Stantec

Worcester Regional Airport
2020-2024 Vegetation Management Plan (VMP) Update

June 2020

Prepared for:

The Massachusetts Port Authority &
Worcester Regional Airport
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1.0 CHAPTER 1 INTRODUCTION

1.1 OVERVIEW

In 2011, The Massachusetts Port Authority (Massport) prepared a Vegetation Management Plan (VMP) to address identified vegetative obstructions to protected air surfaces at Worcester Regional Airport (ORH). Obstructions to protected airspace were identified using data compiled from aerial photogrammetry obtained in 2007. The 2011 VMP provided a description of the critical air surfaces evaluated at the airport, established vegetation management areas (VMAs) in locations where existing vegetation penetrated protected airspace (also referred to as Protection Zones), and prescribed vegetation removal and maintenance regimens designed to maintain protected airspace free of vegetative obstructions over the long term. Vegetation management strategies were developed with careful consideration of environmental constraints including wetlands, priority habitat, surface water protection areas, historic/archaeologically sensitive resources, etc., to ensure impacts to these resources are minimized to the greatest extent possible.

The 2011 VMP was submitted to regulatory agencies for review and comment and ultimately received Orders of Conditions from the Leicester and Worcester Conservation Commissions, enabling Massport to proceed with the implementation of a five-year vegetation management program including initial vegetation removal and subsequent vegetation management practices to be conducted within 42 designated VMAs. The first year of the program included initial obstruction removal efforts (Phase 1) within the VMAs, scheduled for construction in frozen ground conditions during the winter of 2012. These efforts, however, were not initiated due to unseasonably warm winter temperatures that prevented frozen ground conditions. Consequently, Phase 1 obstruction removal was rescheduled for construction during the winter of 2013.

In 2012, new aerial photogrammetry was obtained to update the airport's airspace analysis. This data was obtained, primarily, to delineate vegetative obstruction removal limits and the creation of associated VMAs required for the implementation of Phase 2 vegetation removal (and subsequent maintenance) activities. As indicated in Section 2 *Protection Zone Identification and Obstruction Analysis* of the 2011 VMP, Part 77 Approach Surfaces and 40:1 Departure Surfaces associated with Runway 11-29 were to be addressed in Phase 2 of the VMP. Phase 1 included the treatment of obstructions identified on Massport property to the Runway 11 TERPS approach and airport design surfaces. Phase 2 was to include obstructions to the Runway 11 40:1 Departure Surface located on Massport property as well as obstructions to the Runway 11 Part 77 34:1 approach and transitional surfaces that were identified on Massport property and City of Worcester property. The revised airspace analysis led to the incorporation to the VMP of 11 additional VMAs. All Phase 2 vegetation management activities were proposed within the Town of Leicester on Massport and City of Worcester property. A 2012 VMP Update was prepared to provide vegetation management strategies for VMAs associated with Phase 2 obstruction removal.

Formal wetland delineations were conducted within Phase 2 VMAs and MassGIS data sources were queried for the presence of other potential environmental constraints to be considered while preparing the VMP Update. Phases 1 and 2 of obstruction removal were completed during the winter of 2013. Vegetation management regimens, as outlined in the 2012 VMP update were conducted seasonally through the term of the VMP. The VMP was also updated in 2013 and 2015 to address new obstructions and changes made to airport infrastructure and navigation aids.

2020 VMP Update

For this 2020 VMP Update, new aerial photogrammetry data was obtained in December 2018. This data was used to perform an airspace analysis to evaluate the presence of obstructions and near obstructions (objects within 10 feet) to air surfaces considered in the previous VMP. The 2019 airspace analysis identified several areas with trees penetrating airspace that had not been permitted under the previous VMP. These new vegetation management areas are all located to the west of the Runway 11 end within the town of Leicester. Wetland boundaries within and adjacent to these new VMAs were field delineated in late April 2019. Additional historic/archaeological surveys are not required as potential impacts associated with tree removal will not occur beyond field-verified boundaries of these resources documented in 2011 during the preparation of the original VMP. Impacts to wetlands and buffer areas from proposed vegetation removal and management methodologies and other potential environmental constraints will be addressed in the following sections of this VMP Update.

1.2 PURPOSE AND GOALS

The purpose of the 2020-2024 Worcester Regional Airport VMP is to maintain compliance with FAA regulations protecting airspace surrounding public use airports. The regulations pertaining to the protection of airspace considered in this document include:

- Federal Aviation Regulations (FAR) Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace;
- FAA Advisory Circular 150/5300-13A, Airport Design;
- FAA Engineering Brief #99
- FAA Order 8260.3B, United States Standards for Terminal Instrument Procedures (TERPS);
- FAA Order 6850.2B, Visual Guidance Lighting Systems; and
- FAA Advisory Circular 150/5345-28F, Precision Approach Path Indicator criteria.

The goal of the 2020 VMP Update for ORH is to maintain airport safety in accordance with FAA requirements through the removal of vegetation that currently penetrates or is expected to penetrate protected airspace in and around the airport, and to create low-growing vegetative communities within critical areas to facilitate long-term management of those areas. A secondary goal is to minimize the extent and magnitude of future removal projects. To that end, the VMP serves as a guide for vegetation removal and management practices that will minimize the potential for adverse impacts to the environment. The VMP also provides recommendations to adequately mitigate for such impacts. While the VMP is a guide for the current and future vegetation removal projects at the airport, individual permit applications under the Massachusetts Wetlands Protection Act may be needed for specific removal projects. Details regarding wetland impacts, project access routes, staging areas, etc., will be sufficiently addressed in the permit applications for each project.

Clearing vegetation within wetland resource areas is regulated by the Massachusetts Wetland Protection Act (MGL c. 131 § 40 and Regulations 310 CMR 10.00). The Generic Environmental Impact Report (GEIR) for Vegetation Removal in Wetlands at Public Use Airports in Massachusetts (the GEIR—EOEA # 8978) and subsequent updates were prepared by the Massachusetts Aeronautics Commission (now known as the MassDOT Aeronautics Division) and Massport for revisions to 310 CMR 10.00, leading to the implementation of the limited project provision for airport vegetation removal projects in wetlands, 310 CMR 10.53 (3)(n)(1). In addition, the GEIR precluded the need to prepare an EIR for each individual vegetation removal project at airports.

The limited project provisions include four conditions for vegetation removal in wetland resource areas:

1. No change in existing topography, or soil and surface water levels except for temporary access roads;

2. Removal of trees shall occur only during periods when the ground is stable enough to support equipment;

3. Activities should prevent erosion and siltation of adjacent water bodies and wetlands; and

4. Placement of slash, branches, and limbs shall not occur within 25 feet of the bank of a water body.

The removal and maintenance techniques described in this VMP Update comply with these provisions.

1.3 ELEMENTS OF A VMP

The 2020 VMP Update has been prepared in similar fashion to the *Vegetation Management Plan for Worcester Regional Airport, July 2011* and the subsequent *Worcester Regional Airport 2011 Vegetation Management Plan November 2012 Update*. The sections of this VMP are outlined below:

- Introduction/General Information (Section 1);
- Identification of Airspace Protection Zones (Section 2);
- Sensitive Environmental Resources/Environmental Constraints within Identified Vegetation Management Areas (Section 3);
- Vegetation Management Methodologies (Section 4);
- Yearly Operational Plans (Section 5); and
- Mitigation Measures (Section 6).

The process for obtaining approval for and implementation of the VMP and ensuing updates includes the following:

- Assessment of airspace analysis and identification of obstructions to protected airspace;
- Identification of potential environmental constraints;
- Development of Draft VMP (and Draft VMP Updates);
- Submittal of Notice of Intent and Draft VMP (Update);
- Issuance of Order of Conditions;
- Finalize VMP (Updates);
- Commence implementation of YOPs; and
- Implement monitoring plan.

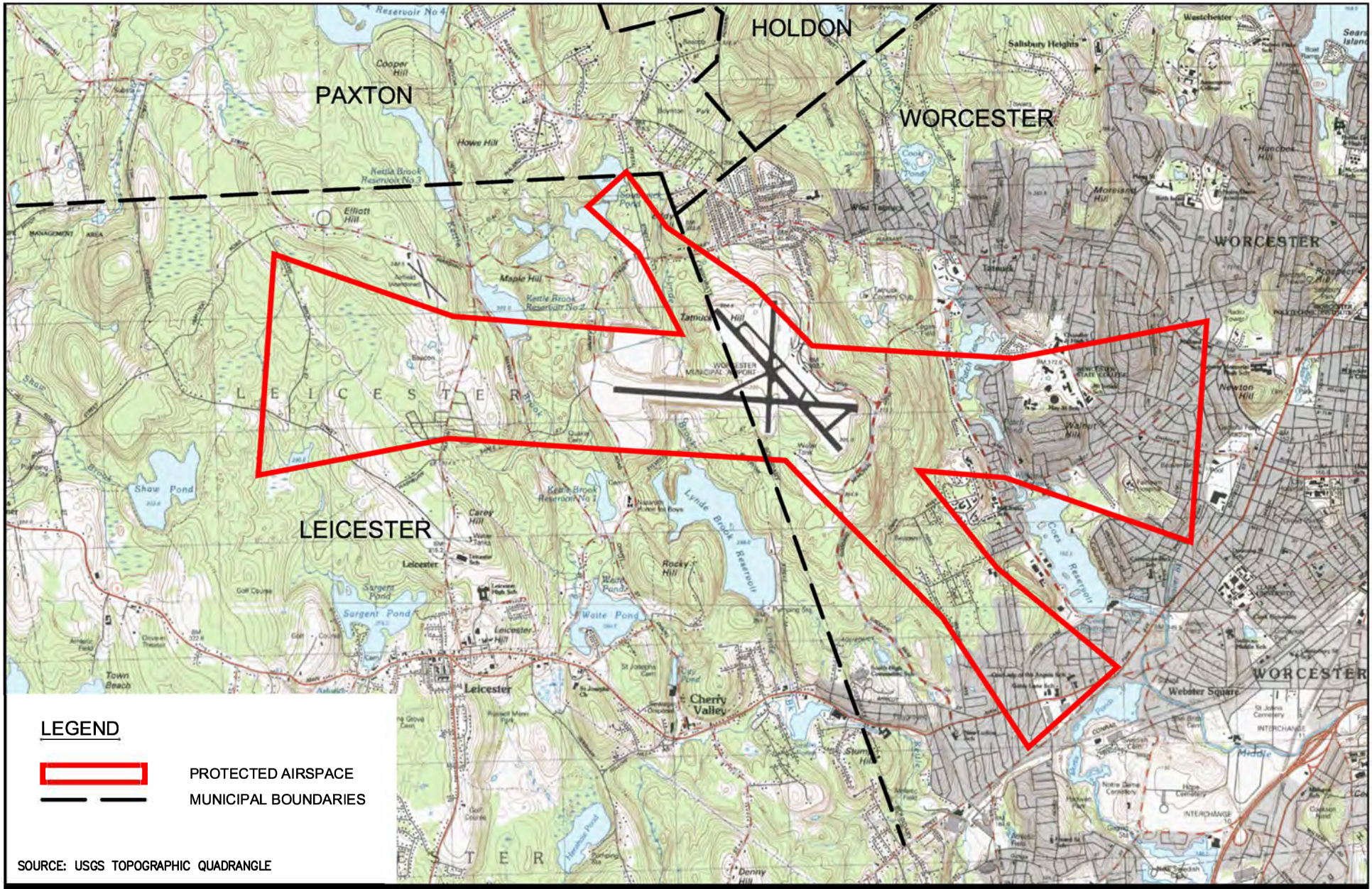
Upon completion of the airspace analysis and identification of obstructions to protected air surfaces, the development of a draft VMP or Update may begin. Identified obstructions and near-penetrations are assessed relative to physical location and affected air surfaces (also referred to as protection zones (PZs)). Once the PZs are identified and the associated vegetation management areas established, each VMA must be evaluated for potential environmental constraints that must be considered when developing vegetation management methodologies and strategies. Potential environmental constraints include but are not limited to the presence of wetlands and/or rare, threatened or endangered species, designated priority habitat (including certified vernal pools), steep slopes, historic and archaeologically sensitive resources, and surface water protection areas. The assessment of local environmental features and constraints plays a critical role in the determination of initial vegetation removal methodologies and future vegetation maintenance regimes to ensure impacts to protected

resources are minimized to the greatest extent possible. In conjunction with updated obstruction analysis information (which provides vegetation height using aerial photogrammetric data), this VMP Update is the result of a comprehensive environmental review of the entire airfield landscape. The development of a pre-established set of vegetation management techniques tailored to specific areas of the airfield will allow Massport to maintain vegetation relative to ORH airspace in an efficient and environmentally responsible manner.

1.4 SETTING

ORH is comprised of approximately 13,000 acres located within the town of Leicester and the City of Worcester, see Figure 1-1 *Location Map*. The airport consists of two paved runways and a series of stub and connecting taxiways. The primary runway, Runway 11-29, is 7,000 feet long and 150 feet wide. This runway is equipped with an instrument landing approach system (ILS) and exhibits an east-west orientation. Runway 15-33 is 5,000 feet long and 100 feet wide. Runway 15 is served by a visual approach while the Runway 33 approach is categorized as non-precision.

The airport is situated atop Tatnuck Hill at a published elevation of 1,009 feet. Topography descends steeply to the north, east and south. Airport property is comprised primarily of mowed turf adjacent to paved areas and forested upland and wetland areas located adjacent to the airfield. A number of public water supply reservoirs are located within the vicinity of the airport. Coes Reservoir, Lynde Brook Reservoir, and Kettle Brook Reservoir No.1 are located to the south of the airfield, while Kettle Brook Reservoirs No.s 2 & 3 are located to the north of the ORH. Patch Reservoir is located to the east of the airport. Another notable waterbody, Lynde Brook, flows from the north through a culvert beneath Runway 11 prior to discharging to Lynde Brook Reservoir. Surrounding land uses include residential (north, east, and southeast), water supply protection land and woodlands (south and west), and industrial (southeast).



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WORCESTER REGIONAL AIRPORT

2020 VEGETATION MANAGEMENT PLAN UPDATE

Project No.
195211197

Title
PROJECT LOCATION MAP

Revision

Date
2020.06.18

Reference Sheet

Figure No.
1-1

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1.5 GENERAL INFORMATION

General information for the 2020 Worcester Regional Airport VMP Update and subsequent updates is provided in Table 1-1 below:

Table 1-1: General Information

Airport Name	Worcester Regional Airport (ORH)
Airport Location	Airport Drive Worcester, MA 01602 *Airport is located within the municipalities of Worcester and Leicester
Contact Person	Mr. Andrew Davis, Director, Worcester Regional Airport (508) 799-1350
Airport Owner	Massachusetts Port Authority (Massport)
Owner Address	One Harborside Drive East Boston, MA 02128-2909

2.0 PROTECTION ZONE IDENTIFICATION AND OBSTRUCTION ANALYSIS

2.1 PROTECTION ZONES

Protection Zones at ORH are defined through the standards established by Federal Aviation Administration Regulation 14 CFR Part 77, commonly referred to as Part 77. This regulation is a planning reference that describes a set of imaginary surfaces centered along airport runways to be maintained free of obstructions. Additional PZs have been established by the FAA to protect air surfaces associated with the use of specific navigational aids employed at an airport. Protection zones at ORH have been broadly categorized as either Part 77 PZs or Terminal Instrument Procedures (TERPS) PZs to simplify the discussion of the many regulations responsible for defining and maintaining protected air surfaces.

These surfaces have been designated by FAA as surfaces that must be maintained clear of obstructions by ORH. As discussed in the Vegetation Management Plan for Worcester Regional Airport, July 2011 (and in the 2012 VMP Update), initial obstruction removal efforts were intended to be conducted in two phases. Phase 1 was intended to manage all surfaces to Runways 11-29 and 15-33 with the exception of Runway 11 34:1 Approach Surface PZ located off Massport property and the Runway 11 40:1 Departure Surface PZ. These exceptions, as well as minor amendments to Phase 1 VMAs, constituted Phase 2 clearing requirements that were based on newly acquired airspace analysis data addressed in the 2012 VMP Update. The 2020 VMP Update intends to provide unobstructed airspace to those surfaces identified in the 2011 VMP and subsequent update. Figure 2-1 *Protected Airspace Surfaces* illustrates typical protected air surface PZs as they occur at Worcester Regional Airport. For graphic illustrations of surfaces discussed below please refer to the Worcester Regional Airport Vegetation Management Plan, July 2011.

2.2 TERPS SURFACES

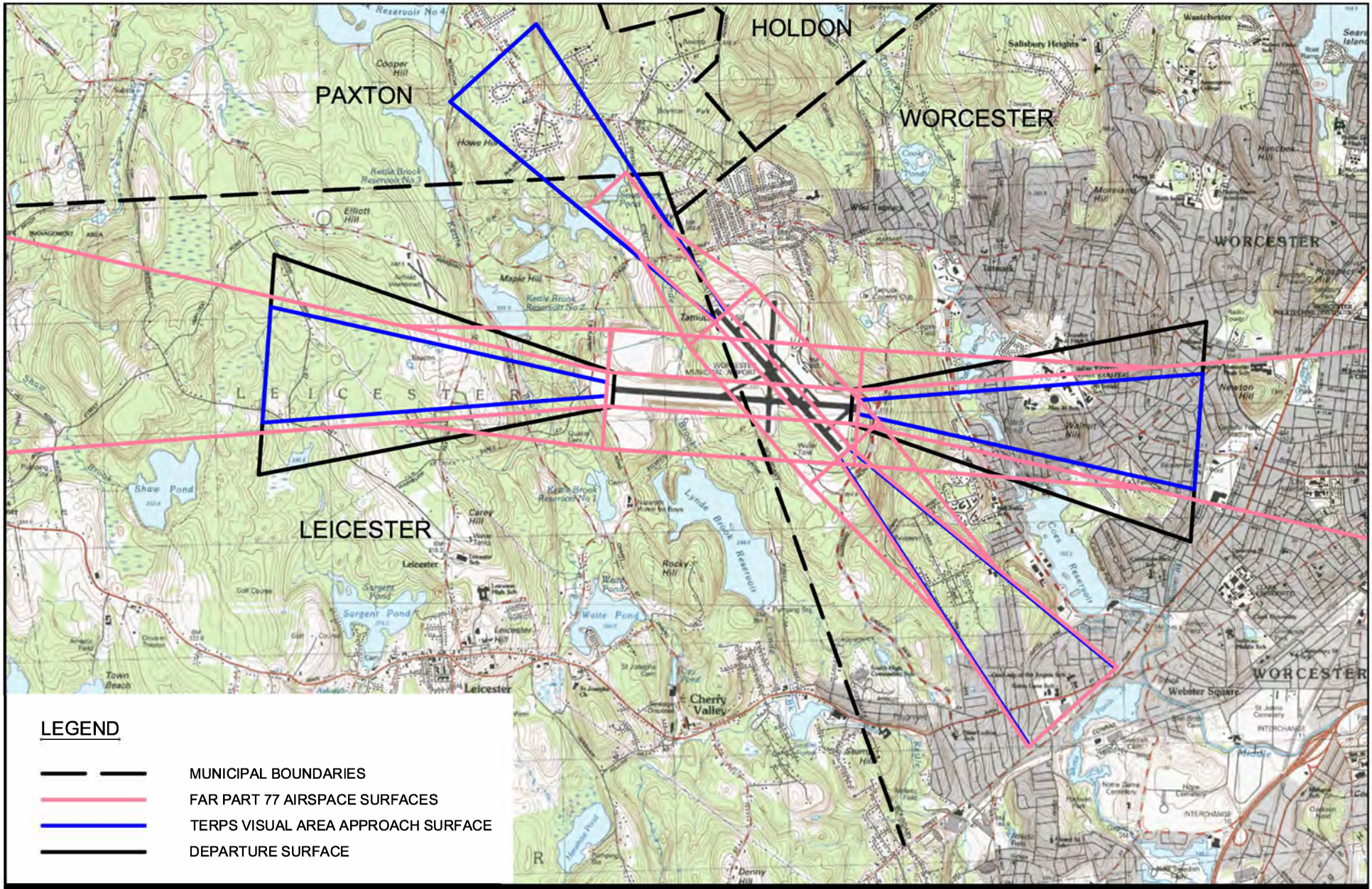
TERPS surfaces determine the approach minimums for instrument approaches. If these surfaces are not maintained free of obstructions, restrictions to air traffic such as visibility criteria or prohibitions on night landing may be necessary to maintain safety. TERPS surfaces that were analyzed for ORH include:

TERPS 34:1 (VA-OIS) Analysis to Runway 11;

Precision Obstacle Clearance Surface (OCS) to Runway 11;

ALSF-2 Approach Light Plane Analysis to Runway 11 (the ALSF-2 approach light system replaced the MALSR approach light system in 2018);

Approach Light System Clear Line-of-Sight to Runway 11;



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2020 VEGETATION MANAGEMENT PLAN UPDATE

Project No.
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PROTECTED AIRSPACE SURFACES

Revision

Date
2020.06.18

Reference Sheet

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40:1 Departure Surface Analysis to Runway 11;

TERPS 20:1 (VA-OIS) Analysis to Runway 33; and

TERPS 34:1 (VA-OIS) Analysis to Runway 33;

2.2.1 TERPS 34:1 (VA-OIS) Analysis to Runway 11

The Terminal Instrument Procedures (TERPS) 34:1 Visual Area-Obstacle Identification Surface (VA-OIS) is centered on Runway 11. It is a trapezoidal surface that is 400 feet wide at the end of Runway 11, and 3,400 feet wide at its westernmost extent. The elevation of the surface is 980 feet NGVD at the end of Runway 11 and rises to an elevation of 1,275 feet NGVD at it westernmost extent, rising at a slope of 34:1 (horizontal:vertical).

2.2.2 Precision Obstacle Clearance Surface to Runway 11

The Precision Obstacle Clearance Surface is centered along Runway 11. It is approximately 7,500 feet wide at the end of Runway 11, and approximately 17,200 feet wide at its westernmost extent. It rises from an elevation of 990 feet NGVD at the end of Runway 11 to 3,770 feet NGVD at the westernmost extent in North Brookfield. The approach surface is centered along the centerline of Runway 11 and has a slope of 34:1. It has two transitional surfaces on either side of the approach surface; an inside surface with a 4:1 slope (approximate), and an outside surface with an 8:1 slope (approximate).

2.2.3 20:1 Threshold Siting Analysis to Runway 11

This surface is similar in origin and extent to the TERPS 34:1 surface discussed above. However, the slope of the threshold siting surface is 20:1.

2.2.4 ALSF-2 Approach Light Plane Analysis to Runway 11

This surface corresponds to a high intensity approach lighting system with sequenced flashing runway alignment indicator lights. This surface extends from the Runway 11 threshold to a point 200 feet beyond the outermost approach light (total surface length of 2,600 feet). This surface is 400 feet wide and is centered on the runway centerline. The surface slope varies from approximately 50:1 in the center region of the surface which is bordered by steeper transitional slopes on each side of the center plane.

2.2.5 Approach Light System Clear Line-of-Sight Analysis to Runway 11

An unobstructed clear line-of-sight to all lights of the ALSF-2 system from any point one-half degree below the Instrument Landing System glide path and extending 250 feet each side of the

runway centerline up to 1,600 feet in advance of the outermost light in the ALSF-2 system must also be maintained.

2.2.6 40:1 Departure Surface Analysis to Runway 11

This surface is intended to provide an obstacle-free airspace for aircraft departing from Runway 29. The slope of this surface is 40:1. It rises from an elevation of 990 feet NGVD at the Runway 11 end to an elevation of 1,245 feet NGVD at its westernmost extent. In conformance with the 2012 VMP Update, the 2020 VMP Update proposes the management of vegetation located only on Massport property for the maintenance of this surface.

2.2.7 TERPS 20:1 (VA-OIS) Analysis to Runway 33

The TERPS 20:1 Visual Area-Obstacle Identification Surface (VA-OIS) is centered on Runway 33. It is a trapezoidal surface that is 400 feet wide at the end of centered Runway 33, and 3,400 feet wide at its southeast extent. The elevation of the surface is 1000 feet NGVD at the end of Runway 33 and rises to an elevation of 1,500 feet NGVD at its southeastern end, rising at a slope of 20:1.

2.2.8 TERPS 34:1 (VA-OIS) Analysis to Runway 33

The TERPS 34:1 VA-OIS is centered on Runway 33. It is a trapezoidal surface that is 400 feet wide at the end of Runway 33 and is 3,400 feet wide at its southeast extent. The elevation of the surface is 1,000 feet NGVD at the end of Runway 33 and rises to an elevation of 1,500 feet at its westernmost extent, rising at a slope of 34:1.

2.2.9 20:1 Threshold Siting Surface Analysis to Runway 33

This surface is similar in origin and extent to the TERPS 34:1 surface discussed above. However, the slope of the threshold siting surface is 20:1.

2.3 FAR PART 77 SURFACES

Federal Aviation Regulations (FAR) Part 77 surfaces analyzed for this VMP Update include the primary, transitional and approach surfaces associated with Runways 11-29 and 15-33.

2.3.1 Primary Surface

The Primary Surface is a rectangular surface centered along the airport's runways. The elevation of this surface corresponds with the elevation of the runway centerline at any given point. The length of this surface extends 200 feet beyond each runway end. The width of the primary surface depends on the type of instrument approach serving the runway and the types of aircraft using it. At the ORH, the primary surface for Runway 11-29 is 1,000 feet wide; the

primary surface for Runway 15-33 is 500 feet wide. Any object, including vegetation, which is within the primary surface and is at a higher elevation than the runway centerline, is a penetration of navigable airspace.

2.3.2 Approach Surface

Similar to TERPS approach surfaces, Part 77 approach surfaces are trapezoidal surfaces beginning at the end of the primary surface. This approach surface extends outward and upward with an inner width equal to the width of the primary surface and gradually widens as it proceeds upward and outward. The outer width, length, and slope of the approach surface depend on the type of instrument approach serving the runway and the types of aircraft using it.

Runways 11 and 29 both have approach surfaces with an inner width of 1,000 feet; an outer width of 16,000 feet; a length of 50,000 feet; and slopes of 34:1 for Runway 11 and 50:1 for Runway 29 for the first 10,000 feet of each approach, continuing at a slope of 40:1 for the remaining 40,000 feet. This approach surface is applicable to all transport category runways with an approved precision instrument approach.

The Runway 15 approach surface has an inner-width of 500 feet and an outer-width of 2,000 feet. Runway 15 has a 5,000-foot visual approach surface with a slope of 20:1.

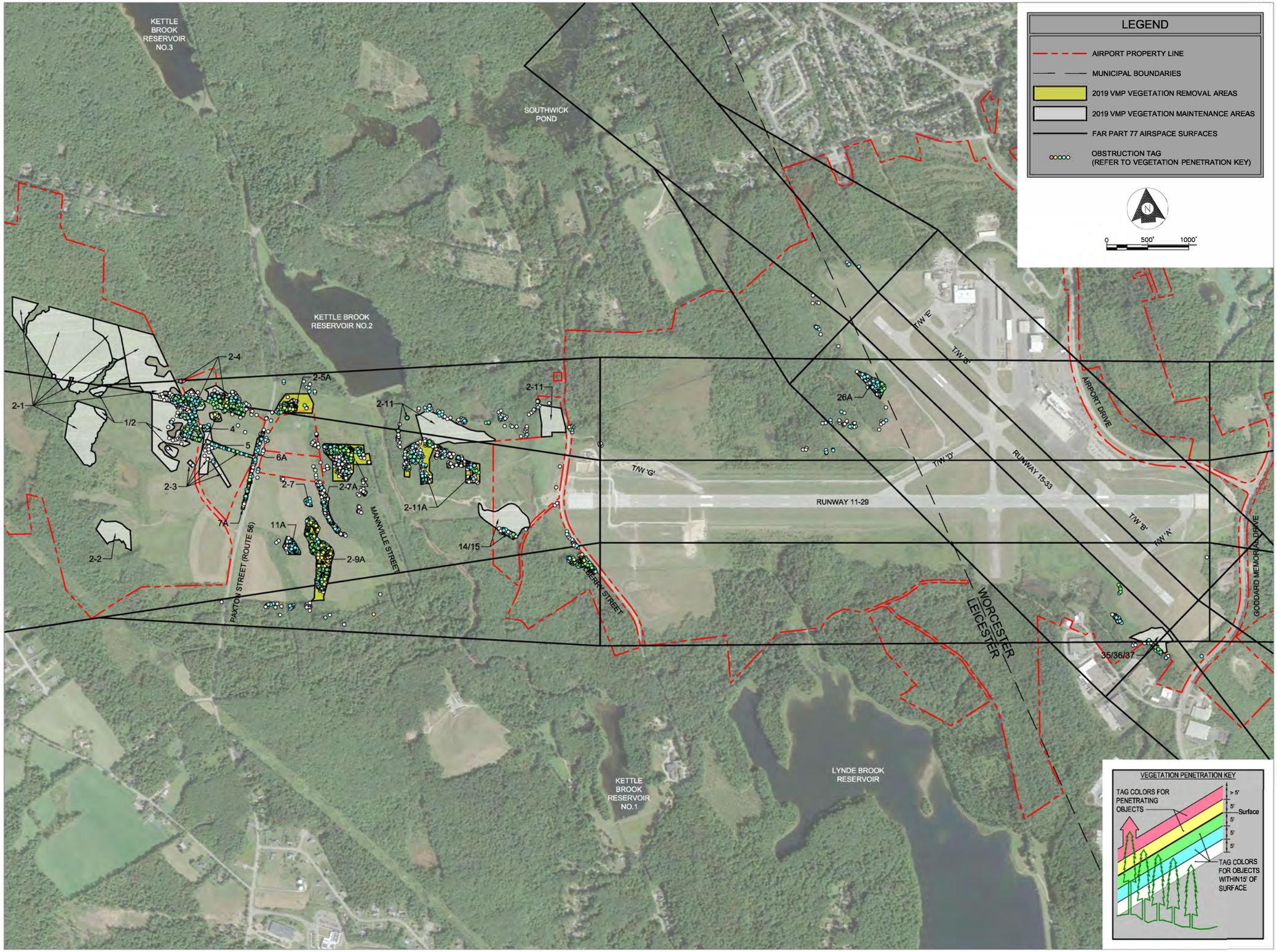
Runway 33 has a 10,000-foot non-precision approach surface with a slope of 34:1. It has an inner width of 500 feet and an outer width of 3,500 feet.

2.3.3 Transitional Surface

Transitional surfaces extend upward and outward from the sides of the primary and approach surfaces at a slope of 7:1. The transition surfaces proceed upwards until reaching an elevation of 150 feet above the elevation of the runways' primary surfaces.

2.4 OBSTRUCTION ANLAYSIS

A detailed description of the first obstruction analysis conducted in 2007 for ORH was provided in the 2011 ORH VMP. This data was supplemented with airspace data obtained in 2012, primarily to obtain new data regarding the Runway 11 Part 77 approach & transitional surfaces and the Runway 11 40:1 departure surface. This data identified previously unknown obstructions and was used to establish new VMAs for the ORH 2012 VMP update. As a matter of due diligence, Massport again collected airspace photogrammetry and data in 2018 in order to ensure airspace above the airport is afforded the highest degree of safety to aircraft operations. An analysis of the 2018 data was completed during the winter of 2019. The 2019 analysis identified several relatively small areas of obstructing vegetation that has grown into protected airspace since the last aerial survey. This VMP introduces new VMAs, all located within the town of Leicester and located to the west of the Runway 11 end, to address the removal and future maintenance of trees in these areas. Updated obstruction data is illustrated in Figure 2-2, *Obstruction Analysis*.



massport

MASSACHUSETTS PORT AUTHORITY
EAST BOSTON, MASSACHUSETTS 02128

PROJECT LOCATION:
WORCESTER REGIONAL AIRPORT
WORCESTER, MA

MPA CONTRACT NO.: AP1824-C1
LOCATION CODE: 7640

PROJECT SUBMISSION PHASE:
VEGETATION MANAGEMENT

REGISTRATION STAMP

REVISIONS:

REV NO.:	DATE:	DESCRIPTION:	BY:

PRIMARY:

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CONSULTANT:

PROJECT NUMBER AND TITLE:

AP1824-C1
2020 VEGETATION
MANAGEMENT PLAN UPDATE

SHEET TITLE:

OBSTRUCTION ANALYSIS

DISCIPLINE:
CIVIL

DRAWN BY:	CHECKED BY:	APPROVED BY:
LRK	JPH	GAC

SCALE:	DATE:
AS SHOWN	JUNE 2020

FIGURE NUMBER:

2-2

To summarize obstruction analysis methodology, prior to the development of the 2020 VMP, Massport completed an extensive analysis of the regulated airspace above Worcester Regional Airport using aerial photogrammetry obtained in 2018 to determine object heights within designated protection zones. The photogrammetry data included the elevations of structures, vegetative canopy height, and in sparsely vegetated areas, individual trees. The photogrammetry data is compared to three-dimensional computer modeling of all pertinent air surfaces at the airport based upon existing runway lengths, widths, approach categories, and navigational aid types and locations. The model assigns elevations to all the protected airspace surfaces and compares them to the identified object elevations. Where vegetation is sparse, individual tree heights were identified from the aerial photogrammetry. Where the cover is dense, it is not feasible to determine the height of each stem. In these areas, the tallest point is determined within a 50-foot by 50-foot grid. Field analysis may be used to supplement this data to determine whether an identified penetration represents one or more actual trees, saplings and/or shrubs. Upon completion of the obstruction analysis, field reconnaissance of affected areas, and a review of environmental constraints, new VMAs were developed and incorporated into this VMP.

3.0 ENVIRONMENTAL CONSTRAINTS

3.1 OVERVIEW

Identification of the protection zones and obstructions within those zones, as described in Section 2, is an important initial step to developing a VMP. The next step is to relate the obstructions to the environmental constraints at ORH so that an environmentally sensitive plan for vegetation removal and management can be developed. This section of the VMP has been updated to address potential environmental constraints that must be considered when evaluating initial vegetation removal methodologies and future maintenance efforts associated with VMAs identified within the VMP. This section first identifies VMAs (Section 3.2) and then describes the environmental constraints associated with vegetation removal and maintenance at ORH (Section 3.3).

3.2 IDENTIFIACTION OF PLANT COMMUNITIES AND VEGETATION MANAGEMENT AREAS

3.2.1 Overview

The environmental constraints (e.g. wetlands, protected habitat, historic/archaeological resources, steep slopes, etc.) located within or adjacent to a specific VMA directly influence the vegetation removal and maintenance methodologies prescribed in a VMP. As defined in Section 2, a VMA is a geographical area with specific vegetation management needs based on topography, soils, hydrology, plant communities and other distinguishing factors. The VMA geographically defines where the recommended management methods should be used. Therefore, it is necessary to identify the environmental characteristics of each VMA within the airport study area.

The goal of the VMA assessment is to: 1) identify and map plant communities located within the study area containing areas of penetration or areas of concern; 2) identify environmental constraints within VMAs; and 3) based on environmental constraints, recommend vegetation management techniques within each VMA.

3.2.2 Methodology for Identifying and Mapping Vegetative Communities and Vegetation Management Areas

A variety of data sources have been used in the preparation of this VMP for the assessment of vegetative communities and the identification of VMAs located within the ORH study area. These data sources include the following:

- Obstruction analyses data obtained in 2007, 2012, and 2018;

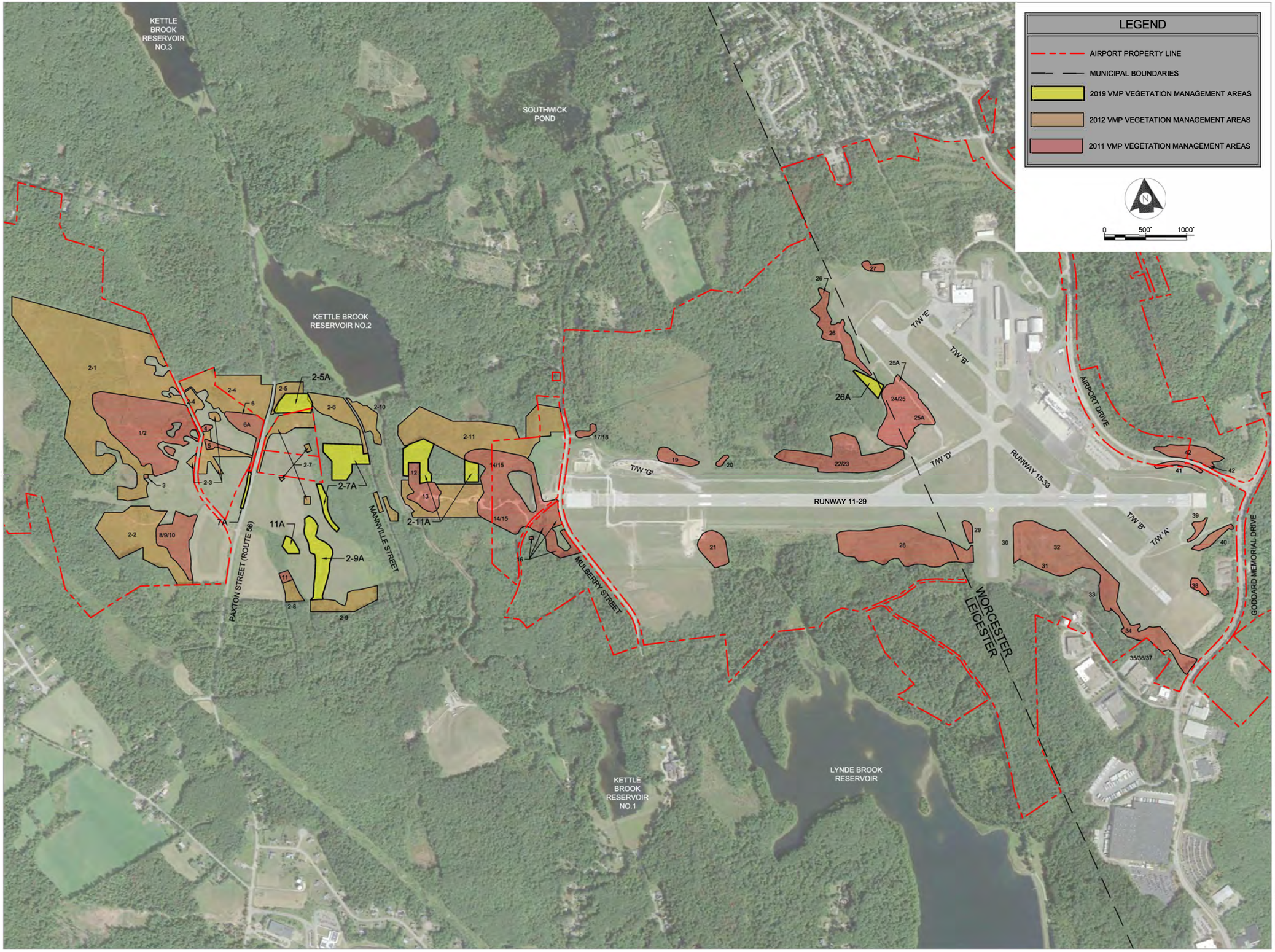
- The *Vegetation Management Plan for Worcester Regional Airport, July 2011* (Camp Dresser & McKee) and the *Worcester Regional Airport 2011 Vegetation Management Plan November 2012 Update*;
- Natural resource feature/boundary identification obtained from MassGIS 2012 & 2019;
- Wetland boundaries professionally delineated in 2011, 2012, 2015, and 2019;
- U.S. Geologic Topographic Quadrangle; and
- Field assessments of VMAs routinely conducted since VMP implementation was initiated in 2012.

Airspace analysis data collected during late summer of 2018 was utilized to locate obstructing vegetation to establish the limits of new VMAs and to review maintenance methods prescribed within existing VMAs established in prior VMPs. The boundaries of the 2020 VMP, 2012 VMP, and the 2011 VMP vegetation management areas are illustrated in Figure 3-1, *Vegetation Management Areas*. A total of 61 VMAs have been identified within the airport's 2020 VMP Update (this number includes several individual VMAs established in the 2011 VMP that were merged, based on proximity and cover type, and managed as single VMAs as part of the 2012 VMP Update).

3.3 ENVIRONMENTAL CONSTRAINTS

Preparation of this VMP involved the investigation of various environmental resources which influence the design of the vegetation management program. As stated above, data were collected from multiple sources and agencies as well as from observations compiled during field research. The following is a list of protected environmental resources investigated as part of the preparation of this edition of the VMP:

- Wetland Resources
- Protected Wildlife Habitat
- Upland Forest Communities
- Restricted Wetlands
- Areas of Critical Environmental Concern (ACEC)
- Wild and Scenic Rivers
- Public Water Supply
- Outstanding Resource Waters
- Historical and Archaeological Resources
- Hazardous Waste Sites
- State and National Forests and Parks
- Land Ownership
- Steep Slopes



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WORCESTER, MA

MPA CONTRACT NO.: AP1824-C1
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REGISTRATION STAMP:

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A summary of the protected resources and potential constraints addressed in this document is provided below in Table 3-1. A more thorough analysis of environmental constraints as they pertain to the VMP and VMAs specifically is presented in following sections of this VMP Update.

Table 3-1: Summary of Environmental Constraints Analysis

Protected Resource Potential Constraint	Present or Absent in the Study Area	Comment
Federal / State Wetlands	Present	Full delineation of wetlands within the VMAs has been completed for this VMP
Rare, Endangered or Threatened Species	Present	Habitat for the grasshopper sparrow (*Ammodramus savannarum*) has been identified within the study area. No activities are proposed within the protected habitat presented in the 14th Edition of the MA Natural Heritage Atlas August 1, 2017.
Vernal Pools	Present	Potential vernal pools identified within VMAs No. 1/2 and 2-4. No certified vernal pools located in or adjacent to VMAs.
Wetland Restriction Orders	Absent	Town of Leicester and City of Worcester Conservation Commissions have indicated no restricted wetlands occur within study area based on available information.
Areas of Critical Environmental Concern	Absent	No ACECs occur within the study area according to MassGIS data sources.
Wild and Scenic Rivers	Absent	No wild or scenic rivers exist within the study area.
Public Water Supplies	Present	44 of 61 VMAs are within the Worcester Water Supply Watershed. Kettle Brook & Lynde Brook and their associated reservoirs designated Class A Waters.
Historical/Archeological Resources	Present	Historical/Archaeological resources including stonewalls, building foundations, well remnants, etc., identified and mapped by previous studies. No impacts to these resources expected from VMP activities.
Hazardous Materials	Present	One hazardous material release site exists on airport property; however, this site is not within VMAs.
National/State Forests	Absent	No national or state forests exist within study area.
Land Ownership	Absent	All VMAs located on land owned by Massport or the City of Worcester.

Protected Resource Potential Constraint	**Present or Absent in the Study Area**	**Comment**
Steep Slopes	Present	Steep slopes are present in the western, northern and eastern regions of study area
Nuisance Vegetation	Continued Evaluation	A thorough assessment of the presence of nuisance vegetation & potential management techniques will be evaluated during implementation of the VMP.

3.3.1 Wetland Resources

Implementation of this VMP requires the identification and delineation of the state and federal wetland resources within established VMAs. Several of the VMAs contain penetrations to be removed from or require continued maintenance within wetland areas, buffer zones of state wetlands, or riverfront areas of perennial streams. Consequently, environmental permits are required to implement the VMP. If soil alteration within wetlands is proposed, a permit is required pursuant to Sections 401 and 404 of the Federal Clean Water Act (33 USC 1251 et seq.). Any proposed work within wetlands or wetland buffers requires a permit pursuant to the Massachusetts Wetlands Protection Act (MGL c. 131 s. 40). A requirement of the permit process is the delineation of the wetland resource areas pursuant to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987)* and the manual *Delineating Bordering Vegetated Wetlands pursuant to the Massachusetts Wetlands Protection Act (1995)*.

Wetlands located within new VMAs were delineated by certified professional wetland scientists for this VMP. The field delineations were completed during the spring of 2019 (wetland boundaries within the 2012 VMP Update VMAs were professionally delineated in 2011 and 2015 (as part of an NOI update). Wetland limits were marked in the field using sequentially numbered surveyor flagging (pink) tied to vegetation. The location of boundary flags was then surveyed utilizing GPS equipment. Wetland resource limits are shown in Figure 3-2, *Wetland Boundaries*. This plan illustrates delineated wetland boundaries within VMAs. Wetland boundaries in locations adjacent to VMAs and other wetland resource boundaries are approximate and were obtained from the MassGIS website.

Wetland Community Descriptions

Deciduous Forested Wetlands
Deciduous wooded swamps are common in the study area and occur within VMAs 1/2, 6, 8, 11, 14/15, 20, 22/23, 26, 28, 30, 31, 2-1, 2-2, 2-4, 2-5, 2-6, 2-8, 2-9, 2-10, 2-11, and 2-11A (2-11A is a new VMA to this VMP). Deciduous forested wetlands in the project area are characterized by canopy species consisting of red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), black cherry (*Prunus serotina)*, American elm (*Ulmus americanus*), black ash (*Fraxinus nigra*), grey birch (*Betula populifolia*), speckled alder (*Alnus rugosa*), red oak (*Quercus rubra*), and willows (*Salix* sp.). The shrub/sapling layer typically consists of red maple, highbush blueberry (*Vaccinium corymbosum*), northern arrowwood (*Viburnum recognitum*), swamp azalea (*Rhododendron viscosum*), and witch hazel (*Hamamelis virginiana*). Ground cover typically includes sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), smartweed

(*Polygonum* sp.), sphagnum moss (*Sphagnum* sp.), jewelweed (*Impatiens capensis*), goldthread (*Coptis trifolia*), water hemlock (*Cicuta* sp.), and false Solomon's seal (*Smilacina racemosa*). These wetlands are most often associated with groundwater seeps and stream channels.

Scrub-shrub Wetlands
Scrub-shrub wetlands occur within VMAs 1/2, 8, 11, 11A, 14/15, 19, 21, 30, 31, 2-1, 2-2, 2-8, 2-3, 2-5A, 2-7A, and 2-9A (VMAs 2-5A, 2-7A and 2-9A are new to this edition of the VMP). Scrub-shrub wetlands identified within the VMAs are most commonly dominated by northern arrowwood, willows, swamp azalea, winterberry holly (*Ilex verticillata*), and saplings of red maple, gray birch and aspen (*Populus sp.*). Ground cover included sensitive fern, smartweed, joe-pye weed (*Eupatoriadelphus* sp.), jewelweed, and meadowsweet (*Spiraea latifolia*).

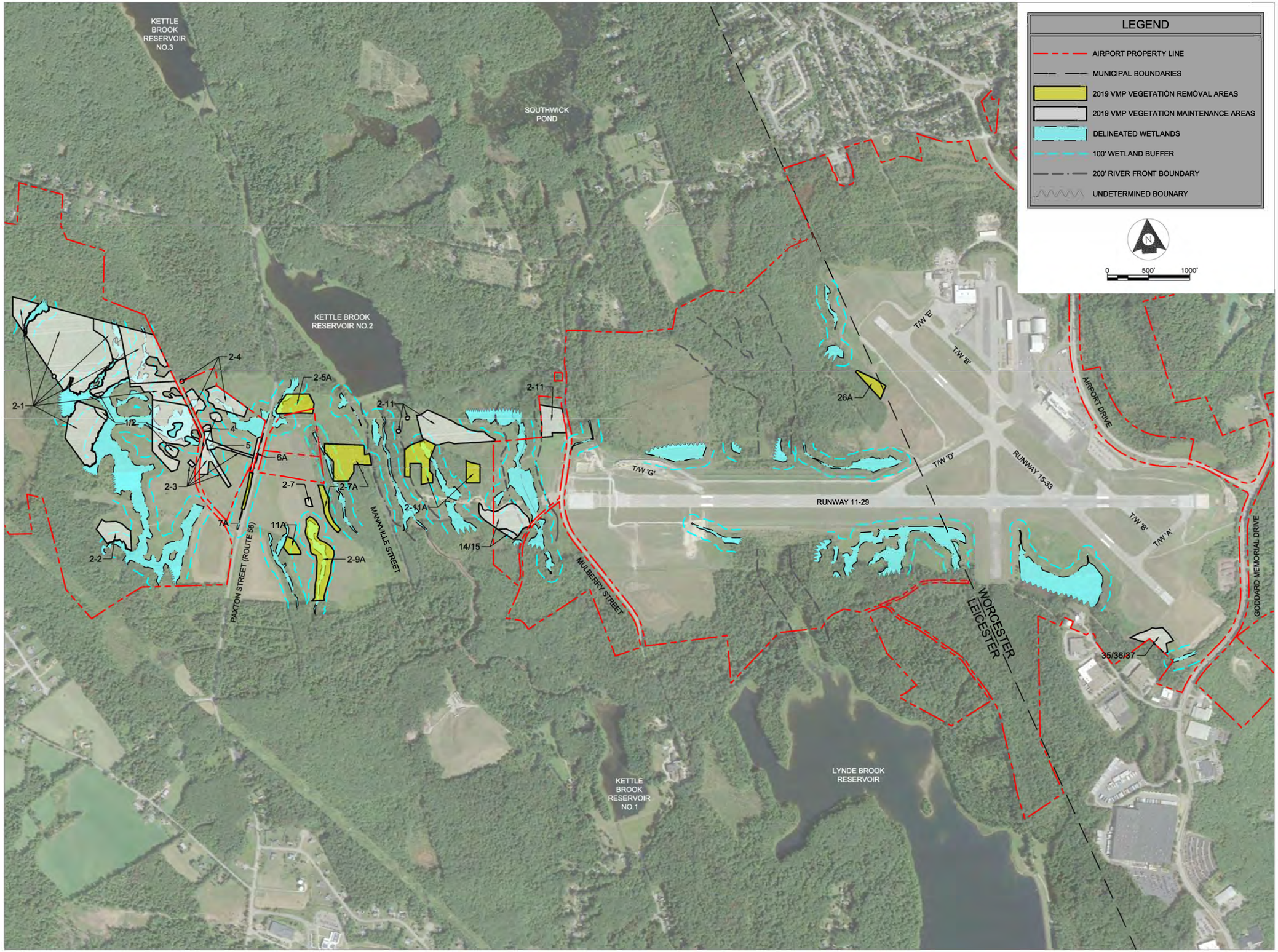
Emergent Wetlands
Emergent wetlands occur within VMAs 1/2, 11, 14/15, 20, 22/23, 31, 2-1, 2-2, 2-8, 2-5A, 2-7A, 2-9A, 2-11, and 2-11A (VMAs 2-5A, 2-7A, 2-9A, and 2-11A are new to this edition of the VMP). Typical species occurring in these wetlands include cattail (*Typha latifolia*), sensitive fern, goldenrod (*Solidago* sp.), switch grass (*Panicum virgatum*), joe-pye weed, steeple bush (*Spiraea tomentosa*), lurid sedge (*Carex lurida*), blunt broom sedge (*Carex tribuloides*), soft rush (*Juncus effusus*), green bulrush (*Scirpus atrovirens*), woolgrass (*Scirpus cyperinus*), and boneset (*Eupatorium perfoliata*).

3.3.2 Wildlife Habitat

Estimated and Priority Habitat
Priority Habitat of Rare Species (rare, threatened and endangered plant and animal species) are designated by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) for species protected by the MA Endangered Species Act Regulations (321 CMR 10). "Estimated Habitats" are a subset of Priority Habitats designated for use with the Wetlands Protection Act (310 CMR 10), which protects rare, threatened, or endangered animals commonly associated with wetlands, or that require wetlands for survival.

As shown in Figure 3-3, *Priority and Estimated Habitats Map*, most of the cleared area adjacent to runways and taxiways at Worcester Regional Airport is identified by NHESP as Priority Habitat. The NHESP mapping overlaid with the VMA delineation indicates that Priority Habitat overlaps VMAs 14/15, 19, 20, 21, 22/23, 25A, 26, 27, 28, 29, 30, 32, 33, 34, 35, 38, 39, 40, and 41. There is no overlap of Priority Habitat within new VMAs introduced in this VMP. The Natural Heritage Atlas effective August 2017 also indicates a region of Priority Habitat located southeast of airport property, outside of the limits of this VMP-this area was mapped as Estimated Habitat of Rare Wildlife under the previous edition of the Natural Heritage Atlas. There are no areas of Estimated Habitat of Rare Wildlife located within or adjacent to the study area.

Original VMP and 2012 VMP Update correspondence with NHESP indicated that the species present in Priority Habitat at ORH is the grasshopper sparrow (*Ammodramus savannarum*), an upland grassland bird, which is designated as threatened by the NHESP. NHESP also identified the marbled salamander (*Ambystoma opacum*), another state-listed threatened species as



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occurring within the project vicinity. In 2011, NHESP review of the VMP indicated that work associated with the VMP would not result in a prohibited take of the species provided work is conducted outside of grassland bird breeding season (May 15th-August 15th).

It is likely that ongoing mowing adjacent to the runways and other paved surfaces at ORH provides grassland habitat for the grasshopper sparrow. This habitat is rapidly disappearing in Massachusetts with the reversion of farmland to forest. Airports and other maintained grassland habitats thus play a key role in preserving and expanding grasslands. To the extent that this VMP expands the area of grassland near the airport, it will likely benefit the grasshopper sparrow and other species that depend on grassland habitat. NHESP review of the NOI submission materials is not required for the work outlined in this VMP Update.

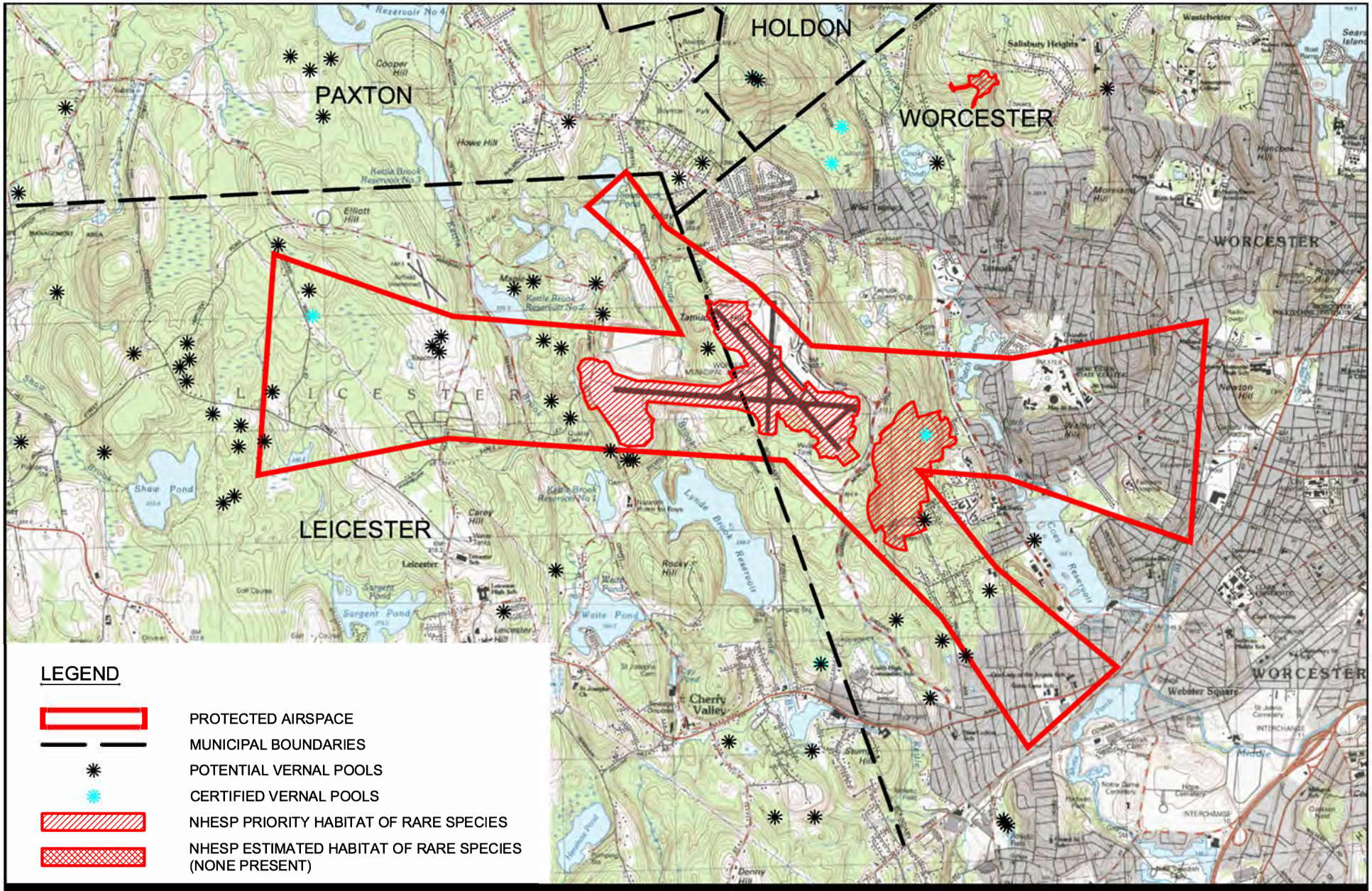
Vernal Pools
Vernal pools are depressions that hold water for at least two months during the spring of each year and provide breeding habitat for amphibian species. By definition, vernal pools are dry during the rest of the year, and as such, do not support fish communities. Some species, especially certain amphibian species, depend exclusively on vernal pools for breeding and egg-laying habitat. Vernal pools certified by NHESP are regulated as Outstanding Resource Waters in Massachusetts per 314 CMR 4.00. Single potential vernal pools have been identified within VMAs 1/2 and 2-4. Figure 3-3 shows these vernal pools. Potential vernal pools have not been field certified by NHESP (and thus are not granted the same level of regulatory protection), rather they have been identified using remote sensing information such as aerial photography and infrared satellite imagery. Two certified vernal pools have been identified, one to the east of the airport and one to the outer western extent of protected air surfaces. No vegetation removal, however, is proposed in or near these areas.

3.3.3 Upland Forest Community

Upland forests occupy most of the study area and are the second-growth forests typical of central New England. Most of the upland forest in the study area is upland mixed forest with relatively mature trees, but some areas show dominance by saplings or conifers. These areas, while not as common as upland mixed forest, may require vegetation management techniques that differ from that of upland forest.

Upland Sapling Forest
VMA 14/15 contains an upland sapling stand just west of Mulberry Street characterized by saplings of red oak, quaking aspen, grey birch, and yellow birch. Trees in this area range in height from approximately 5-10 feet, indicating prior vegetation management activities conducted in this area. Other VMAs reflecting upland sapling community characteristics include VMA 25A, VMA 32, VMAs 2-5A and 2-7A.

Upland Mixed Forest
Upland mixed forest is the dominant community type in the study area, and all VMAs in the study area contain this forest type, with the exception of VMAs 19, 20, 29, 32, and 39. Upland mixed forests include a combination of mature and sapling deciduous and conifer trees. Typical species include red maple, red oak, yellow birch, eastern white pine, eastern hemlock (*Tsuga*



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195211197

Title
PRIORITY AND ESTIMATED HABITATS MAP

Revision

Date
2020.06.18

Reference Sheet

Figure No.
3-3

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canadensis), American beech (*Fagus grandifolia*), American chestnut (*Castanea dentata*) (sprouts only), grey birch, shagbark hickory (*Carya ovata*), bigtooth aspen (*Populus grandidentatum*), hawthorn (*Cretaegus* sp.), and winged sumac (*Rhus copallinum*). Understory communities in many locations consists predominantly of dense stands of mountain laurel (*Kalmia latifolia*).

Upland Coniferous Forest
Interspersed in the upland mixed forest are stands of coniferous forest. They consist of a mixture of eastern white pine and hemlock, with a smaller proportion (less than 20%) of the deciduous trees discussed above. As with the upland mixed forest described above, there is a mix of saplings and more mature trees.

3.3.4 Water Resources

The MassDEP designates all water bodies in Massachusetts according to their existing and potential uses (314 CMR 4.00 – *Massachusetts Surface Water Quality Standards*), with Class A having the highest standards (public water supplies and Outstanding Resource Waters) and Class C having the lowest. Most water bodies in Massachusetts are designated as Class B. If 314 CMR 4.00 does not assign a specific classification to a water body, then it is assumed to be Class B. Classes A, B, and C are defined as follows:

- **Class A** – "These waters include waters designated as a source of public water supply and their tributaries. They are designated as excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation, even if not allowed. These waters shall have excellent aesthetic value. These waters are protected as Outstanding Resource Waters." [314 CMR 4.05]

- **Class B** – "These waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value." [314 CMR 4.05]

- **Class C** – "These waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value." [314 CMR 4.05]

The ORH is within the Blackstone River basin. Table 3-2 lists the water bodies in proximity to ORH and their water quality classification.

Table 3-2: Resource Waters within Study Area

Water Body	Classification
Kettle Brook and Reservoirs 1-4	A – Public Water Supply
Lynde Brook and Reservoir	A – Public Water Supply
Tatnuck Brook	B
Patch Reservoir	B
Coes Reservoir	B

Kettle Brook and its tributary streams are located west of ORH beyond Runway 11-29 in the Town of Leicester. Lynde Brook flows from the north through the western region of the airfield prior to discharging to the Lynde Brook Reservoir, located to the south of ORH. A culvert conveys the flow of Lynde Brook underneath Runway 11. Both the Kettle Brook and Lynde Brook systems are part of the City of Worcester's municipal water supply system. Tatnuck Brook, which is east of ORH, flows through a series of ponds including Patch Reservoir and Coes Reservoir (east and southeast of ORH, respectively). Tatnuck Brook, Coes Reservoir and Patch Reservoirs are not specifically identified in 314 CMR 4.00, and thus are considered Class B waters.

Zone A is a land area designated by MassDEP for surface water supply protection. The Massachusetts Drinking Water Regulations (310 CMR 22.00) states that "Zone A means:

(a) the land area between the surface water source and the upper boundary of the bank;

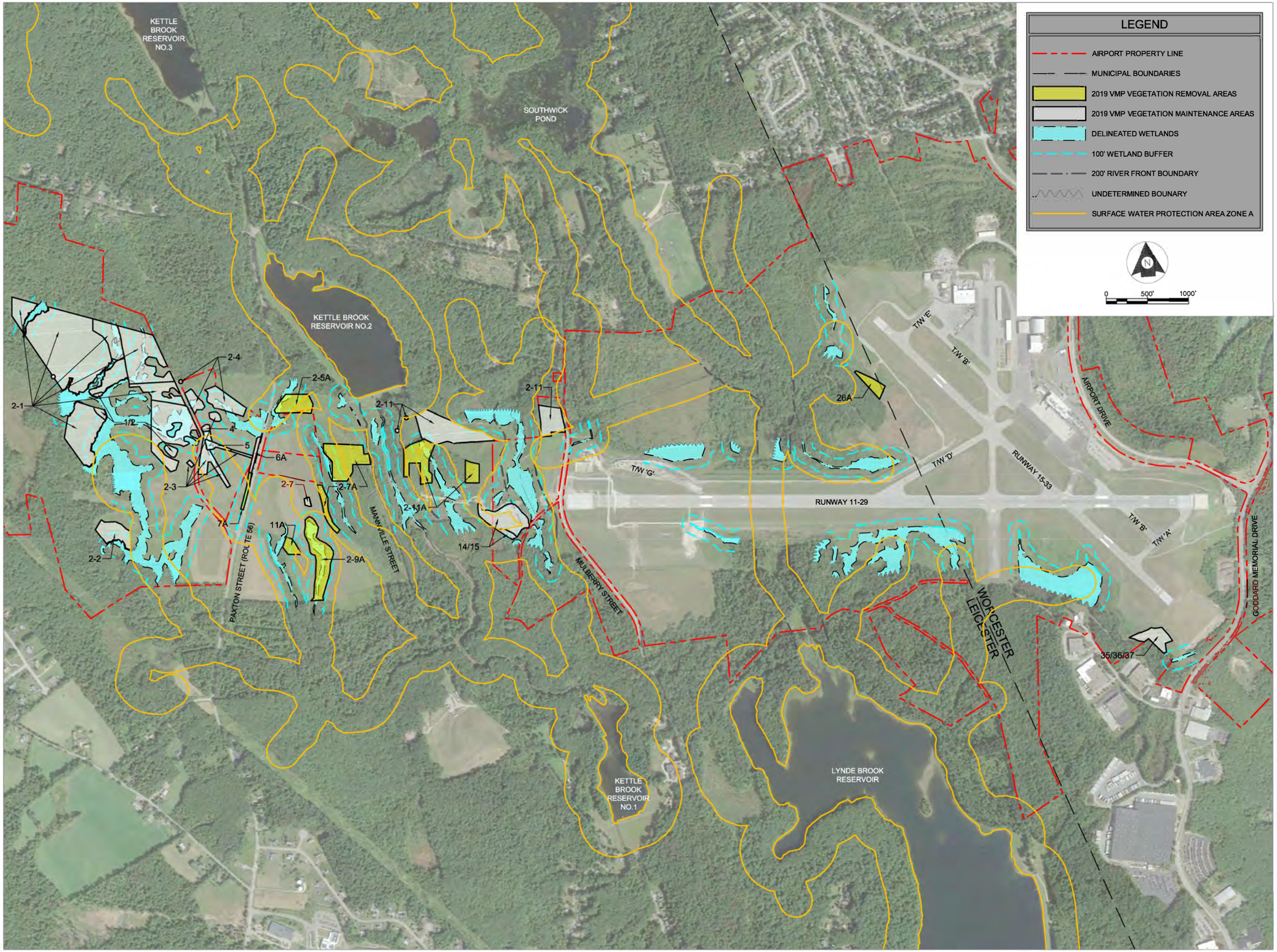
(b) the land area within a 400-foot lateral distance from the upper boundary of the bank of a Class A surface water source, as defined in 314 CMR 4.05(3)(a); and

(c) the land area within a 200-foot lateral distance from the upper boundary of the bank of a tributary or associated surface water body."

A map showing Zone A areas (surface water supply protection zones to a Class A surface water sources) and VMAs is shown on Figure 3-4, *Water Supply Protection Area*. Zone A areas overlap with a significant majority of VMAs included in the VMP.

3.3.5 Hazardous Materials

The MassDEP's Reportable Release database lists eight releases of petroleum-related subsurface contamination within the fenced area of ORH. Because none of these hazardous materials release sites are in or near the VMAs, this environmental constraint will not be addressed further in this VMP Update.



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3-4

3.3.6 Steep Slopes

Steep slopes can affect the ability of certain heavy machinery to access certain sites. For this VMP, steep slopes are defined as slopes greater than or equal to 15 percent. The presence of steep slopes was determined by examination of USGS Topographic Quadrangle Maps and field visits to the VMAs. Steep slopes are present in the following VMAs: 11, 14/15, 19, 22/23, 32, 33, 34, 40, 42, and 2-8. None of the VMAs added to the 2020 VMP Update include areas with steep slopes.

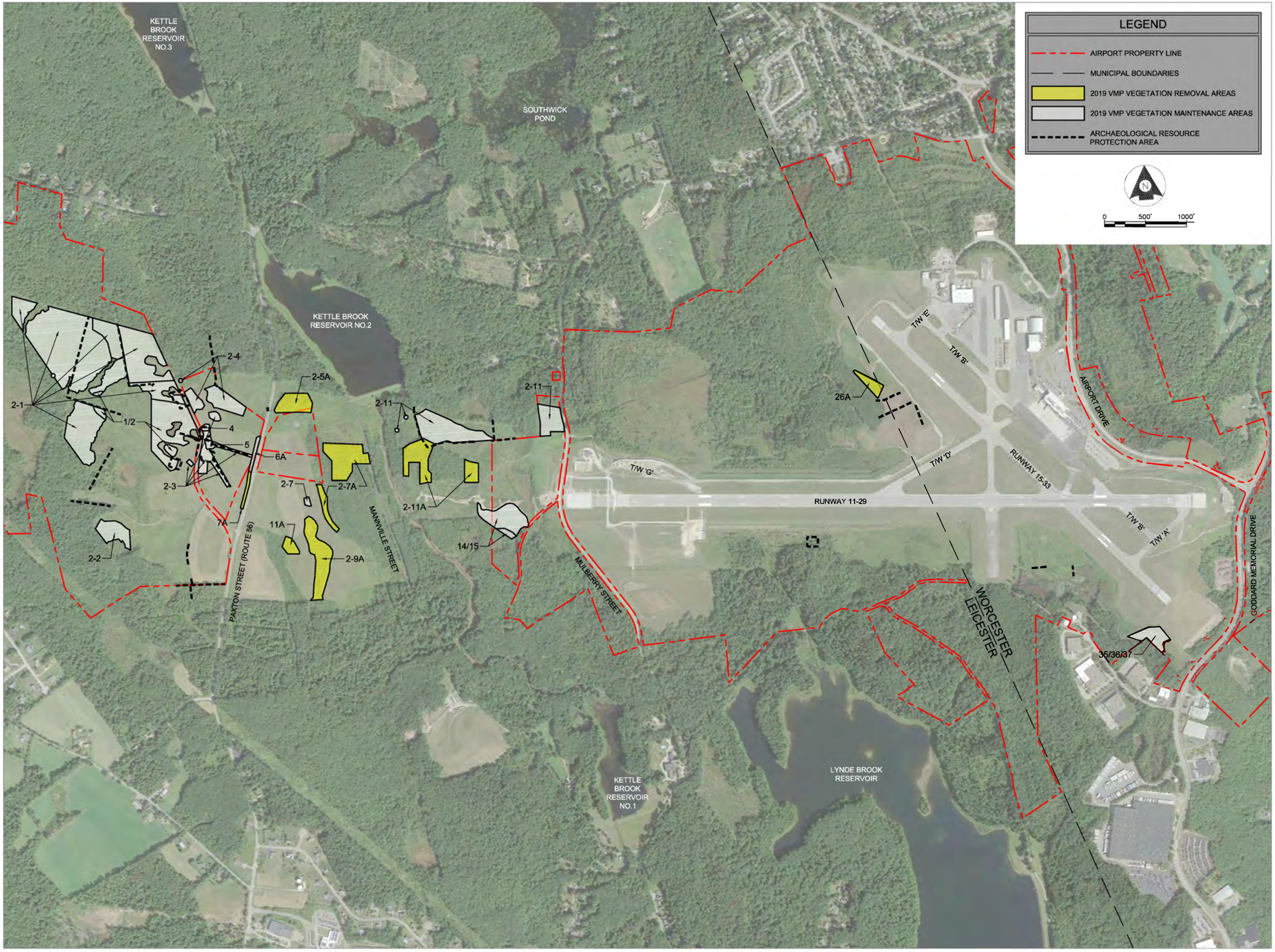
3.3.7 Historical and Archaeological Resources

The presence of historical and/or archaeological resources within vegetation management areas can influence the type of vegetation removal and maintenance methods implemented in a VMP. The services of an independent cultural resource management firms were retained to determine the presence (or absence) of historical or archaeologically sensitive resources located within or adjacent to designated VMAs. Archaeological field surveys were conducted within ORH study area VMS during the summer of and the fall of 2012. New VMAs introduced in this VMP are located within the study area of previously conducted cultural resource boundaries.

A number of potentially sensitive resources were identified and mapped. Most identified resources include stonewalls and building foundations typically encountered in forests and pastures of central Massachusetts. Figure 3-5, *Historical and Archaeological Resource Protection Areas*, illustrates the historical and archaeological resource boundaries in relation to VMP VMA boundaries.

With care taken, typical timber harvesting and forestry operations employed within VMAs should not impact resources identified in historical/archaeological surveys. Reports outlining the findings of surveys were submitted to the Massachusetts Historical Commission (MHC) for prior VMP updates. MHC indicated the project, if constructed utilizing methods to avoid and protect identified archaeological resources, could be completed without disturbances to these resources.

A project notification form (PNF) for the 2020 VMP Update is not required as new VMAs are within the study areas of previously conducted surveys and impacts to identified resources will be avoided during vegetation management activities proposed in this document.



LEGEND

- AIRPORT PROPERTY LINE
- MUNICIPAL BOUNDARIES
- 2019 VMP VEGETATION REMOVAL AREAS
- 2019 VMP VEGETATION MAINTENANCE AREAS
- ARCHAEOLOGICAL RESOURCE PROTECTION AREA

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4.0 VEGETATION MANAGEMENT

4.1 INTRODUCTION

The constraints analysis described in Section 3 was used to define the appropriate vegetation removal methods for use at ORH. The objective of vegetation management at airports is to eliminate or discourage the growth of woody vegetation that would penetrate PZs by implementing removal method(s) that are compatible with identified environmental constraints. The strategy in developing appropriate removal methods is to consider the method, feasibility, environmental impacts, cost, aesthetics, and long-term effectiveness. The initial removal of obstructions represents the beginning of a long-term vegetation management program; selected methods will have a bearing on the ease, cost, and practicality of future maintenance operations.

The selection of appropriate vegetation removal methods involves a review of the techniques outlined in the Vegetation GEIR including physical, chemical, combination physical/chemical, and non-equipment/non-chemical methods. Each of the methods is assigned a "tier classification" that corresponds to its level of potential impact. A listing of the available removal methods from the Vegetation GEIR and their associated "tier classifications" are provided in Table 4-1 below.

Table 4-1: Listing of available vegetation management methods with associated tier classifications from Section 5.2 of the Final Generic Environmental Impact Report (GEIR) for Vegetation Removal at Public Use Airports

GEIR-Listed Management Method	Tier Classification
Physical Methods	
Push Trees Over	High Impact
Pull Trees Down	Moderate Impact
Shear Trees with a Bulldozer	High Impact
Mechanized Felling	Moderate Impact
Build an Impoundment (flooding)	High Impact
Remove Trees by Helicopter	Minimal Impact
Clear and Grub	High Impact
Chemical Methods	
Fell/Lop/Cut-Surface Treatment	Low Impact
Fell/Frill-and-Inject Treatment	Low Impact
Fell/Selective Basal Treatment	Low Impact
Selective Foliar Treatment	Moderate Impact
Combined Physical/Chemical Methods	
Frill-and-Inject/Pull Trees Down	Moderate Impact
Frill-and-Inject/Push Trees Over	High Impact
Mechanized Felling/Cut Surface Treatment	Moderate Impact
Shear Trees with Bulldozer/Cut-Surface Treatment	High Impact
Non-Equipment / Non-Chemical Methods	
Fell Trees and Lop Slash	Minimal Impact
Top Trees	Minimal Impact
Girdle Trees	Minimal Impact
Prescribed Burning	High Impact

Use of the guidelines provided above must consider the following criteria as they relate to the implementation of the VMP:

- Size of the area requiring vegetation removal;
- Elevation of the protected airspace surface compared to the ground surface;
- Potential height of the dominant vegetative species;
- Density of the trees and understory within the removal area;
- Ability of the soils to support removal equipment;
- Presence/absence of environmentally sensitive conditions; and

- Available funding

Each VMA was designed based upon consideration of these factors, resulting in the selection of the initial/secondary management techniques described in this chapter.

4.2 PRIMARY REMOVAL TECHNIQUES

4.2.1 Pushing and Pulling Trees

This method utilizes heavy equipment such as bulldozers to push trees over or to attach cables to individual trees in order to pull them down. Felled trees are difficult to process with dirt and stones often attached to root balls and this method often results in large pits in the ground. This technique will not be implemented during the term of this VMP.

4.2.2 Clearing and Grubbing

Clearing and grubbing is a common form of vegetation removal when the goal is to permanently alter the type of vegetation growing on site. This method, which involves the removal of trees and stumps, surface grading affected areas, and seeding with grass, is often utilized to facilitate future maintenance efforts. This method is more costly than most and effects to the environment are greater than those alternatives that encourage a low-growing woody community on site. There is no clearing and grubbing proposed during the term of this VMP.

4.2.3 Building an Impoundment

This option involves the creation of open water areas to flood and kill penetrating vegetation located within identified PZs. This method, however, is contrary to FAA policy as open water resources attract waterfowl which pose a hazard to aircraft operations. Additionally, the standing dead timber created by flooding often remain as penetrations to airspace for long periods of time, ultimately requiring additional methods of removal mitigation. Impoundment creation requires additional engineering design and permitting efforts. Impoundments may also be subject to the Department of Environmental Management Dam Safety Regulations. The construction of impoundments is not recommended as a management technique in this VMP.

4.2.4 Helicopter Removal

This technique consists of tying cables to trees and removing them from the site via helicopter. Helicopter removal is usually used in areas where access by machinery is limited because of soil conditions. Helicopter removal is one of the most expensive vegetation management methods and is not required to implement this VMP.

4.2.5 Brontosaurus Mowing

Use of heavy-duty flail mowers, or "brontosaurus" mowers, is recommended in areas capable of supporting heavy equipment and having vegetation with trunk diameters less than 6 inches in diameter at ground level. The mowing machinery is often a tracked vehicle weighing approximately 20-40 tons with an attached rotary mowing head, approximately 3 feet to 5 feet wide. Occasionally larger trunks have to be cut manually or be included as part of a cut and chip operation conducted on adjacent areas. This method is suitable in early successional forests, shrub-forest and brushy areas and may be utilized in wetlands when ground conditions are suitable to support the use of equipment without disturbing wetland soils. Brontosaurus mowing is a common removal & maintenance technique to be utilized in this VMP.

4.2.6 Mechanized Felling / Cut and Chip

In areas where the average trunk diameters exceed 6 inches in diameter at breast height (dbh), it is recommended that vegetation be removed by hand cutting with chain saws, mechanical shears, or feller-bunchers. Felled trees and branches are then chipped, often in designated log-handling areas, and where applicable, removed from the site. This method can be employed in sensitive areas (e.g., near historical sites) since the cutting of vegetation is very selective. Stumps are cut as close to ground level as possible, usually within six inches of ground surface. This method may be effectively used in wetlands during dry summer months or in frozen grounds conditions during the winter months when soils are capable of supporting equipment. This technique will be utilized during the term of this VMP if necessary.

4.2.7 Drop and Lop

The drop and lop technique is recommended in areas exhibiting saturated soil conditions or within remote areas requiring the felling of very limited number of trees. Large trees and shrubs can be dropped manually, and slash can be lopped and left in place. Appropriate herbicides may be applied to the stumps to prevent re-sprouts. If operating within a No-Spray Area, re-sprouts and tree saplings may be controlled mechanically. This removal method can be performed in sensitive areas (e.g., wetlands) since the cutting of vegetation is selective and no heavy machinery is necessary. The Drop and Lop technique will be utilized as an obstruction mitigation tool during the term of this VMP.

4.2.8 Selective Logging / Cord Wood Harvest

Trees are felled by hand or with mechanized equipment, processed into logs and removed from the site. Slash may be lopped and diced in a manner exhibiting sound forestry practices or selective mowing of felled tree tops may be considered a feasible alternative. Prior to harvesting, field identification and marking of obstructions or groups of obstructions may be necessary. Typically, logs not chipped during mechanized removal practices are removed from the site in log trucks. This practice may be implemented during the implementation of this VMP.

4.2.9 Selective Tree Topping / Pruning

This method is suitable for a small number of trees where each has a high value, such as residential landscape trees. This method is often necessary when land ownership is a significant environmental constraint and landowners will not permit tree removal. This method can be quite labor intensive and costly, depending upon the number of trees in question. Each tree must be assessed individually before a cost estimate of the removal technique can be determined. This vegetation management technique is not proposed during the term of this VMP.

4.3 MAINTENANCE METHODS

Long-term maintenance should be developed in accordance with integrated vegetation management (IVM) techniques to maintain appropriate vegetation zones. For example, taller vegetation may be permitted further away from the runways without causing safety violations, as the elevation of protected air surfaces increase the further the surface extends from the runway.

The goal of IVM is to utilize practices in VMAs to manage zones within which species that would typically grow to become penetrations are discouraged by active management using techniques most appropriate for the VMA, such as selective cutting and herbicide use. The resulting plant community is one which is dominated by species that will not grow tall enough to penetrate the protected airspace. Such an approach minimizes future maintenance activities, thereby minimizing intrusion into sensitive areas and operational costs.

IVM combines sequential use of mechanical, chemical and biological treatments, as appropriate. A typical approach is to mechanically remove the penetrating trees and/or shrubs initially, followed by chemical treatment of rapidly growing stump and root sprouts and/or invasive species; or selective mechanical removal to encourage the natural development of desirable plant communities which suppress the re-establishment of undesirable plants through shading and other biological means. For example, at ORH, IVM techniques would be implemented to encourage dense mountain laurel stands in VMAs located west of the Runway 11 end to shade out tree seedlings and maintain the dense shrub community. Once the compatible vegetative structure is established, periodic herbicide treatment programs, or within surface water protection areas, selective cutting may be needed every two to five years to maintain desired plant height zones and to prevent succession to vegetative communities with taller tree species.

4.3.1 Mowing

This method is a common method of maintenance due, in part, to the variety and versatility of equipment available. Flail and rotary mower heads, including brontosaurus mowers, are available in different sizes to handle diverse vegetative communities. Additionally, low ground pressure equipment utilizing wide, or high flotation tires, or wide tracks, substantially reduces mowing equipment impacts (e.g., rutting) to both wetland and upland soils, minimizing the potential for erosion. Mowing heads may also be affixed to long extension booms, which

increase their utility on steep slopes and for use in dense stands of tall saplings and young trees less than six inches in diameter. Mowing is the most common form of maintenance utilized at Worcester Regional Airport for vegetation maintenance.

4.3.2 Selective Mechanical Maintenance

Certain areas cannot be maintained with large equipment because of deep organic or saturated soils, steep topography, or difficult access. Mechanized maintenance may also be utilized in existing VMAs when mature trees not previously identified as obstructions have since grown into protected airspace. Mechanized maintenance may include the use of feller bunchers, chain saws, cable skidding (in uplands) and/or smaller-sized shearing equipment. Mechanized maintenance will be utilized in limited instances during the term of this VMP.

4.3.3 Foliar Spray

Selective foliar treatment of re-sprouting vegetation can be used as a follow-up step to work towards obstruction-free PZs after the initial removal of obstructing vegetation. The management of re-sprouting vegetation by selective foliar treatment is an environmentally safe, cost-effective, and successful vegetation management methods. However, this method is not permitted in areas where contamination of a surface water supply may be a concern. Per Massachusetts Right of Way Regulations (333 CMR 11.04(2)(b)): “No herbicides shall be applied within 100 feet of any tributary or associated surface water body located within the Zone A of a Class A public surface water source, or within ten feet of any tributary of associate surface water body located outside of the Zone A of the Class A public surface water source.” 333 CMR 11.00 also prohibits the use of herbicides within 10 feet of any wetland or water body.” Additionally, 333 CMR 11.00 identifies the following “Limited Spray Areas” that occur within the VMP study area:

- Distance between 10 and 100 feet from standing water; and
- Distance between 10 feet from mean high water of a river and the boundary of the Riverfront Area.

While herbicide spraying is permitted in these areas, it is subject to frequency restrictions and must be done using low pressure foliar spraying or cut stump application. Where permitted, selective foliage spraying should ideally occur between mid-August and late-September. This will effectively reduce the volume of re-sprouted vegetation and provide an opportunity for desirable vegetation to become established in following years.

4.3.4 Cut and Dab

The Cut and Dab herbicide application technique includes the hand cutting of regrowth and invasive species followed immediately by a hand application of herbicide to the cut surface. This method is particularly effective within areas adjacent to sensitive resources such as wetlands, as it significantly reduces the potential for non-target mortality and impacts to aquatic species. Several previously permitted VMAs in this VMP are managed using this technique.

4.4 Analysis of Removal Methods

A preliminary analysis was conducted based upon existing site conditions to select the methods that are most environmentally compatible, effective, cost sensitive, and easily maintained. Consideration of criteria outlined in the GEIR (presented in Section 4.1 of the VMP Update) was used in selecting recommended removal methods. The following sections provide justification for those methodologies selected for implementation in the Worcester regional Airport 2020 VMP.

4.4.1 Recommended Primary Removal Methods

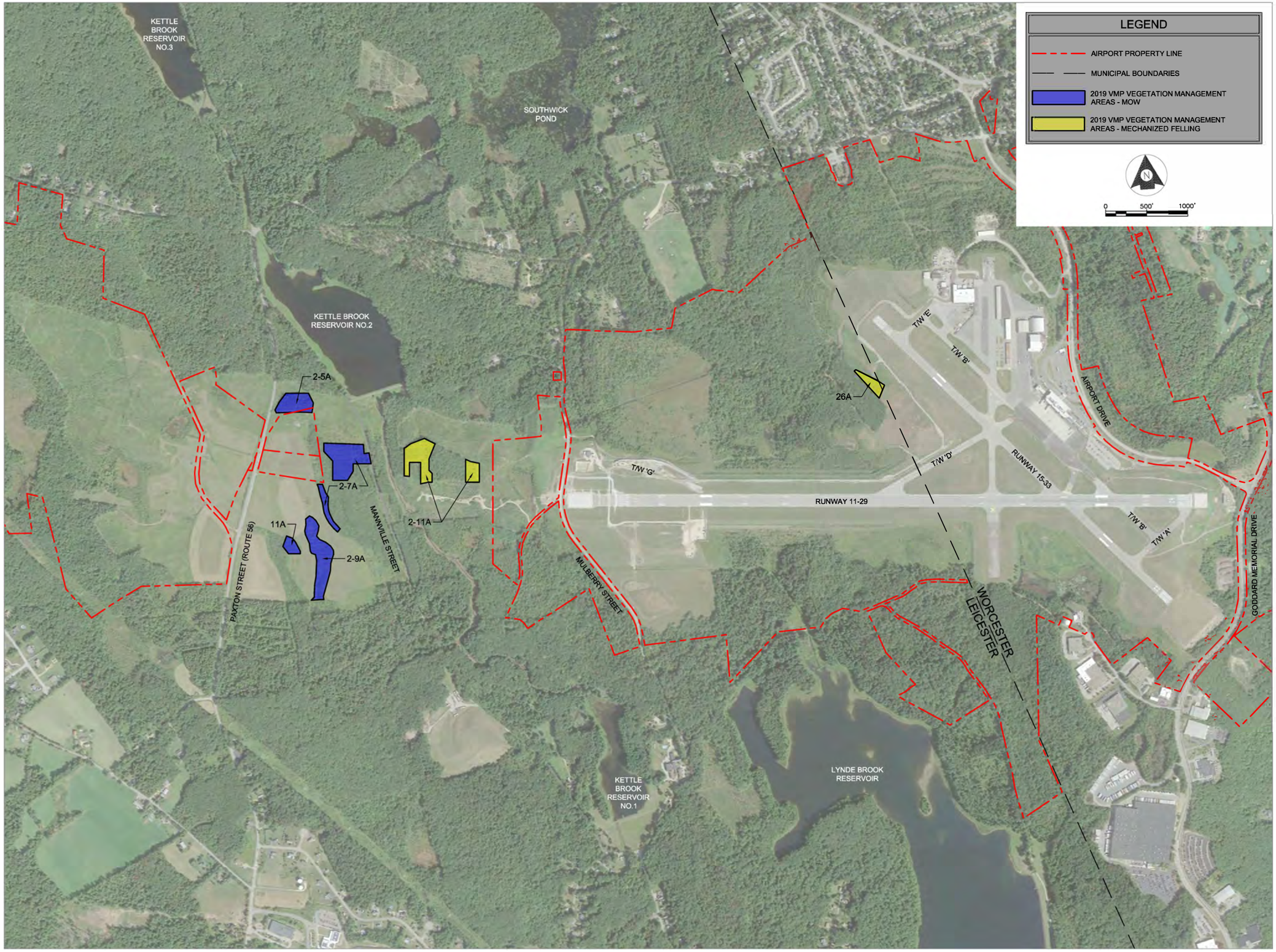
Vegetation removal activities at ORH are proposed for construction in several new VMAs identified in this VMP. New VMAs consist of either dense hardwood-dominant sapling stands or mature deciduous stands. Wetlands are present in some of the new VMAs. Construction is proposed in new VMAs containing wetlands during dry late summer months (only if soil conditions permit) or during frozen ground conditions in winter months. This decision has been made based on consideration of environmental constraints-particularly wetlands and surface water protection areas (Zone A)--associated with several new VMAs. Construction conducted during dry or frozen ground conditions facilitates removal in wetlands and greatly reduces the potential for soil disturbance, erosion and the sedimentation of adjacent water bodies. Winter construction, favorable access to VMAs, and vegetation community composition have contributed to the adoption of two primary removal methodologies—mechanized felling / cut and chip, and mowing. Figure 4-1, *Primary Removal Methods*, illustrates initial removal methods prescribed for 2020 VMP Update operations. These methods are discussed below and correlated to specific VMAs.

4.4.2 Mechanized Felling / Cut and Chip

Within VMAs characterized by canopy vegetation exceeding 6-8 inches dbh and 30 feet in height (VMAs 14/15, 2-11A and 26A), cut and chip methodologies utilizing mechanical shears (i.e., feller-bunchers) will be employed. Trees will be cut as close to ground level as possible and then forwarded to a staging area to be chipped. Trees will be chipped in accordance with U.S.D.A. specifications designed to control the spread of the Asian longhorned beetle (*Anoplophora glabripennis*) and transported off site. Trees may also be felled using chain saws. Residual woody debris (small limbs and brush) will be “laid down” with chain saws and left in place. Slash piles will not exceed two feet in height. Extreme care will be exercised to avoid damaging airport navigational aids and historical/archaeological resources located within VMAs.

4.4.3 Mowing

Heavy-duty forestry mowing equipment shall be utilized to remove vegetation within VMAs characterized by trees of 6-8 dbh or less and less than 30 feet in height (VMAs2-5A, 2-7A, 7A, 2-9A, and 11A). These VMAs typically include dense hardwood sapling and regeneration within areas that have been recently cleared (generally within the past 10-15 years). Vegetation is typically mowed from the top of the tree to its trunk base at ground level. Shredded tree chips shall be left in place.



massport

MASSACHUSETTS PORT AUTHORITY
EAST BOSTON, MASSACHUSETTS 02128

PROJECT LOCATION:
WORCESTER REGIONAL AIRPORT
WORCESTER, MA

MPA CONTRACT NO.:	LOCATION CODE:
AP1824-C1	7640

PROJECT SUBMISSION PHASE:
VEGETATION MANAGEMENT

REGISTRATION STAMP:

REVISIONS:

REV NO.:	DATE:	DESCRIPTION:	BY:

PRIMARY:

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CONSULTANT:

PROJECT NUMBER AND TITLE:

AP1824-C1
2020 VEGETATION MANAGEMENT PLAN UPDATE

SHEET TITLE:

PRIMARY REMOVAL METHODS

DISCIPLINE:
CIVIL

DRAWN BY:	CHECKED BY:	APPROVED BY:
LRK	JPH	GAC

SCALE:	DATE:
AS SHOWN	JUNE 2020

FIGURE NUMBER:
4-1

4.5 RECOMMENDED MAINTENANCE METHODS

Vegetation management at public use airports is a multi-task, continuous process which can only succeed if the VMP adequately addresses long-term maintenance strategies. The maintenance of VMAs is of particular concern to the airports since protected air surfaces must be kept clear of penetrations after the initial removal project has been completed.

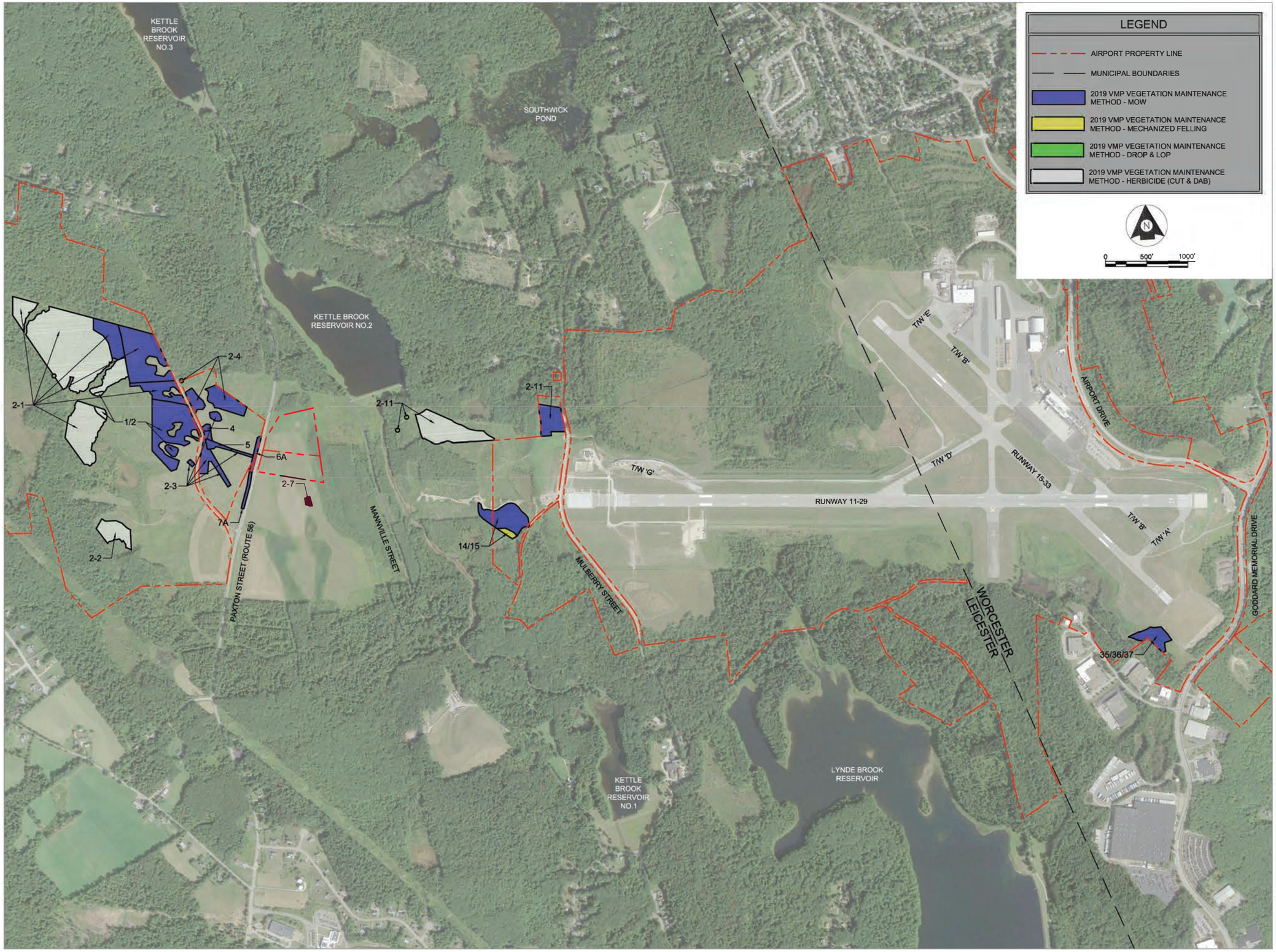
Several tree species occurring within both the upland and wetland regions of VMAs at the airport are capable of rapid re-growth from stumps, stems, and/or root systems. Shrub species are typically not a concern in this regard since they rarely grow tall enough to penetrate protected surfaces. However, many deciduous tree species routinely exhibit re-sprouting from cut surfaces. These sprouts have the capacity for rapid growth since fully developed root systems remain in the ground providing the necessary conditions for optimal regrowth. Additionally, the sprouts are often multi-stemmed, potentially resulting in more penetrations than the original individual plant, and a higher density of stems to maintain. Some of the species capable of this type of re-growth and which are common at the airport include red maple, red oak, aspen (quaking and bigtooth), and cottonwood. The following sections discuss the maintenance methods that have been proposed to facilitate long-term management of VMAs at the airport. Figure 4-2, *Maintenance Methods*, shows maintenance methods proposed at Worcester Regional Airport.

4.5.1 Mechanical Maintenance

Mechanical maintenance may involve a variety equipment including flail head cutters, smaller rotary mowers, or hand-held equipment including chain saws to selectively remove small trees and shrubs. In certain instances where larger trees within existing VMAs have become penetrations to airspace, chain saws may also be used to fell trees in limited instances utilizing the Drop and Lop method. Because much of the VMP project area is within a water supply watershed, no herbicides will be used within any wetland or water body pursuant to past discussions with Conservation Commission and water supply staff at the Worcester Department of Public Works and Parks.

Mowing
Maintenance utilizing heavy-duty forestry mowers is recommended in VMAs that must be maintained as meadow communities due to the proximity of protected airspace. Mowing is also a very efficient maintenance technique for use within herbicide no-spray zones. Maintenance mowing can typically be completed during any season within the upland areas. However, mowing conducted within areas of priority habitat for upland bird species shall be conducted between October 1st and April 1st to avoid disturbances to nesting birds. Mowing in wetlands will be restricted to seasonally dry or frozen ground conditions to minimize disturbances to wetland soils.

Cut and Dab Herbicide Application
Cut and Dab herbicide application is an effective method of chemically managing sapling regrowth within areas that have been previously cleared. This technique includes cutting a small sapling, typically by hand, and either swabbing the fresh cut with an herbicide-soaked cloth or



massport

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PROJECT LOCATION:
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PROJECT SUBMISSION PHASE:
VEGETATION MANAGEMENT

REGISTRATION STAMP:

REVISIONS:

REV NO.:	DATE:	DESCRIPTION:	BY:

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AP1824-C1
2020 VEGETATION
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SHEET TITLE:

MAINTENANCE METHODS

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DRAWN BY:	CHECKED BY	APPROVED BY:
LRK	JPH	GAC

SCALE:	DATE:
AS SHOWN	JUNE 2020

FIGURE NUMBER:

4-2

drizzling herbicide on the cut through a controlled nozzle. This procedure greatly reduces the potential for non-target mortality that can be associated with foliar spray applications. Applications are most successful when made during the period between mid-September and late-October.

During the implementation of the 2012 VMP Update, after discussions with and approval from the Worcester Department of Works and Parks and the Leicester Conservation Commission, it was determined that large upland tracts originally designated to be maintained by mowing were converted to this maintenance method. This modification was requested in an attempt to substantially reduce mowing, required every one to three years, depending on regrowth rates. An initial application using this method was made in the fall of 2014 within designated VMAs. Though effective, several more applications may be required to provide more through control in certain VMAs, particularly larger VMAs where complete coverage of dense sapling regrowth proved difficult. To improve effectiveness and efficiency of the Cut and Dab application, mowing may be utilized as the “cut” method in advance of the herbicide application within regions of larger VMAs such as VMA 2-1.

As a condition of the Worcester Department of Parks and Works, water quality testing was conducted to determine whether herbicides used during the Cut & Dab were impacting local water bodies. Three downstream monitoring stations were established for the collection of samples. Grab samples were collected form each station in advance of the Cut & Dab treatment as control, and samples were taken within 1-2 hours of the start of the first measurable rain event after the application. The results of all samples collected were “non-detect” for the presence of glyphosate. A similar testing protocol will be implemented for Cut & Dab maintenance proposed in this VMP.

The only herbicide that is recommended as part of this VMP is Glyphosate. This herbicide is strongly adsorbed by soils, reducing the potential for leaching into water. This product is biodegradable by soil microbes and has an average half-life of 60 days. Further information on Glyphosate is included in Appendix A. No herbicide applications will be made within 200 feet of from water supply tributaries or within wetlands (vegetation within these areas will be mowed). To ensure that herbicide is applied responsibly, the following guidelines will be observed:

- Herbicide application must be in compliance with all applicable federal (FIFRA) and state (M.G.L. c.32B) laws governing the application of pesticides and rights-of-way management (333 CMR 1.00-11.00).

- Only qualified, state licensed personnel may apply herbicides. "Qualified" should be interpreted to mean those personnel who are trained to recognize and identify target and non-target vegetation and are knowledgeable of safe and proper use of chemical vegetation management techniques.

- Herbicides will only be applied in a selective, efficacious, and judicious manner and applicators will exercise care to ensure that low growing desirable species and other non-target species are not unreasonably affected by the application.

- Setbacks for herbicide application will be measured in the field by tape ties, and herbicide application boundaries will be marked in the field by flags.

- Herbicides are to be handled and applied only in accordance with labeled instructions. All mandated safety precautions directed toward the public, the applicator, and the environment will be strictly adhered to.

- Applicators will at all times exercise good judgment and common-sense during herbicide treatment activities and will immediately cease the operation if adverse conditions or other unpredictable circumstances warrant. Herbicide will not be applied during rain events in excess of 0.2 inches or on days with wind gusts in excess of 20 miles per hour.

Cut and Dab applications should occur between mid-September and late-October to effectively reduce the volume of re-sprouted vegetation and provide an opportunity for desirable vegetation to become established in following years. The extent to which Cut and Dab treatment will be needed in any given year will be determined during the preparation of the YOP for each year. However, initial and follow-up applications should strive to achieve at least a 75 percent success rate of target vegetation. Future maintenance cycle management should follow every three to four years to remove target species that ultimately have the potential to grow into the protected airspace. Foliar spraying has not been included as a maintenance method for implementation during the term of this VMP.

Drop and Lop
The drop and lop method involves the felling of large, individual and isolated trees using a chainsaw within VMAs where the use of heavy-duty mechanized removal equipment such as feller-bunchers is not proposed. These trees occur within the outer borders of existing VMAs where mowing or Cut and Dab has been proposed as the preferred maintenance method. Trees identified for drop and lop will be cut as close to ground level as possible. Once down, the tree will be limbed and the log cut into several sections. Slash from limbing will be reduced in place using a chainsaw, ensuring slash piles do not exceed two feet in height.

4.6 SUMMARY OF VEGETATION MANAGEMENT AREAS AND RECOMMENDED REMOVAL METHODS

Recommended primary removal methods and secondary maintenance methods are prescribed for each VMA identified in this VMP. The initial removal methods shown below in Table 4-2 should be followed by maintenance methods including Cut and Dab herbicide treatment, mowing, or mechanical maintenance, where designated. Removal methods have been prescribed within VMAs only where areas of penetrations and areas of concern have been identified (i.e., vegetation removal will only occur in the specific area within a VMA that contains an obstruction or an area of concern). Environmental constraints (e.g., wetland resources, surface water protection areas, etc.,) within these VMAs targeted for obstruction removal are also identified in Table 4-2.

Table 4-2: Summary of Vegetation Management Areas and Removal Methods

VMA	*Runway*	*Acreage*	*Primary Removal*	*Maint. Method*	*Zone A*	*Wetlands*	*Steep Slopes*	*Priority Habitat*	*Hist./Arch. Resources*	*Pot. Vernal Pools*	*Upland Forest Communities*
1/2	11	7.01	n/a	mow cut dab	x	x			x	x	x
2-1	11	35.00	n/a	mow cut dab	x	x			x		x
2-2	11	2.05	n/a	cut dab drop lop	x	x					x
2-3	11	2.19	n/a	mow	x	x			x		
2-4	11	3.02	n/a	mow drop lop	x	x			x	x	x
*2-5A	11	2.10	mow	mow	x	x					
2-7	11	0.16	n/a	mow	x	x					
*2-7A	11	4.68	mow	mow	x	x					
*2-9A	11	3.88	mow	mow	x	x					
2-11	11	7.07	n/a	mow cut dab drop lop	x				x		

VMA	*Runway*	*Acreage*	*Primary Removal*	*Maint. Method*	*Zone A*	*Wetlands*	*Steep Slopes*	*Priority Habitat*	*Hist./Arch. Resources*	*Pot. Vernal Pools*	*Upland Forest Communities*
*2-11A	11	3.81	mech fell	mow	x	x			x		x
4	11	0.15	n/a	mow		x			x		
5	11	0.43	n/a	mow	x	x					
6A	11	0.39	n/a	mow	x	x					
7A	11	0.36	n/a	mow	x	x					
*11A	11	0.66	mow	mow	x	x					
14/15	11	3.50	mech fell	mow	x	x					x
*26A	15	0.96	mech fell	mow							x
35/36/37	33	1.66	n/a	mow							

Total 2020 VMP Update Area: 79.08 Total VMP Area: 212.00 (in acres)	Total 2020 VMP Update Wetlands (ac): 7.03 (**includes 2.06 ac wetland impacts not previously permitted**) Total VMP Wetlands (ac): 35.56

* Indicates VMAs new to this edition of the Vegetation Management Plan Update.

5.0 YEARLY OPERATIONAL PLANS

This section outlines the vegetation removal projects that have been recommended in the 2020 Update over the next five years at the ORH. The projects are divided into yearly operational plans (YOPs) as summarized in Table 5-1. The regulatory considerations of YOP implementation are outlined in Sections 5.1. It should be noted that the YOP was prepared to address obstructions and areas of concern identified in the 2019 airspace analysis, leading to the creation of several new VMAs. The YOP also includes continued maintenance within certain existing VMAs where, due to elevated topography and proximity to protected air surfaces, more frequent vegetation management is necessary. Should, over the term of this 2020 VMP Update, maintenance becomes necessary in existing VMAs, the YOP will be updated upon consultation with and approval from the conservation commission. Additionally, YOPs may be shifted and/or revised due to budget constraints and/or site conditions. Any changes to the YOP will be coordinated with the local Conservation Commissions.

Table 5-1: Yearly Operational Plan Summary

Year	Primary Method and/or Follow-up	Vegetation Management Areas	Acres Affected
Year 1 2020	Cut and Dab	1/2, 2-1, 2-2 (includes preliminary mow)	26.97
	Mow	N/A	0
	Drop and Lop	2-1	0.05
	Total		**27.02**
Year 2 2021	Cut and Dab	2-11	4.82
	Mow	1/2, 2-1, 2-3, 2-4, 2-5A, 2-7, 2-7A, 2-9A, 11A, 4, 5, 6A, 7A	35.61
	Drop and Lop	2-4, 2-11	0.14
	Total		**40.57**
Year 3 2022	Mow	2-11, 14/15, 35/36/37	7.00
	Mechanized Felling	2-11A, 14/15, 26A	5.08
	Total		**12.08**
Year 4 2023	Cut and Dab	2-1	24.47
	Mow	2-7A, 2-9A, 11A	9.22
	Total		**33.69**
Year 5 2024	Cut and Dab	1/2, 2-2, 2-11	7.26
	Mow	1/2, 2-11A, 35/36/37, 4, 5, 6A, 7A	12.63
	Total		**19.89**

This vegetation removal program for ORH was established based on the obstruction analyses (conducted in 2019) and site conditions observed within individual VMAs. The priority ranking considers issues such as operational safety, degree and extent of obstructions, and ease of implementation. Although the recommended removal method is the primary technique, it is possible for any combination of methods to be implemented on a given acre provided that all vegetation management complies with this VMP and local, state, and federal regulations. The removal method identified for each obstruction is a general recommendation. During the preparation of each YOP, more intensive field investigations may be conducted to further identify the specific method or combination of methods to be employed in each area.

5.1 REGULATORY CONSIDERATIONS

Worcester Regional Airport must comply with FAA regulations related to maintenance of protection zones. Although the 2020 VMP Update covers approximately 212 acres of management area including approximately 36 acres of wetlands, the YOPs principal focus is on vegetation removal, conducted in compliance with state and federal airport safety regulations, on approximately 79 acres, approximately seven acres of which are vegetated wetlands. Most of the environmental impacts will be short-term in nature and related to a change in habitat composition. No net loss of wetlands will result from the implementation of this VMP. Permits that must be obtained prior to the implementation of the Year 1 YOP include the following:

- An Order of Conditions from the Leicester Conservation Commission for 2020 VMP activities–vegetation removal will occur within 7.03 acres of wetlands (this total includes approximately 4.97 acres of work within wetlands permitted in the 2012 VMP Update) -- regulated by the Massachusetts Wetlands Protection Act. The Notice of Intent for work within wetlands will be filed as a Limited Project per 10.53(3) (n)(1). The life of this permit (Order of Conditions) is assumed to be five years per 310 CMR 10.05 (6)(d).

- Department of Food and Agriculture (DFA) Right-of-Way Compliance – Herbicide application is regulated by the DFA, which specifies guidelines and procedures to minimize impacts to plants and wildlife, as well as to the persons applying the herbicide. Although no permits or approvals are granted by the DFA for herbicide application at airports, the project will comply with all rules and regulations pertaining to the application of herbicides.

- United States Department of Agriculture (USDA) Asian Longhorn Beetle (ALB) Compliance – The ALB infestation affecting hardwood trees in the Worcester area is described in Section 6.4 of this VMP. Any contractor performing tree work within the quarantine area must be certified by the Massachusetts ALB Cooperative Eradication Program (CEP), and all work must be performed in accordance with ALB CEP regulations.

6.0 MITIGATION MEASURES

The overall goal of vegetation management at ORH is to remove hazardous obstructions from protected air surfaces in an environmentally responsible manner. There is a wide range of potential impacts with varying degrees of significance associated with vegetation removal activities, particularly in sensitive areas such as wetlands. These impacts range from direct impacts such as soil disturbance (contributing to erosion and sedimentation) and loss of canopy-related wildlife habitat. Potential indirect impacts include changes in the vegetative community structure, increased soil and water temperatures, and increased turbidity levels in water bodies. While vegetation and the associated habitats will be altered as a result of obstruction removal, appropriate mitigation measures will be to prevent significant soil disturbance and associated erosion and sedimentation.

6.1 WETLANDS

At ORH, direct impacts to wetlands will occur within Waters of the United States and within state jurisdictional wetland resources (Bordering Vegetated Wetland and Riverfront Area). Although other state regulated wetland resources are present within the study area (Inland Bank, Land Under Water) there will be no impacts to these wetland resource areas. No wetlands will be filled (or lost) due to vegetation removal activities, and in all cases the wetlands will be maintained as an emergent or shrub community that provides wildlife habitat and meets FAA surface clearance requirements.

6.2 ENDANGERED SPECIES

Designated habitat for the grasshopper sparrow occurs within the grass portions of the airfield at ORH. This habitat exists due to turf management practices employed adjacent to the runways and other paved areas that create grassland habitat supporting this species. Obstruction removal operations may potentially expand habitat for this species through the conversion of forested uplands to low-growth shrub and meadow habitat.

To further enhance grasshopper sparrow habitat and avoid impacts, the following practices will be followed. Mowing within VMAs adjacent to priority habitat will not occur between April 1 and July 31of each year to avoid disturbing nesting birds. Hedgerows located along and near Route 56/Paxton Street were removed during the 2012 VMP Update and maintenance of these VMAs is proposed in this update. Maintaining these areas will have the additional benefit of limiting perches used by predatory birds to hunt the grasshopper sparrow.

6.3 VERNAL POOLS

Two potential vernal pools (PVPs) have been identified within VMP VMAs utilizing MassGIS data sources. According to MassGIS, one PVP is located within VMA 1/2. This PVP consists of a farm pond currently utilized by cows when grazing in the area. There is no canopy shading this pond thus vegetation maintenance activities will have no impact on the shading/temperature regimes of the pond. MassGIS also identified a PVP within VMA 2-4. During a site assessment of this VMA, characterized by young, mixed deciduous, tree species, a shallow depression exhibiting the potential to seasonally hold water was observed adjacent to a farm road truncating the area. A culvert beneath the road drains overflow from the farm pond to this area, also impacted by grazing cows. Disturbance to amphibians potentially utilizing these areas during egg-laying is unlikely as maintenance mowing in these areas will be conducted only during dry summer months or during frozen ground winter conditions.

6.4 INVASIVE SPECIES

Combatting invasive plant species is an ongoing problem throughout New England. Although the ORH study area does not exhibit a severe invasive species problem, these species are present in certain vegetative communities. Since the initial removal of canopy species was conducted in 2013, the expansion of invasive species has not been widely observed. Dense black locust (*Robinia pseudoacasia*) regeneration occurred on airport property after initial removal within VMA 35/36/37 located southwest of the Runway 33 end. Early in the 2012 VMP Update term, maintenance consisted of foliar spray herbicide applications. The area has since been incorporated into a routine mowing regimen, supported by airport maintenance staff. Over the term of the 2020 VMP Update, ORH will continue to monitor VMAs for the presence of invasive plants and will implement appropriate management tactics as necessary. Where applicable, herbicides may be used during regular maintenance to manage invasive vegetation, but only outside the herbicide setbacks discussed in Section 4.

6.4.1 Asian Longhorned Beetle

The Worcester area is currently experiencing an infestation of the Asian longhorned beetle (ALB) (*Anoplophora glabripennis).* The Asian longhorned beetle affects predominantly hardwood trees, such as maples, birches, horse chestnuts, willows, Ohio buckeye, mimosas, poplars, elms, ashes, and others. These trees, referred to as host trees, are widespread in the wooded areas surrounding Worcester Regional Airport.

The infestation cycle begins when a mated ALB female chews several dozen holes into the tree trunk and lays an egg in each hole. When the larva hatches, it burrows deep into the heartwood of the tree and feeds off of the tree's nutrients. The insect matures inside the tree and chews its way out. Affected trees usually die because of the damage to its tissues from the tunneling.

In response to this infestation, the United States Department of Agriculture (USDA) designated a quarantine area including Worcester, West Boylston, Boylston, Shrewsbury, and parts of Holden and Auburn. The Town of Leicester is not included in the quarantine area at this time.

The ALB eradication program has been very successful in halting the spread of the infestation and substantially reducing the number of insects present in the area since the program began in 2008. However, the quarantine remains in effect and any host wood products larger than one-inch diameter harvested within the quarantine area cannot be transported outside of the quarantine area. Host wood products from inside the quarantine area may be marketed and used, as long as they stay within the quarantine area and are not infested by ALB. Any contractor working within the quarantine area must be certified by the Massachusetts ALB Cooperative Eradication Program.

ORH VMP operations will occur within the City of Worcester, and therefore within the quarantine area. All contractors working within this area will be certified by the ALB CEP. Initial removal operations have been designed such that all timber harvested will be chipped on site to USDA specifications enabling transport from the study/quarantine area. All timber harvested from within the town of Leicester will be processed in the same fashion. No logs, branches, slash, etc. will leave the study area prior to chipping. Any evidence of ALB infestation observed during VMP operations will be reported to USDA immediately.

6.5 SHORT-TERM CONSTRUCTION IMPACTS

A summary list of mitigation measures to address short-term construction impacts and minimize post-construction permanent impacts is provided below. This list will be supplemented and provided in more detail in the YOPs and as part of the permitting process for the vegetation removal. Short-term construction impacts from vegetation removal can be minimized by:

- Positioning machinery in upland areas and attaching a hydraulic or mechanical arm which is mounted on a mowing head to reach into the wetlands;
- Using tracks or mats to support the heavy equipment in and adjacent to wetlands;
- Using mechanical methods of removal only during periods of dry or frozen ground conditions to minimize or avoid soil disturbance;
- Using existing cart paths and existing roads for access of machinery;
- Locating staging areas outside the boundaries of sensitive areas;
- Implementation of the pollution prevention and control measures.
- Erecting sediment barriers such as staked haybales or siltation fence to control sediment runoff where necessary;
- Installing runoff diversion measures where necessary;
- Limiting periods of work to late summer and winter months, thereby avoiding the spring thaw, amphibian breeding season, and nesting season for grassland birds;

- Implementing Best Management Practices prescribed with each vegetation removal method. Herbicide application, for example, must follow guidelines similar to those used for clearing utility rights-of-way;

- As a Limited Project pursuant to 310 CMR 10.53(3)(n), compensatory mitigation for long-term impacts to wetlands from airport vegetation removal is not required per the Wetlands Protection Act Regulations.

BMPs utilized during construction shall be routinely reviewed for effectiveness and amended as necessary.

Appendix A

Glyphosate

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
Department of Agricultural Resources
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Secretary

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Commissioner

GLYPHOSATE

Common Trade Name(s): Roundup, Glyphosate VMF Round Up Pro, Rodeo, Accord, Accord Concentrate,

Chemical Name: N—(phosphonomethyl)glycine—isopropylamine salt
CAS No.: 1071-83-6

GENERAL INFORMATION

Glyphosate, n-phosphonomethyl glycine, is a systemic, broad spectrum herbicide effective against most plant species, including deep rooted perennial species, annual and biennial species of grasses, sedges, and broadleafed weeds. The major pathway for uptake in plants is through the foliage, however, some root uptake may occur. The presence of surfactants and humidity increases the rate of absorption of glyphosate by plants (15).

Foliarly applied glyphosate is readily absorbed and translocated from treated areas to untreated shoot regions. The mechanism of herbicidal action for glyphosate is believed to be inhibition of amino acid biosynthesis resulting in a reduction of protein synthesis and inhibition of growth (10, 15, 101).

Glyphosate is generally formulated as the isopropylamine salt in aqueous solution (122). Of the three products containing glyphosate considered here, Roundup is sold with a surfactant and Rodeo and Accord are mixed with surfactants prior to use (15). Glyphosate has been reviewed by US Forest Service (15), FAO (122), and EPA 00W (51).

ENVIRONMENTAL FATE

Mobility

Glyphosate is relatively immobile in most soil environments as a result of its strong adsorption to soil particles. Adsorption to soil particles and organic matter begins almost immediately after application. Binding occurs with particular rapidity to clays and organic matter (l5). Clays and organic matter saturated with iron and aluminum (such as in the Northeast) tend to absorb more glyphosate than those saturated with sodium or calcium. The soil phosphate level is the main determinant of the amount of glyphosate adsorbed to soil particles. Soils which are low in phosphates will adsorb higher levels of glyphosate (14, 15).

Glyphosate is classified as immobile by the Helling and Turner classification system. In soil column leaching studies using aged (1 month) Glyphosate, leaching of glyphosate was said to be insignificant after 0.5 inches of water per day for 45 days (14).

Persistence

It has been reported that glyphosate dissipates relatively rapidly when applied to most soils (14). However, studies indicate that the soil half-life is variable and dependent upon soil factors. The half-life of glyphosate in greenhouse studies when applied to silty clay loam, silt loam, and sandy loam at rates of 4 and 8 ppm was 3, 27 and 130 days respectively, independent of application rate (14). An average half-life of 2 months has been reported in field studies for 11 soils (15).

Glyphosate is mainly degraded biologically by soil micro-organisms and has a minimal effect on soil microflora (15). In the soil environment, glyphosate is resistant to chemical degradation such as hydrolysis and is stable to sunlight (15). The primary metabolite of glyphosate is aminomethyl phosphonic acid (AMPA) which has a slower degradation rate than glyphosate (15). The persistence of AMPA is reported to be longer than glyphosate, possibly due to tighter binding to soil (14). No data are available on the toxicity of this compound.

Glyphosate degradation by microorganisms has been widely tested in a variety of field and laboratory studies. Soil characteristics used in these studies have included organic contents, soil types and pHs similar to those that occur in Massachusetts (117).

Glyphosate degradation rates vary considerably across a wide variety of soil types. The rate of degradation is correlated with microbial activity of the soils and does not appear to be largely dependent on soil pH or organic content (117). While degradation rates are likely temperature dependent, most reviews of studies do not report or discuss the dependence of degradation rate on temperature. Mueller et al. (1981 cited in 117) noted that glyphosate degraded in Finnish agricultural soils (loam and fine silt soils) over the winter months; a fact which indicates that degradation would likely take place in similar soils in the cool Massachusetts climate. Glyphosate halflives for laboratory experiments on sandy loam and loamy sand, which are common in Massachusetts, range up to 175 days (117). The generalizations noted for the body of available results are sufficiently robust to incorporate conditions and results applicable to glyphosate use in Massachusetts.

TOXICITY REVIEW

Acute (Mammalian)

Glyphosate has reported oral LD5Os of 4,320 and 5,600 mg/kg in male and female rats (15,4). The oral LD5Os of the two major glyphosate products Rodeo and Roundup are 5,000 and 5,400 mg/kg in the rat (15).

A dermal LD5O of 7,940 mg/kg has been determined in rabbits (15,4). There are reports of mild dermal irritation in rabbits (6), moderate eye irritation in rabbits (7), and possible phototoxicity in humans (9). The product involved in the phototoxicity study was Tumbleweed marketed by Murphys Limited UK (9). Maibach (1986) investigated the irritant and the photo irritant responses in individuals exposed to Roundup (41% glyphosate, water, and surfactant); Pinesol liquid, Johnson Baby Shampoo, and Ivory Liquid dishwashing detergent. The conclusion drawn was that glyphosate has less irritant potential than the Pinesol or the Ivory dishwashing liquid (120).

Metabolism

Elimination of glyphosate is rapid and very little of the material is metabolized (6,106).

Subchronic/Chronic Studies (Mammalian)

In subchronic tests, glyphosate was administered in the diet to dogs and rats at 200, 600, and 2,000 ppm for 90 days. A variety of toxicological endpoints were evaluated with no significant abnormalities reported (15,10).

In other subchronic tests, rats received 0, 1,000, 5,000, or 20,000 ppm (57, 286, 1143 mg/kg) in the diet for 3 months. The no observable adverse effect level (NOAEL) was 20,000 ppm (1,143 mg/kg) (115). In the one year oral dog study, dogs received 20, 100, and 500 mg/kg/day. The no observable effect level (NOEL) was 500 mg/kg (116).

Oncogenicity Studies

Several chronic carcinogenicity studies have been reported for glyphosate including an 18 month, mouse study; and a two year rat study. In the rat study, the animals received 0, 30, 100 or 300 ppm in their diet for 2 years. EPA has determined that the doses in the rat study do not reach the maximum tolerated dose (112) and replacement studies are underway with a high dose of 20,000 ppm (123). The mice received 1000, 5000 or 30,000 ppm for 18 months in their diets. These studies were non-positive (112,109). There was a non-statistically significant increase in a rare renal tumor (renal tubular adenoma (benign) in male mice (109). The rat chronic study needs to be redone with a high dose to fill a partial data gap (112). The EPA weight of evidence classification would be D: not classified (51).

Mutagenicity Testing

Glyphosate has been tested in many short term mutagenicity tests. These include 7 bacterial (including Salmonella typhimurim and B. subtilis) and 1 yeast strain Sacchomyces cerevisiae as well as a mouse dominant lethal test and sister chromatid exchange. The microbial tests were negative up to 2,000 mg/plate (15), as were the mouse dominant lethal and the Chinese hamster ovary cell tests. EPA considers the mutagenicity requirements for glyphosate to be complete in the Guidance for the Registration of Pesticide Products containing glyphosate (112).

The developmental studies that have been done using glyphosate include teratogenicity studies in the rat and rabbit, three generation reproduction studies in the rat, and a reproduction study in the deer mouse. (15)

Rats were exposed to levels of up to 3,500 mg/kg/d in one rat teratology study. There were no teratogenic effects at 3,500 mg/kg/d and the fetotoxicity NOEL was 1,000 mg/kg/d. In the rabbit study a fetotoxicity NOEL was determined at 175 mg/kg/d and no teratogenic effects were observed at 10 or 30 mg/kg/d in one study and 350 mg/kg/d in the other study (15). No effects were observed in the deer mouse collected from conifer forest sprayed at 2 lbs active ingredient per acre (15).

Tolerances & Guidelines

EPA has established tolerances for glyphosate residues in at least 75 agricultural products ranging from 0.1 ppm (most vegetables) to 200 ppm for animal feed commodities such as alfalfa (8).

U.S. EPA Office of Drinking Water has released draft Health Advisories for Glyphosate of 17.50 mg/L (ten day) and 0.70 mg/L (Lifetime)(51).

Avian

Two types of avian toxicity studies have been done with glyphosate: ingestion in adults and exposure of the eggs. The species used in the ingestion studies were the mallard duck, bobwhite quail, and the adult hen (chickens). The 8 day feeding LC5Os in the mallard and bobwhite are both greater than 4,640 ppm. In the hen study, 1,250 mg/kg was administered twice daily for 3 days resulting in a total dose of 15,000 mg/kg. No behavioral or microscopic changes were observed (15).

Invertebrates

A variety of invertebrates (mostly arthropods) and microorganisms from freshwater, marine, and terrestrial ecosystems have been studied for acute toxic effects of technical glyphosate as well as formulated Roundup. The increased toxicity of Roundup compared with technical glyphosate in some studies indicates that it is the surfactant (MONO 818) in Roundup that is the primary toxic agent (117). Acute toxicity information may be summarized as follows:

Glyphosate (technical): Acute toxicity ranges from a 48 hr EC5O for midge larvae of 55 mg/L to a 96 hr TL5O for the fiddler crab of 934 mg/L (15).

Roundup: Acute toxicity ranges from a 48 hr EC5O for Daphnia of 3 mg/L to a 95 hr LC5O for crayfish of 1000 mg/L (15).

Among the insects tested, the LD50 for honeybees was 100 mg/bee 48 hours after either ingestion, or topical application of technical glyphosate and Roundup. This level of experimental exposure is considerably in excess of exposure levels that would occur during normal field applications (15).

Aquatic Species (Fish)

Technical glyphosate and the formulation Roundup have been tested on various fish species. Roundup is more toxic than glyphosate, and it is the surfactant that is considered to be the primary toxic agent in Roundup:

> Glyphosate (technical):
> Acute 96 hr LC5Os range from 24 mg/L for bluegill (Dynamic test) to 168 mg/L for the harlequin fish (15).
>
> Roundup: Acute lethal toxicity values range from a 96 hr LC5O for the fathead minnow of 2.3 mg/L to a 96 hr TL5O for rainbow trout of 48 mg/L (15).

Tests with Roundup show that the egg stage is the least sensitive fish life stage. The toxicity increases as the fish enter the sac fry and early swim up stages.

Higher test temperatures increased the toxicity of Roundup to fish, as did higher pH (up to pH 7.5). Above pH 7.5, no change in toxicity is observed.

Glyphosate alone is considered to be only slightly acutely toxic to fish species (LC5Os greater than 10 mg/L), whereas Roundup is considered to be toxic to some species of fish, having LC5Os generally lower than 10 mg/L (15,118).

SUMMARY

Glyphosate when used as recommended by the manufacturer, is unlikely to enter watercourses through run-off or leaching following terrestrial application (117). Toxic levels are therefore unlikely to occur in water bodies with normal application rates and practices (118).

Glyphosate has oral LD5Os of 4,320 and 5,600 in male and female rats respectively. The elimination is rapid and very little of it is metabolized. The NOAEL in rats was 20,000 ppm and 500 mg/kg/d in dogs. No teratogenic effect was observed at doses up to 3,500 mg/kg/d and the fetotoxicity NOELS were 1,000 mg/kg/d in the rat and 175 mg/kg/d in the rabbit.

The evidence of oncogenicity in animals is judged as insufficient at this time to permit classification of the carcinogenic potential of glyphosate. The compound is not mutagenic.

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Appendix B

Spill Prevention Plan

Spill Prevention and Containment Plan

Description and Purpose

The purpose of this Spill Prevention and Containment Plan is to prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, and properly disposing of spill materials.

Implementation

The following steps will minimize the likelihood of leaks and spills and will also lessen impacts should a leak or spill occur.

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Establish protocols for educating new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, or substances listed in 40 CFR parts 110,117, and 302, should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Maintain a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runoff during rainfall to the extent that it doesn't compromise cleanup activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly.

Minor Spills

Minor spills typically involve small quantities of oil, gasoline, etc. which can be controlled by the first responder at the discovery of the spill.

- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
- Contain the spread of the spill.
- Recover spilled materials.
- Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers.

- Spills should be cleaned up immediately:
- Contain spread of the spill.
- Notify the project foreman immediately.
- If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
- If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
- If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:

- Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
- Notify the Massachusetts Emergency Management Agency, (617) 727-7775.
- For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
- Notification should first be made by telephone and followed up with a written report.
- The services of a spills contractor or a Haz-Mat team should be obtained immediately.
- Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
- Other agencies may need to be consulted including, but are not limited to, the Fire Department, the Public Works Department, and Department of Toxic Substances.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.