

2008 Wetland Restoration Monitoring Report

Raytheon Company

**Former Raytheon Facility
430 Boston Post Road
Wayland, Massachusetts**

USACE Permit No. 200300294
MADEP File No. 322-533
MADEP BWSC Tier 1B Permit No. 133939/RTN 3-13302

29 January 2009

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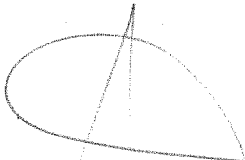
430 Boston Post Road
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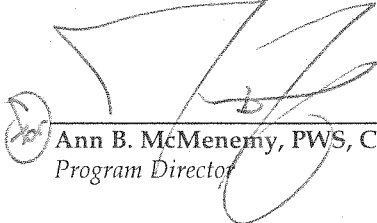
MADEP File #322-553

MADEP BWSC Tier IB Permit #133939/RTN 3-13302

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PROJECT OVERVIEW

On behalf of Raytheon Company (Raytheon), Environmental Resources Management (ERM) has prepared this 2008 Wetland Restoration Monitoring Report to present results of the fifth and final year of monitoring for the wetland remediation site at the Former Raytheon Facility at 430 Boston Post Road in Wayland, Massachusetts (Site). A Site Locus Map and Site Plan are provided as Figure 1 and Figure 2, respectively.

This report is prepared in accordance with the 3 August 2006 regulatory guidance letter by the U.S. Army Corps of Engineers (USACE) entitled, "Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Creation, Restoration, and/or Enhancement of Aquatic Resources" (USACE, 2006). It also meets the applicable permit condition requirements of the USACE, the Massachusetts Department of Environmental Protection (DEP), and the Wayland Conservation Commission (Commission). Project information is listed below:

USACE Permit No.: 200300294
DEP and Wayland Order of Conditions File No.: 322-553
Permittee: Raytheon Company, 880 Technology Park Drive, Billerica, MA
Consultant: ERM, Attn: John Drobinski, 399 Boylston Street, 6th Floor, Boston, MA
Telephone: 617-646-7800
Date Wetland Restoration Complete: 24 February 2003
Wetland Monitoring Dates: 1 August, 3 September 2008
Inspected by: Ann McMenemy and Lyndsey Colburn (ERM)
Site Directions: Route 20 West (Boston Post Road) from Interstate 95/Route 128 (Exit 26)

This project involved restoring an approximately 2-acre area by re-establishing the hydrology, topography, and the emergent marsh community disturbed by the excavation and removal of contaminated wetland soils in 2003.

Site activities in 2008 included two wetland monitoring events and invasive species management control work. The fifth-year monitoring results indicate that the restoration area has not met one of the ten permit requirements established by the Commission's Order of Conditions (OOC) due to the continued presence of non-native plant, purple loosestrife (*Lythrum salicaria*). However, the wetland restoration area is providing valuable wildlife habitat as well as providing flood and water

quality protection for the Sudbury River. Therefore, the project purpose has been achieved.

Special Condition No. 5 of the USACE Section 404 Permit requires that mitigation be performed in accordance with the Regulatory Permit Application for Wetland Impacts Resulting from Remediation of Oils, Hazardous Materials in Sudbury River Floodplain Wetlands, Wayland, Massachusetts (ERM, 2003, the Plan). The above-referenced permit application was prepared to support the remedial activities conducted under the Phase IV Remedy Implementation for the Site. The goal of the restoration was to restore the area to an emergent marsh community with native herbaceous species consistent with the conditions historically found in the Sudbury River floodplain. The presence of exotic and invasive species was to be minimized.

The five growing season requirement of monitoring and implementing invasive species control efforts concluded in 2008. The results of the 2008 wetland monitoring indicate that the restoration area is stable, and provides valuable habitat and flood storage capacity in the Sudbury River floodplain. The removal of contaminated soil and sediment from the wetland was successful, and there is currently a Condition of No Significant Risk to human health and the environment based on soil concentrations in the restoration area. The results of the fifth and final year of wetland monitoring indicate the following:

- The plant community in the restoration area continues to increase in density, areal coverage, and diversity of native species with each growing season.
- The current number of planted buttonbush shrubs exceeds the 25 required under the OOC. It is anticipated that the shrubs will form a shrub overstory along the restored stream channel.
- The stream channel (swale) continues to develop and become naturalized. Water was observed flowing in the channel from its origination at the culvert through Area A;

- The monitoring data collected in 2008 (as well as 2006 and 2007) indicate that the wetland remediation project did not meet the standard for success for one of the three wetland permits (local OOC had highest standard) for areal coverage of native, non-invasive species, primarily due to the presence of purple loosestrife;
- Purple loosestrife continues to be a dominant species in portions of the restoration area. A slight reduction in areal coverage of purple loosestrife has been observed since mechanical control efforts began in 2005; however, it is unlikely that mechanical controls will be successful based on the dominance of this species in many areas of the adjacent Sudbury River floodplain;
- Barnyard grass, an upland, non-native annual species, was identified in the restoration area in 2006 and 2007. Monitoring results from 2008 suggest that barnyard grass is no longer a dominant species in any portion of the restoration area. This shift is likely due to the inundation of the restoration area by floodwater from the Sudbury River for much of the growing season;
- The restoration area provides valuable wildlife habitat as emergent marsh; and
- The restoration area provides flood and water quality protection for the Sudbury River.

3.0

2008 MONITORING RESULTS

3.1

STANDARDS FOR SUCCESS

The wetland permits issued to conduct the remediation and restoration are referenced in the previous section. The standards for success were established in the Plan to ensure that the project could be objectively evaluated to determine whether the restoration area was developing into the desired resource type and providing the expected functions. The fifth and final year of monitoring indicates the restoration area has become a functional emergent marsh wetland that provides valuable habitat and flood storage in the Sudbury River floodplain.

The following table summarizes the standards of the Plan and additional permit requirements in the Wayland OOC and whether these conditions have been met based on the past 5 years of monitoring.

Parameter	Standards for Success	Achieved
Hydrology	Final grading of the remediation project area must be consistent with the original contours.	Yes
Soils	The soils used for restoration shall be a mixture of sand, loam, silt, and clay and 12% organic matter.	Yes
Vegetation	1. <i>Percent areal cover</i> : 1a. The remediation project area must attain at least 75% areal cover of native, non-invasive species within two growing seasons.	1a. Yes
	1b. The OOC also requires 90% or more areal coverage of wetland vegetation for three consecutive growing seasons.	1b. No
	2. <i>Survivorship of Planted Stock</i> : 2a. The herbaceous plantings have a 75% survival; planted buttonbush shrubs have an 80% survival within two growing seasons.	2a. Yes; Yes
	2b. The OOC also requires 100% survival of the buttonbush for three consecutive growing seasons.	2b. Yes*
	3. <i>Invasive species</i> : To be controlled with reasonable measures.	3. Yes
	4. <i>Erosion control</i> : All slopes within and adjacent to the mitigation sites are stabilized.	4. Yes
Wildlife Use	Wetland and aquatic-dependant species must utilize the site.	Yes

*Note that the current number of buttonbush planted in the restoration area (34 total) exceeds the 25 required by the Commission. Several shrubs were replaced during the 2006 and 2007 growing seasons.

3.2 2008 SUMMARY DATA

ERM wetland scientists conducted wetland monitoring on 1 August and 3 September during the 2008 growing season. Wetland monitoring involved collecting data on vegetation, hydrology, and wildlife. Data collection was consistent with the methodology used in the previous 4 years of monitoring.

Figures attached to this report show the location of the restoration area relative to other landscape features, its boundaries, habitat types, locations of photographic reference points, sampling data points, and other features pertinent to the mitigation plan. The locations of the photographs are depicted on Figure 3.

3.2.1 *Hydrology*

Post-remediation topographic elevations were previously surveyed and found to be consistent with the original contours (Woodlot, 2004). Based on field observations, hydrologic conditions range from shallow inundation to surface saturation depending on the location within the remediation project area. In early August 2008, ERM observed a majority of the restoration area inundated with standing water (Appendix A, Photograph 1). Approximately 2 inches of standing water were observed adjacent to the culvert in Area C (Figure 2) with depths rapidly increasing to the north and west. In September 2008, the flood waters of the Sudbury River had receded and surface saturation was observed throughout the restoration area, except for several small areas of standing water and about 4 to 6 inches of flowing water in the stream channel (Figure 2). An algal mat was also observed in the northern end of Area C and throughout Area A, indicating the presence of standing water for a prolonged period of time. Algae was observed at a height of approximately 2 feet on the stalks of plants in the northern portion of Area C.

Current hydrologic conditions in the restoration area are consistent with adjacent portions of the Sudbury River floodplain and support the development of the area as emergent marsh wetland.

3.2.2 *Soils*

Soil profiles collected previously show the constructed soil surface layers ranging from 22 inches or greater in depth and consisting of sandy loam and fine sandy loam textures high in organic matter content. The wetland soils of the restoration area were manufactured off Site by Agro-source,

Inc. to ensure the proper organic matter content and textures consistent with the composition of floodplain soils (ERM, 2003).

Currently, soils in the restoration area are too young in the development of hydric soil morphology to show indicators. However, the frequently flooded nature of these soils for a long duration during the growing season is consistent with the definition of a hydric soil (New England Hydric Soils Technical Committee, 2004).

3.2.3 *Vegetation*

3.2.3.1 *Areal Vegetative Cover*

On 3 September 2008, ERM collected vegetation data from 14 one-meter square plots. The plots were randomly spaced throughout the restoration area (Figure 2). Data collected in each plot included a list of species present, estimated percent areal cover by species, and percent areal cover of bare ground and water for each plot. The data were tabulated and averaged across the plots (see Table 1 for results).

The 14 vegetation plots, when extrapolated to the entire restoration area, yield the following results with respect to areal coverage:

- 77 percent coverage by non-invasive wetland vegetation;
- 12 percent coverage by invasive species; and
- 16 percent coverage of thatch/bare ground.

The attainment of 77 percent coverage by non-invasive wetland vegetation through 2008 reflects the restoration project's successful establishment of an emergent marsh wetland. Over the past 5 years of monitoring, percent coverage of native species in the restoration area has continued to increase. The project currently meets the criterion established by the USACE (75 percent); however, the criterion established in the OOC by the Commission (90 percent) has not been achieved due to the presence of purple loosestrife, an invasive species.

It should also be noted that the percent cover of invasive species has decreased significantly as the density of native plant species has increased over the past 5 years of monitoring. Barnyard grass was previously identified as a dominant species over a large portion of the restoration area; however, this species is no longer dominant in any portion of the

restoration area. The dominance of purple loosestrife in Area C continues to decline as native plants, particularly rice cut grass (*Leersia oryzoides*), increase in density and areal coverage.

Area A was sparsely vegetated during the 2008 monitoring; however, the lack of vegetation is likely attributable to the prolonged period of standing water in the area and not the result of residual impacts to sediment. In previous years when the floodwaters of the Sudbury River retreated early in the growing season, Area A was observed to be approximately 75 percent vegetated.

3.2.3.2 *Planted Stock Survivorship*

The data collected on 3 September 2008 suggest that the survivorship of planted herbaceous stock remains less than 75 percent. The monitoring procedures also included meander surveys to identify additional plant species present in the restoration area but not recorded in the 14 vegetation plots. Table 2 presents a summary of the meander survey results, excluding those species identified in one or more of the 14 vegetation plots.

The results of the vegetation plots and meander surveys reveal that only 13 of the 19 wetland plant species installed in 2003 are established. In addition, four species were identified from the original seed mixes planted in the restoration area. Rice cut grass (*Leersia oryzoides*) had the highest areal coverage of this group, averaging about 17 percent. It is possible that other planted species not encountered during annual monitoring may be present at low population levels. Random change vectors within the restoration area (woody debris, variable flooding) may allow these low-number species to play a greater role in the future vegetation community.

Despite the fact that several planted species were not identified during the annual monitoring activities, the restoration area exhibits a diversity of native plant species and the area is expected to continue to naturalize over time.

The Commission requires the survival of at least 25 planted buttonbush (*Cephalanthus occidentalis*) for three consecutive growing seasons. The 3 September 2008 vegetation survey found more than 25 of the planted buttonbush to be thriving in the restoration area. (Note that 25 plants were located; however, more may exist but could not be located due to the dense vegetation.) These planted individuals are expected to eventually mimic the area of dense buttonbush to the north of Area C.

3.2.3.3

Invasive Species

ERM conducted invasive species control measures on 27 August 2008 for purple loosestrife. The 2008 invasive species control measures continued the maintenance practices conducted during the 2005, 2006, and 2007 growing seasons.

Purple loosestrife flowers were cut throughout Area C. Seed heads were not present at the time of cutting; therefore, cut plants were left on Site. No invasive species management was warranted in Areas A and B.

Barnyard grass, an upland species pervasive in 2007, has not established over the long term due to the emergent floodplain hydrology of the restoration area. No control activities for barnyard grass were warranted.

On 27 August 2008, ERM classified the vegetative composition of the wetland restoration area into three classes based on wetland type and dominance of invasive species, then field-estimated the areal extent of each class (Figure 4). This mapping was performed to supplement the data collected from the 14 random vegetation plots and to provide a better understanding of the distribution of invasive species, primarily purple loosestrife, within the restoration area. The data collected from the vegetation plots provides the actual percentage of areal coverage invasive species, while the mapping provides an estimate of the extent of areas where purple loosestrife is the dominant vegetative cover.

Based on this mapping, it is estimated that purple loosestrife is a dominant species in the vegetative composition of approximately 18 percent of the restoration area. Barnyard grass is no longer a dominant species in the vegetative composition of the restoration area. Cattail is encroaching into the restoration area from adjacent areas outside of the project area. However, cattail is not dominant in any project location. Common reed (*Phragmites australis*) is not present in the restoration area; however, this species is dominant in the wetland to the south of Area C.

The results of this mapping indicate that invasive species control activities implemented at the Site to date have been successful in reducing the areal coverage of purple loosestrife and barnyard grass. While the percent coverage of purple loosestrife has decreased since mechanical control measures were implemented in 2005, purple loosestrife remains dominant across a large portion of Area C. Because purple loosestrife is common, if not dominant, in many areas of the adjacent Sudbury River floodplain, the

results suggest that limited mechanical control may not be effective in limiting the species' competitive success over the long term.

3.2.3.4 *Erosion*

The upland areas disturbed during the remediation project were reclaimed and planted with upland trees and shrubs, and seeded with an erosion control seed mix. The 2005 annual monitoring report indicated that the survival of upland trees and shrubs was approximately 94 percent, including temporary access roads and the area along the edge of the embankment leading to the wetland floodplain (Woodlot, 2005). The past 5 years of monitoring confirm that the restoration area and adjacent upland areas are stabilized and no associated erosion problems exist in the restoration area.

3.3 **WILDLIFE USE**

Wildlife observations in the restoration area over the past 5 years of monitoring are presented in Table 3. Wetland-dependent species observed during the 2008 monitoring work include pickerel frog (*Rana palustris*) and green frog (*Rana clamitans*). The wildlife sightings continue to confirm that the restoration area has meet its success standard of supporting wetland and aquatic-dependent species.

Over the past 5 years of monitoring, percent coverage of native species in the restoration area has continued to increase. The project currently meets the criterion established by the USACE (75 percent). However, the criterion established in the OOC by the Commission (90 percent) has not been achieved due to the presence of purple loosestrife.

This deficiency can be attributed to the continued dominance of purple loosestrife in Area C. Purple loosestrife is an erect perennial herb with highly variable growth form and morphology. Established plants can tolerate very different growing conditions, including permanent flooding, low water, and low nutrient levels. Purple loosestrife spreads to new areas exclusively by seed. Seeds germinate in late spring and early summer in open, sunny places. Plants are long lived, and mature plants may produce more than 2.5 million seeds annually, which remain viable for many years. Once purple loosestrife becomes established in a wetland, it displaces endemic vegetation through rapid vegetative growth and heavy seed production that can eventually lead to a monoculture of loosestrife. Purple loosestrife was observed in the undisturbed wetlands adjacent to the restoration area during the past 4 growing seasons and has likely been transported to the restoration area via the floodwaters of the Sudbury River. Elimination of purple loosestrife is not achievable based on the proximity to the dense populations of this species in the Sudbury River floodplain.

While there are several areas within the restoration area that have not met the standard for success based on the presence of purple loosestrife, the hydrologic functions and values of this wetland have been restored. The restoration area is providing valuable wildlife habitat as emergent marsh as well as providing flood and water quality protection for the Sudbury River. The dominance of purple loosestrife in Area C continues to decline as native plants, particularly rice cut grass (*Leersia oryzoides*), increase in density and areal coverage. However, as previously discussed, the elimination of purple loosestrife from the restoration area is not achievable and the density will likely stabilize.

The 2008 monitoring activities conclude the fifth year of a 5-year monitoring program. A request for Certificate of Compliance will be submitted to the Commission for concurrence on the completion of the wetlands remediation and restoration.

- Environmental Resources Management. 2003. *Regulatory Permit Application for Wetland Impacts Resulting from Remediation of Oils, Hazardous Materials in Sudbury River Floodplain Wetlands, Wayland, Massachusetts*. February 6.
- Environmental Resources Management. 2006. *2006 Wetland Restoration Monitoring Report*. December 15.
- Environmental Resources Management. 2007. *2007 Wetland Restoration Monitoring Report*. December 13.
- New England Hydric Soils Technical Committee. 2004. *Field Indicators for Identifying Hydric Soils in New England, Version 3*.
- U.S. Army Corps of Engineers. 2006. *Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Creation, Restoration, and/or Enhancement of Aquatic Resources, Regulatory Guidance Letter 06-03*. August 3.
- Woodlot Alternatives, Inc. 2004. *The Wetland Remediation Site at the Former Raytheon Facility, Wayland, Massachusetts, 2004 Wetland Restoration Monitoring Report*. December.
- Woodlot Alternatives, Inc. 2005. *The Wetland Remediation Site at the Former Raytheon Facility, Wayland, Massachusetts, 2005 Wetland Restoration Monitoring Report*. December.

Tables

Table 1
Summary of Random Vegetation Plot Surveys
Former Raytheon Facility
Wayland, Massachusetts

Plant Species	Common Name	Origin	Wetland Indicator Status	Area C Plots												Area A Plots		Total Cover In Plots	Average Cover Per Plot (%)	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2			
<i>Acer rubrum</i>	Red maple	V	FAC																0	0.0
<i>Acorus americanus</i>	Sweet flag	P	OBL								63	20.5							83.5	3.3
<i>Alisma plantago-aquatica var. parviflorum</i>	Lesser water-plantain	S	OBL																0	0.0
<i>Asclepias incarnata</i>	Swamp milkweed	V	OBL																0	0.0
<i>Bidens cernua</i>	Nodding bur-marigold	S	OBL																0	0.0
<i>Calamagrostis canadensis</i>	Bluejoint	P	FACW+																0	0.0
<i>Carex/Scirpus</i>	Sedge	S and/or V	FACW																0	0.0
<i>Carex alopecoidea</i>	Foxtail Sedge	S	OBL																0	0.0
<i>Carex lurida</i>	Lurid sedge	S	OBL		10.5			T		10.5		3		10.5				34.5	1.4	
<i>Cephalanthus occidentalis</i>	Buttonbush	P	OBL																0	0
<i>Cyperus eragrostis</i>	Umbrella sedge	V	OBL																0	0.0
<i>Digitaria sp.</i>	Crabgrass	V	UPL																0	0.0
<i>Echinochloa crus-galli</i>	Barnyard grass	V	FACU																0	0.0
<i>Eleocharis palustris</i>	Spike rush	P	OBL																0	0.0
<i>Leersia oryzoides</i>	Rice cut-grass	P	OBL			3	3	95	38		63	38		75	80	20.5	3	418.5	16.7	
<i>Lemma minor</i>	Duckweed	V	OBL	3	3	63													69	2.8
<i>Ludwigia palustris</i>	Water purslane	V	OBL	T															0	0.0
<i>Lythrum salicaria</i>	Purple loosestrife	V	FACW	3	T		T	3		20.5	10.5	38	3	3	3	T		84	3.4	
<i>Penthorum sedoides</i>	Ditch stoncrop	S	OBL																0	0.0
<i>Polygonum sp.</i>	Smartweed	P	FACW										T		T	T			0	0.0
<i>Polygonum coccineum</i>	Water smartweed	P	OBL			3				T								3	0.1	
<i>Polygonum lupathifolium</i>	Willow-weed	V	FACW+																0	0
<i>Polygonum persicaria</i>	Lady's thumb	P	FACW																0	0
<i>Pontederia cordata</i>	Pickernelweed	P	OBL		T	63													63	3
<i>Sagittaria latifolia</i>	Common arrowhead	P	OBL																0	0.0
<i>Salix nigra</i>	Black willow	V	FACW+																0	0.0
<i>Scirpus cyperinus</i>	Wool grass	S	FACW+					80	95	20.5				3				198.5	7.9	
<i>Scirpus atrovirens</i>	Black bulrush	S	OBL																0	0.0
<i>Scirpus validus</i>	Soft-stemmed bulrush	P	OBL	20.5	63	10.5			3	20.5		10.5		20.5	38	10.5		197	7.9	
<i>Sium suave</i>	Water-parsnip	V	OBL																0	0.0
<i>Sparganium americana</i>	Bur-reed	V	OBL										10.5						10.5	0.4
<i>Typha xglauca</i>	Hybrid cattail	V	OBL	10.5		3					3	38	20.5	3	10			88	3.5	
<i>Vegetative forb</i>	Various	S and/or V	N/A																0	0.0
Thatch/bare ground				38	0	0	0	0	0	0	0	0	0	0	0	0	90	100	228	16.3
Saturated to surface				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Standing Water (inches)				0	0	6	0	0	0	0	0	0	0.5	0	0		0	0		
Total % Vegetative Cover for Plot				37	79.5	145.5	95	121	98	135	114.5	110	109	120	71.5	13.5	0		89	
Total % Hydrophytic (Non-invasive) Cover for Plot¹				23.5	79.5	142.5	95	118	98	114.5	101	34	85.5	114	58.5	13.5	0		77	
Total % Invasive Species Cover for Plot				13.5	0	3	0	3	0	20.5	13.5	76	23.5	6	13	0	0		12.3	

Notes:

P = Planted.
S = Seeded.
V = Volunteer.
UPL = Obligate upland species, < 1% occurrence in wetlands.

FACU = Facultative upland, 1-33% occurrence in wetlands.
FAC = Facultative, 34-66% occurrence in wetlands.
FACW = Facultative wetland, 67-99% occurrence in wetlands.
FACW+ = Facultative wetland, greater occurrence than FACW.

OBL = Obligate wetland, greater than 99% occurrence in wetlands.
T = Species occurs in trace amounts.
1 = Excludes barnyard grass, purple loosestrife, and cattail.
All data collected by ERM on 3 September 2008.

Table 2
Summary of Plant Meander Surveys
Former Raytheon Facility
Wayland, Massachusetts

Scientific Name	Common Name	Origin	Wetland Indicator Status
<i>Acer rubrum</i>	Red maple	V	FAC
<i>Bidens frondosa</i>	Beggars-tick	V	FACW
<i>Cephalanthus occidentalis</i>	Buttonbush	P	OBL
<i>Dulichium arundinaceum</i>	Three square sedge	P	OBL
<i>Scirpus acutus</i>	Hard stem bulrush	S	OBL
<i>Onoclea sensibilis</i>	Sensitive fern	S	FACW
<i>Eleocharis sp.</i>	Spike rush	P	OBL or FACW+
<i>Polygonum hydropiperoides</i>	Swamp smartweed	P	OBL
<i>Polygonum persicaria</i>	Lady's thumb	P	FACW
<i>Sagittaria latifolia</i>	Common arrowhead	V	OBL
<i>Typha latifolia</i>	Cattail	V	OBL

Notes:

P = Planted.

S = Seeded.

V = Volunteer.

FAC = Facultative, 34-36% occurrence in wetlands.

FACW = Facultative wetland, 67-99% occurrence in wetlands.

FACW+ = Facultative wetland, greater occurrence than FACW.

OBL = Obligate wetland, greater than 99% occurrence in wetlands.

All data collected by ERM on 3 September 2008.

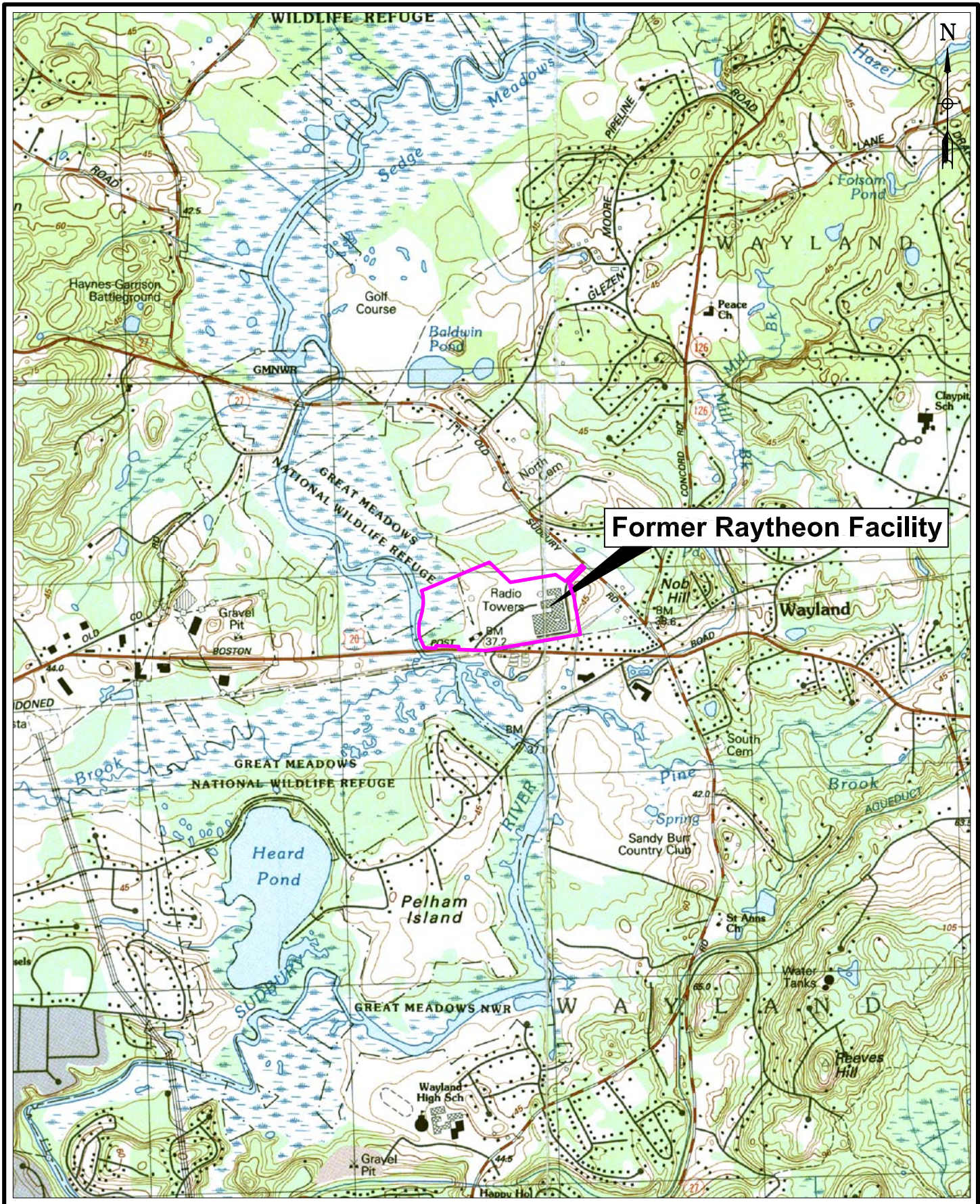
Table 3
Summary of Wildlife Observations On and Adjacent to Site
Former Raytheon Facility
Wayland, Massachusetts

Scientific Name	Common Name
Amphibians and Reptiles	
<i>Rana clamitans</i>	Green frog
<i>Rana palustris</i>	Pickeral frog
<i>Chelydra serpentina</i>	Snapping turtle
Birds	
<i>Agelaius phoeniceus</i>	Red-winged blackbird
<i>Anas platyrhynchos</i>	Mallard
<i>Anas rubripes</i>	Black duck
<i>Ardea herodias</i>	Great blue heron
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Cardinalis cardinalis</i>	Northern cardinal
<i>Charadrius vociferous</i>	Killdeer
<i>Colaptes auratus</i>	Northern flicker
<i>Cyanocitta cristata</i>	Blue jay
<i>Dendroica petechia</i>	Yellow warbler
<i>Dumetella carolinensis</i>	Gray catbird
<i>Egretta thula</i>	Snowy egret
<i>Melospiza georgiana</i>	Swamp sparrow
<i>Melospiza melodia</i>	Song sparrow
<i>Molothrus ater</i>	Brown-headed cowbird
<i>Quiscalus quiscula</i>	Common grackle
<i>Tachycineta bicolor</i>	Tree swallow
<i>Zenaida macroura</i>	Mourning dove
Mammals	
<i>Odocoileus virginianus</i>	White-tailed deer
<i>Procyon lotor</i>	Raccoon
<i>Sciurus carolinensis</i>	Gray squirrel
<i>Sylvilagus floridanus</i>	Eastern cottontail
Insects	
<i>Enallagma signatum</i>	Orange bluet
<i>Melanoplus</i> sp.	Grasshopper
<i>Sympetrum rubicundulum</i>	Ruby meadowhawk
<i>Vanessa cardui</i>	Painted lady butterfly
Fish	
<i>Ameiurus catus</i> (or similar species)	White catfish

Notes:

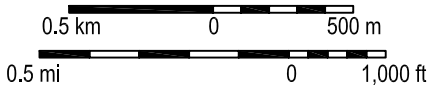
Data is cumulative for the 2004 through 2008 growing seasons.

Figures



Former Raytheon Facility

Scale 1:25,000




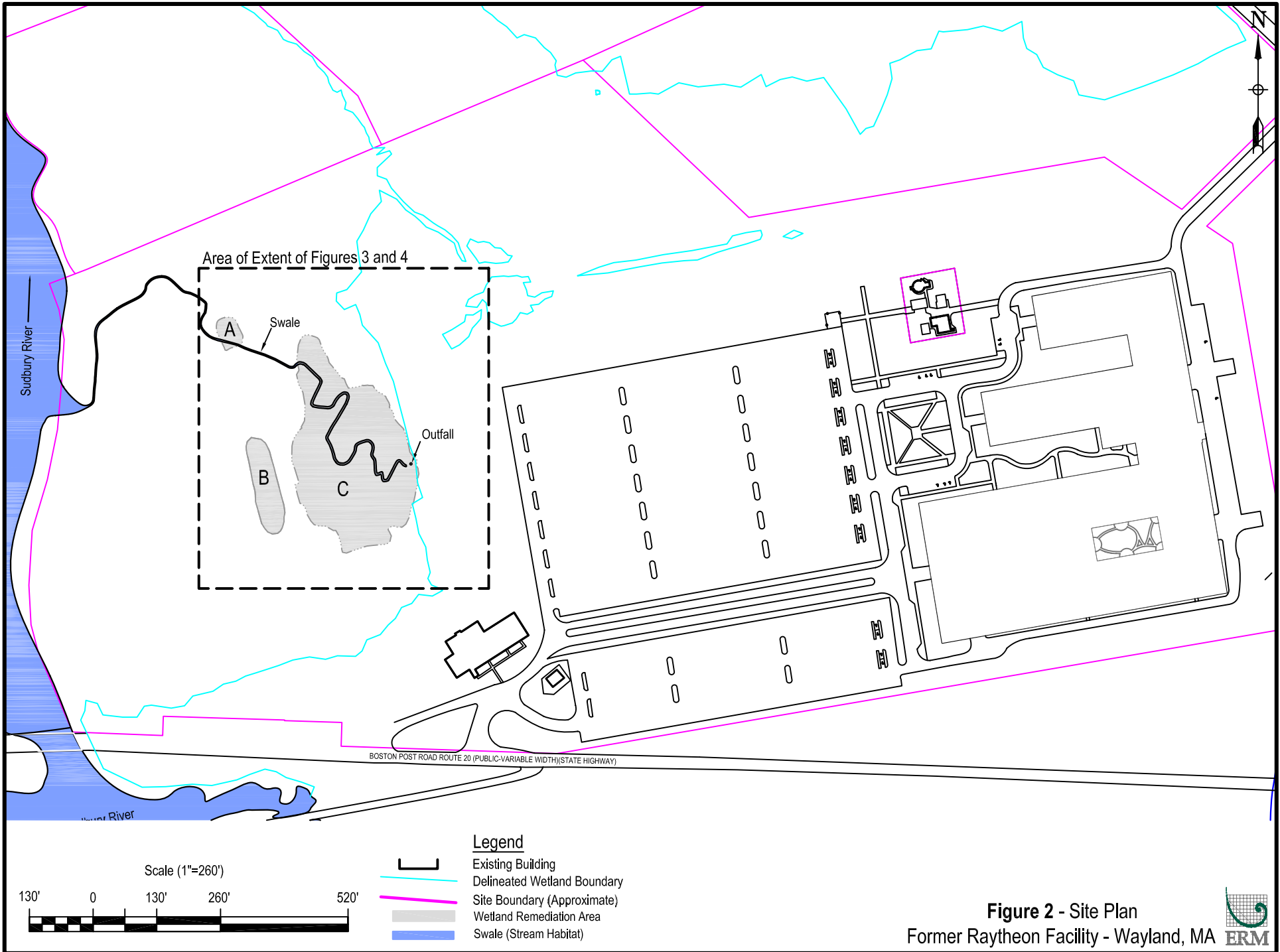
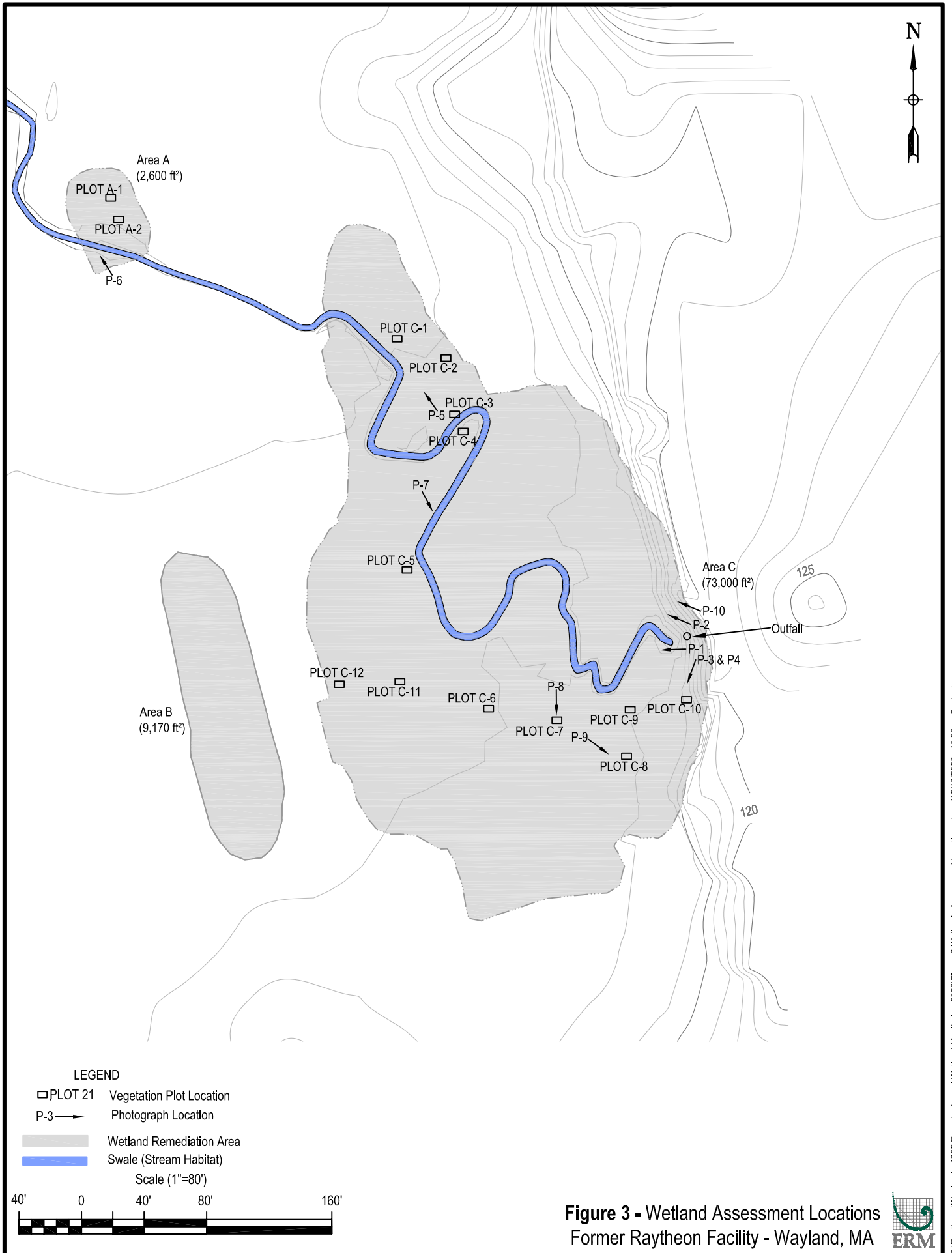
Legend	
	Subject Property Line

Figure 1 - Site Locus Map
Former Raytheon Facility - Wayland, MA







LEGEND

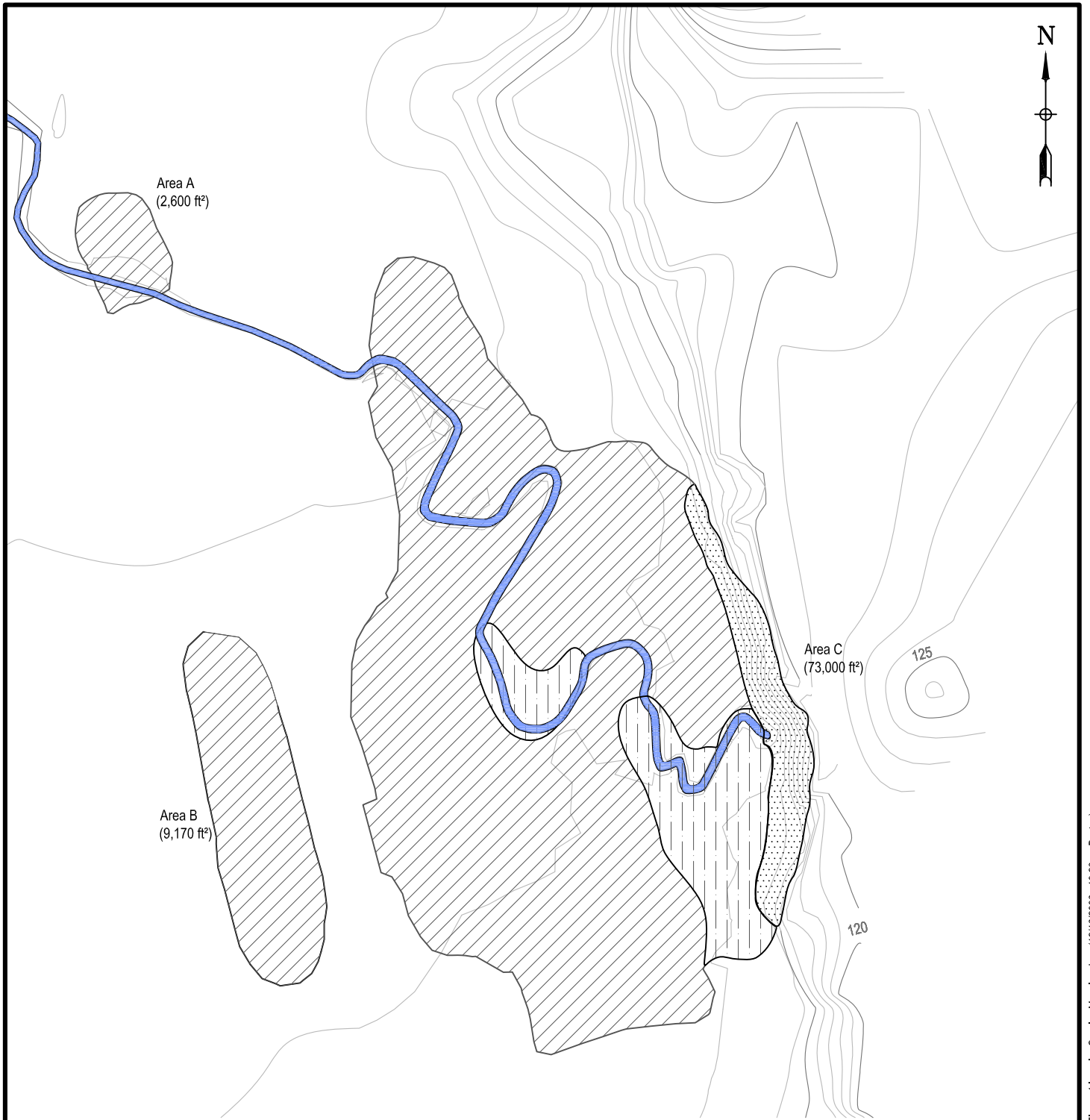
- PLOT 21 Vegetation Plot Location
- P-3 → Photograph Location
- Wetland Remediation Area
- Swale (Stream Habitat)

Scale (1"=80')



Figure 3 - Wetland Assessment Locations
Former Raytheon Facility - Wayland, MA



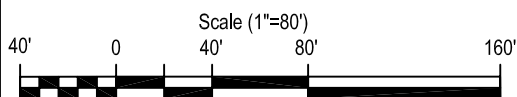


Legend

- Stream Habitat (Includes Non-Invasive Vegetative Communities in Stream Channel) - 2,940 SQ.FT
- Wetland Communities: Native, Non-Invasive Dominant Species - 63,030 SQ.FT
- Wetland Communities: More Than 25% Areal Coverage of Invasive Species (Purple Loosestrife) - 14,150 SQ.FT
- Upland Communities: Less Than 25% Areal Coverage of Invasive Species - 4,650 SQ.FT.
- 5' Topographic Contour
- 1' Topographic Contour

Notes:

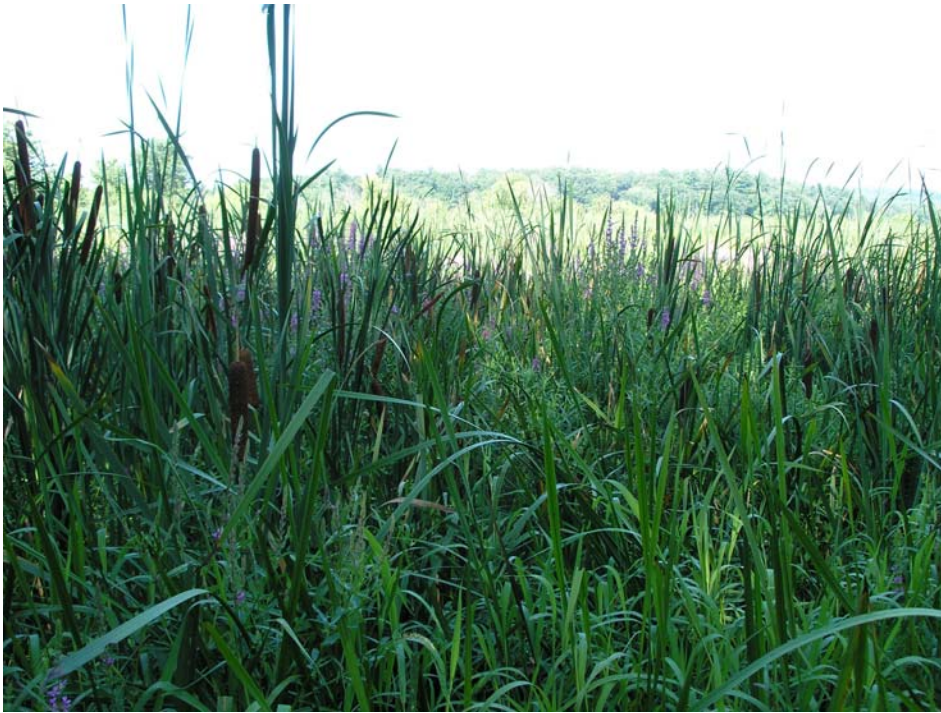
1. Vegetative Communities were Field Estimated by ERM on 9/3/08.
2. Stream Segment in Area A is Vegetated.
3. ft² = square feet



**Figure 4 - Invasive Species Mapping
Former Raytheon Facility - Wayland, MA**



Appendix A
Photographs



Photograph 1 - Area C looking west from base of outfall (8/1/08).
Conditions were flooded to the base of slope. Note very dense vegetation.



Photograph 2 - Area C looking northwest from above outfall (9/3/08).
Note dense vegetation.



Photograph 3 - Area C looking west from above outfall (8/27/08). Note abundant purple loosestrife.



Photograph 4 - Area C looking west from above outfall following invasive species management activities (8/27/08).



Photograph 5 - Northern end of Area C looking north (9/3/08). Note algal mat on vegetation indicative of high water levels.



Photograph 6 - Central portion of Area A looking north (9/3/08). Note sparse vegetation as a result of inundation until late in the growing season.



Photograph 7 - Stream channel in Area C. Note duckweed on standing water and diversity of vegetation (9/3/08).



Photograph 8 - Vegetation plot C-7 (9/3/08).



Photograph 9 – Vegetation Plot C-8 (9/3/08). Note vegetative diversity.



Photograph 10 – View to the northwest from above culvert. Note diversity of vegetation and purple loosestrife along Sudbury River in background (9/3/08).

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