with a vegetative community including pitch pine, dwarf huckleberry, American cranberry, twig-rush, woolgrass, and patches of sphagnum moss. As this area extends well off-site, only a portion of this area was delineated.

**Wetland CB** is a large isolated wetland located in close proximity to Wetlands BB and BC. The vegetation within this forested wetland includes an overstory of pitch pine with occasional swamp tupelo

(*Nyssa sylvatica*), clumps of woolgrass, twig-rush, black grass, bayberry, patches of American cranberry, and occasional clumps of American beachgrass along the wetland periphery.

**Wetland CD** is a larger isolated wetland consisting of a transitional shrub swamp/forested swamp includes a canopy of pitch pine with highbush blueberry and scattered gray birch (*Betula populifolia*), patches of American cranberry and sphagnum moss, woolgrass, black grass, and twig-rush.

**Wetland CE** is a large isolated wetland with a vegetative community similar to that found within Wetlands CC and CD with the addition of clumps and patches of inkberry (*Ilex glabra*).

**Wetland CG** is an extensive isolated wetland located along the lease line that extends well beyond this boundary. The vegetation within this wetland includes expansive patches of American cranberry, patches and clumps of sphagnum moss, twig-rush, black grass, fireweed (*Epilobium angustifolium*), and woolgrass. Shrub species encountered include sweet pepperbush (*Clethra alnifolia*) and highbush blueberry, with a canopy of pitch pine and swamp tupelo.

**Wetland CH** is a large open isolated wetland that was delineated in several non-contiguous flagging series due to its proximity to the Airport lease corner. Several linear-shaped islands of coastal dune were encountered within the interior of this wetland area. The vegetation of this wetland includes expansive areas of American cranberry interspersed with clumps and patches of sheep laurel (*Kalmia angustifolia*), highbush blueberry, individual pitch pine (in forested portions of this wetland), dwarf huckleberry, patches of sphagnum moss, twig-rush, woolgrass, and small entanglements of common greenbrier (*Smilax rotundifolia*).

**Wetland CI** is an isolated wetland that was only partially delineated due to its location along the lease line. Vegetation in this wetland includes pitch pine, woolgrass, black grass, twig-rush, winterberry, American cranberry, and highbush blueberry.

**Wetland CO** is an expansive linear wetland containing several upland islands of secondary coastal dune habitat. The vegetation of this transitional shrub swamp/forested wetland includes a pitch pine canopy with a diverse shrub community of swamp azalea (*Rhododendron viscosum*), bayberry, sheep laurel, and highbush blueberry. Additional vegetation consists of soft rush, sphagnum moss, common greenbrier, royal fern, cinnamon fern, twig-rush, black grass, poison ivy, and dense scattered patches of American cranberry.

**Wetland CP** is an isolated wetland containing a large upland island of coastal dune within its interior. The vegetation of this wetland is forested with a canopy of pitch pine including highbush blueberry, bayberry, swamp dewberry (*Rubus hispidus*), American cranberry, black grass, soft rush, woolgrass, broom sedge (*Andropogon virginicus*), twig-rush, dwarf huckleberry, New England aster, scattered common reed, occasional black cherry (*Prunus serotina*), slender-leaf goldenrod, and poison ivy.

**Wetland CQ** is a smaller isolated wetland consisting of bayberry, twig-rush, black grass, woolgrass, swamp dewberry, and poison ivy with a pitch pine overstory.

**Wetland DB** is an expansive wetland that incorporates several small islands of secondary dune. Vegetation of this transitional forested wetland includes a canopy of pitch pine, with dense carpets of American cranberry, scattered woolgrass, black grass, twig-rush, and sphagnum moss.

#### 6.1.15 Wetlands BB, CC, CJ, CK, CL, CN, CR, DA, DC, DD/E, DE, DF, DG, DH, DI, and DM

Several smaller isolated wetlands were also encountered south and east of the Airport facilities. These areas, often with developing emergent marsh communities (PEM), are generally sparsely vegetated, and occasionally support a sparse canopy of pitch pine (i.e., PFO) but lacking a definite shrub community.

**Wetland BB** is a small isolated wetland located immediately adjacent to Wetland BC, separated by a small dune ridge. The vegetation within this small wetland is limited to twig-rush and black grass and surficial indicators of hydrology.

**Wetland CC** is an isolated, forested wetland consisting of pitch pine with twig-rush, highbush blueberry, swamp tupelo, black grass, patches of sphagnum moss, and an occasional scrub oak (*Quercus ilicifolia*).

**Wetland CJ** is a very small triangular isolated wetland with a vegetative community limited to black grass and twig-rush. **Wetland CK** is a somewhat larger isolated wetland with a similar vegetative composition along the exterior and an interior canopy of pitch pine.

**Wetland CL** is a small isolated wetland, and the only wetland located among the secondary dune system in the southern “tail” of the Airport lease area. As with Wetland CK, the vegetation within this wetland is limited to pitch pine and black grass, along with obvious surficial indicators of hydrology (soil staining).

**Wetland CN** is a small isolated wetland comprised of clumps of black grass with surficial evidence of hydrology (soil staining) and subsurface hydric soils.

**Wetland CR** is a small isolated wetland consisting of an open emergent marsh community dominated by woolgrass, twig-rush, and black grass.

**Wetland DA** is an isolated wetland with a pitch pine canopy. The vegetative community is limited to clumps and patches of woolgrass, black grass, and sphagnum moss.

**Wetland DC** is a small isolated wetland that is relatively “deep” as compared to most of the more shallow depressions found within the Airport with an estimated depth of approximately 2 to 3 feet at the lowest point. This area contains small patches of sphagnum moss surrounded by surficial evidence of seasonal hydrology. A canopy of pitch pine surrounds this isolated depression.

**Wetland DD/E** is a larger isolated wetland area that constitutes an extension of Wetland E. The dominant vegetation along this section includes American cranberry, black grass, and twig-rush with a pitch pine canopy.

**Wetlands DF, DG, and DM** are all small isolated wetlands with a plant community of black grass, twig-rush, and occasional woolgrass beneath a pitch pine canopy. **Wetland DI** is a small isolated wetland with a similar vegetative community as found within **Wetlands DF** and **DH**, with the addition of dense patches of American cranberry. Vegetation within **Wetland DG** is limited to twig-rush, pitch pine, and a single bayberry shrub.

**Wetland DJ** is a smaller isolated wetland located just north of Wetland DI. The vegetative community is comprised of pitch pine, black grass, and twig-rush. **Wetlands DK** and **DL** are also isolated wetlands located along the eastern edge of the Airport lease line with similar vegetative communities as Wetland DJ.

#### 6.1.16 Wetlands CF, CM, CU, CV, and DE

Wetlands described below are generally shrub swamps (PSS) with a somewhat greater species diversity than the smaller isolated wetlands encountered.

**Wetland CF** is an isolated shrub swamp with a vegetative community dominated by highbush blueberry along with clumps and patches of black grass, sphagnum moss, and cinnamon fern (*Osmunda cinnamomea*).

**Wetland CM** is an isolated wetland located just off-site of the southernmost lease corner. Vegetation within this shrub swamp included large patches of American cranberry, with clumps and patches of sphagnum moss, woolgrass, dwarf huckleberry, sheep laurel, highbush blueberry, bayberry, poison ivy, inkberry, and twig-rush. A large patch of common reed and scattered pitch pine cover the wetland periphery.

**Wetland CU** is a small isolated wetland comprised of scattered individuals of woolgrass, bayberry, slender-leaf goldenrod, and swamp dewberry vines.

**Wetland CV** is another small isolated shrub swamp wetland encompassing clumps and patches of woolgrass, twig-rush, and slender-leaf goldenrod, with scattered bayberry and swamp dewberry vines.

**Wetland DE** is an isolated wetland with a similar vegetative community as found within Wetland DD/E with the additional of highbush blueberry and bayberry in the shrub layer.

### 6.2 Bordering Vegetated Wetland (Wetlands C, J, CS, and CT/J)

Wetland areas described below are freshwater wetlands contiguous with the larger Hatches Harbor wetland system.

#### 6.2.1 Wetlands C and J

**Wetlands C and J** are BVWs due to their direct connections to the Hatches Harbor tidal wetland system. The easternmost portions of both wetland areas are characteristic of the Coastal Interdunal Marsh community and can be further classified as scrub-shrub palustrine habitats (PSS) with areas of palustrine emergent marsh (PEM) interspersed. Commonly observed plant species included winterberry, arrowwood, meadowsweet, blue-joint (*Calamagrostis canadensis*), American cranberry, and rose (*Rosa* spp.). Lesser amounts of purple loosestrife (*Lythrum salicaria*) (a non-native species), wide-leaf cattail (*Typha latifolia*), and woolgrass were also observed within these interdunal swales. In addition, there are significantly large communities of common reed within Wetland C, particularly to the north of the taxiway. The eastern corner of Wetland C nearest the Airport terminal and parking lot is a forested palustrine habitat (PFO) supporting a mature community of willow trees. The easternmost portions of these wetlands are non-tidal and probably have a seasonally- or temporarily-flooded water regime.

The westernmost portions of both wetlands are common reed-dominant emergent marshes (PEM), likely have a ground water table at or near the surface for most of the year, and likely experience an irregularly flooded tidal water regime. The soil survey indicates that the Berryland mucky loamy coarse sand (0-2% slopes) and Pipestone loamy coarse sand (0-3% slopes) are the two soil types that comprise these wetland areas.

### 6.2.2 Wetland CS

**Wetland CS** represents a portion of the larger BVW along Hatches Harbor. The vegetation within this wetland area is comprised of woolgrass, bayberry, twig-rush, black grass, and occasional pitch pine.

### 6.2.3 Wetland CT/J

**Wetland CT/J** is also a BVW associated with the Hatches Harbor wetland system. Flagging stations represent the southwestern boundary of Wetland J, which abuts managed areas near the approach to the Runway 7 end. While the wetland boundary is representative of a freshwater wetland (BVW), the vegetative community transitions from freshwater to brackish to saline, and contains a large diversity of wetland indicator species. Species encountered include black grass, slender-leaf goldenrod, St. John's wort, marsh fern, twig-rush, swamp dewberry, American cranberry, poison ivy, and common greenbrier. Interior sections contain a large area dominated by common reed, while the upper edge of the brackish community is comprised of several shrub species, including highbush blueberry, bayberry, winterberry, meadowsweet, and scattered eastern red cedar (*Juniperus virginiana*).

## 6.3 Updated and Amended Isolated Freshwater Wetland Descriptions

Throughout the descriptions of the isolated wetlands delineated in 2006, HW references wetland areas delineated prior to the development of the Master Plan (i.e., areas delineated in 2004 and 2005 under a more limited assessment area), in particular Wetlands F, G, E, K, and L. Below is a discussion of modifications or expansions to these areas.

**Wetlands K and L.** Portions of Wetlands K and L that had had been delineated for the purposes of the ENF and were previously identified as two separate isolated wetlands. Once revisited for the purposes of supporting DEIR, HW determined that these two areas constitute a single larger isolated wetland, interrupted by small ridges of secondary coastal dune. HW identified and delineated several of these dune ridges as they relate to various CIP project footprints, but did not delineate all of these dune areas.

**Wetlands F and G.** Wetlands F and G, previously delineated in part for the purposes of the ENF, were incorporated within the larger Wetland BC. As a result, the designations for Wetlands F and G were eliminated from the updated plans (see Figure 6).

**Wetland E.** As described above, Wetland E is hydrologically connected to the area labeled as Wetland DD. As a result, the designation on the site plans is Wetland E/DD.

## 6.4 Salt Marsh

Salt Marsh associated with the Hatches Harbor wetland system is found along the base of a secondary dune ridge running approximately perpendicular to the Lease Line in the northwestern part of the Airport. HW delineated a segment of this salt marsh as it relates to the Lease Line, where previously freshwater vegetation has begun to die back (due to tidal flushing). In this area, HW observed dead or dying shrubs of bayberry, sumac (*Rhus* sp.), rugosa rose, and highbush blueberry, among developing patches of saltmarsh cordgrass (*Spartina patens*). A small ridge of dune was also identified in this area. This area and its immediate surroundings have not taken on the full distinctions of a salt marsh. The Hatches Harbor Salt Marsh Restoration Project is relatively recent, as compared to the geologic development of the entire wetland system, but it is clear that this area is characteristic of a salt marsh. This portion of developing salt marsh is contiguous with Wetland areas CT and J.

## 7. WETLANDS FUNCTIONS AND VALUES

Freshwater wetlands contribute to the protection of groundwater supply, public and private water supplies, storm damage prevention and flood storage control, water quality, protection of fisheries and preservation of wildlife habitat, and in some instances preservation of rare species habitat. The majority of the wetlands delineated at the Airport provide many of the same functions and values, depending on location and cover type. Most, if not all, of the wetland areas contribute to flood storage and flood storage control by retaining stormwater runoff and allowing for slow groundwater recharge. These wetlands also contribute to water quality by removing sediments and attenuating pollutants.

The topography, soil structure, plant community composition and structure, and hydrologic regime of certain wetlands contribute to the protection of wildlife habitat by providing food, shelter, migratory and overwintering areas, and breeding areas for birds, mammals, reptiles, and amphibians. Some of the wetland areas, particularly those within the coastal interdunal marsh/swales, may also provide habitat for rare species.

A summary of the potential functions and values of the delineated wetland areas is provided in Table 1. Further discussion of the wildlife habitat values of these areas is provided in a separate *Summary of Natural Resources and Rare Species Habitat Assessments* report (HW, April 2007).



Table 1. Summary of jurisdictional wetland areas delineated at the Provincetown Municipal Airport, Provincetown, Massachusetts.

WETLAND AREA	CLASSIFICATION	JURISDICTION <sup>1</sup>	FUNCTIONS AND VALUES
Salt Marsh	EEM	ACOE, DEP, PCC, CCC	Protection of Marine Fisheries, Wildlife Habitat; Storm Damage Prevention; Groundwater and Water Quality;
Wetland AA	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AB	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AC	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AD	PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AE	PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AF	PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AG	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AI	PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AJ	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland AK	PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality
Wetland AL	PFO/PSS/PEM	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality
Wetland AM	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland BA	PSS/PEM/PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland BB	PEM	ACOE, PCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland BC	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CA	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CB	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CC	PSS/PEM/PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CD	PSS/PEM/PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CE	PSS/PEM/PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CF	PSS/PEM/PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CG	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CH	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CI	PSS	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CJ	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CK	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CL	PFO/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CM	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CN	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CO	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CP	PFO/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CQ	PFO/PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CR	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CS	PFO/PSS/PEM	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CT	PFO/PSS/PEM	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland CU	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality
Wetland CV	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality
Wetland DA	PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DB	PSS/PEM/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DC	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DD	PSS/PEM/PFO	ACOE, PCC, CCC (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DE	PSS/PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DF	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DG	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DH	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DI	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DJ	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DK	PSS/PEM/PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DL	PSS/PEM/PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland DM	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat

<sup>1</sup> Note: the jurisdictional status of Isolated Land Subject to Flooding (ILSF) under the State Regulations at 310 CMR 10.57(2)(b) has not yet been determined.

Table 1 (cont.)

WETLAND AREA	CLASSIFICATION	JURISDICTION	FUNCTIONS AND VALUES
Wetland A	PSS/PFO	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland B	PSS/PEM	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland C	PSS/PEM/PFO	ACOE, PCC, CCC (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland D	PFO	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland E	PFO/PSS	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland F	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland G	PSS	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland H	PSS	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland I	PSS	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland J	PSS/PEM	ACOE, PCC, CCC (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland K	PEM	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland L	PFO/PSS	ACOE, PCC, CCC, (DEP)	Flood Storage/Flood Control; Groundwater and Water Quality; Wildlife Habitat
Wetland M	PEM	ACOE, PCC, CCC	Flood Storage/Flood Control; Groundwater and Water Quality
Wetland N	PEM	ACOE	Flood Storage/Flood Control; Groundwater and Water Quality

**KEY**

**Classification** (Cowardin, et al., 1979)

- PSS Palustrine Scrub-Shrub wetland
- PFO Palustrine Forested habitat
- PEM Palustrine Emergent Marsh
- EEM Estuarine Emergent Marsh

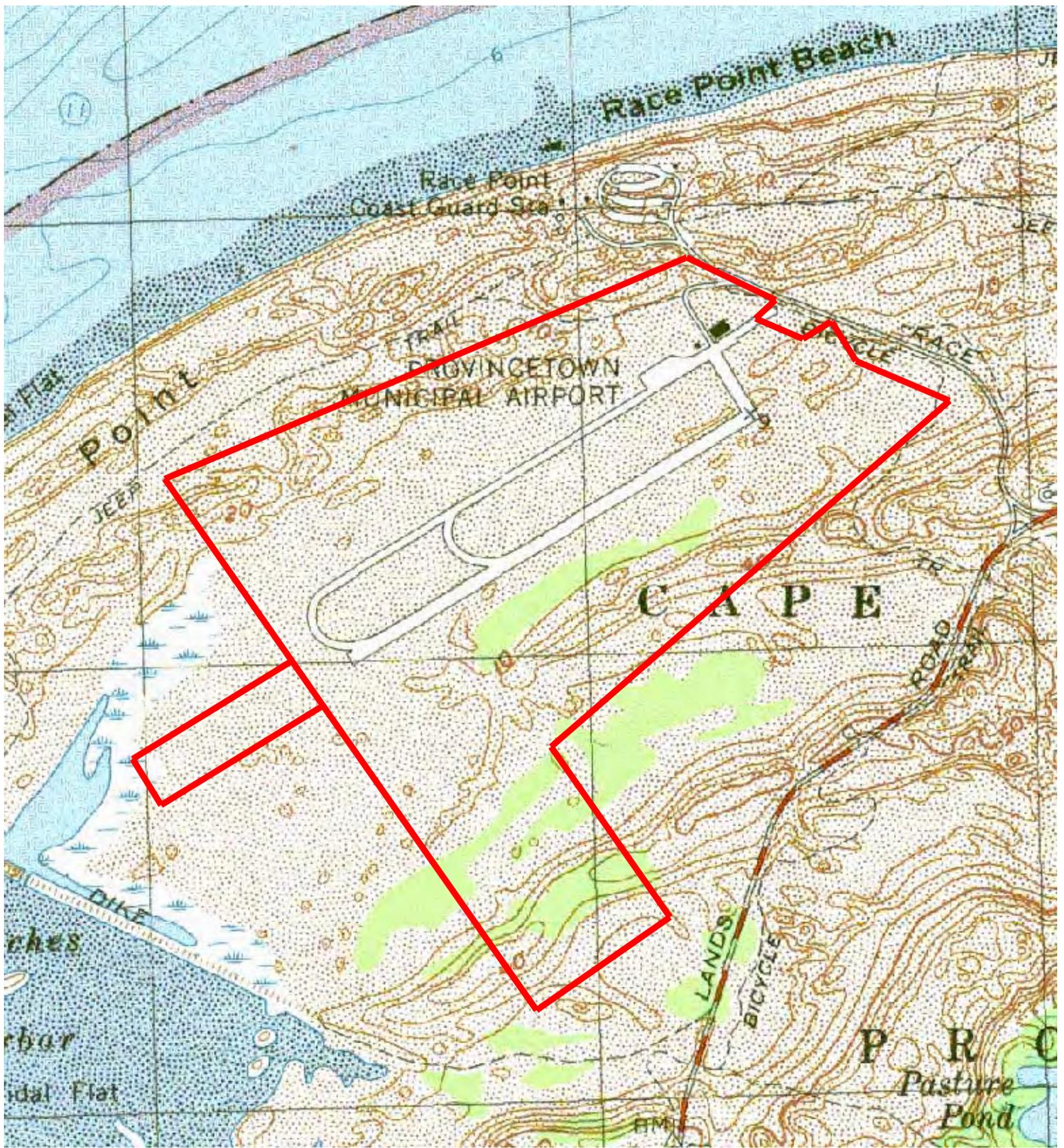
**Jurisdiction**

- DEP Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40) and Regulations (310 CMR 10.00)
- ACOE Section 404 of the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*) (Army Corps of Engineers)
- PCC Provincetown *Wetlands Protection Bylaw* (Chapter 12)
- CCC Cape Cod Commission Regional Policy Plan

## 8. REFERENCES

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- Horsley Witten Group, Inc. 2006. Abbreviated Notice of Resource Area Delineation (December 2006).
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- Swain, P.C. and J.B. Kearsley. 2001. Classification of the Natural Communities of Massachusetts. Version 1.3. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife. Westborough, MA.





**Legend**

 Airport Lease Line

\*Data Source: MassGIS, Commonwealth of Massachusetts EOEA

Horsley Witten Group   
 phone: 508-833-8800  
 www.horsleywitten.com

USGS Locus  
 Provincetown Municipal Airport  
 Provincetown, MA

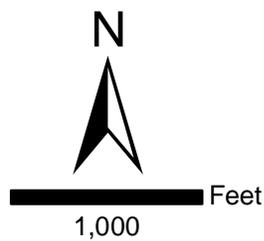
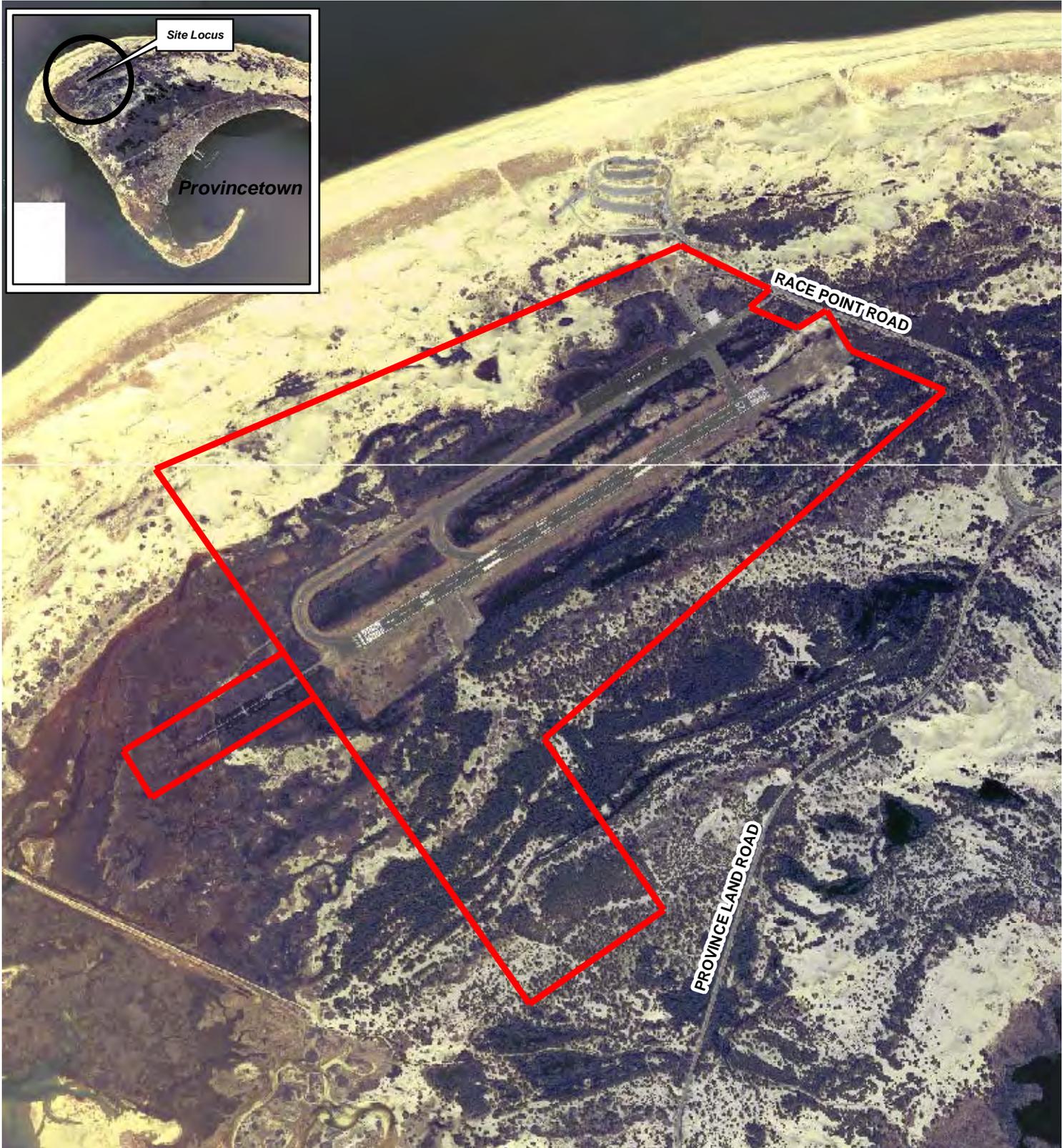


Figure 1

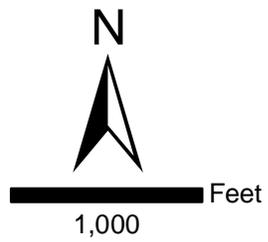




\*Data Source: MassGIS, Commonwealth of Massachusetts EOE

**Legend**

 Airport Lease Line

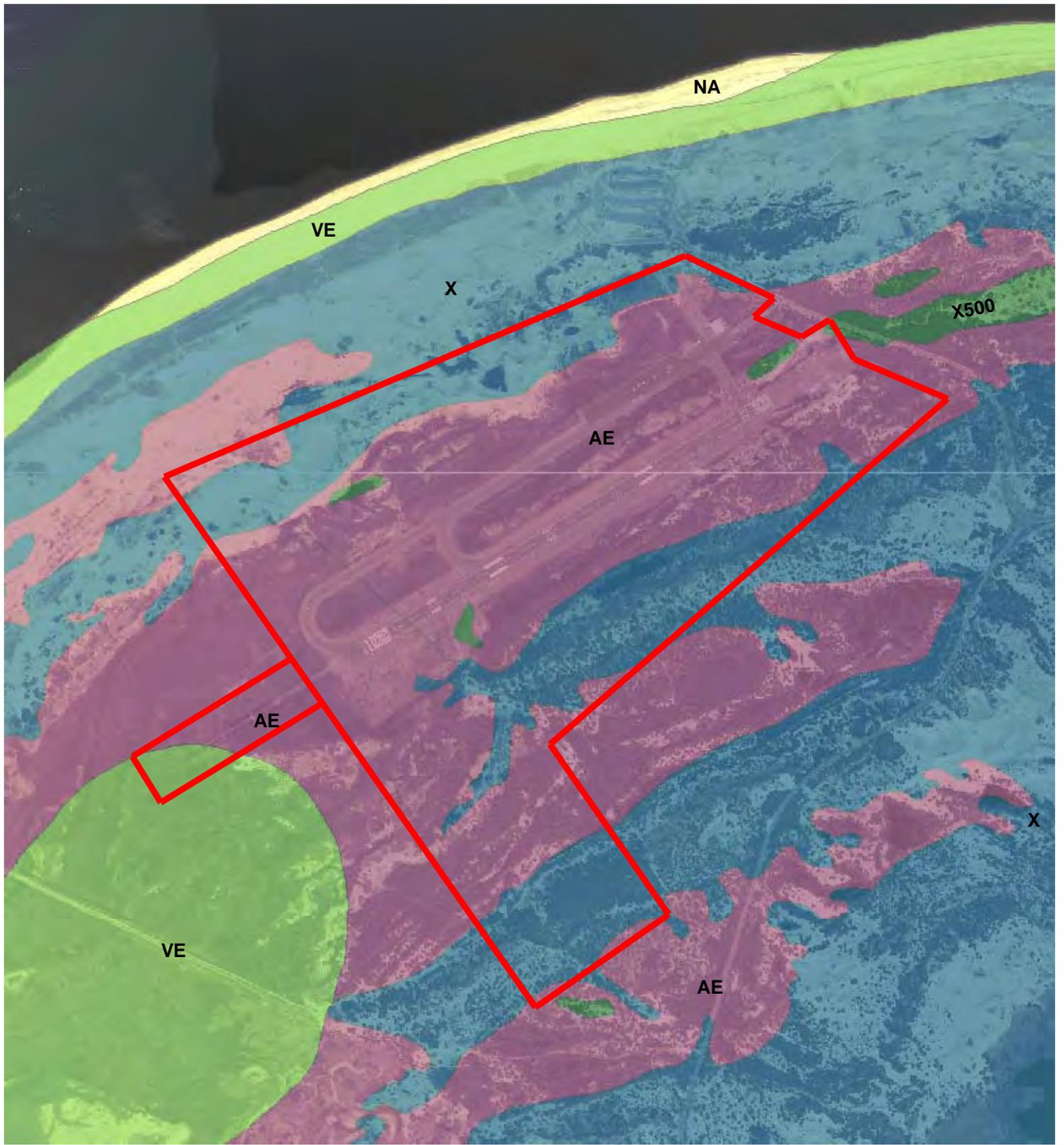


Horsley Witten Group  
 phone: 508-833-8800  
 www.horsleywitten.com

Aerial Photo  
 Provincetown Municipal Airport  
 Provincetown, MA

Figure 2





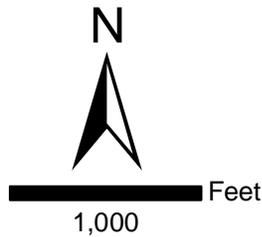
**Legend**

\*Data Source: MassGIS, Commonwealth of Massachusetts EOEa

 Airport Lease Line

**FEMA Flood Zones**

- |  |   |  |
|--|---|--|
|  A   |  AO    |  VE   |
|  AE  |  D     |  X    |
|  AH  |  UNDES |  X500 |
|  ANI |  V     | NA = Not Available   |

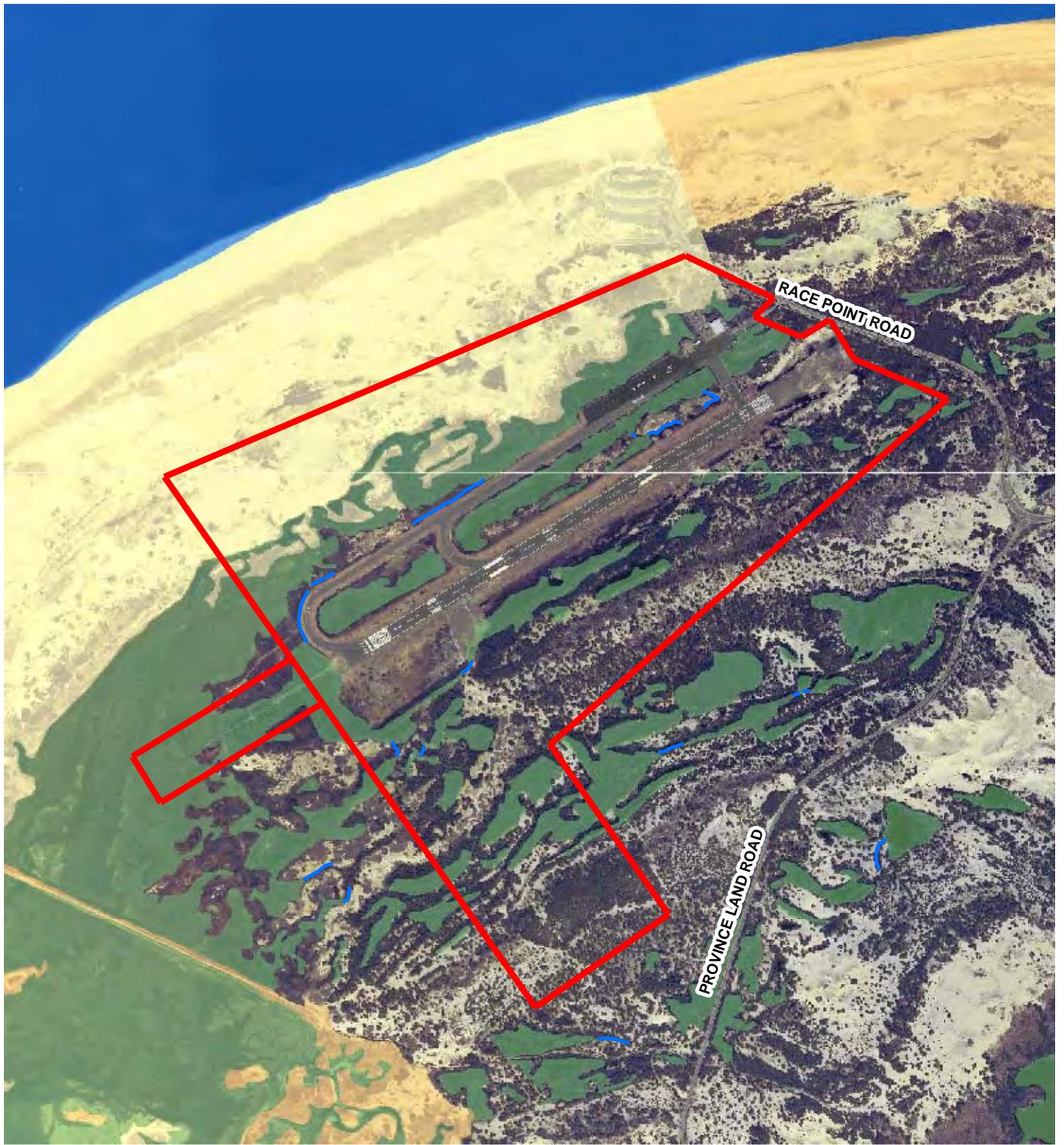


Horsley Witten Group  
 phone: 508-833-8800  
 www.horsleywitten.com 

FEMA Flood Zones  
 Provincetown Municipal Airport  
 Provincetown, MA

Figure 3





**Legend**

\*Data Source: MassGIS, Commonwealth of Massachusetts EOE

 Airport Lease Line

 Streams

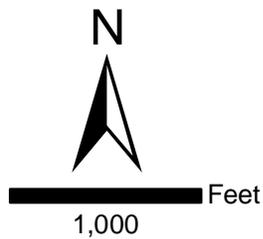
**DEP Wetlands**

 Barrier Beach

 Surface Water

 Coastal Bank, Bluff, Dune, Beach or Sea Cliff

 Wetlands

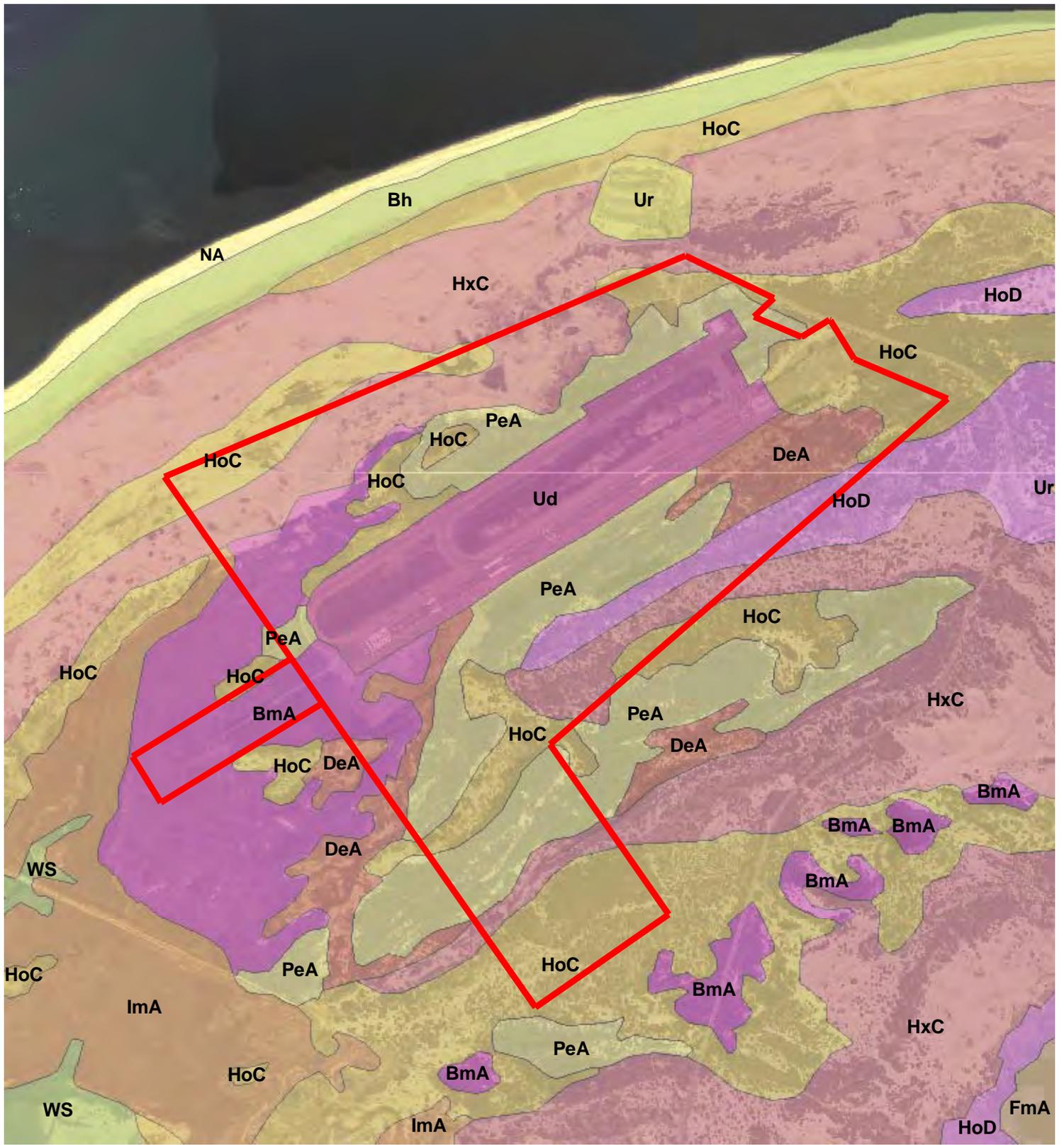


Horsley Witten Group   
 phone: 508-833-8800  
 www.horsleywitten.com

DEP Wetlands & Streams  
 Provincetown Municipal Airport  
 Provincetown, MA

Figure 4





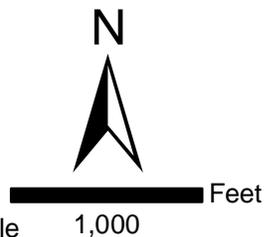
**Legend**

\*Data Source: MassGIS, Commonwealth of Massachusetts EOE

 Airport Lease Line

**Soils**

- |  |   |   |  |
|--|---|---|--|
|  Bh  |  FmA |  HxC |  Ur |
|  BmA |  FsA |  ImA |  W  |
|  DeA |  HoC |  PeA |  WS |
|  Dm  |  HoD |  Ud  | NA = Not Available   |

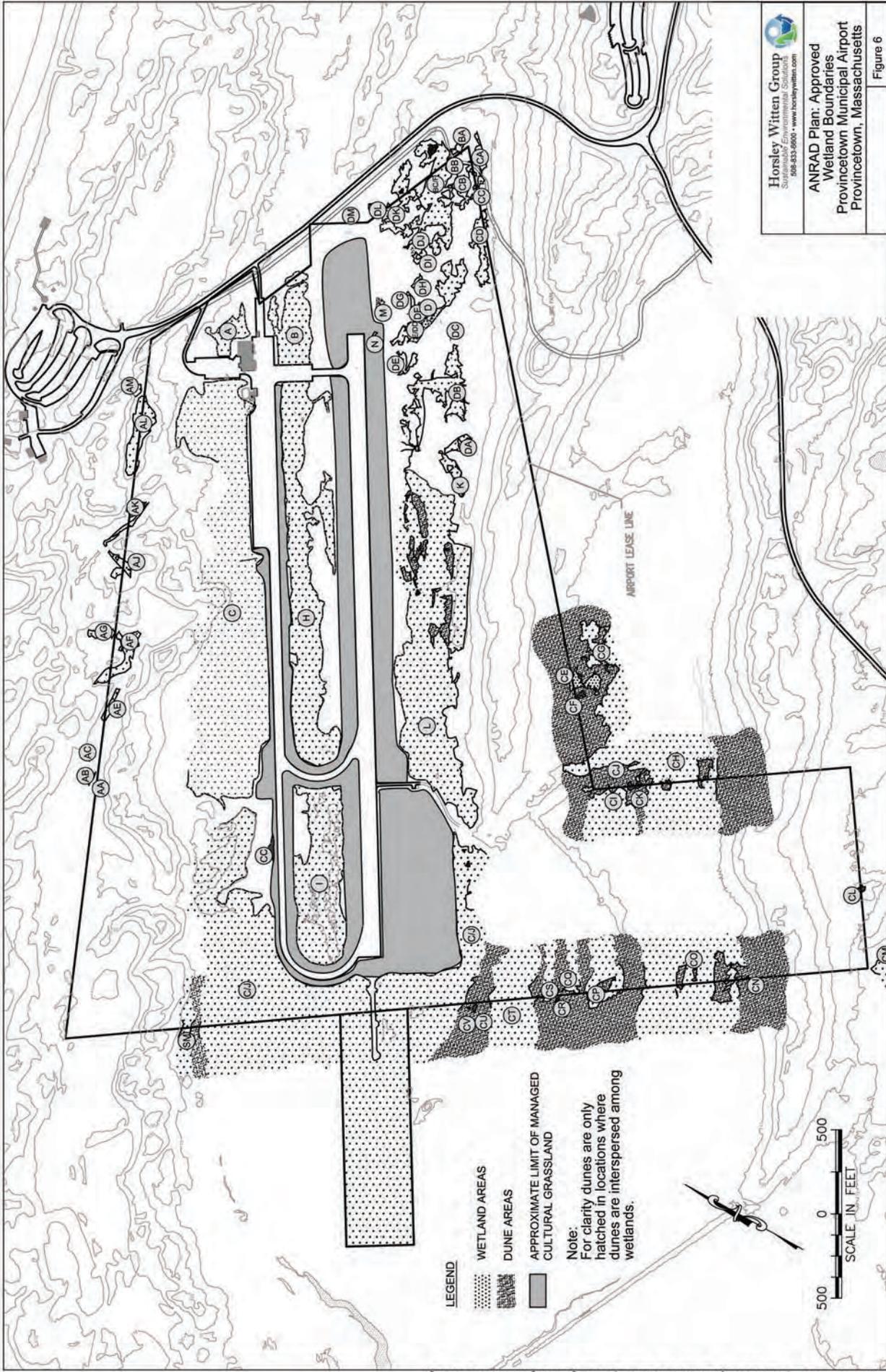


Horsley Witten Group  
 phone: 508-833-8800  
 www.horsleywitten.com

Soils  
 Provincetown Municipal Airport  
 Provincetown, MA

Figure 5







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**APPENDICES**

*DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Forms*

Order of Resource Area Delineation (issued January 25, 2007)

U.S. Army Corps of Engineers Jurisdictional Determination



# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: \_\_\_\_\_ Prepared by: HOBSEY WITTEN Project location: PRINCETON MUNICIPAL AIRPORT DEP File #: \_\_\_\_\_

Check all that apply:

- Vegetation alone presumed adequate to delineate BVW; fill out Section I only
- Vegetation and other indicators of hydrology used to delineate BVW boundary; fill out Sections I and II
- Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: E1-WET Transect Number: TE-1 Date of Delineation: 11 AUG 2004

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. NWI Wetland Indicator
<u>TREES</u> (species abundance determined through DBH measurements and basal area calc's): pitch pine <i>Pinus rigida</i>	85.5	100.0	YES	FACU
<u>SAPLINGS</u> (species abundance determined by estimating aerial cover class): no species of sapling size observed within limits of this vegetation community sampling plot				
<u>SHRUBS</u> (species abundance determined by estimating aerial cover class): Northern bayberry <i>Myrica pensylvanica</i> highbush blueberry <i>Vaccinium corymbosum</i>	20.5 20.5	50.0 50.0	YES YES	FAC FACW
<u>GROUND COVER</u> (species abundance determined by estimating aerial cover class): wool grass <i>Scirpus cyperinus</i> large cranberry <i>Vaccinium macrocarpon</i>	5.0 85.5	5.5 94.5	NO YES	FACW+ OBL
<u>MOSESSE &amp; LIVERWORTS</u> (species abundance determined by estimating aerial cover class): no mosses or liverworts observed within limits of this vegetation community sampling plot				
<u>CLIMBING WOODY VINES</u> (species abundance determined by estimating aerial cover class): no climbing woody vines observed within limits of this vegetation community sampling plot				

**HW established this soil profile and plant community observation transect in a location along the boundary of Wetland E. Plant community was typical of the pitch pine / cranberry-dominant interdunal forested swale habitats common at this site.**

\*Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:**  
 Number of dominant wetland indicator plants: 3      Number of dominant non-wetland indicator plants: 1  
 Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? (yes) no

*If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability, ANRAD, or Notice of Intent.*

## Section II. Indicators of Hydric Soils & Hydrology

Hydric Soil Interpretation (WETLAND HABITAT)

### 1. Soil Survey

Is there a published soil survey for this site? YES no  
 title/date: Barnstable County - 1993  
 map number: 1  
 soil type mapped: Pipestone Loamy Crs Sand  
 0 - 3 percent slopes  
 hydric soil inclusions: Pipestone is a listed hydric.  
 Berryland and Walpole are listed  
 Are field observations consistent with soil survey descrip? YES no  
 Remarks:

### 2. Soil Morphology (Soil Profile Description)

Horiz/Layer Depth Texture Matrix Color Redoximorphic Features

ORGANIC MATERIAL ACCUMULATION ON  
 SOIL SURFACE  
 w/ ORGANIC STREAKING IN SOIL MATRIX  
 IMMEDIATELY BELOW,  
 AND  
 w/ REDOX CONCENTRATIONS w/in 12"  
 (DISTINCT, REDDISH-BROWN, 10-15%)

Remarks:

3. Other:

Conclusion: Is soil hydric? (yes) no

Other Indicators of Wetland Hydrology: (check/describe all that apply)

- Site inundated: OBSERVED IN SPRING 05
- Depth to free water in observation hole: \_\_\_\_\_
- Depth to saturation in observation hole: \_\_\_\_\_
- Water marks: \_\_\_\_\_
- Drift lines: \_\_\_\_\_
- Sediment deposits: \_\_\_\_\_
- Drainage patterns in BVW: \_\_\_\_\_
- Oxidized rhizospheres: \_\_\_\_\_
- Water-stained/blackened leaves: \_\_\_\_\_
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_
- Other: \_\_\_\_\_

Plant Community and Hydrology Conclusion		yes	no
Number of wetland indicator plants =>	number of non-wetland indicator plants	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Wetland hydrology:			
hydric soil present		<input checked="" type="checkbox"/>	<input type="checkbox"/>
other wetland hydrology indicators		<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Sample location is in a BVW</b>		<input checked="" type="checkbox"/>	<input type="checkbox"/>

Submit this form with the Request for Determination of Applicability or Notice of Intent.

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: \_\_\_\_\_ Prepared by: HORSLEY WITTEN GROUP, INC. Project location: PROVINCE TOWN MUNICIPAL AIRPORT DEP File #: \_\_\_\_\_

- Check all that apply:
- Vegetation alone presumed adequate to delineate BVW: fill out Section I only
  - Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
  - Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: EL-UPL Transect Number: TE-1 Date of Delineation: 11 AUG 2004

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. NWI Wetland Indicator
<b>TREES</b> (species abundance determined through DBH measurements and basal area calc's):				
pitch pine <i>Pinus rigida</i>	85.5	100.0	YES	FACU
<b>SAPLINGS</b> (species abundance determined by estimating aerial cover class):				
no species of sapling size observed within limits of this vegetation community sampling plot				
<b>SHRUBS</b> (species abundance determined by estimating aerial cover class):				
Northern bayberry <i>Myrica pensylvanica</i>	20.5	28.5	YES	FACU
pitch pine <i>Pinus rigida</i>	20.5	28.5	YES	FACU
scrub oak <i>Quercus ilicifolia</i>	20.5	28.5	YES	UPL
highbush blueberry <i>Vaccinium corymbosum</i>	10.5	14.6	NO	FACU -
<b>GROUND COVER</b> (species abundance determined by estimating aerial cover class):				
bearberry <i>Arctostaphylos uva-ursi</i>	63.0	68.5	YES	UPL
common hairgrass <i>Deschampsia flexuosa</i>	10.0	10.9	NO	UPL
American beachgrass <i>Ammophila brevifolium</i>	10.0	10.9	NO	UPL
lowbush blueberry <i>Vaccinium angustifolium</i>	3.0	3.3	NO	UPL
starflower <i>Trientalis borealis</i>	3.0	3.3	NO	FACU
bracken fern <i>Pteridium aquilinum</i>	3.0	3.3	NO	FACU
<b>MOSESSES &amp; LIVERWORTS</b> (species abundance determined by estimating aerial cover class):				
no mosses or liverworts observed within limits of this vegetation community sampling plot				
<b>CLIMBING WOODY VINES</b> (species abundance determined by estimating aerial cover class):				
no climbing woody vines observed within limits of this vegetation community sampling plot				

**HW established this soil profile and plant community observation transect in a location along the boundary of Wetland E. This plant community was typical of the dune habitats adjacent to the pitch pine / cranberry-dominant interdunal forested swale habitats common at this site.**

\*Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations describe the adaptation next to the asterisk.

**Vegetation conclusion:**  
 Number of dominant wetland indicator plants: \_\_\_\_\_ Number of dominant non-wetland indicator plants: 4  
 Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? yes (no)

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability, ANRAD, or Notice of Intent.

## Section II. Indicators of Hydric Soils & Hydrology

Hydric Soil Interpretation ( UPLAND AREA )

### 1. Soil Survey

Is there a published soil survey for this site? **YES** no  
 title/date: **Barnstable County - 1993**  
 map number: **1**  
 soil type mapped: **Deerfield Loamy Fine Sand**  
 hydric soil inclusions: **Pipestone is listed**

Are field observations consistent with soil survey descrip? **YES** no  
 Remarks:

### 2. Soil Morphology (Soil Profile Description)

Horiz/Layer Depth Texture Matrix Color Redoximorphic Features

**TYPICAL DUNE HABITAT SOIL PROFILE.**  
**NO ORGANIC ACCUMULATION.**  
**NO REDOX FEATURES.**

Remarks:

3. Other:

Conclusion: Is soil hydric? yes **(no)**

Other Indicators of Wetland Hydrology: (check/describe all that apply)

- Site inundated: \_\_\_\_\_
- Depth to free water in observation hole: \_\_\_\_\_
- Depth to saturation in observation hole: \_\_\_\_\_
- Water marks: \_\_\_\_\_
- Drift lines: \_\_\_\_\_
- Sediment deposits: \_\_\_\_\_
- Drainage patterns in BVW: \_\_\_\_\_
- Oxidized rhizospheres: \_\_\_\_\_
- Water-stained/blackened leaves: \_\_\_\_\_
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_
- Other: \_\_\_\_\_

Plant Community and Hydrology Conclusion	yes	no
Number of wetland indicator plants =/ > number of non-wetland indicator plants	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wetland hydrology: hydric soil present	<input type="checkbox"/>	<input checked="" type="checkbox"/>
other wetland hydrology indicators	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Sample location is in a BVW</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Submit this form with the Request for Determination of Applicability or Notice of Intent.

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: \_\_\_\_\_ Prepared by: HUBERT WITTEN Project location: PROVINCE TOWN DEP File #: \_\_\_\_\_  
ERDOP, INC. MUNICIPAL AIRPORT

Check all that apply:  
 Vegetation alone presumed adequate to delineate BVW: fill out Section I only  
 Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II  
 Method other than dominance test used (attach additional information)

Section I. **Vegetation** Observation Plot Number: A1-WET Transect Number: TA-1 Date of Delineation: 8-10-04

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. NWI Wetland Indicator
<b>TREES</b> (species abundance determined through DBH measurements and basal area calc's):				
Bebb willow <i>Salix bebbiana</i>	85.5	100.0	YES	FACW
<b>SAPLINGS</b> (species abundance determined by estimating aerial cover class):				
no species of sapling size observed within limits of this vegetation community sampling plot				
<b>SHRUBS</b> (species abundance determined by estimating aerial cover class):				
Northern bayberry <i>Myrica pensylvanica</i>	3.0	5.5	NO	FAC
Bebb willow <i>Salix bebbiana</i>	10.5	19.1	YES	FACW
trembling aspen <i>Populus tremula</i>	10.5	19.1	YES	FACU
winterberry <i>Ilex verticillata</i>	20.5	37.3	YES	FACW+
dwarf huckleberry <i>Gaylussacia dumosa</i>	10.5	19.1	YES	FAC

**GROUND COVER** (species abundance determined by estimating aerial cover class):

broad-leaf meadowsweet <i>Spiraea latifolia</i>	38.0	33.3	YES	FAC+
poison ivy <i>Toxicodendron radicans</i>	38.0	33.3	YES	FAC
dwarf huckleberry <i>Gaylussacia dumosa</i>	38.0	33.3	YES	FAC

**MOSSES & LIVERWORTS** (species abundance determined by estimating aerial cover class):  
 no mosses or liverworts observed within limits of this vegetation community sampling plot

**CLIMBING WOODY VINES** (species abundance determined by estimating aerial cover class):

poison ivy <i>Toxicodendron radicans</i>	5.0	100.0	YES
--	-----	-------	-----

**HW established this soil profile and plant community observation transect in a location between flag stations A-41 and A-42.**

\*Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*: plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:**  
 Number of dominant wetland indicator plants: 7      Number of dominant non-wetland indicator plants: 1  
 Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? (yes) no  
*If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability, ANRAD, or Notice of Intent.*

## Section II. Indicators of Hydric Soils & Hydrology

Hydric Soil Interpretation (WETLAND HABITAT)

### 1. Soil Survey

Is there a published soil survey for this site? YES no  
 title/date: Barnstable County - 1993  
 map number: 1  
 soil type mapped: Pipestone Loamy Crs Sand  
 0 - 3 percent slopes  
 hydric soil inclusions: Pipestone is a listed hydric.  
 Berryland and Walpole are listed  
 Are field observations consistent with soil survey descrip? YES no  
 Remarks:

### 2. Soil Morphology (Soil Profile Description)

Horiz/Layer Depth Texture Matrix Color Redoximorphic Features

APPROX' 4 INCHES OF ORGANIC MATERIAL  
 AT / ON SOIL SURFACE.  
 WITH ORGANIC STREAKING IN MEDIUM  
 SAND SOIL MATRIX IMMEDIATELY  
 BELOW SURFACE ORGANICS

Remarks:

### 3. Other:

Conclusion: Is soil hydric? (yes) no

Other Indicators of Wetland Hydrology: (check/describe all that apply)

- Site inundated: \_\_\_\_\_
- Depth to free water in observation hole: \_\_\_\_\_
- Depth to saturation in observation hole: \_\_\_\_\_
- Water marks: ON TRUNKS / STEMS OF WOODY PLANTS
- Drift lines: \_\_\_\_\_
- Sediment deposits: \_\_\_\_\_
- Drainage patterns in BVW: \_\_\_\_\_
- Oxidized rhizospheres: \_\_\_\_\_
- Water-stained/blackened leaves: \_\_\_\_\_
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_
- Other: \_\_\_\_\_

### Plant Community and Hydrology Conclusion

Number of wetland indicator plants =/ >  
 number of non-wetland indicator plants

yes [x] no [ ]

Wetland hydrology:  
 hydric soil present [x] [ ]

other wetland hydrology indicators [x] [ ]

Sample location is in a BVW [x] [ ]

Submit this form with the Request for Determination of Applicability or Notice of Intent.

# DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: HOBSEY WITTEN GAP Project location: PROVINCETOWN MUNICIPAL AIRPORT DEP File #: \_\_\_\_\_

Check all that apply:

- Vegetation alone presumed adequate to delineate BVW: fill out Section I only
- Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- Method other than dominance test used (attach additional information)

Section I. **Vegetation** Observation Plot Number: A1-UPL Transect Number: T A-1 Date of Delineation: 8-10-04

**A. Sample Layer and Plant Species (by common/scientific name)**      **B. Percent Cover (or basal area)**      **C. Percent Dominance**      **D. Dominant Plant (yes or no)**      **E. NWI Wetland Indicator**

**TREES** (species abundance determined through DBH measurements and basal area calc's):

pitch pine	<i>Pinus rigida</i>	28.3	43.8	YES	FACU
Bebb willow	<i>Salix bebbiana</i>	36.3	56.2	YES	FACW

**SAPLINGS** (species abundance determined by estimating aerial cover class):

no species of sapling size observed within limits of this vegetation community sampling plot

**SHRUBS** (species abundance determined by estimating aerial cover class):

Northern bayberry	<i>Myrica pensylvanica</i>	20.5	55.4	YES	FAC
beach plum	<i>Prunus maritima</i>	10.5	28.4	YES	UPL
trembling aspen	<i>Populus tremula</i>	3.0	8.1	NO	FACU
lowbush blueberry	<i>Vaccinium ananquifolium</i>	3.0	8.1	NO	UPL
pitch pine	<i>Pinus rigida</i>	T	0.0	NO	FACU

**GROUND COVER** (species abundance determined by estimating aerial cover class):

bearberry	<i>Arctostaphylos uva-ursi</i>	20.5	43.6	YES	UPL
poverty grass	<i>Danthonia spicata</i>	20.5	43.6	YES	UPL
common hairgrass	<i>Deschampsia flexuosa</i>	3.0	6.4	NO	UPL
little bluestem	<i>Schizachyrium scoparium</i>	3.0	6.4	NO	FACU

**MOSESSES & LIVERWORTS** (species abundance determined by estimating aerial cover class):

no mosses or liverworts observed within limits of this vegetation community sampling plot

**CLIMBING WOODY VINES** (species abundance determined by estimating aerial cover class):

no climbing woody vines observed within limits of this vegetation community sampling plot

**HW established this soil profile and plant community observation transect in a location between flag stations A-41 and A-42.**

\*Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*: plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

**Vegetation conclusion:**

Number of dominant wetland indicator plants: 2      Number of dominant non-wetland indicator plants: 4

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants?    yes     no

*If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability, ANRAD, or Notice of Intent.*

## Section II. Indicators of Hydric Soils & Hydrology

Hydric Soil Interpretation ( UPLAND AREA )

### 1. Soil Survey

Is there a published soil survey for this site? YES no  
 title/date: Barnstable County - 1993  
 map number: 1  
 soil type mapped: Hooksan Sand, Rolling

hydric soil inclusions: None listed by survey

Are field observations consistent with soil survey descrip? YES no  
 Remarks:

### 2. Soil Morphology (Soil Profile Description)

Horiz/Layer Depth Texture Matrix Color Redoximorphic Features

NO ORGANIC MATERIAL ACCUMULATION  
 OR STREAKING.  
 TYPICAL LOOSE, DRY MEDIUM SAND.

Remarks:

### 3. Other:

Conclusion: Is soil hydric? yes (no)

Other Indicators of Wetland Hydrology: (check/describe all that apply)

- Site inundated: \_\_\_\_\_
- Depth to free water in observation hole: \_\_\_\_\_
- Depth to saturation in observation hole: \_\_\_\_\_
- Water marks: \_\_\_\_\_
- Drift lines: \_\_\_\_\_
- Sediment deposits: \_\_\_\_\_
- Drainage patterns in BWV: \_\_\_\_\_
- Oxidized rhizospheres: \_\_\_\_\_
- Water-stained/blackened leaves: \_\_\_\_\_
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): \_\_\_\_\_
- Other: \_\_\_\_\_

### Plant Community and Hydrology Conclusion

Number of wetland indicator plants =/>> yes [ ] no [x]  
 number of non-wetland indicator plants

Wetland hydrology:  
 hydric soil present [ ] [x]

other wetland hydrology indicators [ ] [x]

Sample location is in a BWV [ ] [x]

Submit this form with the Request for Determination of Applicability or Notice of Intent.





**WPA Form 4B – Order of Resource Area Delineation**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

---

## B. Order of Delineation

The Conservation Commission has determined the following (check whichever is applicable):

**Accurate:** The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

Bordering Vegetated Wetlands

Other Resource Area(s), specifically:

isolated vegetated wetland, vegetated wetlands, unvegetated wetlands, isolated land subject to flooding, coastal flood zone, coastal dune and barrier beach, salt marsh.

---

**Modified:** The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

Bordering Vegetated Wetlands

Other Resource Area(s), specifically:

---

---

**Inaccurate:** The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

Bordering Vegetated Wetlands

Other Resource Area(s), specifically:

---

---

The boundaries were determined to be inaccurate because:

---

---

---



# WPA Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

## B. Order of Delineation (cont.)

This Order of Resource Area Delineation determines the boundaries of those resource areas noted above and is binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00) regarding such boundaries. This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see Appendix A)

Signatures:

*[Handwritten signatures: Gordon, Paul Moody, Lynn L. Martin, Peter U. Gold]*

This Order is valid for three years from the date of issuance.

This Order is issued to the applicant and the property owner (if different) as follows:

by hand delivery on

by certified mail, return receipt requested on

Date

Date

1/25/07

## C. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office (see Appendix A) to issue a Superseding Order of Resource Area Delineation. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Appendix E: Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**DEP Regional Addresses**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

*Mail transmittal forms and DEP payments, payable to:*

Commonwealth of Massachusetts  
Department of Environmental Protection  
Box 4062  
Boston, MA 02211

**DEP Western Region**  
436 Dwight Street  
Suite 402  
Springfield, MA 01103  
Phone: 413-784-1100  
Fax: 413-784-1149

Adams	Colrain	Hampden	Monroe	Pittsfield	Tyringham
Agawam	Conway	Hancock	Montague	Plainfield	Wales
Alford	Cummington	Hatfield	Montlery	Richmond	Ware
Amherst	Dalton	Hawley	Montgomery	Rowe	Warwick
Ashfield	Deerfield	Heath	Monson	Russell	Washington
Becket	Easthampton	Hinsdale	Mount Washington	Sandisfield	Wendell
Belchertown	East Longmeadow	Holland	New Ashford	Savoy	Westfield
Bernardston	Egremont	Holyoke	New Marlborough	Sheffield	Westhampton
Blandford	Erving	Huntington	New Salem	Shelburne	West Springfield
Brimfield	Florida	Lanesborough	North Adams	Shutesbury	West Stockbridge
Buckland	Gill	Lee	Northampton	Southampton	Whately
Charlemont	Goshen	Lenox	Northfield	South Hadley	Wilbraham
Cheshire	Granby	Leverett	Orange	Southwick	Williamsburg
Chester	Granville	Leyden	Otis	Springfield	Williamstown
Chesterfield	Great Barrington	Longmeadow	Palmer	Springfield	Windsor
Chicopee	Greenfield	Ludlow	Perham	Stockerbridge	Worthington
Clarksburg	Hadley	Middlefield	Peru	Sunderland	
				Tolland	

**DEP Central Region**  
627 Main Street  
Worcester, MA 01605  
Phone: 508-792-7650  
Fax: 508-792-7621  
TDD: 508-767-2788

Acton	Charlton	Hopkinton	Millbury	Rutland	Uxbridge
Ashburnham	Clinton	Hubbardston	Milville	Shirley	Warren
Ashby	Douglas	Hudson	New Braintree	Shrewsbury	Webster
Athol	Dudley	Holliston	Northborough	Southborough	Westborough
Auburn	Dunstable	Lancaster	Northbridge	Southbridge	West Boylston
Ayer	Leicester	Leicester	North Brookfield	Spencer	West Brookfield
Barre	Fitchburg	Leominster	Oakham	Sterling	Westford
Bellingham	Gardner	Littleton	Oxford	Stow	Westminster
Berlin	Grafton	Lunenburg	Paxton	Sturbridge	Winchendon
Blackstone	Groton	Marlborough	Pepperell	Sutton	Worcester
Bolton	Harvard	Maynard	Petersham	Templeton	
Boxborough	Hardwick	Medway	Phillipston	Townsend	
Boylston	Holden	Mendon	Princeton	Tyngsborough	
Brookfield	Hopedale	Milford	Royalston	Upton	

**DEP Southeast Region**  
20 Riverside Drive  
Lakeville, MA 02347  
Phone: 508-946-2700  
Fax: 508-947-6557  
TDD: 508-946-2795

Abington	Dartmouth	Freetown	Mattapoisett	Provincetown	Tisbury
Acushnet	Dennis	Gay Head	Middleborough	Raynham	Truro
Attleboro	Dighton	Gosnold	Nantucket	Rehoboth	Wareham
Avon	Duxbury	Halifax	New Bedford	Rochester	Wellfleet
Barnstable	Eastham	Hanover	North Attleborough	Rockland	West Bridgewater
Berkley	East Bridgewater	Hanson	Norton	Sandwich	Westport
Bourne	Easton	Harwich	Norwell	Scituate	West Tisbury
Brewster	Edgartown	Kingston	Oak Bluffs	Seekonk	Whitman
Bridgewater	Fairhaven	Lakeville	Orleans	Sharon	Wrentham
Brockton	Fall River	Mansfield	Pembroke	Somerset	Yarmouth
Carver	Falmouth	Marion	Plainville	Stoughton	
Chatham	Foxborough	Marshfield	Plymouth	Swansea	
Chilmark	Franklin	Mashpee	Plympton	Taunton	

**DEP Northeast Region**  
1 Winter Street  
Boston, MA 02108  
Phone: 617-654-6500  
Fax: 617-556-1049  
TDD: 617-574-6868

Amesbury	Chelmsford	Hingham	Merrimac	Quincy	Wakefield
Andover	Chelsea	Holbrook	Methuen	Randolph	Walpole
Arlington	Cohasset	Hull	Middleton	Reading	Waltham
Ashland	Concord	Ipswich	Millis	Revere	Watertown
Bedford	Danvers	Lawrence	Millon	Rockport	Wayland
Belmont	Dedham	Lexington	Nahant	Rowley	Wellesley
Beverly	Dover	Lincoln	Natick	Salem	Wenham
Billerica	Dracut	Lowell	Needham	Salisbury	West Newbury
Boston	Essex	Lynn	Newbury	Saugus	Weston
Boxford	Everett	Lynnfield	Newburyport	Sherborn	Westwood
Braintree	Framingham	Malden	Newton	Somerville	Weymouth
Brookline	Georgetown	Manchester-By-The-Sea	Norfolk	Stoneham	Wilmington
Burlington	Gloucester	Marblehead	North Andover	Sudbury	Winchester
Cambridge	Groveland	Medfield	North Reading	Swampscott	Winthrop
Canton	Hamilton	Medford	Norwood	Tewksbury	Woburn
Carlisle	Haverhill	Melrose	Peabody	Topsfield	



**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection - Wetlands  
**Request for Departmental Action Fee Transmittal Form**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**A. Request Information**

**Important:**  
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. Person or party making request (if appropriate, name the citizen group's representative):

(fee exempt - municipal)

Name \_\_\_\_\_

Mailing Address \_\_\_\_\_

City/Town \_\_\_\_\_

State \_\_\_\_\_

Zip Code \_\_\_\_\_

Phone Number \_\_\_\_\_

Fax Number (if applicable) \_\_\_\_\_

Project Location \_\_\_\_\_

Mailing Address \_\_\_\_\_

City/Town \_\_\_\_\_

State \_\_\_\_\_

Zip Code \_\_\_\_\_

2. Applicant (as shown on Notice of Intent (Form 3), Abbreviated Notice of Resource Area Delineation (Form 4A); or Request for Determination of Applicability (Form 1)):

Name \_\_\_\_\_

Mailing Address \_\_\_\_\_

City/Town \_\_\_\_\_

State \_\_\_\_\_

Zip Code \_\_\_\_\_

Phone Number \_\_\_\_\_

Fax Number (if applicable) \_\_\_\_\_

3. DEP File Number:

\_\_\_\_\_

**B. Instructions**

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions (\$100 for individual single family homes with associated structures; \$200 for all other projects)
- Superseding Determination of Applicability (\$100)
- Superseding Order of Resource Area Delineation (\$100)

Send this form and check or money order for the appropriate amount, payable to the *Commonwealth of Massachusetts* to:

Department of Environmental Protection  
 Box 4062  
 Boston, MA 02211



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands

## Request for Departmental Action Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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### B. Instructions (cont.)

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office.
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

**DISTRICT OFFICE:** New England District  
**FILE NUMBER & APPLICANT:** Provincetown Airport Commission, NAE-2006-4281

**PROJECT LOCATION INFORMATION:**

State: Massachusetts  
County: Barnstable  
Center coordinates of site (latitude/longitude):  
Approximate size of area (parcel) reviewed, including uplands: acres.  
Name of nearest waterway: Cape Cod Bay  
Name of watershed: Cape Cod Bay

**JURISDICTIONAL DETERMINATION**

**Completed:** Desktop determination  Date:  
Site visit(s)  Date(s): January 8, 2007

**Jurisdictional Determination (JD):**

- Preliminary JD - Based on available information,  *there appear to be* (or)  *there appear to be no* "waters of the United States" and/or "navigable waters of the United States" on the project site. A preliminary JD is not appealable (Reference 33 CFR part 331).
- Approved JD – An approved JD is an appealable action (Reference 33 CFR part 331).  
Check all that apply:
- There are* "navigable waters of the United States" (as defined by 33 CFR part 329 and associated guidance) within the reviewed area. Approximate size of jurisdictional area: .
- There are* "waters of the United States" (as defined by 33 CFR part 328 and associated guidance) within the reviewed area. Approximate size of jurisdictional area: .
- There are* "isolated, non-navigable, intra-state waters or wetlands" within the reviewed area.  
 Decision supported by SWANCC/Migratory Bird Rule Information Sheet for Determination of No Jurisdiction.

**BASIS OF JURISDICTIONAL DETERMINATION:**

- A. Waters defined under 33 CFR part 329 as "navigable waters of the United States":**
- The presence of waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
- B. Waters defined under 33 CFR part 328.3(a) as "waters of the United States":**
- (1) The presence of waters, which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.
- (2) The presence of interstate waters including interstate wetlands<sup>1</sup>.
- (3) The presence of other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate commerce including any such waters (check all that apply):
- (i) which are or could be used by interstate or foreign travelers for recreational or other purposes.
- (ii) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
- (iii) which are or could be used for industrial purposes by industries in interstate commerce.
- (4) Impoundments of waters otherwise defined as waters of the US.
- (5) The presence of a tributary to a water identified in (1) – (4) above.
- (6) The presence of territorial seas.
- (7) The presence of wetlands adjacent<sup>2</sup> to other waters of the US, except for those wetlands adjacent to other wetlands.

**Rationale for the Basis of Jurisdictional Determination (applies to any boxes checked above).** *If the jurisdictional water or wetland is not itself a navigable water of the United States, describe connection(s) to the downstream navigable waters. If B(1) or B(3) is used as the Basis of Jurisdiction, document navigability and/or interstate commerce connection (i.e., discuss site conditions, including why the waterbody is navigable and/or how the destruction of the waterbody could affect interstate or foreign commerce). If B(2, 4, 5 or 6) is used as the Basis of Jurisdiction, document the rationale used to make the determination. If B(7) is used as the Basis of Jurisdiction, document the rationale used to make adjacency determination:*

**Lateral Extent of Jurisdiction:** (Reference: 33 CFR parts 328 and 329)

- Ordinary High Water Mark indicated by:
- clear, natural line impressed on the bank
  - the presence of litter and debris
  - changes in the character of soil
  - destruction of terrestrial vegetation
  - shelving
  - other:
- High Tide Line indicated by:
- oil or scum line along shore objects
  - fine shell or debris deposits (foreshore)
  - physical markings/characteristics
  - tidal gages
  - other:
- Mean High Water Mark indicated by:
- survey to available datum;  physical markings;  vegetation lines/changes in vegetation types.
- Wetland boundaries, as shown on the attached wetland delineation map and/or in a delineation report prepared by:

**Basis For Not Asserting Jurisdiction:**

- The reviewed area consists entirely of uplands.
- Unable to confirm the presence of waters in 33 CFR part 328(a)(1, 2, or 4-7).
- Headquarters declined to approve jurisdiction on the basis of 33 CFR part 328.3(a)(3).
- The Corps has made a case-specific determination that the following waters present on the site are not Waters of the United States:
- Waste treatment systems, including treatment ponds or lagoons, pursuant to 33 CFR part 328.3.
  - Artificially irrigated areas, which would revert to upland if the irrigation ceased.
  - Artificial lakes and ponds created by excavating and/or diking dry land to collect and retain water and which are used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing.
  - Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating and/or diking dry land to retain water for primarily aesthetic reasons.
  - Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States found at 33 CFR 328.3(a).
  - Isolated, intrastate wetland with no nexus to interstate commerce.
  - Prior converted cropland, as determined by the Natural Resources Conservation Service. Explain rationale:
  - Non-tidal drainage or irrigation ditches excavated on dry land. Explain rationale:
  - Other (explain):

**DATA REVIEWED FOR JURISDICTIONAL DETERMINATION (mark all that apply):**

- Maps, plans, plots or plat submitted by or on behalf of the applicant.
- Data sheets prepared/submitted by or on behalf of the applicant.
- This office concurs with the delineation report, dated \_\_\_\_\_, prepared by (company):
  - This office does not concur with the delineation report, dated \_\_\_\_\_, prepared by (company):
- Data sheets prepared by the Corps.
- Corps' navigable waters' studies:
- U.S. Geological Survey Hydrologic Atlas:
  - U.S. Geological Survey 7.5 Minute Topographic maps:
  - U.S. Geological Survey 7.5 Minute Historic quadrangles:
  - U.S. Geological Survey 15 Minute Historic quadrangles:
  - USDA Natural Resources Conservation Service Soil Survey:
  - National wetlands inventory maps:
  - State/Local wetland inventory maps:
  - FEMA/FIRM maps (Map Name & Date):
  - 100-year Floodplain Elevation is: \_\_\_\_\_ (NGVD)
  - Aerial Photographs (Name & Date):
  - Other photographs (Date):
  - Advanced Identification Wetland maps:
  - Site visit/determination conducted on: January 8, 2007
  - Applicable/supporting case law:
  - Other information (please specify):

<sup>1</sup>Wetlands are identified and delineated using the methods and criteria established in the Corps Wetland Delineation Manual (87 Manual) (i.e., occurrence of hydrophytic vegetation, hydric soils and wetland hydrology).

<sup>2</sup>The term "adjacent" means bordering, contiguous, or neighboring. Wetlands separated from other waters of the U.S. by man-made dikes or barriers, natural river berms, beach dunes, and the like are also adjacent.

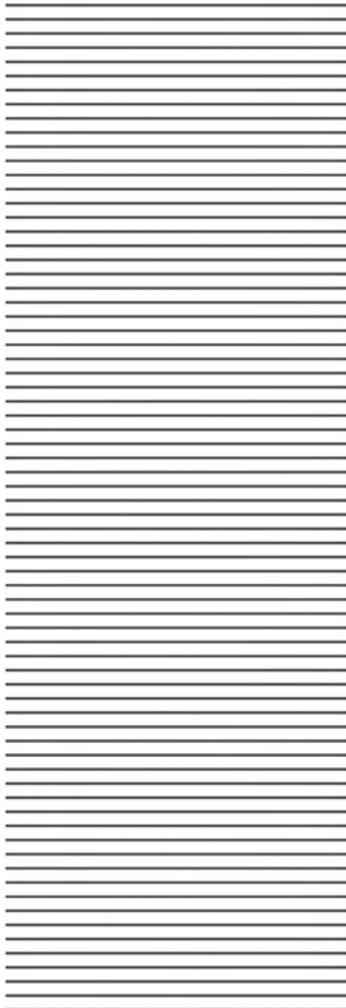
**APPENDIX 2**  
**Wildlife and Rare Species Habitat Assessment Reports**

1. Natural Resources Inventory and Rare Species Habitat Assessment Report, Horsley Witten Group, March 2007
2. Wetland Descriptions and Observations of Habitat Suitability Relative to the Eastern Spadefoot, Horsley Witten Group, June 2008, revised July 2009



Appendix 2.1 Natural Resources Inventory and Rare Species Habitat Assessment  
Report, Horsley Witten Group, March 2007





# Horsley Witten Group

*Sustainable Environmental Solutions*

90 Route 6A • Sandwich, MA • 02563

Phone - 508-833-6600 • Fax - 508-833-3150 • [www.horsleywitten.com](http://www.horsleywitten.com)



## Summary of Natural Resources and Rare Species Habitat Assessments

Provincetown Municipal Airport  
Provincetown, Massachusetts

April 2007



Prepared for:

**Edwards and Kelcey, Inc.**  
343 Congress Street, Suite 200  
Boston, Massachusetts  
02210





**Summary of Natural Resources and Rare Species Habitat Assessments  
Provincetown Municipal Airport  
Provincetown, Massachusetts**

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Provincetown Municipal Airport  
Provincetown, Massachusetts**

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## 1. INTRODUCTION

The Provincetown Airport Commission recently filed an Environmental Notification Form (ENF; EOE A No. 13789) under the *Massachusetts Environmental Policy Act* (M.G.L. c. 30 §§ 61 through 62H, inclusive, or MEPA). The ENF was based on the Provincetown Municipal Airport (Airport) 2005 Master Plan, the preparation of which is the initial step toward developing a Capital Improvement Project (CIP) program for the Airport facilities.

An integral component of this planning process involves identifying the existing conditions and facility needs, while also identifying various alternatives for meeting those needs. The various improvement projects, as well as alternative project footprints, were outlined in the ENF. Data provided on existing conditions in support of the ENF were based upon initial field surveys performed in 2004 and 2005 in the areas immediately surrounding the Airport facilities, and supplemented with available Massachusetts Department of Environmental Protection (DEP) wetlands data from MassGIS. The initial field surveys were reported in two documents prepared by the Horsley Witten Group, Inc. (HW) in support of the Master Plan: *Wetland Resource Area Report* (October 2005) and *Wildlife Habitat and Rare Species Report* (December 2005). The Certificate of the Secretary of the Executive Office of Environmental Affairs (EOEA) on the ENF (May 26, 2006) specifically requested that the Airport definitively quantify the potential impacts on wetlands, wildlife habitat, and rare species habitat for each of the proposed projects and the alternative footprints, thus necessitating additional field surveys. As a result, additional habitat surveys and wetland delineations were completed in 2006 to support the pending (DEIR).

Wetland resource areas, including isolated and bordering vegetated wetlands that are protected and regulated under the *Massachusetts Wetlands Protection Act* (M.G.L. Ch. 131 § 40), its implementing Regulations (310 CMR 10.00), the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*), the Town of Provincetown *Wetlands Protection Bylaw* (Chapter 12 of the Provincetown General Bylaws), and/or the Cape Cod Commission (CCC) Regional Policy Plan (RPP), were reviewed and approved by the Provincetown Conservation Commission under an Order of Resource Area Delineation (“Order”) issued January 25, 2007. Figure 1 depicts the approved wetland areas. A summary of the wetland resource areas is provided as a separate document entitled *Summary of Wetland Resource Areas* (HW, April 2007).

According to the 2006 *Massachusetts Natural Heritage Atlas* (12<sup>th</sup> Edition), the entire Airport lease area is located within both *Priority Habitat of Rare Species* (PH 1232) and *Estimated Habitat of Rare Wildlife and Certified Vernal Pools* (EH 821) as designated by the Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP). As shown in Figure 2, these designated habitats extend well beyond the Airport lease area, including most of Provincetown, and extending throughout Cape Cod and southeastern Massachusetts. Correspondence from NHESP, included in the Appendix, indicates that the Airport property is mapped for four State-listed rare species: Eastern Box Turtle, Eastern Spadefoot, Vesper Sparrow, and Broom Crowberry. NHESP had recommended that rare wildlife and plant surveys be conducted to assess the existing habitats for these species for use in future site planning and to address the Massachusetts *Endangered Species Act* (M.G.L. Ch. 131A) or MESA. Species-specific surveys were conducted in 2005 in accordance with the

protocols established through NHESP (The protocols are provided in the Appendices to this report).

Additional regulatory review relating to the implementation of future projects identified in the ENF will likely include review by NHESP under a MESA Project Review, review by the CCC under its Development of Regional Impact (DRI) review process, and permitting through the Town of Provincetown under local bylaws. These regulatory agencies have specific requirements for evaluating wildlife habitat and/or rare species habitat. HW has prepared this Summary of Natural Resources and Rare Species Habitat Assessments report to supplement and expand upon the earlier *Wildlife Habitat and Rare Species Report* (December 2005) which was prepared to support the 2005 Master Plan and the ENF.

This report provides a description of the natural resources habitats with specific emphasis on the areas where alternatives for Airport facility improvements are being considered. Included within this report are a general description of the Airport property, its general habitat characteristics, a discussion of field methodologies and the results of the wildlife habitat assessments conducted between 2004 and 2006, and further discussion on habitats for rare species. Information within this report is intended to provide a thorough overview of the natural resources and wildlife habitats at the Airport in addition to addressing comments submitted by various agencies in response to the ENF.

## **2. GENERAL HABITAT CHARACTERISTICS**

The Airport lease area occupies approximately 322 acres of land situated within the bounds of the Cape Cod National Seashore (CCNS) at the northern tip of Cape Cod. The Airport lease area consists of developed areas maintained for Airport facilities and operations, as well as undeveloped areas. The undeveloped areas contain diverse wetland and upland habitats, including salt marsh, freshwater wetlands, forested areas, a system of coastal dunes, and open grasslands; portions of the grasslands are managed as part of the airfield. These diverse areas provide a variety of habitats for the local wildlife.

To support the preparation of the ENF and future EIR documents, the habitat assessments focused on the areas where the CIP projects described in the ENF and their identified alternatives would occur. Areas along the taxiway, runway, and approach areas include vegetative communities that are mowed to maintain aviation safety zones and navigational surfaces. Beyond these areas, the vegetative communities are largely undisturbed and uninterrupted, but for a portion of the CCNS bike path that traverses the southeastern corner of the Airport lease area.

Vegetative communities and habitats at the Airport are described in this report based upon the classification system described in the *Classification of the Natural Communities of Massachusetts* (Swain and Kearsley, 2001; hereinafter referred to as “the *Classification*”). The dominant types of vegetative communities encountered at the Airport include Cultural Grassland, Maritime Dune Community, Coastal Interdunal Marsh/Swale with developing areas of Sandplain Grassland and/or Sandplain Heathland, and Estuarine Intertidal Salt Marsh. Descriptions of

these habitat communities and our general observations within each community type are provided below. Additional information regarding the soils classification and geologic characteristics may be found in the *Summary of Wetland Resource Areas* (HW, April 2007), included as a separate document within the DEIR Appendices.

## 2.1 Cultural Grassland

According to the *Classification*, the Cultural Grassland community is “*a human-created and maintained open community dominated by grasses, normally maintained by mowing.*” This community often occurs at airfields and is “*a grassland community that generally occurs on sand or other droughty, low-nutrient soils.*” In general, the unpaved areas at the Airport that are maintained by mowing or selective cutting for aviation operations are Cultural Grasslands, which may also contain areas of developing Sandplain Grassland and/or Sandplain Heathland (descriptions provided below), and or developing dunes. These areas are immediately adjacent to the Airport runway, the partial parallel TW, and along both sides of the west end entrance taxiway and mid-entrance taxiway that are maintained to provide Airport safety. Cultural Grassland areas at the Airport vary in width from approximately 20-25 feet along either side of the mid-entrance taxiway, to nearly 400 feet wide in the southwestern corner of the airfield between the Runway 7 end and the Glideslope Antenna, as well as southeast of the Runway 25 end. The vegetative community observed in areas of Cultural Grassland is dominated by grass species and various herbaceous species that are mowed an average of three to four times annually.

### 2.1.1 Sandplain Grassland

Sandplain Grasslands are open communities dominated by grasses with some herbaceous species and small shrubs. According to the *Classification*, this community occurs on “*flat outwash plains with droughty, low nutrient soils. Most occurrences are near the ocean and within the influence of winds and salt spray of storms.*” This habitat type is maintained by fire, salt spray, and mowing. Associated plant species include grasses with patches of shrubs. This vegetative community has great overlap with species found in Sandplain Heathlands (below), but with a greater diversity of vascular plant species. Approximately 29 hectares (72 acres) of the land in proximity of the Airport [not necessarily corresponding to the Airport lease area] are considered grasslands and/or heathlands (Kearney and Cook, 2001).

### 2.1.2 Sandplain Heathland

The Sandplain Heathland community is described as an “*open, shrub dominated primarily coastal community, sharing many species with Sandplain Grasslands. Heathlands often have sparse clumps of plants with bare soil or lichen cover between the vascular plants.*” This plant community type occurs in poor nutrient, acidic soils, dominated by low-growing woody vegetation. This vegetation includes scrub oak (*Quercus ilicifolia*), black huckleberry (*Gaylussacia baccata*), bearberry (*Arctostaphylos uva-ursi*), and lowbush blueberry (*Vaccinium angustifolium*), with much overlap in species diversity as within Sandplain Grasslands.

## 2.2 Maritime Dune Community

According to the *Classification*, a Maritime Dune community is “*the classic community of sand dunes, with patches of herbaceous plants interspersed with areas of bare sand and shrubs.*” This community type “*occurs on windswept dunes, within the salt spray zone, often landward of the Beach Strand Community and grading into shrubland or woodlands on the more sheltered back dunes.*” The vegetative composition and structure of the vegetation depends on the dune stability. The Maritime Dune Community observed along the Airport lease line to the north and northwest of the Airport facilities occurs within the boundaries of the Race Point barrier beach system, consisting of both primary and secondary dune habitats, although there are no primary dunes located within the Airport lease area. These dunes are generally vegetated with American beachgrass (*Ammophila breviligulata*) and common hairgrass (*Deschampsia flexuosa*) in open exposed areas. Plant diversity increases on the leeward side of these dunes, where HW field biologists observed open clumps and patches of golden heather (*Hudsonia ericoides*), poison ivy (*Toxicodendron radicans*), beach plum (*Prunus maritima*), and bayberry (*Myrica pensylvanica*). HW observed that frequently, seaward-facing slopes were completely devoid of vegetation. Topography among these dunes varies widely from nearly flat to steeply sloping (e.g., 1:1 slopes or steeper).

The coastal dune habitats located to the southeast of the Airport are secondary coastal dune habitats that are not within the barrier beach system. While the topography among these secondary dunes is equally varied, the more stable substrate of these areas supports a greater diversity of vegetative species, particularly trees and shrubs. It is in these areas that communities of Maritime Pitch Pine on Dunes and Maritime Shrubland occur to varying degrees. These communities share similar characteristics in terms of the vegetative species composition of other communities, including Pitch Pine (Scrub Oak, Pitch Pine), Oak Forest/Woodland, and Coastal Forest/Woodland communities as described in the *Classification*.

## 2.3 Coastal Interdunal Marsh/Swale

Among the interdunal swales, sheltered from shifting sands, HW observed various types of freshwater wetland communities. The Coastal Interdunal Marsh/Swale community type appears to be one of the predominant, if not the predominant, type of wetland habitat existing at the site. According to the *Classification*, this community type is a “*graminoid-[grasses or grass-like species such as sedges or rushes] or shrub-dominant coastal community occurring in shallow basins (swales) between sand dunes.*” With respect to environmental setting, “*Interdunal swales are low, shallow depressions that form between sand dunes along the coast. They occur as part of a dune system, and the best examples are complexes of numerous swales. Soils generally have a thin, about one centimeter [0.4 inch], organic layer over coarse sand. The water regime ranges from seasonally flooded to permanently inundated.*” The interdunal swales observed at the Airport range from sparsely vegetated seasonally flooded pools to graminoid or shrub dominated communities to forested communities.

Within this Coastal Interdunal Marsh/Swale community type, HW generally encountered three basic variations: a graminoid-dominated palustrine emergent marsh (PEM), a shrub-dominated

palustrine shrub swamp (PSS), and a palustrine forested swamp (PFO). Emergent marshes and shrub swamps were generally encountered north of the Airport facilities and in low-lying areas to the immediate south and west of the runway, where the wetlands are either connected to the Hatches Harbor wetland system, or else are part of the Airport-managed areas. Dominant vegetation within the emergent marshes includes woolgrass (*Scirpus cyperinus*), twig rush (*Cladium mariscoides*), black grass (*Juncus gerardii*), and soft rush (*Juncus effusus*).

Vegetation encountered within shrub swamp communities included bayberry, willow (*Salix* spp.), winterberry (*Ilex verticillata*), arrowwood (*Viburnum dentatum*), shadbush (*Amelanchier canadensis*), Virginia rose (*Rosa virginiana*), and poison ivy, with a diversity of herbaceous species including Joe-Pye weed (*Eupatorium* spp.), various goldenrods (*Solidago* spp.), various asters (*Aster* spp.), and various ferns. In more inland areas, there are large patches of American cranberry (*Vaccinium macrocarpon*), interspersed with clumps of woolgrass, ferns, and sphagnum moss (*Sphagnum* spp.) among dense clumps and patches of highbush blueberry (*Vaccinium corymbosum*), swamp azalea (*Rhododendron viscosum*), and dwarf huckleberry (*Gaylussacia dumosa*).

Forested wetlands (PFO) are located primarily to the south of the Airport runway beyond the managed areas. HW considered all areas conforming to a pitch pine (*Pinus rigida*), cranberry, and highbush blueberry-dominant, forested wetland habitat type (also referred to here as “cranberry-pine swales”) to be a local variant of the shrub-dominant Coastal Interdunal Marsh/Swale. Pitch pine appears to have become well adapted to seasonally wet conditions, and was considered to be a local wetland-indicator species.

The freshwater wetland communities within the Airport lease area are generally either Bordering Vegetated Wetland (BVW), isolated freshwater wetlands (PFO/PSS), or Coastal Interdunal Marsh/Swales.

## **2.4 Estuarine Intertidal Salt Marsh**

The extreme western end of the Airport lease area extends into the Hatches Harbor salt marsh system, classified as an Estuarine Intertidal Salt Marsh community by Swain and Kearsley (2001). Generally dominated by graminoid species, such as smooth cordgrass (*Spartina alterniflora*) and saltmarsh cordgrass (*Spartina patens*) with occasional shrub species observed along its upper reaches, salt marshes are well known as a productive ecosystem that “provide[s] habitat for various species of wildlife – including migrating and overwintering waterfowl and shorebirds and the young of many species of marine organisms.”

The Hatches Harbor salt marsh system represents an area of former salt marsh that had developed brackish to freshwater characteristics over time due to the construction of the Hatches Harbor dike in 1930. The dike was constructed in an attempt to eradicate the problem of a flourishing mosquito population. However, the resultant near monoculture of common reed, and the severe reduction of wildlife habitat values prompted the Hatches Harbor Salt Marsh Restoration Project, initiated by National Park Service (NPS) in 1998. Subsequent improvements to the tidal flushing in this area have begun to restore brackish and freshwater

wetlands to salt marsh that is contiguous with undisturbed salt marsh areas located seaward of the dike. The resultant community along the upper reaches of this salt marsh is somewhat brackish, and has yet to take on the full distinctions of a salt marsh community.

The *Summary of Wetland Resource Areas* report (HW, April 2007) discusses in detail each of the wetland resource areas delineated and approved under the Order. A copy of the Order and *Wetland Resource Area Map* (December 2006), are provided in the DEIR Appendix.

### **3. METHODOLOGY AND APPROACH**

#### **3.1 Initial Site Assessments**

During the initial assessment period, HW field biologists observed site conditions at the Airport between August 2004, and September 2005, to describe site characteristics related to previously documented and potential use of the various habitats by local wildlife. Fieldwork included the assessment of habitats of locally common plant and animal species, as well as habitats of certain State-listed rare species. A combination of meander surveys and linear walking surveys were performed during the assessment period for the purposes of:

- describing the areas in the vicinity of the Airport;
- documenting wildlife species utilization and the habitats in which these species, both resident and migratory, were observed; and
- identifying structural landscape or other features observed within the wetland resources and adjacent upland resources that are or are likely important to individual species or groups of species.

Initial field investigations focused upon the areas immediately surrounding the airport facilities where any future projects identified under the Airport Master Plan planning process would likely occur. Field biologists visited the site on 14 different dates during the initial assessment period. Fieldwork performed in 2004 was completed in conjunction with initial wetland resource area delineations immediately around the Airport facilities, while the majority of the wildlife surveys (both species-specific and general wildlife inventories) were performed in 2005. Most site visits involved two field biologists observing site conditions over a six- to ten-hour period. Several surveys began at dawn while other surveys began later in the day and extended past dusk. Meander surveys were performed within and along the margins of the various vegetative communities for the purpose of observing and documenting habitat features in accordance with accepted natural resource inventory guidelines. HW recorded all field observations and took numerous photographs documenting the occurrence of various site features and habitat types.

#### **3.2 Rare Species Habitat Survey Methodologies**

Previous wildlife studies conducted by others identified the presence of three State-listed species within the airport property: Eastern Spadefoot (*Scaphiopus h. holbrookii*), Northern Harrier (*Circus cyaneus*), and Broom Crowberry (*Corema conradii*) (Fugro/ENSR, 1993). In previous reports describing the habitat characteristics at the Airport, it had been noted that the Piping

Plover (*Charadrius melodus*), a State- and Federally-listed Threatened shorebird, nests and breeds in the “immediate vicinity” of the Airport. Based upon an understanding of the habitat requirements of this species, this would likely occur primarily within the dunes north of the Airport along the CCNS shoreline, and outside of the Airport lease area.

HW contacted NHESP in May 2004 to determine whether their database of State-listed species for this area had been updated since the early 1990s. The most current NHESP database identifies four “protected rare species that have been found in the vicinity of the [Airport] site”:

- Eastern Box Turtle (*Terrapene c. carolina*);
- Eastern Spadefoot (*Scaphiopus h. holbrookii*);
- Vesper Sparrow (*Pooecetes gramineus*); and
- Broom Crowberry (*Corema conradii*).

In their correspondence, NHESP recommended that rare wildlife and plant surveys be conducted in accordance with scientifically accepted survey methodologies for each of the four species. Survey protocol methods were developed by HW and approved by NHESP prior to commencement of the habitat surveys. Rare species habitat surveys were conducted in accordance with the approved survey protocols for each of the four State-listed species identified. Copies of the written correspondence with NHESP and the approved protocols are included within the Appendix. Below is a brief description of each species, its general habitat requirements, and the survey methods.

### 3.2.1 Eastern Box Turtle

The Eastern Box Turtle is a Massachusetts Species of Special Concern. This small terrestrial turtle uses a relatively wide range of terrestrial habitat types, including woodlands, field edges, and thickets (DeGraaf and Rudis, 1983), and has also been found in various wetland habitat types including wet meadows and lowland swamps (Klemens, 1993). NHESP identifies two natural communities with which this species is associated, including Coastal Forest/Woodland and Pitch Pine-Oak Forest (Swain and Kearsley, 2001), although other similar vegetative communities may also provide suitable habitat for this species. Optimal habitats on Cape Cod include pine barrens and oak thickets, where box turtles are associated with cranberry dominated swales. Communities with similar vegetative characteristics to these identified habitats are found within the Airport.

Survey methods included a presence-absence survey for this species, as well as a general characterization of the potential habitat for the Eastern Box Turtle at the Airport. HW performed meander surveys within each habitat type at the site. Field surveys specifically performed to observe this species were done in the early morning and/or during the day immediately following storm events when this species is reported to be most active (Klemens, 1993). Surveys for the Eastern Box Turtle occurred primarily in the spring and fall.

### 3.2.2 Eastern Spadefoot

The Eastern Spadefoot is a medium-sized toad, protected as a Threatened Species in Massachusetts. Reported habitat for this species includes dry sandy or loose soils in areas of sparse shrub growth of open forest areas (DeGraaf and Rudis, 1983). In addition, this species breeds only in shallow, temporary pools formed after very heavy, warm rains (Martof, 1980). Natural communities with which this species is associated that exist at the Airport include Coastal Interdunal Marsh/Swale, Wet Meadow, and Shrub Swamp.

Surveys for the Eastern Spadefoot included identification of isolated depressions that may temporarily hold water after significant rainfalls, and observation surveys following significant rainfall events from April through September. Target areas included the Coastal Interdunal Marsh/Swales in and immediately surrounding the Airport facilities.

This species emergence from underground burrows and migration to these temporary pools is triggered by heavy rainfall. There were very few evenings during the 2005 field survey period between May 15 and September 1 (the period when this species is most active) when significant precipitation events occurred. HW conducted evening field surveys within several of the inundated isolated wetland areas on two occasions (March 28 and August 31, 2005), during warm evening storm events.

### 3.2.3 Vesper Sparrow

The Vesper Sparrow is a small sparrow reported to inhabit open areas (cultivated fields, grasslands, fallow fields, and pastures) as well as Sandplain Heathlands. NHESP reports that this species is associated with Cultural Grasslands, which are often maintained open communities dominated by grasses. The Vesper Sparrow is designated as a Threatened Species in Massachusetts.

HW conducted morning and evening absence-presence surveys in 2005 between May 1 and July 31, when this species is most active. Surveys for the Vesper Sparrow and its habitat were concentrated within the managed areas (Cultural Grasslands) adjacent to the airport runway, taxiway, and runway approach. Field surveys included both listening and visual surveys, performed along walking transects. HW established 15 transects spaced approximately 150 meters apart within Cultural Grassland habitat located adjacent to shrub-dominant thickets (Figure 3). At each transect HW recorded all avian species seen or heard during a five-minute interval. A recording of Vesper Sparrow calls was then repeatedly broadcast along the length of each transect.

### 3.2.4 Broom Crowberry

Broom Crowberry is a low-growing, densely branching evergreen shrub, which inhabits open areas (low shrub communities or sandy flats, as well as dry pitch pine/scrub oak barrens and relic sand dunes). The NHESP-described natural communities with which this species is associated

include Sandplain Heathland and Pitch Pine – Scrub Oak Communities. Broom Crowberry is a Massachusetts Species of Special Concern.

Broom Crowberry was previously reported at the Airport in the managed grassland habitat southwest of the glide slope antennae. HW conducted meander surveys for Broom Crowberry, targeting the area where this species was previously identified and areas of Cultural Grassland habitat and/or Sandplain Grasslands/Sandplain Heathlands, as well as pitch-pine forested areas with associated plant communities.

### **3.3 Capital Improvement Program Projects and Supplemental Field Assessments**

Since the ENF, the CIP projects have been refined slightly, as listed below. The CIP projects include the following:

1. Relocate the West Entrance Taxiway (TW)
2. Realign the Westerly End of the Partial Parallel TW
3. Improve the Access Road to the Approach Lights
4. Install TW Edge lights and Construct an Electric Vault
5. Rehabilitate or Replace the Sightseeing Shack
6. Realign the Mid Entrance TW
7. Relocate the East Entrance TW
8. Reconstruct the Terminal Apron within the Existing Footprint
9. Reconstruct the Easterly End of the Partial Parallel TW within the Existing Footprint
10. Construct Additional Turf Apron
11. Construct Service Access Roads to the Localizer Equipment Shelter and to the Weather Station
12. Install a Perimeter Safety/Security Fence
13. Expand Auto Parking
14. Expand the Terminal Building

Please note that the DEIR combines the relocation of the West Entrance TW, realignment of the Westerly End of the Partial Parallel TW, and realignment of the Mid Entrance TW, and that these three CIP projects are discussed as a whole.

HW field biologists performed continued site observations and assessments at the Airport from August through December 2006 in order to further describe the site characteristics related to the various projects identified in the ENF. As with HW's initial field efforts in 2004 and 2005, a combination of meander surveys and linear walking surveys were performed for the purposes of identifying structural landscape, or other features detected within the wetland resource areas, along with adjacent uplands that are, or are likely important, to an individual species or groups of species. In addition, 2006 field surveys focused upon:

- Identifying and delineating all wetland resource areas in the general vicinity of the identified CIP project alternatives (i.e., within 100 feet of these areas); and
- Describing the general habitat characteristics and documenting wildlife species observations.

Specific to one of the CIP projects, Installation of a Perimeter Safety/Security Fence, the Airport Lease Line, as well as the two interior alternative layouts identified in the ENF that were under consideration were survey-located, and marked at 50- or 100-foot intervals with labeled wooden stakes to facilitate our field efforts. Additional projects located immediately adjacent to existing Airport facilities did not necessitate field staking.

HW concentrated field assessments around the footprints of the CIP projects identified in the ENF, including the provided alternatives, to accurately describe the existing habitat and vegetative communities in these locations. During a verbal conversation with NHESP regarding their ENF comment letter, the NHESP review biologist indicated that additional species-specific surveys were unnecessary to address the NHESP Comments, and that all future field assessments for the four State-listed species should focus upon the site characteristics with respect to their potential to provide habitat for each specific species. As a result, all habitats encountered within the Airport lease area were evaluated for their ability to provide suitable habitat for rare species.

During this phase of the field assessments, field biologists visited the site on 17 separate dates. Most often, habitat assessments were completed in conjunction with wetland resource area delineation fieldwork, as both wetland and upland habitats are likely to be affected by the various CIP projects. As with previous field surveys performed by HW, site assessments generally involved two to three field biologists observing site conditions over a six- to nine-hour period. Most of the 2006 surveys began in the early morning and extended throughout the day, and occasionally extended into dusk. As our focus was on assessing the habitat characteristics, nighttime surveys were not deemed necessary for this phase of the wildlife studies.

#### **4. RESULTS OF GENERAL HABITAT ASSESSMENTS**

This discussion of the wildlife habitats survey is organized according to the different natural community types observed at the site. A list of all bird, mammal, amphibian, and reptile species observed at the Airport during these and previous field surveys is provided in this section. Additional details regarding wetland habitats are provided in the *Summary of Wetland Resource Areas* report (HW, April 2007).

##### **4.1 Coastal Interdunal Marsh/Swale Habitat**

The Coastal Interdunal Marsh/Swale community is one of the predominant types of wetland habitats existing at the Airport. With respect to habitat functions and values, the *Classification* indicates that “*interdunal swales can function as vernal pool habitat if water remains standing for two to three months and they lack fish; these swales provide important amphibian breeding habitat, particularly for toads, including American, Fowler’s, and spadefoot toads.*” The *Classification* identifies the Eastern Spadefoot as a rare animal species associated with this community type, while HW also notes that this may be an important habitat component for the Eastern Box Turtle.

As noted in the *Classification*, “*Interdunal swales have a high habitat value to birds and mammals for food, cover, and nesting sites.*” In addition to numerous resident and migratory bird species that were observed in or near these wetland habitats during each field visit, Northern black racer (*Coluber c. constrictor*), Fowler’s toad (*Bufo w. fowleri*), and small mammals were frequently encountered. Following the 2006 *Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands*, published by DEP, HW assessed the project areas overall in the context of whether any important habitat features occur at the Airport. HW noted the overall presence or absence of wetland-specific and upland wildlife habitat features and characteristics (Table 1).

Table 1. Presence-absence of habitat features within the Airport assessment areas.

Habitat Feature	Present (Y/N)
Habitat(s) for State-listed animal species	Y
Sphagnum hummocks and pools suitable as for nesting habitat for four-toed salamanders	N
Trees with large cavities (≥18” tree diameter at cavity entrance)	N
Existing beaver mink or otter beds	N
Areas within 100 feet of existing beaver, mink or otter dens	N
Existing nest trees for birds that traditionally reuse nests	Y
Land containing freshwater mussel beds	N
Wetlands and waterbodies known to contain open water in winter	Y
Potential turtle nesting areas	Y
Vertical sandy banks	N
Depressions that hold standing water with potential to provide vernal pool habitat	Y
Areas surrounding vernal pools	Y
Isolated wetlands greater than 5,000 square feet in surface area	Y

The cranberry-pine swale habitat type is expansive on the southern side of the runway and most often supports cranberry and pitch pine as the predominant species with lesser amounts of highbush blueberry, bayberry, and woolgrass. Sphagnum moss is often abundant in these swales, which remained inundated to varying degrees in the winter, spring, and early summer; and generally dried up in late summer into the fall. These swales are geographically isolated and range in size from only a few square meters to several hundred square meters in area. These swales are seasonally inundated for relatively long periods during the year due to the seasonal rise in the groundwater table.

With respect to valuable structural features and hydrologic regimes comprising this habitat, these cranberry-pine swales are characterized by abundant wildlife habitat cover and fruit-bearing plants. Windfalls and standing dead wood are present in relative abundance, providing suitable foraging and nesting habitat for cavity nesting bird species. Small-diameter, fallen dead wood is plentiful, providing escape cover for amphibians, certain reptiles, and small mammals. Pine needle-litter is relatively thick, and mature pitch pines are generally less than 10 inches at breast-height diameter (DBH). Common resident and migratory avifauna were frequently observed,

along with Eastern ribbon snakes (*Thamnophis s. sauritus*). Coyotes were frequently heard and often observed in the vicinity of these habitats, with one coyote den noted to the east of Wetland L at the margin of the pine-forested area. Evidence of white-tail deer breeding activity (territorial markings such as scrapes and rubs along woody vegetation) was frequently observed throughout wetland areas south of the runway.

#### 4.1.1 Potential Vernal Pool Habitat

In the period between August 2004 and September 2005, and again throughout most of the fall season in 2006, HW observed that all of the isolated wetland areas conforming to the Coastal Interdunal Marsh/Swale community type held some amount of standing water for a period of time during the growing season. This was evident by water stained vegetation along the surface. Observations of standing water in many of the larger wetland areas in late spring of 2005 and again in early January 2007.

HW observed juvenile amphibians (tadpoles) within several of the cranberry-pine swales southeast of the Airport runway when shallow inundation was present in May 2005. Within Wetland B, HW noted the presence of Fowler's Toads through recognition of their distinctive breeding chorus. Although not observed in all of the isolated freshwater wetland areas, evidence of amphibian breeding activity indicates that many of these seasonally inundated wetland areas provide suitable amphibian breeding habitat at least during some years. These pools, as well as the surrounding upland areas (primarily coastal dune habitats) that are considered part of the vernal habitat under the local wetlands bylaw, are important wildlife habitat features found within the Airport lease area.

The current source data available in MassGIS (updated as of January 2007) indicates that there are no certified vernal pools (CVPs) or potential vernal pools (PVPs) within the Airport lease area (see Figure 2). The nearest certified vernal pool is located to the east of the Airport, adjacent to Race Point Road just to the north of this road's intersection with Province Land Road. Two NHESP-designated Potential Vernal Pools are identified by the *Atlas*, northeast and southwest of the Airport lease area.

#### 4.1.2 Persistent Water Regime

All of the geographically isolated freshwater wetland areas, with the exception of a small area within Wetland K, appear to experience dry conditions for some period during mid to late summer and early fall when regional groundwater elevations are at their lowest levels. Due to persisting surface water in the northern corner of Wetland K (PEM/PSS habitat), this wetland resource is highly valuable for wildlife species as a source of fresh water during drier portions of the year.

## 4.2 Maritime Dune Habitat

The Maritime Dune Habitat community is the predominant unmanaged upland habitat type within the Airport lease area. Stable Maritime Dune communities (i.e., Maritime Pitch Pine on Dunes and Maritime Shrubland), supporting shrubs and trees interspersed with Coastal Interdunal Marsh/Swales, are found at the lowest land elevations. These comprise nearly the entire habitat community south of the Airport runway, outside of, and beyond areas identified as Cultural Grassland and the wetland areas. HW found these Maritime Dune communities to be relatively consistent in vegetative makeup, dominated by pitch pine, with a canopy cover of 40-50%, and understory species limited to various lichens (*Cladonia* spp.) and common hairgrass. In addition, HW observed that these areas were interspersed with open areas of golden heather and lichens with less frequent occurrences of pinweed (*Lechea maritima*), occasional scrub oak, bayberry, and smaller areas of open bare sand. Prostrate branches of the pitch pine provide cover for small mammals and reptiles, and HW frequently observed small cavities or dens among these branches. Occasionally, HW encountered small stands of Virginia pine (*Pinus virginiana*), an introduced species. HW frequently observed small wildlife paths and corridors traversing the dune habitat south of the Airport runway.

A less sheltered Maritime Dune community exists between the Airport facilities and the CCNS shoreline to the north. The dunes in these areas are undulating, varying in topography and vegetative composition, yet are largely uniform in species diversity outside of the wetland areas. Open areas of bare sand, and occasional pebbles, are interspersed with sparsely to moderately vegetated dunes, dominated by American beachgrass, hairgrass, and areas containing clumps and patches of golden heather. Sparsely scattered areas of dense upland vegetation observed primarily along leeward slopes and consisting largely of bayberry, beach plum, and/or poison ivy, are interspersed among the more open dune areas and provide shelter and valuable food source for small mammals and birds.

Coyote activity (in the form of tracks and scat) was observed frequently among the outermost dunes. Broken shells (quahog) among pebbly areas indicate that this area provides some feeding habitat for shorebirds. HW observed flocks of tree swallows (*Tachycineta bicolor*) congregating in the dense vegetation in these outer dune areas. These birds were presumed to be migrating due to the timing of the observations (late fall 2006). For the most part, the outer dune community does not support pitch pine, with the exception of the dunes in the northeastern corner of the Airport lease area (near the Airport parking lot). Interspersed among the outer dunes are several isolated vegetated wetland areas, which provide additional habitat diversity. Descriptions of the plant communities within individual wetland areas are provided in the *Summary of Wetland Resource Areas* report (HW, April 2007). On one occasion in October 2006, HW observed a Northern Harrier in a small stand of pitch pines just south of Wetland AL; observations of this species were previously reported by HW foraging along the airport runway, and by others during past surveys (see HW, December 2005).

With respect to habitat values, the *Classification* indicates that “a variety of seabirds, shorebirds, and song birds nest at the base and sides of dunes and in the interdunal area. The particular species depend upon topography, hydrologic regime, and the amount and type of plant cover.

*Vernal pools occur in some dune systems, serving as important feeding and breeding areas for a variety of reptiles and amphibians, invertebrates, and birds and mammals.”* A complete list of species observed by HW and/or documented by other field biologists at the Airport is provided in Table 2.

Table 2 includes species observed by HW during field surveys between 2004 and 2005, and continued surveys in 2006. This list is updated from species observed by others between 1991 and 1994 as presented in the October 1999 Final Environmental Impact Statement (FEIS)/ Final Environmental Impact Report (FEIR), Department of Transportation Section 4(f) Statement for the Airport.

Table 2. Recorded and Observed Wildlife Species.

SCIENTIFIC NAME	COMMON NAME	STATUS*
<b>Avian Species</b>		
<i>Gavia immer</i>	Common Loon	MASC
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	--
<i>Ardea herodias</i>	Great Blue Heron	--
<i>Butorides virescens</i>	Green Heron	--
<i>Cathartes aura</i>	Turkey Vulture	--
<i>Anas rubripes</i>	American Black Duck	--
<i>Anas platyrhynchos</i>	Mallard	--
<i>Pandion haliaetus</i>	Osprey	--
<i>Circus cyaneus</i>	Northern Harrier	MAT
<i>Accipiter cooperii</i>	Cooper's Hawk	--
<i>Buteo jamaicensis</i>	Red-tailed Hawk	--
<i>Falco sparverius</i>	American Kestrel	--
<i>Phasianus colchicus</i>	Ring-necked Pheasant	--
<i>Bonasa umbellus</i>	Ruffed Grouse	--
<i>Colinus virginianus</i>	Northern Bobwhite	--
<i>Charadrius vociferus</i>	Killdeer	--
<i>Haematopus palliatus</i>	American Oystercatcher	--
<i>Larus argentatus</i>	Herring Gull	--
<i>Larus marinus</i>	Great Black-backed Gull	--
<i>Sterna hirundo</i>	Common Tern	MASC
<i>Sterna antillarum</i>	Least Tern	MASC
<i>Zenaida macroura</i>	Mourning Dove	--
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	--
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	--
<i>Bubo virginianus</i>	Great Horned Owl	--
<i>Picoides pubescens</i>	Downy Woodpecker	--
<i>Picoides villosus</i>	Hairy Woodpecker	--
<i>Colaptes auratus</i>	Northern Flicker	--
<i>Tyrannus tyrannus</i>	Eastern Kingbird	--
<i>Cyanocitta cristata</i>	Blue Jay	--
<i>Corvus brachyrhynchos</i>	American Crow	--
<i>Eremophila alpestris</i>	Horned Lark	--
<i>Tachycineta bicolor</i>	Tree Swallow	--
<i>Hirundo rustica</i>	Barn Swallow	--
<i>Poecile atricapillus</i>	Black-capped Chickadee	--
<i>Sitta carolinensis</i>	White-breasted Nuthatch	--
<i>Thryothorus ludovicianus</i>	Carolina Wren	--
<i>Turdus migratorius</i>	American Robin	--
<i>Dumetella carolinensis</i>	Gray Catbird	--
<i>Mimus polyglottos</i>	Northern Mockingbird	--
<i>Sturnus vulgaris</i>	European Starling	--
<i>Dendroica petechia</i>	Yellow Warbler	--
<i>Dendroica magnolia</i>	Magnolia Warbler	--

SCIENTIFIC NAME	COMMON NAME	STATUS*
<i>Dendroica coronata</i>	Yellow-rumped Warbler	--
<i>Dendroica virens</i>	Black-throated Green Warbler	--
<i>Dendroica pinus</i>	Pine Warbler	--
<i>Mniotilta varia</i>	Black-and-white Warbler	--
<i>Geothlypis trichas</i>	Common Yellowthroat	--
<i>Pipilo erythrophthalmus</i>	Eastern Towhee	--
<i>Spizella passerina</i>	Chipping Sparrow	--
<i>Poocetes gramineus</i>	Vesper Sparrow (obs. by others)	MAT
<i>Passerculus sandwichensis</i>	Savannah Sparrow	
<i>Melospiza melodia</i>	Song Sparrow	
<i>Melospiza georgiana</i>	Swamp Sparrow	
<i>Cardinalis cardinalis</i>	Northern Cardinal	--
<i>Dolichonyx oryzivorus</i>	Bobolink	--
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	--
<i>Quiscalus quiscula</i>	Common Grackle	--
<i>Icterus spurius</i>	Orchard Oriole	--
<i>Icterus galbula</i>	Baltimore Oriole	--
<i>Carpodacus purpureus</i>	Purple Finch	
<i>Carpodacus mexicanus</i>	House Finch	
<i>Carduelis tristis</i>	American Goldfinch	--
<i>Passer domesticus</i>	House Sparrow	--
<b>Mammalian Species</b>		
<i>Blarina brevicauda</i>	Northern Short-tailed Shrew	--
<i>Sylvilagus floridanus</i>	Eastern Cottontail	--
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	--
<i>Microtus pennsylvanicus</i>	Meadow Vole	--
<i>Canis latrans</i>	Coyote	--
<i>Vulpes vulpes</i>	Red Fox	--
<i>Procyon lotor</i>	Common Raccoon	--
<i>Mephitis mephitis</i>	Striped Skunk	--
<i>Odocoileus virginianus</i>	White-tailed Deer	--
<b>Reptile and Amphibian Species</b>		
<i>Plethodon cinereus</i>	Eastern Red-backed Salamander	--
<i>Bufo fowleri</i>	Fowler's Toad	--
<i>Pseudacris crucifer</i>	Spring Peeper	--
<i>Coluber constrictor</i>	Eastern Racer	--
<i>Thamnophis sauritus</i>	Eastern Ribbon Snake	--
<i>Thamnophis sirtalis</i>	Common Garter Snake	--

**Key**

- MAE = Massachusetts Endangered species  
MAT = Massachusetts Threatened species  
MASC = Massachusetts Species of Special Concern

\*Status of Massachusetts' species as designated by the Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program, set forth in 321 CMR 10.00 *et seq.*

## 5. RARE SPECIES HABITAT ASSESSMENTS

Four State-listed rare species, identified by the NHESP, have been previously documented to occur in the vicinity of the Airport by HW and/or by others. Surveys for these species were performed in accordance with NHESP-approved protocols. Following the verbal directive from NHESP (as noted above in Section 3.3), HW conducted additional field assessments for each of these species, focusing on the habitat potential for each species, rather than presence/absence surveys. The results of the 2005 species-specific surveys as well as the general characteristics of each species are provided in this section, followed by the identification of the communities and areas likely to be significant for providing habitat for each species. Figure 4 depicts the approximate areas of potential habitat within the Airport lease area for each of the four rare species based upon our field observations. Portions of the Airport lease area that were not assessed were supplemented with available source data from MassGIS.

### 5.1 Broom Crowberry

HW observed a population of Broom Crowberry located within Cultural Grassland to the southwest and west of the glide slope antenna within approximately 200 to 300 feet of this antenna, verifying previously documented observations of this species within the Airport lease area. The location of approximately 52 clusters of this species were survey-located and are shown on Figure 4. The observed clusters of Broom Crowberry, all of which are located within a few meters of each other, range in size from approximately 0.25 to 1.25 meters in diameter. The NHESP Rare Plant Observation Form is provided in the Appendices to this report.

HW continued to conduct meander surveys for Broom Crowberry in 2006 within areas of potential habitat for this species, including the area near the Glideslope antennae, in additional areas of Cultural Grassland habitat, in developing Sandplain Grasslands/Sandplain Heathlands, and within pitch-pine forested areas along the dunes. HW did not identify any additional occurrences of this species within the project areas.

### 5.2 Eastern Box Turtle Habitat

HW did not observe Eastern Box Turtles during any of the field assessments between 2004 and 2006. However, suitable habitat for this species is present, particularly in the southern portion of the Airport lease area, classified as Maritime Dune and Coastal Interdunal Marsh/Swale communities, where foraging habitat and abundant food sources are found within close proximity to open areas of sand suitable for nesting habitat. The rare species information provided by NHESP for Eastern Box Turtles states that “*in optimal habitats in Cape Cod pine barrens and oak thickets, the species is generally associated with cranberry dominated swales interspersed with bearberry groundcover, low bush blueberries, and thickets of bracken fern.*” The Eastern Box Turtle would be considered a generalist in the context of habitat preference, and many of these habitat characteristics are found within the Airport lease area, observed primarily in the expansive areas to the south of the Airport runway. All pitch-pine dominated habitats, including the cranberry-pine swales and the lower slopes of the pitch pine and oak dominant dune habitats together are suitable habitat for the Eastern Box Turtle. These areas contain

abundant fruit-bearing shrubs and ericaceous plants, as well as abundant mushrooms, which are considered high-value food sources for the Eastern Box Turtle as well as for many other birds and mammals.

### **5.3 Eastern Spadefoot Habitat**

Eastern Spadefoots were not observed by HW during any site visits. The distinctive breeding call of this animal was also not detected during evening surveys performed in 2005. However, Eastern Spadefoots have been observed by others during nocturnal road surveys conducted along nearby Race Point Road (Patten, et al., 2003). These researchers also positively identified a single Eastern Spadefoot breeding area, consisting of two small temporary ponds on Hatches Harbor Dike Road, located considerably south of the Airport lease area.

The Eastern Spadefoot uses temporary pools of standing water as breeding habitat, and prefers a soil in which it can burrow, consisting of loose, sandy material, with temporarily inundated isolated wetlands nearby (breeding habitat). The emergence of this species from underground burrows and migration to these temporary pools is triggered by heavy rainfall. The evening field visit conducted in August 2005 occurred immediately following a significant storm event, during which approximately four inches of rain fell within a 24-hour period<sup>1</sup>. It was anticipated that after such a significant rainfall that most isolated wetlands located in the eastern corner of the Airport, as well as other isolated wetland areas would contain standing water. However, due to the rainfall deficit observed on Cape Cod during the 2005 summer months<sup>2</sup>, and the relatively high porosity of the coarse sandy soils, significant precipitation events occurring over a short period of time during the summer months did not result in temporary pools at the Airport this year. Temporary inundation likely occurs earlier in the season when groundwater elevations are higher. The presence and fluctuation in depth of standing water in the wetlands at this site are likely related primarily to the gradual changes in groundwater elevation on a seasonal basis and not to precipitation events.

Habitat suitability surveys for the Eastern Spadefoot included identification of open, sandy depressions, which may temporarily hold water after significant rainfalls. Target areas included the Coastal Interdunal Marsh/Swales in and immediately surrounding the proposed footprints of the CIP projects, along with the alternative locations where vegetation was sparse, but with plentiful vegetative cover in surrounding areas. Portions of the Airport lease area, particularly in the southeastern corner, provide both of these features and may provide suitable habitat for the Eastern Spadefoot. These suitable habitat features are abundant within the Airport lease area, particularly south of the Airport runway.

### **5.4 Vesper Sparrow Habitat**

HW did not document the presence of any Vesper Sparrows during our 2004-2005 field surveys. Following the survey protocol approved by NHESP and incorporating techniques used successfully by researchers in 1993 (Jones and Vickery, 1995), HW performed field surveys for

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<sup>1</sup> Source: Massachusetts Climatological Reports, National Weather Service, 24-hour precipitation amounts.

<sup>2</sup> Source: Massachusetts Department of Conservation and Recreation <http://www.mass.gov/dcr/waterSupply/rainfall/>

the presence of Vesper Sparrows between mid-May and the end of July in 2005. Three early morning surveys (May 18, June 16, and July 29) and two early evening surveys (June 3 and July 11) were conducted during favorable weather conditions (i.e., no precipitation and light or no wind).

Kearney and Cook (2001) reported that approximately 29 hectares of land at the Provincetown Airport that are considered grasslands and/or heathlands, some or all of which may be classified as Cultural Grassland, with which the State-Threatened Vesper Sparrow is associated (Swain and Kearsley, 2001). The most recently documented observation of the Vesper Sparrow at the Airport that HW is aware of occurred in 2000, when NPS ecologists documented two Vesper Sparrows within the grassland habitat located northeast of the runway. Prior to this, in July of 1996, NPS observers reported “*small flocks of adult males (less than or equal to five individuals)*” observed along the Airport runway shoulders<sup>3</sup>. Earlier documented observations of this species at the Airport occurred in 1993, during a State-wide grassland bird survey, when seven (7) vocalizing male vesper sparrows were recorded at the airport (Jones and Vickery, 1995).

Kearney and Cook (2001) report that the distribution and abundance of Vesper Sparrows within the CCNS declined from 1995 to 2000. Earlier observations indicate that this species has been decreasing in numbers since the 1930s (Hill, 1965, as reported in Kearney and Cook, 2001). However, based upon the reported Vesper Sparrow observations by others during past surveys at the Airport, available resources including information from the NHESP pertaining specifically to known habitat requirement of this species, observations of associated wildlife (Northern Harrier; see below), and an understanding of existing community types, HW believes that the Cultural Grassland community and adjacent maintained shrub thickets that along the Airport runway, taxiway, and approach areas may provide suitable habitat for Vesper Sparrow, although perhaps not during every breeding season. Regular mowing of these areas as part of routine Airport maintenance, in part, maintains suitable habitat for this species.

## 5.5 Other State-Listed Species Observed

During their review of protocols for this study, NHESP requested that any observations of the Northern Harrier and the Grasshopper Sparrow (*Ammadramus savannarum*) be recorded. These species, both State-listed Threatened species, are associated with similar, overlapping habitat types as the Vesper Sparrow. While Grasshopper Sparrows were not observed (this species is thought to be extirpated from this part of Cape Cod; Kearney and Cook, 2001), HW observed individual male and female Northern Harriers during 12 of the 14 site visits made between August 2004 and September 2005, and routinely observed individual male and female Northern Harriers during site assessments and land surveys in 2006. Generally, these individuals were observed hunting or foraging along the Cultural Grasslands adjacent to the Airport runway. On one occasion, HW observed a female harrier in the dune area adjacent to Wetland AL.

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<sup>3</sup> Source: Rare Species Observation Form, submitted to NHESP July 25, 1996; observer K. Jones.

## **6. CAPITAL IMPROVEMENT PROJECTS AND HABITAT ASSESSMENTS**

Based on the habitat assessments presented here, several projects included in the CIP for the Airport have the potential to impact wetlands, wildlife habitat, and/or rare species habitat. The type and amount of impact depends on the alternative ultimately selected for each project element. The DEIR for the CIP will include an alternatives analysis. Table 3 presents a baseline overview of potential impacts, with respect to each project.

Table 3. Estimated potential for environmental impacts to wetland resource areas and rare species habitat for all build alternatives of CIP projects identified in the ENF.

Projects	Potential for Impact to Natural Resource Areas and Rare Species Habitat							
	Cultural Grassland	Maritime Dune Habitat	Coastal Interdunal Marsh/Swale	Freshwater Wetland Habitat	Broom Crowberry	Eastern Box Turtle	Eastern Spadefoot	Vesper Sparrow
West End TW (Alt. 1)	Impact	No Impact	Impact	Impact	No Impact	Potential	Potential	Potential
West Taxiway (Pref. Alt. 2)	Impact	No Impact	Impact	Impact	No Impact	Potential	Potential	Potential
Mid Entrance TW	Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	Potential
East End TW	Impact	No Impact	No Impact	Impact	No Impact	Potential	Potential	Potential
Partial Parallel TW	Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	Potential
Electrical Vault	No Impact	No Impact	Impact	Impact	No Impact	No Impact	No Impact	No Impact
Sightseeing Shack	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Turf Apron Expansion	Impact	No Impact	Impact	Impact	No Impact	No Impact	No Impact	Potential
AWOS Access Rd (Alt. A)	Impact	Impact	Impact	Impact	No Impact	Potential	Potential	Potential
AWOS Access Rd (Alt. B)	Impact	Impact	Impact	Impact	No Impact	Potential	Potential	Potential
AWOS Access Rd (Pref. Alt. C)	No Impact	Impact	Impact	Impact	No Impact	Potential	Potential	No Impact
AWOS Access Rd (Alt. D)	No Impact	Impact	Impact	Impact	No Impact	Potential	Potential	No Impact
Equip Shelter Road (Alt. A)	Impact	Impact	No Impact	No Impact	No Impact	Potential	Potential	Potential
Equip Shelter Road (Pref. Alt. B)	No Impact	Impact	No Impact	No Impact	No Impact	Potential	Potential	No Impact
Equip Shelter Road (Alt. C)	No Impact	Impact	Impact	Impact	No Impact	Potential	Potential	No Impact
Equip Shelter Road (Alt. D)	No Impact	Impact	No Impact	No Impact	No Impact	Potential	Potential	No Impact
Equip Shelter Road (Alt. E)	Impact	Impact	No Impact	No Impact	No Impact	Potential	Potential	Potential
Perimeter Fence (Pref. Alt.)	No Impact	Impact	Impact	Impact	No Impact	Impact	Impact	No Impact
Perimeter Fence (Alt. 2 – 500 ft.)	Impact	Impact	Impact	Impact	Impact	Impact	Impact	Potential
Perimeter Fence (Alt. 3 – 1,000 ft.)	No Impact	Impact	Impact	Impact	No Impact	Impact	Impact	No Impact
Terminal Building-Vertical	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Terminal Building-Horizontal	No Impact	No Impact	No Impact	Impact	No Impact	No Impact	No Impact	No Impact
Parking Area	No Impact	Impact	Potential	Potential	No Impact	Potential	Potential	No Impact

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## 7. SUMMARY

This report constitutes a draft Natural Resources Inventory (NRI) for submission to the CCC, and an initial summary for submittal with a MESA Project Review with NHESP. Data and information submitted with this report are used to support the DEIR.

Within the Airport lease area, HW conducted numerous habitat inventories, concentrated within areas likely to be affected by various alternatives to proposed projects for the CIP which were presented in the ENF. Site assessments were completed between the summer of 2004 and the fall of 2005, and again in the summer-fall seasons in 2006 to evaluate wildlife habitat characteristics and quantify the site's natural resources. As most of the CIP projects will be analyzed with respect to meeting performance standards under applicable local, State, Federal, and/or regional regulations (pertaining to wetland resource areas, wildlife habitat, and habitat of rare plant and animal species), this information is intended to serve as the baseline for evaluation of the CIP projects and development of the alternatives analyses in the EIR. Data here will also serve as the basis for developing appropriate mitigation where it is deemed necessary.

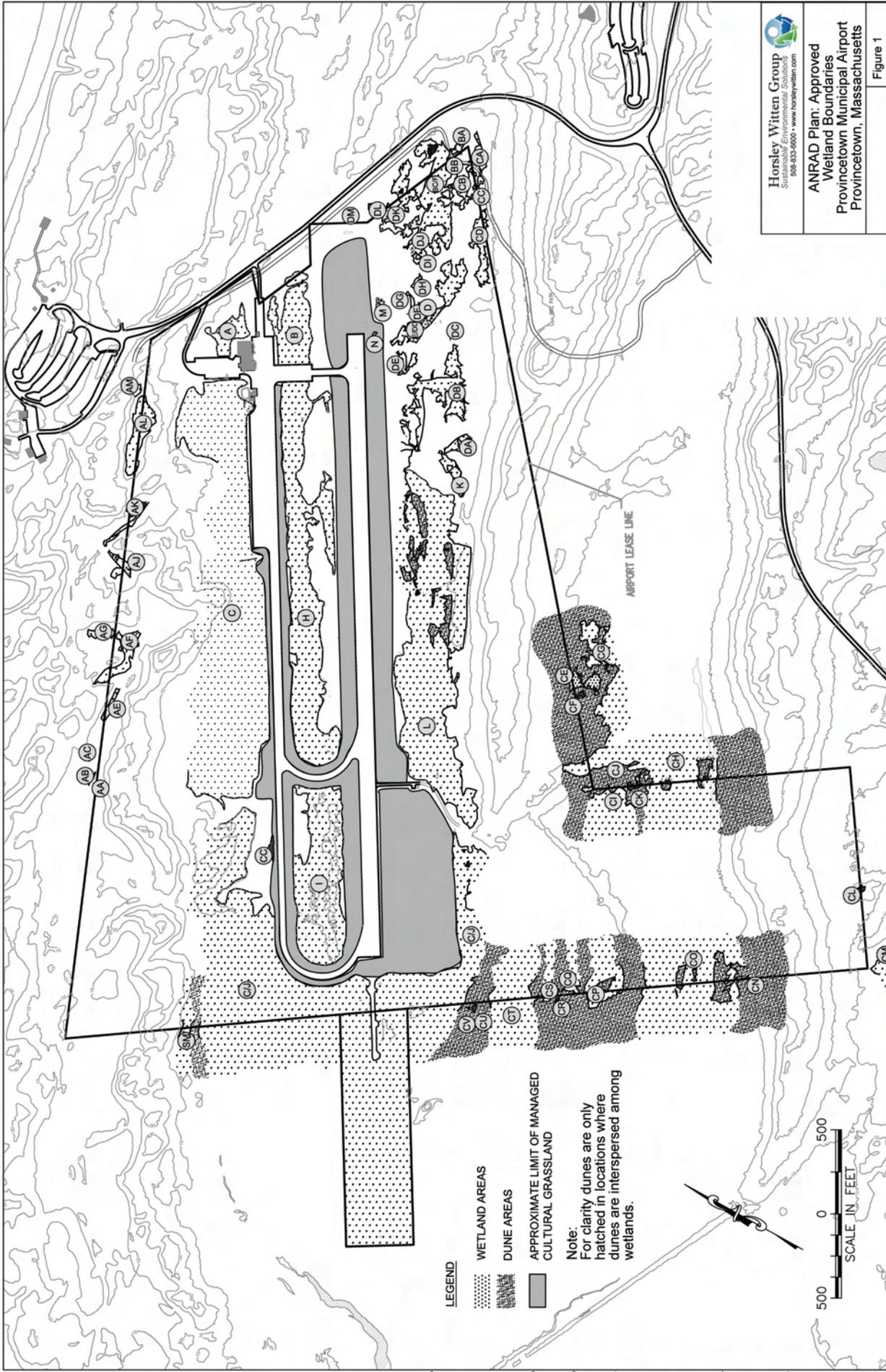
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## 8. REFERENCES

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**LEGEND**

-  WETLAND AREAS
-  DUNE AREAS
-  APPROXIMATE LIMIT OF MANAGED CULTURAL GRASSLAND

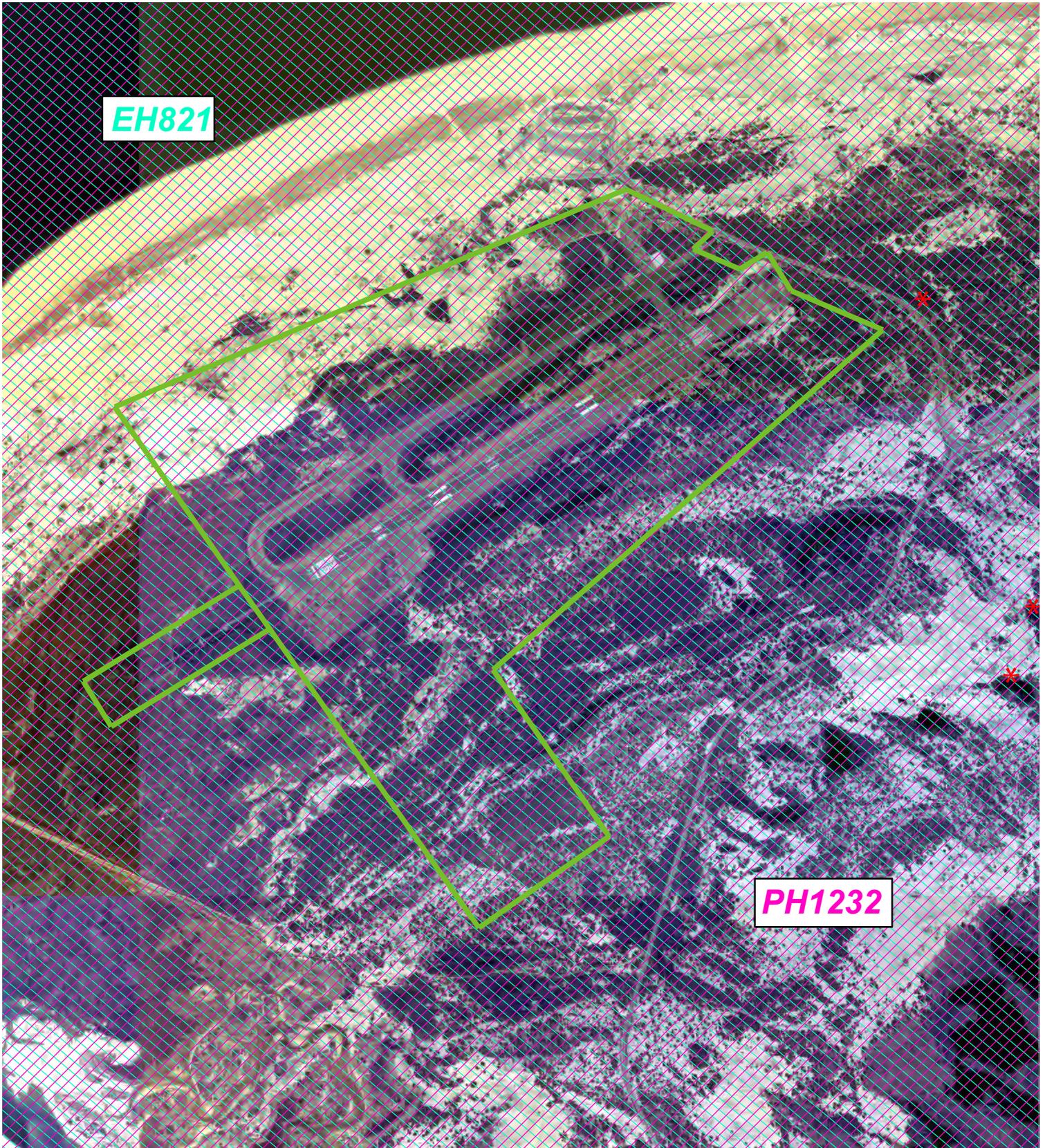
**Note:**  
For clarity dunes are only hatched in locations where dunes are interspersed among wetlands.

**Horsley Witten Group**  
Sustainable Environmental Solutions  
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**ANRAD Plan: Approved Wetland Boundaries Provincetown Municipal Airport Provincetown, Massachusetts**

Figure 1

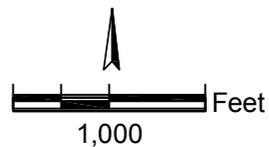




**Legend**

-  Lease Line
-  NHESP Estimated Habitats of Rare Wildlife
-  NHESP Priority Habitats of Rare Species
-  NHESP Certified Vernal Pools

*\*Source: Certified Vernal Pools - MassGIS, January 2007  
 Estimated & Priority Habitats - MassGIS, December 2006*

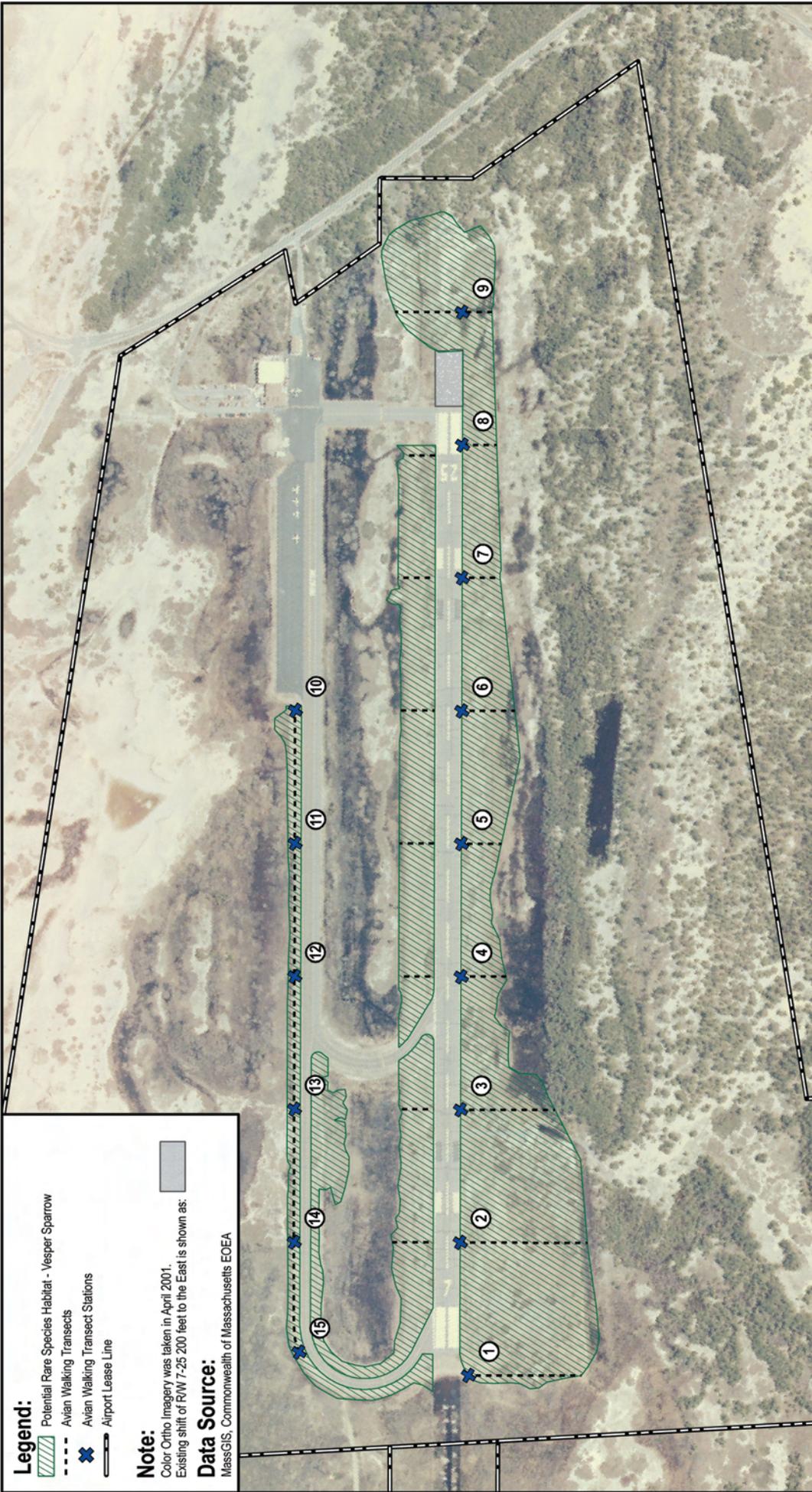


Horsley Witten Group  
 phone: 508-833-6600  
 www.horsleywitten.com

Natural Heritage & Endangered  
 Species Program (NHESP)  
 Provincetown Municipal Airport  
 Provincetown, MA

**Figure 2**



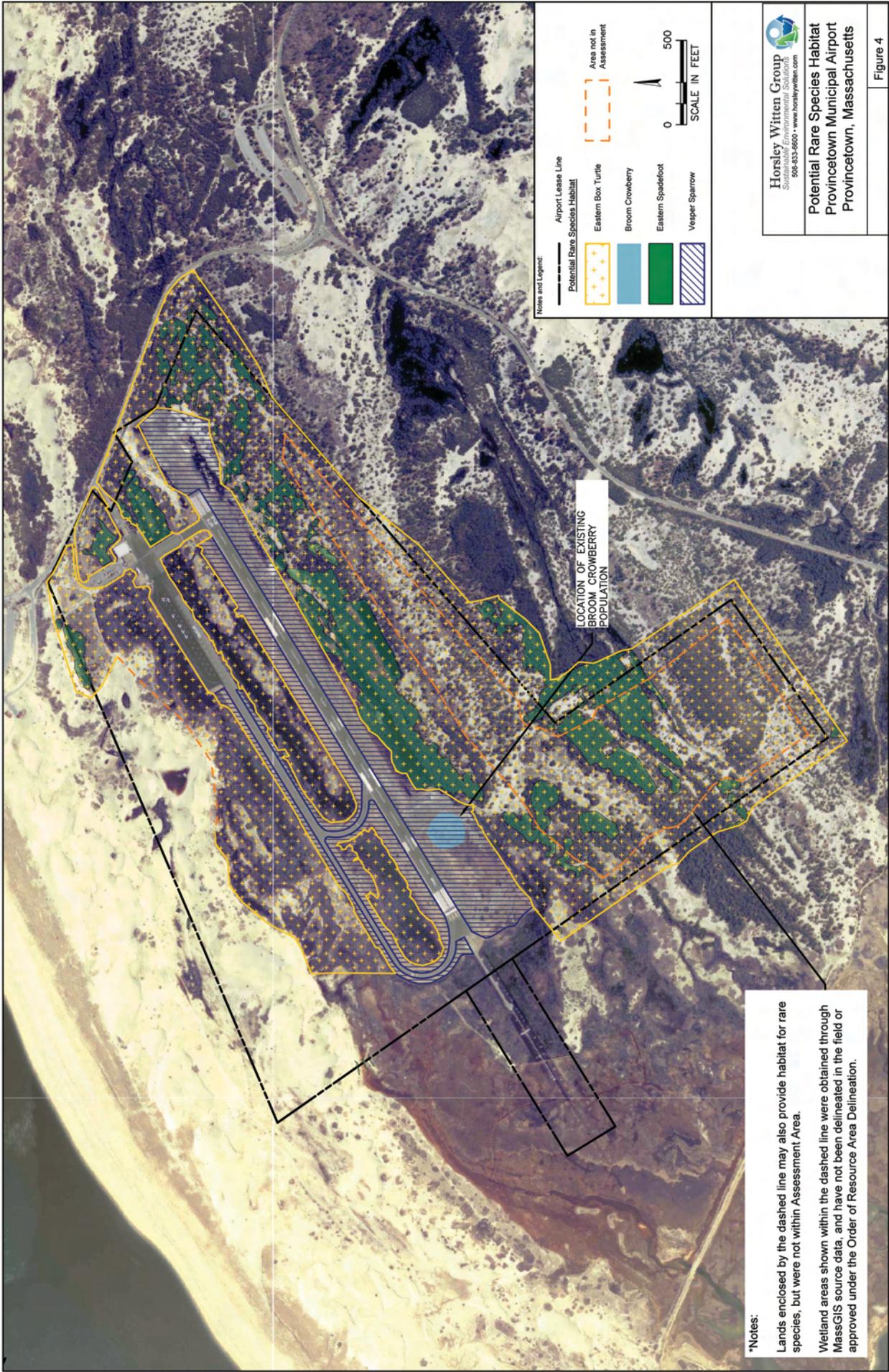


**Edwards AND Kelcey**  
343 Congress Street  
Boston, MA 02210  
Tel: 617-242-9222

**Walking Transects  
for Vesper Sparrow Surveys  
Provincetown Municipal Airport**

Prepared For:  
Horsley Witten Group





Notes and Legend:

- Airport Lease Line
- ★ Potential Rare Species Habitat
- ★ Eastern Box Turtle
- Broom Crowberry
- Eastern Spadefoot
- Vesper Sparrow
- Area not in Assessment

0 500  
SCALE IN FEET

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Potential Rare Species Habitat  
Provincetown Municipal Airport  
Provincetown, Massachusetts

Figure 4

\*Notes:  
Lands enclosed by the dashed line may also provide habitat for rare species, but were not within Assessment Area.  
Wetland areas shown within the dashed line were obtained through MassGIS source data, and have not been delineated in the field or approved under the Order of Resource Area Delineation.



---

**APPENDICES**

Correspondence with NHESP  
NHESP-Approved Rare Species Habitat Survey Protocols  
Rare Plant Observation Form (*Corema conradii*)





MassWildlife

Commonwealth of Massachusetts

# Division of Fisheries & Wildlife

JUN 01 2004

HORSLEY & WITTEN, INC.

Wayne F. MacCallum, Director

May 26, 2004

Amy Ball  
Horsley Witten Group  
90 Route 6A  
Sandwich, MA 02563

Re: Provincetown Municipal Airport  
Provincetown, MA  
NHESP File: 04-15716

Dear Ms. Ball

Thank you for contacting the Natural Heritage and Endangered Species Program ("NHESP") of the MA Division of Fisheries & Wildlife for information regarding state-protected rare species in the vicinity of the above referenced site. We have reviewed the site and would like to offer the following comments.

This project site is located entirely within Priority Habitat 1150 and near Estimated Habitat 17 as indicated in the 11<sup>th</sup> Edition of the Massachusetts Natural Heritage Atlas. Our database indicates that the following protected rare species have been found in the vicinity of the site:

<u>Scientific name</u>	<u>Common Name</u>	<u>Taxonomic Group</u>	<u>State Status</u>
<i>Scaphiopus holbrookii</i>	Eastern Spadefoot	Amphibian	Threatened
<i>Terrapene carolina</i>	Eastern Box Turtle	Reptile	Special Concern
<i>Pooecetes gramineus</i>	Vesper Sparrow	Bird	Threatened
<i>Corema conradii</i>	Broom Crowberry	Plant	Special Concern

These species are protected under the Massachusetts Endangered Species Act (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.37 and 10.59). Fact sheets for these species can be found on our website <http://www.state.ma.us/dfwele/dfw/nhesp/nhfact.htm>.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. Should your site plans change, or new rare species information become available, this evaluation may be reconsidered.

### MA Endangered Species Act (G.L. c. 131A)

Using the list of rare species provided above, we recommend that rare wildlife and plant surveys and assessments be conducted by qualified individuals within suitable habitats on and near the site according to

[www.masswildlife.org](http://www.masswildlife.org)

Division of Fisheries and Wildlife

Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 792-7270 Fax (508) 792-7275

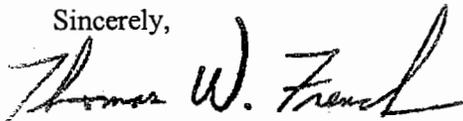
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

scientifically accepted survey methodologies. Survey methodologies should be approved by NHESP prior to initializing rare species surveys. A Rare Animal/Plant Observation Form, available at our website [www.nhesp.org](http://www.nhesp.org), should be submitted for each species encountered. If during this site evaluation rare species are found on or near the site, then site plans and a project description should be sent to NHESP Environmental Review to determine whether a probable "take" under the MA Endangered Species Act would occur (321 CMR 10.04).

If NHESP determines that the proposed project would "take" a rare species, and the site is greater than two acres, and within a Priority Habitat site, an Environmental Notification Form should be submitted pursuant to the MA Environmental Policy Act regulations (301 CMR 11.03(2)(b)(2)). A Conservation & Management Permit (321 CMR 10.04 (3)(b)) may be required for work in rare species habitat.

If you have any questions regarding this review please call Ellen Shultzabarger, Environmental Review Assistant, at ext. 154.

Sincerely,

A handwritten signature in cursive script that reads "Thomas W. French". The signature is written in black ink and is positioned to the right of the word "Sincerely,".

Thomas W. French, Ph.D.  
Assistant Director

cc:

Provincetown Conservation Commission

# Horsley Witten Group

Sustainable Environmental Solutions



June 29, 2004

90 Route 6A • Sandwich, MA • 02563  
Phone - 508-833-6600 • Fax - 508-833-3150 • [www.horsleywitten.com](http://www.horsleywitten.com)

Mr. Jon Regosin, Endangered Species Project Analyst  
MA Natural Heritage and Endangered Species Program  
Route 135, North Drive  
Westborough, MA 01581

**Re: Rare Species Habitat Survey Methodologies  
Provincetown Municipal Airport Master Plan Update**

Dear Mr. Regosin:

The Horsley Witten Group (HW) will be performing fieldwork to update all wetland resource area boundary delineations and conduct appropriate wildlife habitat evaluations in conjunction with the Provincetown Municipal Airport Master Plan Update (AMPU). Proposed projects associated with the AMPU will likely occur within Priority Habitat of Rare Species (PH 1150).

We recently requested and obtained information from the Massachusetts Natural Heritage and Endangered Species Program (NHESP) regarding the potential state-listed species at the airport facility. These include:

- Eastern Box Turtle (*Terrapene c. carolina*),
- Vesper Sparrow (*Pooecetes gramineus*),
- Broom Crowberry (*Corema conradii*), and
- Eastern Spadefoot (*Scaphiopus h. holbrookii*)

We are anxious to begin field surveys for these species and their habitats as soon as possible this growing season. Our intention is to coordinate closely with NHESP prior to conducting any wildlife habitat evaluations. At Patricia Huckery's suggestion, I am forwarding to you draft descriptions of our proposed field survey methodologies for review and comment.

As the AMPU will involve long-term projects, we anticipate extensive future coordination with the NHESP, as well as the Cape Cod Commission and the Provincetown Conservation Commission, prior to the design phase of any future project. Thank you in advance for your assistance with this matter. Should you have any questions, please do not hesitate to contact me at (508) 833-6600 ext. 123, or Mike Ball at ext. 105. You may reach either of us by email at [aball@horsleywitten.com](mailto:aball@horsleywitten.com) and [mball@horsleywitten.com](mailto:mball@horsleywitten.com). We look forward to hearing from you.

Sincerely,

HORSLEY WITTEN GROUP

  
Amy M. Ball  
Project Manager – Wetland Scientist

Enclosures (4)

cc: William Richardson, Edwards and Kelcey

J:\4027 E&K-PTown Airport\Correspondence\NHESP rare species\cover letter to NHESP - methodologies.doc  
Sandwich Boston Providence





**DRAFT**

## **Broom Crowberry (*Corema conradii*)**

(Massachusetts Species of Special Concern)

### **Description**

Broom Crowberry is a low-growing, densely branching evergreen shrub with tiny leaves. This species blooms between March and May with inconspicuous reddish purple flowers. Summer growth is characterized by a bright yellow-green coloration, distinguishing this species from similar heather-like plants.

### **Reported Habitat**

This species inhabits open areas (low shrub or moor communities or sandy flats, as well as dry pitch pine/scrub oak barrens and relic sand dunes. Associated species include scrub oak (*Quercus ilicifolia*), pitch pine (*Pinus rigida*), golden heather (*Hudsonia ericoides*), and bearberry (*Arctostaphylos uva-ursi*). The NHESP- described natural communities with which this species is associated include Scrub Oak Shrubland and the Pitch Pine – Scrub Oak Community.

Broom Crowberry was previously recorded at the Provincetown Municipal Airport in the managed grassland habitat southwest of the glide slope antennae. The airport's current environmental consultant has documented additional records of this species within a developing sandplain grassland habitat. All documented occurrences of this species will be incorporated within any future project development.

### **Methodology for Identification and Mapping of Habitat**

Horsley Witten Group will conduct meander surveys for Broom Crowberry, targeting areas of open grassland habitat and/or sandplain grasslands/heathlands with associated plant communities (described above) to search for occurrences of Broom Crowberry located in and immediately adjacent to the airport facility.

The location of any Broom Crowberry communities encountered within the site will be recorded by field measurements (when practical) and by using a GPS unit for potential future mapping. Documentation will include photographs and a description of the habitat occupied, including the associated plant community. A Rare Plant Observation Form will be completed for submission to the Massachusetts Natural Heritage and Endangered Species Program.

### **References**

Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

Massachusetts Natural Heritage and Endangered Species Program Fact Sheet – Broom Crowberry (1985).



**DRAFT**

## **Vesper Sparrow (*Pooecetes gramineus*)**

(Massachusetts Threatened Species)

### **Description**

The Vesper Sparrow is a small, short-tailed grayish-brown sparrow with a streaked breast. Unique characteristics include a notched, black tail with white outer tail feathers that are conspicuous during flight.

### **Reported Habitat**

This species is reported to inhabit open areas (cultivated fields, grasslands, fallow fields, and pastures) as well as sandplain heathlands with clump-forming grasses, bare patches, and scattered shrubs or saplings growing in typically dry and well drained soils. This type of habitat serves as nesting habitat, cover, foraging sites, and singing perches for the Vesper Sparrow. The NHESP- described natural community with which this species is associated is Cultural Grassland (formerly described as Sandplain Grassland – Cultural Community), which is often a maintained, open community dominated by grasses, normally maintained by mowing.

### **Methodology for Identification of Habitat**

Meander surveys for the Vesper Sparrow and its habitat will concentrate on managed grassland areas adjacent to airport runways and taxiways, as well as target areas of open grassland habitat within and immediately adjacent to the airport facility.

As this species is known to frequently sing during the early evening hours, habitat assessments will be timed appropriately. Field investigators may solicit territorial singing by playing recorded vocalizations of this species and may attempt to record species response to these recordings.

Any individual Vesper Sparrow encountered will be documented as to location within the site, its activity (nesting, foraging, singing, etc.), and a description of the habitat occupied. Photographs will be taken as obtainable. A Rare Animal Observation Form will be completed for submission to the Massachusetts Natural Heritage and Endangered Species Program. Incidental bird species observed within these areas will also be recorded.

### **References**

Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

Connecticut Department of Environmental Protection, Wildlife In Connecticut Endangered And Threatened Species Series, Vesper Sparrow (*Pooecetes gramineus*) website.  
<http://dep.state.ct.us/burnatr/wildlife/factshts/vesp.htm>

New Jersey Department of Environmental Protection, Endangered Species Program website  
[www.nj.gov/dep/fgw/ensp/pdf/end-thrtened/vespersparrow.pdf](http://www.nj.gov/dep/fgw/ensp/pdf/end-thrtened/vespersparrow.pdf)

NatureServ Explorer Fact Sheet on Vesper Sparrow

Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. New York: A Fireside Book published by Simon & Schuster, Inc., 785 pp.



**DRAFT**

## **Eastern Spadefoot (*Scaphiopus h. holbrookii*)**

(Massachusetts Threatened Species)

### **Description**

The Eastern Spadefoot is a medium-sized, smooth-skinned toad with small, scattered warts. Distinguishing characteristics are a bright golden eye with a vertical pupil and a dorsal pattern of two golden stripes (Klemens, 1993). A spade-like, black horny projection is located on the inner border of the foot. The call is a short, explosive, low-pitched “wank” repeated every two seconds (Martof, 1980).

### **Reported Habitat**

Available literature describing this species reports that spadefoots require dry sandy or loose soils in areas of sparse shrub growth of open forest areas (DeGraaf and Rudis, 1983). In addition, this species breeds only in shallow, temporary pools formed after very heavy, warm rains and may be found in large numbers when rainfall is extensive (Martof, 1980). The NHESP-described natural communities with which this species is associated and that may exist at the subject site include Coastal Interdunal Marsh/Swale, Wet Meadow, and Shrub Swamp.

### **Methodology for Identification and Mapping of Habitat**

Fieldwork to identify suitable habitats for the Eastern Spadefoot will involve location of all isolated depressions within the defined limits of the survey area that may temporarily hold water after significant rainfalls. Once these isolated areas are identified, these areas will be observed during and within five days of following a significant rainfall event in order to observe breeding activity (i.e. mating pairs or vocalizations) or evidence of this activity (i.e., egg masses). At least one evening observation period will be performed in the period between the mid-July and mid-September, when the breeding season is reported to end. We intend to acquire a recording of this species vocalization and use this recording during the evening observation period. The locations of all potential and known breeding habitats will be mapped and any individuals observed will be photographed and the location(s) in which they were observed will be located by GPS. In addition, a Rare Animal Observation Form will be completed for submission to the NHESP.

### **References**

Massachusetts Natural Heritage and Endangered Species Program Fact Sheet – Eastern Spadefoot

Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

DeGraaf, Richard M. and Rudis, Deborah D. Amphibians and Reptiles of New England, Amherst, Massachusetts: The University of Massachusetts, 1983.

Klemens, Michael W., Amphibians and Reptiles of Connecticut and Adjacent Regions. State Geological and Natural History Survey of Connecticut, Bulletin 12, Connecticut DEP, 1993.

Martof, Bernard S., W. M. Palmer, J. R. Bailey, J. R. Harrison. Amphibians and Reptiles of the Carolinas and Virginia. The University of North Carolina Press, Chapel Hill, 1980.



**DRAFT**

## **Eastern Box Turtle (*Terrapene c. carolina*)**

(Massachusetts Species of Special Concern)

### **Description**

The Eastern box turtle is a small to medium-sized (4.5 to 8-inch) terrestrial turtle, recognized by its domed, globular carapace with a pattern of orange or yellow markings on a dark brown or black background. Adults have varying amounts of yellow, orange, and pink pigment on the head, neck, throat, and forelimbs (Klemens, 1993).

### **Reported Habitat**

Available literature describing this species reports that this species uses a relatively wide range of terrestrial habitat types, including woodlands, field edges and thickets (DeGraaf and Rudis, 1983). These habitats are generally characterized by sandy, well-drained soils and, despite this species association with terrestrial habitats, they have been found in various wetland habitat types including wet meadows and lowland swamps (Klemens, 1993). The Massachusetts NHESP-described natural communities with which this species is associated include Coastal Forest/Woodland and Pitch Pine-Oak Forest.

### **Methodology for Identification and Mapping of Habitat**

The Horsley Witten Group (HW) will perform meander surveys for the Eastern Box Turtle within each habitat type at the site. The primary habitat types at this site within which searches will predominantly be done will be any coastal forest/woodland or pitch pine-oak forest habitat, and the margins (i.e., "edge areas") between these wooded habitats and any open field or wet meadow habitats encountered. As this species is strictly diurnal, field surveys specifically performed to observe this species will be done in the early morning and/or during the day immediately following thunderstorms when the species is reported to be active (Klemens, 1993). HW will document any box turtle encountered by recording its observed location with a GPS unit (for habitat mapping purposes), its apparent activity (nesting, aestivation, direction of travel, etc.), a description of the habitat in which the individual animal was observed, and any characteristic markings, including evidence of injury to the animal. Photographs of each individual will be collected. A Rare Animal Observation Form will be completed for submission to the Massachusetts Natural Heritage and Endangered Species Program. Any box turtle remains will be documented as well.

### **References**

Massachusetts Natural Heritage and Endangered Species Program Fact Sheet – Eastern Box Turtle

DeGraaf, Richard M. and Rudis, Deborah D. Amphibians and Reptiles of New England, Amherst, Massachusetts: The University of Massachusetts, 1983.

Klemens, Michael W., Amphibians and Reptiles of Connecticut and Adjacent Regions. State Geological and Natural History Survey of Connecticut, Bulletin 12, Connecticut DEP, 1993.

Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

Horsley Witten Group  
Sustainable Environmental Solutions

90 Route 6A • Sandwich, MA • 02563  
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com



## Memorandum

**TO:** Mr. William Richardson, Edwards and Kelcey  
**FROM:** Amy M. Ball  
**DATE:** July 30, 2004  
**RE:** Provincetown Rare Species Habitat Evaluations

---

Horsley Witten Group has received verbal feedback from Dr. Jon Regosin at the Massachusetts Natural Heritage and Endangered Species Program (NHESP) regarding our proposed field protocols for assessing the potential habitat for the four state-listed species identified at the Provincetown Airport site. Several individuals at NHESP reviewed our proposed protocols and provided us with input. I have incorporated these comments into our revised field protocols (see attached) with a brief summary for each species provided below.

NHESP has requested that we modify our protocols to include the following specifications:

### Vesper Sparrow

- Surveys should be conducted between the hours of 5:30-10:00 a.m. and 6:00 to 8:00 p.m. during three (3) evenly spaced surveys between May 1<sup>st</sup> and July 31<sup>st</sup>;
- Field conditions should not be windy or rainy;
- Walking transects should be established approximately 150 meters apart within all grassland areas and at the edges of paved areas;
- Surveys should include both listening and visual surveys (broadcasting during surveys, as we had proposed, is not essential, but may be useful);
- Locations of all species observed should be plotted;
- All adults observed carrying food should be indicated; and
- Observers should also note any observations of two other bird species which utilize the same habitat types: the Grasshopper Sparrow (*Ammodramus savannarum*) and the Northern Harrier (*Circus cyaneus*).

### Broom Crowberry

- Survey areas should be expanded to include Pitch Pine forested areas as well as sandplain grassland areas;
- Survey protocols should refer to the *NHESP Plant Survey Protocols*, noting precisely when and how the surveys were conducted;
- Reporting should include an overall description of the plant community in which a rare species was observed; and
- Reporting should include a complete list of vascular plants observed during the rare plant survey, including any other rare species encountered.

### Spadefoot Toad

- Initial surveys should include a general assessment of isolated wet areas;
- Surveys for actual individuals should be conducted from April through September, when this species is most active; and
- Surveys should be conducted after a storm event; approximately once every three (3) weeks with a focus on the tadpole stage (this species has a three week aquatic larval stage).

### Eastern Box Turtle

- Walking transects should be set up, focusing efforts on prime habitat areas:
  - (a) Edges of ecotones
  - (b) Mesic areas
  - (c) Wetland edges;
- Surveys should be conducted after a storm event with an ideal focus on spring and late fall; and
- Shells of all (live) individuals encountered should be carefully notched to assist in general population study efforts.

Essentially, the NHESP has granted us permission to begin this fieldwork, as long as we incorporate their comments and specifications into our protocols. I will be seeking written confirmation from the NHESP to that effect. Note that the NHESP comments regarding the surveys for the Vesper Sparrow, and to a lesser degree for the Eastern Box Turtle and the Spadefoot Toad, will necessitate our continuing rare species survey work into next spring. At this time I am not certain how this would affect the project timeline that was presented to the FAA and MAC. At the very least, we can still document the potential habitat for these species, as our intent is to identify the habitat for the rare animal species, rather than documenting actual individuals, for project planning purposes.

In the interim, we are planning to begin the rare species fieldwork the first to second week in August. We will coordinate with the Airport Manager, Butch Lisenby, regarding security identification for all field personnel involved.

Mr. William Richardson  
July 30, 2004  
Page 3 of 3

We should discuss our approach to contacting the Cape Cod Commission (CCC) to give them some notice on our fieldwork related to wildlife habitat. I would recommend keeping contact with the CCC informal at this point, particularly since there is no definitive proposal for the upcoming projects. Given the proposed timing for some of our rare species habitat surveys, we would also be able to collect information toward our Natural Resources Inventory (NRI) that is required by the CCC (i.e., early morning and early evening field surveys). However, we would anticipate that the bulk of the NRI fieldwork would occur between September and November, as per their Technical Bulletin guidelines..

cc: Joseph Longo  
D. Michael Ball

**NHESP-Approved Rare Species Habitat Assessment Protocols**

## **Vesper Sparrow (*Pooecetes gramineus*)**

(Massachusetts Threatened Species)

### **Description**

The Vesper Sparrow is a small, short-tailed grayish-brown sparrow with a streaked breast. Unique characteristics include a notched, black tail with white outer tail feathers that are conspicuous during flight.

### **Reported Habitat**

This species is reported to inhabit open areas (cultivated fields, grasslands, fallow fields, and pastures) as well as sandplain heathlands with clump-forming grasses, bare patches, and scattered shrubs or saplings growing in typically dry and well drained soils. This type of habitat serves as nesting habitat, cover, foraging sites, and singing perches for the Vesper Sparrow. The NHESP- described natural community with which this species is associated is Cultural Grassland (formerly described as Sandplain Grassland – Cultural Community), which is often a maintained, open community dominated by grasses, normally maintained by mowing.

### **Methodology for Identification of Habitat**

Three (3) evenly spaced surveys will be conducted between May 1<sup>st</sup> and July 31<sup>st</sup>, between the hours of 5:30-10:00 a.m. and 6:00 to 8:00 p.m., during non-windy, non-rainy conditions. Surveys for the Vesper Sparrow and its habitat will concentrate on managed grassland areas adjacent to airport runways and taxiways, as well as target areas of open grassland habitat and at the edges of paved areas within and immediately adjacent to the airport facility. Walking transects will be established approximately 150 meters apart.

Field surveys will include both listening and visual surveys. As this species is known to frequently sing during the early evening hours, habitat assessments will be timed appropriately. Field investigators may solicit territorial singing by playing recorded vocalizations of this species, and may attempt to record species response to these recordings.

Any individual Vesper Sparrow encountered will be documented and its location plotted, its activity (nesting, foraging, singing, etc.), including observations of adult individuals carrying food, and a description of the habitat occupied. Photographs will be taken as obtainable. A Rare Animal Observation Form will be completed for submission to the Massachusetts Natural Heritage and Endangered Species Program. Observers will also document any observations of two other bird species, which utilize the same habitat types: the Grasshopper Sparrow (*Ammodramus savannarum*) and the Northern Harrier (*Circus cyaneus*). Incidental bird species observed within these areas will also be recorded.

### **References**

Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

Connecticut Department of Environmental Protection, Wildlife In Connecticut Endangered And Threatened Species Series, Vesper Sparrow (*Pooecetes gramineus*) website.  
<http://dep.state.ct.us/burnatr/wildlife/factshts/vesp.htm>

New Jersey Department of Environmental Protection, Endangered Species Program website  
[www.nj.gov/dep/fgw/ensp/pdf/end-thrtened/vespersparrow.pdf](http://www.nj.gov/dep/fgw/ensp/pdf/end-thrtened/vespersparrow.pdf)

NatureServ Explorer Fact Sheet on Vesper Sparrow

Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. New York: A Fireside Book published by Simon & Schuster, Inc., 785 pp.

## **Eastern Box Turtle (*Terrapene c. carolina*)**

(Massachusetts Species of Special Concern)

### **Description**

The Eastern box turtle is a small to medium-sized (4.5 to 8-inch) terrestrial turtle, recognized by its domed, globular carapace with a pattern of orange or yellow markings on a dark brown or black background. Adults have varying amounts of yellow, orange, and pink pigment on the head, neck, throat, and forelimbs (Klemens, 1993).

### **Reported Habitat**

Available literature describing this species reports that this species uses a relatively wide range of terrestrial habitat types, including woodlands, field edges and thickets (DeGraaf and Rudis, 1983). These habitats are generally characterized by sandy, well-drained soils and, despite this species association with terrestrial habitats, they have been found in various wetland habitat types including wet meadows and lowland swamps (Klemens, 1993). The Massachusetts NHESP-described natural communities with which this species is associated include Coastal Forest/Woodland and Pitch Pine-Oak Forest.

### **Methodology for Identification and Mapping of Habitat**

The Horsley Witten Group (HW) will perform meander surveys along walking transects for the Eastern Box Turtle within each habitat type at the site. The primary habitat types at this site within which searches will predominantly be done will be any coastal forest/woodland or pitch pine-oak forest habitat, along edges of ecotones (i.e., "edge areas") between these wooded habitats and any open field or wet meadow habitats, and into the wetland edges.

As this species is strictly diurnal, field surveys specifically performed to observe this species will be done in the early morning and/or during the day immediately following storm events when the species is reported to be most active (Klemens, 1993). Surveys will occur primarily in the spring and fall.

HW will document any box turtle encountered by recording its observed location with a GPS unit (for habitat mapping purposes), its apparent activity (nesting, aestivation, direction of travel, etc.), a description of the habitat in which the individual animal was observed, and any characteristic markings, including evidence of injury to the animal. Photographs of each individual will be collected and shells will be carefully notched (for general population study efforts). A Rare Animal Observation Form will be completed for submission to the Massachusetts Natural Heritage and Endangered Species Program. Any box turtle remains will be documented as well.

### **References**

- Massachusetts Natural Heritage and Endangered Species Program Fact Sheet – Eastern Box Turtle
- DeGraaf, Richard M. and Rudis, Deborah D. Amphibians and Reptiles of New England, Amherst, Massachusetts: The University of Massachusetts, 1983.
- Klemens, Michael W., Amphibians and Reptiles of Connecticut and Adjacent Regions. State Geological and Natural History Survey of Connecticut, Bulletin 12, Connecticut DEP, 1993.
- Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

## **Broom Crowberry (*Corema conradii*)**

(Massachusetts Species of Special Concern)

### **Description**

Broom Crowberry is a low-growing, densely branching evergreen shrub with tiny leaves. This species blooms between March and May with inconspicuous reddish purple flowers. Summer growth is characterized by a bright yellow-green coloration, distinguishing this species from similar heather-like plants.

### **Reported Habitat**

This species inhabits open areas (low shrub or moor communities or sandy flats, as well as dry pitch pine/scrub oak barrens and relic sand dunes. Associated species include scrub oak (*Quercus ilicifolia*), pitch pine (*Pinus rigida*), golden heather (*Hudsonia ericoides*), and bearberry (*Arctostaphylos uva-ursi*). The NHESP- described natural communities with which this species is associated include Scrub Oak Shrubland and the Pitch Pine – Scrub Oak Community.

Broom Crowberry was previously recorded at the Provincetown Municipal Airport in the managed grassland habitat southwest of the glide slope antennae. The airport's current environmental consultant has documented additional records of this species within a developing sandplain grassland habitat. All documented occurrences of this species will be incorporated within any future project development.

### **Methodology for Identification and Mapping of Habitat**

Horsley Witten Group (HW) will conduct meander surveys for Broom Crowberry, targeting areas of open grassland habitat and/or sandplain grasslands/heathlands, as well as pitch-pine forested areas with associated plant communities (described above) to search for occurrences of Broom Crowberry located in and immediately adjacent to the airport facility.

Survey protocols will follow the guidelines outlined in the *NHESP Plant Survey Protocols*, noting precisely when and how the surveys were conducted, and following reporting guidelines for all occurrences of this species.

The location of any Broom Crowberry communities encountered within the site will be recorded by field measurements (when practical) and by using a GPS unit for potential future mapping. Documentation will include photographs and a description of the habitat occupied, including the associated plant community. A Rare Plant Observation Form will be completed for submission to the Massachusetts Natural Heritage and Endangered Species Program.

### **References**

Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

Massachusetts Natural Heritage and Endangered Species Program Fact Sheet – Broom Crowberry (1985).

## **Eastern Spadefoot (*Scaphiopus h. holbrookii*)**

(Massachusetts Threatened Species)

### **Description**

The Eastern Spadefoot is a medium-sized, smooth-skinned toad with small, scattered warts. Distinguishing characteristics are a bright golden eye with a vertical pupil and a dorsal pattern of two golden stripes (Klemens, 1993). A spade-like, black horny projection is located on the inner border of the foot. The call is a short, explosive, low-pitched “wank” repeated every two seconds (Martof, 1980).

### **Reported Habitat**

Available literature describing this species reports that spadefoots require dry sandy or loose soils in areas of sparse shrub growth of open forest areas (DeGraaf and Rudis, 1983). In addition, this species breeds only in shallow, temporary pools formed after very heavy, warm rains and may be found in large numbers when rainfall is extensive (Martof, 1980). The NHESP-described natural communities with which this species is associated and that may exist at the subject site include Coastal Interdunal Marsh/Swale, Wet Meadow, and Shrub Swamp.

### **Methodology for Identification and Mapping of Habitat**

Fieldwork to identify suitable habitats for the Eastern Spadefoot will involve location of all isolated depressions within the defined limits of the survey area that may temporarily hold water after significant rainfalls. Once these isolated areas are identified, these areas will be observed approximately once every three (3) weeks following significant rainfall events from April through September in order to observe evidence of breeding activity (i.e. mating pairs or vocalizations) with an emphasis on the tadpole larval stage. At least one evening observation period will be performed in the period between the mid-July and mid-September, when the breeding season is reported to end. We intend to acquire a recording of this species vocalization and use this recording during the evening observation period. The locations of all potential and known breeding habitats will be mapped and any individuals observed will be photographed and the location(s) in which they were observed will be located by GPS. In addition, a Rare Animal Observation Form will be completed for submission to the NHESP.

### **References**

Massachusetts Natural Heritage and Endangered Species Program Fact Sheet – Eastern Spadefoot

Swain, Patricia, C., and J.B. Kearsley. Classification of the Natural Communities of Massachusetts. Natural Heritage and Endangered Species Program - Massachusetts Division of Fish and Wildlife, Westborough, Massachusetts, DRAFT July 2000.

DeGraaf, Richard M. and Rudis, Deborah D. Amphibians and Reptiles of New England, Amherst, Massachusetts: The University of Massachusetts, 1983.

Klemens, Michael W., Amphibians and Reptiles of Connecticut and Adjacent Regions. State Geological and Natural History Survey of Connecticut, Bulletin 12, Connecticut DEP, 1993.

Martof, Bernard S., W. M. Palmer, J. R. Bailey, J. R. Harrison. Amphibians and Reptiles of the Carolinas and Virginia. The University of North Carolina Press, Chapel Hill, 1980.





# Natural Heritage & Endangered Species Program

Massachusetts Division of Fisheries & Wildlife

Please submit field forms, a copy of a USGS map, and all supporting documentation to the State Botanist at:

**1 Natural Heritage and Endangered Species Program**  
**2 Massachusetts Division of Fisheries and Wildlife**  
**Route 135, Westborough MA 01581**  
**(508) 792-7270 Ext. 200**

## RARE PLANT OBSERVATION FORM

**SPECIES SCIENTIFIC NAME:** *Corema conradii*

**Element Occurrence No., if known:**

**Observation Date:** 8-24-04 (initial)

**Today's Date:** 01-17-06

**Population Found?**  Yes  No

**Observed By:** Michael Ball of the Horsley Witten Group, Inc.

**Other Observers:** Jennifer McKay, Amy Ball

**Observer's Address:** 90 Route 6A Sandwich, Massachusetts 02563

**Observer's Email Address:** mball@horsleywitten.com

**Telephone:** 508-833-6600 ext. 105

Photograph Taken?  Yes  No (if yes, please attach, and label back with your name, date taken, and the location)

Specimen Collected?  Yes  No Collection #

Repository:

**Site Name (informal):** Provincetown Airport

**USGS Topo Name:** Provincetown

**County:** Barnstable

**Town:** Provincetown

**Directions** to the rare plant population (if found), or search area (if not found). **Mark the location on a copy of the USGS topo map.**

Proceed to the glide slope antenna structure near the southwest end of the airport runway. At building face west. The slightly elevated, open grassland community in front of you supports the population of this rare plant. (On date of observation each mound of crowberry observed was marked with a numbered pink pin flag. However, we expect that only the metal pins remains and not the flagging material.)

**GPS Coordinates:** System used (check one):  UTM  Lat-Long  Mass. State Plane Datum:

At, or near, the center of the population:

or:

Least-rectangle (i.e., the coordinates delimiting the north, east, south, and west corners of the population):

North East South West

**Has the full extent of the population been determined?** (check one)  yes;  no;  uncertain whether full extent is known

**Identification Problems?**  Yes  No **Explain:**

**Diagnostic Characters used:** much branched bushy shrub to 5dm tall, 2m wide; lvs linear, 3-6 mm **Reference used:** Gleason & Cronquist

**Do other members of the genus or look-alike plants occur at this site?**  Yes  No

**Explain:** *Hudsonia* also present; however, the two species are fairly distinctive

### Population Data

**Approximate Area Occupied by the Population** (check appropriate unit): apx. 1,850  sq. m  ha  sq. ft  sq. yds  acres

**Population Size:**

Total number of "genets" (i.e., genetically distinct, or clearly separate individuals): 52 (  Precise count or  estimate? )

and/or

Total number of "ramets" (e.g., stems or shoots arising from clones): (  Precise count or  estimate? )

**Population Structure** (check all that apply):

Age Classes Present

- Seedlings
- Immature plants
- Mature plants
- Plants of unknown age

Reproductive Condition of the Population on this Date

- Vegetative (in leaf)
- In bud
- In flower
- Immature fruit
- Mature fruit
- Seed dispersing
- Senescent
- Dormant

**How would you characterize the vigor of this population?**  Excellent  Good  Fair  Poor

**Evidence of Disease, Predation, or Injury?** No

**Pollinators:** unknown

## Environmental Setting

**Describe the plant community and list the associated species:**

*Population is located adjacent to an airport runway in a Cultural Grassland community that is maintained by regular mowing.*

*Other observed plant species comprising this habitat included Hudsonia tomentosa, Schizachyrium scoparius, Danthonia spicata, Holcus lanatus.*

**List any exotic plant species present and discuss their possible impacts:**

*Exotics including Holcus lanatus, Festuca ovina, and Poa pratensis were observed as part of the plant community, but not in significant amounts.*

**Describe evidence of natural or human-caused disturbance (including changes in ecological processes) and effects on population:**

*Maintenance by infrequent mowing may benefit the species by maintaining conditions favorable for its growth.*

**Surrounding Land Use:** *municipal airport*

**Elevation:** <10  ft. or  m?

**Soil Type(s):** *Hooksan - Beaches - Dune Land*

**Surficial Geology:** *Dune / Interdunal Swale*

**Bedrock Geology:** *unknown*

**Check Appropriate Habitat Descriptors:**

<u>Landform/Topography</u>	<u>Aspect</u> °	<u>Slope</u> %	<u>Light</u>	<u>Soil Moisture Regime</u>	<u>Important Ecological Processes</u>
<input type="checkbox"/> summit/crest	<input type="checkbox"/> N <input type="checkbox"/> NE	<input checked="" type="checkbox"/> flat	<input checked="" type="checkbox"/> open	<input type="checkbox"/> xeric	<input type="checkbox"/> seasonal or regular flooding
<input type="checkbox"/> upper slope	<input type="checkbox"/> E <input type="checkbox"/> SE	<input type="checkbox"/> gentle	<input type="checkbox"/> filtered	<input checked="" type="checkbox"/> dry	<input type="checkbox"/> groundwater seepage
<input type="checkbox"/> mid slope	<input type="checkbox"/> S <input type="checkbox"/> SW	<input type="checkbox"/> average	<input type="checkbox"/> shade	<input type="checkbox"/> mesic	<input type="checkbox"/> colluvial processes
<input type="checkbox"/> lower slope	<input type="checkbox"/> W <input type="checkbox"/> NW	<input type="checkbox"/> rather steep		<input type="checkbox"/> wet	<input type="checkbox"/> alluvial processes
<input type="checkbox"/> rolling terrain/plain	<input checked="" type="checkbox"/> flat/variable	<input type="checkbox"/> steep		<input type="checkbox"/> inundated	<input checked="" type="checkbox"/> wind/salt spray
<input checked="" type="checkbox"/> flood plain/terrace		<input type="checkbox"/> very steep			<input type="checkbox"/> erosion
<input type="checkbox"/> wetland		<input type="checkbox"/> abrupt			<input type="checkbox"/> fire
<input type="checkbox"/> shore/pond/lake/stream					<input type="checkbox"/> none apparent

**Describe Microhabitat Conditions:**

## Conservation Information

**Land Owned/Managed by:**

Name(s)

Address

Telephone

*CC National Seashore / NPS*

*Marconi Site Road, South Wellfleet*

*(508)-349-3785*

*P-Town Municipal Airport*

*Race Point Road, Provincetown*

*(508)-487-0241*

**Managed Area Name:** *Provincetown Municipal Airport*

**Contact Person:** *Arthur "Butch" Lisenby (Mgr.)*

**Owner Comments:**

**Are any past or existing negative impacts on the Element Occurrence evident? What additional factors might potentially threaten the population?**

*None*

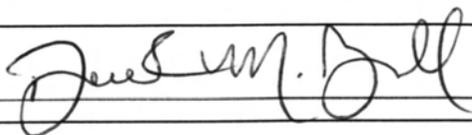
**What are your recommendations for future inventory, monitoring, research, and/or management?**

*Annual count of individual genets. Continue existing maintenance practice of mowing area.*

**What are your protection recommendations? Continue existing maintenance of area to maintain plant community structure.**

**Additional Comments:**

Signature: \_\_\_\_\_



Date: \_\_\_\_\_

*1/17/06*

**For office use only:** Relative Size: \_\_\_\_\_ Relative Condition: \_\_\_\_\_ Relative Landscape Context: \_\_\_\_\_ MA EO Rank: \_\_\_\_\_

MA EO Rank Comments: \_\_\_\_\_

Global EO Rank: \_\_\_\_\_ Global EO Rank Comments: \_\_\_\_\_

**Sketch:**

Use this space to draw or diagram useful information about the rare plant occurrence, such as its location relative to landmarks and habitat features. Consider depicting, for instance, a vertical cross section of a population's position on a ledge or slope, or how a population is distributed in clumped patches in the habitat relative to boulders, stone walls, brooks, trees, etc.

SEE ATTACHED FIGURES.

**Please:**

**Don't forget to attach a copy of a USGS topo map indicating the location of the rare plants or the search area!  
Mark the location of the rare plants as precisely as possible, and label with the map source, date and species name.**



Appendix 2.2 Wetland Descriptions and Observations of Habitat Suitability Relative to the Eastern Spadefoot, Horsley Witten Group, June 2008, revised July 2009



# Horsley Witten Group

*Sustainable Environmental Solutions*

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## Wetland Descriptions and Observations of Habitat Suitability

### Relative to the Eastern Spadefoot (*Scaphiopus h. holbrookii*)

Provincetown Municipal Airport  
Provincetown, Massachusetts

June 2008  
Revised July 2009

*Prepared for:*

**Jacobs Engineering Group**  
343 Congress Street, Suite 200  
Boston, Massachusetts  
02210





**Wetland Descriptions and Observations of Habitat Suitability  
Relative to the Eastern Spadefoot (*Scaphiopus h. holbrookii*)**

**Provincetown Municipal Airport  
Provincetown, Massachusetts**

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**Wetland Descriptions and Observations of Habitat Suitability  
Relative to the Eastern Spadefoot (*Scaphiopus h. holbrookii*)  
At Provincetown Municipal Airport**

**Introduction and Background**

Following the issuance of the Massachusetts Environmental Policy Act (MEPA) Certificate for the Notice of Project Change/Draft Environmental Impact Report/Environmental Assessment (NPC/DEIR/EA), Airport representatives met with staff from the Massachusetts Natural Heritage and Endangered Species Program (NHESP) and the National Park Service (NPS) to discuss their specific comments regarding potential impacts to rare species habitat. Since many of the Capital Improvement Program (CIP) projects will impact isolated wetlands, NHESP and NPS will require additional input specifically regarding the Eastern Spadefoot (*Scaphiopus h. holbrookii*). These agencies indicated that to evaluate the impact on Eastern Spadefoot habitat for MESA review that there was a need for the Airport to conduct additional wildlife surveys to assess the prime and potential breeding habitat for this species within the potential project impact areas. This information has also been used to refine project siting in relation to Eastern Spadefoot habitat to minimize impacts and to avoid a Take.

The following habitat suitability report has been prepared by the Horsley Witten Group, Inc. (HW) to support the Provincetown Municipal Airport environmental review and permitting process. At the recommendation of NHESP, HW field biologists communicated frequently with Brad C. Timm, a Ph.D. student at the University of Massachusetts, Amherst, who is currently conducting studies on various aspects of the Eastern Spadefoot in the Cape Cod National Seashore (CCNS) for his Ph.D. thesis.

The Airport is situated within the bounds of the CCNS which is federally owned land administered by the NPS. The Airport contains diverse natural resources including freshwater wetlands, open grasslands, forested areas and a system of coastal dunes. Portions of these habitats are managed as part of routine airport operations. The Airport is also located within *Priority Habitat of Rare Species* and *Estimated Habitat of Rare Wildlife and Certified Vernal Pools* as mapped by NHESP as shown in Figure 1. The Airport is currently mapped for four State-listed rare species: Eastern Box Turtle, Eastern Spadefoot, Vesper Sparrow and Broom Crowberry. To support the MEPA and NEPA process, rare wildlife and plant surveys were previously conducted to assess the existing habitats for use in future site planning to address the Massachusetts *Endangered Species Act* (M.G.L. Ch. 131A) (MESA). These studies were completed in 2004-2005, and the results of these habitat assessments were presented in the Draft EIR/EA (EEA No. 13789).

Included within this report are a general description of the Airport property, a brief description of the ecology and life history of the Eastern Spadefoot and its habitat requirements, a discussion of field methodologies, and the results of the Eastern Spadefoot breeding habitat assessments conducted in March and April, 2008.

Additional site visits and habitat surveys were conducted on November 17 and 18, 2008, with Brad Timm with the intent of verifying all previously documented spadefoot breeding habitat and locating any potential habitat areas that were not identified during the site visits earlier in 2008. All wetland descriptions, tables, and figures have been updated to incorporate additional information that was collected during the field survey with Brad Timm.

This information is intended to supplement earlier habitat assessments for rare species conducted at the Airport.

### **General Site Description**

The Airport occupies approximately 322 acres of land within the CCNS, at the northern tip of Cape Cod (Figure 1). Race Point Road and the Coast Guard Station at Race Point are located to the immediate northeast. Areas at the Airport that are maintained for airport operations include an airport terminal, a hangar, and other buildings, a paved runway and taxiway, gravel and paved parking areas, and navigation equipment. Areas along the taxiway and runway, as well as the approach areas, include vegetative communities that are mowed to maintain aviation safety areas and navigational surfaces. Non-managed areas include isolated and bordering vegetated wetlands and coastal dune communities. South of the airfield, there is a mosaic of isolated vegetated wetlands, which range from forested to scrub-shrub to open meadow habitats which are interspersed with vegetated coastal dune communities. Additional discussions on the habitats found at the Airport were included within the appendices of the NPC/DEIR/EA.

### **Eastern Spadefoot Life History**

The Eastern Spadefoot is a medium-sized toad, protected as a Threatened Species in Massachusetts. It is also characterized as an obligate vernal pool species in the state. The Spadefoot has a squat body with short legs and a large head, and is distinguished by its vertically-elliptical pupils. The skin is fairly smooth and is covered by small, scattered warts. The Spadefoot's coloring is generally grayish to blackish-brown with olive markings. Two characteristic yellowish lines run from each eye down the dorsal surface of the toad, forming what is often called a "lyre-shaped" pattern. The Spadefoot gets its name from the single, sharp-edged spade on the inner surface of each hind foot which aids in its ability to burrow.

The Spadefoot requires dry sand or sandy loam soils that are normally associated with pitch pine barrens, coastal oak woodlands, or sparse shrub communities, all of which are interspersed by temporary ponds. This nocturnal species has been documented to burrow up to depths of eight feet below the surface. Since this species is active only at night, their activity peaks just after sundown and right before sunrise. During the summer, a Spadefoot has been documented to remain in its burrow an average of 9.5 days between feedings.

### *Breeding Habitat Requirements*

Wetland habitat quality is the most critical factor in determining the potential for an area to serve as habitat for the Eastern Spadefoot. Early successional temporary wetlands serve as optimal breeding sites for this species. More established wetlands (i.e., those wetlands with a thick canopy and shrub cover) are less ideal, since dense vegetation results in an increase in evapotranspiration and reduces available water, thus reducing the length of the hydroperiod. A shortened hydroperiod may not be able to maintain adequate water levels to sustain breeding activities and juvenile development of the Eastern Spadefoot.

A less-densely vegetated wetland that demonstrates a strong connection to the groundwater table will most likely be able to support a larger breeding population of the Eastern Spadefoot and facilitate successful reproduction. Generally, the only vegetation established in these ideal wetlands is cranberry (*Vaccinium* spp.) or scattered forbs (sedges, grasses, rushes). Cranberry often emerges above the water surface, and varying degrees of the presence of the cranberry within the water column do not appear to deter or impair breeding activities (Brad Timm, pers. comm.).

In addition, dense perimeter vegetation around a wetland may deter the Eastern Spadefoot from utilizing the wetland for breeding. For instance, if vegetation is dense and spans laterally upwards of 10 meters (about 32 feet), it is unlikely that a Spadefoot will attempt to traverse the barrier to breed in the wetland, even if open water exists beyond that vegetation, particularly if an alternative potential breeding site is available with little to no such physical barrier.

The lack of a tree canopy and shrub understory in these open wetlands allows for more sunlight penetration and higher ambient temperatures, both of which enhance the development rates of the Eastern Spadefoot. This species begins to breed in mid to late April, and the hydroperiod of the breeding site ideally should last until mid to late June. If standing water is observed in a wetland at the beginning of seasonal high groundwater, then the wetland has a greater chance of functioning as viable breeding habitat, as water levels are likely to increase as a result of subsequent storm events.

Prime (i.e., ideal or optimal) breeding habitat would contain several inches of standing water in an openly vegetated wetland, where areas of open water occupy between five meters by five meters (270 SF), to 10 meters by 10 meters (about 1,000 SF) or more, of the wetland surface; smaller pockets of water are less likely to sustain proper water levels to support breeding, although may provide potential breeding habitat for the Eastern Spadefoot.

### *Non-breeding Habitat Requirements*

The quality of available upland habitat is a secondary determinant of prime or optimal versus potential Eastern Spadefoot habitat. The home range of this toad species extends from 5 meters up to 450 meters. This extensive home range indicates that burrowing and foraging activities

may not occur immediately upgradient from the breeding habitat, and that quality upland habitat does not necessarily need to be in close proximity to a given breeding pool.

Preferred upland is generally characterized by open sandy areas colonized by scattered, low-lying pitch pine with a lichen edge. The low-lying pitch pine with a low, 'weeping' branch morphology provides substantial ground cover without high root density that would otherwise impair this species' ability to burrow. Thus upland areas with dense vegetation and root mass are less suitable as burrowing sites, although these areas may provide cover for nocturnal foraging.

### **Methodology**

HW conducted site visits on March 4 and 6, and April 3, 10, and 15, 2008, to re-examine previously delineated wetland areas and assess their potential suitability as Eastern Spadefoot habitat. All wetland areas surrounding the airfield within the potential impact area of the preferred alternatives of the proposed projects as identified in the Draft EIR/EA were observed (Figure 2). The HW survey was specifically conducted during a period of seasonal high groundwater at the recommendation of Brad Timm.

The selected wetlands were surveyed for their potential to support the breeding activities of the Eastern Spadefoot. A wetland's degree of potential as breeding habitat was based upon observations of standing water (at a period of typical seasonal high groundwater), vegetation within the wetland and vegetation surrounding the wetland. Areas of potential habitat within each wetland were located with a GPS unit with sub-meter accuracy and mapped on the existing wetland plans (Figure 2). Data points were collected from the center of each potential breeding area. The square footage of each area was also estimated while in the field and depth of standing water was measured (in inches) with a standard tape measure. Photographs were taken of all wetlands to document standing water, vegetation, and overall wetland characteristics.

The following observations of each wetland are based upon the March and April site visits as well as the November site visits with Brad Timm and are intended to serve as an assessment of prime and potential Eastern Spadefoot habitat.

### **Observations**

A description of observations made in each wetland area is presented below (in alphabetical order). Table 1 summarizes the potential of each wetland area to provide suitable breeding habitat for this species. Figure 2 presents areas with prime (ideal) or high potential to provide breeding habitat based upon our observations. Where appropriate comments are made regarding the adjacent upland community to certain wetland areas.

## Wetland Observations and Breeding Habitat Assessment

### SOUTH SIDE OF AIRPORT

**Wetland A** is characterized by a well-established plant community and has high stem density. Pockets of standing water are present during periods of high groundwater prior to the growing season and are, on average, three inches deep. Upland immediately adjacent to Wetland A has thick vegetation/groundcover. While there are small pockets of open water that may hold minimum potential for Spadefoot breeding, it is unlikely that the water levels could be sustained at appropriate levels, due to the amount of evapotranspiration that would occur from the vegetative community. This wetland has low potential to serve as breeding habitat.

**Wetland B** possesses areas that have prime and potential areas Spadefoot breeding. A few open patches of standing water with cranberry may serve as breeding areas. Approximate depth of standing water in the eastern region of the wetland ranges from two to four inches and is an average of six to eight inches in the western region, which is vegetated by patches of *Phragmites*. This portion of the wetland is less densely vegetated than other regions of the wetland. The majority of the wetland, however, has thick plant growth and moderate canopy cover. Pitch pine creates a significant amount of shade over the wetland, and meadowsweet occurs in dense patches throughout the wetlands, rendering those areas less than ideal breeding habitat. The upland surrounding Wetland B provides some suitable burrowing and foraging habitat, but is still not what could be characterized as ideal upland. The upland has clumps of various grasses, some pitch pine, and some lichen cover. There are few areas of open sand to the south and southwest of Wetland B.

**Wetland BA** has approximately two inches of standing open water. Vegetation includes pitch pine and cranberry. Adjacent upland areas are suitable as non-breeding habitat. This wetland holds potential as breeding habitat.

**Wetland BB** has no standing water and is an open area of sedges and black rush (*Juncus gerardii*). It is unlikely that this wetland would serve as breeding habitat.

**Wetland BC** has areas with an open canopy, sunlight exposure, cranberry growth, and standing water, which comprise the ideal characters for Spadefoot breeding habitat. The remainder of the wetland is colonized by dense populations of sheep laurel (*Kalmia angustifolia*) and mature pitch pines. Nearby (but not immediately adjacent) open sandy patches with scattered pitch pine provide suitable upland habitat for all non-breeding activities. There are several areas within this wetland that provide near optimal breeding habitat, with standing water ranging from two to five inches.

**Wetland CA** has very dense plant growth in the center. Sparse clumps of twig-rush (*Cladium mariscoides*) and woolgrass (*Scirpus cyperinus*) occupy the perimeter of the wetland. The canopy is thin and sunlight penetrates through to the understory and water surface. The pitch pine density may be characterized as moderate. Approximately three to four inches of standing

water were present during initial site visits. Contiguous upland habitat is suitable for burrowing and foraging activities. The open area of water in this wetland that is closest to the CCNS bike path may serve as optimal breeding habitat.

**Wetland CB** has an average of three to four inches of standing water during seasonal high groundwater, however, the majority of the wetland has a moderate amount of established vegetation, including twig-rush (*Cladium mariscoides*) and dwarf huckleberry (*Gaylussacia dumosa*). Open patches of water within Wetland CB with intermediate exposure to sunlight may provide potential breeding habitat for the Eastern Spadefoot.

**Wetland CC** supported almost no standing water during site observations in 2008. In addition, this wetland is densely vegetated with a canopy of pitch pine and a dense understory of dwarf huckleberry, grasses, and sedges. This wetland will not likely serve as breeding habitat for the Eastern Spadefoot.

**Wetland CD** has dense vegetation, comprised primarily by pitch pine, dwarf huckleberry and cranberry. The pitch pine forms a closed canopy, minimizing the wetland's exposure to sunlight. Standing water averaged two to three inches, however, once the growing season commences water drawdown is anticipated to be substantial from the established plant community. The wetland itself does not appear to be ideal for Spadefoot breeding, but does hold slight potential. The surrounding upland provides suitable non-breeding habitat.

**Wetland C/J/FK** contains some discrete areas that have potential to support breeding populations of the Eastern Spadefoot along with large uninterrupted swaths of prime breeding habitat. The northeastern section of C/J/FK, specifically near flag J-60 (see Figure 2), is a large open area of cranberry where HW observed as much as 10 to 12 inches of standing water which would provide high potential as breeding habitat. In addition, this portion of Wetland C/J/FK does not have a pitch pine canopy and there is very little shrub growth (small clumps of dwarf huckleberry and woolgrass). Adjacent upland "islands" of dune habitat provide ideal burrowing and foraging areas and would ultimately provide optimal interplay between upland and wetland for the Eastern Spadefoot.

More interior portions of wetland C/J/FK have areas of open water that have some/average potential to host Spadefoot breeding. Small areas of upland in the interior of this wetland possess the characteristics of ideal Spadefoot upland habitat.

**Wetland D** has one to two inches of standing water during seasonal high groundwater. However, like Wetland DF (below), the pitch pine is very dense and the wetland has a very thick canopy with little sunlight exposure. This wetland would not provide ideal breeding habitat, but may hold low potential in some years.

**Wetland DA** has two to three inches of standing water during seasonal high groundwater. Pitch pine forms moderate canopy cover. Twig-rush occurs in scattered clumps. Some open patches

of water are present within the wetland in conjunction with canopy openings. This wetland does not have potential to support Spadefoot breeding.

**Wetland DB** is a large wetland with several open pockets of water. A portion of DB that is near the “connector channel” to FG has an open canopy, substantial sunlight exposure, and significant amounts standing water in some areas totals seven to eight inches and has potential to support breeding populations of the Eastern Spadefoot. Vegetation throughout the wetland consists of sparse pitch pine, patches of cranberry, and scattered twig-rush around the perimeter. Several other large open pockets of water, approximately 600 SF to 800 SF each, quite similar to aforementioned area are present throughout Wetland DB and have potential to host breeding activities. Some areas of this have been categorized as prime/optimal breeding habitat. Nearby upland is also optimal in most areas.

**Wetland DC** supported no standing water during 2008 site visits and vegetation was limited to black rush. This area is not believed to have potential as Eastern Spadefoot breeding habitat.

**Wetland DD** has large open areas of standing water (averaging three inches in depth) within the wetland with little to no canopy cover. Pitch pine is only moderately dense in certain areas, not throughout the entirety of the wetland. Cranberry is the primary plant in these open areas with scattered patches of twig-rush. In the southern central portion of Wetland DD there is a large open area with significant standing water that has high potential to serve as ideal breeding habitat. Adjacent upland areas characterized by low-lying pitch pine, lichen and open sands are also suitable for non-breeding activities. This wetland has potential to serve as breeding habitat.

**Wetland DE** has an average of three inches standing water during seasonal high groundwater. There is no canopy cover and this wetland receives maximum exposure to sunlight. Scattered pitch pine seedlings are also present throughout the wetland and contiguous upland. This wetland is believed to have potential as Eastern Spadefoot breeding habitat.

**Wetland DF** has one to two inches of standing water. Pitch pine in this wetland is extremely dense and the wetland is heavily shaded. This wetland would not provide potential breeding habitat.

**Wetland DG** has no standing water and holds no potential as a breeding site.

**Wetland DH** has a well-established population of pitch pine and thick canopy cover. The wetland has one to two inches of standing water but is well shaded and may not have great potential as a breeding site for the Eastern Spadefoot. Some suitable upland is present around the wetland, however.

**Wetland DI** has one to two inches of standing water and moderately dense pitch pine cover. There is no cranberry. The wetland is partially shaded. The wetland is not ideal for breeding, but may hold some potential. Portions of the adjacent upland are good burrowing and foraging habitat.

**Wetland DJ** has one inch of standing water, dense pitch pine cover, and does not hold potential as breeding habitat.

**Wetland DK** has portions with the potential to host breeding activities of the Eastern Spadefoot, specifically the areas that are closest to the airfield, as well as patches along the northern boundary of the wetland. Depth of standing water averages two inches. Pitch pine is present in the wetland, but does not form a closed canopy. Standing water is present at seasonal high groundwater. Cranberry is present in well established mats among several open areas of standing water. Low lying pitch pine surrounded by open sand and lichen cover provides an ideal upland habitat contiguous with Wetland DK. Overall, breeding habitat potential can be characterized as moderate.

**Wetland DL** has minimal amounts of standing water (totaling no more than one inch) during seasonal high groundwater and the wetland has a thick canopy of established pitch pine. This wetland has little potential as breeding habitat.

**Wetland DM** does not have standing water during seasonal high groundwater. It has no potential to serve as breeding habitat for the Eastern Spadefoot.

**Wetland E**, especially the portion abutting the airfield, possesses areas that function as prime and potential breeding habitat. There is a significant amount of standing water about three to four inches deep. Thick mats of cranberry are also present. There are dense clumps of flat-top goldenrod. Large pitch pines are also scattered throughout the area. Water levels and vegetation indicate that this wetland will be able to maintain sufficient water levels for the duration of the breeding season.

**Wetland EA** has minimal amounts of standing water, totaling no more than one inch. Vegetation is very dense in this wetland. This wetland does not have potential to support Eastern Spadefoot breeding activities.

**Wetland EB** has pockets of shallow standing water in many areas and the soil is highly saturated throughout the rest of the wetland. Water depth is approximately two inches in areas of standing water. Vegetation is limited to clumps of woolgrass and black rush. This wetland has potential to serve as breeding habitat.

**Wetland F** has an area that may serve as a prime breeding site. There is almost one foot of standing water in an open area at the edge of a stand of pitch pine that comprises the northern portion closest to the airfield. Vegetation is primarily black rush, twig-rush and soft rush. The water depth and exposure to sunlight suggest that this wetland has high potential to maintain water levels and support breeding. Suitable upland habitat is also nearby.

**Wetland FA** has only a slight amount of standing water, totaling no more than one inch. Pitch pine is very dense and there is no cranberry present. It is unlikely that this wetland will serve as breeding habitat.

**Wetland FB** has only a slight amount of standing water, and is approximately half an inch deep. Pitch pine is very dense and there is no cranberry present. It is unlikely that this wetland will serve as breeding habitat.

**Wetland FC** does not have standing water. Vegetation is minimal. Some pitch pine is present, but remains sparsely scattered throughout the wetland. This wetland is unlikely habitat for the breeding activities of the Eastern Spadefoot.

**Wetland FD** does not have standing water. Vegetation is minimal. Some pitch pine is present, but remains sparsely scattered throughout the wetland. This wetland is unlikely habitat for the breeding activities of the Eastern Spadefoot.

**Wetland FE** has minimal standing water (less than one inch deep) during seasonal high groundwater. Small clusters of cranberry exist. Although this wetland is not suitable for breeding, the adjacent upland has great potential to support the burrowing and foraging activities of the Spadefoot.

**Wetland FF** has less than one inch of standing water and is unlikely habitat for the breeding activities of the Eastern Spadefoot. Vegetation is primarily pitch pine, which occurs at a moderate density.

**Wetland FG** has an open canopy with substantial sunlight exposure. There is very little standing water, which is approximately one to two inches deep. Vegetation consists mostly of twig-rush and scattered cranberry. Due to the minimal amount of water present, Wetland FG may not be suitable for Spadefoot breeding and is not ideal habitat.

**Wetland FH** has no more than two inches of standing water during seasonal high groundwater. Vegetation is primarily pitch pine, which occurs at a moderate density. This wetland has little potential to serve as prime Spadefoot breeding habitat.

**Wetland FI** has no standing water. Vegetation is limited to patches of black rush. This wetland will not serve as Eastern Spadefoot breeding habitat.

**Wetland FJ** has no standing water. Vegetation is primarily scattered pitch pine and black rush. This wetland does not have potential to serve as breeding habitat.

**Wetland H** is confined by the runway and taxiway. Vegetation consists primarily of red chokeberry, winterberry, steeplebush, highbush blueberry, cranberry, bayberry, and poison ivy, along with large sphagnum mats found throughout the wetland. Large pockets of standing water persist in this wetland throughout the year, providing potential breeding areas for the spadefoot.

The isolated location of this wetland (i.e., inside the runway and taxiway) may greatly deter the Spadefoot from utilizing this wetland for breeding. If this wetland was not quite as isolated, it would hold potential to provide prime breeding areas, due to the large amounts of standing water that are present year-round, regardless of the moderately dense vegetation.

**Wetland I**, also confined by the runway and taxiway, possesses several areas of potential breeding habitat. Vegetation is consistent with vegetation observed within Wetland H. Large sphagnum mats occur throughout this wetland as well. Standing water persists in this wetland throughout the year, providing multiple potential breeding areas for the spadefoot. However, as with Wetland H, the isolated location of this wetland (i.e., inside the runway and taxiway) may greatly deter this species from utilizing this wetland for breeding. If this wetland was not as isolated from the surrounding natural landscape, it would otherwise serve as prime breeding habitat, due to the large amounts of standing water that are present year-round, regardless of the moderately dense vegetation.

**Wetland K** consists primarily of an open expanse of water, the majority of which abuts an open dune/pitch pine area. While Wetland K had originally been delineated (during the Airport Master Plan Update process) as just the submarine-shaped wetland area, it should be noted that further field investigations revealed that Wetland K is hydrologically connected with Wetland L just beyond the treeline to the north (see Photo 4). Standing water is approximately eight inches deep (or more) throughout the wetland. Cranberry is the dominant plant in this wetland and is abundant. The depth of the water column would be able to support the entire breeding season of the Spadefoot. According to HW observations since 2004 during all seasons, standing water is present in this wetland year round. The immediate upland is characterized by low lying pitch pine, open sand, and scattered lichen ground cover; these are the ideal upland characteristics for Eastern Spadefoot foraging and burrowing habitat. The amount of standing water and lack of canopy cover result in ideal Spadefoot breeding habitat. Due to this combination of ideal characteristics, Wetland K possesses the most ideal breeding habitat area, as well as the most optimal overall habitat. The northeastern portions of Wetland K, however, are less ideal due to moderate pitch pine cover and shading.

**Wetland L** is generally characterized by dense stands of pitch pine with substantial shading. Standing water (three to four inches deep, on average) is present and patches of cranberry can be found throughout. The dense canopy cover, however, detracts from the potential of this wetland to host Eastern Spadefoot breeding due to the lack of sunlight. It should be noted that Wetland L is hydrologically connected to Wetland K.

The central region of Wetland L is considered prime breeding habitat. There is no canopy cover and patches of black rush, twig-rush and cranberry comprise the groundcover. There is a significant amount of standing water which may be able to support breeding and larval development. Patches of adjacent upland may also provide suitable habitat. Overall, this wetland has optimal/high potential to serve as habitat.

**Wetland C** was also observed. Upland habitat in the area is not consistent with the characteristics of preferred upland of the Spadefoot. Thus, there may not be ideal foraging and burrowing areas on the northern side of the airport. This wetland has standing water, averaging five inches or more in depth in certain areas, but exhibited extremely dense vegetation, especially around the perimeter, which would deter Spadefoot passage and utilization of the wetland for breeding. However, due to the large volume of water sustained by the wetland, it holds moderate potential as breeding habitat. Areas within the large expanse of Wetland C exhibiting potential breeding habitat characteristics were GPS-located as potential breeding habitat.

## **NORTH SIDE OF AIRPORT**

**Wetland AA** possesses a vegetative community that consists of clumps of woolgrass, twig rush and black rush. There is no standing water in this wetland. It is unlikely that Wetland AA would serve as potential habitat.

**Wetland AB** is a small isolated wetland consisting of clumps of woolgrass, twig rush, soft rush and black rush. Some sedimentation has also occurred in this wetland; sand has been blown in from the surrounding dunes. There was minimal standing water in this wetland at the time of the November site visits. It is possible that this wetland holds potential to serve as breeding habitat.

**Wetland AC** has no standing water. Dominant vegetation in the wetland includes clumps of woolgrass, pilewort (*Erechtites hieracifolia*), and slender-leaf goldenrod (*Euthamia tenuifolia*) interspersed with patches of bayberry and willow. This wetland does not have potential to support a breeding population of the Spadefoot.

**Wetland AE** has no standing water. This densely vegetated wetland consists of a large, central patch of common reed (*Phragmites australis*) with clumps of willow, woolgrass, Gray's Flatsedge (*Cyperus grayii*), hyssop-leaved boneset (*Eupatorium hyssopifolium*), bayberry, pilewort and black rush. This wetland does not have potential to host the breeding activities of the Eastern Spadefoot.

**Wetland AF** has pockets of standing water, but the water is no more than one to two inches deep. Vegetation within Wetland AF consists of large clumps of willow dominating the wetland interior with large clumps and patches of cranberry, bayberry, hyssop-leaved boneset, slender-leaf goldenrod, common reed, poison ivy, twig-rush, black rush and woolgrass. The northwestern portion of the wetland has a larger pocket of open water with minimal canopy cover and dense patches of cranberry. The remainder of the wetland has very thick vegetation that may very well deter breeding. A small portion of this wetland holds potential to serve as breeding habitat for the Spadefoot; however, adjacent uplands are not ideal for burrowing and foraging.

**Wetland AG** has groundwater at the soil surface, but no standing water is present. The vegetation within this wetland includes bayberry, twig-rush, woolgrass, black rush, pitch pine

seedlings and hyssop-leaved boneset. This wetland is unlikely to serve as potential Spadefoot breeding habitat.

**Wetland AI** does not have standing water. The vegetation is dominated by bayberry and poison ivy, both species extending beyond the boundary of the wetland itself. Additional vegetation includes willow, twig-rush, woolgrass, black rush and patches of hyssop-leaved boneset. This wetland does not hold potential as Spadefoot breeding habitat.

**Wetland AJ** has no standing water. The vegetation is limited to black rush and twig-rush. This wetland would not be able to support the breeding activities of the Eastern Spadefoot.

**Wetland AK** has damp soil but no standing water during seasonal high groundwater. This wetland area displays two different types of dense vegetative communities: the western half of the wetland is dominated by pussy willow and dwarf huckleberry with the remaining areas dominated by Virginia rose, bayberry, poison ivy, spotted Joe-Pye weed, meadowsweet, woolgrass, twig-rush and steeplebush. This wetland does not have potential to serve as breeding habitat for the Eastern Spadefoot.

**Wetland AL** has pockets of standing water, most of which are concentrated in the interior. These areas have an average depth of two inches. Dense vegetation forms a thick perimeter around the wetland. There is a dense low shrub community of Virginia rose, bayberry and poison ivy interspersed with clumps and patches of woolgrass, marsh fern, twig-rush and black rush. Dense patches of cranberry were observed in the wetland interior. This wetland is unlikely to serve as potential breeding habitat for the Eastern Spadefoot, primarily due to the thick perimeter vegetation.

**Wetland AM** has a significant amount of standing water during seasonal high groundwater, averaging three to four inches. This densely vegetated wetland is dominated by bayberry, winterberry, woolgrass, slender-leaf goldenrod, twig-rush, poison ivy, reed canary-grass, sea myrtle, Virginia rose, marsh St. Johns wort and New England aster. A dense open patch of cranberry is present in the center of the wetland. The thick vegetation encountered in this wetland makes it less than ideal breeding habitat.

Of note, upland area encountered on the northern side of the airport is generally not ideal habitat for Eastern Spadefoot burrowing and foraging activities. No low-lying pitch pine is present with a sandy edge. The upland consists mostly of upland dunes with thick grass, sedge and rush cover, or is characterized by open sandy dunes with little to no vegetation or groundcover. Ideal upland habitat seems to be more frequently encountered throughout the southern portion of the airport property.

The wetlands on the southwestern tail of the property were also not observed during this site visit and Spadefoot habitat assessment, for they fall outside of proposed project impact areas. A description of this wetland series is provided below. These descriptions are based upon previous site visits outside of seasonal high groundwater.

**Wetland CE** is a larger isolated wetland marked by 81 flagging stations. The vegetative community of this wetland is similar to that found within Wetlands CC and CD with the addition of clumps and patches of inkberry (*Ilex glabra*).

**Wetland CF** is an isolated shrub swamp with a vegetative community dominated by highbush blueberry along with clumps and patches of black grass, sphagnum moss and cinnamon fern (*Osmunda cinnamomea*). Flags CF1 through CF19 mark the boundary of this wetland.

**Wetland CG** is an extensive isolated wetland located along the lease line that extends well beyond this boundary. As a result, HW delineated only a portion of this wetland (175 flags). The vegetation within this wetland includes expansive patches of cranberry, patches and clumps of sphagnum moss, twig-rush, black grass, fireweed (*Epilobium angustifolium*) and woolgrass. Shrub species encountered include sweet pepperbush (*Clethra alnifolia*) and highbush blueberry, with a canopy of pitch pine and swamp tupelo.

**Wetland CH** is a large open isolated wetland consisting of 142 flags that was delineated in several non-contiguous flagging series due to its proximity to the lease corner. Several linear-shaped islands of coastal dune were encountered within the interior of this wetland area. The vegetation of this wetland includes expansive areas of cranberry interspersed with clumps and patches of sheep laurel (*Kalmia angustifolia*), highbush blueberry, individual pitch pine (in forested portions of this wetland), dwarf huckleberry, patches of sphagnum moss, twig-rush, woolgrass and small entanglements of common greenbrier (*Smilax rotundifolia*).

**Wetland CI** is an isolated wetland that was only partially delineated due to its location along the lease line (40 flags in two series). Vegetation in this wetland includes pitch pine, woolgrass, black grass, twig-rush, winterberry, cranberry and highbush blueberry.

**Wetland CJ** is a very small triangular isolated wetland consisting of only three flags. The vegetative community within this open area is limited to black grass and twig-rush.

**Wetland CK** is a somewhat larger isolated wetland consisting of 21 flags. As with Wetland CJ, the vegetation is limited to twig-rush and black grass with a pitch pine canopy.

**Wetland CL** is a small isolated wetland, and the only wetland located among the secondary dune system in the southern "tail" of the Airport property. As with Wetland CK, the vegetation within this wetland is limited to pitch pine and black grass, along with obvious surficial indicators of hydrology (soil staining). Flags CL1 through CL13 mark the boundary of this wetland.

**Wetland CM** is an isolated wetland located just off-site of the southernmost lease corner. Flagging stations CM1 through CM12 mark a portion of this large wetland area. Vegetation within this shrub swamp included large patches of cranberry, with clumps and patches of sphagnum moss, woolgrass, dwarf huckleberry, sheep laurel, highbush blueberry, bayberry,

poison ivy, inkberry and twig-rush. A large patch of common reed and scattered pitch pine cover the wetland periphery.

**Wetland CN** is a small isolated wetland consisting of only four flags. The wetland is composed of black grass with surficial evidence of hydrology (soil staining) and subsurface hydric soils.

**Wetland CO** is an expansive linear wetland consisting of 107 flags, often with narrow (three to four foot wide) connections between lobes. Several upland islands of secondary coastal dune habitat were encountered within the interior of Wetland CO. The vegetation of this transitional shrub swamp/forested wetland includes a pitch pine canopy with a diverse shrub community of swamp azalea (*Rhododendron viscosum*), bayberry, sheep laurel and highbush blueberry. Additional vegetation consists of soft rush, sphagnum moss, common greenbrier, royal fern, cinnamon fern, twig-rush, black grass, poison ivy and dense, scattered patches of cranberry.

**Wetland CP** is an isolated wetland consisting of 41 flags with a large upland island of coastal dune. The vegetation of this wetland is forested with a canopy of pitch pine including highbush blueberry, bayberry, swamp dewberry (*Rubus hispidus*), cranberry, black grass, soft rush, woolgrass, broom sedge (*Andropogon virginicus*), twig-rush, dwarf huckleberry, New England aster, scattered common reed, occasional black cherry (*Prunus serotina*), slender-leaf goldenrod and poison ivy.

**Wetland CQ** is a smaller isolated wetland consisting of 16 flags. The vegetation includes bayberry, twig-rush, black grass, woolgrass, pitch pine, swamp dewberry and poison ivy.

**Wetland CR** is a small isolated wetland consisting of only six flags. The vegetation of this open emergent marsh community is composed of woolgrass, twig-rush and black grass.

**Wetland CS** represents a portion of the larger BVW along Hatches Harbor, and is marked by 18 flags. The vegetation within this wetland area consists of woolgrass, bayberry, twig-rush, black grass and occasional pitch pine.

**Wetland CT/J** is a BVW associated with the Hatches Harbor wetland system. Flagging stations represent the southwestern boundary of Wetland J, which abuts managed areas near the runway. While the wetland boundary is representative of a freshwater wetland (BVW), the vegetative community transitions from freshwater to brackish to saline, and contains a large diversity of wetland indicator species. Species encountered include black grass, slender-leaf goldenrod, St. John's wort, marsh fern, twig-rush, swamp dewberry, cranberry, poison ivy and common greenbrier. Interior sections contain a large area dominated by common reed, while the upper edge of the brackish community is composed of several shrub species, including highbush blueberry, bayberry, winterberry, meadowsweet and scattered eastern red cedar (*Juniperus virginiana*).

**Wetland CU** is a small isolated wetland consisting of eight flags. The vegetation is mainly scattered clumps of woolgrass, bayberry, slender-leaf goldenrod and swamp dewberry vines.

**Wetland CV** is another small isolated wetland delineated by only three flags, encompassing clumps and patches of woolgrass, twig-rush, and slender-leaf goldenrod, with scattered bayberry and swamp dewberry vines.





Photo 1. Suitable upland habitat for Eastern Spadefoot adults. Photo taken at the Provincetown Municipal Airport, March 2008.



Photo 2. A creeping pitch pine edge meeting an area of open sand. This is an example of preferred upland habitat for adult Eastern Spadefoots. Photo taken at Provincetown Municipal Airport, March 2008.



Photo 3. Low-lying pitch pine branches that form ideal upland habitat for the Eastern Spadefoot. Photo taken at Provincetown Municipal Airport, March 2008.

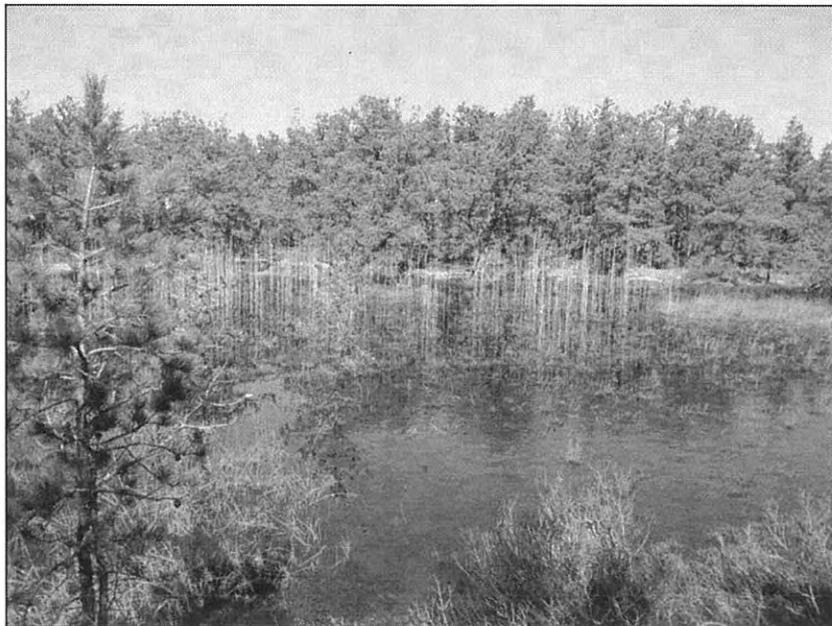


Photo 4. Wetland K at Provincetown Municipal Airport. This is ideal (prime) Eastern Spadefoot breeding habitat. Photo taken March 2008.



Photo 5. Wetland BC is a high-quality to ideal area for Eastern Spadefoot breeding at Provincetown Municipal Airport. Photo taken March 2008.



Photo 6. Wetland DD is also a high-potential to ideal quality habitat for Eastern Spadefoot breeding. Photo taken at Provincetown Municipal Airport, March 2008.



Photo 7. Wetland B has moderate to high potential to serve as Eastern Spadefoot breeding habitat at Provincetown Municipal Airport. Photo taken March 2008.



Photo 8. Wetland DE has moderate potential to serve as Eastern Spadefoot breeding habitat. Photo taken at Provincetown Municipal Airport, March 2008.



Photo 9. Wetland E has moderate potential to serve as Eastern Spadefoot breeding habitat at Provincetown Municipal Airport. Photo taken March 2008.

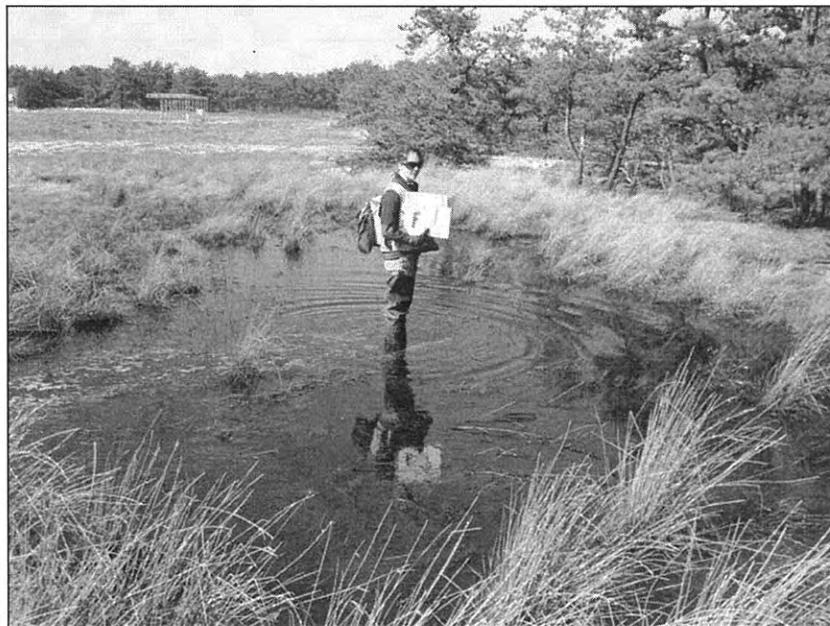


Photo 10. Wetland F has moderate to high potential to serve as Eastern Spadefoot breeding habitat at Provincetown Municipal Airport. Photo taken March 2008.



Photo 11. Wetland BA is an example of a wetland with low to moderate potential to serve as Eastern Spadefoot breeding habitat. Photo taken at Provincetown Municipal Airport, March 2008.

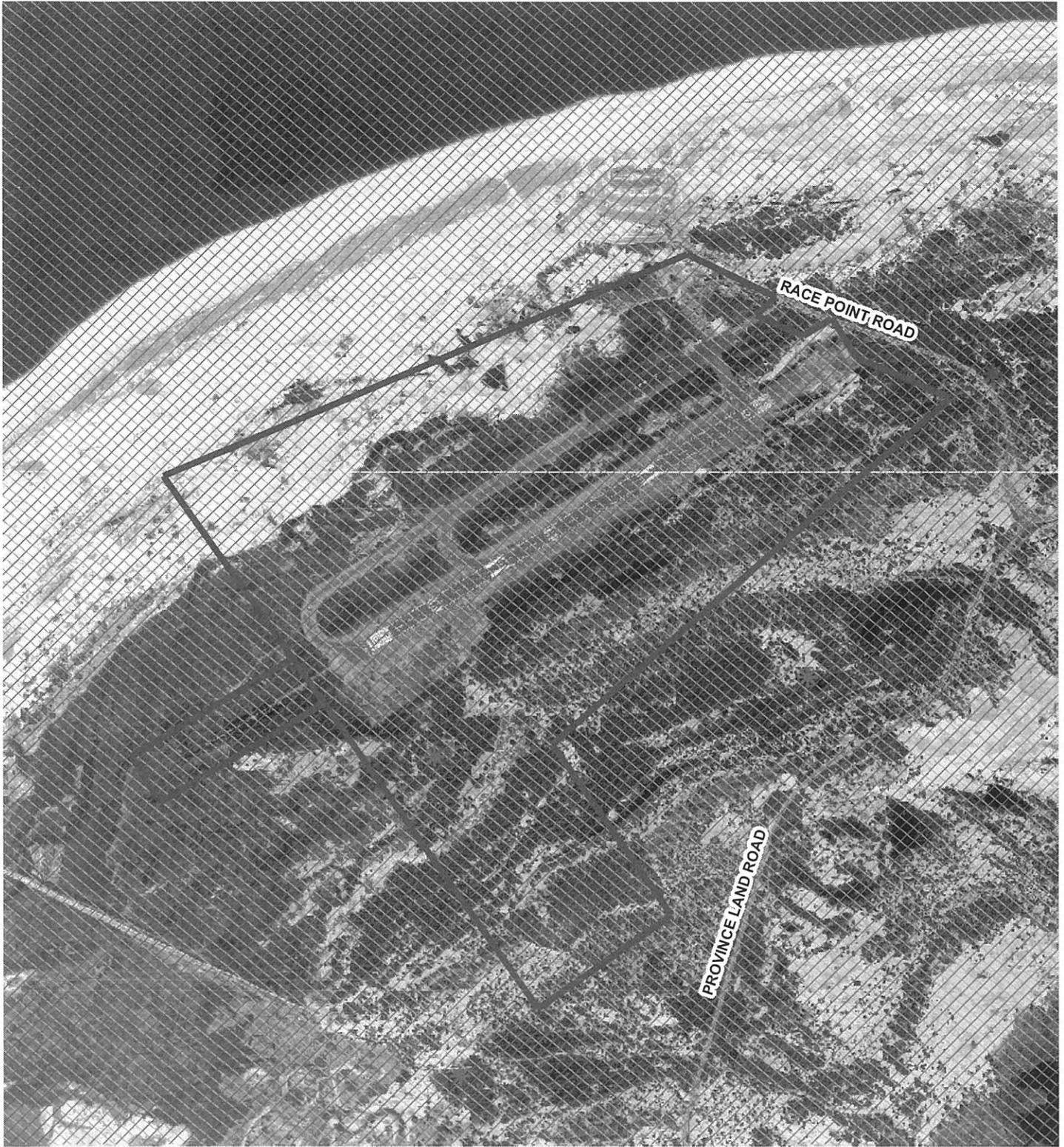


Photo 12. Wetland C is an example of a wetland with low potential to serve as Eastern Spadefoot breeding habitat. Photo taken March 2008, at Provincetown Municipal Airport.



Photo 13. Wetland AE is an example of a wetland with little to no potential to serve as Eastern Spadefoot breeding habitat. Photo taken at Provincetown Municipal Airport, March 2008.





**Legend**

-  Lease Line
-  NHESP Potential Vernal Pools - December 2000
-  NHESP Certified Vernal Pools - September 2006
-  NHESP Priority Habitats of Rare Species  
September 2006
-  NHESP Estimated Habitats of Rare Wildlife  
September 2006



 Feet  
1,000

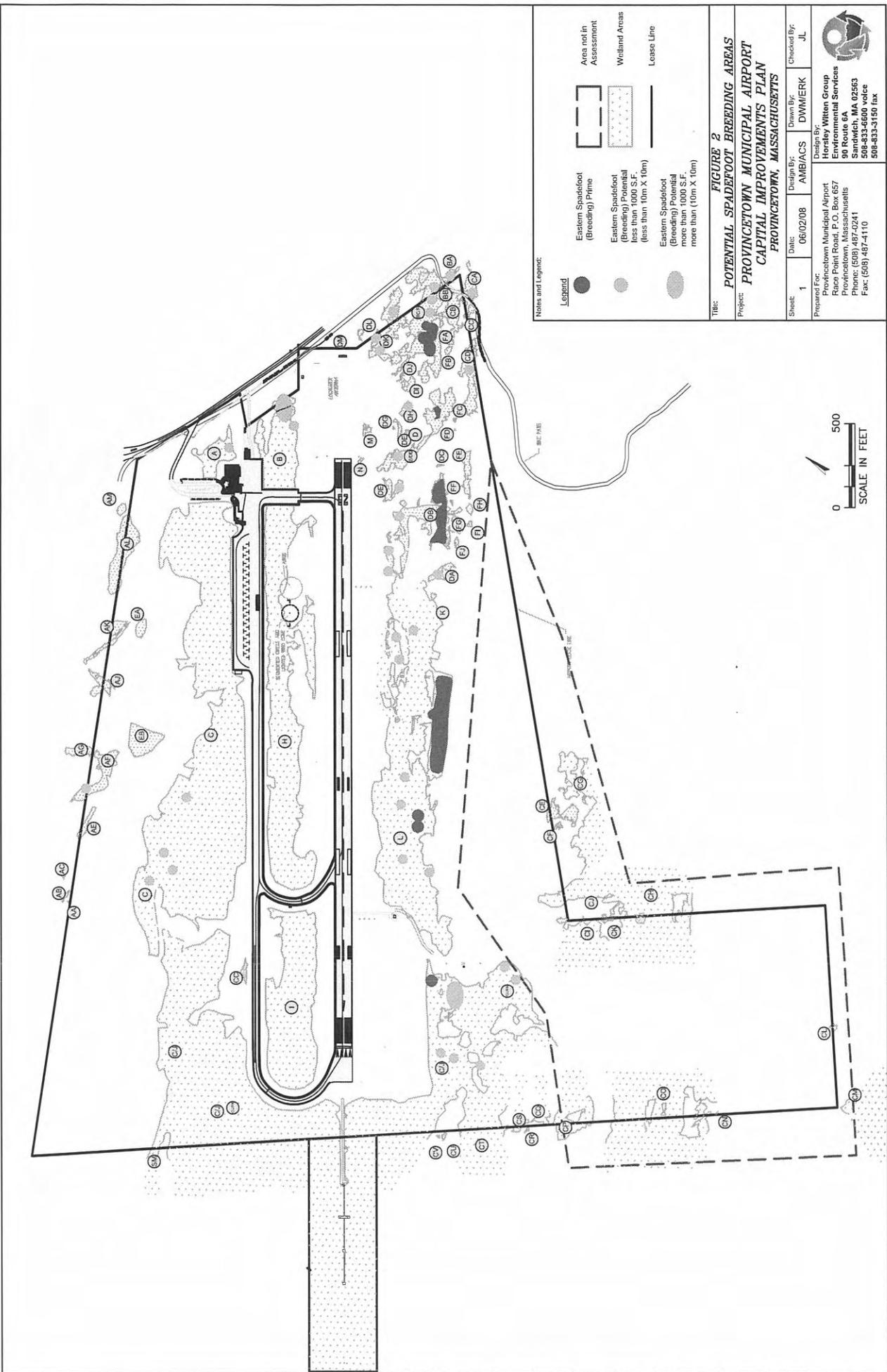
Horsley Witten Group   
 phone: 508-833-6500  
 www.horsleywitten.com

Natural Heritage & Endangered  
 Species Program  
 Provincetown Municipal Airport  
 Provincetown, MA

12/13/06 ec  
 J:\4027 E&K-PTown Airport\GIS

Figure 1





Notes and Legend:

**Legend**

- Eastern Spadefoot (Breeding) Prime
- Eastern Spadefoot (Breeding) Potential less than 1000 S.F. (less than 10m X 10m)
- Eastern Spadefoot (Breeding) Potential more than 1000 S.F. more than (10m X 10m)
- Area not in Assessment
- ▨ Wetland Areas
- Lease Line

**FIGURE 2**  
**POTENTIAL SPADEFOOT BREEDING AREAS**  
**PROVINCETOWN MUNICIPAL AIRPORT**  
**CAPITAL IMPROVEMENTS PLAN**  
**PROVINCETOWN, MASSACHUSETTS**

Sheet: 1	Date: 06/02/08	Design By: AMB/ACS	Drawn By: DMM/ERK	Checked By: JL
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Table 1. Summary of Eastern Spadefoot breeding habitat identified at the Provincetown Municipal Airport, Provincetown, Massachusetts.

WETLAND AREA	PRIME (IDEAL)	POTENTIAL	LOW POTENTIAL/NO POTENTIAL
Salt Marsh			X
Wetland AA			X
Wetland AB		X	
Wetland AC			X
Wetland AE			X
Wetland AF		X	
Wetland AG			X
Wetland AI			X
Wetland AJ			X
Wetland AK			X
Wetland AL			X
Wetland AM		X	X
Wetland BA		X	
Wetland BB			X
Wetland BC		X	
Wetland CA	X	X	
Wetland CB		X	
Wetland CC			X
Wetland CD		X	
Wetland DA			
Wetland DB/FG	X	X	
Wetland DC			X
Wetland DD	X	X	
Wetland DE		X	
Wetland DF			X
Wetland DG			X
Wetland DH			X
Wetland DI			X
Wetland DJ			X
Wetland DK		X	
Wetland DL			X
Wetland DM			X
Wetland EA			X
Wetland EB		X	X
Wetland FA			X
Wetland FB			X
Wetland FC			X
Wetland FD			X
Wetland FE			X
Wetland FF			X
Wetland FH			X
Wetland FI			X
Wetland FJ			X
Wetland A		X	
Wetland B	X	X	
Wetland C		X	X
Wetland C/J/FK	X	X	
Wetland D			X
Wetland E	X	X	
Wetland F		X	
Wetland H		X	X
Wetland I		X	X
Wetland K	X	X	
Wetland L	X	X	
Wetland M			X
Wetland N			X

Note: Wetland areas not listed were not assessed for the potential to provide breeding habitat for Eastern Spadefoot. Also, Wetland G was incorporated into Wetland BC/F during initial delineation.

