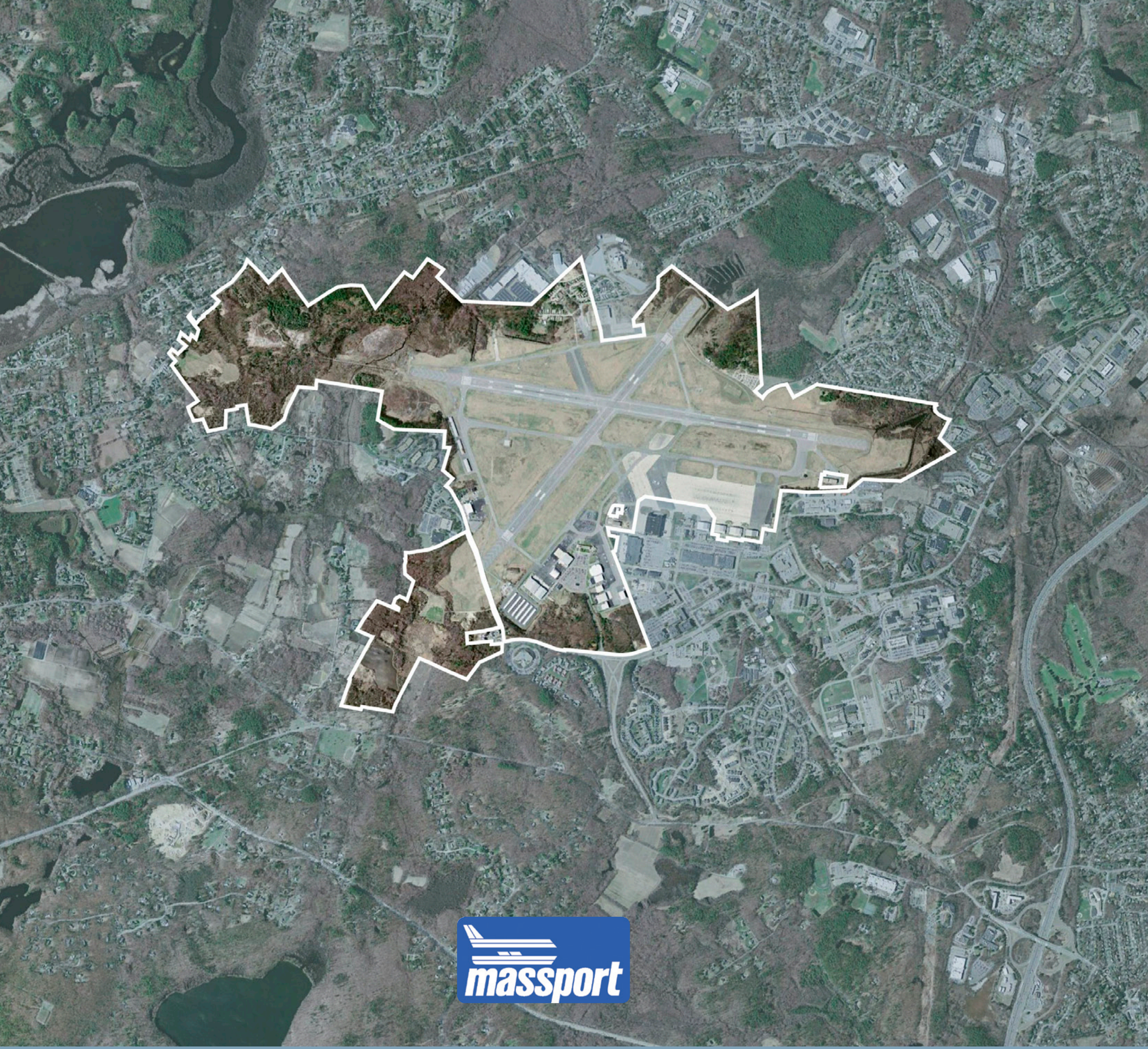


2012 L.G. Hanscom Field

ESPR

Environmental Status & Planning Report

Bedford, Massachusetts • EEA Number: 5484/8696 • December 2013

Massachusetts Port Authority
One Harborside Drive, Suite 200S
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

December 31, 2013

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, EEA 5484/8696
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: 2012 L.G. Hanscom Field Environmental Status and Planning Report (ESPR)

Dear Secretary Sullivan and Director Buckley:

The Massachusetts Port Authority (Massport) is pleased to submit for your review this 2012 L.G. Hanscom Field Environmental Status and Planning Report (*2012 ESPR*) (EEA #5484/8696). The *2012 ESPR* is being submitted in accordance with the provisions of the Massachusetts Environmental Policy Act (MEPA), G.L. Chapter 30, Sections 62-62H and its implementing regulations, 301 Code of Massachusetts Regulations (CMR) 11.00. The *2012 ESPR* responds to your May 18, 2012, Certificate on the Proposed Scope for the *2012 ESPR*.

Massport is requesting an extension of the public comment period to approximately 60 days with the close of public comments on March 11, 2014. The MEPA consultation session is tentatively scheduled for March 3, 2014 at 5pm in the Civil Air Terminal (first floor) at Hanscom Field. Massport will also be presenting the *2012 ESPR* at the monthly meeting of the Hanscom Area Town Selectmen (HATS) meeting on February 27, 2014 at 7pm at the Bedford Town Hall. Three additional technical meetings are scheduled for 6:00pm on January 29, February 5, and February 11, 2014 in the Civil Air Terminal (first floor) at Hanscom Field.

Members of Massport staff are available to discuss the attached document with you at your earliest convenience. Please contact Thomas Ennis at 617-568-3546 or tennis@massport.com with any questions or comments.

Sincerely,

Massachusetts Port Authority

Stewart Dalzell, Deputy Director
Environmental Planning and Permitting

Enclosures

2012 L.G. Hanscom Field

Environmental Status and Planning Report

Bedford, Massachusetts

EEA NUMBER: 5484/8696

December 2013

Contents

Figures

Tables

1 Introduction / Executive Summary

1.1 Environmental Status and Planning Report

The Massachusetts Port Authority (Massport) has filed this Environmental Status and Planning Report (ESPR) for calendar year 2012, in compliance with Massachusetts Environmental Policy Act (MEPA), to provide a status report on activity levels and environmental conditions at Laurence G. Hanscom Field (Hanscom). The Secretary of the Executive Office of Energy and Environmental Affairs (EEA) defined the scope for the *2012 ESPR* in a Certificate issued May 18, 2012.

This ESPR reports on current conditions at Hanscom Field and compares them to historical data from the *2000* and *2005 ESPRs* and other available sources as described in each chapter. The *2012 ESPR* informs future planning by presenting and evaluating the potential cumulative environmental effects of future scenarios for the planning years of 2020 and 2030 based on forecasts of airport activity levels. The 2020 and 2030 scenarios represent estimates of what *could* occur (not what *will* occur) in the future using certain planning assumptions, but are not necessarily recommended outcomes. The future scenarios are consistent with Massport's 1978 Master Plan and 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

The retrospective and prospective information presented in this ESPR provide a planning tool for assessing and reviewing changes at Hanscom Field and its environs over time. The aviation activity forecasts in the *2012 ESPR* account for a realistic level of aviation growth based on local and national aviation trends and forecasts from the Federal Aviation Administration's (FAA) New England Regional Aviation System Plan (NERASP). Additionally, the *2012 ESPR* provides a database and regional planning tool for the Towns of Bedford, Concord, Lexington, and Lincoln, as well as State agencies and other interested parties. Figure 1-1 shows the location of Hanscom on the USGS map.

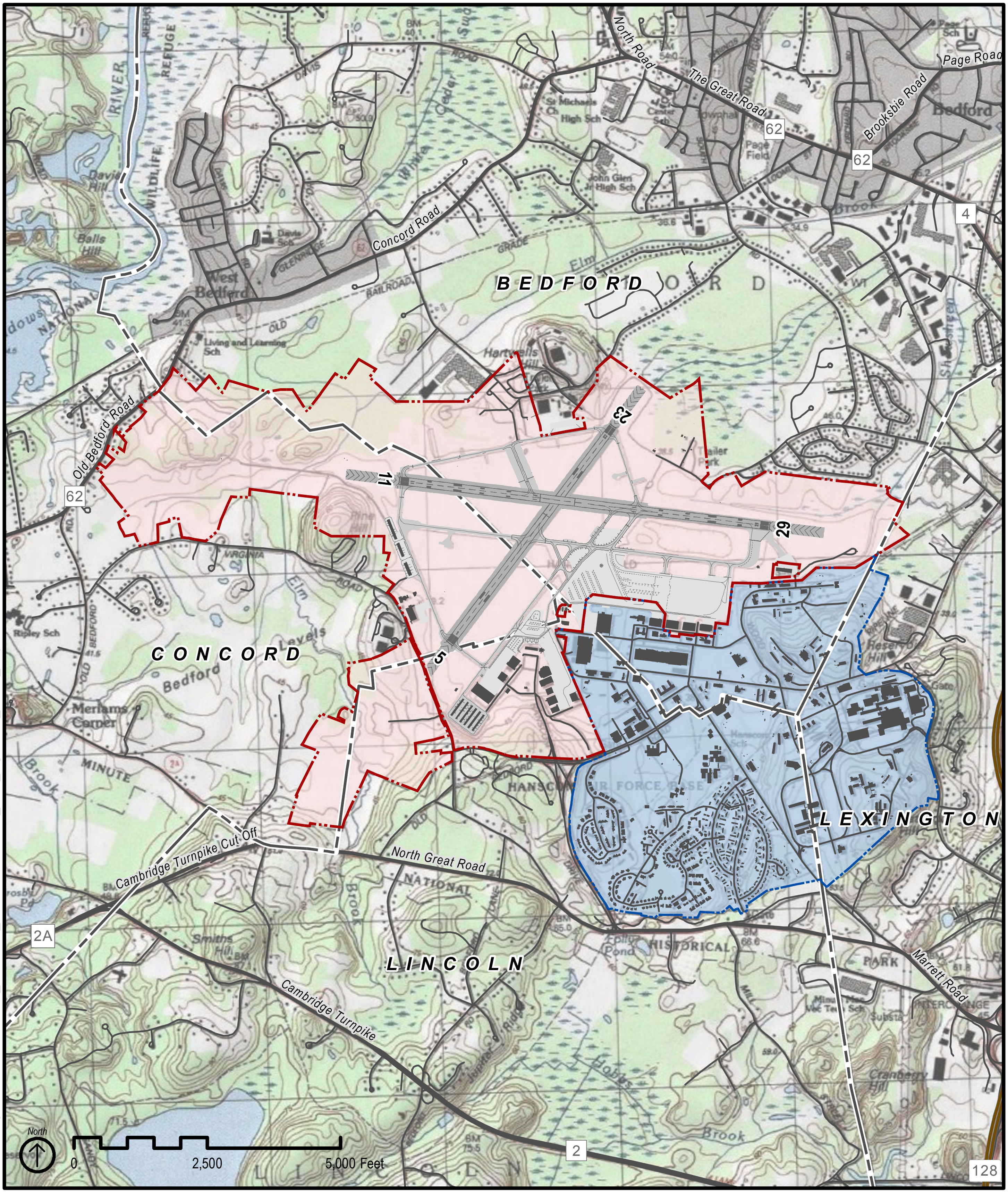
EEA #5484/8696

Submitted by:

Massachusetts Port Authority
Logan Office Center
One Harborside Drive, Suite 200 South, Second Floor
East Boston, MA 02128

Stewart Dalzell, Deputy Director
Economic Planning and Development Department
(617) 568-3524
sdalzell@massport.com

Tom Ennis, Senior Project Manager/Senior Planner
Economic Planning and Development Department
(617) 568-3546
tennis@massport.com



Hanscom Field Property Boundary

Hanscom AFB Property Boundary

Municipal Boundary

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Locus Map

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Figure **1-1**

This introduction to the *2012 ESPR* provides background information on Hanscom Field, describes the environmental review process, identifies the analytical framework for the ESPR, and summarizes the primary changes since 2005, and provides the organization for the report.

1.2 Hanscom Field

Hanscom Field is New England's premier, full-service general aviation (GA) airport and serves as a GA reliever for Boston Logan International Airport with limited commercial passenger service. It is located approximately 20 miles northwest of Boston, comprising approximately 1,300 acres of land, in close proximity to Minute Man National Historical Park (MMNHP) and Great Meadows National Wildlife Refuge (GMNWR). Hanscom lies just outside Route 128/I-95, and is convenient to most of metropolitan Boston. Route 2A serves as a primary commuter route and the primary access route to the airport, Hanscom Air Force Base (AFB), and MMNHP. Figure 1-2 provides the site location of Hanscom Field in relation to these roads and its boundaries with MMNHP and GMNWR.

Hanscom Field is located in parts of four different municipalities: Bedford, Concord, Lexington, and Lincoln. To the south, it abuts the MMNHP, which comprises over 900 acres. The 800-acre Hanscom AFB adjoins Hanscom to the south. GMNWR, which includes 3,600 acres along the Concord and Sudbury Rivers, is located to the west of Hanscom Field. These large land holdings provide a buffer between Hanscom Field and residential areas. Despite its proximity to these many public recreational areas and adjacent communities, the airport is visible from few locations due to its position in a low, flat area in the landscape.

The FAA identifies Hanscom Field as a reliever airport. As such, its primary role in the regional aviation system is to accommodate regional GA needs, while providing supplemental commercial and cargo service to meet small-scale, niche demands. This allows larger nearby airports to concentrate on large-scale commercial and cargo activity.

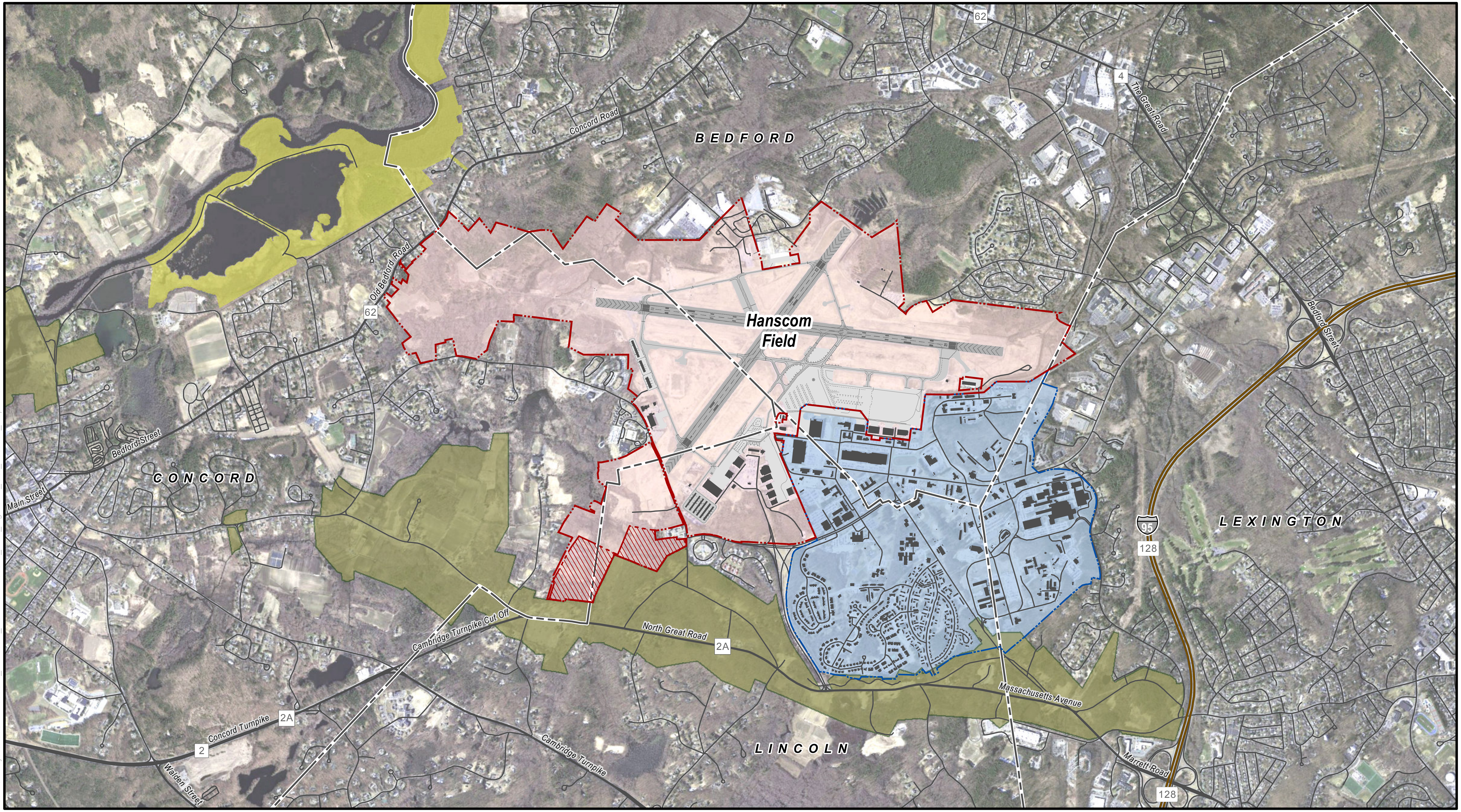
Massport assumed ownership of Hanscom Field in 1974 and prepared a Master Plan for the airport in 1978, which included a comprehensive public outreach process. In 1980, after additional stakeholder engagement, Massport adopted the Hanscom Field Noise Rules (740 CMR 25.00), which were an important outgrowth of the Master Plan. The Master Plan and the 1980 Noise Rules remain the framework for airport planning and operations today.

The variety of aviation activities at Hanscom Field include private and corporate aviation, recreational flights, pilot training, air charter, cargo, commuter service, and limited military use. The Master Plan and 1980 Noise Rules contemplated and provided for commercial airline service specifically allowing for commercial passenger aircraft with 60 seats or fewer. Commercial airlines have operated periodically at Hanscom Field since the mid-1970s. Pan Am was the most recent airline to provide commercial passenger services and Streamline Air provided scheduled charter service until September 2012.

In 1970, four years before Massport assumed operation of Hanscom Field, airport activity peaked at slightly more than 300,000 total annual aircraft operations. By 2000, operations at Hanscom Field had decreased to 212,400, with GA representing 96 percent of total activity, scheduled commercial passenger service accounting for three percent, and military at less than one percent.

Hanscom’s total aircraft operations have declined by 2 percent annually since 2000, down from approximately 218,000 operations in 2000 to 166,000 operations in 2012. The number of scheduled commercial air passengers decreased from a historic high of 162,100 in 2000 to 8,609 in 2012.

(This page intentionally left blank)



North

0 2,000 4,000 Feet

Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary
MMNHP Boundary
Great Meadows
Interstate
Highway
Road

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Site Location Map

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure1-2_Site_Location_Map.mxd

Figure **1-2**

(This page intentionally left blank)

Likewise, scheduled commercial aircraft operations have decreased from 6,600 in 2000 to 635 in 2012. GA now accounts for 99 percent of all operations. The overall decrease in activity at Hanscom mirrors long-term national trends in aviation use and fleet mix change

Despite these trends, Hanscom Field continues to play an important role as a regional transportation asset that is linked to the economic health of the region. This is reflected in the expanding market for corporate aviation. Business jet operations at Hanscom have increased 27 percent from 2000-2012 possibly indicating sustained growth in that sector.

1.3 Hanscom Field Environmental Review Process

Since 1985, the Massachusetts Secretary of the Executive Office of Energy and Environmental Affairs (EEA) has requested that Massport prepare an ESPR every five years, in order to evaluate the cumulative effect of growth and change at Hanscom Field and provide data and analyses on noise, ground transportation, air quality, and water quality. The original *1985 GEIR* (Generic Environmental Impact Report), the *1995 GEIR* Update, the *2000 ESPR*, the *2005 ESPR*, and now the *2012 ESPR* provide a retrospective analysis of the environmental effects of Hanscom Field while including analyses for future conditions. With the EEA Secretary's approval, the current ESPR was deferred until analysis year 2012 due to the economic recession of 2008-09 and respective decline in the number of aviation operations, which have remained well below the 2005 and future analysis years (see Appendix A). The role of the ESPR and relationship to project-specific environmental review is described below.

1.3.1 Role of the ESPR as an Airport-wide Review

Environmental review of Hanscom Field activities is undertaken at the state level through the ESPR process, which provides a public forum to assess the cumulative environmental effects of airport operations and informs Massport and the community regarding the implications of those environmental effects. The ESPR presents an overview of the operational environment and planning status of Hanscom Field and long-range projections of environmental conditions against which the effects of future individual projects can be compared. It allows the reader to see past and current environmental information, and a forecast of potential future environmental effects at Hanscom Field based on realistic changes in activity levels.

The ESPR is an important tool in early public engagement for future development activities. It provides a list and description of capital projects that may be undertaken or supported by Massport within the timeframes of the 2020 and 2030 scenarios. Additionally, the ESPRs are a comprehensive source of technical data and planning information for use by the towns of Bedford, Concord, Lexington, and Lincoln, State agencies and other interested parties. The ESPR does not replace the requirement for filing an Environmental Notification Form (ENF) for a specific project that meets or exceeds a MEPA regulation threshold.

1.3.2 Project-Specific Review

While the ESPRs are an important part of the regulatory process, environmental review must also be undertaken on a project-specific basis, as indicated in the EEA Certificate for the *2012 ESPR*:

> The ESPR does not replace the MEPA review of specific projects at Hanscom that meet or exceed regulatory thresholds, with the exception of routine maintenance and replacement projects. For each project-specific review, Massport would be required to perform an individual analysis of impacts and mitigation (for those projects that require a stand-alone EIR and Section 61 Findings).

> The ESPR serves as a vehicle for ensuring that the long-term, broad-scope planning informs the review and implementation of individual actions at Hanscom Field.

In cases where the state environmental review thresholds are triggered, Massport or the project proponent will prepare the appropriate environmental filing, including an ENF or, for projects of significant scale requiring more extensive MEPA review, an Environmental Impact Report (EIR). Where National Environmental Policy Act (NEPA) environmental review thresholds are triggered at the federal level, projects typically are also reviewed under the NEPA environmental review process with the FAA acting as the lead federal agency responsible for NEPA compliance. Both MEPA and NEPA review processes include opportunities for public comment. For example, the Runway 5/23 Safety Area Improvements project required subsequent review under MEPA and NEPA, with a Final Environmental Impact Report (FEIR) Certificate issued on March 15, 2007.

Massport also meets monthly with the Hanscom Field Advisory Commission (HFAC) to review activities at Hanscom Field. HFAC was established by an act of the state legislature in 1980 and includes 16 members appointed by constituent groups and approved by the selectmen from the four host municipalities. HFAC includes representatives from the towns of Bedford, Concord, Lexington, and Lincoln; local citizens groups; other area towns affected by Hanscom Field; businesses basing aircraft at Hanscom Field; aviation or aviation-related businesses at Hanscom Field; and business aviation and/or general aviation organizations. The HFAC process provides an opportunity to review projects that are not subject to formal MEPA review.

1.4 Development of the 2012 ESPR

Massport filed the *2005 ESPR* in November 2006 and the Secretary issued the MEPA Certificate on March 29, 2007, which determined that the *2005 ESPR* "adequately and properly complies with the Massachusetts Environmental Policy Act." The Secretary's Certificate requires that the major areas of analyses for the next ESPR include, but are not limited to, aviation planning, landside planning, ground access, noise, air quality, water quality, cultural and historical resources, sustainability and airport mitigation.

Using the 2007 Certificate as a starting point, Massport filed a proposed scope for the *2012 ESPR* with MEPA on February 28, 2012 and MEPA published notice of the proposed scope in the March 7, 2012 edition of the "Environmental Monitor." After an extended public comment period which included scoping meetings at the Lexington Town Hall on March 20th and Bedford Town Hall on April 4th, the Secretary issued the scope for the *2012 ESPR* in its Certificate on May 18, 2012.

The *2012 ESPR* follows the general outline of the *2005 ESPR*. The *2005 ESPR* was initially filed as a Draft ESPR in accordance with the MEPA Scope. Since there were limited comments on the 2005 Draft ESPR, the document was re-noticed as the Final ESPR. Based on this experience, Massport proposed and EEA agreed that a single ESPR is now appropriate given that Massport also prepares and circulates the "Annual Noise Report" and the "State of Hanscom" every year to the public. A single ESPR volume is consistent with the ESPR process for Boston Logan International Airport (EEA #3247).

Detailed ESPR technical studies are summarized in a readable format to illustrate clearly the implications of recent trends, existing conditions and potential future scenarios. The ESPR builds on the base information developed for the *2005 ESPR*, presenting policy considerations and an overview of the airport's current and potential future role within the regional planning context, including a status report on Massport's proposed planning initiatives and projects. The *2012 ESPR* technical studies include analysis of airport activity levels, ground access, noise, air quality, water quality, natural resources, cultural and historical resources, and sustainability.

This section outlines the enhancements to the technical analysis since the *2005 ESPR*, describes the outreach program for the development of the *2012 ESPR*, and provides a schedule for the *2012 ESPR* public review and comment.

1.4.1 Technical Analysis and Data Gathering for the 2012 ESPR

Massport has responded to the Secretary's Certificate and prepared a detailed study of existing and projected future conditions at Hanscom. The *2012 ESPR* includes a comprehensive analysis of information collected over the past three ESPRs to show important trends in Hanscom and regional activities and the associated trends in environmental conditions over that time.

The preparation of single forecast scenarios for the two planning years (2020 and 2030) based on realistic development assumptions provides a practical and effective way to evaluate potential future environmental effects and avoids confusion with the previously reviewed high and moderate growth conditions. The *2012 ESPR* updates several of the comprehensive studies undertaken in 2005, including the reconnaissance level survey of historic and archeological resources, detailed field measurements of traffic conditions, and quantification of acreage and linear miles of cultural, historical and recreational resources within the 65 and 55 dBA Day-Night Sound Level (DNL) contours. Commuter surveys and parking lot occupancy assessments were also repeated providing for comparisons over time.

Issues that are addressed in the *2012 ESPR* include airport facilities and infrastructure; aviation activity levels; airport planning; regional transportation context; ground transportation; noise; air quality; wetlands, wildlife, and water resources; historical and cultural resources; sustainability; and summary of potential beneficial measures. Technical appendices are provided with responses to comments on the proposed *2012 ESPR* Scope and supportive material for the technical studies.

1.4.2 Outreach for Preparation of the 2012 ESPR

In addition to the MEPA scoping process, Massport engaged with state, regional and local agencies and commissions in the preparation of the *2012 ESPR*. Massport met with a variety of groups to review the scope and methodologies, solicit information for inclusion, and identify the need for additional studies. Many others were contacted by phone.

Massport sent letters to each of the local Historic Commissions and then made a presentation at one of their regularly scheduled public meetings where the *2012 ESPR* planning effort was described and input solicited. Specifically, each commission was asked to discuss any updates to historic resources since 2005 that should be included in the *2012 ESPR*. This information has been incorporated into Chapter 10 Cultural and Historical Resources.

Massport also sent letters to each of the Town Planners informing them of the *2012 ESPR* and requesting information about planned development and infrastructure projects, the status of their long-range comprehensive plans and changes in conservation and recreational land. Follow-up calls were made to each of the planning offices to discuss the material and ensure a comprehensive amount of input. This information has been incorporated in Chapter 4 Airport Planning, Chapter 6 Ground Transportation, and Chapter 10 Cultural and Historical Resources.

MMNHP staff reviewed existing material about the Park and provided updates. Staff from the Hanscom AFB cooperated on efforts to minimize single occupancy automobile travel. Table 1-1 provides a list of all outreach meetings conducted by Massport for the 2012 ESPR.

Table 1-1 2012 ESPR Outreach Meetings

Category	Meeting	Date
Federal Agencies	National Park Service	May 23, 2013
State Agencies	MassDOT, MassRides	October 10, 2013
Town Planning Departments	Letters and Telephone correspondence	March-June 2013
Historic Commissions	Bedford Historic Preservation Commission	January 7, 2013
	Concord Historic Commission	December 13, 2012
	Lexington Historic Commission	January 10, 2013
	Lincoln Historic Commission	February 5, 2013
Others	Hanscom Field Tenants	December 18, 2012
	Hanscom AFB	September 19, 2013

1.4.3 Environmental Review Schedule

The environmental review schedule provides several opportunities beyond those required by the MEPA process for the public to learn about activities at Hanscom both today and in the future. The public comment schedule for this *2012 ESPR* is as follows:

- Massport filed the *2012 ESPR* with the EEA, MEPA Office on December 31, 2013. Notice was published in the Environmental Monitor on January 8, 2014.
- Massport has requested an extension of the required 30-day public comment period to 60 days, with the comment period ending on March 10, 2014. The Secretary's Certificate is anticipated to be issued approximately one week later.
- A MEPA consultation meeting will be scheduled specifically for MEPA to solicit public comments on the ESPR.
- The ESPR will be presented at the monthly Hanscom Area Town Selectmen (HATS) meeting in January during the MEPA comment period.
- In addition, three public presentations will be scheduled prior to the close of comments to provide greater detail on each of the technical topic areas addressed in the *2012 ESPR*.

1.5 Primary Findings of the 2012 ESPR

The following section provides a summary of the key *2012 ESPR* findings, corresponding with the subject matter of each chapter.

Airport Facilities and Infrastructure

Since the *2005 ESPR*, Massport has made key improvements to fundamental airport infrastructure at Hanscom Field and third-party developers have upgraded corporate aviation facilities. The following is a list of significant projects and activities completed since 2005:

- Runway Safety Area (RSA) improvements at Runway Ends 5 and 23 including grading of the RSA and wetland replication to meet federally-mandated airfield safety standards (2008)
- RSA improvements at the end of Runway 11 by relocating portions of the perimeter road (2012)
- Reconstruction of the western end of Taxiway E, Taxiway G, and Taxiway M (2009)
- Redevelopment of the Hangar 24 site for a Fixed Base Operator (FBO) facility by Rectrix Aviation, a project which is nearing completion at this time
- Removal of fuel storage tanks at Hangar 10 (2011)

- Implementation of enhanced access control system and replacement of a portion of the perimeter fence (2012)
- Relocation of portions of the perimeter road at the approach to Runway 29 (2012)
- Ongoing airfield maintenance
- Ongoing vegetation removal and maintenance

Due to a decrease in airport activity levels, most of the projects undertaken were primarily associated with updating and maintaining existing infrastructure. The ongoing redevelopment of hangar/FBO space by Rectrix Aviation is representative of the persistent demand for business aviation use of the airfield.

Since the *2005 ESPR*, there has been no increase in impervious surface. Additionally, there have been no significant changes in the utility systems or in the parking spaces inventoried in the *2005 ESPR*.

Airport Activity Levels

In 2012, Hanscom Field accommodated approximately 166,000 aircraft operations, with GA accounting for 99 percent and commercial and military operations accounting for the remainder. Nearly three-quarters (73 percent) of the operations performed at Hanscom in 2012 were in single-engine piston (SEP) aircraft, consisting primarily of training operations and recreational (or personal) flying. Training at two flight schools at Hanscom is the prevailing type of aircraft operation at Hanscom Field.

Hanscom also serves the needs of business aviation users, including corporations that own their own aircraft and businesses that charter private flights. Business aviation operations conducted in jets, turboprops, and multi-engine piston aircraft accounted for 22 percent of Hanscom's activity. Streamline Air offered regularly scheduled commercial passenger services at Hanscom from April 2011 to September 2012 primarily serving business travelers. No scheduled commercial flights have operated at Hanscom Field since September 13, 2012.

Hanscom's total aircraft operations have declined by 2.0 percent annually since 2000, from approximately 218,000 operations in 2000 to 166,000 operations in 2012. The drop in operations at Hanscom mirrors a long-term decline in GA activity in the U.S, due rising fuel prices and the economic recession of 2008-09. Nationally, the GA industry has yet to recover from the downturn. GA operations at U.S. airports with air traffic control towers were down by nearly 7 percent in 2012 compared to 2009. However, GA at Hanscom Field has recovered with operations increasing by approximately 11 percent over the same period. Business aviation has been the fastest growing segment of activity at Hanscom Field, increasing at a long-term average annual rate of 2 percent from 2000 to 2012. After a sharp decline in business aviation following the economic recession of 2008-09, business operations have been slow to recover due to the sluggish pace of economic growth and fiscal uncertainty. Yet, investment commitments from the FBOs suggest a strong future market for business aviation at Hanscom.

Total aircraft operations are forecast at 168,300 in 2020 and 193,100 in 2030. Long-term growth in overall aircraft operations is expected to be modest at 0.8 percent per year from 2012 to 2030. Consistent with a positive outlook for business aviation nationally, total business-related operations are expected to increase by 2.9 percent per year reaching nearly 60,000 operations in 2030. The subset of business jet operations are forecast to grow by 3.4 percent per year to nearly 46,800 in 2030. Table 1-2 presents actual 2005 and 2012 aviation activity levels (7:00 am to 11:00 pm) by aircraft type to illustrate recent trends and then activity levels forecasted for the planning years of 2020 and 2030.

Table 1-2 Summary of Actual and Forecast Activity Levels at Hanscom Field

	Actual 2005	Actual 2012	Forecast	
			2020	2030
Aircraft Operations (7:00 am to 11:00 pm)				
General Aviation				
Local (SEP)	58,535	70,196	62,605	65,164
Personal Flying (SEP)	57,894	51,477	50,661	58,285
Business Non-Jet (MEP + Turbo)	9,646	10,178	10,861	12,985
Business Jet	32,345	25,638	35,043	46,782
Helicopter	7,004	7,345	7,345	7,345
Subtotal GA	**165,424**	**164,834**	**166,515**	**190,561**
Military	**904**	**745**	**745**	**745**
Commercial Scheduled Airline[1]	**3,627**	**635**	**1,040**	**1,820**
Total Operations	**169,955**	**166,214**	**168,300**	**193,126**
Based Aircraft	**387**	**340**	**360**	**416**
Commercial Airline Passengers	**17,457**	**8,609**	**20,280**	**40,600**

Notes:
1. Aircraft operations are tracked by the FAA daily between 7:00 am and 11:00 pm, which are the hours that the air traffic control tower is open.

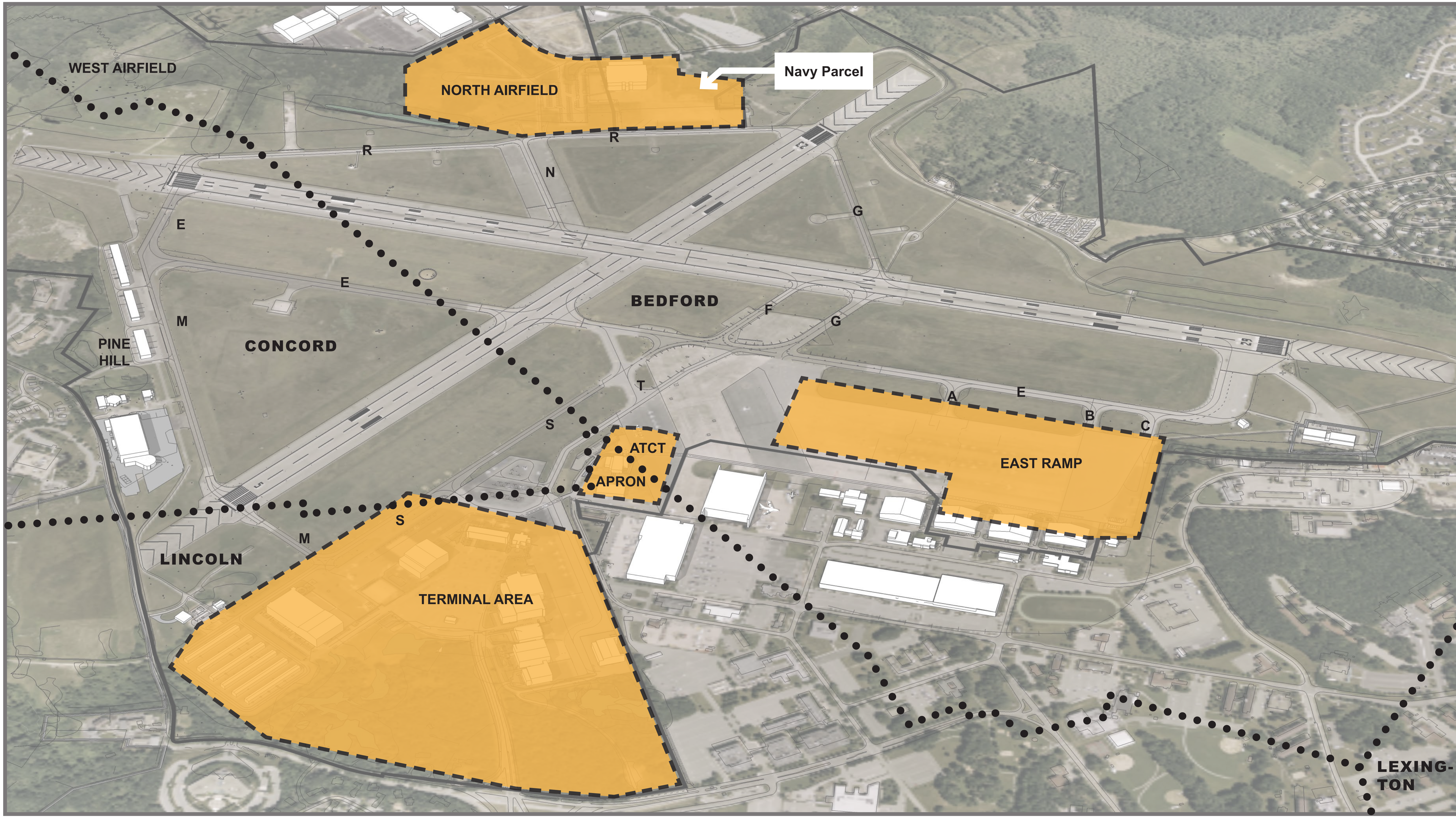
Source: Massport and FAA Tower Counts

Airport Planning

The airport planning section of the *2012 ESPR* includes an assessment of the adequacy of existing facilities to support safe aviation activity and an evaluation of improvements necessary to support anticipated future aircraft activity levels. It also considers Hanscom's future role in the regional transportation network, recent and expected near-future trends in the industry, and other conditions that will support a sustainable aviation business. Planning for Hanscom Field is based on the airport activity levels that have been forecast for the 2020 and 2030 planning scenarios. The planning concepts take into account the 1978 Master Plan and Massport's 1980 Regulations, which establish the general planning framework for Hanscom Field. Detailed environmental analysis would occur for projects that move from conceptual screening to the proposal stage when those projects exceed MEPA or NEPA review thresholds.

This ESPR assesses current planning initiatives and projects at Hanscom Field, and compatible development consistent with activity forecasts for the 2020 and 2030 planning scenarios. If fully implemented, the plans included in the 2020 scenarios would create approximately 9 acres of new impervious surface as compared to 2012 (2 acres at the Terminal Area and 7 acres in the North Airfield). By comparison, if fully implemented, the 2030 scenarios would create approximately 19 acres of new impervious surface as compared to 2012 (10 acres at the Terminal Area and 9 acres in the North Airfield). Where new construction is proposed, Massport will consider opportunities to remove existing pavement to achieve its goal of no net gain in impervious surfaces. These impervious surface estimates are for planning purposes only and measures would be taken to minimize or offset any potential increases in impervious surfaces.

Figure 1-3 depicts the possible location of planning initiatives and concepts in the 2020 and 2030 scenarios. Table 1-3 summarizes the current planning initiatives and projects at Hanscom Field,



Town Boundaries
Property Line

Aerial: Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

massport

Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

Planning Areas

Figure **1-3**

(This page intentionally left blank)

supporting Hanscom Field's role as a premier full-service GA airport. Massport has identified appropriate environmental management approaches to achieve consistency with the local and regional plans.

Table 1-3 Potential Planning Concepts under the 2020 and 2030 Scenarios

Planning Area	2020 Scenarios[1]	2030 Scenarios[2]
Terminal Area	• Replacement hangars with associated support facilities and a new access road • Replacement of salt storage/maintenance facility • First phase of Air & Space Museum for the Massachusetts Aviation Historical Society • Civil Air Terminal enhancements	• Second phase of Air & Space Museum • GA hangars with associated support facilities • Hotel • Civil Air Terminal enhancements • New and replacement structured public parking spaces as needed
Air Traffic Control Tower (ATCT) Apron	• Addition to the airport maintenance facility • Relocation option for US customs facility	• Addition to the airport maintenance facility • GA hangar development • Alternative landside access
East Ramp	• GA hangars with associated support facilities • Alternative landside access • Relocation option for US customs facility	• GA facilities and replacement of existing GA hangars • Alternative landside access
North Airfield	• GA hangars with associated support facilities on existing Massport property as well as on land expected to be obtained from the Navy	• GA facilities on existing Massport property as well as on land expected to be obtained from the Navy

Note:
The Pine Hill and West Airfield areas are referenced in this ESPR for consistency with past ESPRs. No new development has been evaluated for the *2012 ESPR*. The 2005 planning concepts can be considered current.
1. 2020 includes potential activities in 2013 through 2020.
2. 2030 includes potential activities in 2021 through 2030 and planning concepts from the 2020 scenarios.

Regional Transportation Context

Massport advocates a multi-modal regional transportation policy to improve the efficient use of the region's transportation infrastructure by appropriate expanded use of regional airports and alternative transportation modes. For more than a decade, Massport has formed partnerships with federal, state, and regional agencies to expand and improve inter-city travel options for the New England region by supporting an integrated, multi-modal, regional transportation network.

Within this context, Massport is committed to maintaining Hanscom Field as a vital transportation resource within the regional airport system. Because of its proximity to Boston and Route 128 area businesses that rely on corporate aviation, Hanscom Field handles about 166,000 annual GA operations, more GA activity than any other GA or commercial service airport in the region. Hanscom Field will continue to function within the regional airport network primarily as a GA reliever for Logan Airport with a limited role as a commercial air service airport.

Table 1-4 GA Operations at Airports in the Boston Metropolitan Area

Airport[1]	Primary Aviation Service	GA Operations[2]		Average Annual Growth	Percent Local[3]	Based Aircraft[3]
		2005	2012			
Hanscom Field	General Aviation	165,424	164,835	-0.1%	42.3%	340
Norwood Municipal	General Aviation	70,496	68,405	-0.4%	51.9%	160
Beverly Municipal	General Aviation	64,110	58,203	-1.4%	54.9%	98
Nashua/Boire Field	General Aviation	127,573	55,620	-11.2%	53.2%	324
Lawrence Municipal	General Aviation	70,828	52,157	-4.3%	45.8%	212
Worcester Regional	General Aviation	65,938	44,070	-5.6%	39.8%	63
Portsmouth International	General Aviation	32,586	38,132	2.3%	67.7%	117
Boston Logan International	Commercial Service	32,652	28,144	-2.1%	0.0%	-
Manchester-Boston	Commercial Service	27,538	12,504	-10.7%	21.8%	60
Total		**657,145**	**522,070**	**-3.2%**	**39.8%**	**1,322**

Sources:
Massachusetts Port Authority; Federal Aviation Administration, ATADS; and FAA, Terminal Area Forecast, December 2012.
Notes:
[1] Includes air taxi operations except for Manchester-Boston Airport, where air taxi operations counts are comingled with regional commuter airline operations.
[2] Hanscom Field based aircraft are from Massport records. All other based aircraft from FAA, Terminal Area Forecast.
[3] Presents statistics for 2012.

As shown in Table 1-4, GA operations at airports in the greater Boston area fell by 3.2 percent per year between 2005 and 2012, consistent with national trends. GA operations at all U.S. towered airports declined by 3.6 percent per year from 2005 to 2012.[1] High fuel prices, a weak economy, and a decline in the number of student pilots over the past decade have depressed the overall demand for GA. An even sharper drop in GA occurred following the economic recession of 2008-09 and a reduction in the use of corporate air transportation by many businesses. Over a two-year period from 2007 to 2009, GA operations in the U.S. fell by 15.5 percent.[2]

GA activity levels at Hanscom Field have remained relatively stable in recent years. Between 2007 and 2012, GA and military operations at Hanscom declined slightly by an average 0.1 percent per year. While Hanscom's current GA operations are still substantially lower than previous peak levels (over 204,000 in 2000 and over 300,000 in the 1970s), the airport has continued to accommodate a very strong level of GA demand and has performed well relative to other GA reliever airports in the region. With its proximity to Boston, as well as the growing metro-west suburbs and Route 128/I-495 area businesses, Hanscom is expected to continue to be the principal airport for the region's corporate and business aviation needs.

Ground Transportation

Consistent with conditions reported in the *2005 ESPR*, Hanscom Field is not a significant contributor to traffic volumes on the roadways that surround the airport. Commercial and residential developments, coupled with reliance on single occupancy vehicles, remain the most significant source of traffic volume on area roadways. As Figure 1-4 indicates, Hanscom Field traffic comprises four percent of traffic on Route 2A during the morning peak hour and afternoon peak hours in 2012, comparable to 2005 levels. The contribution of Hanscom Field traffic to Route 2A volumes could increase to 5 percent in the 2020 planning scenario and 7 percent in the 2030 planning scenario.

[1] FAA, Aerospace Forecast, FY2013 – FY2033.
[2] Ibid.

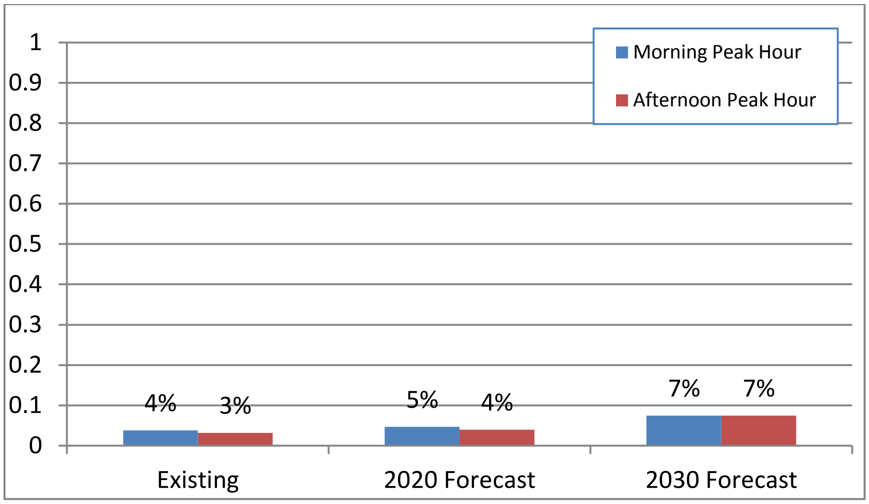


Figure 1-4 Hanscom Field Peak Hour Traffic Volumes as a Percent of Route 2A (East of Hanscom Drive) Traffic Volumes for Existing and Future Conditions

The lack of effect on area roadways by Hanscom Field is historical and long-standing. Traffic arrivals and departures by Hanscom Field employees and passengers are scheduled to avoid peak hour congestion. As Table 1-5 indicates, the amount of peak hour traffic generated in 2012 by Hanscom Field has not changed significantly since 2005. The average daily traffic volumes entering and exiting Hanscom Field have decreased from 2,600 in 2005 to 2,200 vehicles in 2012, consistent with the reduction in commercial air passenger and GA activity at the airport. Because of the refinements to the aviation activity forecasts, the 2020 and 2030 ground traffic volume estimates are significantly less than the *2005 ESPR* estimates.

Table 1-5 Hanscom Field Peak Hour Trip Generation

Year/Scenario	Morning Peak Hour	Afternoon Peak Hour
2005 Actual	157	154
2012 Actual	165	121
2020 Forecast	220	166
2030 Forecast	384	336

The assessment of traffic operations at morning and afternoon peak for the 2020 and 2030 scenarios indicate that most intersections would operate at the same level of service or with slight increases in delay regardless of the level of Hanscom Field-related traffic growth. Transportation Demand Management (TDM) and operational approaches would be expected to minimize any slight increases in delay associated with the 2020 and 2030 scenarios.

Noise

In general, noise levels at Hanscom Field have decreased over the last several years, due primarily to decreases in operations, technological and development of quieter and better performing aircraft. In addition, Massport instituted changes in the Fly Friendly Program in 2009 to minimize flights over the MMNHP and nearby residential areas. Overall noise levels are projected to increase in the 2020 and 2030 planning scenarios, driven by forecast increases in Stage 3 GA jet activity.

Using radar data, Massport staff monitors the number of touch-and-go operations over the MMNHP. This data is a critical part of ongoing quarterly meetings between Massport, FAA air traffic control tower, and flight school staff to review touch-and-go flight paths. Since the initiation of this program, flights over MMNHP have been reduced by an average of 21%.

Comparison of year 2012 Day-Night Sound Levels (DNL)[3] noise contours to 2005 contours shows that overall noise levels decreased, largely due to lower activity levels by jets and Stage 2 GA aircraft, as well as decreased nighttime operations. The total population exposed to sound levels greater than DNL 65 dB has decreased from 17 people in 2005 to 0 people in 2012. The total population in the four towns exposed to DNL values of 55 dB or greater in 2012 is estimated to be 1,041, down from 2,953 in 2005. [DNL 65 dBA is a threshold at which the FAA defines a significant impact; DNL 55 dBA is the level for analysis requested by MEPA.] Table 1-6 presents the population estimates within the 65 and 55 DNL contours existing, past and future forecast scenarios. Even with the projected growth in operations for 2020 and 2030, no residents near Hanscom Field are expected to be located within the 65 dB contour and populations exposed to both the 65 dB and 55 dB contour will remain below 2005 actual levels. Figure 1-5 provides a visual comparison of the 2005 and 2012 DNL noise contours.

Table 1-6 Summary of U.S. Census Population Counts within DNL Contours

Year/Scenario	Population[1]	
	65 dB or Greater[2]	55 dB or Greater[3]
2000	26	2,848
2005	17	2,953
2012	0	1,041
2020	0	1,176
2030	0	1,859

Notes:
1. Based on the most recent U.S. Census information available
2. These population estimates fall within the 65 and 70 DNL contours.
3. These population estimates include population within the 55, 60, 65 and 70 DNL contours.

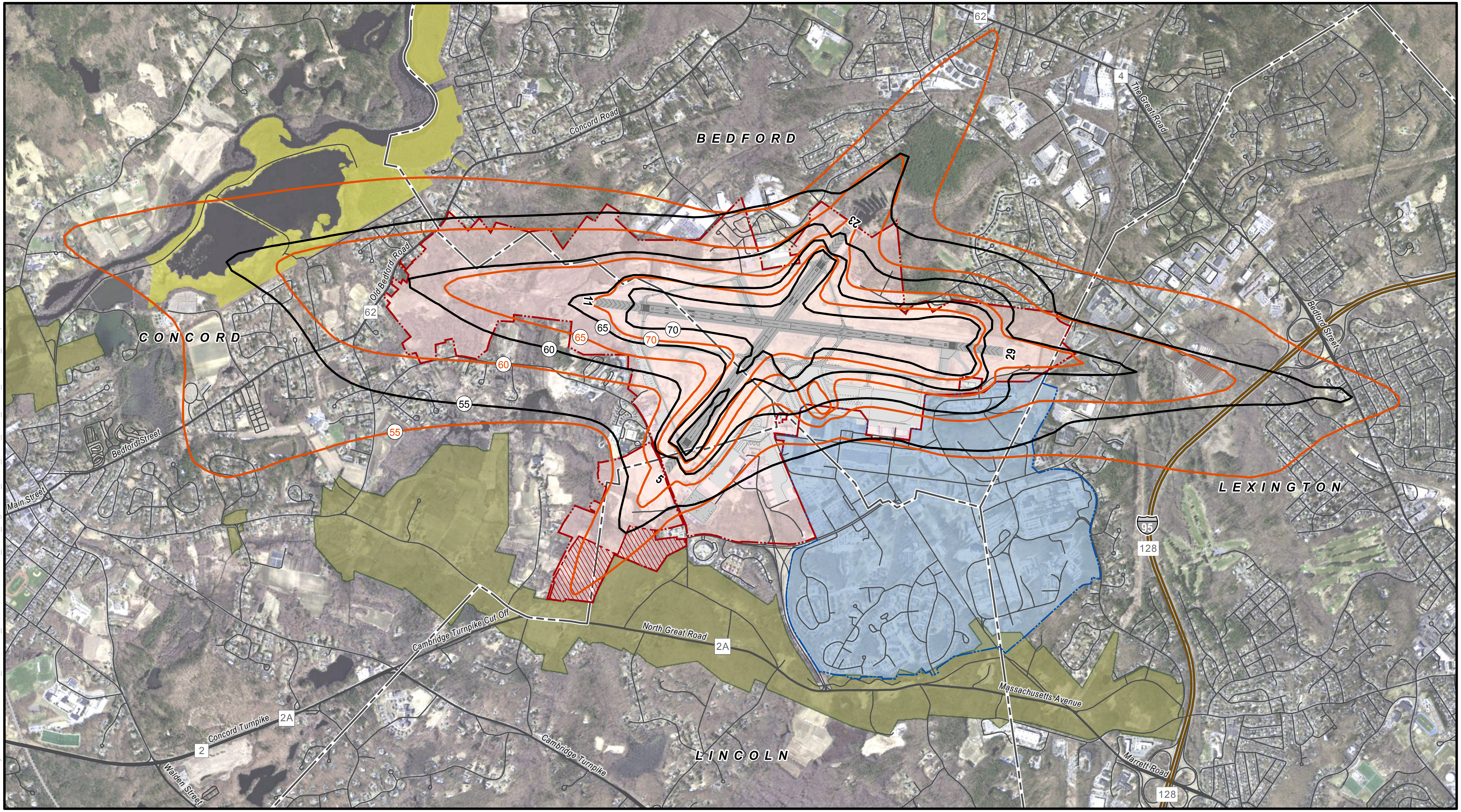
The analysis of the 2020 and 2030 scenarios suggest that the greatest noise exposures would occur in the 2030 scenario since it has the highest projected activity levels. Even with activity increases over current levels, no noise analysis locations (including historic sites) would experience a DNL value greater than 60 dB under any future scenario. The Deacon John Wheeler/Capt. Jonas Minot Farmhouse and the Wheeler-Meriam House are the only historic sites that would experience noise levels between 55 and 60 dBA in the 2020 and 2030 scenarios.

No portion of the MMNHP is located in the 55 DNL contour in 2012. For the 2020 scenario, the MMNHP will remain outside of the 55 DNL contour and only a small portion of the MMNHP (0.4 acres) will be in the 55 DNL contour in 2030.

Air Quality

Aircraft emissions for all pollutants decreased between 2005 and 2012. These changes are a result of the changes in the mix of aircraft operating at Hanscom Field as well as a reduction in the number of operations. Roadway emissions for all pollutants declined between 2005 and 2012 due to the effects of more stringent federal emission controls on motor vehicles. Table 1-7 presents changes in total air emissions at Hanscom Field between 1985 and 2012 and shows the overall improvements in air quality over the past two decades.

[3] DNL: Average annual daily sound level, in decibels, computed on the basis of a 24-hour period.



North

0 2,000 4,000 Feet

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Community Boundaries), March 5, 2013; NPS (Park Boundary), March 8, 2013; ArcGIS - Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

2012 DNL Noise Contour
2005 DNL Noise Contour
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

Open Water
Wetland/Marsh
Stream
MNNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2005 and 2012 DNL Noise Contour Comparison

Figure **1-5**

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure1-5_2005_2012_DNL_Noise_Contour_Comparison.mxd

(This page intentionally left blank)

Table 1-7 Total Air Emissions at Hanscom Field (1,000s of kg/yr)

Pollutant/Source	Year						Percent Change (Total)			
	1985	1995	2000	2005 (EDMS v4.3)	2005 (EDMS v5.1.4.1)	2012	1985 to 2005	1995 to 2005	2000 to 2005	2005 to 2012
CO										
Aircraft	698.8	409.2	591.2	483.6	1,670	1,123				
Ground Vehicles	49.2	30.3	60.8	36.1	36.1	19.05				
Total	**748.0**	**439.5**	**652.0**	**519.7**	**1,706.1**	**1,142.1**	**-31%**	**+18%**	**-20%**	**-33.1%**
NO_x										
Aircraft	14.2	14.9	25.4	28.0	34.1	31.9				
Ground Vehicles	5.1	3.9	6.9	4.1	4.1	2.18				
Total	**19.3**	**18.8**	**32.3**	**32.1**	**38.2**	**34.1**	**+66%**	**+71%**	**-1%**	**-10.7%**
VOC										
Aircraft	38.3	27.9	39.4	58.1	112.7	80.4				
Ground Vehicles	5.0	2.9	3.0	1.6	1.6	0.86				
Total	**43.3**	**30.8**	**42.4**	**59.7**	**114.3**	**81.3**	**+38%**	**+94%**	**+41%**	**-28.9%**
PM_{10}										
Aircraft	2.6	2.3	2.3	3.0	13.5	9.9				
Ground Vehicles	0.4	0.6	0.21	0.14	0.14	0.10				
Total	**3.0**	**2.9**	**2.51**	**3.14**	**13.6**	**10.0**	**+5%**	**+8%**	**+25%**	**-26.5%**
$PM_{2.5}$										
Aircraft	2.6	2.3	2.3	3.0	13.5	9.9				
Ground Vehicles	0.4	0.6	0.16	0.10	0.10	0.06				
Total	**3.0**	**2.9**	**2.46**	**3.10**	**13.6**	**9.96**	**+3%**	**+7%**	**+26%**	**-27%**
CO_2										
Aircraft	7,280.6	6,727.8	10,108.1	11,806.6	19,233	16,356				
Ground Vehicles	-	-	1,495.6	1,312.3	1,312.3	1,555.4				
Total	**-**	**-**	**11,603.6**	**13,118.9**	**20,545**	**17,911**	**-**	**-**	**+13%**	**-12.8%**

Note:
1. Data to calculate the ground vehicle CO2 emissions for 1985 and 1995 were not were available; therefore, total CO2 emissions for these years are not available for comparison with later years
2. Percent total based on EDMS 5.1.4.1 to estimate aircraft emissions for 2005 and 2012.

All current and predicted year 2020 and 2030 air pollutant concentrations are safely in compliance with state and federal health-based air quality standards. Calculations of annual emissions from aircraft operations and motor vehicles accessing the airport demonstrate that Hanscom Field emissions are a very small fraction of regional emissions.

Wetlands/Wildlife/Water Resources

In 2008, Massport updated its Vegetation Management Plan (VMP) to address the goals of aviation safety and natural resource management. In accordance with the VMP, Massport removed vegetative obstructions to Runway 23. This project also resulted in the renewal of trail connections between Bedford and Concord conservation lands. Additional wetland areas around the Terminal Area have also been delineated as part of proposed redevelopment projects including a new hangar proposed by Jet Aviation. An updated composite wetlands plan showing newly identified wetland areas is provided in this ESPR. Table 1-8 presents the current state-listed Endangered, Threatened, or Special Concern Species at Hanscom Field. Future development contemplated to support increased aircraft activity levels is not currently proposed in any areas currently identified as habitat for state-listed species. Most new development is also located outside of wetlands and buffer zones. Activities proposed in areas subject to review under the Massachusetts Wetlands Protection Act (MAWPA) are subject to review by the municipal conservation commission and Massport will make the necessary filings.

Table 1-8 Endangered, Threatened, or Special Concern Species at Hanscom Field

Common Name	Latin Name	Status[1]
Upland Sandpiper	*Bartramia longicauda*	Endangered
Grasshopper Sparrow	*Ammodramus savannarum*	Threatened
Blanding's Turtle	*Emydoidea blandingii*	Threatened
Wood Turtle	*Glyptemys insulpta*	Special Concern

Source:
Natural Heritage and Endangered Species Program, January 13, 2013 letter
Notes:
1. In accordance with the Massachusetts Endangered Species Act (M.G.L. Ch. 131A) and regulations (321 CMR 10.03)

Massport has been working cooperatively with the Massachusetts Department of Environmental Protection (MassDEP), the U.S. Environmental Protection Agency (EPA), and the U.S. Air Force (USAF) to improve the flow characteristics and profile of stormwater discharges into the Shawsheen River. Massport continues to evaluate pavement removal to decrease impermeable areas on the airfield and has incorporated water quality and quantity improvements into ongoing projects using Low Impact Development (LID) technologies. Massport has also taken measures to control stormwater discharges into the river directly. In 2008, Massport had silt and sand removed from portions of three storm drainpipes just upstream from the Shawsheen River. In 2009, Massport completed soil permeability testing related to the potential installation of additional stormwater structures designed to increase groundwater recharge and decrease runoff.

Massport continues to comply with its Spill Prevention Control and Countermeasure (SPCC) Plan. The "State of Hanscom" states that there has been one reported spill at Hanscom Field since 2005. The spill was reported to MassDEP and appropriate measures were taken to protect the environment. During 2003 and 2004, Massport conducted a deicing study and monitoring at Hanscom Field. The study showed that neither current nor future scenario deicing at Hanscom Field would adversely affect the water supply for Bedford, Burlington or any other community. Massport continues to utilize the results of this study in evaluating impacts of deicing materials at Hanscom.

Any projects implemented under the 2020 and 2030 scenarios will meet requirements of the Stormwater Regulations under the MAWPA and its National Pollutant Discharge Elimination System (NPDES) permit.

Cultural and Historical Resources

The Massachusetts Historical Commission (MHC) maintains the State Register of Historic Places, MHC Inventory, and the Massachusetts Cultural Resource Information System (MACRIS). These resources provided baseline information for Bedford, Concord, Lexington, and Lincoln, which was supplemented through research of the MHC Inventory and the MACRIS files, discussions with the historic commissions for each of the four towns and research of their files, and discussions with the National Park Service (NPS). The inventory of existing cultural and historical resources included the identification of historic buildings and landscapes in MMNHP.

The *2012 ESPR* describes the potential environmental effects of traffic, air quality, and noise on cultural and historical resources. Impacts from roadway improvements are unlikely given Hanscom's comparatively small contribution to traffic and Massport's preference for TDM and other traffic management strategies that do not require physical modification to intersections. There are no expected adverse effects attributable to air quality in 2012 or under the 2020 and 2030 scenarios for any cultural and historic resources.

Table 1-9 lists noise exposure for 2005 and 2012 to demonstrate recent trends and for the forecasted 2020 and 2030 scenarios for State Register properties, the MMNHP, Great Meadows National Wildlife Refuge (GMNWR), and key conservation and recreational facilities. The results show that noise exposure has decreased significantly from 2005 to 2012 for all of the cultural and recreational areas listed. For future scenarios, noise exposure levels at State Register historic properties would increase from DNL 0.5 to 1.5 dBA above 2012 levels in the 2020 planning scenario to DNL 1.5 to 2.0 dBA above 2012 levels in the 2030 scenario. Figure 1-6 illustrates the location of historic resources relative to the recent noise levels (2005 and 2012) and projected noise levels (2020 and 2030 scenarios).

Analysis shows that no buildings or historic districts have exposure above 65 dB DNL in 2012 or would have exposure above DNL 65 dBA in any of the 2020 or 2030 scenarios. For the Hartwell Town Forest/Jordan Conservation Area, approximately 0.1 acres would be exposed to the DNL 65 dBA contour in 2012, a decrease from 1.4 acres in 2005. No historic districts including the MMNHP exist within the DNL 55 dBA contour in 2012. Two individual National and State Registers properties have DNL values greater than DNL 55 dBA in 2012, which are 1.7 to 2.0 dB lower than in 2005, respectively:

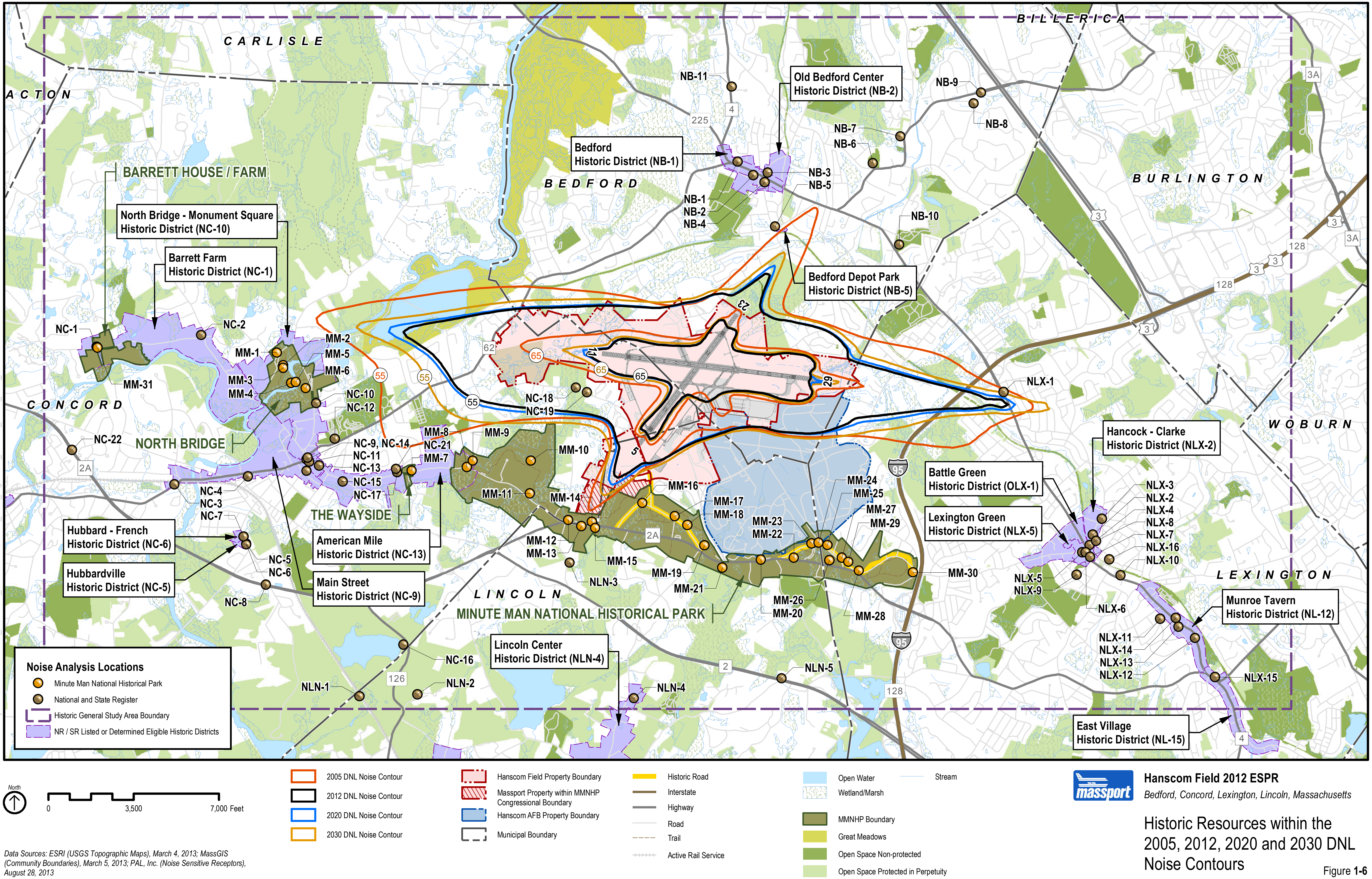
- The Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace), 341 Virginia Road in Concord at DNL 58.4 dBA
- The Wheeler-Meriam House, 477 Virginia Road in Concord at DNL 58.1 dBA

Additionally, the Simonds Tavern (331 Bedford Street, Lexington), which was included in this group in 2005, has a value lower than DNL 55 dBA (53) in 2012.

Areas within the 55 DNL contour in the MMNHP have decreased since 2005 but are projected to increase marginally under the year 2030 scenario. In 2012, no area of the MMNHP is within the 55 DNL contour dropping from 1.7 acres in 2005. Assuming increases in aircraft activity levels for the planning scenarios, the 55 DNL contour area within MMNHP is expected to remain at 0 acres in 2020 and increase to 0.4 acres in 2030.

Massport encourages new development in areas with existing impervious surfaces that take advantage of existing infrastructure. Any physical changes proposed near archaeological sites located in undisturbed portions of the airport have the potential to affect archaeological resources. Using the detailed archaeological reconnaissance survey conducted within the Hanscom Field property boundaries for the *2005 ESPR*, which was reassessed in 2012, potential effects of future development on archaeological resources can be evaluated.

(This page intentionally left blank)



Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Historic Resources within the 2005, 2012, 2020 and 2030 DNL Noise Contours

Figure **1-6**

(This page intentionally left blank)

Table 1-9 Summary of Noise Effects on Cultural and Historic Resources

Resource[1]	Total Quantity[2]	Total Properties or Geographic Area within the 65 DNL Contour[3]			
		2005	2012	2020	2030
National and State Register Individual Properties[4]	39 properties	0 properties	0 properties	0 properties	0 properties
National and State Register Historic Districts[5]	1,646.2 acres	0 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975.4 acres	0 acres	0 acres	0 acres	0 acres
Battle Road Interpretive Trail	4.0 miles	0 miles	0 miles	0 miles	0 miles
Minuteman Commuter Bikeway	10.1 miles	0 miles	0 miles	0 miles	0 miles
Narrow Gauge Rail-Trail	3.0 miles	0 miles	0 miles	0 miles	0 miles
Hartwell Town Forest/ Jordan Conservation Area	165.9 acres	1.4 acres	0.1 acres	0.1 acres	0.9 acres
Great Meadows National Wildlife Refuge	3,409 acres	0 acres	0 acres	0 acres	0 acres
Concord River[6]	6.5 miles	0 miles	0 miles	0 miles	0 miles
Resource[1]	**Total Quantity[2]**	**Total Properties or Geographic Area within the 55 DNL Contour**			
		2005	**2012**	**2020**	**2030**
National and State Register Individual Properties[4]	39 properties	3 properties	3 properties	3 properties	3 properties
National and State Register Historic Districts[5]	1,646.2 acres	2.4 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975.4 acres	1.7 acres	0 acres	0 acres	0.4 acres
Battle Road Interpretive Trail	4.0 miles	0 miles	0 miles	0 miles	0 miles
Minuteman Commuter Bikeway	10.1 miles	1.3 miles	0.3 miles	0.4 miles	0.5 miles
Narrow Gauge Rail-Trail	3.0 miles	1.3 miles	0 miles	0 miles	0 miles
Hartwell Town Forest/ Jordan Conservation Area	165.9 acres	118 acres	26.4 acres	66.4 acres	72.1 acres
Great Meadows National Wildlife Refuge	3,409 acres	210 acres	26.4 acres	43.1 acres	94.4 acres
Concord River[6]	6.5 miles	0.5 miles	0 miles	0 miles	0.1 miles

Notes:
1. See Tables 10-19 and 10-20 for more detail on National and State Register individual properties and historic districts.
2. All surveyed historic properties; total acreage of surveyed historic districts, Minute Man National Historical Park, Hartwell Town Forest/Jordan Conservation Area, and Great Meadows National Wildlife Refuge; and, total length of trails and Concord River.
3. This is the exposure level that the FAA identifies as a guideline for determining potential land use incompatibilities.
4. Does not include Minute Man National Historical Park sites. In this table, the noise effects are quantified through the estimation of park acreage within a given contour.
5. Includes Bedford Depot Park Historic Dist., Bedford Historic Dist., and Old Bedford Center Historic Dist. in Bedford; American Mile Historic Dist., Barrett Farm Historic Dist., Concord Monument Square-Lexington Road Historic Dist., Hubbard-French Historic Dist., Hubbardville Historic Dist., Main Street Historic Dist., and North Bridge-Monument Square Historic Dist. in Concord; Battle Green Historic Dist., East Village Historic Dist., Hancock-Clarke Historic Dist., Lexington Green Historic Dist. and Munroe Tavern Historic Dist. in Lexington; and, Lincoln Historic Dist. in Lincoln. Areas of overlap in districts are counted once.
6. Concord River is approximately 6.5 miles in length from State Route 2 (South of Airport) to State Route 225 (North of Airport)

Development at Hanscom contemplated to support 2020 and 2030 activity levels is considered for four planning areas: Terminal Area, Air Traffic Control Tower (ATCT) Apron, East Ramp, and North Airfield. Any proposals considered for the ATCT Apron and East Ramp would be directed to existing impervious areas which have low sensitivity for archaeological resources. Some areas evaluated for future development on the North Airfield are pervious, but previously disturbed, and therefore have low archaeological sensitivity. Development considered in the Terminal Area includes both pervious and impervious areas adjacent to existing facilities. The areas that are presently vegetated have been identified as having a high sensitivity for archaeological resources. Any proposed future activities under the 2020 and 2030 scenarios that involve ground disturbance in areas of archaeological sensitivity or near known archaeological sites will require more detailed investigation as part of the individual permitting of the project. No physical modifications are proposed to improve traffic intersections, and therefore there are no adverse effects to these resources in 2012 or under the 2020 and 2030 scenarios.

Sustainable Development / Environmental Management System (EMS)

Massport is a leader among Massachusetts agencies and airport operators nationally in the promotion and implementation of sustainable design and operations. This is reflected in two relevant examples: (1) Boston Logan Terminal A was the first terminal in the world to achieve Leadership in Energy and Environmental Design (LEED) certification[4]; and (2) Hanscom was the first US airport to achieve ISO 14001 certification. Logan's new Rental Car Center and the recently completed Green Bus Depot are also anticipated to achieve LEED Silver certification. Since the *2005 ESPR*, Massport has established a number of policies and implemented projects to advance sustainability at all of its facilities including Hanscom.

Massport requires that new development, including that conducted at Hanscom, meet performance standards established by the LEED program for Silver certification. LEED certification is achieved through the incorporation of sustainability commitments in building design and operation including energy efficiency, use of environmentally-friendly products, reuse and recycling, and renewable energy. At Hanscom, as an example, the new Liberty Mutual Hangar includes a range of environmentally-friendly elements to reduce energy utilization and environmental management. Rectrix Aviation is constructing a new state-of-the-art FBO facility which is designed to achieve LEED Silver certification to replace Hangar 24. In addition to LEED, Massport has developed Sustainable Design Standards and Guidelines which are used to plan, design, and construct all new development projects on Massport properties. Massport has constructed solar photovoltaic (PV) panels on the Hanscom Terminal Building to provide onsite renewable energy and reduce its demand for power from offsite electricity sources. It has also used warm-mix asphalt, a lower energy intensity pavement, in several areas at Hanscom. Massport will continue to encourage future development of Hanscom Field facilities to be performed in a sustainable manner.

Environmentally Beneficial Measures

Environmentally beneficial measures are those actions identified in each of the technical chapters of the ESPR that could be implemented to minimize potential effects of existing activities at Hanscom. Massport recognizes the importance of operating and developing Hanscom Field in a manner that maximizes its contribution to the regional transportation system while minimizing potential impacts on local communities and stakeholders. A number of actions have been implemented since the *2005 ESPR* and others are proposed in the future to achieve that goal.

[4] The U.S. Green Building Council developed the LEED Green Building Rating System® to rate the sustainability of different building types.

In accordance with the EEA Scope for the *2005 ESPR*, Table 1-10 presents the responsible parties, implementation and schedule of beneficial measures that are presented in the *2012 ESPR*.

Table 1-10 Summary of Existing and Possible Future Environmentally Beneficial Measures

Measure	Responsible Party	Timetable
GROUND TRANSPORTATION		
Transportation information on Massport website	Massport	Ongoing
Transit information in Civil Air Terminal	Massport	Ongoing
Participation as a partner in MassRIDES Transportation Management Initiative program	Massport	Ongoing
Information about transit and non-auto travel options in prominent locations throughout Hanscom Field	Massport	2014
Bus shelter with transit information	Massport	2014
Exploration of working with local communities and stakeholders on a bikeshare network	Multiple parties including Massport	Ongoing
NOISE		
Modifications to the Fly Friendly Program using the flight tracking software to direct pilots conducting touch-and-go procedures to fly more over the airport than neighboring lands	Massport	Ongoing
Continued implementation of the Fly Friendly program	Massport	Ongoing
Run-up procedures for use of the East Ramp	Massport	Ongoing
Relocation of noise monitors based on input from ongoing community coordination process and implementation of updates to the Noise and Operations Monitoring System	Massport	2014
Creation of the “Airport Activity Monitor” which allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance.	Massport	Ongoing
AIR QUALITY		
Continued encouragement of tenants to consider the purchase of alternatively fueled ground service equipment, where appropriate	Massport	Ongoing
Encouragement of Fixed Base Operators to minimize Auxiliary Power Unit/Ground Power Unit use	Massport	Ongoing
Use of Ultra Low Sulfur Fuel in Massport fleet vehicles	Massport	Ongoing
Evaluation of the installation of a paved aircraft holding area at the head of Runway 23 to reduce minor aircraft delays	Massport	2014-2016
Continued consideration of Alternative Fuel Vehicles for any new Massport vehicle purchase	Massport	Ongoing
WATER QUALITY		
Support for Shawsheen Watershed Initiative to improve water quality and quantity flow in the Shawsheen River and its tributaries	Massport working with the MassDEP, USEPA, and Hanscom AFB	Ongoing
Stormwater improvements to construct detention areas around Hanscom in conjunction with the USAF	Massport through MassDEP grant	2014-2016
Continuation of MassDEP Best Management Practices	Massport	Ongoing
WILDLIFE		
Manage airfield in a manner that does not disrupt breeding season for grassland birds of which two species are listed under the Massachusetts Endangered Species Act	Massport	Ongoing
SUSTAINABLE DEVELOPMENT		
Implementation and maintenance of EMS procedures to control environmental effects	Massport	Ongoing

While site-specific noise abatement is not proposed, the advancement of Massport’s noise abatement program is described. It is important to note that no noise-analysis locations experienced a DNL value greater than 60 dB in 2012 (i.e., DNL 5 dBA quieter than FAA’s threshold of significance) nor would any site be expected to experience a DNL value greater than 60 dB under the 2020 and 2030 scenarios.

1.6 MEPA Documentation

Massport typically submits the ESPR on a five-year cycle. As described above, with the EEA Secretary's consent, preparation of this ESPR was deferred given the local and national decreases in aviation activity and the corresponding declines at Hanscom.

The *2012 ESPR* is posted on Massport's web site (www.massport.com) and is available in CD-ROM to all commenters. Hard copies of the report are available upon request. All four town libraries, Planning Departments, and Conservation Commissions have received both a CD-ROM and hard copy of the *2012 ESPR*.

In addition to the ESPR process, Massport publishes two annual reports for public review: the "State of Hanscom" and the "Annual Noise Report." Both documents are distributed to the Hanscom Field Advisory Commission (HFAC) and are available on Massport's website. The "State of Hanscom" describes Massport's financial performance, economic benefits and accomplishments, as well as its plans for the near future. The report also includes information on aircraft activity from the past year. Massport will continue to use this process to distribute information about Hanscom Field. The first noise report for Hanscom Field was prepared in 1982, and it compared data for 1978 and 1981. Annual updates were started in 1984 (based on the previous year's data), making 2012 the 31th Hanscom noise report.

1.7 Organization of the 2012 ESPR

The *2012 ESPR* contains planning information, technical analyses, and supportive data, including the Secretary's May 18, 2012 Certificate, comment letters on the Draft Scope for the *2012 ESPR*, responses to the Certificate and the comment letters, a list of reviewers and technical appendices. The Introduction / Executive Summary provides a brief overview of the content and key findings of each chapter. The technical appendices provide detailed analytical data and methodological documentation for the various environmental analyses conducted for this *2012 ESPR*.

Chapter 1: Introduction / Executive Summary

- Provides background of Hanscom Field
- Discusses the environmental and regulatory context
- Identifies the analytical framework for the ESPR
- Summarizes the primary changes since 2005
- Presents an overview of the outreach program and public engagement process
- Provides the organization for the report

Chapter 2: Airport Facilities and Infrastructure

- Describes the airfield and its supporting infrastructure, including parking and the utility system serving the airport
- Describes Massport's tenant audit program
- Provides information about the tank management program and spill prevention efforts at Hanscom Field

Chapter 3: Airport Activity Levels

- Presents an analysis of different descriptors to characterize future scenarios
- Describes the aircraft operations, including nighttime operations, and passenger activity levels for 2012 and compares the 2012 data to historic trends and forecasts from the *2005 ESPR*
- Describes the forecast coordination with the Logan ESPR and the FAA's NERASP study

- Presents 2020 and 2030 aircraft operation and air passenger forecasts for the future planning scenarios
- Describes the procedures for new airline entrants at Hanscom Field

Chapter 4: Airport Planning

- Describes the status of planning initiatives and projects for the terminal area, airside area and landside area
- Evaluates the potential effects of the 2020 and 2030 scenarios on the airport infrastructure
- Presents the relationship between the *2012 ESPR* and Executive Orders 385 and 438
- Describes projects in the five-year capital program and identifies which projects may require individual MEPA review
- Describes new Transportation Security Administration or Massport security policies
- Updates any new planning and development initiatives at the MMNHP, Hanscom AFB, and the four contiguous towns
- Addresses the consistency of planning strategies with the following:
    - Local comprehensive plans
    - Four Town Planning Study
    - MAPC's regional policy plan
    - Hanscom Area Towns (HATS) Master Plan

Chapter 5: Regional Transportation Context

- Provides a summary of the regional transportation system
- Describes the role of Hanscom Field in the region's transportation system
- Describes activities at other regional airports
- Describes the long-term advantages and disadvantages of Hanscom Field as a commercial reliever airport
- Discusses Hanscom Field's role as a GA reliever airport

Chapter 6: Ground Transportation

- Reports on current conditions and potential conditions in the 2020 and 2030 analysis years for traffic, roadway and access, including intersection operations and Average Daily Traffic volumes
- Provides mode share data including tenant survey results
- Describes the review process with local towns; presents information on Transportation Demand Management
- Reviews, summarizes and analyzes existing metropolitan planning documents
- Discusses the status of existing and future parking needs at Hanscom Field

Chapter 7: Noise

- Updates the status of the noise environment around Hanscom Field for 2012 conditions and for the 2020 and 2030 analysis years, including the following:
    - Total Noise Exposure (EXP) calculations
    - DNL, Time-Above (TA) and Single Event contours
    - Single Event Level (SEL) Distribution metrics
    - Ranked tabulation of take-off noise levels
- Reports past trends and the projections for the forecast activity levels and years and adjustments for such changes in the Integrated Noise Model (INM)

- Addresses the issue of engine run-ups and the operation of Auxiliary Power Units and Ground Power Units
- Addresses potential measures to reduce noise impacts from airport operations

Chapter 8: Air Quality

- Reports on 2012 conditions and conditions in the 2020 and 2030 analysis years including the following:
  - Carbon monoxide
  - Oxides of nitrogen
  - Volatile organic compounds
  - Particulate matter
  - Monitoring results for ozone precursors and nitrogen dioxide
  - Summary of national lead emission standards
- Presents a review of environmentally beneficial measures including the following:
  - Airside operational improvements
  - Ground service and landside conversion to alternative fuels
  - Aviation support emissions reductions
- Discusses the clean vehicle program at Hanscom Field

Chapter 9: Wetlands/Wildlife/Water Resources

- Describes the natural environment at Hanscom Field including the following:
  - Wetlands delineations
  - Vernal pools
  - Wildlife habitats
- Reports on the surface stormwater management system
- Provides an update on the Vegetation Management Plan (VMP)
- Presents information about Massport's National Pollution Discharge Elimination System (NPDES) permit
- Provides figures that illustrate the current wetlands resources at Hanscom Field and the location of local water supplies
- Identifies current and proposed use of de-icing chemicals

Chapter 10: Cultural and Historical Resources

- Reviews the existing data on historical and archeological resources located at and near Hanscom Field
- Presents information about the MMNHP and historical properties in the park
- Evaluates the potential effects future planning scenarios for the 2020 and 2030 analysis years

Chapter 11: Sustainable Development and Environmental Management System (EMS)

- Discusses reduction in the use of toxic materials at Hanscom Field
- Reports on Massport's sustainable design program at Hanscom Field
- Provides information on the sustainable design approaches for new and existing facilities
- Provides information on the EMS Program

Chapter 12: Environmentally Beneficial Measures

- Summarizes environmentally beneficial measures that are identified in previous chapters
- Identifies, in general terms, parties responsible, costs and schedule for implementation

Appendices:

- A Glossary of Terms that defines key terms used in the *2012 ESPR* and an Abbreviations and Acronyms directory
- List of Reviewers
- Appendix A that provides the Secretary's Certificate on the *2012 ESPR* Scope and a Response to Comments section
- Appendix B that provides the 2011 Airport Layout Plan
- Appendix C through Appendix G are technical appendices that provide detailed analytical data and methodological documentation for the various environmental analyses conducted for the *2012 ESPR.*

(This page intentionally left blank)

2 Airport Facilities and Infrastructure

Hanscom Field is a Federal Aviation Administration (FAA) certified airport (per 14 CFR Part 139). It is one of three airports owned and operated by the Massachusetts Port Authority (Massport). Located about 20 miles northwest of Boston, Hanscom Field plays an important role as a corporate and General Aviation (GA) reliever to Boston Logan International Airport. Massport operates Hanscom as a class 1 airport facility which serves all types of scheduled operations of air carrier aircraft designed for at least 31 passenger seats), whose major users are a mix of corporate aviation, private pilots, flight schools, commuter/commercial air services, as well as some charter and light cargo.

This chapter provides updated information about Hanscom's airport facilities and infrastructure since the publication of the previous Environmental Status and Planning Report (ESPR) in 2006. The description of airside and landside facilities includes runways, taxiways, aprons, hangars, general aviation facilities, roadways, parking, and utility systems. The chapter also discusses the status of programs designed to prevent, reduce, and mitigate the occurrence of environmental impacts related to the use and storage and handling of fuel.

2.1 Key Findings Since 2005

Efforts undertaken toward improving and updating airport facilities and infrastructure at Hanscom since the *2005 ESPR* are represented by the following projects:

- Runway Safety Area (RSA) improvements at Runway Ends 5 and 23 including grading of the RSA and wetland replication to meet federally-mandated airfield safety standards (2008)
- RSA improvements on Runway End 11 by relocating portions of the perimeter road (2012)
- Reconstruction of the western end of Taxiway E, Taxiway G, and Taxiway M (2009)
- Redevelopment of the Hangar 24 site for a Fixed Base Operator (FBO) facility by Rectrix Aviation, a project which is nearing completion at this time
- Removal of fuel storage tanks at Hangar 10 (2011)
- Implementation of enhanced access control system and replacement of a portion of the perimeter fence (2012)
- Relocation of portions of the perimeter road at approach to Runway 29 (2012)
- Ongoing airfield maintenance
- Ongoing vegetation removal and maintenance

Improvements in airport facilities and infrastructure since 2005 have not increased impervious surfaces. Additionally, there have been no significant changes in the utility systems or in the parking spaces since the *2005 ESPR* inventory. While parking spaces located on property formerly leased by Massport to the United States Air Force (USAF) are now available to Hanscom, the inclusion of these parking spaces does not represent an increase as they were located on Hanscom Property prior to 2005.

2.2 Airport Facilities

Hanscom Field has two intersecting asphalt-paved runways and additional supporting infrastructure. Runway 11-29 is oriented in an east/west configuration and Runway 5-23 is oriented in a northeast/southwest configuration. Supporting infrastructure includes taxiways, a FAA-owned and operated air traffic control tower (ATCT), navigational aids (NAVAIDs), aircraft aprons, hangars, passenger terminal buildings, US Customs and Border Protection (CBP), and other aviation support facilities. These facilities are described in more detail below.

2.2.1 Runways

Two intersecting runways at Hanscom provide aircraft with four approach options. Runway 11-29 is the primary runway. The runway thresholds and runway ends are located at the extremity of the pavement, which is 150 feet wide, and allows 7,011 feet for landings and departures in both directions. This runway is a precision instrument runway because each end of the runway is equipped with an Instrument Landing System (ILS) with Distance Measuring Equipment (DME). The runway is equipped with a Medium Intensity Approach Lighting System and Runway Alignment Indicator Lights (MALSR) and High Intensity Runway Lighting System (HIRLS). Both runway ends have paved runway safety areas beyond the runway end that are 200 feet wide and 1,000 feet long. Both runway ends are equipped with a four-light Precision Approach Path Indicator (PAPI).

Runway 5-23 is the secondary, crosswind runway. The runway thresholds and runway ends are located at the extremity of the pavement, which is 150 feet wide, allowing 5,107 feet for landings and departures in both directions. This runway is a non-precision instrument runway. The runway is equipped with a Medium Intensity Runway Lighting (MIRL) system and runway end identifier lights.

Beyond both runway ends are graded RSAs. At the approach end of Runway 23, the paved safety area is 200 feet wide and 890 feet long. At the approach end of Runway 5, the paved safety area is 200 feet wide and 682 feet long at the centerline. Both runway ends are equipped with a Visual Approach Slope Indicator (VASI).

2.2.2 Taxiways

A system of taxiways provides access between the two runways and aircraft parking aprons. Taxiway widths at Hanscom Field range from 50 to 75 feet. According to FAA criteria, a taxiway width of 50 feet can accommodate aircraft with a wingspan no greater than 118 feet and a wheelbase no greater than 60 feet. Similarly, a 75-foot wide taxiway can accommodate aircraft with a wingspan no greater than 214 feet (Group V). The extremities of all four runway ends are connected by taxiways that allow aircraft to utilize the full available runway length without the need to backtrack. On the south side of the runway, the full-length parallel Taxiway E supports Runway 11-29. In addition, Taxiways F and G provide mid-point access to the runway. Taxiway G crosses Runway 11-29 and provides direct access to the extremity of Runway 23. Taxiway R provides connection on the north side of the airfield between the extremities of Runway 23 and Runway 11, while Taxiway N provides mid-point access to Runway 11-29. Finally, Taxiway S is a partial parallel to Runway 5-23.

In addition to the taxiways that provide direct access to the runways, Hanscom has a series of taxiways that provides connectivity between these taxiways and the aircraft parking aprons. Taxiways A, B, and C provide connection to the East Ramp that is in front of the USAF and Civilian hangars, and the CBP building.

2.2.3 Air Traffic Control Facilities and Navigational Aids

The FAA, who manages Hanscom's airspace, provides air traffic control at Hanscom Field.[5] FAA rules and regulations govern the movement of air traffic at Hanscom. The FAA's Consolidated Terminal Radar Approach Control (TRACON), located at Merrimack New Hampshire, has authority and responsibility for Instrument Flight Rule (IFR) arrivals, departures, and low-altitude (above 2,500 feet) over-flights in the controlled airspace surrounding Hanscom. By means of remote communication air/ground facilities, direct communication is maintained between TRACON controllers and individual pilots. The communication system is further augmented by radar coverage that enables TRACON controllers to monitor the location and movement of each aircraft.

The ATCT is located on the south side of the airfield by Taxiway J. The FAA owns the ATCT, operating it daily between 7:00 a.m. and 11:00 p.m. The tower staff directs the operations of aircraft within a five-mile radius of the airport. Air traffic controllers are responsible for controlling Hanscom's airspace. Close coordination is maintained between the ATCT and the FAA's Consolidated TRACON.

FAA-owned and maintained, electronic NAVAIDs serving Hanscom are located on and near the airport and are used to support instrument approach procedures. Runways 11 and 29 are both equipped with a Category I ILS. The ILS provides pilots with electronic guidance for aircraft alignment (horizontal), descent gradient (vertical), and aircraft position until visual contact is made with the runway. Runway 11 is also supported with a runway visual range (RVR) system consisting of a projector and receiver. The RVR provides a measurement of horizontal visibility. A Very-High-Frequency Omni-Directional Range (VOR) station, located near Lawrence Massachusetts, provides a non-precision instrument approach to Runways 5 and 23 at Hanscom Field.[6]

2.2.4 Buildings and Hangars

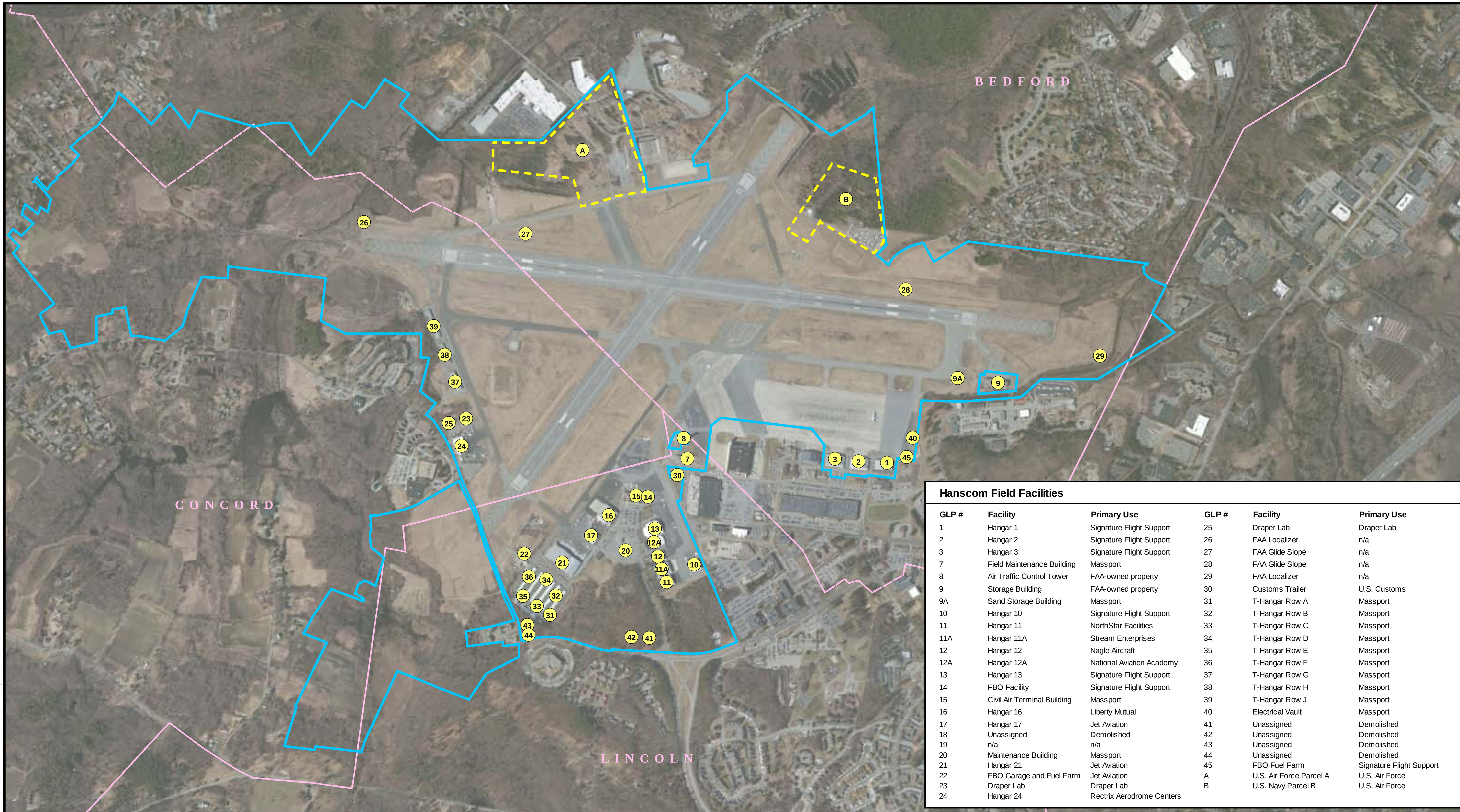
The primary existing facilities at Hanscom are considered to be in good condition. Some of the older buildings lack amenities. Table 2-1 provides a summary of existing building size and condition (i.e., excellent, good, fair, or poor). Figure 2-1 serves as a reference guide to the facilities listed in Table 2-1 and illustrates the location of leased properties. One parcel of land in the North Airfield Area, consisting of area above and below Hartwell Road, was returned to Massport control in 2011. The available vehicle parking for these facilities is presented in this chapter in Table 2-2.

---

[5] Massport and Federal Aviation Administration (FAA), *Runway 5-23 Safety Area Improvements Draft Environmental Assessment and Draft Environmental Impact Report*, July 2006.

[6] Airport IQ 5010: Airport Master Records and Reports. http://www.gcr1.com/5010web/airport.cfm?Site=BED.

(This page intentionally left blank)



Hanscom Field Facilities

GLP #	Facility	Primary Use	GLP #	Facility	Primary Use
1	Hangar 1	Signature Flight Support	25	Draper Lab	Draper Lab
2	Hangar 2	Signature Flight Support	26	FAA Localizer	n/a
3	Hangar 3	Signature Flight Support	27	FAA Glide Slope	n/a
7	Field Maintenance Building	Massport	28	FAA Glide Slope	n/a
8	Air Traffic Control Tower	FAA-owned property	29	FAA Localizer	n/a
9	Storage Building	FAA-owned property	30	Customs Trailer	U.S. Customs
9A	Sand Storage Building	Massport	31	T-Hangar Row A	Massport
10	Hangar 10	Signature Flight Support	32	T-Hangar Row B	Massport
11	Hangar 11	NorthStar Facilities	33	T-Hangar Row C	Massport
11A	Hangar 11A	Stream Enterprises	34	T-Hangar Row D	Massport
12	Hangar 12	Nagle Aircraft	35	T-Hangar Row E	Massport
12A	Hangar 12A	National Aviation Academy	36	T-Hangar Row F	Massport
13	Hangar 13	Signature Flight Support	37	T-Hangar Row G	Massport
14	FBO Facility	Signature Flight Support	38	T-Hangar Row H	Massport
15	Civil Air Terminal Building	Massport	39	T-Hangar Row J	Massport
16	Hangar 16	Liberty Mutual	40	Electrical Vault	Massport
17	Hangar 17	Jet Aviation	41	Unassigned	Demolished
18	Unassigned	Demolished	42	Unassigned	Demolished
19	n/a	n/a	43	Unassigned	Demolished
20	Maintenance Building	Massport	44	Unassigned	Demolished
21	Hangar 21	Jet Aviation	45	FBO Fuel Farm	Signature Flight Support
22	FBO Garage and Fuel Farm	Jet Aviation	A	U.S. Air Force Parcel A	U.S. Air Force
23	Draper Lab	Draper Lab	B	U.S. Navy Parcel B	U.S. Air Force
24	Hangar 24	Rectrix Aerodrome Centers			

Path: F:\ES\ES\HanscomField\MapFiles\305540\305540_BED_Format_Tabloid2-1.mxd

North

0 1,200 2,400 Feet

Legend

Hanscom Field

Town Boundary

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Airport Facilities

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Figure 2-1

(This page intentionally left blank)

Table 2-1 Hanscom Field Buildings & Hangar Facilities

2005 GLP No.[1]	Facility[2]	Primary User[2]	Total S.F. Building Footprint[2]	Year Built[2]	Condition[2, 3]	Facility Type/ Comments
1	Hangar 1	Signature Flight Support	28,376	1955	Fair	Fixed Base Operator
2	Hangar 2	Signature Flight Support	36,000	1955	Fair	Fixed Base Operator
3	Hangar 3	Signature Flight Support	36,000	1955	Fair	Fixed Base Operator
7	Field Maintenance Building	Massport	11,300	1984	Good	Airfield Maintenance
8	Air Traffic Control Tower	FAA-owned property	n/a	2002	Excellent	FAA Control Tower
9	Storage Building	FAA-owned property	n/a	n/a	n/a	Storage
9A	Sand Storage Building	Massport	2,500	2005	Excellent	Airfield Sand Storage
10	Hangar 10	Signature Flight Support	20,300	1950s	Good	Fixed Base Operator
11	Hangar 11	NorthStar Facilities	15,608	1969	Good	Corporate/Conventional GA Hangar
11A	Hangar 11A	Stream Enterprises	26,250	2001	Excellent	Corporate/Conventional GA Hangar
12	Hangar 12	Nagle Aircraft	14,300	2002	Excellent	Aircraft Maintenance Facility
12A	Hangar 12A	National Aviation Academy	23,763	1963	Good	Technical School (aircraft mechanics)
13	Hangar 13	Signature Flight Support	38,000	2001	Excellent	Fixed Base Operator
14	FBO Facility	Signature Flight Support	5,000	1988	Excellent	Fixed Base Operator
15	Civil Air Terminal Building	Massport	13,475	1953	Good	Passenger Terminal and Aviation Support
16	Hangar 16	Liberty Mutual	37,800	June 2005	Excellent	Corporate/Conventional GA Hangar
17	Hangar 17	Jet Aviation	21,315	1954	Poor	Fixed Base Operator
18	Classroom	National Aviation Academy	5,850	1983	Demolished in 2012	
19	n/a	n/a	n/a	n/a	n/a	Unused Building ID
20	Maintenance Building	Massport	2,500	1954	Fair	Building Maintenance
21	Hangar 21	Jet Aviation	40,000 34,000	1985 2000	Excellent	Fixed Base Operator
22	FBO Garage and Fuel Farm	Jet Aviation	4,500	1985	Excellent	Fixed Base Operator
23	Draper Lab	Draper Lab	n/a	n/a	n/a	Leased from Massport by the USAF
24	Hangar 24	Rectrix Aerodrome Centers	89,714	2013 - (under development	Ongoing construction	New building and tenant on parcel scheduled for completion in 2013.

2005 GLP No.[1]	Facility[2]	Primary User[2]	Total S.F. Building Footprint[2]	Year Built[2]	Condition[2, 3]	Facility Type/ Comments
25	Draper Lab	Draper Lab	27,000	1948	n/a	Leased from Massport by the USAF
26	FAA Localizer	n/a	n/a	n/a	n/a	
27	FAA Glide Slope	n/a	n/a	n/a	n/a	
28	FAA Glide Slope	n/a	n/a	n/a	n/a	
29	FAA Localizer	n/a	n/a	n/a	n/a	
30	Customs Trailer	U.S. Customs	4,000	n/a	n/a	
31	T-Hangar Row A	Massport	15,360	1972	Fair	New roof in 2005
32	T-Hangar Row B	Massport	16,128	1973	Fair	New roof in 2005
33	T-Hangar Row C	Massport	16,128	1973	Fair	New roof in 2005
34	T-Hangar Row D	Massport	16,051	1982	Fair	Installed roof coating in 2005
35	T-Hangar Row E	Massport	16,051	1982	Fair	Installed roof coating in 2005
36	T-Hangar Row F	Massport	16,051	1982	Fair	Installed roof coating in 2005
37	T-Hangar Row G	Massport	18,236	1987	Fair	Installed roof coating in 2011
38	T-Hangar Row H	Massport	15,744	1987	Fair	Installed roof coating in 2011
39	T-Hangar Row J	Massport	23,616	1987	Fair	Installed roof coating in 2011
40	Electrical Vault	Massport	4,000	n/a	Fair	
41	Residence	Massport	n/a	n/a	n/a	Demolished in 2010
42	Residence	Massport	n/a	n/a	n/a	Demolished in 2010
43	Residence	Massport	n/a	n/a	n/a	Demolished in 2010
44	Residence	Massport	n/a	n/a	n/a	Demolished in 2010
45	FBO Fuel Farm	Signature Flight Support	3,996	1976	Good	Fixed Base Operator
A	USAF Parcel A	Massport	n/a	n/a	n/a	Leased from Massport by the USAF
B	U.S. Navy Parcel B	USAF	n/a	n/a	n/a	Massport actively seeking to acquire

Notes:
1. L.G. Hanscom Field 2013 General Location Plan (GLP). Does not include USAF or U.S. Navy facilities, except properties leased from Massport.
2. Not applicable (n/a) applies to unused Building ID or facilities where information was not available
3. Property condition determined from HNTB 2012 Massport Facilities Annual Report of Conditions.

Since the *2005 ESPR*, Massport submitted a Final Environmental Impact Report (FEIR) prepared in accordance with the Massachusetts Environmental Policy Act (MEPA) in 2007 for improvements to the Runway Safety Area and two wetland replication projects, one at the end of Runway 23 and a second west of Runway 23 and north of Runway 11. The Secretary of Environmental Affairs issued a certificate showing the FEIR complied with the MEAP scope. Construction of the RSA project began in August of

2008 and completed in 2009. The project included the re-grading Runway 05 and 23 ends so that the width of the Safety Area complied with FAA criteria, reconstructing the FAA access road that was being used by trucks hauling soil, relocating airfield fencing to improve visibility and security, and replicating wetlands impacted by the RSA improvements.

2.2.4.1 Full-service Fixed Base Operator Facilities

A full-service Fixed Base Operator (FBO) is a company that handles a range of needs for based and transient aircraft, their operators, and their passengers. Services may include cleaning, maintaining, fueling and parking, hangaring aircraft, flight planning services for the pilots, and arranging for the specific needs of passengers and flight crews, such as ground transportation or overnight accommodations. Although the majority of FBO activity involves servicing corporate GA aircraft activity, the FBOs also serve some charter activity. Typically, the corporate and charter flights that use Hanscom Field carry two to eight passengers per flight and have a flight crew of two pilots, and occasionally one flight attendant. FBO activity is heavily influenced by the business day. The majority of flights departs between 7:00 and 9:00 a.m. and returns the same day between 3:00 and 7:00 p.m. on weekdays. Saturday is typically the lightest day of the week. Occasionally, activity resumes Sunday afternoon with departures in support of the following workweek.

Hanscom currently has two full-service FBOs, which are Jet Aviation and Signature Flight Support. These FBOs are open from 6:00 or 7:00 a.m. to 11:00 p.m. and are staffed in two shifts. In the mid-1980s, Jet Aviation constructed a 40,000 square-foot (sf) FBO facility adjacent to the T-hangars located at the southwest corner of the Terminal Area. Jet Aviation added 34,000 sf of hangar space to this facility in 2001. In the same vicinity, Jet Aviation operates a fuel farm and leases Hangar 17, which is 21,315 sf. In addition to supplying corporate flights with these services, Jet Aviation also provides services for Linear Air. Linear offers on-demand air taxi service and shared charter services (purchase seats) limited to four roundtrips per week. Office staff for Linear Air is located on the third floor of the Civil Air Terminal and at Signature. Linear Air is serviced by on-airport FBO facilities.

The Signature 38,000 sf hangar is located next to the Civil Air Terminal. The hangar was constructed by the Mercury Air Group in 2001. In addition to its primary hangar, Signature leases Hangar 10 which is approximately 20,000 sf in size. Signature also leases three hangars on the East Ramp: Hangar 1 at 28,376 sf and Hangars 2 and 3 at 36,000 sf each. The buildings are primarily used for aircraft maintenance and storage with some area available for general office activities. Signature also has a fuel farm on the East Ramp.

In January 2012, the Massport Board approved a developer, Rectrix, for FBO facilities at Hanscom Field and the Worcester Regional Airport. The Rectrix Aerodrome Center at Hanscom is currently under development, which will include a 60,000 sf hangar, 7,000 sf tenant office space, and 22,000 sf, two-story FBO. It is expected that the construction will be completed in the first quarter of 2014. Rectrix' new Worcester FBO facility is also under construction in 2013 and is expected to be completed in 2014.

2.2.4.2 Aircraft Maintenance Facilities

An aircraft maintenance facility provides service and repairs to aircraft including engines, flight instruments, interiors, and structural components. These services are provided on both a scheduled and as-needed basis to locally-based and transient aircraft. Both of the above-mentioned FBOs at Hanscom provide aircraft maintenance, as does Nagle Aircraft Services.

In 2002, Nagle Aircraft Services completed construction of a 14,300 sf hangar, Hangar 12, on the east side of the Terminal Area. This hangar replaced an 8,100 sf Nagle hangar that was removed in order to accommodate the new FBO hangar constructed by Mercury Air Group in 2001, which is now occupied by Signature. Since the *2005 ESPR* was completed, Hangar 24, located in the Pine Hill area, was redeveloped by Rectrix Aviation and will become the airports third FBO. Completion is expected in early 2014. Additionally, Massport removed the above-ground storage tanks (AST) that were located at Hangar 10.

2.2.4.3 Corporate/Conventional Hangars

Corporate and conventional hangars are generally large, open span hangars for storage of one or multiple aircraft. Corporate hangars at Hanscom Field are designed to accommodate larger turbo prop or small jet aircraft that are used for business or commercial operations.

There are three active corporate and conventional hangars at Hanscom. The three active hangars include a 15,608 sf Hangar 11and a 26,250 sf Hangar 11A both located on the east side of the Terminal Area, and a 37,800 sf Hangar 16 on the west side of the Terminal Area. Construction of Hangar 16 was completed in 2005. It replaced a 6,225 sf hangar on this site previously occupied by Executive Flyers Aviation (a flight school), and a vacant 18,000 sf hangar. These hangars are used by corporate entities to support their flight departments or businesses. Most corporate hangars include office or storage space to accommodate the needs of those entities that are using the hangar.

2.2.4.4 T-Hangars

T-hangars are smaller than corporate and conventional hangars and offer private storage for GA aircraft. The name refers to the shape of each unit, which affords the most efficient space storage for small, individual aircraft (see Figure 2-2). Six T-hangar buildings with 12 individual T-hangar units each are located in the southwest portion of the Terminal Area. These are commonly referred to as the "Old Ts." Each individual hangar unit contains approximately 1,344 sf of space and can accommodate one small aircraft. Since 2005, funding has been allocated for roof and pavement repairs on the Old T-Hangars and the Pine Hill T Hangars, and repairs to the Pine Hill T-hangar roofs were completed. Corporate and conventional hangars may also include office or storage space.

On the southwest side of the airfield in the Pine Hill Area, there are three T-hangar buildings commonly referred to as the "Pine Hill Ts." These were constructed in 1986. One building has 18 units and the second has 12 units. Each unit in these buildings is 1,312 sf and can accommodate single-engine aircraft. The third building has eight 1,886 sf units. The larger units can accommodate light to medium twin-engine aircraft.

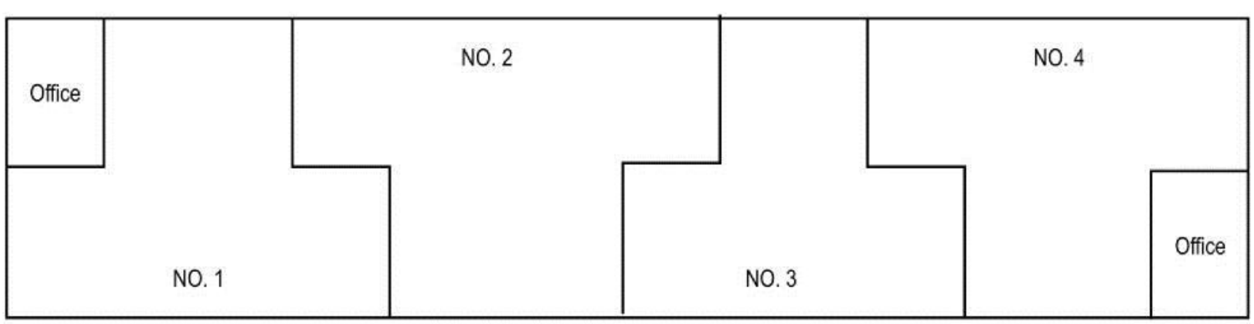


Figure 2-2 Standard T-Hangar Layout

2.2.5 Flight Schools

Flight schools provide flight training to individuals learning to fly aircraft. Training is provided in classroom facilities as well as in an aircraft with a certified instructor. Many flight schools also offer aircraft rentals to current, qualified pilots. Currently, two flight schools at Hanscom operate out of the Civil Air Terminal: East Coast Aero Club and Executive Flyers Aviation. Both flight schools use the tie-down facilities (areas on an airport specifically designed for the outdoor storage of aircraft) on the East and West Ramps for aircraft storage.

2.2.6 Technical School Facilities

National Aviation Academy (NAA) operates a technical school at Hanscom that provides aircraft maintenance training. The program includes FAA-approved courses that combine classroom and hands-on training in aircraft systems. Currently, there are approximately 200 students actively enrolled at the NAA, which is located in Hangar 12A. The Hanscom campus specializes in aeronautical maintenance technology.

2.2.7 Commuter Services

Commuter service is not currently offered from Hanscom Field. The previous operator, Streamline Air, which commenced operations on April 4, 2011, suspended service in September 2012. Linear Air, an air-taxi operator, initiated on-demand air taxi and shared charter service at Hanscom Field in January 2005, as described in the full-service FBO Facilities section in this chapter.

2.2.8 Other Aviation-related and Ancillary Businesses

In addition to the services referenced above, there are varieties of mostly aviation-related businesses that operate out of offices located in the Civil Air Terminal or the FBOs. These range from Boston MedFlight to aviation insurance to a variety of ancillary services such as car rental agencies and food services.

2.2.9 Civil Air Terminal

The three-story Civil Air Terminal building has a total gross floor area of approximately 36,000 sf, consisting of space for passenger holding areas, public seating, security checkpoint improvements, general office space, flight schools, rental agencies, food service, and Massport administrative offices. In 2011, Massport completed the installation of a new Access Control System at the Civil Air Terminal and various airfield gates. The new system enhances security by incorporating physical controls and electronic surveillance. The transition to the new system included issuing new security badges to over 1,700 badge holders. As described in Section 2.3, Infrastructure, the Civil Air Terminal is served by a one-way frontage road with drop-off and pick-up lanes, sidewalks, and pedestrian crossing to the general parking lot.

2.2.10 Aircraft Parking Areas

Aircraft that are not kept inside hangars are parked on apron areas. Aprons are open, paved spaces that provide no shelter from the elements. Small aircraft are tied down with anchors provided for securing aircraft.

Spaces for aircraft parking are located at the East Ramp, and the West Ramp. The West Ramp includes areas to the east, west, and north of the Civil Air Terminal. The East Ramp abuts the Hanscom AFB. This ramp is comprised of approximately two million sf of gross apron space. Approximately 850,000 sf are used for aircraft tie-downs. The remainder is currently used for taxiway access and other transient aircraft parking for civilian and military aircraft. In 2006, Massport completed an East Ramp Overlay project that rehabilitated a section of pavement on the ramp as part of the ongoing East Ramp rehabilitation program.

2.2.11 Fire Fighting and Police

Massport contracts with the Hanscom AFB Fire Department to meet FAA Aircraft Rescue and Fire Fighting (ARFF) requirements. The emergency responder facilities are located at the airport on the East Ramp. The Massachusetts State Police is located inside the Civil Air Terminal and provides policing and law enforcement services for the civil side of Hanscom.

2.2.12 Miscellaneous Terminal Support Facilities

Additional terminal and general airport support facilities exist at Hanscom, including fuel storage and airfield maintenance facilities. The two FBOs store and dispense fuel for civil and military aircraft.[4] Hangar 16 has fuel storage facilities. The ASTs at Hangar 10 have been removed. Massport stores its maintenance vehicles, including trucks, snowplows, construction equipment, and other general maintenance equipment outside or in an 11,300 sf Airfield Maintenance Building located adjacent to the FAA ATCT. A fuel farm used for Massport vehicles is also located at the facility. The Rectrix fuel farm is under development and will be located southwest of the existing Jet Aviation fuel farm facility. Massport also has a 2,500 sf Maintenance Building with carpentry shop space located at the south end of the Civil Air Terminal parking area.

2.3 Infrastructure

Hanscom is served by an infrastructure system of transportation and utility facilities. Roadway conditions are described generally below, with more detail provided in Chapter 6, Ground Transportation. In the *2005 ESPR*, a detailed inventory of parking areas was conducted to describe the number and location of spaces. Updates provided by site personnel have been used to prepare the *2012 ESPR*. Information regarding the water distribution system's supply and demand and the wastewater system serving Hanscom is based upon information in the *1995 GEIR*, the *2000 ESPR*, plus updates provided by Massport. Information regarding the stormwater management and drainage system is based on the *1995 GEIR*, *2000 ESPR*, *2005 ESPR*, the Stormwater Pollution Prevention Plan (SWPPP) and updates supplied by Massport.

2.3.1 Surface Access Roadways

Hanscom Drive provides the primary access to the Massport facilities on Hanscom Field. Hanscom Drive intersects with Route 2A, which in turn provides connections to Route 128/I-95. These designated state and federal highways form the main surface transportation connections to points north, east, and south of the airport. Route 2A also provides connections to Route 2 origins and destinations to the west. Old Bedford Road, which intersects with Hanscom Drive at the entrance to Hanscom Field and Virginia Road, provides connection to Routes 4, 225, and 62.

Hanscom Drive is a paved, four-lane divided roadway from Route 2A that provides access to Hanscom Field and the Hanscom AFB. After crossing Old Bedford Road, Hanscom Drive becomes an undivided two-lane roadway providing access to the Civil Air Terminal, the main parking lot, and other facilities in the Terminal Area of the airport.

Hanscom Drive feeds into a two-lane roadway around the perimeter of the main lot. The roadway is one-way in front of the Civil Air Terminal with designated areas for passenger drop-off and pick-up, taxis, and bus stops. In general, this roadway is in good condition, and the capacity of the roadway is adequate to meet its internal circulation needs.

2.3.2 Automobile Parking

Hanscom has adequate parking facilities for its current level of activities. The number of parking spaces available at Hanscom, including marked and unmarked spaces in the lot south of the Civil Air Terminal and at other locations around the airport, now numbers 1,667. Massport manages the parking inventory at Hanscom and from time to time relocates and reassigns the use and location of parking spaces.

Table 2-2 summarizes available parking by facility. The *2012 ESPR* inventory represents an approximate three percent increase over the results that were reported in the *2005 ESPR*. The increase includes the introduction of 18 lined spaces at the Storage Building, the addition of 28 spaces at Rectrix, and the addition of 10 spaces at T Hangar J. Ten spaces were also removed from Hanscom from various locations between 2005 and 2012.

Parking is also available on property that the USAF formerly leased from Massport in the North Airfield Area. There are 410 spaces in USAF Parcel B. This includes 278 spots next to the former U.S. Navy hangar and 132 spots for 66 of the former residential trailers.

Table 2-2 Summary of Vehicular Parking Spaces

2005 GLP No.[1]	Facility[2]	Primary User[2]	Number of Parking Spaces[2]			Comments
			2000	2005	2012	
1	Hangar 1	Signature Flight Support	37	37	37	
2	Hangar 2	Signature Flight Support	20	20	20	
3	Hangar 3	Signature Flight Support	22	22	20	
7	Field Maintenance Building	Massport	18	18	18	
8	Air Traffic Control Tower	FAA	93	107	107	
9	Storage Building	FAA	n/a	n/a	18	striped spaces
9A	Sand Storage Building	Massport	n/a	0	0	2,500 sf constructed in 2005
10	Hangar 10	Signature Flight Support	64	64	64	
11	Hangar 11	NorthStar Facilities	34	34	34	
11A	Hangar 11A	Stream Enterprises	25	25	25	
12	Hangar 12	Nagle Aircraft	12	12	12	
12A	Hangar 12A	National Aviation Academy	57	57	57	
13	Hangar 13	Signature Flight Support	12	15	15	
14	FBO Facility	Signature Flight Support	10	10	10	
15	Civil Air Terminal Building	Massport	701	667	667	Restriping of parking lot
16	Hangar 16	Liberty Mutual	11	45	45	2000 includes only Hangar 3 spaces
17	Hangar 17	Jet Aviation	25	25	25	
18	Classroom	National Aviation Academy	0	0	n/a	Building demolished 2012

2005 GLP No.[1]	Facility[2]	Primary User[2]	Number of Parking Spaces[2]			Comments
			2000	2005	2012	
19	n/a	n/a	n/a	n/a	n/a	
20	Maintenance Building	Massport	23	23	23	
21	Hangar 21	Jet Aviation	142	142	142	
22	FBO Garage and Fuel Farm	Jet Aviation	0	0	0	
23	Draper Lab	Draper Lab	n/a	17	17	Small lot not assessed in 2000
24	Hangar 24	Rectrix Aerodrome Centers	42	42	70	New building and tenant on parcel scheduled for completion in 2014
25	Draper Lab	Draper Lab	26	26	26	
26	FAA Localizer	n/a	n/a	n/a	n/a	
27	FAA Glide Slope	n/a	n/a	n/a	n/a	
28	FAA Glide Slope	n/a	n/a	n/a	n/a	
29	FAA Localizer	n/a	n/a	n/a	n/a	
30	Customs Trailer	U.S. Customs	0	5	5	
31	T-Hangar Row A	Massport	12	12	12	
32	T-Hangar Row B	Massport	12	12	12	
33	T-Hangar Row C	Massport	12	12	12	
34	T-Hangar Row D	Massport	12	12	12	
35	T-Hangar Row E	Massport	12	12	12	
36	T-Hangar Row F	Massport	12	12	12	
37	T-Hangar Row G	Massport	8	8	8	
38	T-Hangar Row H	Massport	12	12	12	
39	T-Hangar Row J	Massport	18	18	18	
40	Electric Vault	Massport		0	0	
41	Residence	Massport	n/a	n/a	n/a	
42	Residence	Massport	n/a	n/a	n/a	
43	Residence	Massport	n/a	n/a	n/a	
44	Residence	Massport	n/a	n/a	n/a	
45	FBO Fuel Farm	Signature Flight Support	0	0	0	
Total			**1,484**	**1,523**	**1,557**	
Adjustments based upon *2005 ESPR* [3]:						
Hangar 16			**32**	**-**		
Draper Labs/Pine Hill T-Hangar Lot			**17**	**-**		
Customs Trailer			**5**	**-**		
USAF Parcel B (formerly leased property)[4]					**410**	
Total with Adjustments			**1,538**	**1,523**	**1,967**	

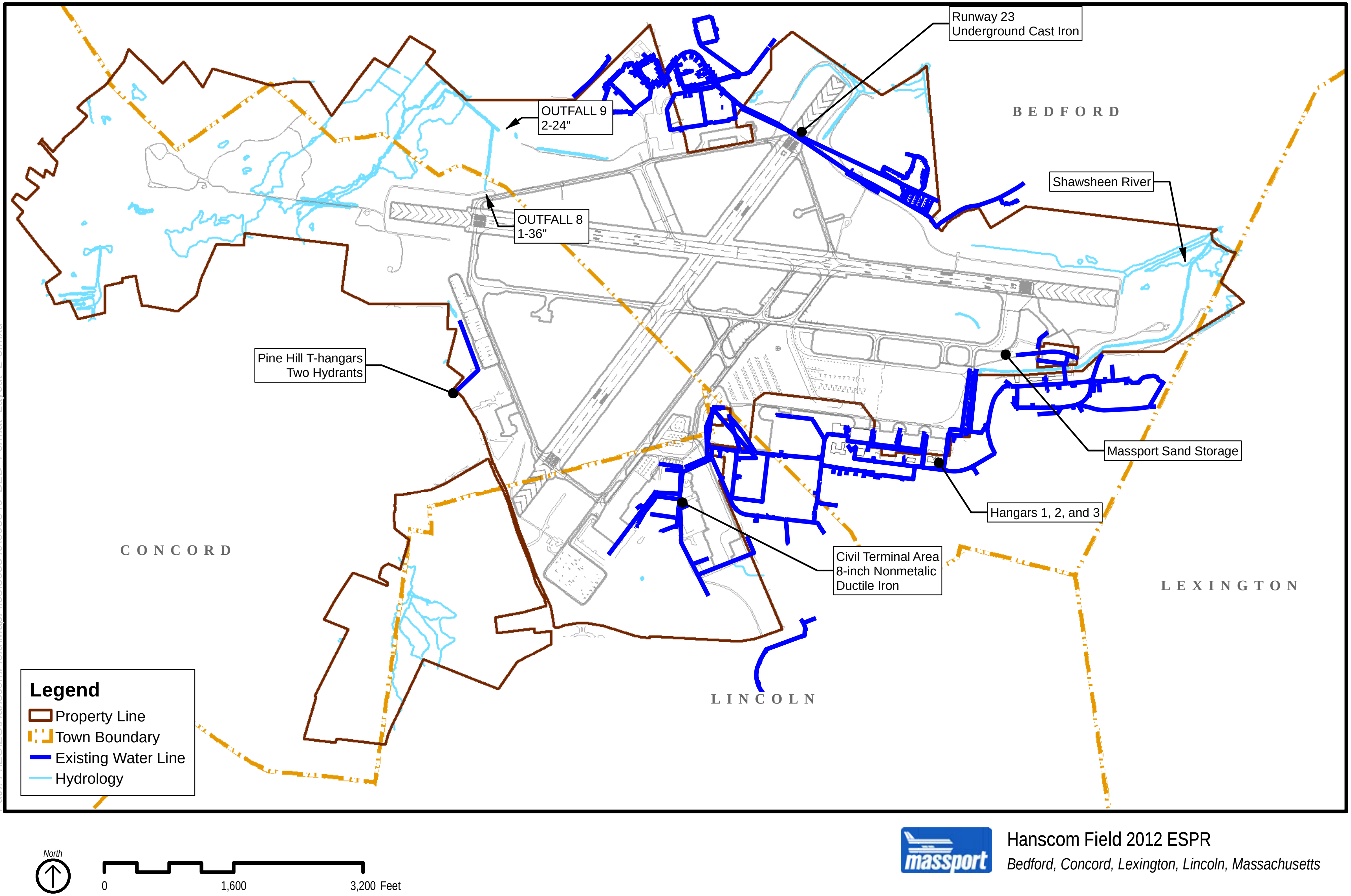
Notes:
1. L.G. Hanscom Field 2005 General Location Plan (GLP). The parking inventory in this table includes facilities owned by the USAF or U.S. Navy or properties formerly leased from Massport by the USAF.
2. Not applicable (n/a) applies to unused Building ID or facilities where information was not available.
3. These adjustments were verified during the development of the *2012 ESPR* by Hanscom Field and Massport personnel.
4. While these parking spaces are new to Hanscom, they were pre-existing spaces utilized by the USAF.

2.3.3 Water Supply and Demand

Information regarding the water supply and demand is based upon the *1995 GEIR* and *2000 ESPR* and the "Water System Improvements Study: Hanscom Field" (Metcalf & Eddy, 1992), water meter readings from 1996 through 2005, and further input from Massport. A history of water usage from 1988 to 2012 is provided in Table 2-3. Figure 2-3 shows the Massport water distribution system.

Table 2-3 History of Water Usage from 1988 to 2012

Fiscal Year	Gallons per Day
1988	11,250
1989	10,000
1990	13,100
1991	n/a
1992	n/a
1993	n/a
1994	13,600
1995	10,700
1996	10,000
1997	7,100
1998	9,900
1999	8,930
2000	15,790
2001	14,470
2002	23,940
2003	30,820
2004	25,340
2005	34,800
2006	11,813 (includes only USAF Main)
2007	11,907
2008	14,979
2009	12,920
2010	10,818
2011	13,997
2012	16,180



Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Existing Water System

Figure 2-3

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Massport's water supply is provided primarily by the adjacent Hanscom AFB water distribution system. The USAF purchases its water from the Town of Lexington, which in turn is supplied by the Massachusetts Water Resources Authority (MWRA). Massport's needs are met through the Hanscom AFB connection, except for a line from the Town of Concord for the Pine Hill Area.

The USAF has an agreement with the Town of Lexington to purchase up to two million gallons of potable water per day. According to USAF personnel, the combined Hanscom Field and Hanscom AFB daily demand rarely exceeds one million gallons per day. The Town of Lexington has available capacity in its lines and the allocation for the Hanscom AFB from the town remains intact. The supply from the Town of Lexington is via a 10-inch main located along Wood Street. Depending upon demand, water flows directly into the Hanscom AFB distribution system. The water line provided by the Town of Concord runs from a water main located along Virginia Road to the Pine Hill Area facilities.

The Massport water mains vary in size (6, 8, or 12 inches in diameter) and composition (cast iron, ductile iron, asbestos cement, and polyvinyl chloride). Massport conducted extensive water distribution system testing in 1991. The test results revealed the water system pipes and other components to be in good condition, passing pipe leak testing and hydrant flow tests at maximum daily flows. The existing Hanscom Field water system is estimated to support a total average daily demand of 65,500 gallons per day (gpd).

The Massport water distribution system primarily serves the Terminal Area, Pine Hill Area, and the East Ramp Area. The Hanscom AFB system can provide a maximum flow rate of 1,500 gallons per minute (gpm) at 20 pounds per square inch (psi) at the master meter that supplies the Terminal Area. The East Ramp has a separate connection to the Hanscom AFB system. The Hanscom AFB system includes approximately 22 hydrants for firefighting purposes. Twenty of these hydrants are fed from the USAF water distribution system and two are fed from the Town of Concord. These hydrants are all located strategically near the major buildings and hangars. The fire flow assessment for each area is described in Table 2-4.

2.3.4 Sanitary Sewer System

Table 2-5 provides average daily wastewater flows at Hanscom Field. Figure 2-4 shows Massport's existing sewer system, the location of the septic system serving Lincoln North, which is sited on Massport land west of the Terminal Area, and the septic system used in the Pine Hill Area.

Table 2-4 Existing System Fire Flow Modeling

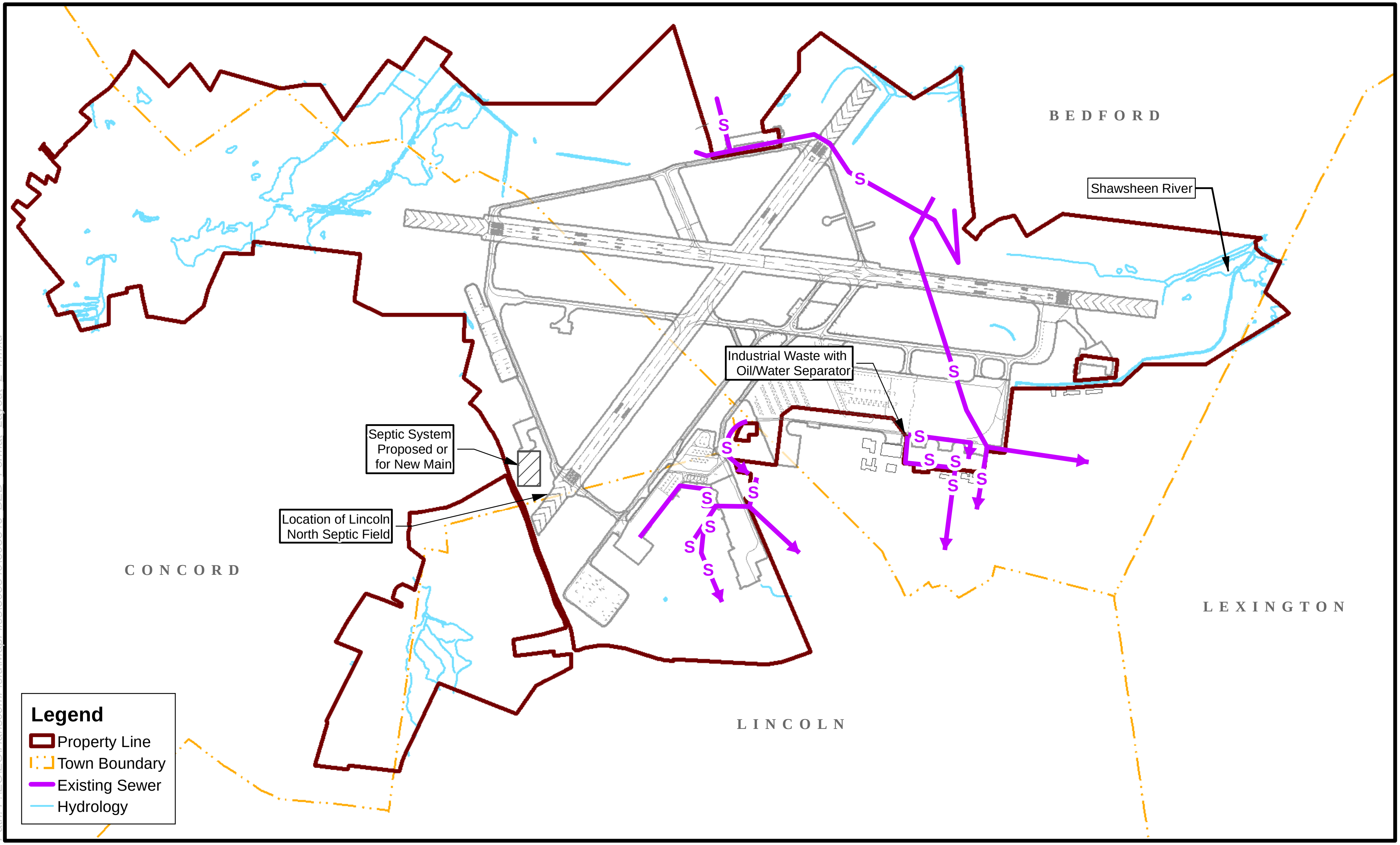
Area/Facility	Available Fire Flow at 20 psi (gpm)
Terminal Area	
Civil Air Terminal	1,410
Hangar 11	1,160
Hangars 1 & 3	1,230
Hangar 10	1,020
Hangar 12A	1,230
Hangar 2	1,150
Old T-Hangars	990
MPA Maintenance Buildings	1,460
Pine Hill Area	1,500
East Ramp Area	2,000
Hangars 1, 2, and 3	2,000
FAA Storage Facility	Not Available

Source: Massport

Table 2-5 Average Daily Wastewater Flow

Fiscal Year[1]	Gallons per Day[1]
1988	7,900
1989	7,000
1990	9,200
1992	n/a
1993	n/a
1994	n/a
1995	7,500
1996	7,000
1997	4,970
1998	6,930
1999	6,250
2000	11,050
2001	10,130
2002	16,760
2003	21,570
2004	17,740
2005	24,360
2006	8,269
2007	8,335
2008	10,485
2009	9,044
2010	7,573
2011	9,798
2012	11,326

1. Flows south to the Massachusetts Water Resources Authority System. Wastewater leaving the site is estimated to be 70 percent of water usage (see Table 2-4). This reflects some on-site septic systems that do not tie into the MWRA



Path: F:\ES\ES\HanscomField\MapFiles\305540\305540_BED_Format_Layout_2-4.mxd

North

0 1,600 3,200 Feet

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Existing Sanitary Sewer System

Figure 2-4

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Massport's wastewater system discharges into the Hanscom AFB wastewater system, which in turn discharges into the MWRA wastewater system through the Town of Lexington. The USAF has two pump stations on base: the lower station at Building 1539 and the upper station at Building 1306. The lower pump station, upgraded in 1983 with three 40-horsepower (HP) pumps, has a capacity of 1,000 gpm and serves Massport's Hanscom facilities and Hanscom AFB housing. The upper station receives flow from the lower pump station as well as the Officers Club, Lincoln Laboratory, and MITRE. The upper station was upgraded in 1987 and is equipped with two 800 gpm (40 HP) pumps, one 1,500 gpm (125 HP) pump, and two wet wells with a combined storage capacity of 250,000 gallons.

The flow from the upper station is pumped to a 10-inch force main that discharges wastewater to a force main along Hartwell Avenue. This main connects to a 20-inch force main from the Town of Bedford near the intersection of Hartwell Avenue and Bedford Street. The capacity of the force main leaving the Hanscom AFB is 1,725 gpm but use is limited to 1,500 gpm in keeping with the USAF's agreement with the Town of Bedford and the MWRA.

Massport's wastewater system was initially constructed in the 1950s. The system underwent expansion in the 1970s and 1980s to service new facilities. It was upgraded in 1994 in the Terminal Area. The upgraded pipe network, along with upgrades to the manholes in the same area, eliminated a problem of infiltration and inflow. According to the "Water System Improvements Study," the on-site 6-inch and 8-inch vitrified clay pipes have capacities of 230,000 gpd and 500,000 gpd respectively. Neither is currently near full capacity. Additionally, the Supplement to Site Development Plan and Design Guidelines by Greiner Engineering Services, Inc. (1987) states, prior to the lower pumping station on the Hanscom AFB, the system expands from an 8-inch to a 12-inch line with a capacity of 1,045,000 gpd.

2.3.5 Stormwater Management and Drainage System

Hanscom Field is located in the Shawsheen River Basin. Runoff from Massport property and the USAF property is conveyed by open channels and a closed storm drainage system. The system discharges directly and indirectly into the Shawsheen River to the east, Elm Brook (a tributary to the Shawsheen) to the west, and wetlands to the north of the site. Most of the soil types on Hanscom Field are classified as Hydrologic Soils Group C. This soil type is characterized by a slow rate of infiltration after the soils have become saturated during long duration storm events and high groundwater levels.

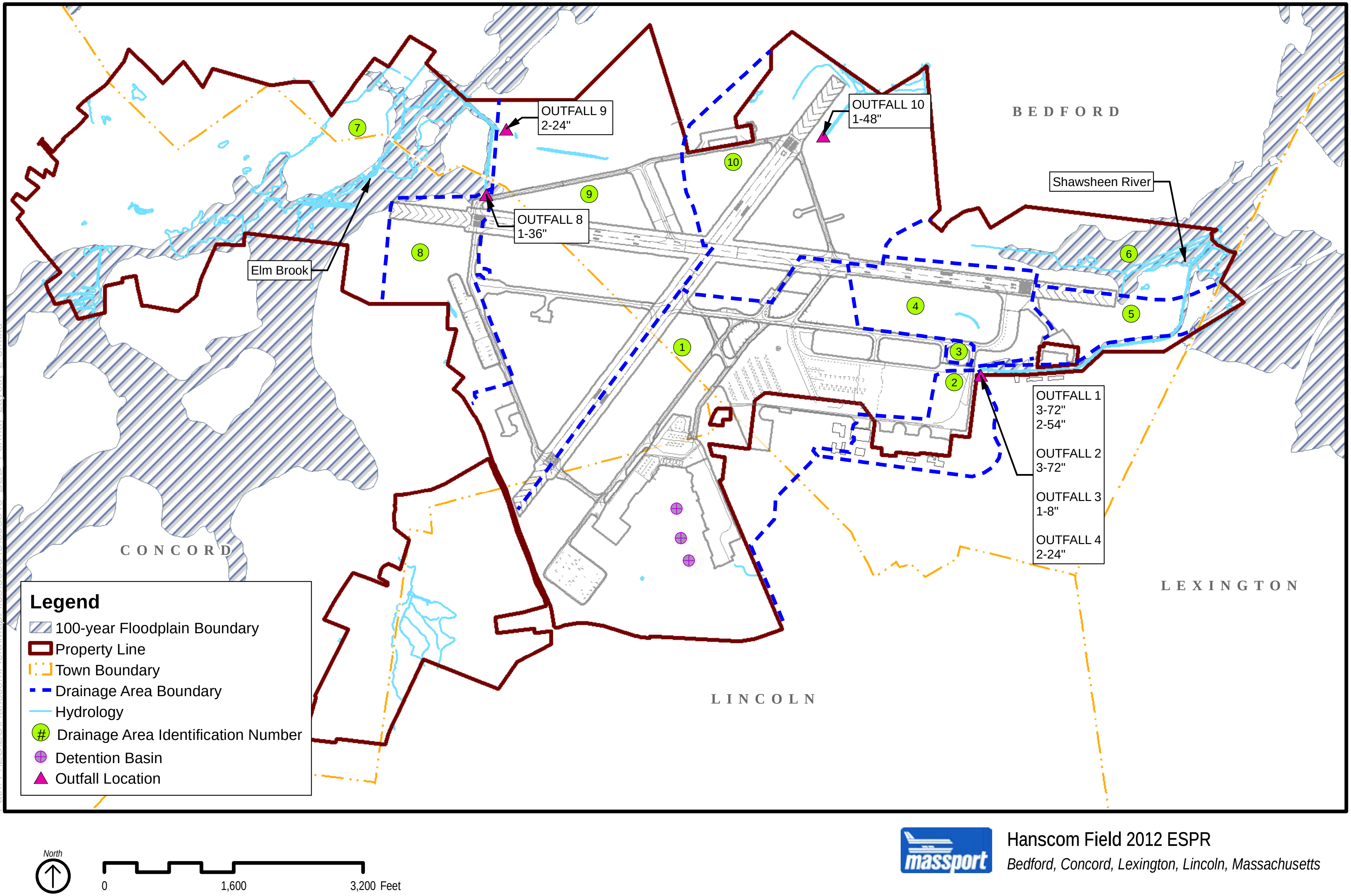
Hanscom Field employs an extensive drainage system that was designed and constructed in the early 1950s when the USAF enlarged and improved the airfield. The system was expanded and modified over the ensuing years to serve the additional development. The storm drainage system consists of a series of catch basins placed along most of the edges of the runways, taxiways, and apron areas. The stormwater system's original design, containing pervious bottom catch basins and perforated/open jointed pipes, was intended to drain groundwater as well as convey surface water away from the airfield's paved surface and infield areas. The collection system conveys stormwater and groundwater to eight outfall locations and two overland flow areas that in turn discharge directly or indirectly into the Shawsheen River.

Massport has been working cooperatively with the Massachusetts Department of Environmental Protection (MassDEP), the U.S. Environmental Protection Agency (EPA), and the USAF to improve the flow characteristics and profile of stormwater discharges into the Shawsheen River. Massport has removed pavement to decrease impermeable areas on the airfield and has incorporated water quality and water quantity improvements into ongoing projects using Low Impact Development (LID) technologies. Massport has also taken measures to control stormwater discharges into the river directly. For example, overflow weirs for temporarily storing water were installed in three large drainage pipes leading to the Shawsheen River in 2006. The weirs were designed to reduce the peak discharge of stormwater and increase base flow by releasing the stored water over time. In 2007, Massport prepared a computer model to evaluate potential stormwater improvement projects at Hanscom Field or on Hanscom AFB. An important goal of the work was to develop a system for determining which stormwater improvements would be of the greatest benefit to the Shawsheen River. In 2008, Massport had silt and sand removed from portions of three storm drainpipes just upstream from the Shawsheen River, and an additional weir was installed in a large collection chamber to reduce peak flow during a storm event. A new structure was also constructed in an infield area to reduce the amount of flow entering a culvert. In 2009, Massport completed soil permeability testing related to the potential installation of additional stormwater structures designed to increase groundwater recharge and decrease runoff.

In 2010, in compliance with the National Pollutant Discharge Elimination System (NPDES) Stormwater Multi-Sector General Permit, Massport updated its SWPPP to include best management practices for stormwater management and snow removal. All programs and audits were implemented during 2010.

Massport and the USAF continued joint discussions with MassDEP regarding the Shawsheen Watershed Initiative. In 2011, Massport received internal approval to proceed with a plan for future improvements to the Shawsheen River headwaters, to be completed jointly by Massport and the USAF. With approval from MassDEP, Massport and the USAF are jointly developing a new, more comprehensive computer model to assess how various stormwater recharge structures and best management practices could improve base flow. This model will be used to guide the future implementation of stormwater best management practices at both Hanscom Field and Hanscom AFB.

Hanscom Field is divided into ten separate drainage areas encompassing on and off-site tributaries totaling approximately 1,216 acres. Table 2-6 lists the volume of stormwater that is projected to occur during specific storm events under existing conditions for the ten drainage areas that are illustrated in Figure 2-5.



Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Drainage Area, Outfall Locations, and Floodplain Boundary

Figure 2-5

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Table 2-6 Hanscom Field Runoff Summary

Basin/ Discharge Location[1]	Drainage Area (Acres)	Percent Impervious [2]	Storm Event Runoff (Cubic Feet per Second)				
			2 Year	5 Year	10 year	25 Year	100 Year
Shawsheen River							
1	312.9	62	139.5	195.8	246.4	304.8	400.4
2	37.3	99	38.1	47.9	56.4	66.2	81.9
3	2.2	45	4.1	5.9	7.6	9.5	12.6
4	53.3	36	6.3	13.2	19.2	26.6	39.5
5	33.1	36	10.4	18.1	25.6	34.9	50.9
6	75.4	36	6.8	13.2	19.9	28.5	43.8
Elm Brook							
7	242.0	0	19.4	40.2	62.8	92.3	146.3
8	51.9	42	21.7	33.6	44.7	58.0	80.4
9	237.8	24	26.8	45.1	63.0	84.9	123.0
Wetlands							
10	170.7	21	38.6	62.4	85.5	113.5	161.2
Drainage Area No.1 includes 38.9 acres of USAF property.							

Source: Massport

Drainage Area 1: Drainage Area 1 drains to three 72-inch (1A, B, and C) and two 54-inch (1D and 1E) circular storm drains that discharge to the Shawsheen River. These drains have been identified as Outfalls lA to 1E on Figure 2-5. The five pipes collect runoff from an area of approximately 312 acres that includes land areas occupied by Massport, Signature, Jet Aviation, Sabrina Fisheries, Nagle Aircraft, Liberty Mutual, National Aviation Academy, and a portion of USAF property. Jet Aviation's fuel farm is also included in the drainage area for Outfalls lA-1E.

Drainage Area 2: The contributing drainage area to Outfalls 2A-2C consists of approximately 37 acres from Hanscom Field, which drains into three 72-inch circular storm drains (Outfalls 2A-2C) that discharge to the Shawsheen River. These 72-inch drains also collect runoff from USAF Property (upstream of Hanscom Field), which is not included in the SWPPP. The area contributing to these outfalls includes the land occupied by the Signature hangars and its fuel farm.

Drainage Area 3: This drainage area collects runoff from a small mostly vegetated area of approximately 2.2 acres and discharges to the Shawsheen River through an l8-inch pipe (Outfall 3).

Drainage Area 4: This 53-acre tributary area drains to Outfalls 4A and 4B and includes runway and infield area that discharges through two 24-inch pipes to the Shawsheen River.

Drainage Area 5: Drainage Area 5 includes runway and infield area of approximately 33 acres that contributes runoff via an overland flow to the Shawsheen River.

Drainage Area 6: Drainage Area 6 includes runway and infield area of approximately 75 acres that contributes runoff via drainage swale to the Shawsheen River.

Drainage Area 7: This is an undeveloped vegetated area of approximately 242 acres that contributes runoff to Elm Brook via overland flow.

Drainage Area 8: This drainage area collects runoff from approximately 52 acres of runway and infield area and discharges through a 36-inch pipe (Outfall 8). The discharge flows via drainage swale (approximately 900 feet) to Elm Brook.

Drainage Area 9: This area is a 238-acre basin that contributes runoff to Outfall 9. A large portion of this area (Area B) is comprised of a runway with associated grassed infield. This area includes approximately

5.6 acres of U.S. Navy property. Rectrix and Draper Laboratory are located in this drainage area. It discharges through a 54-inch reinforced concrete pipe at a location approximately 500 feet from Elm Brook.

Drainage Area 10: Outfall 10 receives runoff from 170 acres of land that consist of runway and infield areas and includes approximately 11.4 acres owned by the U.S. Navy. This area discharges through a 48-inch reinforced concrete pipe to the wetland area north of the airport.

2.3.6 Hazardous Material Management

Drainage areas 1 and 2 contain facilities that are reported to store and use hazardous materials, including fuel oils and chemicals. Massport has developed a Spill Prevention Control and Countermeasures (SPCC) Plan that covers general Massport operations. Tenants that store a total of more than 42,000 gallons of oil in underground storage tanks (USTs) and/or more than 1,320 gallons of oil in ASTs or containers are required to have a SPCC Plan as required under 40 CFR 112 (Oil Pollution Prevention). Table 2-7 lists the hazardous materials that are likely to be present at Hanscom.

Table 2-7 Hanscom Field List of Hazardous Materials

Fuels	Miscellaneous Materials	Waste Materials	Vehicle Maintenance Materials
Jet Fuel A	Cooking oil grease	Waste mix oils	Hydraulic Fluid
Low Lead 100 Fuel	Ethylene Glycol	Battery Acid	Transmission Fluid
Gasoline	Propylene Glycol	Waste Jet Fuel	Brake Fluid
Kerosene	Paint		
Number 2 Heating Oil	Ureas		
Motor Oil	Calcium Chloride		
Turbine Oil	Sodium Formate		
Gasoline	Cleaners/Detergents		
	Parts Cleaners		
	Asbestos		

Source: Massport

Spills of hazardous materials on site must be immediately reported to the Hanscom AFB Fire Department. Notification to the National Response Center and the MassDEP is also required if the amount exceeds the Reportable Quantity threshold or enters a catch basin or drain. All spills shall be documented in writing to Massport's Operations and Environmental Departments.

Spills exceeding the reportable quantity limits established in Table 302.4 - List of Hazardous Substances and Reportable Quantities of 40 CFR 302 and Table 1 - Massachusetts Oil and Hazardous Materials List 310 CMR 40.1600, Subpart P, must be reported to the National Response Center, and the MassDEP, respectively. The limits established by these regulations for the most common materials handled at Hanscom are provided in the SWPPP, Laurence G. Hanscom Field, Bedford, Massachusetts (January, 2009; Last Updated: June 2013), along with the spill reporting contact list.

2.3.7 Floodplain

Figure 2-5 depicts the 100-year floodplain boundary for the area surrounding Hanscom according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for the Town of Bedford, Panel No. 255209-005 and 006 C, effective July 4, 1988. There is no FEMA mapping done for the Hanscom Field area located within Towns of Lincoln and Concord.

2.3.8 Wellhead Protection Areas

As discussed in Chapter 9, Wetlands Wildlife and Water Resources, portions of Hanscom Field are located within the Wellhead Protection Area for three wells in Bedford (see Figure 9-4). There are no Surface Water Supply Protection Areas (Zone A, B, C) in Hanscom Field.

2.3.9 Electrical Distribution System

Hanscom Field electrical power is provided primarily by NSTAR Electric and Gas. Electrical services for facilities located in Concord are provided by Concord Municipal Power and Light (CMPL). For the most part, the civilian and Hanscom AFB electrical distribution systems are separate. The few exceptions are power supplies to some navigational aids.

The overall capacity of the electrical system is approximately 800kVA. In 1987, average annual power consumption was estimated at 600kVA (Greiner, 1987), 75 percent of total capacity. The existing system has sufficient capacity for some additional power demands by existing tenants and buildings. To meet future demands, additional electrical capacity may be required. The 5kV supply from NSTAR is small, considering the demand placed by the airfield and buildings. In 1987, the utility company considered the installation of a 13.8kV feeder to the airfield. If this occurs, the primary electrical distribution system would need to be redesigned and significantly upgraded but would provide the benefit of adequate power for long-term electrical needs.

Electricity generation is also conducted at one location at Hanscom. A solar photovoltaic array was constructed on the roof of the Civil Air Terminal in 2011. The facility has a rated capacity of 51 kW and is predicted to produce over 57,233 kilowatt-hours (kWh) of electricity per year, or 21 percent of the total building electricity requirement. For any periods when it is producing more electricity than the building requires, the electricity will flow back to the on-site distribution system for consumption by other facilities.

2.3.10 Natural Gas

Natural gas is supplied by National Grid through a 4-inch high pressure main that comes onto airport property from Route 2A along Hanscom Drive. Gas is used for heating purposes with demand peaking during the winter months. This gas service was increased from a 2-inch high pressure main in order to supply the new hangars and conversion of the Civil Air Terminal building to gas heat, and construction by the USAF of a new Commissary facility. This four-inch line can accommodate future development.

2.3.11 Telephone/Communications

Verizon Communications provides telephone service to Hanscom. Telephone service lines enter along Hanscom Drive on overhead poles to the Terminal Area. The lines then run in underground conduits, which are routed to each of the facilities at Hanscom. Telephone conduit capacities are adequate for current demands although routine service upgrades may be required to provide a sufficient number of lines for future conditions.

2.3.12 Tank Management Program

Beginning in 1993, Massport instituted a tank management program designed to track the age and physical characteristics of all Massport-owned and fuel storage tanks at Hanscom Field. The purpose of this program is to maintain current tank information and ensure that tanks comply with the current AST and UST regulatory requirements.

In 1995, the Massport Environmental Management Unit established a database of all Massport- and tenant-owned tanks identified at Hanscom. This regularly updated database tracks more than 50 tanks that are currently in use, have been removed, or have been replaced. Information on tenant tanks is obtained from tank permits filed with the Massport Fire Department. Massport records show that its existing tanks are currently in compliance with applicable state and federal regulations. Massport will continue to monitor the condition of all active tanks to ensure proper functioning and regulatory compliance.

Since 2005, the ASTs at Hangar 10 were removed. In 2010, Massachusetts State Tank Regulations were revised, and regulatory jurisdictions are now assigned by tank size and position (above or below the ground). Storage tanks on Massport property are now regulated by various jurisdictions—ASTs of less than 10,000-gallon capacity by the Massport Fire Department, ASTs of greater than 10,000-gallon capacity by the Massachusetts Department of Fire Services, and USTs by the MassDEP. As of 2010, ASTs must be renewed annually; however, UST permits no longer expire. Active smaller ASTs, larger ASTs, and USTs at Hanscom Field are listed in Tables 2-8, 2-9, and 2-10, respectively.

Table 2-8 ASTs Less Than 10,000 Gallons at Hanscom Field

Tank ID	Owner	Location	Volume (gallons)	Content
HANAM-0042	Massport	Field lighting vault	500	D
HANAM-0073	Massport	Building 37	275	D
HANAM-0074	Massport	Building 31	110	D
HANAT-0050	Jet Aviation	380 Hanscom Drive	3,000	G
HANAT-0054	Stream Enterprises	140 Hanscom Drive	1,065	D
HANAT-0061	Signature Flight Support	East ramp	6,000	G
HANAT-0062	Signature Flight Support	East ramp	6,000	D
HANAT-0064	Signature Flight Support	NW corner of Building 13	275	D
HANAT-0071	Signature Flight Support	Hangar 1	275	HO
HANAT-0072	Signature Flight Support	Hangar 1	275	D
HANAT-0076	Liberty Mutual	230 Hanscom Drive, Building #16	200	D
HANAT-0079	Boston Medflight	Hangar 2 (in front, airside)	400	HO
HANAT-1004	Jet Aviation	Building #17, Jet Aviation	350	D
HANAT-1005	Jet Aviation	Building #17, Jet Aviation	300	WO

Tank list updated May 20, 2013
Tanks inspected annually
Permit expires 1/15/2014 for all tanks
D = diesel HO = heating oil
G = gasoline WO = waste oil

Source: Massport

Table 2-9 Active ASTs Greater Than 10,000 gallons at Hanscom Field

Tank ID	Owner/Operator	Location	Volume (gallons)	Content	Permit Expiration
HANAT-0047	Jet Aviation	380 Hanscom Drive	20,000	JA	1/15/2014
HANAT-0048	Jet Aviation	380 Hanscom Drive	20,000	JA	1/15/2014
HANAT-0049	Jet Aviation	380 Hanscom Drive	12,000	AG	1/15/2014
HANAT-0059	Signature Flight Support	East Ramp	15,000	JA	1/15/2014
HANAT-0060	Signature Flight Support	East Ramp	10,000	AG	1/15/2014
HANAT-0063	Signature Flight Support	East Ramp	15,000	JA	1/15/2014
HANAT-0066	Signature Flight Support	East Ramp	15,000	JA	1/15/2014
Tank list updated 1/28/13 Tanks inspected annually Permit expires 1/15/2014 for all tanks AG = AvGas JA = Jet A					

Source: Massport

Table 2-10 Active USTs at Hanscom Field

Tank ID	Owner/Operator	Location	Volume	Content
HANBM-0026	Massport	Building maintenance shop	1,000	HO
HANBM-0038	Massport	150 Hanscom Drive	6,000	HO
HANBM-0043	Massport	Field maintenance garage	6,000	G
HANBM-0044	Massport	Field maintenance garage	6,000	HO
HANBM-0045	Massport	Field maintenance garage	6,000	D
HANBT-0065	FAA	ATCT	2,500	D
HANBT-0067	Liberty Mutual	230 Hanscom Drive	25,000	JA
Tank list updated May 2013. All underground storage tanks on Massport property are permitted by Massport Fire and no longer expire. ATCT = Air Traffic Control Tower FAA = Federal Aviation Administration HO = heating oil	G = gasoline D = = diesel JA = Jet A			

Source: Massport

Information about Massport's Tenant Audit Program and MassDEP-listed disposal sites at Hanscom Field is provided in Chapter 9, Wetlands Wildlife and Water Resources. Site remediation was completed in 2005 for the only MassDEP-listed disposal site that was open. Massport submitted documents to MassDEP and the U.S. EPA on May 22, 2006 to bring this site to regulatory closure. A search of the MassDEP's Online 21E Site File Review database returned data indicating that there are three 21E-cases associated with Hanscom Field with notification dates in 2000, 1994, and 1993 and response action outcome (RAO) status. RAO status indicates that response actions were sufficient to achieve a level of no significant risk or at least ensure that all substantial hazards were eliminated.

(This page intentionally left blank)

3 Airport Activity Levels

This chapter reports on aviation activity levels and trends at Hanscom Field from 2000 to 2012. Aviation activity levels form the basis of the evaluations of ground transportation, noise and air quality impacts associated with the airport. This *2012 ESPR* also provides an opportunity to re-assess the prior forecasts presented in the *2005 ESPR* and update the forecasts to reflect current conditions and industry trends. Base year (2012) traffic is compared to forecast activity from the *2005 ESPR*, and new forecasts for the mid (2020) and long-term (2030) planning horizons are presented and described. The actual operations for 2012 can also be compared with actual operations in past years to reveal activity trends. The updated forecasts are subsequently used to assess potential future ground traffic, noise and air quality impacts associated with the airport under certain planning scenarios.

Hanscom Field accommodates all segments of the general aviation (GA) industry including business and corporate aviation, air taxi/private charter services, recreational and personal flying and pilot training activities. In addition to GA, from time to time commercial passenger services have been available at Hanscom Field. The most recent such service was provided by Streamline Air from April 2011 to September 2012. This chapter reports on all aviation activities at Hanscom Field and the following traffic measures:

- Aircraft operations by type and aircraft category
- Based aircraft
- Commercial air passengers

Table 3-1 presents the 2005 and 2012 actual operations by aircraft type from 7:00 am to 11:00 pm along with forecasts prepared for the planning years 2020 and 2030.

3.1 Key Findings Since 2005

- Hanscom Field functions as a premier full-service GA airport and corporate reliever for Boston Logan Airport with limited commercial passenger service.
- There were 166,000 aircraft take-offs and landings performed at Hanscom Field in 2012. GA accounted for 99 percent of the operations.
- Nearly three-quarters of the aircraft operations are conducted with single-engine piston aircraft, including 70,200 local pilot training operations and 51,500 itinerant operations for personal or recreational purposes.
- Hanscom also serves the needs of business aviation users, including corporations that own their own aircraft and businesses that charter private flights. Business aviation operations conducted in jets, turboprops and multi-engines piston aircraft accounted for 22 percent of Hanscom's activity, or 35,800 operations.
- Streamline Air offered regularly scheduled public charter services at Hanscom from April 2011 to September 2012. Streamline's services were geared towards business travelers. Two daily roundtrips were flown from Hanscom to Trenton, New Jersey with 30-seat turboprop aircraft.

There have been no scheduled passenger services at Hanscom since Streamline Air discontinued services in 2012.

- Hanscom's total aircraft operations have declined by 2.0 percent annually from approximately 218,000 operations in 2000 to 166,000 operations in 2012. The drop in aircraft operations at Hanscom mirrors a long-term decline in general aviation activity nationally. GA suffered steep declines as a result of rising fuel prices and the economic recession in 2008 and 2009. Nationally, the GA industry has yet to recover from the downturn. GA operations at U.S. airports with air traffic control towers were down by nearly 7 percent in 2012 compared to 2009. However, GA at Hanscom Field has recovered with operations increasing by approximately 11 percent over the same period.
- Business aviation has been the fastest growing segment of activity at Hanscom Field, increasing at a long-term average annual rate of 2 percent from 2000 to 2012. After a sharp decline in business aviation following the economic and financial collapse in 2008/09, business operations have been slow to recover due to the slow pace of economic growth and economic uncertainty.
- Forecasts of aviation activity at Hanscom Field were prepared for the near-term (2020) and long-term (2030) planning periods. A key assumption underlying the forecasts is that Hanscom continues to function as a GA reliever for Logan Airport and the premier business aviation airport in the Greater Boston area with limited military and commercial airline operations.

Table 3-1 Summary of Actual and Forecast Activity at Hanscom Field

	Actual		Forecast	
	2005	**2012**	**2020**	**2030**
Aircraft Operations (7:00 am to 11:00 pm)				
General Aviation				
Local (SEP)	58,535	70,196	62,605	65,164
Personal Flying (SEP)	57,894	51,477	50,661	58,285
Business Non-Jet (MEP + Turbo)	9,646	10,178	10,861	12,985
Business Jet	32,345	25,638	35,043	46,782
Helicopter	7,004	7,345	7,345	7,345
Subtotal GA	**165,424**	**164,834**	**166,515**	**190,561**
Military	**904**	**745**	**745**	**745**
Commercial Scheduled Airline[1]	**3,627**	**635**	**1,040**	**1,820**
Total Operations	**169,955**	**166,214**	**168,300**	**193,126**
Based Aircraft	**387**	**340**	**360**	**416**
Commercial Airline Passengers	**17,457**	**8,609**	**20,280**	**40,600**

1. Aircraft operations are tracked by the FAA daily between 7:00 am and 11:00 pm, which are the hours that the air traffic control tower is open.

Source: Massport, FAA Tower Counts, and *2005 ESPR*.

- Total aircraft operations are forecast at 168,300 in 2020 and 193,100 in 2030. Long-term growth in overall aircraft operations (2012 to 2030) is expected to be modest at 0.8 percent per year. Consistent with a positive outlook for business aviation nationally, business operations are expected to increase by 2.9 percent per year reaching nearly 60,000 operations in 2030. Business jet operations are forecast to grow by 3.4 percent per year to nearly 46,800 in 2030.
- Although there is no commercial airline services offered at Hanscom today, the activity forecasts include a commercial passenger airline scenario. The forecast scenario assumes services by a small regional airline or public charter provider, similar to the recent Streamline Air operation at

Hanscom. The assumed services would target business passengers and would be operated with 30-seat turboprop aircraft. Under these assumptions, scheduled commercial airline passenger traffic at Hanscom Field is forecast at 20,300 by 2020 and 40,600 in 2030. Annual commercial airline operations are forecast at 1,040 in 2020 and 2,080 in 2030.

3.2 2012 Activity Levels at Hanscom

In 2012, there were approximately 166,000 aircraft landings and take-offs at Hanscom Field[7]. GA accounted for nearly all of the activity at Hanscom Field, with military and commercial airline activity representing less than 1 percent of the airport's operations. Commercial services provided by Streamline Airlines were discontinued in September 2012.

Nearly three-quarters (73 percent) of the operations performed at Hanscom in 2012 were in single-engine piston (SEP) aircraft (see Figure 3-1). At Hanscom, single-engine piston activity consists of training operations and recreational (or personal) flying. Training operations associated with the two flight schools are the prevailing type of aircraft operation at Hanscom Field. In 2012, more than 70,000 training operations occurred at Hanscom.

Training operations are also referred to as "local" operations by the FAA because these operations are conducted in the local traffic pattern or within sight of the airport tower or are known to be departing for, or arriving from, local practice areas located within a 20-mile radius of the airport. All other operations have an arrival or departure outside the local traffic pattern and are considered "itinerant." Operations that are itinerant may be performed by aircraft that are based at Hanscom or based at other airports.

Recreational flying in single engine piston aircraft is the second most prevalent type of aircraft activity at Hanscom. In 2012, there were approximately 51,500 recreational operations conducted by single engine piston aircraft.

Hanscom Field also serves the needs of business aviation users, which include corporations that own and operate their own aircraft. These users may have aircraft that are based at Hanscom or their aircraft may be based at other airports, either in the region or across the globe. Business aviation users also include on-demand air taxi and charter operators that provide private air transportation services for hire or fractional aircraft operators whose customers own a share of an aircraft and are guaranteed a certain number of air transportation hours per year. In 2012, Hanscom accommodated approximately 35,800 business aviation operations, which represents 22 percent of total operations. Business aviation activity includes operations in jet and non-jet aircraft, such as multi-engine pistons (MEP) and turboprops (TP).

Helicopters based at Hanscom Field provide medical and other emergency transportation services and private charter operations. In 2012, helicopters performed 7,300 operations, which represent approximately 4 percent of Hanscom's total operations. Military operations account for less than one half percent of Hanscom's aircraft activity. In 2012, there were 745 operations in military aircraft.

[7] Massport's official aircraft operation counts are based on the FAA Air Traffic Control Tower (ATCT) counts from 7:00 am to 11:00 pm when the tower is operational. In 2012, there were 1,631 additional aircraft operations during the late night/early morning hours when the tower is closed. The nighttime operations presented in the 2012 ESPR differ slightly from those published in the Hanscom Field Annual Noise Report. This discrepancy is due to the difference in the timing of the preparation for the two reports. Each report used the best available data at the time of the analysis for that report. The difference of approximately 0.3 daily nighttime operations or 0.07% of all daily operations would change computed noise levels by less than 0.1 dB, which is imperceptible and would not change the analysis presented.

In 2012, Streamline Air offered regularly scheduled public charter services between Hanscom Field and Trenton Mercer Airport in New Jersey with 30-seat Embraer Brasilia turboprops. Services were geared toward the business traveler and were operated on weekdays with up to two departures per day. Streamline Air which began serving the Hanscom market in April 2011, discontinued services in September 2012. From January through September, Streamline conducted 635 operations and had 8,600 passengers (enplaned plus deplaned) at Hanscom Field.

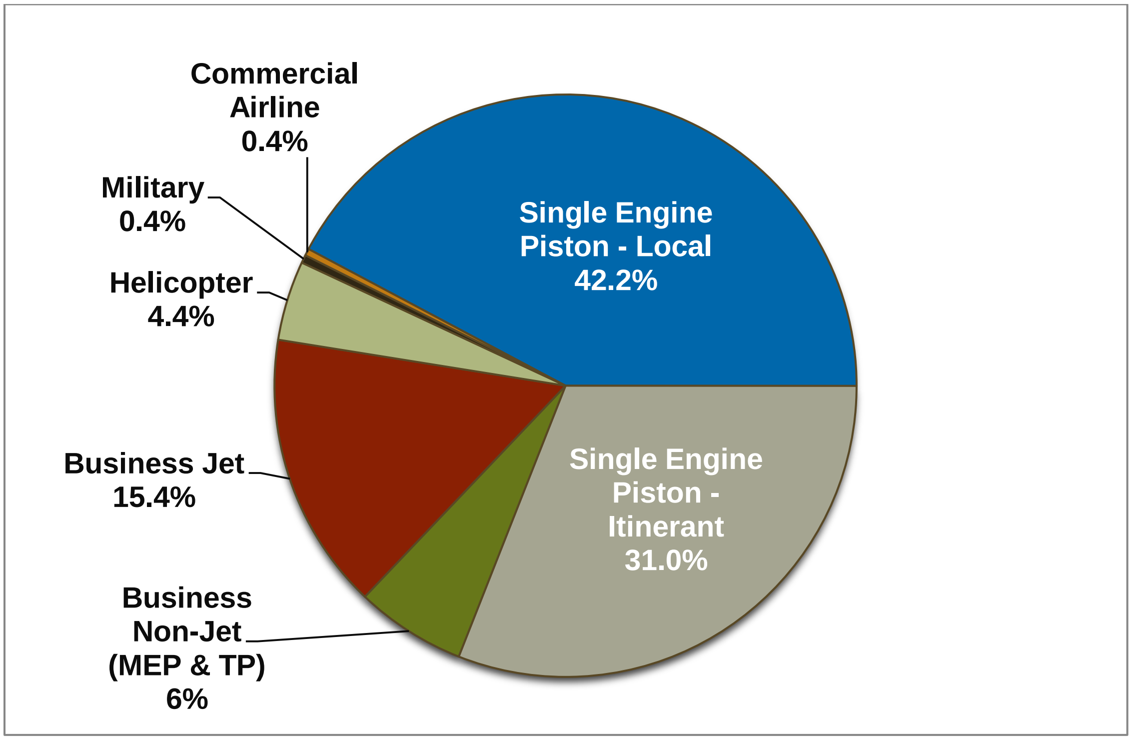


Figure 3-1 Hanscom Field Aircraft Operations by Type and Aircraft Category

Source: Massport

3.2.1 Comparison of 2005 ESPR forecast to actual 2012 activity

All long-term aviation forecasts are subject to uncertainty. A variety of unforeseen external factors can positively or negatively impact airport traffic levels and lead to discrepancies between forecast and actual activity levels. There have been a number of such unpredictable external shocks over the past several years that have affected aviation both locally and nationally.

Table 3-2 compares actual 2012 activity levels at Hanscom to predicted 2012 levels based on the *2005 ESPR* forecasts. Predicted 2012 activity levels were interpolated based on the 2010 and 2020 forecasts presented in the *2005 ESPR.* Hanscom's actual aircraft operations for 2012 were lower than the activity levels based on the *2005 ESPR* forecasts by 32,000 to 47,000 for the Moderate and High scenarios, respectively (see Table 3-2). The largest discrepancies are in the personal flying and business jet categories. Compared to the 2005 projections, there were 8,000 to 20,000 fewer itinerant operations in single-engine piston aircraft and 25,000 to 34,000 fewer operations in business jet aircraft. Both of these activity segments were negatively impacted by higher fuel prices, which have more than doubled since 2005, as well as the 2008/2009 economic recession and slow pace of economic recovery, which depressed demand for private air transportation.

In addition, the global financial collapse had a negative impact on the per-seat on-demand air taxi model that was predicated on the use of new, low-cost very light jets like the Eclipse. When the *2005 ESPR* forecasts were being developed, there were several new entrant air taxi operators like DayJet and Pogo, which were forecast to transform the industry and lead to higher growth in business jet activity. However, these companies were unable to obtain needed financing to launch their operations and they ultimately collapsed. Nationally, actual growth in business jet activity between 2005 and 2012 was much lower than predicted by industry analysts and the FAA.

Table 3-2 2005 ESPR Forecast and Actual 2012 Activity at Hanscom Field

	2005	2012	2005 ESPR Forecast for 2012		Actual vs. Forecast Net Difference		Actual vs. Forecast Percent Difference	
			Moderate	High	Moderate	High	Moderate	High
Aircraft Operations								
General Aviation								
Local (SEP)	58,535	70,196	64,178	52,360	6,018	17,836	9.4%	34.1%
Personal Flying (SEP)	57,894	51,477	59,274	71,158	(7,797)	(19,681)	-13.2%	-27.7%
Business Non-Jet (MEP + Turbo)	9,646	10,178	10,138	10,496	40	(318)	0.4%	-3.0%
Business (Jet)	32,345	25,638	50,751	59,388	(25,113)	(33,750)	-49.5%	-56.8%
Helicopter	7,004	7,345	7,000	7,000	345	345	4.9%	4.9%
Subtotal GA	**165,424**	164,834	191,341	200,402	(26,507)	(35,568)	-13.9%	-17.7%
Military	**904**	745	900	1,028	(155)	(283)	-17.2%	-27.5%
Commercial Scheduled Airline								
Passenger	3,627	635	5,949	11,085	(5,314)	(10,450)	-89.3%	-94.3%
Cargo	-	-	-	1,128	-	(1,128)	-	-100.0%
Subtotal Commercial Airline	3,627	635	5,949	12,213	(5,314)	(11,578)	-89.3%	-94.8%
Total Operations	169,955	166,214	198,190	213,644	(31,976)	(47,430)	-16.1%	-22.2%
Based Aircraft	387	340	384	400	(44)	(60)	-11.5%	-15.0%
Commercial Airline Passengers	**17,457**	8,609	82,238	325,012	(73,629)	(316,403)	-89.5%	-97.4%
Note: 2012 projections from the *2005 ESPR* are interpolated based on the 2010 and 2020 forecast years. Operations are for the period 7:00 am to 11:00 pm.								

Source: Massport and FAA Tower Counts.

The *2005 ESPR* forecasts also projected 5,900 to 11,100 commercial airline operations and 82,000 to 325,000 passengers in 2012. Actual commercial airline activity fell significantly short of the projections at 635 operations and 8,600 passengers in 2012. The commercial airline industry was also greatly affected by the combination of high fuel prices and weak demand. The airline industry, which has seen fuel prices more than triple since 2000, has consolidated and airlines have radically altered their business models by cutting capacity and withdrawing services from small, secondary regional airports. In the New England region, the secondary Boston area airports, T.F. Green/Providence and Manchester-Boston Regional, experienced passenger declines of 36 and 43 percent, respectively, between 2005 and 2012.

While several segments underperformed relative to the forecasts, training operations were higher than the predicted levels in both the Moderate and the High scenarios. The *2005 ESPR* forecast predicted 52,300 to 64,200 training operations compared to 70,200 actual operations in 2012.

3.3 Long-term Activity Trends

3.3.1 Total aircraft operations

Hanscom's total aircraft operations, as shown in Table 3-3, have declined at an average annual rate of 2.0 percent from 212,400 in 2000 to 166,200 in 2012. Over the period shown, aircraft operations reached a high of 218,200 in 2003 before falling to a low of 150,000 in 2009, when the economy was at its weakest. All major activity segments (i.e. general aviation, commercial airline and military) experienced declines in activity from 2000 to 2012.

Table 3-3 Summary of Hanscom Field Aircraft Operations, 2000 to 2012

Year	General Aviation	Commercial Airline	Military	Total	Annual Percent Change
2000	204,512	6,572	1,287	212,371	-
2001	197,770	6,414	1,252	205,436	-3.3%
2002	210,221	6,603	1,424	218,248	6.2%
2003	190,789	2,956	1,142	194,887	-10.7%
2004	175,301	4,308	1,195	180,804	-7.2%
2005	165,424	3,627	904	169,955	-6.0%
2006	167,808	3,057	1,592	172,457	1.5%
2007	160,992	3,477	1,438	165,907	-3.8%
2008	164,195	104	1,590	165,889	0.0%
2009	148,604	-	1,307	149,911	-9.6%
2010	161,942	-	1,795	163,737	9.2%
2011	160,830	750	1,419	162,999	-0.5%
2012	164,834	635	745	166,214	2.0%
Average Annual Growth					
2000-2005	-4.2%	-11.2%	-6.8%	-4.4%	
2005-2012	-0.1%	-22.0%	-2.7%	-0.3%	
2000-2012	-1.8%	-17.7%	-4.5%	-2.0%	

Source: Massport and FAA Tower Counts.

3.3.2 General aviation aircraft operations

General aviation (GA) includes all aviation operations except for scheduled commercial airline and military operations. GA includes flying by businesses that provide on-demand passenger or cargo charter services; corporate flight departments; owner-flown aircraft; air ambulance providers; law enforcement, firefighting and public safety agencies; companies that provide aerial services such as photography; and flight schools that train pilots. The GA fleet includes a diverse range of aircraft types from light sport aircraft to sophisticated, long-range business jets, but the predominant general aviation aircraft is the single-engine piston.

Since 2000, GA operations at Hanscom Field have declined from more than 204,000 to 166,200 in 2012. The overall decline at Hanscom mirrors a long-term decline in GA nationally. As shown in Figure 3-2, GA operations at Hanscom fell by 1.8 percent annually from 2000 to 2012 compared to a national decline of 3.5 percent per year. Since the recent recession, GA activity has continued to decline nationwide, falling by 6.7 percent from 2009 to 2012. In contrast, GA activity at Hanscom has returned to growth, increasing by 10.9 percent over the same period. The recovery observed at Hanscom reflects a different mix of GA activities compared to the overall U.S. industry. Business jets, the growth segment of the GA industry, accounts for approximately 5 percent of national GA activity compared to 15 percent GA operations at Hanscom. Hanscom's growth trends in each of the major general aviation segments are summarized in Table 3-4 and described in the following sections.

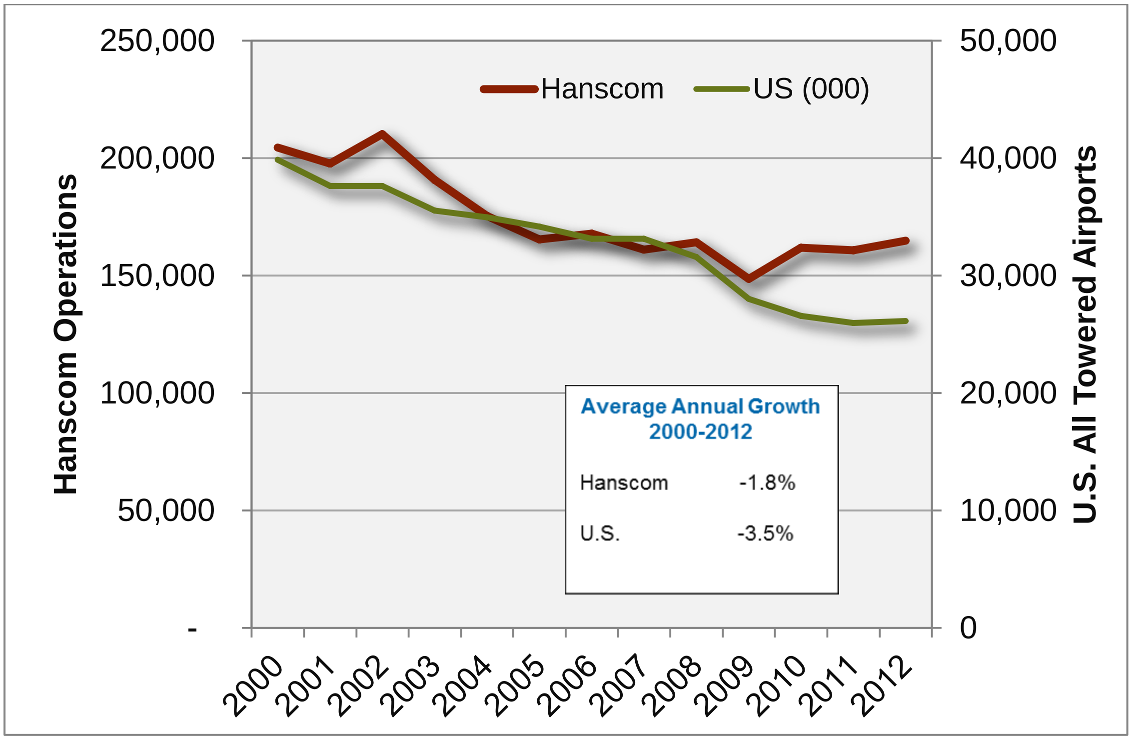


Figure 3-2 Historic Trend in General Aviation Operations at Hanscom Field and U.S. Towered Airports

Note: Includes local and itinerant operations. U.S. operations include operations at towered airports only.

Source: Massport and FAA, Aerospace Forecasts, various years.

Table 3-4 Hanscom Field General Aviation Aircraft Operations, 2000 to 2012

	General Aviation Operations							
		Personal	Business					
Year	Training (SEP)	Flying (SEP)	MEP	Turbo	Jet	Subtotal	Helicopter	Total GA
2000	75,676	90,323	5,099	6,274	20,226	31,599	6,914	204,512
2001	72,605	84,803	4,858	7,166	22,839	34,863	5,499	197,770
2002	76,849	82,282	5,295	7,995	30,788	44,078	7,012	210,221
2003	71,696	70,912	4,750	6,101	30,352	41,203	6,978	190,789
2004	60,794	63,713	4,818	5,849	33,061	43,728	7,066	175,301
2005	58,535	57,898	4,265	5,381	32,341	41,987	7,004	165,424
2006	59,222	58,198	4,352	5,771	33,251	43,374	7,014	167,808
2007	56,731	51,776	4,196	6,878	34,522	45,596	6,889	160,992
2008	65,906	50,069	3,977	6,778	30,661	41,416	6,804	164,195
2009	60,263	46,478	3,963	5,588	25,482	35,033	6,830	148,604
2010	66,038	52,631	3,451	5,704	27,293	36,448	6,825	161,942
2011	60,268	56,059	3,542	6,136	27,838	37,516	6,987	160,830
2012	70,196	51,477	3,763	6,415	25,638	35,816	7,345	164,834
Average Annual Growth								
2000-2005	-5.0%	-8.5%	-3.5%	-3.0%	9.8%		0.3%	-4.2%
2005-2012	2.6%	-1.7%	-1.8%	2.5%	-3.3%		0.7%	-0.1%
2000-2012	-0.6%	-4.6%	-2.5%	0.2%	2.0%		0.5%	-1.8%

Source: Massport and FAA Tower Counts.

3.3.2.1 Training operations

The flight schools located at Hanscom Field provide flight instruction to student pilots and advanced skills training to existing pilots. Student pilots accompanied by a flight instructor often practice take-offs and landings at Hanscom Field. These activities are called "touch-and-go" operations and are typically conducted in single-engine piston aircraft. A touch-and-go operation occurs when an aircraft lands and then takes-off without stopping or exiting the runway.

In 2012, there were 70,200 training (i.e. local) operations at Hanscom Field, an increase of 16.5 percent over the prior year. Although training operations have fluctuated from year to year, the long-term trend has been a decline in training operations at Hanscom. Nationally, local operations at towered airports have decreased at a rate of 3.1 percent per year from 2000 to 2012[8]. However, training operations at Hanscom have declined less sharply, falling at a rate of 0.6 percent per year over the same period.

3.3.2.2 Personal flying operations

Personal, or recreational, operations at Hanscom are conducted with small, single-engine piston aircraft that are often pilot owned. These flights may be for personal travel to leisure or business destinations or for the pleasure of flying.

There were nearly 51,500 personal flying operations conducted at Hanscom in 2012, a decrease of 8.2 percent over the prior year. This has been one of the fastest declining segments of activity at Hanscom Field. From 2000 to 2012, personal flying operations have fallen at an average annual rate of 4.6 percent. This segment of GA flying has also declined nationally but at a more moderate rate. According to the FAA, flying hours in single-engine piston aircraft have fallen by 0.8 percent per year over the same time period.[9] Personal flying is a price sensitive segment of the general aviation market and is negatively affected by the rising costs of aircraft ownership and fuel prices, as well a weak economic climate. The long-term decline seen in this segment also reflects changing demographics and a declining pool of private pilots. The number of private pilots in the U.S. has declined by 2.4 percent per year from 2000 to 2012.

3.3.2.3 Business/corporate aviation operations

Business operations may be conducted in a variety of aircraft including multi-engine pistons, turboprops and jet aircraft. These operations may involve aircraft owned by corporations, individuals or fractional owners, or aircraft that is leased or chartered through an air-taxi or aircraft charter provider. Companies and organizations of all sizes derive benefits from the flexibility that business aviation provides including: (1) the ability to reach destinations on a more convenient timetable than commercial airline schedules, often eliminating the need for long layover flights; (2) the ability to access multiple locations in a single day; (3) access to locations not easily reached with commercial airline services; (4) eliminates the time spent on airport check-in and security allowing employees from top executive to mid-level manager to be more productive and (4) allows small to large businesses to be more responsive to customer needs.

At Hanscom Field, there were approximately 35,816 business aviation operations in multi-engine piston, turboprop and jet aircraft. Business activity has been the fastest growing segment of operations at Hanscom, increasing at a long-term average rate of 1.0 percent per year from 2000 to 2012. Growth was significantly faster in early part of the period, with operations climbing from less than 32,000 in 2000 to a peak of 45,600. This rapid growth was largely driven by increased interest in private business transportation sparked by growth in fractional ownership programs, increased security screening at commercial airports which made commercial short-haul flights unattractive, and the introduction of new

[8] FAA, Aerospace Forecasts – FY 2013-2033, March 2013.
[9] Ibid.

business aircraft models. However, business aviation dropped off sharply following the economic and financial collapse in 2008/09. At Hanscom, business operations fell by 23 percent over the two-year period from 2007 to 2009. Business operations have not yet recovered at Hanscom, as businesses continue to proceed cautiously in an uncertain economic environment.

The long-term increase in business operations at Hanscom has been driven by growth in jet operations, which have grown at a rate of 2.0 percent per year. In comparison, the turboprop segment increased only slightly at 0.2 percent annually and multi-engine piston operations actually declined by 2.5 percent per year due to an aging fleet. In 2012 jets accounted for 72 percent of the business aviation operations at Hanscom.

3.3.2.4 Helicopter operations

Helicopter activity at Hanscom Field has been fairly stable over the historic period at approximately 7,000 annual operations. Over the long-term historical period (2000-2012) helicopter operations have increased slightly at an average rate of 0.5 percent per year.

3.3.3 Military operations

Hanscom AFB is central to the Air Force's development and acquisition of command and control systems. It serves as part of the Air Force Life Cycle Management Center (LCMC), which is responsible for the total life cycle management of Air Force weapon systems. The host unit at Hanscom AFB is the 66th Air Base Group, which supports military personnel and civilians at Hanscom AFB and retired military personnel and dependents in the New England and New York state region. In 2011, some Air Force research labs located at Hanscom were moved to Wright-Patterson AFB, Ohio, and Kirtland Air Force Base, N.M. The former Electronic Systems Center at Hanscom was deactivated in 2012 as part of a major Air Force realignment and was consolidated into the new (LCMC), headquartered at Wright-Patterson AFB resulting in a reduction of personnel at the AFB. Despite the realignment, Hanscom AFB remains an integral part of the evolving electronics technology community in the Boston area, consisting of educational institutions, private industry and military research and development installations. Today, the base continues its leadership role in the development and acquisition of Air Force command and control systems.[10]

Since the core functions of the Hanscom AFB do not involve a flying mission, the military operations at Hanscom Field are infrequent and most often involve the transport of military and civilian personnel in business aviation type aircraft. In 2012, there were 745 military operations at Hanscom which represents less than one-half percent of the airport's total aircraft operations. As a result of the Air Force realignment and downsizing at Hanscom, military operations fell by 48 percent in 2012. Over the long-term, military operations at Hanscom have declined at an average annual rate of 4.5 percent (see Table 3-3).

3.3.4 Based aircraft

In 2012, there were 340 aircraft based at Hanscom Field. Approximately 64 percent of the aircraft housed at Hanscom are single-engine pistons. Jets are the next most prevalent type accounting for 23.2 percent of based aircraft. The distribution of based aircraft by type is provided in Figure 3-3.

[10] The Official Web Site of Hanscom Air Force Base

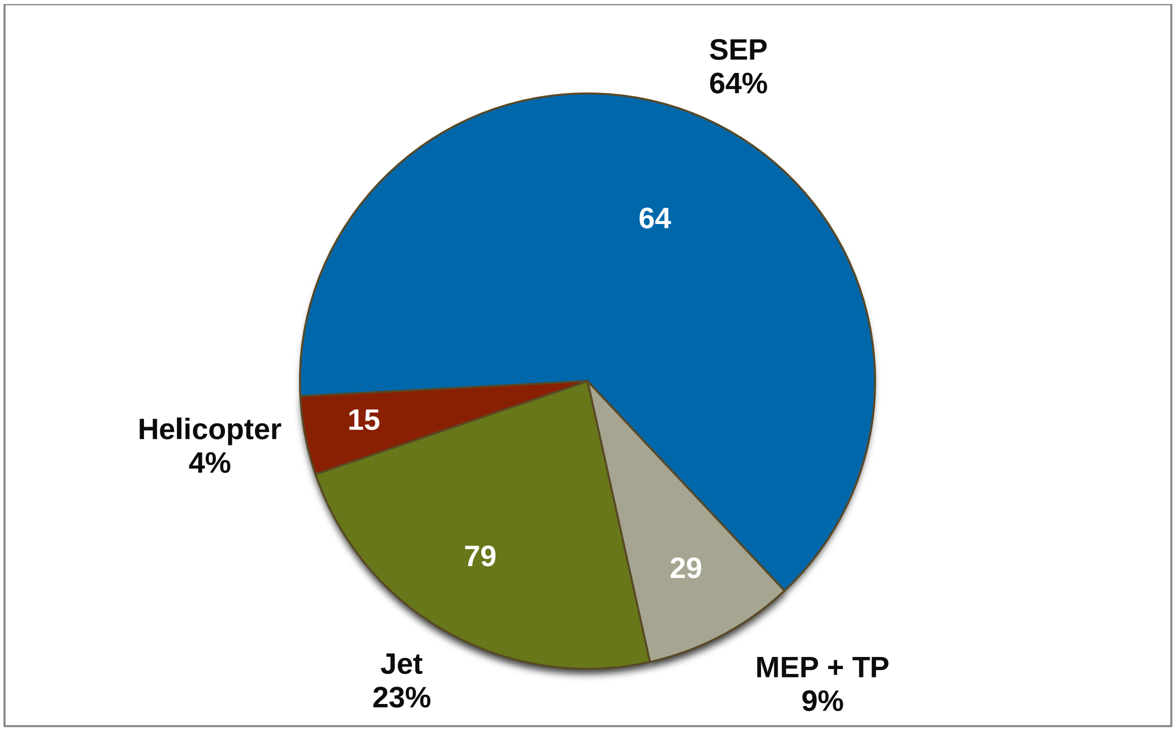


Figure 3-3 Hanscom Field Based Aircraft by Type, 2012

Source: Massport.

The number of aircraft based at Hanscom fluctuates from year-to-year as shown in Figure 3-4. Over the historical period (2000 to 2012), based aircraft reached a high of 411 in 2006 and a low of 290 in 2010. Over the long term, total based aircraft have declined by 14 percent.

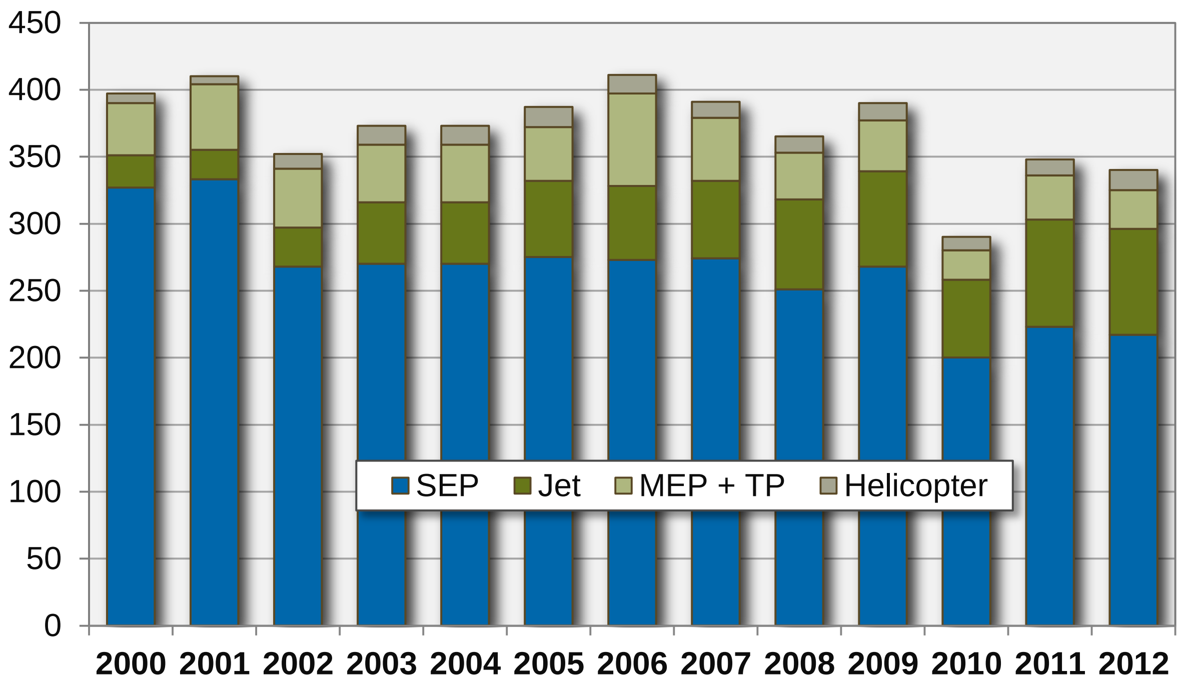


Figure 3-4 Hanscom Field Based Aircraft by Type, 2000-2012

Source: Massport.

The SEP and MEP/TP categories have been in decline, falling by 34 and 26 percent, respectively. While jets based at the airport have more than tripled and helicopters have more than doubled, they accounted for less than 30 percent of Hanscom's based aircraft, combined, in 2012.

3.3.5 Commercial airline activity

Hanscom Field has periodically received limited regional commuter airline services. In the 1980s, services were provided by small regional commuter airlines that linked Hanscom to markets in the Northeast, largely other small airport markets in upstate New York. Traffic in years when services were provided varied from 200 to just under 10,000 passengers. Throughout most of the 1990s there were no scheduled commercial airline services at Hanscom Field.

Table 3-5 summarizes scheduled commercial airline services and passenger traffic at Hanscom Field since 2000. Shuttle America, which entered the Hanscom market in 1999, provided nonstop services to various Northeast markets with small turboprop aircraft. Shuttle America's passenger traffic at Hanscom peaked at 162,000 in 2000. The airline entered bankruptcy in 2002 and eventually became a US Airways feeder carrier, operating under the US Airways Express brand at Hanscom. Shuttle America's Hanscom services were eventually discontinued in 2004 so that aircraft could be redeployed to US Airways' Pittsburgh hub.

Table 3-5 Scheduled Commercial Airline Services and Passengers at Hanscom Field, 2000 to 2012

Year	Airline	Destinations	Total Passengers
2000	Shuttle America	Buffalo, Greensboro, New York La Guardia, Trenton, Wilmington	**162,147**
2001	Shuttle America	Buffalo, New York La Guardia, Philadelphia, Trenton	**134,337**
2002	Shuttle America	Philadelphia, Trenton	67,513
	Boston-Maine Airways	Newark, Portsmouth	175
	Total		**67,688**
2003	Shuttle America	Trenton	36,073
	Boston-Maine Airways	Manchester, Nantucket	26
	Total		**36,099**
2004	Shuttle America	Trenton	9,972
	Boston-Maine Airways	Portsmouth, Trenton	12,106
	Total		**22,078**
2005	Boston-Maine Airways	Portsmouth, Trenton	**17,457**
2006	Boston-Maine Airways	Portsmouth, Trenton	**17,680**
2007	Boston-Maine Airways	Elmira, Portsmouth, Trenton	**17,398**
2008	Boston-Maine Airways	Trenton	**325**
2009	None		**0**
2010	None		**0**
2011	Streamline Air	Trenton	**6,519**
2012	Streamline Air	Trenton	**8,609**
Note: Includes scheduled commercial passenger airline services operating under FAA Part 121 certificates and public charters operated by air taxi operators governed by FAA Part 135 regulations. Excludes private charters conducted by FAA Part 135 operators.			

Source: Massport and Official Airline Guide

Boston-Maine Airways, headquartered in Portsmouth, NH, operated scheduled commuter services at Hanscom from 2002 to 2008. Trenton was the airline's primary market from Hanscom and services were provided with 19-seat Jetstream 31 turboprop aircraft. The airline's traffic at Hanscom peaked at approximately 17,700 passengers in 2006. Services ended abruptly in February 2008 when the U.S. DOT revoked the airline's operating certificate.

From February 2008 through March 2011, there were no scheduled airline services operating at Hanscom Field. In April 2011, Streamline Air commenced scheduled public charter services from Hanscom Field to Trenton-Mercer Airport in New Jersey. Streamline operated two daily flights on weekdays only with 30-seat Embraer 120 turboprops targeting business passengers. After nearly 18-months of operation, the services were discontinued in September 2012. More than 8,600 passengers flew on the Streamline services in 2012. Since September 2012, there have been no scheduled passenger airline services operating at Hanscom Field.

Table 3-6 summarizes scheduled passenger airline activity at Hanscom Field from 2000 to 2012. Passenger traffic peaked at 162,000 at the beginning of the period. Aircraft operations peaked at approximately 6,600 in 2000 and 2003. The average passengers per flight varied from nearly 25, when Shuttle America served the market with 50-seat turboprops to a low of 3-5 when Boston-Maine Airways operated 19-seat turboprops at Hanscom.

Table 3-6 Scheduled Commercial Passenger Airline Activity at Hanscom Field, 2000 to 2012

Year	Passengers	Aircraft Operations	Passengers per Operation
2000	162,147	6,572	24.7
2001	134,337	6,414	20.9
2002	67,688	6,603	10.3
2003	36,099	2,956	12.2
2004	18,123	4,308	4.2
2005	17,457	3,627	4.8
2006	17,680	3,057	5.8
2007	17,398	3,477	5.0
2008	325	104	3.1
2009	-	-	-
2010	-	-	-
2011	6,519	750	8.7
2012	8,609	635	13.6

Source: Massport

3.3.6 Nighttime activity

The nighttime period at Hanscom Field is defined as 11:00 pm to 7:00 am, the period when the FAA Tower is closed and when Massport's nighttime field use fee is in effect. In 2012, there were 1,631 nighttime operations, representing approximately one percent of Hanscom's total aircraft operations (see Table 3-7). The majority of nighttime operations are conducted by jet aircraft, which accounted for 72 percent of the nighttime activity in 2012.

Total nighttime operations have fluctuated from year-to-year as overall activity has fluctuated. From 2000 to 2012, nighttime operations decreased by 15 percent while total aircraft operations (including nighttime activity) fell by 22 percent. There has been reduced nighttime activity in all but one aircraft category. Jet operations during the nighttime have grown by 24 percent over the long-term historical period, consistent with the overall growth of jet operations at the airport (+27 percent).

Table 3-7 Nighttime Operations (11:00 pm to 7:00 am) at Hanscom Field, 2000 to 2012

Year	Jet	MEP + TP	SEP	Helicopter	Military	Total
2000	944	353	194	427	n/a	1,918
2001	808	273	161	432	n/a	1,674
2002	1,079	377	142	572	n/a	2,170
2003	1,035	153	130	425	n/a	1,743
2004	1,100	164	136	606	n/a	2,006
2005	1,131	131	112	520	n/a	1,894
2006	1,148	148	298	730	n/a	2,324
2007	1,350	211	175	547	n/a	2,283
2008	1,244	148	81	437	n/a	1,910
2009	1,075	136	106	418	n/a	1,735
2010	1,199	174	74	385	n/a	1,832
2011	1,230	179	143	276	n/a	1,828
2012	1,173	251	63	141	3	1,631
Percent Change (2000-2012)	24.3%	-28.9%	-67.5%	-67.0%	n/a	-15.0%

1 The nighttime operations presented in the 2012 ESPR differ slightly from those published in the Hanscom Field Annual Noise Report. This discrepancy is due to the difference in the timing of the preparation for the two reports. Each report used the best available data at the time of the analysis for that report. The difference of approximately 0.3 daily nighttime operations or 0.07% of all daily operations would change computed noise levels by less than 0.1 dB, which is imperceptible and would not change the analysis presented.

Source: Massport

3.4 Aviation Activity Forecasts

The forecasts of aviation activity at Hanscom Field include projections of aircraft operations, scheduled airline passengers and based aircraft for near-term (2020) and long-term (2030) planning periods. The forecasts assume that Hanscom Field continues to function as a general aviation reliever for Logan Airport and the premier business aviation airport in the Greater Boston area with limited military and commercial airline operations.

The GA forecasts are based on historical trends at Hanscom, national historical trends and industry projections for general aviation, the economy and fuel prices. The forecast of commercial airline activity is based on a scenario of the potential types of services that Hanscom could accommodate given current and projected trends in the overall airline industry. All forecast assumptions are consistent with Massport's 1980 regulations limiting scheduled commercial passenger services to aircraft with 60 or fewer seats. Forecasts for each of the distinct segments of aviation activity are described in the following sections.

3.4.1 General aviation aircraft operations

GA activity at Hanscom Field is forecast to increase from approximately 164,800 operations in the base year to 190,600 operations in 2030. Separate forecasts were developed for each of the sub-segments of GA activity: 1) pilot training; 2) personal flying; 3) business/corporate flying and 4) helicopter operations. Forecasts for each of these sub segments is summarized in Table 3-8 and described in the following sections.

Table 3-8 Forecast Hanscom Field General Aviation Aircraft Operations, 2020 and 2030

	Actual		Forecast		Average Annual Growth		
	2005	2012	2020	2030	2012 - 2020	2020 - 2030	2012 - 2030
Training (SEP)	58,535	70,196	62,605	65,164	-1.4%	0.4%	-0.4%
Personal Flying (SEP)	57,894	51,477	50,661	58,285	-0.2%	1.4%	0.7%
Business Non-Jet (MEP)	4,265	3,763	3,837	4,321	0.2%	1.2%	0.8%
Business Non-Jet (Turbo)	5,381	6,415	7,024	8,664	1.1%	2.1%	1.7%
Business (Jet)	32,345	25,638	35,043	46,782	4.0%	2.9%	3.4%
Helicopter	7,004	7,345	7,345	7,345	0.0%	0.0%	0.0%
Total General Aviation	165,424	164,834	166,515	190,561	0.1%	1.4%	0.8%

Source: Massport

3.4.1.1 Training operations

Pilot training operations, or local SEP operations, are forecast to decline over the forecast period from 70,200 operations in 2012 to 65,164 operations in 2030. The forecast rate of decline is 0.4 percent per year and is similar to the rate of decline over the historical period, 0.6 percent from 2000 to 2010. Projected trends that will influence pilot training activity include a decline in student pilots. Nationally, the FAA forecasts the student pilot base to decline by 0.1 percent per year through 2030.[11]

3.4.1.2 Personal flying operations

The level of personal flying operations, or itinerant operations in single-engine piston aircraft, is sensitive to the state of the economy and the costs of private flying, especially fuel prices. Over the forecast period, economic growth is expected to be moderate and fuel prices are projected to increase further. In its national projections, the FAA assumes that U.S. Gross Domestic Product, adjusted for inflation, increases at an average annual rate of 2.5 percent through 2030. The FAA also assumes that the cost of fuel, as measured by the cost of crude oil, continues to increase over the long term, rising at an average rate of 0.9 percent per year.[12]

At Hanscom Field, personal flying operations are forecast to increase from nearly 51,500 in 2012 to approximately 58,300 in 2030. Activity is forecast to grow at a slower pace than the economy, increasing by 0.7 percent per year over the planning horizon.

3.4.1.3 Business/corporate aviation operations

The long-term outlook for business aviation remains strong, though not as optimistic as projections from the mid-2000s. The FAA assumes that nationally business aviation will continue to recover from the 2008/09 economic downturn as the economy improves and corporate profits rise. Over the long term, business aviation is expected to be an attractive option over commercial aviation due to the increased flexibility that it provides and continued concerns over safety, security and commercial airline flight delays. The FAA forecasts total flight hours in turboprop and jet aircraft in the U.S. to grow by 2.1 and 4.3 percent, respectively, through 2030.

Business aviation at Hanscom Field is forecast to be consistent with the national outlook and is predicted to increase by 2.9 percent per year. Total business aviation operations are forecast to reach 59,800 in 2030, up from 35,800 in 2012. Jet operations are forecast to continue to grow the fastest and are

[11] FAA, Aerospace Forecasts – FY 2013-2033, March 2013.
[12] Ibid.

predicted to increase by 3.4 percent per year to nearly 46,800 in 2030. Non-jet operations are forecast to grow at a slower pace of 1.4 percent growing to nearly 13,000 operations by 2030.

3.4.1.4 Helicopter operations

Helicopter activity at Hanscom has remained relatively stable over the historical period at around 7,000 annual operations. Consistent with the historic trend, helicopter operations are forecast to remain constant at the 2012 level (7,345 annual operations).

3.4.2 Based aircraft

Aircraft based at Hanscom Field are forecast to increase over the planning period from 340 aircraft in the base year to 416 aircraft in 2030. Business jet aircraft based at the airfield are projected to grow from 79 in 2012 to 120 in 2030. Similar to past trends, jets will account for an increasing share of based aircraft at Hanscom Field. Jets represented 6 percent of based aircraft in 2000 and 23 percent of based aircraft in 2010. Over the forecast period, the jet share of based aircraft is projected to rise further to 29 percent. At more than 240 based aircraft, single-engine pistons will continue to be the predominant aircraft type housed at Hanscom. However, the single-engine piston share will drop from 64 percent in 2012 to 58 percent in 2030. Forecasts of based aircraft were developed based on historical ratios of operations per based aircraft for each aircraft category.

3.4.3 Military operations

Since the military's function at Hanscom AFB does not involve an active flying mission, annual military operations are less than one percent of the total aircraft operations at the airfield. The forecast assumes that the air force base remains active over the forecast period and continues to focus on research, development and management functions. Consistent with this assumptions, future military operations are projected to hold constant at the 2012 level (745 operations).

3.4.4 Commercial airline activity

There have been no scheduled commercial airline passenger services at Hanscom Field since Streamline Air discontinued its services in September 2012. Therefore, the forecast of commercial airline services is based on a scenario of the type of services and the type of airline that may initiate operations at Hanscom and is not a continuation of past trends. The commercial airline scenario for Hanscom considers the current and projected operating environment for U.S. air carriers. Faced with sustained, high fuel prices, the airline industry has consolidated and U.S. airlines have drastically altered their business models. Through consolidation and restructuring, airlines have shed many unprofitable routes and have withdrawn from or scaled back services at many smaller, secondary markets. Since 2007, airlines have reduced scheduled weekly departures from non-hub airports by 19 percent and more than three dozen non-hub airports have lost all commercial services.[13] Airlines have also renewed their aircraft fleets eliminating fuel inefficient and uneconomical models including regional jets with 50 or fewer seats.

The commercial airline forecast scenario assumes that the types of service that may be implemented at Hanscom would be similar to the service most recently provided. This includes a small regional airline or public charter provider operating small turboprop or regional jet aircraft to short haul business markets.

[13] Based on scheduled weekly departures at non-hub airports in the continental U.S. as reported in the Official Airline Guides for August (2007 to 2013).

The forecast services would comply with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services in aircraft with more than 60 seats. The Hanscom forecast specifically assumes weekday service operated with a 30-seat turboprop aircraft (Embraer Brasilia) serving one to two destinations in the Northeast. The forecast scenario details are summarized in Table 3-9.

Table 3-9 Summary of Forecast Commercial Passenger Service Assumptions, 2020 and 2030

Aircraft Type:	Small turboprop with 30 seats, e.g., Embraer 120
Number of Nonstop Markets:	One in 2020 Two in 2030
Types of Markets:	Business destinations in the northeast, e.g., Trenton
Service Frequency:	Two roundtrips per market, five days a week
Average Load Factor:	65%

Source: Massport

As shown in Table 3-10, Hanscom Field is projected to accommodate 20,300 commercial airline passengers by 2020 and 40,600 in 2030. With weekday only services provided to one destination in 2020, annual commercial airline operations are forecast at 1,040. In 2030, under the assumption of weekday services to two destinations, annual operations increase to 2,080. Since the scenario assumes that services would be targeted to the business traveler, the 2030 forecast assumes that one daily departure would occur in the early morning before 7:00 am. Thus, in the 2030 forecast, there are 1,820 commercial airline operations that would occur between 7:00 am and 11:00 pm, and 260 commercial airline flights that would be operated during the 11:00 pm to 7:00 am period.

Table 3-10 Forecast Commercial Passenger Airline Activity at Hanscom Field, 2020 and 2030

	Actual		Forecast	
	2005	**2012**	**2020**	**2030**
Aircraft Operations	3,627	635	1,040	2,080
Passengers	17,457	8,609	20,280	40,560
Passengers per Operation	4.8	13.6	19.5	19.5

Source: Massport

3.4.4.1 Procedures for new-entrant airlines

An airline proposing to commence scheduled service at Hanscom Field must comply with established FAA and Massport requirements for new entrant airlines. At the federal level, a new entrant to Hanscom must have its Operations Specifications ("OpSpecs") amended by the FAA to permit services to Hanscom Field with a specified type of aircraft. OpSpecs must be amended each time an airline adds a new destination from any airport or uses a new type of aircraft at an airport. Once an amendment is granted for a specific market and aircraft type, additional amendments or approvals are not needed to increase the frequency of service.

New commercial service at Hanscom Field proposed by new airline entrants must be consistent with the Master Plan and 1980 Massport Regulations. The Master Plan provides that the economic, noise and ground access impacts of new passenger or air cargo service proposals will be reviewed with the

Hanscom Field Advisory Commission. Massport Regulations prohibit commercial passenger services at Hanscom with aircraft that have more than 60 seats.

As a prerequisite to entering into an operating agreement with Massport, an airline must submit to Massport all valid and current certifications, authorizations, and approvals from all state, federal and other governmental bodies applicable to the proposed aircraft type and operations. Specifically, an airline must submit its FAA-approved OpSpecs authorizing the proposed service at Hanscom Field, in accordance with applicable provisions of federal law. Thus, no new carrier may begin service until all necessary approvals have been secured.

3.4.5 Nighttime activity

Total nighttime aircraft operations (11:00 pm to 7:00 am), including general aviation, commercial airline and military activity, are forecast to increase from 1,631 in the base year to 2,766 in 2030. Forecasts of nighttime operations for GA activity are based on the forecasts of annual activity by market segment described above and the historical share of annual activity that occurs in the nighttime period. As shown in Table 3-11, approximately 4 percent of jet aircraft operations and 2 percent of general aviation turboprop operations occur during the nighttime hours. Less than one percent of itinerant operations in single-engine or multi-engine piston aircraft occur during the nighttime period. In addition to nighttime operations by GA users, the forecast assumes that a commercial airline serving business destinations may operate an early morning (e.g., 6:00 am to 7:00 am) departure.

In 2030, jet aircraft are forecast to account for approximately 2,000 nighttime operations representing more than 70 percent of total predicted nighttime activity. Turboprop aircraft are forecast to account for approximately 600 nighttime operations in 2030. These include approximately 340 operations by GA users and 260 operations by a commercial passenger airline. The forecast includes less than 300 nighttime operations by piston aircraft (SEP and MEP) and nighttime activity by helicopter and military aircraft is projected to hold constant at the 2012 levels.

Table 3-11 Forecast Nighttime Operations (11:00 pm to 7:00 am) at Hanscom Field

Year	General Aviation				Military	Commercial Airline	Total
	Jet	MEP + TP	SEP	Helicopter			
Actual							
2005	1,131	131	112	520	n/a	0	1,894
2012	1,173	251	63	141	3	0	1,631
Forecast							
2020	1,515	192	92	141	3	0	1,944
2030	2,023	233	106	141	3	260	2,766

1 The nighttime operations presented in the 2012 ESPR differ slightly from those published in the Hanscom Field Annual Noise Report. This discrepancy is due to the difference in the timing of the preparation for the two reports. Each report used the best available data at the time of the analysis for that report. The difference of approximately 0.3 daily nighttime operations or 0.07% of all daily operations would change computed noise levels by less than 0.1 dB, which is imperceptible and would not change the analysis presented.

Source: Massport

(This page intentionally left blank)

4 Airport Planning

Planning is critical to putting an airport in a position to address fundamental needs to meet future operating conditions and respond to new opportunities in a cost-effective and environmentally sensitive way. The Environmental Status and Planning Report (ESPR) plays an important role in Massport's planning process and addresses potential future activities in the context of environmental review and stakeholder engagement. This chapter is focused on the development planning framework for Laurence G. Hanscom Field (Hanscom) and how it aligns with local and regional planning activities. In this context, Massport presents potential physical and operational conditions consistent with the 2020 and 2030 activity forecast scenarios described in Chapter 3, Airport Activity Levels, and baseline conditions and needs described in Chapter 2, Facilities and Infrastructure.

Massport's primary responsibility at Hanscom Field is to maintain a safe, secure, and efficient regional airport while minimizing the environmental impact of its operations. It maintains Hanscom as a first-class, full-service airport. Massport consistently couples improvements and maintenance at the airport with a variety of environmental initiatives, programs, and policies.

Forecasts and planning assumptions presented in this ESPR are founded on the 1978 Hanscom Field Master Plan and Environmental Impact Statement (Master Plan) and Massport's 1980 regulations, which establish the general planning framework for Hanscom Field. For context, this chapter describes the key aspects of the 1978 Master Plan and Massport's 1980 regulations as well as other planning criteria, such as Executive Orders 385 and 438 that affect airport planning statewide, regional planning studies such as those conducted by the Metropolitan Area Planning Council (MAPC) and local planning from the host municipalities. The forecasts are projections of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes. This ESPR also evaluates current Massport planning initiatives, projects and the 2020 and 2030 planning concepts for their consistency with local and regional planning.

4.1 Key Findings Since 2005

The *2005 ESPR* evaluated potential master planning development scenarios in the years 2010 and 2020 using several different growth forecasts. Given the downturn in the national economy that resulted in an overall contraction in aviation growth, only a small amount of construction occurred. The following is a list of projects, which have been completed:

- Runway Safety Area (RSA) improvements at Runway Ends 5 and 23 including grading of the RSA and wetland replication
- RSA improvements on Runway 11 by relocating portions of the perimeter road
- Reconstruction of the western end of Taxiway E, Taxiway G, and Taxiway M
- Redevelopment of the Hangar 24 site for a Fixed Base Operator (FBO) facility by Rectrix Aviation, a project which is nearing completion at this time
- Removal of fuel storage tanks at Hangar 10

- Implementation of enhanced access control system and replacement of a portion of the perimeter fence
- Relocation of portions of the perimeter road at approach to Runway 29
- Ongoing airfield maintenance
- Ongoing vegetation removal and maintenance

Massport spent approximately $3.4 million on improvements in 2012.

In this ESPR, Massport has reassessed the primary planning areas considered in the *2005 ESPR*. It has updated planning to reflect changes in aircraft mix and related infrastructure issues as well as an updated view of aviation growth expectations borne out of the activity level forecasts presented in Chapter 3, Airport Activity Levels.

4.2 Airport Planning Context

Massport has developed the planning concepts evaluated in this *2012 ESPR* within the framework of the 1978 Master Plan and Massport's 1980 Regulations. Jointly, the Master Plan and the Regulations provide the planning framework for Hanscom Field. Massport also considers the following:

- Federal, state, and local environmental regulatory requirements and review processes;
- Executive Order 385, which is the Growth Management Policy for Massachusetts;
- Executive Order 438, which initiated the new State Sustainability Program;
- Regional planning framework;
- Local comprehensive and growth management plans; and
- Long-range plans for the Minute Man National Historical Park (MMNHP) and Hanscom Air Force Base (AFB).

This approach provides a planning context for potential improvements at the airport.

The economic downturn and events of September 11, 2001, has had a significant impact on airport planning in the United States. Hanscom is continually adapting and adjusting to new Massport and Transportation Security Administration (TSA) issued security directives. Furthermore, legislative mandates are affecting airports near- and long-term operations and planning efforts. Hanscom Field will be subject to many of these mandates and will comply as required by law. Examples of security-driven projects might include reconfiguring terminal space or parking facilities, relocating airport functions from non-secure to secure locations, and implementing airfield access restrictions.

Massport acknowledges the importance of managing Hanscom Field in an environmentally sensitive manner that recognizes the significance of MMNHP, Hanscom AFB, and the towns of Bedford, Concord, Lexington, and Lincoln. The following sections describe local and regional planning initiatives, including overviews of the comprehensive plans of the four towns and information gathered through discussions with local officials and the National Park Service (NPS) as part of the process to prepare the *2012 ESPR*.

4.2.1 Airport Land Plans and Regulations

4.2.1.1 Hanscom Field Master Plan and Regulations

In 1978, Massport issued the "Hanscom Field Master Plan and Environmental Impact Statement." In response to community concerns that developed when Massport took over operation of Hanscom Field in 1974, Massport outlined a number of policies in the Master Plan that still guides Massport's management of and planning for Hanscom Field. The adoption of the Massport Regulations and Noise Rule in 1980 was an outgrowth of the Master Plan. The Master Plan and the 1980 Noise Rules limit commercial airline service to passenger aircraft with 60 seats or less and also applies a nighttime field use fee to help discourage activity between 11 p.m. and 7 a.m.

In 1978, the Master Plan foresaw aviation-related development on lands dedicated to aviation-related uses or on U.S. Air Force (USAF) land that would later be ceded to Massport. Other land uses, according to the Master Plan, would be developed in a manner compatible with existing, adjacent land uses and airport operations.

These policies and regulations have guided Massport's development of the *2012 ESPR*, which reaffirms the role of Hanscom Field as a premier regional GA airport

4.2.1.2 Hanscom Airport Layout Plan

The Federal Aviation Administration (FAA) defines the Airport Layout Plan (ALP) as a set of scaled drawings depicting existing and future airport facilities and property. This section provides a description of the eight drawings contained in the Hanscom Field ALP set. Appendix B presents the 2011 ALP for Hanscom Field, which reflects the planning conducted since the FAA approved the previous ALP in 1981.

The 2011 ALP reflects planning improvements discussed in the *2005 ESPR*. The ALP set described here offers a graphic depiction of Hanscom's existing scenario, potential development projects, "imaginary surfaces" that protect the airfield, and the existing land use in and around Hanscom. The ALP set is prepared in compliance with FAA standards.

The ALP indicates areas that might be suitable for future aviation-related or compatible aviation land uses, as well as buildings that might be suitable for future aviation-related facilities. Specifically, areas shown as potential locations for future aviation-related use include the south and southeast of the Civil Air Terminal, East Ramp, North Airfield by the U.S. Navy Hangar, west of Runway 5-23 near Taxiway M, and east of Runway 5-23 near the Parcel B land that the USAF previously managed. The only proposed new taxiway in the ultimate configuration is east of the current Civil Air Terminal. A new parallel taxiway to existing parallel Taxiway S would serve aircraft landing or departing on Runway 5-23.

According to the Existing Land Use sheet in the ALP, the majority of land use at Hanscom is designated Transportation. A small percentage of land within the Runway Protection Zones (RPZs) is designated as Open Land, Wetlands, Agriculture, and Forest.

4.2.1.3 Procedures for New Airline Entrants

Commercial air travel is a small component of Hanscom's future forecasted aviation activity. An airline must follow Massport and FAA procedures to commence scheduled services at Hanscom. The specific process for a new airline entrant is discussed in Chapter 3, Airport Activity Levels, and is incorporated into the airport planning process.

4.2.2 Environmental Planning

Massport has developed the *2012 ESPR* for review under the Massachusetts Environmental Policy Act (MEPA). However, the document is utilized in a broader context. For example, the FAA has used the environmental analyses contained in prior MEPA documents (Generic Environmental Impact Reports [GEIRs] and ESPRs) to assist with its evaluation of potential impacts of proposed actions at Hanscom Field. Depending upon the nature of the proposed action, the FAA could determine that the documentation of potential impacts discussed in the *2012 ESPR* meet the FAA's responsibilities under the National Environmental Policy Act (NEPA) review. Likewise, the FAA could determine that additional analysis is required and that an Environmental Assessment (EA) or Environmental Impact Statement (EIS) would have to be prepared depending on the nature and anticipated impacts of the proposed action(s).

In addition to the role that the FAA plays in the environmental review process for airport projects, it also requires air service operators to meet specific environmental and operational requirements. Massport requires that carriers obtain all FAA approvals as well as all applicable state and local approvals prior to entering into an operating agreement with Massport. Thus, Massport does not allow any new carrier to begin service until it has secured all necessary environmental approvals.

FAA Orders 1050.1E, Change 1, Environmental Impacts: Policies and Procedures (FAA 2006) and 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects (FAA 2006) provide instructions and guidelines for preparing and processing NEPA documents for airport development proposals and other airport actions as required by law. In accordance with FAA regulations, some projects are "categorically excluded" from environmental review due to the low potential for adverse environmental impact (referred to as a CATEX). Examples include acquiring security equipment required by rule or regulation for the safety of security personnel and property on the airport and safety equipment required by rule or regulation for certification of an airport. The specific action being requested will determine the type of environmental processing required by the FAA.

In the event that a project is not categorically excluded from environmental review, the potential environmental consequences associated with a proposed action would be assessed as determined by the FAA. Such environmental review, as specified in FAA Orders 1050.1E (Policies and Procedures for Considering Environmental Impacts, June 8, 2004) and 5050.4B (NEPA, April 28, 2006), includes an analysis of the following impacts:

- Air Quality
- Coastal Resources
- Compatible Land Use
- Construction Impacts
- Department of Transportation Act: Section 4(f)
- Farmlands
- Fish, Wildlife, and Plants
- Floodplains
- Hazardous Materials, Pollution Prevention, and Solid Waste
- Historical, Architectural, Archeological, and Cultural Resources
- Light Emissions and Visual Impacts
- Natural Resources, Energy Supply, and Sustainable Design
- Noise
- Secondary (Induced) Impacts
- Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks
- Water Quality
- Wetlands
- Wild and Scenic Rivers

Some of these categories, such as impacts to coastal zone management and coastal barriers, would not apply to an action at Hanscom Field.

There is potential that some projects included in this ESPR could require development proximate to wetland areas, particularly those within the Terminal Area and North Airfield. Massport is committed to minimizing environmental impacts and would avoid these impacts to the extent possible, and fully mitigate any unavoidable impacts. None of the projects contemplated would require filling of wetlands. Permits for fill in wetlands would be required from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and Massachusetts Department of Environmental Protection under the Massachusetts Wetlands Protection Act. Section 404 of the Clean Water Act requires demonstration of efforts to first avoid wetland impacts, and then minimize wetland impacts, and mitigate any impacts that cannot be avoided or minimized. Wetlands at Hanscom are described in detail in Chapter 9, Wetlands Wildlife and Water Resources.

4.2.3 Municipal Partners

Hanscom Field is located within the towns of Bedford, Concord, Lexington, and Lincoln, which are suburban communities of metropolitan Boston with strong economic ties to the high-tech and service economies that anchor Route 128/I-95. These suburbs are moderate-density residential communities with a lessening amount of developable property. More than half of the housing units are single-family homes that are owner-occupied.[14] As Table 4-1 indicates, the four towns have undergone significant changes since 1970, when Hanscom Field activity peaked at more than 300,000 operations. Between the years of 1970 and 2000, the population of Bedford and Lexington showed a slight decrease, while Concord and Lincoln increased. Overall, the decline in population was under 2 percent. This is compared to a general population increase of all four communities combined of almost two percent from 2005 to 2010.

Table 4-1 Population Trends in Bedford, Concord, Lexington, and Lincoln

Town	1970	2000	Percent Change Between 1970-2000	2000	2005	Percent Change Between 2000-2005	2005	2010	Percent Change Between 2005-2010
Bedford	13,513	12,595	-6.80%	12,595	12,462	-1.10%	12,462	13,320	6.88%
Concord	16,148	16,993	5.20%	16,993	16,833	-0.90%	16,833	17,668	4.96%
Lexington	31,886	30,355	-4.80%	30,355	30,266	-0.30%	30,266	31,394	3.73%
Lincoln	7,567	8,056	6.50%	8,056	7,931	-1.60%	7,931	6,362	-19.78%
TOTAL	**69,114**	**67,999**	**-1.60%**	**67,999**	**67,492**	**-0.7%**	**67,492**	**68,744**	**1.86%**

Source: U.S. Census Data 1970, 2000, 2005, and 2010.

As shown in Table 4-2, the MAPC forecasts for 2020 and 2030 indicate that the populations of the four towns will increase 6.5 percent by 2020 and 8.1 percent by 2030 from 2010. Average household size may decrease from 2.6 to 2.4 people per household, and the region may experience a decline in school-aged children and an increase in the over-55 population.[15]

[14] Metropolitan Area Planning Council, *MetroFuture: Regional Plan*, 2008.
[15] Metropolitan Area Planning Council, *MetroFuture: Regional Plan*, 2008.

Table 4-2 Population Projections for Bedford, Concord, Lexington, and Lincoln

Town	2010	2020	2030	Percent Change	
				2010 to 2020	2010 to 2030
Bedford	13,320	13,756	14,077	3.3%	5.68%
Concord	17,668	18,565	19,216	5.1%	8.76%
Lexington	31,394	32,089	31,985	2.2%	1.88%
Lincoln	6,362	8,803	9,031	38.4%	41.95%
TOTAL	**68,744**	**73,213**	**74,309**	6.5%	8.10%
1. 2020 and 2030 reflects MAPC estimates after input from municipalities.					

Source: U.S. Census Data (2010) and MAPC (2020 and 2030)

As shown in Table 4-3, available employment data indicate that the overall number of jobs in the four towns decreased by approximately 6 percent from 56,000 in 2000 to almost 53,000 in 2010. Contributing factors include the effects of September 11, 2001, and the closing of Raytheon's Hartwell Road facility just north of Hanscom Field. Projections suggest that the four towns will see an almost 19 percent increase by 2020 and over a 22 percent increase by 2030. In the Boston region, half of the net new jobs are expected to be in Professional and Business Services and Education and Health Services. Manufacturing jobs are expected to decline, with an estimated reduction of approximately 46,000 jobs, a decrease of 16 percent.[16]

With some minor variations, the population and job trends in this region over the last 35 years are consistent with the general growth patterns in the metropolitan area. As Tables 4-2 and 4-3 indicate, future projections by MAPC indicate that population and the employment trends in the four towns will increase over the next 20 years.

The number of jobs and projected population increases in the four towns illustrate the importance of these communities as employment centers. MAPC employment projections in Table 4-3 indicate that future growth is anticipated in each town, with the highest levels expected to occur in Bedford (over 26 percent).

Table 4-3 Employment Trends and Projections for Bedford, Concord, Lexington, and Lincoln

Town	Past Trends				Future Trends			
	2000	2004	2010	Percent Change (2000-2010)	2020	2030	Percent Change	
							2010 to 2020	2010 to 2030
Bedford	19,938	18,653	19,473	-2.33%	22,940	22,705	17.80%	16.60%
Concord	13,425	12,204	11,916	-11.24%	12,685	12,464	6.45%	4.60%
Lexington	21,009	19,622	19,281	-8.23%	22,392	21,548	16.14%	11.76%
Lincoln	1,668	1,718	2,004	20.14%	1,824	1,295	-8.98%	-35.38%
TOTAL	**56,040**	**52,197**	**52,674**	-6.01%	**59,841**	**58,012**	**13.61%**	**10.13%**
1. 2020 and 2030 reflects MAPC estimates after input from municipalities.								

Source: U.S. Census Data (2000, 2004, 2010) and MAPC (2020 and 2030).

Absent changes in travel behavior and land use development patterns, the estimated increases in population and employment will result in continued growth in traffic demand on area roadways, particularly for suburb-to-suburb trips, entirely unrelated to operations or developments at Hanscom Field. Massport has participated in transportation demand management (TDM) programs, and these measures are described in Chapter 6, Ground Transportation. Other measures include "growth

[16] Metropolitan Area Planning Council, *MetroFuture: Regional Plan*, 2008.

management" initiatives to reduce sprawl by improving land use management practices. Concentrating development at Hanscom Field and the AFB supports smart growth principles and minimizes sprawl in adjoining land areas.

4.2.3.1 Bedford

Bedford produced a comprehensive plan in 2002.[17] The plan includes nine elements: land use, housing, economic development, natural and cultural resources, open space and recreation, services and facilities, circulation and implementation. At this time, Bedford is updating its comprehensive plan to include responses to issues and needs for the next 10 years and beyond, and the following sections will be reflected: land use, economic development, transportation and housing, natural resources and open space; cultural and historic resources; services, facilities and recreation; and aspects of energy.

Massport has worked through the Bedford Conservation Commission to secure environmental approvals for several projects including the Vegetation Management Plan (VMP), the RSA project, and the perimeter service road relocation.

A high priority for Hanscom is to maintain compliance with FAA certification and safety requirements. The intention of the VMP is to identify obstructions for removal in the approach and departure surfaces for all four runway ends. Since the preparation of the *2000 ESPR*, Massport implemented Phase I of the VMP (2004-2008) in accordance with Bedford's Order of Conditions. Then in 2007, Massport performed an aerial photogrammetric mapping of the approach and departure surfaces for all four runway ends to develop the second VMP. Massport found that:

- the first implementation of the VMP minimized the need for additional vegetation removal in areas cut in 2004.
- vegetation removal was required in areas that were not part of the first 5-year VMP.
- there were obstructions in Bedford's Jordan Conservation Area (JCA).
- there were no obstructions in the Bedford Hartwell Town Forest.

In 2008, Massport submitted the second VMP to the Conservation Commissions of the four towns, along with Notices of Intent (NOI) for the required vegetation removal in wetland areas. By early 2009, Massport received Orders of Conditions for vegetation removal in wetland areas from all four towns and vegetation removal began mostly on Massport property. Chapter 9, Wetlands Wildlife and Water Resources, includes additional information about the VMP and effects on wetland resources.

Massport also identified for removal seven obsolete light poles that were at the Runway 23 end both on and off Massport property. Of the 10 original light poles, Massport left in place the three furthest from the airport, but it removed all equipment from them. The three remaining light poles are not obstructions to the approach and departure surfaces. In February 2013, all obstructions identified in the 2007 Hanscom Airspace Analysis had been removed.

The *2012 ESPR* did not identify additional potential uses in the West Airfield Area and facilities identified in the *2005 ESPR* are currently not being considered.[18] Massport would consider proposed uses in the West Airfield Area that are compatible with the natural resources found there and that incorporate prudent resource management.

---

[17] Town of Bedford, Bedford Comprehensive Plan, 2002.
[18] The 1995 GEIR explored non-aviation development in the West Airfield area, including office parks and a golf course.

The 2002 Bedford Comprehensive Plan indicates the importance of alleviating traffic congestion along Great Road. Hanscom-related traffic is considered a minimal contributor to traffic volumes on Bedford roadways comprising approximately 4 percent of morning and afternoon peak traffic. In 2005, Massport expanded the traffic study area to provide additional information to Bedford officials exploring options to address the Great Road traffic conditions. Chapter 6, Ground Transportation provides more information on the landside roadways around Hanscom.

4.2.3.2 Concord

The Town of Concord adopted its comprehensive long-range plan, A Vision for 2020[19] in 2005. This is the first time Concord had completely updated its town plan since 1973-74. The 13 sections in the Concord comprehensive plan are Vision for 2020, land use, housing, economic development, cultural and historic resources, natural resources, open space, recreation, facilities and services, transportation and circulation, fiscal resources, governance, and implementation.

Concord wants to ensure that undeveloped Massport lands are preserved and used for agricultural purposes. There has been no demand for this type of use on Massport property; however, Massport will continue to entertain proposals for agricultural uses at appropriate locations at Hanscom Field that do not conflict with FAA recommendations for aviation safety and security, such as avoiding land uses in the vicinity of the runway that attract bird or other wildlife. Massport has made available 1.8 acres of land in Concord to Gaining Ground, a non-profit organic farming organization, for agricultural use.

Concord is also concerned about stormwater runoff in the Old Bedford Road area. Massport is committed to limiting the effect of stormwater runoff from new development on Hanscom Field through best management practices (BMPs). Between the *2000* and *2005 ESPR*'s, Massport eliminated approximately 4.4 acres of impervious surfaces at Hanscom Field by removing unused airside pavement. Since the *2005 ESPR*, no further removal has occurred.

Concord has also expressed an interest in exploring opportunities to expand the regional network of trails and bicycle paths in the town. Chapter 6, Ground Transportation identifies the current location of paths and trails near Hanscom Field, and illustrates a potential opportunity for future connections. As described in Chapter 12, Environmentally Beneficial Measures, Massport will work with the Town of Concord to evaluate this opportunity. Massport has identified and marked a trail across Hanscom land connecting Gaining Ground in Concord with Bedford Conservation Areas. This work was agreed to as part of the Bedford Conservation Commission's approval of vegetation management activities in the Jordan Conservation Area to remove airspace obstructions.

In Concord, Massport has worked through the appropriate local processes to address environmental issues related to the airport, such as the VMP. Since adoption of the VMP in 2004, Massport has implemented it in accordance with Concord's Order of Conditions. Chapter 9, Wetlands Wildlife and Water Resources, includes additional information about the VMP and conservation and recreation lands in Concord.

In January 2011, Massport received an Order of Conditions from the Concord Natural Resources Commission for vegetation removal allowing Massport to remove vegetation obstructions on properties owned by the Concord Land Trust and at an adjacent office park in February.

[19] Town of Concord, *Comprehensive Long Range Plan: A Vision for 2020,* March 2005

Concord's primary goal outlined in its comprehensive plan is protecting its scenic quality and historical significance, as well as the rural character of its roads, such as Virginia Road. Chapter 10 of the *2012 ESPR* provides a review of cultural and historical resources and potential effects on them from Hanscom.

4.2.3.3 Lexington

Given its proximity to Hanscom Field and the AFB relative to Metropolitan Boston, the Town of Lexington is focused on potential transportation impacts of Hanscom and works with Massport to attempt to mitigate impacts from proposed development and air travel, and improve vehicle traffic safety at intersections that are high-accident locations. Lexington finalized the transportation component of its comprehensive plan in 2003.[20] Four elements had previously been completed and were adopted by the Lexington Planning Board on January 30, 2002: land use, housing, economic development, and natural and cultural resources.[21]

In 2010, Lexington revised its zoning on Hartwell Avenue to allow greater density for commercial development. The Hartwell Avenue Transportation Management Overlay District (TMOD) provides for increased development density within its boundaries to spur redevelopment of existing commercial properties. The goal of the TMOD is to increase the assessed value and tax revenues associated with commercial properties along Hartwell Avenue.

Massport has worked through the appropriate local processes in Lexington to address environmental issues, such as the VMP. Chapter 9, Wetlands Wildlife and Water Resource, includes additional information about the VMP and conservation and recreation lands in Lexington.

The critical community priority for Lexington is preserving the quality of life for town residents by protecting and promoting the community's character and beauty. Another area of concern for Lexington is the decline in housing diversity, which is largely in response to rising home prices and the growth of large, expensive new homes. The town hopes to increase diversity by broadening the opportunities to produce good housing through a variety of planning measures such as mixed-use development and better public transportation infrastructure. The Town adopted a TDM policy on September 16, 1998 that seeks to reduce the use of single-occupancy vehicles.

4.2.3.4 Lincoln

Lincoln is the smallest of the four towns in terms of population and economic base. The Town of Lincoln Comprehensive Long-range Plan was accepted at a special town meeting on October 17, 2009[22]. The plan presents issues, goals, and recommendations pertaining to the following sections: land use and zoning, natural resources, cultural and historic resources, the built environment, open space, housing, economic development, transportation and circulation, community services and facilities, and governance. The Town Vision Statement of Lincoln states, "Lincoln is a town that cherishes its rural, agricultural character, its small town heritage, its open space, and its historical legacy."

Hanscom AFB and Hanscom Field make up approximately 8 percent of Lincoln's land area, at approximately 544 and 117 acres, respectively. Any changes in the status of the AFB or traffic at Hanscom would have an impact on the town. A goal of the plan is to continue to monitor the status of

---

[20] Town of Lexington, *The Lexington We Want: Transportation Element*, 2003.
[21] Town of Lexington, *The Lexington We Want: The First Four Elements*, 2002.
[22] Town of Lincoln, *Comprehensive Plan, September 22, 2009.*

Hanscom AFB with respect to military housing, through base closure or privatization of existing housing that may place new demands on Lincoln's municipal and school services.

Massport supports the continued use of agricultural land for agricultural purposes; however, Massport has not seen adequate demand for this type of use on its property. Massport will continue to entertain proposals for agricultural uses at appropriate locations on Hanscom Field property. Through the ESPR process, Massport identifies appropriate TDM and traffic management measures that do not require physical changes to the roadway network and that will preserve the scenic and rural nature of Lincoln's roads including Route 2A.

In Lincoln, Massport has worked through the appropriate local processes to address environmental issues, such as the Order of Conditions on the VMP. Chapter 9, Wetlands Wildlife and Water Resource, includes additional information about the VMP and conservation and recreation lands in Lincoln.

4.2.3.5 HATS Master Plan

The Hanscom Area Towns Master Plan (HATS Master Plan)[23] was prepared in July 1997, soon after the completion of the *1995 GEIR*. The plan was a collaborative effort of the four towns and addressed land use and development policies; land conservation, open space, and recreation policies; MMNHP goals and current initiatives; cultural and historical issues; transportation policies; public transportation and private sector initiatives; and economic parity and fiscal policies, and zoning policies. The purpose of the HATS Committee is to coordinate policies and activities of Bedford, Concord, Lexington, and Lincoln in their relationships with the major organizations that operate at Hanscom. The *2012 ESPR* is responsive to the HATS Master Plan insofar as it applies to Hanscom Field.

As described in this *2012 ESPR*, Massport takes a comprehensive approach to managing airfield operations at Hanscom Field and protecting natural resources. Massport has implemented many recommendations of the Hanscom Noise Workgroup and is pursuing TDM approaches as a MassRIDES partner. Massport has periodically met with NPS to discuss issues of concern and to identify historic resources as described in Chapter 10, Cultural Resources.

In 2001, Massport initiated a "Fly Friendly" Program to reduce noise over the MMNHP. In 2009, a new flight pattern was implemented that keeps aircraft closer to the airfield rather than over sensitive park areas. Prior to this initiative, most touch-and-go operations on Runways 11-29 and 5-23 circled to the south of the airport, over areas of the Battle Road Trail that are used for outdoor programs and interpretive talks. In a partnership involving coordination with the MMNHP, the FAA, the flight schools, and the pilots at Hanscom, it was determined that small aircraft would reduce the flight pattern in a touch-and-go operation that would provide a larger buffer between training operations and the MMNHP.

Similar to the *2005 ESPR,* the future scenarios in the *2012 ESPR* describe potential additional aviation and aviation-related uses on the airport and retain many areas in their current, natural state. Non-aviation uses, including the Aviation Museum and a hotel, are also identified. These types of uses are anticipated to include environmentally friendly designs that would be compatible with the HATS Master Plan.

4.2.4 Key Stakeholders

In addition to the associated municipalities, Hanscom also has two key stakeholders who are central partners to airport planning. Both the MMNHP and Hanscom AFB are direct abutters of Hanscom Field.

[23] Hanscom Area Towns Committee, *Hanscom Area Towns (HATS) Master Plan*, July 1997.

Activities proposed on the airfield and on their properties has a direct impact on the others. As a result, Massport engages with the NPS and the USAF periodically to discuss mutually beneficial projects to improve the mission of each organization.

4.2.4.1 Minute Man National Historical Park

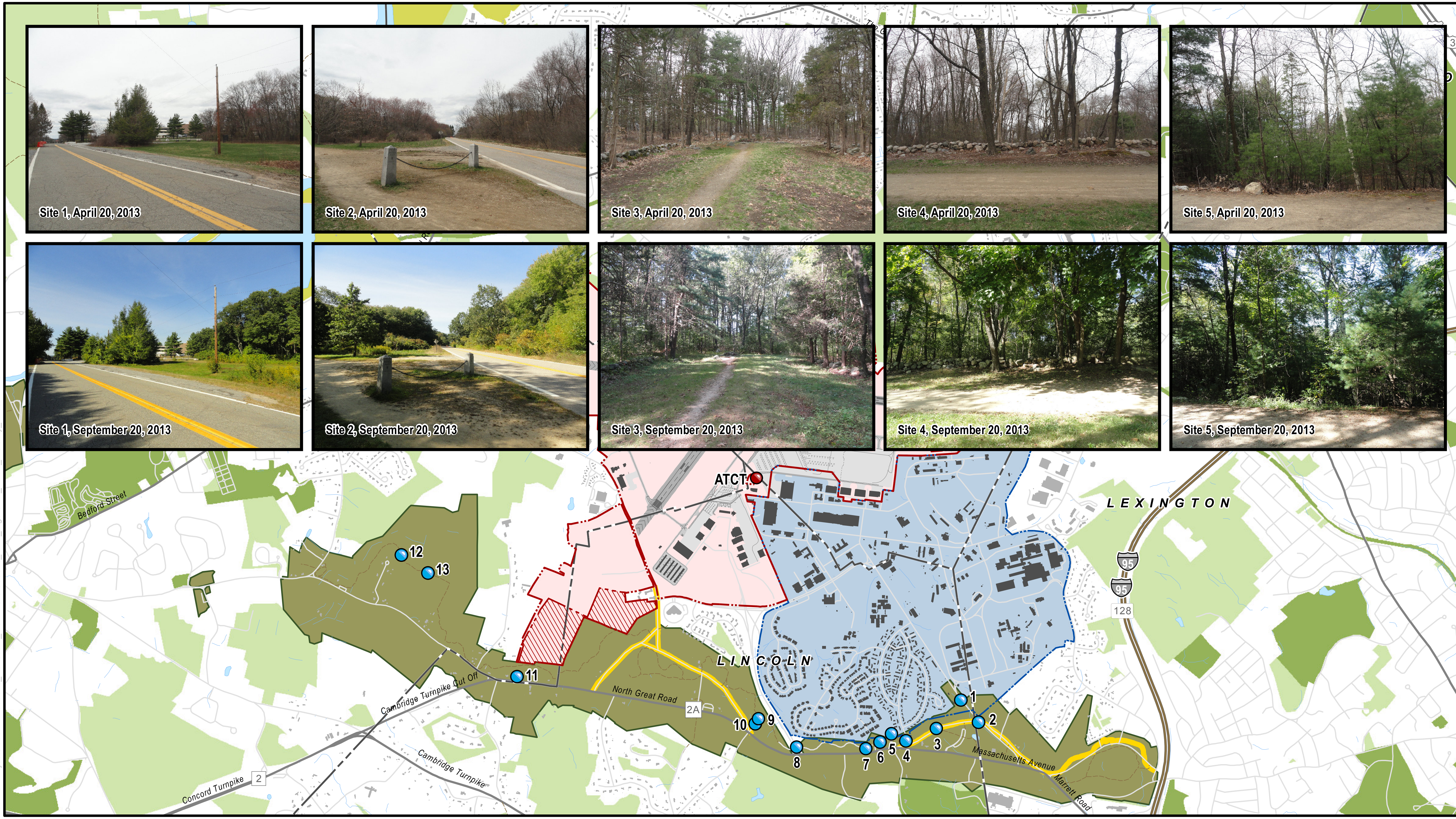
The MMNHP, created in 1959 and operated by the NPS, consists of three discontinuous units—Battle Road, Wayside, and North Bridge. This park covers approximately 967 acres spread out along Route 2A in Concord, Lexington, and Lincoln. The MMNHP is nationally significant as the site of the Battle of Concord - one of the first battles of the Revolutionary War, for its association with prominent literary figures of the 19th and 20th centuries, and as one of the earliest places in the nation to be commemorated.

The NPS reports that an estimated one million people visit the MMNHP annually, and it anticipates that annual visitations will continue at current levels. While the park is open year round, its main season is the 7-month period between April and October. Major attractions are the North Bridge area in Concord and Battle Road in Concord, Lexington, and Lincoln. Two parking lots at the North Bridge unit and one at the Visitor Center in the Battle Road unit accommodate automobile and bus parking; six other parking lots are located in the park. Chapter 10, Cultural Resources provides additional information about the MMNHP.

The congressionally approved boundaries of the MMNHP abut the southern boundary of Hanscom Field and include approximately 48.5 acres of Massport property in the Runway 5 Approach Area. To assess the visibility of Hanscom on the MMNHP Battle Road Interpretative Trail, a photographic inventory was conducted for the *2005 ESPR* and repeated for the *2012 ESPR* to identify areas of potential visibility particularly related to the Air Traffic Control Tower (ATCT), which is the tallest structure at Hanscom. The inventory was conducted from the Battle Road Interpretive Trail on April 20 before foliage appeared on trees, and on September 20 with tree foliage.

Despite the close proximity of the park to the airport, Hanscom Field is not visible from most of the Battle Road Interpretive Trail (see Figures 4-1 to 4-3). The FAA ATCT can be seen through the vegetation from scattered locations along the trail and in areas near Meriam's Corner when there is no foliage. A small portion of the airport is visible from an area near Hanscom Drive. However this view is obscured when there is foliage on the trees.

(This page intentionally left blank)



North

0 2,000 4,000 Feet

Air Traffic Control Tower (ATCT)

Photo Location (April 20, 3013 / Sept. 20, 2013)

Hanscom Field Property Boundary

Massport Property within MMNHP Congressional Boundary

Hanscom AFB Property Boundary

Municipal Boundary

Historic Road

Interstate

Highway

Road

Trail

Active Rail Service

Open Water

Stream

MMNHP Boundary

Great Meadows

Open Space Non-protected

Open Space Protected in Perpetuity

The Air Traffic Control Tower (ATCT) is visible, or partially visible from photo locations 6 and 7 in the April (Leaf-off) condition.

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure4-1_ATCT_Visibility_Photo1.mxd

massport

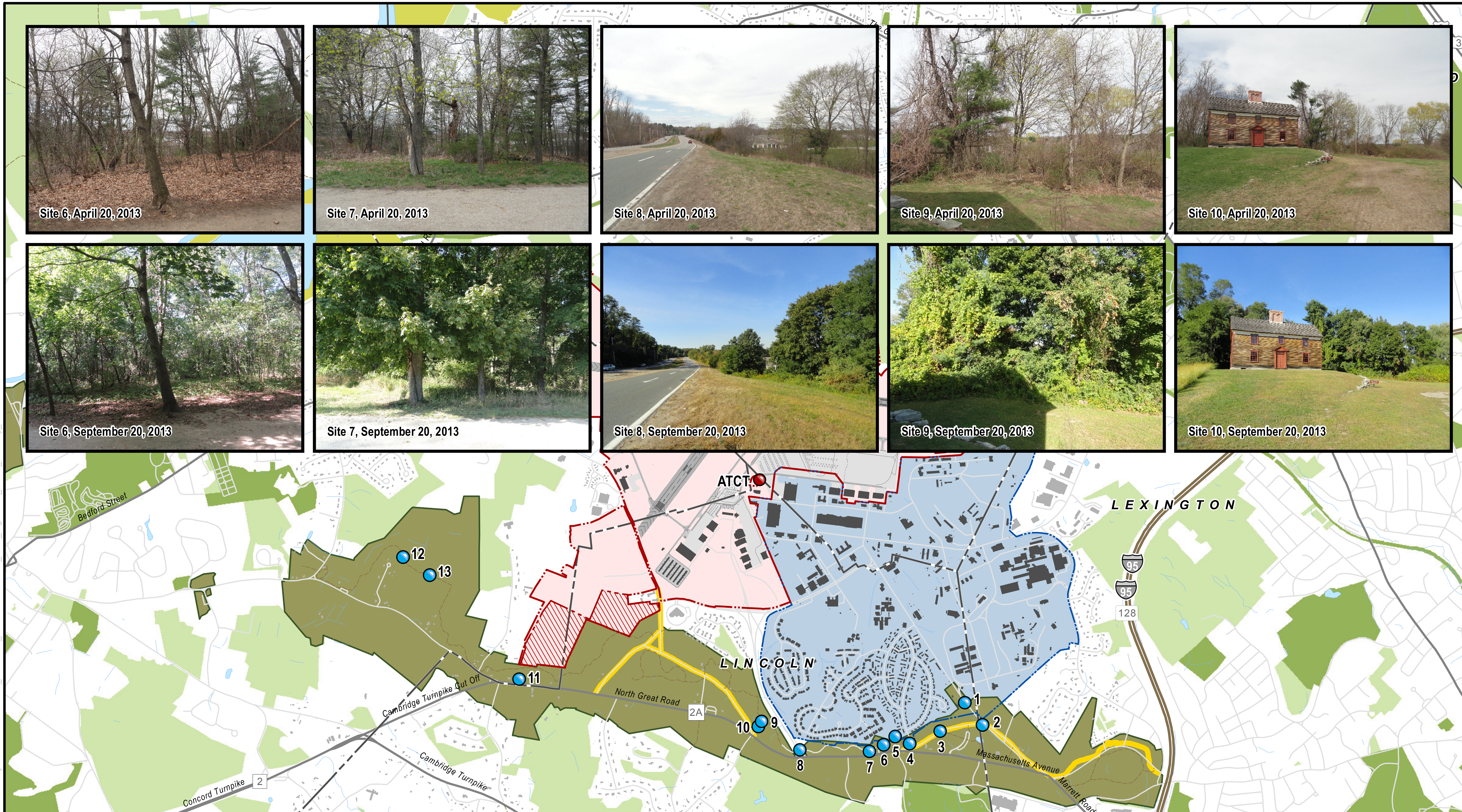
Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Views from Battle Road Trail Sites 1 to 5

Figure **4-1**

(This page intentionally left blank)



Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure4-2_ATCT_Visibility_Photo2.mxd

North

0 2,000 4,000 Feet

Air Traffic Control Tower (ATCT)
Photo Location (April 20, 3013 / Sept. 20, 2013)
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

Open Water
Stream
MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity

The Air Traffic Control Tower (ATCT) is visible, or partially visible from photo locations 6 and 7 in the April (Leaf-off) condition.

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Views from Battle Road Trail
Sites 6 to 10

Figure **4-2**

(This page intentionally left blank)

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure4-3_ATCT_Visibility_Photo3.mxd

North

0 2,000 4,000 Feet

The Air Traffic Control Tower (ATCT) is visible, or partially visible from photo locations 6 and 7 in the April (Leaf-off) condition.

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

- Air Traffic Control Tower (ATCT)
- Photo Location (April 20, 3013 / Sept. 20, 2013)
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service
- Open Water
- Stream
- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Views from Battle Road Trail Sites 11 to 13

Figure 4-3

(This page intentionally left blank)

The preservation of Battle Road, which makes up 80 percent of the Park, is of particular importance to the NPS. The potential impacts of transportation activity from Hanscom and Route 2A are important issues for managing the Park. Massport has continued a dialogue about potentially feasible environmentally beneficial measures that would help address potential concerns. In accordance with this effort, Massport met with the NPS on May 23, 2013 to discuss the *2012 ESPR* and necessary updates. Of notable significance, the NPS acquired the Barrett's Farm and 3.4 acres of land and added it to the North Bridge Unit of the MMNHP since the *2005 ESPR*. The MMNHP staff also reviewed the proposed historical and interpretative locations for the *2012 ESPR's* noise assessment.

Aircraft noise is a concern for many Hanscom area residents and the MMNHP. Massport recognizes the importance of proactively addressing this issue and is committed to continuing its current noise-related programs while exploring appropriate new initiatives. In response to the residential community's aircraft noise and operational concerns, Massport adopted regulations (Part F of the General Rules and Regulations for Laurence G. Hanscom Field) in 1980. Most of these programs could not be duplicated or changed under current federal law. They include the following:

- A nighttime field use fee to help discourage activity between 11 p.m. and 7 a.m.
- A restriction on scheduled commercial air carrier service to aircraft with no more than 60 seats
- Restrictions on touch-and-go activity (aircraft operations conducted to repeatedly and consecutively practice landing and departing techniques) by weight of aircraft and time of day. Touch-and-go operations are not permitted between the hours of 11:00 pm and 7:00 am.
- A phase out of most Stage 1 aircraft (some of the noisiest aircraft in the U.S. fleet) at Hanscom
- Limitations on auxiliary and ground power unit use including a 30-minute operation limitation.

Massport periodically meets with NPS to discuss issues of concern and to identify historic resources as described in Chapter 10, Cultural Resources. In 2001, Massport initiated a "Fly Friendly" Program to reduce noise over the MMNHP. In 2009, a new flight pattern was implemented specifically to keep the aircraft closer to the airfield rather than over sensitive park areas. Prior to this initiative, most touch-and-go operations on Runways 11-29 and 5-23 circled to the south of the airport, over areas of the Battle Road Trail that are used for outdoor programs and interpretive talks. In a partnership involving coordination with the MMNHP, the FAA, the flight schools, and the pilots at Hanscom, it was determined that small aircraft would reduce the flight pattern in a touch-and-go operation that would provide a larger buffer between training operations and the MMNHP.

4.2.4.2 Hanscom Air Force Base

Hanscom AFB, which directly abuts Hanscom Field on the southern side of the airfield, occupies approximately 846 acres of land. Hanscom AFB and the firms that do business at the Base are important employers in the region. More than 3,000 active duty, Reserve, and National Guard military personnel and Department of Defense civilians work and live at Hanscom AFB. According to information published by the Hanscom AFB, as of May 2013, the total estimated Economic Impact is approximately $6.2 billion. Primary Hanscom jobs are over 5,500 and secondary jobs created are over 14,500.[24]

Hanscom AFB operates as a research and development office park with approximately 732 residential units. The 66th Air Base Group is headquartered at Hanscom AFB, which is part of the USAF Life Cycle

[24] http://www.hanscom.af.mil/library/factsheets/factsheet.asp?id=7493

Management Center. The Life Cycle Management Center is responsible for total life cycle management of USAF weapon systems.

On November 5, 2012, the Massachusetts National Guard Joint Force Headquarters became operational at Hanscom. This group serves as an administrative complex to support state and federal missions of the State's National Guard. In addition, the Massachusetts Institute of Technology proposed a research facility at Hanscom AFB to design small electronic components for use in emerging aerospace, communications, and missile technologies. In 2012, the Pentagon approved the plan.

Because the Hanscom AFB directly abuts Hanscom Field, Massport has placed greater importance of working with the USAF on areas of common concern and benefit. This relationship has focused on TDM actions, including relocating a Massachusetts Bay Transportation Authority bus stop shelter from the Hanscom AFB to Massport property to accommodate Hanscom AFB transit patrons and establishing shuttle services to Concord Center commuter rail station.

In 2005, the Base Realignment and Closure (BRAC) Commission reviewed Hanscom AFB for closure as part of BRAC process. Massport worked closely with State and local officials to advocate for keeping the Base open. Opportunities to add new research and development, office space, and residential units on the Base and to create the opportunity for the USAF to expand the mission of the Base were identified. As part of this effort, MassHighway identified transportation improvements to the Hartwell Avenue corridor that would improve access to Hanscom AFB. The BRAC Commission decided to maintain Hanscom AFB as a military facility.

In the development of the *2012 ESPR*, Massport reviewed the landside roadways that provide access to the main AFB gate and security checkpoint, including a new location for the Vandenberg Gate under consideration by Hanscom AFB, in consultation with the Massachusetts Department of Transportation (MassDOT), MassDevelopment, and Massport. The new roadway and gate structure would replace the one at the intersection of Old Bedford Road, Vandenberg Drive, and Hanscom Drive with a roundabout. Along with the improvements to the roadways, a bicycle lane would be included in the design to increase the safety of cyclists.

4.2.5 Metropolitan Area Planning Council Regional Plan

The MAPC is the regional planning agency for metropolitan Boston, representing 101 cities and towns. MAPC encourages sustainable development practices. The primary areas of focus are land use, transportation, economic development, housing, environment, public safety, and municipal administration. The most recent plans drafted by the MAPC are the MetroPlan 2000[25], MetroFuture in 2002, and the MetroFuture in 2009. [26]

The MetroPlan 2000 "encourages efficient development by promoting compact development patterns and discouraging sprawl." MetroPlan provides guidance to reduce the adverse environmental impacts of sprawl and to protect natural resources. The plan identifies three development areas that are distinguished by different land use densities and sewer services. Hanscom Field, which is connected to sewer service, is located within a "Multi-Service Area" as defined in MetroPlan. In addition to the MetroPlan, the MAPC initiated MetroFuture: Making a Greater Boston Region in 2002.

[25] Metropolitan Area Planning Council, *MetroPlan 2000: A Plan for Future Growth*, 1990.
[26] Metropolitan Area Planning Council, *MetroFuture: Regional Plan*, 2008.

In concert with these two plans, the MAPC's 15 Smart Growth principles provide a framework for guiding changes in the Greater Boston Region. Per the plans, "smart growth will refocus a larger share of regional growth within central cities, urbanized areas, near transportation nodes, and in communities already served by infrastructure." Hanscom Field is an existing resource that is served by existing infrastructure. The future scenarios that are described in the *2012 ESPR* make efficient use of these existing resources to satisfy a demand that is generated by nearby residential and commercial activities. The current and future use of Hanscom Field is consistent with Smart Growth principles. Table 4-4 presents MAPC's 15 Smart Growth principles and their relationship to Hanscom Field.

MAPC most recently released MetroFuture, a 30-year plan that serves as a guide for the work in all areas of the agency. The MetroFuture plan supports a vision of smart growth and regional collaboration through the promotion of efficient transportation systems, conservation of land and natural resources, improvement of the health and education of residents, and an increase in equitable economic development opportunities for prosperity. MetroFuture identified 65 "Goal Statements" that are specific to Metropolitan Boston, and not specifically applicable to Hanscom. Noteworthy goal statements as they may pertain to future planning at Hanscom include:

1. Population and job growth will be concentrated in municipalities already well served by infrastructure, with slower growth in less developed areas where infrastructure is more limited.
5. Most new homes and jobs will be near train stops and bus routes, and new growth will be designed to promote transit use.
9. The region's landscape will retain its distinctive green spaces and working farms.
23. All neighborhoods will have access to safe and well-maintained parks, community gardens, and appropriate play spaces for children and youth.
36. Businesses will grow expeditiously thanks to consistent and predictable economic development policies set by an informed public sector.
37. A strong supply of educated and skilled workers—of all ages—will encourage businesses to locate and expand here.
44. An expanded transit system will provide better service to both urban and suburban areas, linking more homes and jobs.
46. Commuters will have more options to avoid congestion.
47. Most people will choose to walk or bike for short trips.
49. Outlying areas will see little increase in traffic congestion.
51. Regional transportation planning will be linked with sustainable land use planning.
52. The transportation system will be reliably funded and transportation agencies will demonstrate accountability to the public.
55. The region's businesses will access the global marketplace through an efficient freight transportation network.

Table 4-4 MAPC Smart Growth Principles

Principle	Response/Applicability
#1 Encourage community and stakeholder collaboration in development decisions.	Massport is engaged in on-going meetings and discussions with the four towns through the Hanscom Field Advisory Commission.
#2 Integrate people and place.	Not Applicable. This principle is oriented toward development within communities.
#3 Promote regional equity and reduce local and regional disparities.	The presence of air travel at Hanscom Field offers a service for people in the surrounding region who would otherwise be traveling greater distances to use a facility elsewhere, and it reduces air traffic at other regional facilities.
#4 Strengthen regional cooperation.	Massport is engaged in on-going community discussions through the Hanscom Field Advisory Commission (HFAC) process. Massport continues to work cooperatively with the EEA and the Shawsheen Watershed partners to improve the Shawsheen River water quality and to reach out to Hanscom AFB and the NPS on issues of common concern.
#5 Promote distinctive, attractive communities with a strong sense of place.	The ESPR provides a comprehensive evaluation of the cumulative environmental effects of Hanscom Field and a retrospective analysis of changes at the airport. The ESPR process provides a framework to identify and plan for potential environmental effects at the airport and in the surrounding communities.
#6 Preserve open space, farmland, and critical environmental resources.	Massport manages the environmental resources at Hanscom Field to address issues related to wetlands, watersheds, and drinking water supplies. Locations for potential agricultural use have been identified if demand warrants.
#7 Encourage development in currently developed areas to take advantage of existing community assets.	Hanscom Field is an existing resource that is well served by existing infrastructure.
#8 Mix land uses.	Hanscom Field incorporates a mix of land use consistent with airport use.
#9 Take advantage of compact development design and create walkable neighborhoods.	Massport seeks to make effective use of existing impervious surface, utility systems and built areas at Hanscom Field.
#10 Promote economic development in ways that produce jobs, strengthen low and moderate-income communities, and protect the natural environment.	Hanscom Field supports air travel needs of existing businesses along Route 128 and provides jobs for area residents. National Aviation Academy, one of Massport's tenants at Hanscom Field, provides training for technical jobs in the aviation industry. Massport is a responsible manager of environmental resources at Hanscom Field. Massport requires third-party development as well as its own development at Hanscom Field to achieve the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Certification.
#11 Create a range of housing opportunities and choices in cities and towns throughout the region.	Not Applicable.
#12 Promote more transportation choices through the appropriate development of land.	Hanscom Field satisfies a regional demand for air travel for people in the surrounding region who would otherwise be traveling greater distances to use a facility elsewhere. Massport has also been working with the AFB to enhance the TDM programs available to employees.
#13 Develop predictable, fair, and cost effective regulatory approvals for smart growth oriented developments.	Not Applicable
#14 Encourage fiscal policies that support smart growth.	Not Applicable
#15 Enable smart growth by reforming existing zoning.	Not Applicable

Source: MAPC, Smart Growth Principles for the Metropolitan Area Planning Commission, February 2003

4.3 Description of Planning Areas

For purposes of the *2012 ESPR*, Hanscom Field has been divided into six planning areas based on geographic considerations to facilitate the discussion of planning for future aviation-related facilities at Hanscom and the evaluation of the conceptual development scenarios (see Figure 4-4). The planning areas are referred to as:

- Terminal Area
- ATCT Apron
- East Ramp
- North Airfield
- Pine Hill
- West Airfield

The Pine Hill and West Airfield areas are provided for consistency with past ESPRs. No new development is foreseen in these three planning areas at this time. Any new development would be consistent with what was presented in the *2005 ESPR*. The ATCT Apron is a new planning area identified in this ESPR.

Each area is divided between airport function referred to as landside and airside. The landside area at Hanscom Field is the area that is located outside the Secure Identification Display Area (SIDA) that is generally accessible to the public. Examples of landside facilities include the roadway system, the parking lot in front of the Civil Air Terminal. Airside includes areas within the SIDA, which are located in a secure environment with controlled access. Examples of airside facilities include runways, taxiways, and aircraft parking areas. Some structures like the Civil Air Terminal and hangars commonly have both landside and airside components, distinctly segregated.

Third-party developers undertake the majority of development at Hanscom Field. In preparing the ESPR and looking at locations for future development, Massport must take into account a range of aviation development types. This requires Massport to have a variety of sites and different locations available in order to accommodate future development opportunities. To do this, Massport looks to areas at Hanscom Field that can be developed with the fewest environmental impacts. The development areas that are shown in the ESPR will provide market-driven development opportunity to third-party developers.

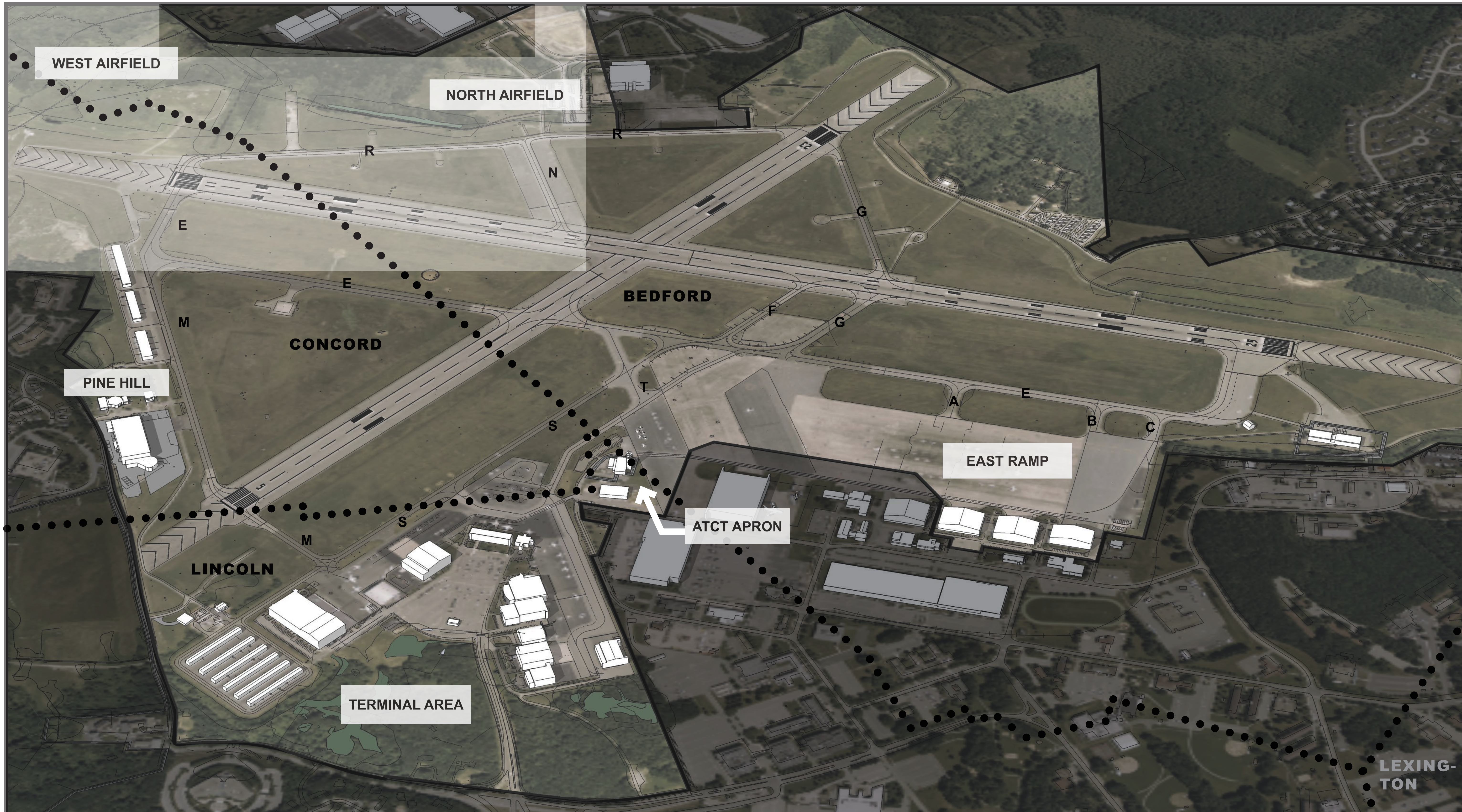
4.3.1 Terminal Area

The Terminal Area includes a mix of terminal, airside, and landside functional areas. Specific facilities include the Civil Air Terminal and supporting facilities, such as public parking, FBOs, flight schools, airport maintenance facilities, fuel farms, and several privately operated facilities. The Terminal Area is bounded to the southwest by Virginia Road and the Runway 5 Approach, to the west by Runway 5-23 and Pine Hill, to the north by Runway 11-29, to the northeast by the East Ramp, to the east by the Hanscom AFB, and to the south by Old Bedford Road and the Town of Lincoln. Access to the Terminal Area is provided by Hanscom Drive and Old Bedford Road.

4.3.2 Air Traffic Control Tower Apron

The Air Traffic Control Tower (ATCT) Apron area is confined to a small parcel of land that surrounds the FAA's ATCT. It includes the ATCT and associated parking lot, which is FAA property, the aircraft maintenance building, and adjacent apron area. It is between the Terminal and the East Ramp and abuts

(This page intentionally left blank)



North

Town Boundaries
Property Line

Aerial: Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

Planning Areas

(This page intentionally left blank)

the airfield to the north and west, and the Hanscom AFB to the south and east. The entire ATCT and Apron is contained within secure areas. Current physical access is from the Terminal.

4.3.3 East Ramp

The East Ramp area includes a large developed area for aircraft maneuvering, parking, servicing, fueling, and tie-downs. Common land uses in the East Ramp Area include hangars, ramp parking, and support activities associated with the Hanscom AFB. Five existing hangars form the southern boundary of the East Ramp, two of which are located on Massport property and occupied by an FBO and three of which are within the AFB property boundary. All hangars have direct airside access to the East Ramp, along with dedicated apron frontage.

Additionally, the USAF Fire Department, an FBO fuel farm, and Massport's fueling facility are located in this area. Other facilities include Massport's maintenance garage and sand storage building, FAA equipment storage, navigational aids, and a U.S. Customs and Border Protection (CBP) trailer.

Massport does not have direct vehicle landside access to the East Ramp. Currently the USAF controls access through the AFB to the East Ramp. The East Ramp is bounded on the west by Runways 5-23 and the Terminal and Pine Hill Areas; to the north by Runway 11-29, the North Airfield, and a residential neighborhood; to the east by properties located along and off Hartwell Avenue in the Towns of Lexington and Bedford; and to the south by the Hanscom AFB. Any non-military tenants wanting access to the East Ramp must enter the AFB through the main gate.

In 2008, Massport completed a utility study of the East Ramp to identify utility needs for future hangar development on the existing East Ramp. Massport analyzed potential noise and air quality conditions based on hangar development scenarios in this area. These analyses were included with a Massport letter to the FAA requesting a categorical exclusion under NEPA for new hangars on the East Ramp. The FAA considered the cumulative impacts of East Ramp development along with Hangar 24 (Rectrix FBO) redevelopment and ultimately determined that hangar development on the East Ramp is a categorically excluded project.

The evaluation in the *2005 ESPR* of alternative access routes to the East Ramp including a new road from Hartwell Avenue. Access options through the AFB are unchanged since 2005.

4.3.4 North Airfield

The North Airfield includes property located north of Runway 11-29 and both east and west of Runway 5-23. It is bounded on the far west by the West Airfield and to the north by the Town of Bedford.

Other than runways and taxiways and their supporting infrastructure, airport-related facilities in the North Airfield are limited to two buildings housing the runway glide slope indicators and one building occupied by the runway localizer. Massport had previously leased a large portion of this area to the USAF, but this area has reverted to Massport control. The land was occupied by a trailer park, which provided supplemental housing for the AFB. In 2008, the USAF decided to close the trailer park. In 2009, all structures were removed and by 2010, the USAF had removed all utility poles and ensured that the site was environmentally acceptable for return to Massport in 2011.

Another part of the North Airfield is owned by the U.S. Navy, but was operated by Raytheon until 2000. It includes a hangar, apron, and has direct access to the airfield. Massport has been working with the

Government Services Administration (GSA) to obtain control of the Navy Hangar site and filed an application for formal transfer of the property in 2012. It expects to receive the land in 2014.

In 2012, Edge Sports leased of portion of the North Airfield site north of Hartwell Road owned by Massport and constructed two turf athletic fields adjacent to their existing facility. These fields were completed in 2013.

4.3.5 Pine Hill

The Pine Hill primarily consists of an airside secured area with limited landside access to several facilities. It includes the facilities previously occupied by the Massachusetts Institute of Technology and now being developed by the FBO Rectrix Aviation (previously known as Hangar 24), three T-hangar facilities adjacent and parallel to Taxiway M, and the Draper Labs. The Pine Hill is bounded to the southwest and west by Virginia Road and the Runway 5 Approach, to the northwest by the West Airfield, to the north by Runway 11-29 and the North Airfield, and to the east and southeast by Runway 5-23, the East Ramp, and Terminal Area. Access to the Pine Hill is provided by Virginia Road.

Massport explored future development opportunities in the Pine Hill in the *2005 ESPR*. No updates to that work are provided in this ESPR.

4.3.6 West Airfield

The West Airfield extends west from the approach end of Runway 11. It is bounded to the south, west, and north by the Towns of Concord and Bedford, and to the east by Pine Hill and North Airfield.

This area is largely undeveloped and contains a significant amount of wooded area, wetlands, wetland buffers, and vernal pools, and is traversed by Elm Brook. There is a conservation easement over a portion of this area held by the Town of Concord, which constrains future development. This area has more variable terrain than most other portions of the airport. In addition, Massport marked a number of trails in the West Airfield that connect to the Town of Bedford conservation land trails as well as to Gaining Ground in Concord. This work was conducted in accordance with an agreement with Bedford to remove vegetation obstructions in the Jordan Conservation Area.

Massport explored future development opportunities in the West Airfield in the *2005 ESPR*. No updates to that work are provided in this ESPR.

4.4 Current Planning Initiatives and Projects

Massport has implemented programs to promote environmental quality at Hanscom Field. The ISO 14001 Certification of Hanscom Field recognizes Massport's progressive environmental programs and policies, including BMPs. Massport voluntarily subscribes to the guidelines of Executive Orders 385 and 438 as described below and supports the more efficient use of Hanscom Field within the broader context of growth management and sustainability.

Massport is a leader among Massachusetts agencies in promoting and implementing sustainable designs. New hangar facilities at Hanscom Field must achieve the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver Certification. Logan Airport's Terminal A was the first terminal in the world to achieve LEED Certification. Massport will continue to require future development of airport facilities at Hanscom Field, such as any future hangar development in the North

Airfield and the East Ramp to achieve LEED Silver certification. Rectrix is constructing its new facility as a LEED Silver certified hangar.

Massport meets monthly with the Hanscom Field Advisory Commission (HFAC) to review activities at Hanscom Field. HFAC is an advisory commission that was established by the state legislature in 1980. HFAC includes 16 members appointed by different constituencies and approved by the selectmen of Bedford, Concord, Lexington, and Lincoln. HFAC includes representatives from the Towns of Bedford, Concord, Lexington, and Lincoln; local citizens groups; other area towns affected by Hanscom Field; businesses basing aircraft at Hanscom Field; aviation or aviation-related businesses at Hanscom Field; and business-aviation general aviation organizations. The HFAC process affords the opportunity for review of projects that are not subject to formal MEPA review.

As summarized in this section, Massport has initiated a number of projects since the *2005 ESPR* including third-party redevelopment of the Hangar 24 site, rehabilitation of existing apron pavement, increased security measures around the airfield, and continued maintenance activities at Hanscom. This section summarizes current planning initiatives and projects within Hanscom's airside and landside areas, elements of Massport's 5-year capital program at Hanscom Field, and FAA and Massport security policies and projects that could have environmental effects. These planning initiatives and projects are listed in Table 4-5 along with an indication of the expected need for MEPA review. Massport will continue to use the ESPR process to describe planned and potential projects and review the potential applicability of MEPA review.

Table 4-5. Current Hanscom Field Planning Initiative Projects

Planning Area	Current Planning Initiative/Projects[1]	Description/Status	MEPA Review
Terminal Area	Salt Storage	Salt Storage Enclosure	None anticipated
	Pine Hill	T-Hangar Apron Rehabilitation	None anticipated
	Terminal Apron	Rehabilitate old T-hangar pavement	None anticipated.
	Roadways	Rehab Landside Roadways	None anticipated
	Terminal Enhancement	Replace windows and HVAC units First Floor of CAT	None anticipated
East Ramp	East Ramp	Joint Repair	None anticipated
	Taxiway J Maintenance	Rehabilitate Taxiway J	None anticipated
North Airfield	Perimeter Road	Relocated portions of perimeter road	Possible MEPA filing
Pine Hill	Pavement Maintenance	Rehab T-hangar pavements	None anticipated
Other	Taxiway G upgrade	Taxiway G upgrade	Possible MEPA filing

[1]Massport, *The State of Hanscom*, March 2013. FY13-FY17 Capital Projects

4.4.1 Five-Year Capital Improvement Program

Massport's 5-year capital program spanning from FY13 to FY17 includes various projects such as perimeter road enhancements, taxiway and apron pavement rehabilitations, terminal enhancements, and new equipment and storage for materials.

Between 2005 and 2012, one project required MEPA and Conservation Commission review: the Runway 5-23 Safety Area Improvements.[27] The RSA project involved regrading turf at the Runway 5 and 23 ends, some of which was in wetland areas. This project did not expand the runway and did not require any additional pavement. On October 18, 2006, MEPA issued a certificate on the Draft EIR for the RSA project and found that the project adequately and properly complied with MEPA. Massport completed the Final EIR for this project and filed it in early 2007. The project was also reviewed by the MassDEP which issued a variance. The project included replication of wetland areas disturbed adjacent to the Runway 23 RSA. The replication areas were located west of Runway 23 and north of Runway 11.

Massport will file an EIR for the projects in the 5-year capital program at Hanscom Field requiring MEPA review. See Table 4-5 for more information specific to each project.

Possible improvements to the Civil Air Terminal will address existing needs of the building tenants. Additional maintenance and repairs for the first floor of the Civil Air Terminal are under consideration.

4.4.2 Third-Party Development

Third parties undertake the majority of development at Hanscom Field. Third-party development that occurs at Hanscom Field is subject to appropriate local, state, and federal review as well as Massport policies. New facilities would be required to meet the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards for water quality and quantity. Massport's policy is to maintain or reduce (not to increase) existing rates of stormwater runoff from Hanscom Field. Massport also requires future development of airport facilities at Hanscom Field to achieve LEED Silver certification. The Rectrix Aviation hangar has been designed to achieve LEED Silver certification.

In preparing the ESPR and looking at locations for future development, Massport takes into account a range of aviation-compatible development types in areas that would result in the fewest environmental impacts. The development areas presented in the ESPR will provide market driven development opportunity to third-party developers. The most recent third-party development ventures are summarized in this section.

In 2011, Jet Aviation submitted a proposal to replace Hangar 17 with a modern hangar and ramp to accommodate the future business jet fleet. Jet Aviation is an FBO currently located at Hanscom that handles a range of needs for based and transient aircraft, operators, and passengers. Services offered include cleaning, maintaining, fueling, parking and hangaring of aircraft, providing pilot flight planning services, and arranging for specific needs of those flying.

The existing 21,315 square foot hangar was constructed in 1945 and is inefficient and undersized for the newer fleet. In 2012, Massport approved Jet Aviation's proposal to include the 40,000 sf replacement hangar with associated office/shop space, a 12,000 square foot FBO facility, approximately 94,000 square feet of apron area, a landside access road, and replacement automobile parking. The new hangar will be connected to the existing ramp via new ramp space.

Although the project was not subject to MEPA, Jet Aviation prepared an Environmental Assessment (EA) under NEPA to disclose the potential human and environmental effects of this proposed action. Jet

[27] Massport in conjunction with FAA, *Runway 5-23 Safety Area Improvements Draft Environmental Assessment and Draft Environmental Impact Report*, July 2006.

Aviation will begin the process of seeking individual construction permits in 2014. In accordance with Massport policy, Jet Aviation is designing the facility to achieve LEED Silver certification standards.

In 2012, the Massport Board also approved Rectrix Aviation as the developer for FBO facilities at the Hangar 24 site. Following extensive public review, Rectrix obtained its permits and finished with the demolition of Hangar 24 in September 2012. Rectrix anticipates completion of the project in early 2014.

4.4.3 Security Policies and Projects

As TSA and Massport security policies are formulated and specific projects identified, regulatory approvals might be required. All relevant projects will go through the appropriate environmental process. Massport has installed new security fencing at Hanscom and an enhanced access control system. Massport will add pedestrian gates near the vehicle trap gates and bollards may replace Jersey barriers in front of the Civil Air Terminal. Massport will continue to review all security measures while making appropriate adjustments, as warranted. Massport does not anticipate that these projects would require MEPA review.

4.5 Master Planning

This section describes the characteristics of the potential future planning concepts for the 2020 and the 2030 scenarios. Figure 4-5 illustrates the potential development opportunity areas at Hanscom Field.

The general approach applied in the future scenarios is as follows:

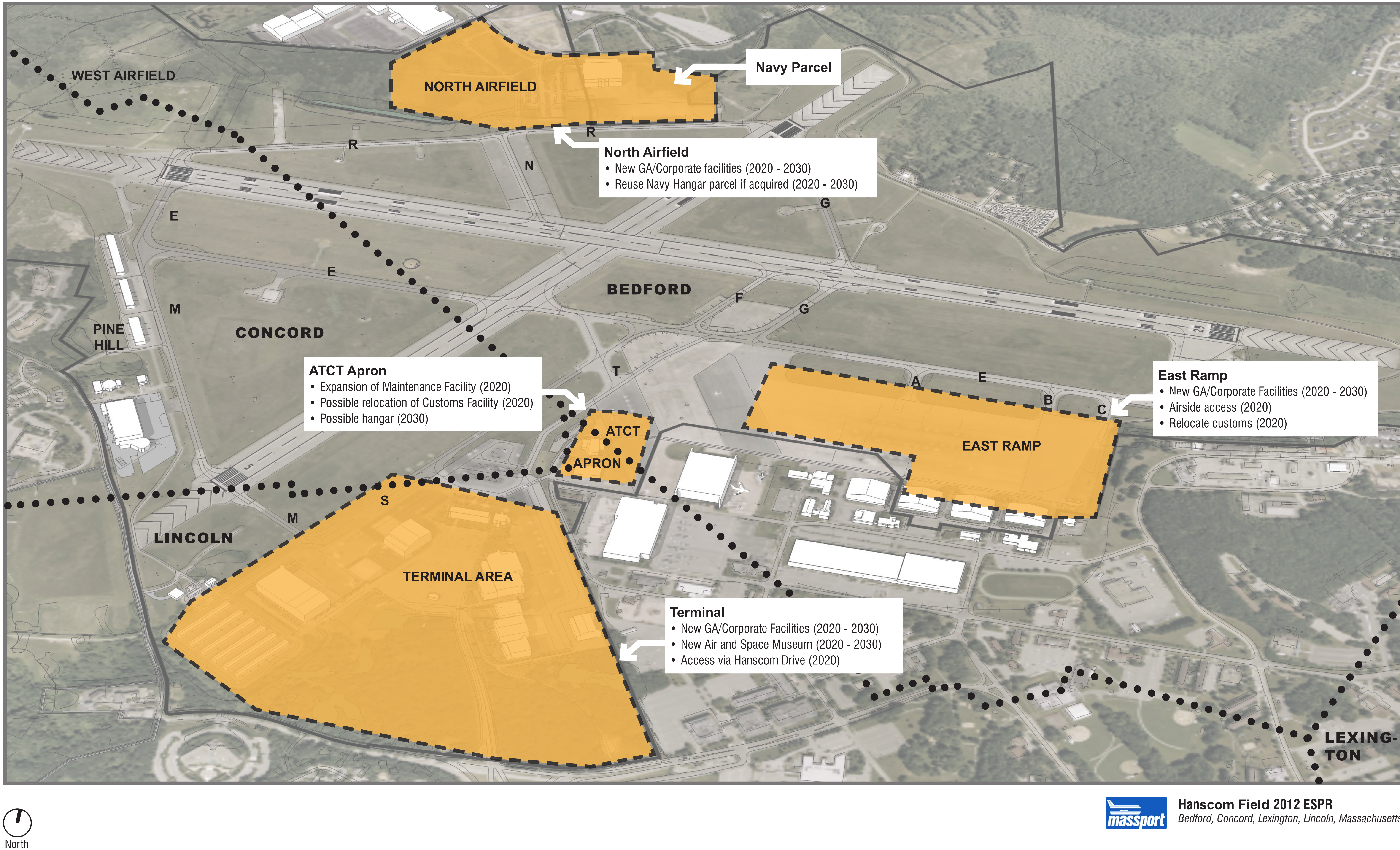
- Enhancing aviation-related facilities on the East Ramp, which includes maximizing the use of the existing apron area,
- Infill development in the Terminal Area, which has existing infrastructure to support new GA facilities, and
- Reusing developed areas in the North Airfield Area that utilize the northern edge of the airport.

The planning concepts shown provide flexibility to respond to the anticipated variability of future demand in a coordinated fashion. The proposed concept layouts are shown for illustrative purposes only and are expected to evolve over time. Detailed environmental analyses would be required for projects that move from conceptual screening to the proposal stage whenever MEPA or other regulatory thresholds are triggered. However, because third-party developers complete most new development at Hanscom Field, Massport's planning must be programmed to be flexible and able to respond to changing conditions and regional demands.

The future airport planning concepts presented here are based on:

- The planning context described in this Chapter,
- Infrastructure conditions discussed in Chapter 2, Facilities and Infrastructure,
- Potential market forces that shape and change demand for airport facilities and infrastructure, and,
- The forecasts of aviation activity levels discussed in Chapter 3, Airport Activity Levels.

(This page intentionally left blank)



Aerial: Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

Summary of Planning Areas

Figure **4-5**

(This page intentionally left blank)

The Master Planning concepts are matched with activity level forecasts for the planning years 2020 and 2030. Table 4-6 summarizes Forecast Aviation Activity Levels described in Chapter 3. It should be noted that:

- Forecast long-term (2030) aircraft operations are 37,000 to 56,000 below the *2005 ESPR* long-term forecasts.
- Forecast long-term (2030) passenger levels are significantly lower than the *2005 ESPR* forecast.
- Based aircraft forecast is lower than the *2005 ESPR* forecasts by approximately 27 to 60 aircraft.

Table 4-6 Summary of Actual and Forecast Activity at Hanscom Field

	Actual 2012	Forecast	
		2020	2030
Aircraft Operations (7:00 am to 11:00 pm)			
General Aviation			
Local (SEP)	70,196	62,605	65,164
Personal Flying (SEP)	51,477	50,661	58,285
Business Non-Jet (MEP + Turbo)	10,178	10,861	12,985
Business Jet	25,638	35,043	46,782
Helicopter	7,345	7,345	7,345
Subtotal GA	**164,834**	**166,515**	**190,561**
Military	**745**	**745**	**745**
Commercial Scheduled Airline[1]	**635**	**1,040**	**1,820**
Total Operations	**166,214**	**168,300**	**193,126**
Based Aircraft	**340**	**360**	**416**
Commercial Airline Passengers	**8,609**	**20,280**	**40,600**

1. Total commercial airline operations in 2030 are forecast at 2,080, including 260 operations before 7:00 am.
2. The operations presented in the 2012 ESPR differ slightly from those published in the Hanscom Annual Noise Report. This discrepancy is due to the difference in the timing of the preparation for the two reports. Each report used the best available data at the time of the analysis for that report. The difference of approximately 0.3 daily nighttime operations or 0.07% of all daily operations would change computed noise levels by less than 0.1 dB.

Source: Massport and FAA Tower Counts.

As discussed in Chapter 3, Activity Levels, a comparison of the GA activity in the 2020 and 2030 scenarios suggests that GA activity could grow modestly between 2013 and 2030. Much of this growth would be attributable to business jets, which would increase the demand for GA hangars and associated facilities. GA hangars are an interface between landside and airside and will be discussed in the landside section. Forecasts of activity presented in Chapter 3 indicate that single-engine aircraft operations would comprise an increasingly smaller percentage of the general aviation operations than previously forecast.

Similarly, business jet activity would constitute an increasingly greater percentage of the general aviation operations over the forecast period.

Actual numbers of total based aircraft have declined approximately 14 percent from 2000 to 2012, from 397 to 340. Most of the decrease is attributable to reductions in single-engine and multiengine piston aircraft. However, the number of based jets has increased from 24 to 79 in the same period, or an approximate increase of 229 percent. Helicopters have also increased approximately 114 percent.

Total based single-engine and multiengine piston aircraft are forecast to remain relatively constant across the scenarios through 2020, suggesting that the demand for hangar space would remain constant through this same time period. However, based jet aircraft are forecast to grow from 79 in 2012 to 90 in 2020 and to 120 in 2030, therefore increasing the need for GA/corporate hangar and FBO space over the forecast period.

The following discussion of 2020 and 2030 scenarios presents a general context for the future planning of potential GA facility development. The array of GA facilities, which exceeds the GA facility requirements for the 2020 and 2030 scenarios, represents a range of development options that could be pursued in response to changing market forces. The concepts for the Hanscom Field planning areas provide a basis to evaluate the cumulative environmental effects of these options under the 2020 and 2030 scenarios. Table 4-7 summarizes potential planning concepts for the 2020 and 2030 scenarios for each of the Planning Areas.

Table 4-7 2020 and 2030 Hanscom Field Planning Concepts

Planning Area	2020 Scenarios[1]	2030 Scenarios[2]
Terminal	GA facilities with new parking spaces Salt storage/maintenance facility Jet Aviation to replace Hangar 17 New access way to Jet's replacement hangar First phase of Air & Space Museum for the Massachusetts Aviation Historical Society Civil Air Terminal enhancements	Second phase of Air & Space Museum New GA hangars Hotel Civil Air Terminal enhancements New and replacement structured public parking spaces as needed
ATCT Apron	Relocation option for customs facility Expansion of the airport maintenance facility Alternative landside access	Further expansion of the airport maintenance facility GA hangar development
East Ramp	Relocation option for customs facility GA facilities with new parking spaces Alternative landside access	Expansion of GA facilities and upgrading or replacement of existing GA hangars Alternative landside access
North Airfield	GA facilities with parking in area with existing parking spaces GA facilities at Navy hangar site once the parcel turns over to Massport	Additional GA facilities at the Navy hangar site

Note: The Pine Hill and West Airfield areas are provided in this ESPR for consistency with past ESPRs. No new development has been evaluated for the *2012 ESPR*.

[1]2020 includes potential activities in 2013 through 2020.

[2]2030 includes potential activities in 2021 through 2030 and planning concepts from the 2020 scenarios.

4.5.1 2020 Scenario

The 2020 planning scenario includes a range of planned and potential airfield facilities, as described below. Future considerations in the Pine Hill and West Airfield are unchanged since the *2005 ESPR*. In addition, there have been no changes to the East Ramp access alternatives evaluated in 2005.

4.5.1.1 Terminal Area

GA facilities could be added or replaced in the Terminal Area to support personal, business and/or corporate, and flight training activity in the 2020 scenario, as shown in Figure 4-6.

Landside:

- Landside improvements for the Terminal Area considered in the 2020 scenario include improved access to the Terminal and to existing and new GA facilities. New and replacement surface parking spaces for the public and new GA facilities were anticipated.

Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

Terminal Area

Figure **4-6**

(This page intentionally left blank)

- Other improvements could include the first phase of the Air & Space Museum for the Massachusetts Aviation Historical Society.
- Civil Air Terminal maintenance and needed repairs and a relocated salt storage enclosure facility could be added within this timeframe.
- A new roadway connection and replacement parking would be made from Hanscom Drive to the GA facilities as part of the ongoing Jet Aviation Hangar Replacement Project.

Airside:

Within the 2020 scenario, Jet Aviation's replacement of Hangar 17 is projected to be completed and under operation. As Figure 4-6 illustrates, a 40,000 sf GA hangar could be accommodated in this area. Apron and ramp improvements would be constructed in connection with the Jet Aviation replacement of Hangar 17.

4.5.1.2 ATCT Apron

Existing facilities around the ATCT include aircraft tie-downs, Massport's airfield maintenance shed, and a restricted-access parking lot. Any improvements proposed in this area must not affect the lines of sight from the ATCT. Figure 4-7 illustrates the potential changes and improvements.

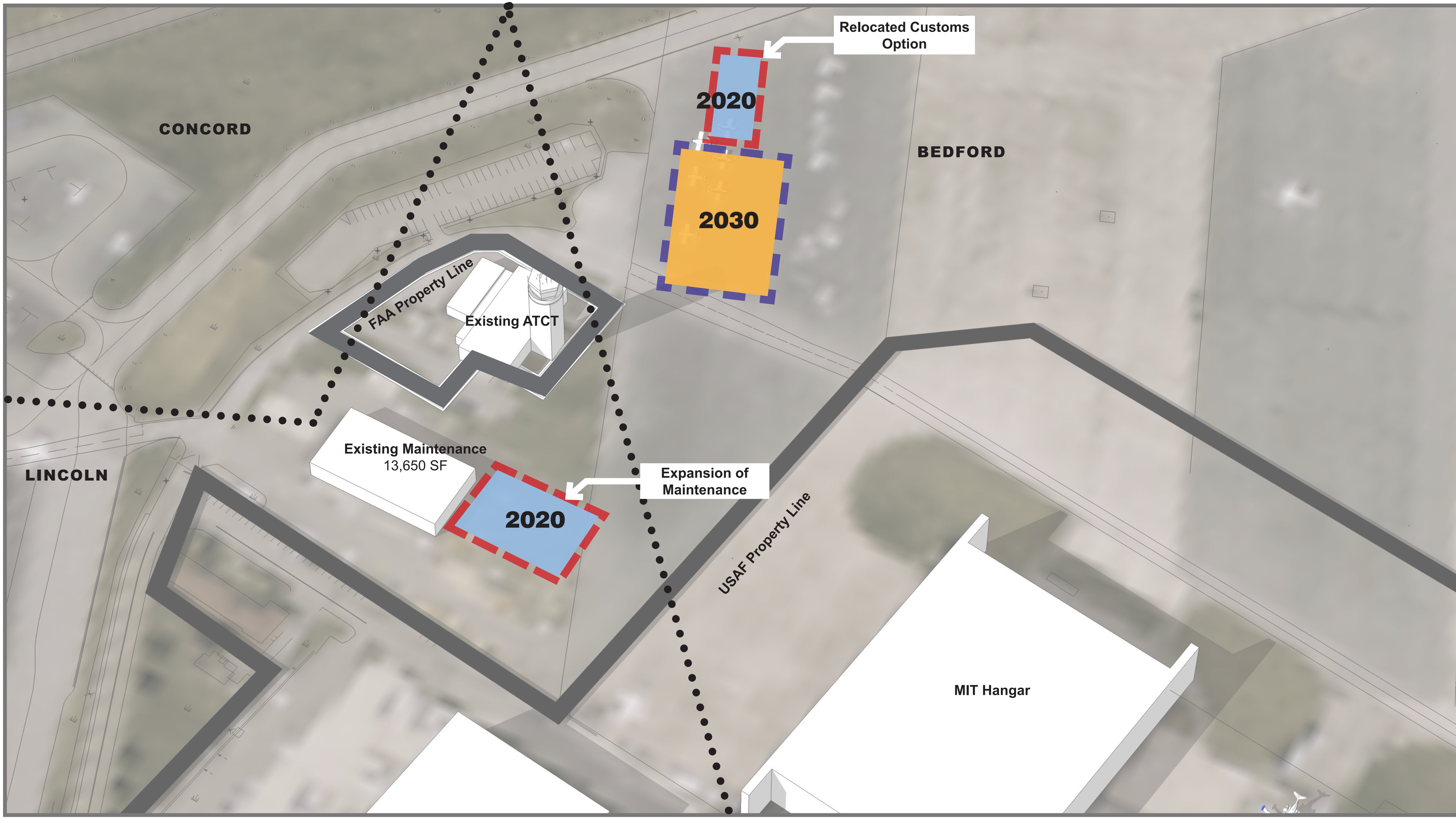
Landside:

Alternative landside access could be developed through the USAF property within the 2020 scenario. This would require planning and coordination with the USAF. The airport maintenance facility is proposed to be expanded within this timeframe.

Airside:

As described earlier, Hanscom's Customs and Border Protection (CBP) facility is located in a trailer along with an adjacent Aircraft Design Group (ADG) V parking position on the East Ramp. The area is suitable for future GA hangar development. One option for relocation of the CBP trailer is to a new facility located at the west end of the East Ramp near the ATCT.

(This page intentionally left blank)



North

Hangar Development Parcel

Development Parcel

2020 2030 Phasing for Scenario Planning Concepts

Town Boundaries

Property Lines

Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

ATCT Apron

Aerial: Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

Figure **4-7**

(This page intentionally left blank)

4.5.1.3 East Ramp

Figure 4-8 illustrates the planning concepts for the East Ramp. The East Ramp concept includes expanded and new GA and corporate hangar facilities with full vehicle landside access and one or two potential taxiway connections.

Landside:

On the north side of the East Ramp, the plan identifies a new hangar development area. New hangars could be built in phases, likely starting on the west side and moving east, with roadway access on the north side. Utilities would need to be expanded into the East Ramp upon development of the first hangar on the north side of the East Ramp.

This development could occur on existing impervious surfaces. In 2020, it is assumed that access to the East Ramp would occur by badging and escorting individuals. Massport does not anticipate that this type of development on the East Ramp would trigger MEPA review.

Airside:

In the 2020 planning scenario, the potential for new hangar development on the north side of the East Ramp is calculated as approximately 200,000 sf. The amount of hangar development is determined by market demand from third-party developers. In this development scenario, existing Taxiways B and C, which connect the East Ramp to Taxiway E, may need to be reviewed for possible closure. Two taxiway ingress and egress points (Taxiways A and G) to the new hangars on the north side of the East Ramp would remain. Taxiway A could remain for at least the first phase of development. On the south side of the ramp, the three (36,000 sf, 36,000 sf, and 28,800 sf) existing hangars on the Massport property could be extended by enlarging towards the ramp onto their apron areas. The existing Hangars 2 and 3 could also be rebuilt as a single, expanded hangar of up to 137,000 sf. The height of any hangar development would be restricted to maintain the ATCT line of sight to the airfield movement area and within the tolerances of the FAR Part 77 surfaces from the runways. On the East Ramp, it appears that the ATCT line of sight is more restrictive than the FAR Part 77 surface.

Access to the CBP office needs to be maintained in a manner so that ADG V aircraft can be inspected. As noted above, full development of the East Ramp Area might eventually require relocating the CBP office, and a location closer to the west side of the East Ramp has been identified for this potential relocation.

4.5.1.4 North Airfield

Two parcels of land north of Runway 5-23 in Bedford abut the airfield and have been vacated. The other parcel is owned by Massport, which until 2011 was leased by the USAF, but has since been cleared of structures and returned to Massport. One of these parcels is currently owned by the U.S. Navy, but was used by Raytheon until 2000. Massport expects to acquire the property in 2014.

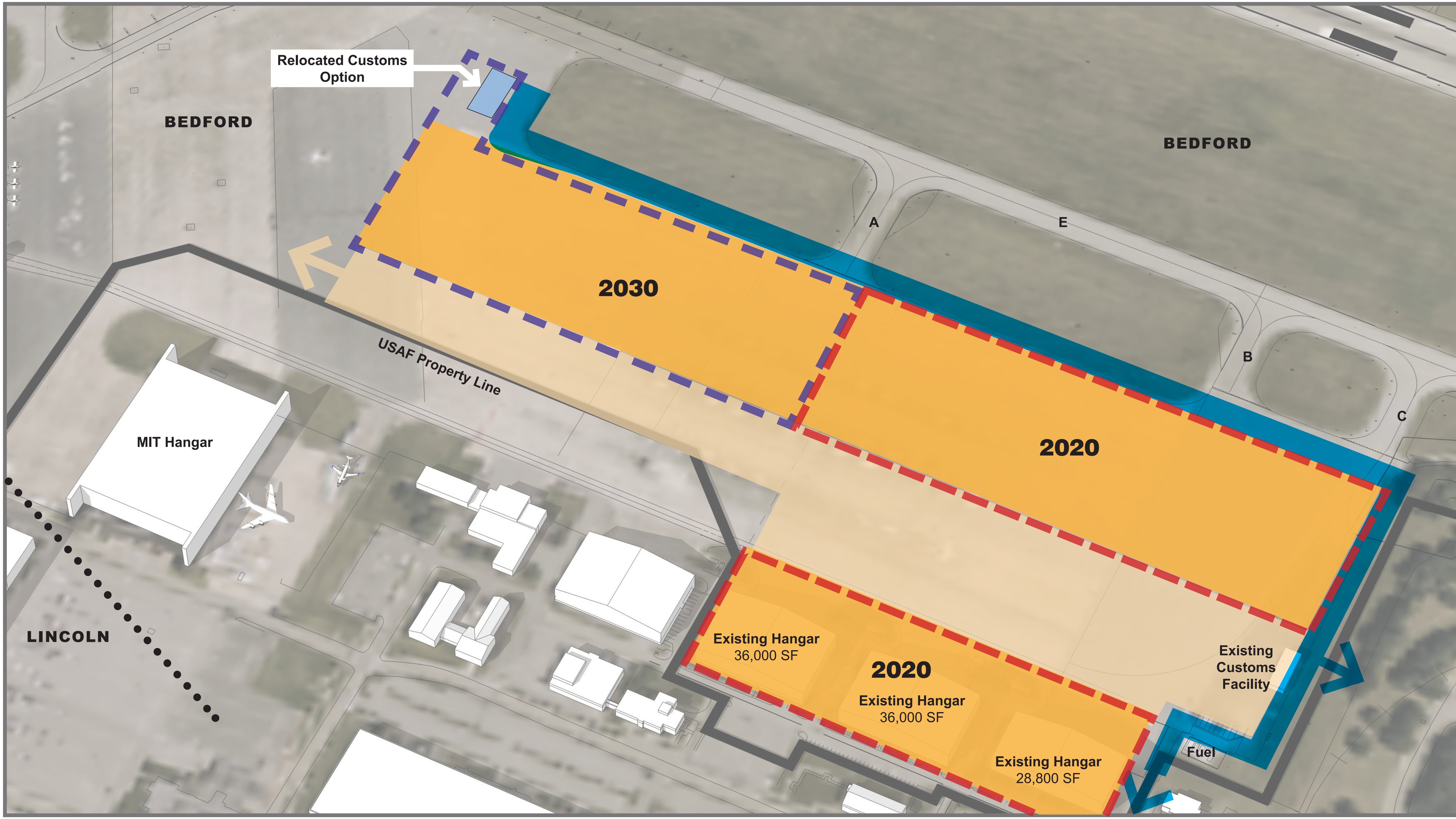
Aviation improvements in the North Airfield evaluated as part of the 2020 scenario include GA facilities, and aircraft and vehicle parking spaces on the formerly leased USAF parcel, as shown in Figure 4-9. Massport has received some interest from third-party developers to use this property. Multiple corporate hangars could be accommodated in this area without affecting wetlands. The area would require leveling in some areas before any hangars could be constructed. This concept will require NEPA review and may trigger MEPA review depending on the extent of the development.

Landside:

Corporate and GA facilities could be constructed with associated parking in the area of existing parking spaces and previous development.

Airside:

Corporate and GA facilities could be constructed with a total program of up to 165,000 sf, together with new ramps and taxi lanes for the GA facilities are proposed in this scenario. The amount of hangar development is contingent upon market forces driving third-party development of GA facilities.



North

Hangar Development Parcel

Ramp Area

Development Parcel

New Roadway

2020 2030 Phasing for Scenario Planning Concepts

Town Boundaries

Property Line

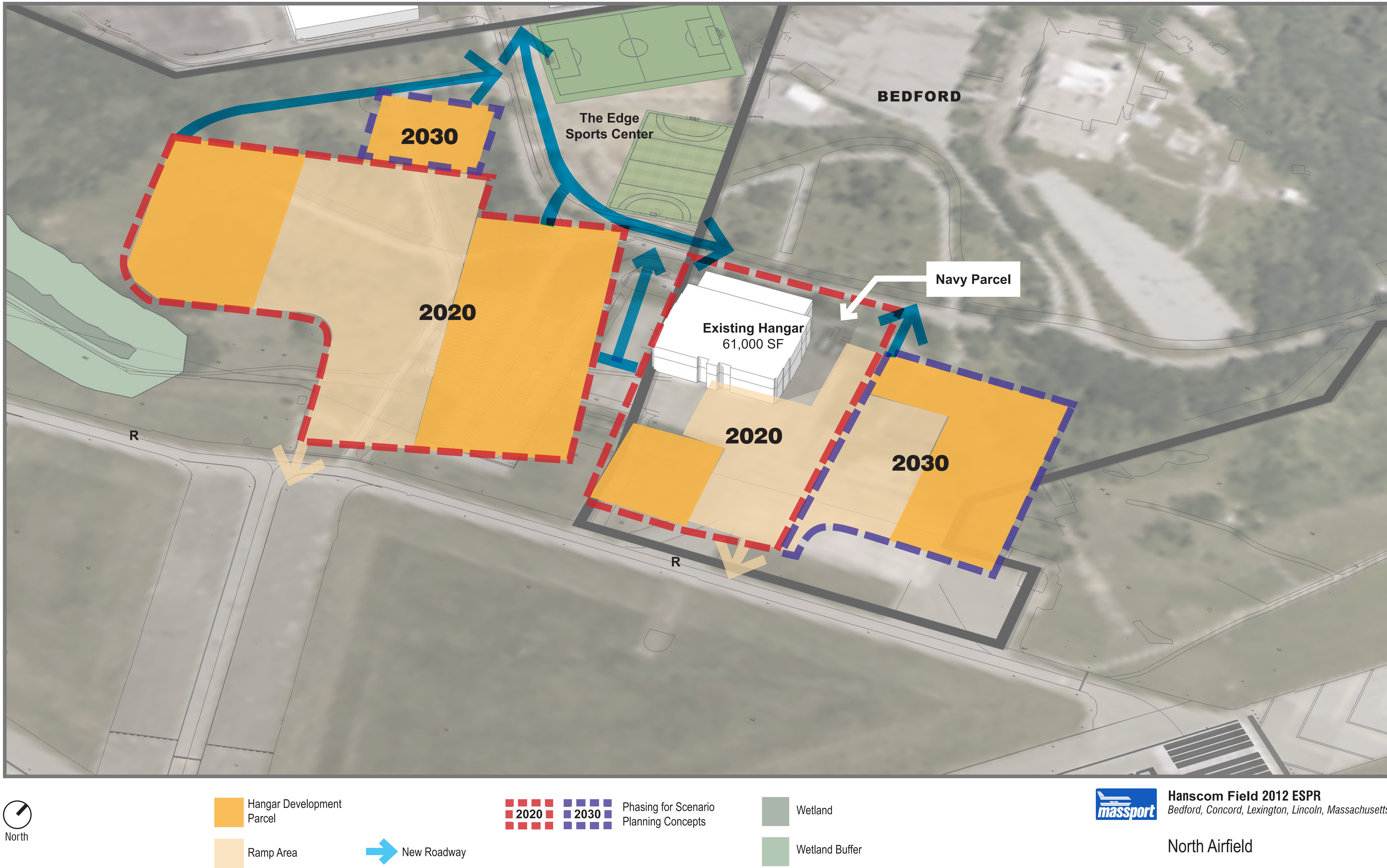
Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

East Ramp

Aerial: Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

Figure **4-8**

(This page intentionally left blank)



Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

North Airfield

Aerial: Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

Figure **4-9**

(This page intentionally left blank)

4.5.2 2030 Scenario

In the 2030 scenario, additional development beyond what was evaluated for 2020 could occur in the Terminal Area, East Ramp, and North Airfield. There are no updates to the Pine Hill and West Airfield and future considerations in these areas are unchanged since the *2005 ESPR*. In addition, there are no updates to the East Ramp access alternatives evaluated in 2005.

4.5.2.1 Terminal

The 2030 scenarios include the possible GA facilities, which are described for the 2020 scenarios. The Terminal Area also has the potential for additional GA hangars through the redevelopment of existing T hangar area and new GA hangars to the south of Jet Aviation, as shown in Figure 4-6.

<u>Landside</u>:

The 2030 growth scenario includes a second phase of the proposed Air and Space Museum. A moderate-sized hotel could be located west near the intersection of Hanscom Drive and Old Bedford Road. For analysis purposes, the hotel is anticipated to accommodate between 100 and 200 rooms with basic hotel amenities, such as a restaurant and a limited amount of meeting space. Access to the site could be from either Hanscom Drive and/or Old Bedford Road. This type of development was also evaluated in the 1995 GEIR and the 2000 and 2005 ESPRs. The hotel would be expected to serve demand generated by Hanscom Field and the general metropolitan Boston market and address specific local needs, such as those generated by visitors to the MMNHP and the future Air and Space Museum. The possible location of the potential hotel site development parcel is illustrated as a development site in Figure 4-6. A hotel project would require NEPA review and may also trigger MEPA depending on the extent of the development.

Additional vehicle parking might be required for the 2030 Scenario based on future operations and passenger levels. An allowance for optional structured parking over or adjacent to the existing Civil Air Terminal parking area is provided in the 2030 Scenario.

<u>Airside</u>:

Figure 4-6 illustrates an aviation development area that could accommodate approximately 60-80,000 sf of GA facilities with associated ramp space and taxi lanes in addition to the development that could occur in the 2020 scenario.

4.5.2.2 Air Traffic Control Tower Apron

The 2030 scenario analysis assumes the addition of a small GA hangar. Figure 4-7 illustrates the scenario for the ATCT Apron.

<u>Landside</u>:

Access to a new GA hangar would be part of this scenario.

<u>Airside</u>:

In the 2030 scenario, the addition of a smaller GA hangar with approximately 15,000 sf is considered that maintains line of sight to the airfield movement area and is within the tolerances of the FAA Part 77 surfaces.

4.5.2.3 East Ramp

Additional GA facilities beyond those described in the 2020 scenario could be developed in the East Ramp. This development could occur on existing impervious surfaces within the aviation development area that is shown in Figure 4-8.

Landside:

The East Ramp currently has restricted access through the primary entrance to the Hanscom AFB at the Vandenberg Gate. Access to the East Ramp is handled under an agreement that is in place with the Base. With the development of the East Ramp, the number of tenants on the East Ramp could increase. In this event, Massport would like to improve the access to the East Ramp. Two options were considered. The first was to develop a secondary access from Hartwell Road to handle the additional flow of traffic. A secondary access that does not require transitioning through the Base would improve the commute time to the East Ramp. The second option was to maintain access via the Vandenberg Gate and add connections from Marrett Street within the Base.

Airside:

In general, airside facilities could consist of a series of GA and/or corporate hangars that expand from the 2020 Scenario increasing hangar space by up to an additional 160,000 sf.

4.5.2.4 North Airfield

Of the two parcels of land north of Runway 5-23 in Bedford that abut the airfield, the potential aviation improvements in the North Airfield Area as part of the 2030 scenario include additional hangars in the areas formerly leased to the USAF, and hangars and aircraft and vehicle parking spaces on the U.S. Navy parcel. This work assumes that Massport will acquire the Navy parcel.

Landside:

Landside access would be from Hartwell Road.

Airside:

Figure 4-9 illustrates an aviation development area that could accommodate up to 150,000 sf, as GA hangar space with associated ramp and parking. These hangars could be located in the area to the north of Taxiway R and would require access to this taxiway.

4.6 Analysis of Future Utilities

This section presents the potential changes in utility demands that would be needed to serve the 2020 and 2030 scenarios. In general, any improvements and new facilities specified in the 2020 and 2030 scenarios would require new connections and upgrades to the existing utility system. In the *2006 State of Hanscom* report, Massport identified potential capital projects to upgrade its water, stormwater, and electrical utility systems and to provide utility service to the East Ramp. Massport would work with the appropriate public and private utility companies to implement these projects or other potential system upgrades that would be needed to accommodate the demands of the 2020 and 2030 scenarios. As part of the 2020 scenario, Massport will continue to explore third-party development opportunities on the East Ramp. Massport is considering the feasibility of expanding its electric utility system to parts of Hanscom not currently served by that system.

4.6.1 Water Supply and Demand

In the *2005 ESPR*, water demands were estimated for the 2010 and 2020 scenarios. These demands are shown in Table 4-8. This potential future demand is compared with 2005 existing conditions at Hanscom Field. The development scenarios evaluated in the *2012 ESPR* are of a similar nature and size as the proposed improvements in the *2005 ESPR*.

Table 4-8 Potential Water Usage and Wastewater Generation of 2010 and 2020 Scenarios [6]

	Existing (2005) Conditions (gallons per day)	2010 Scenarios from 2005 ESPR (gallons per day)		2020 Scenarios from 2005 ESPR (gallons per day)	
		Moderate Growth	High Growth	Moderate Growth	High Growth
WATER USE					
Total Average Daily Demand	34,800	44,100	48,000	59,200	66,900
Total Maximum Daily Demand[1]	69,600	88,200	96,000	118,400	133,800
WASTEWATER GENERATION					
Total Average Daily Flow[2]	27,800	35,300	38,400	47,400	53,500
Total Off-site Average Daily Flow[3]	24,400	30,900	33,600	41,400	46,800
Off-site Peak Flow[4]	**54,900**	**69,500**	**75,600**	**93,200**	**105,300**
Increase over 2000 Peak Flows[5]	29,900	44,500	50,600	68,200	80,300

1. Based on a ratio of maximum day to average day demand of 2.0 in accordance with Metcalf & Eddy report (1992).
2. A wastewater ratio of 0.8 was utilized to develop total wastewater generation (average daily flow).
3. Wastewater flows Wastewater leaving the site is estimated to be 70 percent of water usage (off-site average daily flow). This reflects some on-site septic systems that do not tie into the Massachusetts Water Resources Authority system.
4. Based on Peak to Average flow ratio of 2.25 as utilized in the *2000 ESPR* and Metcalf & Eddy report (1992), considering on-site equalization storage.
5. 2000 Peak Flow equals 25,000 gallons per minute as provide in the *2000 ESPR*.
6. The potential water usage and wastewater generation are estimates of activity based on planned future developments. The actual water usage and wastewater generation might differ depending on the actual development implemented.

Source: Metcalf & Eddy, Water System Improvements Study for L.G. Hanscom Field, 1992

Based on existing water uses and available system flow capacity from the Hanscom AFB of 1,500 gallons per minute at 20 pounds per square inch to the site, the existing systems are sized to supply the potable water flows required for each of the future growth scenarios while maintaining adequate pressures. Future fire suppression requirements might necessitate increased water pressure, standby water storage (fire pumps or alternative standby supply tank), or additional supply and pressure from the Hanscom AFB water system that currently supplies the Massport water distribution system. Massport will either incorporate a campus-wide fire protection plan or require each developer to construct a deluge and fire protection system within the individual site. The potential water usage and wastewater generation are estimates of activity based on planned future developments. The actual water usage and wastewater generation might differ depending on the actual development implemented.

4.6.1.1 Sanitary Sewer System

The potential future wastewater generation was estimated in the *2005 ESPR* for the 2010 and 2020 scenarios. The planned improvements in the *2012 ESPR* are of a similar nature and size as the proposed improvements in the *2005 ESPR*. These results are shown on Table 4-8 and are broken down by stage. Potential new facilities in the West Airfield Area would tie into the existing sewer line in South Road. For the other areas, wastewater flows would continue to be discharged to the Hanscom AFB system as described in Chapter 2, Facilities and Infrastructure.

The existing on-site wastewater system is expected to have the capacity to handle the foreseeable future growth scenarios. Off-site systems via the Hanscom AFB appear to have capacity for the 2020 scenario.

For the 2030 scenario, a detailed wastewater study likely be required to determine if there is available capacity off site. If additional capacity is necessary, options could include obtaining additional capacity to discharge to the Massachusetts Water Resources Authority system, mitigating increases through on-site measures such that the peak pumping rate does not exceed the force main capacity, and/or constructing on-site septic systems meeting Title 5 requirements.

4.6.2 Stormwater Management and Drainage System

As projects are developed that increase impervious surfaces, areas of paving could be removed as part of the development project or as a separate project to ensure that there is no gain in impervious surfaces. Between the *2000* and *2005 ESPR's*, Massport eliminated approximately 4.4 acres of impervious surfaces at Hanscom Field by removing unused airside pavement. Since the *2005 ESPR*, no further removal of impervious surface has occurred. Within the *2012 ESPR*, as indicated in Table 4-9, some of the potential new GA facilities would add new impervious surfaces. It is estimated that the 2020 scenario could add approximately 9.1 acres of new impervious surface. If all development options proceeded, the 2030 scenario could add an additional 16.6 acres of impervious surface. These areas would be offset to the maximum extent practicable.

Table 4-9 Potential Change in Impervious Surface (Acres) in 2020 and 2030 Scenarios

Planning Area	2020 Scenario[1]	2030 Scenario[2]
Terminal Area	2.1 acres	7.2 acres
ATCT Area		
Runway 5 Approach Area	-	-
Pine Hill Area	-	-
West Airfield Area	-	-
North Airfield Area	7.0 acres	9.4 acres
East Ramp Area	-	-
Total Potential Increase/(Decrease)	**9.1 acres**	**16.6 acres**

1. 2020 includes potential activities in 2013 through 2020.
2. 2030 includes potential activities in 2021 through 2030 and planning concepts from the 2020 scenario.

Any new facilities in the 2020 and 2030 scenarios would be required to meet the MassDEP Stormwater Management Standards for water quality and quantity. This would be achieved through the implementation of various stormwater BMPs to mitigate peak runoff rates so that post-development peak runoff rates do not exceed existing conditions. The site's stormwater runoff ultimately outfalls to the Shawsheen River, Elm Brook (both Class B watercourses according to 314 CMR 4.06 Surface Water Quality regulations), and to on-site wetland resource areas. The stormwater runoff would be treated for water quality to achieve a total suspended solids removal rate of 80 percent prior to discharging into these resource areas in accordance with the MassDEP Stormwater Management Standards.

4.6.3 Electrical Distribution System

The on-site distribution system delivers electricity to all of Hanscom Field. According to the evaluation in the *2005 ESPR*, additional capacity and an expanded distribution system would be necessary to serve the 2010 and 2020 Moderate and High Growth scenarios. Massport has identified potential upgrades to the electrical utility system as part of the 5-year capital program. This additional electrical supply might come from sources other than NSTAR Electric and Gas or CMPL Trading Company. The additional capacity has not been implemented and would still be required if the 2020 and 2030 scenarios were implemented. However, because the level of development considered in the 2010 and 2020 growth scenarios has not yet materialized due to the economic downturn, improvements are not an issue for operations today but will need to be accomplished to support certain levels of future development.

4.6.4 Natural Gas

According to the *2005 ESPR*, the natural gas distribution system has sufficient capacity to accommodate the 2010 and 2020 Moderate and High-growth scenarios because potential additional future demand was considered when the existing 4-inch high-pressure main line was sized. This condition remains unchanged for the *2012 ESPR*. Massport is currently working with the USAF on a gas line extension that will connect Hangars 1, 2, and 3 to natural gas service. It is anticipated that this extension will be completed in 2014.

4.6.5 Telephone and Communications

According to the *2005 ESPR*, upgrades to telephone and other communications service capacities would be needed to accommodate the 2010 and 2020 Moderate and High Growth scenarios. The upgrades have been ongoing with improvements made in 2012 and 2013.

4.7 Consistency of 2012 ESPR with Plans and Regulations

Massport is a state authority that owns and operates public-use transportation facilities that include Boston-Logan International Airport, Worcester Regional Airport, Hanscom Field, marine terminals within the Port of Boston, and a range of real-estate properties in the Boston area. Massport's goals and objectives are consistent with local plans of the towns of Bedford, Concord, Lexington, and Lincoln and regional plans such as MAPC's *MetroPlan 2000* and *MetroFuture*. Massport supports many of the principles described in these plans, including the creation and operation of environmentally friendly facilities, sustainability, promoting regional equity, economic development opportunities, and the efficient use of existing resources. Massport seeks to achieve these results within the context of managing public-use facilities.

Hanscom Field has existed as an airport in its present location since 1941. After providing primarily military service from 1941-54, Hanscom became a GA airport and control of the airfield's general operations and maintenance was transferred to Massport in 1974. Much of the infrastructure and impervious surfaces of the airfield has remained largely unchanged under Massport's tenure. However, the predominately rural, agricultural character of the area surrounding Hanscom Field continues to be transformed by increasing residential and commercial development independent of and unrelated to Hanscom Field.

Activities at Hanscom Field are consistent with local, regional, and other plans, to the extent that these plans or policies apply to Hanscom Field. The future scenarios described in the *2012 ESPR* are consistent with those that were evaluated in the *2000 and 2005 ESPRs*, but with lower commercial air passenger forecasts. The 2020 and 2030 scenarios describe potential additional aviation and aviation-related uses on the airport and retain many areas in their current, natural state. A hotel use, which is included in the 2030 scenario, is compatible with land uses in the adjacent communities, MMNHP, and Hanscom AFB. Massport has also implemented many of the recommendations of the Hanscom Noise Workgroup.

Hanscom Field continues to have a minimal effect on local traffic, air quality, water quality, and wetland resources. However, Hanscom Field remains an airfield facility and, therefore, has the accompanying effects implicit to aircraft operations, including aircraft noise. Noise analysis and mitigation are discussed in detail in Chapter 7, Noise.

Massport's plans are currently limited to those investments described above in the Five-Year Capital program. These plans support Hanscom Field's role as a premier full-service GA airport with limited commercial passenger service. The future scenarios that were evaluated in this document present estimates of what could happen at Hanscom Field using certain assumptions, not necessarily what will happen. In this context, Massport has identified environmental management approaches to help achieve consistency with the local and regional plans.

4.7.1 Federal and State Regulations

This ESPR identifies potential projects that could occur based on the aviation forecasts described in Chapter 3, Airport Activity Levels. Massport will follow appropriate local, state, and federal review for any future project that triggers such reviews. For example, the 2030 scenario identifies parking demand that could be met by increased surface or structured parking, which may require MEPA and NEPA review. Before proposing changes such as to the parking supply, Massport would review MEPA and NEPA regulations to determine if it needed to file with MEPA and NEPA and, if appropriate, make the necessary environmental filing for the project.

4.7.2 Consistency with the 1978 Master Plan and Massport's 1980 Regulations

Massport's 1978 Master Plan and 1980 regulations for Hanscom have guided Massport's development of the *2012 ESPR*. The *2012 ESPR* reaffirms the role of Hanscom Field as a premier regional GA airport with limited commercial service. The Master Plan anticipated cargo operations at the airport and commercial air passenger services. The *2012 ESPR* evaluates future scenarios that include scheduled commercial passenger service utilizing aircraft of no more than 60 seats, but did not consider cargo services given current market conditions. The number of operations for each future year scenario, including the 2030 scenario, is well below the Master Plan's estimated practical capacity of 320,000 operations per year.

4.7.3 Consistency with Local Plans

In general, the visions articulated by Bedford, Concord, Lexington, and Lincoln and their planning documents speak to a desire to preserve the historical character and natural resources of the towns, while balancing the demands of changing social and economic conditions. Economic development, which has occurred throughout the four towns and the larger suburban area, has resulted in the associated traffic and environmental impacts experienced in the area.

The basic use of Hanscom Field for aviation purposes takes place within a local planning and zoning context that only describes non-aviation related uses. The towns' plans do not provide for aviation related land uses. The Commonwealth's policy is to maintain Hanscom Field as a key aviation resource. While Massport considers local planning and zoning, it is not subject to local regulations unless specified by state law.

4.7.4 Consistency with Regional Plans

The efficient use of Hanscom Field as an existing part of the region's transportation infrastructure is consistent with "Smart Growth" policies, including those outlined in MAPC's *MetroPlan 2000* and *MetroFuture*. In addition, through the ESPR process, Massport has identified and clearly described potential environmental effects of future scenarios to provide a comprehensive evaluation of potential conditions that would be associated with forecasted aviation activity levels.

5 Regional Transportation Context

This chapter reviews the role of Hanscom Field in the region's broader airport and long-distance transportation system. It describes Massport's efforts to work with other state and regional transportation agencies in a cooperative planning context to strengthen the regional transportation network. The chapter also focuses on the regional transportation planning initiatives that Massport is undertaking relative to Hanscom, Worcester, and Logan. Highlights of the chapter include:

- Hanscom's role in the regional airport system;
- The role of Logan Airport in the regional airport system;
- An update on the integration of New England regional airports as a regional system;
- Massport's efforts to promote commercial airline services at Worcester Regional Airport;
- Passenger and aircraft operations at the regional airports in 2012 and trends in aviation activity levels at the regional airports since 2005;
- The status of current improvement plans and projects at the regional airports;
- Long-range cooperative regional transportation planning;
- An update on long-distance rail services including Amtrak's Acela and Northeast Regional services along the Northeast Corridor; and
- Airport ground access improvements.

5.1 Key Findings Since 2005

Hanscom Field is the busiest general aviation airport in the Massachusetts and New England region. Hanscom has historically accommodated a wide variety of general aviation (GA) activities, including business/corporate aviation, light cargo and limited commercial passenger service, air taxi/private charter services, recreational and personal flying, and pilot flight training. In addition to general aviation, Hanscom accommodates some commercial airline services and limited military flights associated with Hanscom AFB. Because of its close proximity to Boston and the Route 128/I95 and Route 495 high-tech corridors, Hanscom accommodates more GA activity than any other GA or commercial service airport in the region (Figure 5-1). Hanscom handles over five times as many general aviation operations as Boston-Logan International Airport and provides substantial airside relief to Logan. While Hanscom has supported limited commercial airline services, its primary roles within the regional airport network are to function as a general aviation reliever for Logan Airport and serve as a premier general aviation facility for the region.

Figure 5-1 General Aviation Reliever and Commercial Airports Accommodating General Aviation Activity in the Greater Boston Metro Area

Hanscom also provides limited commercial passenger service

- General aviation operations in the greater Boston area fell by 3.2 percent per year between 2005 and 2012 as a result of high fuel prices, a weak economy and declining number of student pilots, consistent with the national trend. By comparison, general aviation activity at Hanscom was more stable, falling by only 0.1 percent per year over the same period.
- Passenger levels at the regional airports have declined steeply in recent years, similar to trends at other small regional airports across the nation. From 2005 to 2012, the combined passenger traffic at the regional commercial airports in New England dropped by 29 percent, or 4.7 percent per year. Hanscom lost its only commercial airline service in September 2012 when Streamline Air ceased operations. The passenger declines are a result of reduced airline capacity at the smaller regional airports as airlines cut services on thinner, less profitable routes to deal with high fuel costs and weak passenger demand resulting from the 2008/09 economic crisis and subsequent sluggish economic growth.
- In 2012, Logan's passenger traffic reached a new peak of 29.3 million, which represents 66 percent of the region's commercial air passengers. JetBlue's aggressive expansion and the entry of other low-cost carriers have been the primary drivers of passenger growth at Logan Airport.
- Massport's successful efforts to increase regional airport utilization have led to an increased role for the region's secondary airports in serving air passenger demand. Despite recent declines in passenger traffic at the T.F. Green and Manchester airports, their combined share of the Logan/T.F. Green/Manchester market area has increased from 11 percent in 1995 to 17 percent in 2012.
- Since 2005, commercial operations at Logan and the regional airports have declined by 2.0 percent per year and 6.2 percent per year, respectively. The downward trend in commercial aircraft operations reflects airline reductions in scheduled services, especially at the smaller airports, as well as an industry-wide shift away from small aircraft and tighter capacity control on the part of

airlines. Airlines have retired large numbers of the small regional jets (RJs) with 30 to 50 seats, which have proven to be cost-ineffective in the current high fuel price environment, while increasing the use of large RJs or turboprops with 60 to 90 seats. Commercial operations at Hanscom Field have historically represented less than one percent of the region’s total commercial operations.

- Massport, in conjunction with the city of Worcester, has been active in promoting the reintroduction of scheduled airline service at Worcester Regional Airport. JetBlue commenced new services from Worcester to Orlando International and Fort Lauderdale-Hollywood airports on November 7, 2013.

5.2 The Role of Hanscom Field and Logan Airport in the Regional Airport Network

5.2.1 Role of Hanscom Field

Hanscom Field currently serves as a premier full-service general aviation facility for the Massachusetts and New England regions with limited commercial passenger service. The airport accommodates a variety of corporate and private general aviation activities, as well as air taxi/charter, and public service operations that might otherwise use Boston-Logan International Airport. This role for Hanscom Field as a general aviation reliever with limited commercial service was established in the airport’s 1978 Master Plan and clarified in Massport’s 1980 Regulations.

Hanscom Field does not currently play a significant role in meeting the region’s scheduled commercial air travel needs. Shuttle America and Boston-Maine Airways provided limited commercial services from Hanscom in the past, but discontinued services in 2004 and 2008, respectively. Streamline Air initiated regularly scheduled service at Hanscom in April 2011, but suspended operations in September 2012.

The ability of Hanscom Field to provide more significant air passenger services is affected by its proximity to several larger commercial service airports (e.g., Logan, Providence/T.F. Green and Manchester-Boston). The airport is also subject to Massport’s 1980 Regulations for Hanscom Field, which restrict scheduled commercial passenger services to aircraft with 60 seats or less.

5.2.2 Role of Logan Airport

By virtue of its location relative to New England's population and commercial center, Logan Airport is the region’s dominant airport for scheduled commercial airline services. Logan Airport, the primary commercial airport for the core Boston metropolitan area, serves the long-haul domestic and international air travel needs of the New England region. Logan Airport also provides more than 50 daily departures to small and/or remote communities including the Cape & Islands and markets in northern New England and upstate New York, connecting these communities to the national air transportation network.

5.2.3 Massport’s efforts to support a regional airport network

Massport advocates a multi-modal regional transportation policy to improve the efficient use of the region's transportation infrastructure by the appropriate expanded use of regional airports and alternative transportation modes. In response to growing congestion and delays at Logan Airport in the 1990s, Massport adopted a policy to promote increased usage and development of New England's regional airports and to support the region's inter-city rail projects. For nearly two decades, Massport has formed partnerships with federal, state and regional agencies to support an integrated regional transportation plan that expands and improves inter-city travel options for New England through an integrated, multi-modal regional transportation network.

Massport's efforts to increase regional airport utilization have led to an increased role for the region's secondary airports in serving air passenger demand. The regional airports that are closest to the Boston area and have the greatest influence on passenger traffic and aircraft activity at Logan are Providence/T.F. Green Airport in Warwick RI, Manchester-Boston Regional Airport in Manchester NH, and Worcester Regional Airport. In the late 1990s, Massport's cooperative marketing efforts with the regional airports led airlines, including Southwest Airlines, to initiate new services at T.F. Green and Manchester-Boston airports viewing them as attractive alternatives to Logan, which suffered from airside delays as well as roadway access congestion. An increase in scheduled services and the introduction of competitive airfares at the regional airports resulted in the secondary airports accommodating a higher share of the region's commercial air passengers. As shown in Figure 5-2, T.F. Green and Manchester airports have increased their share of passengers in the combined Logan/T.F. Green/Manchester market area from 11 percent in 1995 to 17 percent in 2012.

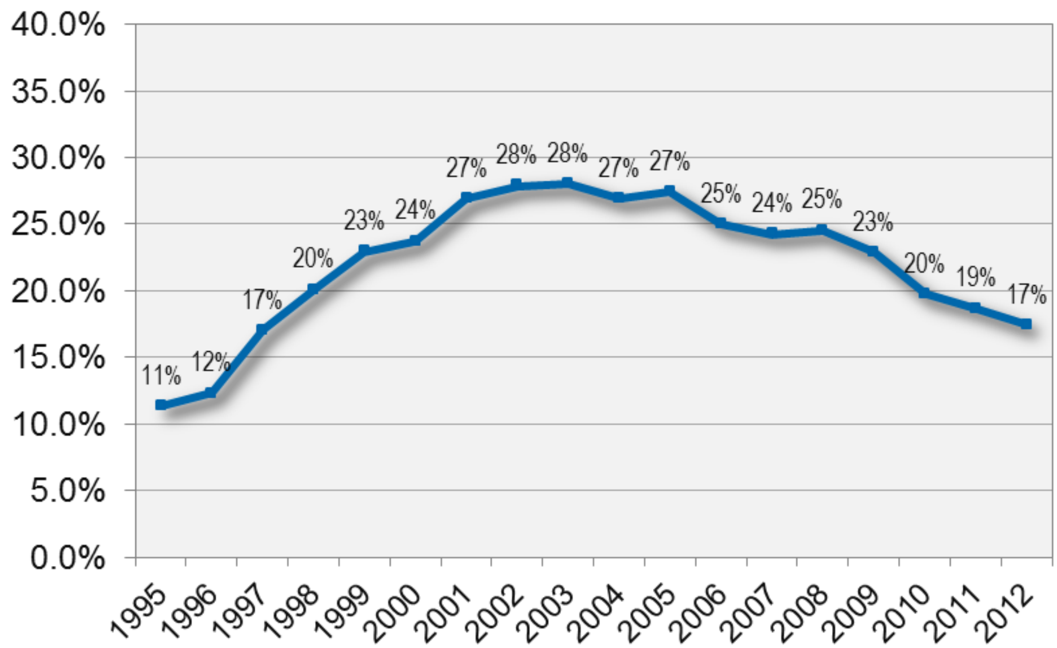


Figure 5-2 T.F. Green and Manchester Share of Boston Area Airport Passengers

Note: Percent represents T.F. Green and Manchester-Boston passengers as a percent of total T.F. Green, Manchester-Boston and Logan Airport passengers.

Source: Individual airport traffic reports.

The T.F. Green and Manchester market share peaked at 28 percent in 2003 as the major elements of the Central Artery/Tunnel projects in Boston were nearing completion. Their market share began to decline with the introduction of low-fare JetBlue services at Logan beginning in 2004. More recently, the regional airports have been negatively affected by airline service cuts stemming from high fuel prices and weak passenger demand following the economic recession and slow recovery. Logan Airport, on the other hand, has benefitted from JetBlue's aggressive expansion at Logan, which is now a key focus city in the JetBlue network with over 100 daily departures. As shown in Figure 5-2, the T.F. Green and Manchester market share declined to approximately 17 percent in 2012. Nevertheless, the airports accommodate a greater share of the region's passengers than they did in the mid-1990s. Massport continues to support regional initiatives and efforts to promote air services at regional airports, including Worcester Regional

Airport. Because of limited capacity at Logan Airport, it is expected that airlines will continue to serve the New England air travel market by offering air services from Logan as well as the outlying regional airports.

Massport has also been active in promoting air service activity at Worcester Regional Airport in Worcester MA. Massport began collaborating with the City of Worcester in 1995 to identify opportunities for increasing Worcester's utilization to accommodate some of the regional demand that would otherwise use Logan Airport. Massport assumed operation of Worcester Regional Airport in 2000 and acquired the airport from the City of Worcester in June 2010. While Worcester has a long history of commercial airline services, it was served only sporadically by Allegiant Airlines and Direct Air, after 2003 when US Airways discontinued services. In April 2012, after a concerted effort by Massport and the local Worcester community to recruit air carriers to the airport, JetBlue announced new services from Worcester to Orlando International and Fort Lauderdale-Hollywood airports. JetBlue began operating one daily roundtrip to each Florida destination November 7, 2013.

5.2.4 Expected Future Role of Hanscom Field

As part of its regional approach, Massport is committed to maintaining Hanscom Field as a vital transportation resource within the regional airport system. Hanscom Field will continue to function within the regional airport network primarily as a general aviation reliever for Logan Airport and as the region's premier, full service general aviation and business aviation airport with limited commercial passenger service.

5.3 Regional General Aviation Activity Trends

Table 5-1 compares general aviation operations for Hanscom Field to other general aviation reliever and commercial service airports in the greater Boston metropolitan area. In 2012, Hanscom handled nearly 165,000 general aviation operations, approximately 32 percent of total general aviation operations in the region. Hanscom remains the busiest general aviation facility in the region and the primary general aviation reliever for Boston-Logan International Airport. Hanscom handled almost six times as many general aviation operations as Boston-Logan International Airport in 2012. Norwood Municipal, the next busiest general aviation airport in the Greater Boston area, handled approximately 68,000 annual general aviation operations, about 59 percent fewer operations than Hanscom.

Overall, general aviation operations in the greater Boston area fell by 3.2 percent per year between 2005 and 2012, consistent with the national trend. General aviation operations at all U.S. towered airports declined by 3.6 percent per year from 2005 to 2012.[28] High fuel prices, a weak economy and a decline in the number of student pilots over the past decade have depressed the overall demand for general aviation. An even sharper drop in general aviation operations occurred following the global credit crisis, the 2008/09 economic recession in the U.S. and a reduction in the use of corporate air transportation by many businesses. Over a two-year period from 2007 to 2009, general aviation operations in the U.S. fell by 15.5 percent.[29]

[28] FAA. Aerospace Forecast, FY2013-FY2033
[29] Ibid.

Table 5-1 General Aviation Operations at General Aviation Reliever and Commercial Service Airports in the Boston Metropolitan Area

Airport	Primary Aviation Service	General Aviation Operations[1]		Average Annual Growth	Percent Local (2012)	Based Aircraft[2] (2012)
		2005	2012			
Hanscom Field	General Aviation	165,424	164,835	-0.1%	42.3%	340
Norwood Municipal	General Aviation	70,496	68,405	-0.4%	51.9%	160
Beverly Municipal	General Aviation	64,110	58,203	-1.4%	54.9%	98
Nashua/Boire Field	General Aviation	127,573	55,620	-11.2%	53.2%	324
Lawrence Municipal	General Aviation	70,828	52,157	-4.3%	45.8%	212
Worcester Regional	General Aviation	65,938	44,070	-5.6%	39.8%	63
Portsmouth International	General Aviation	32,586	38,132	2.3%	67.7%	117
Boston Logan International	Commercial Service	32,652	28,144	-2.1%	0.0%	-
Manchester-Boston	Commercial Service	27,538	12,504	-10.7%	21.8%	60
Total		**657,145**	**522,070**	**-3.2%**	**39.8%**	**1,322**

Notes:
1. Includes air taxi operations except for Manchester-Boston Airport, where air taxi operations counts are comingled with regional commuter airline operations.
2. Hanscom Field based aircraft are from Massport records. All other based aircraft from FAA, Terminal Area Forecast.

Sources: Massachusetts Port Authority; Federal Aviation Administration, ATADS; and FAA, Terminal Area Forecast, December 2012.

General aviation activity levels at Hanscom Field have remained relatively stable in recent years. Between 2007 and 2012, general aviation and military operations at Hanscom declined slightly by an average 0.1 percent per year. While Hanscom's current general aviation operations are still substantially lower than previous peak levels (over 204,000 general aviation operations in 2000), the airport has continued to accommodate a very strong level of general aviation demand and has performed well relative to other general aviation reliever airports in the region. With its proximity to Boston, as well as the growing metro-west suburbs and Route 128/I-495-area businesses, Hanscom is expected to continue to be the principal airport for meeting the region's corporate and business aviation needs.

5.4 Regional Commercial Service Trends

The region's air passengers are primarily served by a network of commercial service airports throughout the six-state region. Figure 5-2 depicts the airports that are included in the FAA's New England Regional Airport System Plan. Boston-Logan International Airport, the largest of New England's commercial service airports, served 29.3 million passengers or about 68 percent of the region's air passengers in 2012. The other commercial airports range in size from the Bradley International Airport in Hartford, Connecticut, which served 5.4 million commercial passengers in 2012, to Pease International Tradeport in Portsmouth, New Hampshire, which served 26,820 commercial passengers in 2012.

In addition to its role as a general aviation facility, Hanscom Field has also accommodated limited commercial airline services in the past. Throughout the 1980s, Hanscom received small regional airline services to small commuter markets in New England and up-state New York. After a hiatus during most of the 1990s, commercial airline service was reintroduced at Hanscom in September 1999, when Shuttle America began scheduled services at the airport. Hanscom supported limited regional airline services operated by Shuttle America and Boston-Maine Airways through the beginning of 2008, when scheduled services ceased. In April 2011, Streamline Air launched regularly scheduled flights between Hanscom and Trenton, New Jersey. However, Streamline suspended all services in September 2012 and there is currently no scheduled commercial service at the airport.

Figure 5-1 New England Commercial Service Airports

5.4.1 Commercial airline trends

The larger regional commercial service airports attracted new low-fare services and experienced strong passenger growth from the late 1990s through 2005. Southwest Airlines expanded into the New England market through the region's secondary airports rather than Logan Airport, introducing service first at T.F. Green (1996) and then at Manchester-Boston (1998) and Hartford-Bradley (1999). As regional airports gained more nonstop service to both origin-destination (O&D) markets and airline connecting hubs, the region became less reliant on Logan Airport for scheduled commercial airline services.

Logan Airport experienced a rapid increase in low cost carrier (LCC) services starting in 2004 when JetBlue entered the Boston market. Since then, JetBlue has grown to be the largest carrier at Logan, accounting for 21 percent of aircraft operations and 25 percent of total passengers in 2012. Other LCC entrants such as Southwest Airlines and Virgin America have also contributed to recent passenger growth at Logan. The expansion of JetBlue and other low-fare services at Logan has contributed to Logan's increased share of regional air passengers.

The challenging airline operating environment has also affected smaller communities disproportionately in recent years. Unprecedented increases in fuel prices over the past decade resulted in steep increases in airline operating costs. Airlines have been forced to eliminate less profitable routes, cut frequencies in smaller markets and reduce flying with small regional jets which are uneconomical to operate at when fuel prices are high. The global economic downturn in 2008 and 2009 further reduced passenger demand and resulted in widespread airline capacity reductions, particularly at the smaller regional airports. While the majority of the service cuts were completed by 2010, airlines have remained conservative with growth plans and have not increased overall capacity significantly at regional airports across the U.S.

5.4.2 Commercial airline passengers

Table 5-2 presents the change in commercial airline passenger levels at Hanscom, Logan Airport and other New England commercial airports between 2005 and 2012. Over this period, combined passenger traffic at the smaller regional airports declined at an average rate of 4.7 percent per year compared to Logan, where passenger traffic increased by 1.1 percent per year. Passenger levels at Hanscom fluctuated as carriers exited and entered the market. Hanscom's commercial passenger traffic in 2012, when Streamline Air ceased services, was more than 50 percent lower than the passenger traffic accommodated in 2005.

Logan's passenger traffic fell between 2007 and 2010 due to weakening passenger demand during the economic recession and airline consolidation, but has since recovered and reached a new peak in 2012. Passenger growth at Logan was driven primarily by the aggressive expansion of JetBlue and other LCCs at the airport. In 2012, Logan's passenger traffic reached a new peak of 29.3 million and represented 66 percent of the region's air passengers.

Passenger levels at the regional airports have declined steeply in recent years, similar to trends at other small regional airports across the nation. From 2005 to 2012, the combined passenger traffic at T.F. Green and Manchester-Boston airports fell by 39 percent. Total passenger traffic at the regional airports in New England dropped by 29 percent, or 4.7 percent per year. The passenger declines are a result of reduced airline capacity at the smaller regional airports as airlines cut services on thinner, less profitable routes to deal with high fuel costs and weak passenger demand.

Table 5-2 Passenger Activity at Logan Airport, Hanscom Field, and Other New England Commercial Service Airports

Airport	Passengers (millions)		Average Annual Growth	2012 Passenger Share
	2005	2012	2005 - 2012	
Logan Airport	27.09	29.33	1.1%	66.3%
Regional Airports				
Bradley International, CT	7.38	5.38	-4.4%	12.2%
T.F. Green, RI	5.73	3.65	-6.2%	8.2%
Manchester-Boston, NH	4.33	2.45	-7.8%	5.5%
Portland International Jetport, ME	1.46	1.62	1.5%	3.7%
Burlington International, VT	1.38	1.23	-1.6%	2.8%
Bangor International, ME	0.48	0.46	-0.6%	1.0%
Tweed New Haven, CT	0.13	0.08	-7.4%	0.2%
Worcester Regional, MA	-	0.03	-	0.1%
Portsmouth International, NH	0.01	0.03	12.1%	0.1%
Hanscom Field, MA	0.02	0.01	-9.6%	0.0%
Subtotal Regional Airports	**20.92**	**14.93**	**-4.7%**	**33.7%**
Total New England Airports	**48.01**	**44.26**	**-1.2%**	**100.0%**

Sources: Massachusetts Port Authority and individual airport data

5.4.3 Commercial airline operations

Commercial airline aircraft operations for Hanscom, Logan and the regional airports for 2005 and 2012 are shown in Table 5-3. Logan Airport, the busiest airport in the region for commercial airline service, handled over 326,700 commercial airline operations or 55 percent of the region's commercial operations in 2012. The regional airports combined accounted for approximately 263,400 commercial operations in 2012, representing 45 percent of commercial operations in the region.

Commercial operations declined at both Logan Airport and the regional airports between 2005 and 2012. This trend reflects reductions in scheduled services, especially at the smaller airports, as well as an industry-wide shift away from small aircraft and tighter capacity control on the part of airlines. Airlines have retired large numbers of the small regional jets (RJs) with 30 to 50 seats, which have proven to be cost-ineffective in the current high fuel price environment, while increasing the use of large RJs or turboprops with 60 to 90 seats. This ongoing emphasis on restrained capacity growth and larger, more fuel-efficient aircraft has led to increased passenger load factors and a drop in commercial operations across the industry. Since 2005, commercial operations at Logan and the regional airports have declined by 2.0 percent per year and 6.2 percent per year, respectively. Nationwide, commercial airline operations (including regional commuter carriers) declined by 2.8 percent annually over the same period.

Commercial operations at Hanscom Field have historically represented less than one percent of the region's total commercial operations. In 2005, Boston Maine Airways conducted approximately 3,600 aircraft operations at Hanscom. In 2012, Streamline Air performed 635 aircraft operations before suspending services in September 2012.

Table 5-3 Commercial Aircraft Operations at Logan Airport, Hanscom Field, and Other New England Commercial Service Airports

Airport	Commercial Airline Operations[1]		Average Annual Growth	Percent of Total
	2005	2012		
Logan Airport	376,414	326,755	-2.0%	55.4%
Regional Airports				
Bradley International, CT	119,048	79,503	-5.6%	13.5%
T.F. Green, RI	89,489	50,301	-7.9%	8.5%
Manchester-Boston, NH	76,115	45,379	-7.1%	7.7%
Portland International Jetport, ME	42,661	33,118	-3.6%	5.6%
Burlington International, VT	43,987	27,067	-6.7%	4.6%
Bangor International, ME	25,924	16,128	-6.6%	2.7%
Portsmouth International, NH	2,303	5,722	13.9%	1.0%
Tweed New Haven, CT	6,137	3,936	-6.1%	0.7%
Worcester Regional, MA	2,727	1,639	-7.0%	0.3%
Hanscom Field, MA	3,627	635	-22.0%	0.1%
Subtotal Regional Airports	**412,018**	**263,428**	**-6.2%**	**44.6%**
Total New England Airports	**788,432**	**590,183**	**-4.1%**	**100.0%**

Notes:
1. May include some air taxi operations at airports other than Logan, Hanscom and Worcester.

Sources: Massachusetts Port Authority; Federal Aviation Administration, ATADS and Terminal Area Forecasts

5.5 Regional Airport Improvement Plans and Projects

The following section describes airport improvement projects being planned or underway at the regional airports.

5.5.1 Hanscom Field, Bedford, MA

Massport continues to invest in Hanscom Field to improve and upgrade facilities and maintain a safe, secure and efficient airport. Past and future capital investments ensure that Hanscom can continue to serve its role as a general aviation reliever to Logan with limited commercial passenger service and premiere business aviation facility for the region. In FY 2012, Massport invested $3.4 million in airfield, terminal, equipment and other facility improvements at Hanscom. These airport improvement projects are summarized here and described in more detail in Chapter 4, Airport Planning, as well as in the annual report on *The State of Hanscom*.

Massport's FY 2012 capital investment projects at Hanscom included:

- Relocating portions of the perimeter road at the approach to Runway 11 to comply with FAA Runway Safety Area mandates.
- Maintenance of vegetation removal areas and the trail system that connects two Massport-owned parcels with portions of conservation land and open spaces in the towns of Bedford and Concord. In addition, Massport performed aerial photogrammetric mapping as part of its five-year Vegetation Management Plan update.
- Implementation of an enhanced Access Control System in conjunction with the replacement of a portion of the perimeter fence which had reached the end of its useful life.
- Signage and landscape improvements along the airport entrance.

Planned projects for FY 2013 and beyond include:

- Relocation of portions of the perimeter road at the approach to Runway 29 to comply with FAA Runway Safety Area mandates.
- Rehabilitation of pavement areas along the entry roadway.
- Airfield pavement replacement will continue to be an ongoing project in coming years.

In addition to Massport's investments, the Authority solicits third-party development of facilities that support and enhance Hanscom's role in the regional transportation system. Many of the hangars at Hanscom are owned or leased by tenants who are responsible for maintaining them.

On-going third-party projects at Hanscom include the following:

- In 2012, Rectrix Aviation was selected by Massport to develop FBO facilities at the former Hangar 24 site at Hanscom Field and also at the Worcester Regional Airport. Demolition of the Hangar 24 was completed in September 2012 and Rectrix began construction of the new hangar and FBO facilities at both airports in 2013. Project completion for the new FBO facilities at both airports is expected by early 2014.
- The Massport Board approved a proposal by Jet Aviation, a current FBO operator at Hanscom, to replace Hangar 17 with a more modern facility. In 2012, Jet Aviation initiated the planning and design process and permitting is underway as of the date of this document.

5.5.2 T.F. Green/Providence, Warwick, RI

In September 2011, the FAA issued a favorable Record of Decision (ROD) approving the Preferred Alternative for the T.F. Green Airfield Improvement Program, which will allow an extension to the airport's main runway to allow for nonstop flights to the West Coast. In January 2013, the FAA issued a final Written Reevaluation of the ROD, as project design and construction phasing has changed since the ROD was issued. Construction of project elements of the T.F. Green Airfield Improvement Program began in July 2013 and is expected to continue through December 2017. The Airfield Improvement Program includes the following projects:

- Phase 1 of the Runway 16 End Safety Area Improvements project will be completed by the end of 2013. Phase 1 involves preparation of the site of the Engineered Material Arresting System (EMAS), airfield electrical improvements on the Runway 16 end and reconfiguration of the taxi lane from the northeast ramp to the Runway 16 end.

- Phase 2 of the Runway 16 End Safety Area Improvements project, which involves installation of the EMAS, will begin in May 2014 and is expected to be completed in June 2014.
- The demolition of Hanger 1 will also be completed by the end of 2013. In addition to the hangar removal, this project involves the construction of an aircraft parking apron in a portion of the former hanger's footprint.
- Construction of a Deicer Management System, which will collect and treat the glycol used to de-ice aircraft at T.F. Green, will begin in the spring of 2013. The system is expected to be operational by the end of 2015.
- The Runway 34 End Safety Area Improvements project will commence in May 2014. Major elements of the project include the reconstruction of 1,600 feet of Runway 16-34, EMAS construction at the Runway 34 end, partial reconstruction of Taxiway C, installation of new edge lights on taxiway C, and construction of the associated airport service road.
- FAA System Upgrades, which will proceed concurrently with the Runway 34 Safety Area Improvement project, will include improvements to the approach lighting system and Glide Slope Antenna.
- The Runway 5 End Extension project is expected to begin in 2016 and be completed by the end of 2017. This project involves extension of the Runway from its current length of 7,166 feet to 8,700 feet, which will allow T.F. Green to handle aircraft capable of long haul flights to West Coast destinations. The project also involves an extension of the parallel Taxiway M and construction of an EMAS at the Runway 5 end.

5.5.3 Manchester-Boston Airport, Manchester, NH

Since the early 1990s, over $500 million was invested in Manchester-Boston Airport to improve and develop landside and airside facilities and infrastructure. Projects included a 158,000 square foot passenger terminal and two subsequent 75,000 square foot terminal additions, a 4,800 space parking garage with an elevated pedestrian walkway connection to the terminal, roadway improvements and extensive runway reconstruction and lengthening. Recent customer service enhancement initiatives have included the construction of a new cell phone lot in 2007 for motorists waiting to pick up passengers and various concessions improvements through 2008 and 2009.

Manchester-Boston Regional Airport completed an Airport Master Plan Update in 2011. The master plan update provides a blueprint for development and improvement of airport facilities and infrastructure through 2030. Recent and on-going improvement projects at the airport include:

- The Terminal Ramp Replacement Project to rehabilitate the concrete apron areas adjacent to the terminal building began in 2012 and is anticipated to be completed in 2013.
- Demolition of structures in the runway protection zone (RPZ) of Runway 06 involves the removal of buildings with usages deemed non-compatible with RPZs as defined by the FAA. Elements of the project include the demolition of the Highlander Inn and Conference Center and associated buildings.
- Upgrades to the terminal building HVAC systems will address certain deficiencies in the terminal cooling system and will provide significant improvements to customer comfort levels within areas of the terminal building.

Other potential projects over the coming years include:

- Roadway and parking improvements;

- Curbside enhancements;
- Refurbishing and expansion of baggage claim equipment;
- Construction of a glycol collection/treatment facility; and
- Construction of a snow removal equipment storage building.

5.5.4 Bradley International Airport, Hartford, CT

A $200 million airport modernization project at Bradley International Airport was completed in 2010. Originally launched in 2000, the modernization project introduced a refurbished and expanded Terminal A with an additional 260,000 square feet of new concourse, ticket counters and waiting areas, major gate renovations, and a state-of-the-art security and communications system. A 28,000 square feet International Arrivals Building was also completed.

In 2011, the Connecticut Airport Authority (CAA) was established to oversee the operation and development of Bradley International Airport. The CAA, a quasi-public agency consisting of an 11-member board, will manage day-to-day operations at Bradley International Airport, as well as at five GA airports in Connecticut. The goal of the CAA is to transform Bradley International Airport and the state's five GA airports (Danielson, Groton/New London, Hartford Brainard, Waterbury-Oxford, and Windham airports) into economic drivers for the state. Bradley International Airport was previously run by a board under the Connecticut Department of Transportation.

A three-year renovation project for the airport hotel, the Sheraton Bradley Airport Hotel, was completed in 2011, featuring newly outfitted guest rooms, a redesigned lobby, and an expanded fitness center and pool. The 2010-2013 Bradley International Airport Strategic Plan highlights several airport improvement projects between 2012 and 2013. These projects include:

- A sound insulation program;
- The rehabilitation of Taxiway C North;
- The rehabilitation of Taxiway C South;
- Utility relocation and obstruction removal;
- The demolition of old Murphy Terminals and design of new Terminal B; and
- Construct roadway realignment.

The airport's $280 million capital improvement program for FY 2014 –FY 2018 includes the following projects:

- A consolidated rental car facility;
- Demolition of the Murphy Terminal;
- Roadway demolition and re-alignment;
- Utility relocation; and
- Airfield improvements.

5.5.5 Worcester Regional Airport, Worcester, MA

The Worcester Regional Airport Master Plan Update, completed in 2008, was funded by the FAA and the former Massachusetts Aeronautics Commission (MAC). The Worcester Master Plan provides a strategic guide to airport development through 2020. Near-term projects were focused on maintaining essential operations, safety and security functions and included runway pavement reconstruction, runway safety area upgrades, and a vegetation removal and maintenance plan. Long-term initiatives include upgraded corporate/GA facilities including a FBO facility and hangars, a new Airport Rescue and Firefighting

Facility (ARFF) and ongoing runway and taxiway pavement rehabilitation. Various demand driven projects including terminal enhancements and additional parking facilities were also identified; however, these projects depend on the level and type of future aviation activity realized at Worcester Regional Airport. Massport is currently pursuing enhancements to Worcester's all-weather capability including upgrading the Runway 11 Instrument Landing Systems (ILS) from a Category I to a Category III system, and its associated required infrastructure and navigation aids along with a partial parallel taxiway. This project is a safety and operational priority for the Airport.

The following near-term projects identified in the Worcester Master Plan were completed as of 2011:

- Installed engineered materials arresting system (EMAS) on the Runway 29 End;
- Resurfaced 3,000 feet of Runway 11;
- Installed EMAS on the Runway 11 End; and
- Resurfaced 4,000 feet of Runway 29 and reconstructed Taxiway Delta.

In January 2012, Massport approved a proposal by Rectrix Aviation to develop an aircraft hangar and office space at Worcester Regional Airport as part of as joint solicitation for new FBO facilities at Worcester and Hanscom. Construction started on the $6.7 million project in August 2013. The Rectrix project includes 27,000-square-feet of hangar and office space that will house large corporate jets and a regional aircraft maintenance facility. Rectrix will offer private jet charters and FBO services, including transient aircraft parking and fueling services from the new hangar facility.

Massport has committed to invest in the following additional airside and landside improvement projects over the next few years:

- Installation of a new terminal roof and HVAC system;
- Airside and landside pavement rehabilitation;
- Rehabilitation of the existing ARFF station;
- Security improvements;
- Obstruction removal; and
- Category III ILS upgrade and related taxiway improvements.

5.6 Long-Range Regional Transportation Planning

This section reports on state and regional planning efforts to achieve a balanced regional intermodal transportation network to reduce reliance on Logan Airport and provide travelers with a greater range of long-distance, intercity transportation options.

The unified MassDOT brought together many Commonwealth entities which plan, build, own, operate and maintain all modes of transportation, under a five-member board of directors. (Massport remains an independent authority focused on airport and seaport needs with its own board of directors, including the Secretary of MassDOT.) The creation of MassDOT was intended to help integrate, coordinate and prioritize multimodal transportation policy and investment in Massachusetts, resulting in a more effective, efficient, equitable, rational and innovative transportation system. In 2012, MassDOT continued to make strides in improving the existing transportation infrastructure by addressing structurally deficient infrastructure with innovative construction techniques, developing a comprehensive environmental responsibility and sustainability initiative and continuing to invest in the Boston metropolitan area's rapid transit.

As a fundamental part of the transportation framework in the Boston metropolitan area, and for all of New England, Massport supports an integrated multimodal transportation policy to improve the efficient use of transportation infrastructure on both a metropolitan and a regional scale.

5.6.1 Regional Aviation Economic Impact Study

The Aeronautics Division of MassDOT completed a wide-ranging economic impact study of the statewide airports system's (the 39 public use airports including Logan Airport) contribution to the economy of Massachusetts. The analysis found that Massachusetts public use airports generated $11.9 billion in total economic activity, including $4.9 billion in total annual payroll resulting from 124,369 jobs that can be traced to the aviation industry. In particular, Massport's three airports are noted to make significant contributions to the regional economy generating approximately $10.3 billion or 87 percent of the overall economic benefits generated by the Massachusetts airport system. Specifically, Logan Airport supported over 94,000 jobs in Massachusetts and the total economic impact is now estimated at approximately $8.87 billion per year and Worcester Regional Airport supported 418 jobs with a total economic impact of $51.5 million. Hanscom Field is particularly important for its function as the airfield for Hanscom Air Force Base, an active military facility, which is aided by its proximity to Boston-area technology and research industry. Hanscom Field alone supports 1,551 jobs and generates 249 million in economic activity, but combined with Hanscom AFB they together support 11,765 jobs and have a total economic impact of $1.4 billion. For every $100 spent by aviation-related businesses, an additional multiplier impact of $56 is created within Massachusetts according to the study. While the economic impact of the region's airports was the focus of the study, it also noted qualitative benefits of the state's airports including:

- Facilitating emergency medical transport;
- Providing police support;
- Supporting aerial surveying, photography, and inspection operations;
- Conducting search-and-rescue operations;
- Supporting the U.S. military and other government operations; and
- Providing youth outreach activities.

5.6.2 Massachusetts Statewide Airport System Plan (MSASP)

The MassDOT Aeronautics Division (formerly the Massachusetts Aeronautics Commission or MAC) completed the Massachusetts Statewide Airport System Plan (MSASP) in 2010. The MSASP provides guidance to state policy makers for the long term development of the Commonwealth's airport system. It documents the status of the current airport system; provides a long term vision for the system; identifies system goals and related improvements; establishes priorities for system and airport funding; and provides supporting data and materials.

5.6.3 Boston Region Long-term Transportation Vision

Massport is a member of the Boston Region Metropolitan Planning Organization (MPO). The Boston MPO developed a long-range vision for the region and its transportation network out to the year 2035. The vision described by the Boston MPO identifies the Boston metropolitan region as continuing to be an economic, educational and cultural hub that will continue to contribute to a high quality of life. The high quality of life will be supported by a well-maintained transportation system consisting of safe, healthy, efficient and varied options. The variety of transportation options will allow people to find jobs and services within easy reach of affordable housing, and will reduce environmental impacts thereby improving air and environmental quality. This vision is possible through attentive maintenance, cost-effective management and strategic investment in the region's transportation system. The Long Range Transportation Plan recognizes that Hanscom support air transport of light cargo.

5.6.4 Statewide Long-term Transportation Vision

MassDOT is currently undertaking the Commonwealth's first statewide strategic multi-modal transportation plan known as weMove Massachusetts. weMove Massachusetts' purpose is to inform MassDOT's choices as to how to invest the agency's limited resources. The goals of weMove Massachusetts is to engage stakeholders through a bottom-up approach as well as internal agency stakeholders in a discussion about the present and future needs of the transportation system, to build action-oriented policies based on stakeholder feedback that can serve as a bridge between MassDOT's values and investments, and to develop a forward thinking, data-driven, decision-making methodology to assist MassDOT in implementing its priorities transparently and measurably.

Massport was an active participant in the development of the MassDOT's Rail Plan and Freight Plan. The Massachusetts State Rail Plan is the Commonwealth's 20-year plan for the state's rail system (through 2030) and describes a set of strategies and initiatives aimed at enhancing rail transportation so that it can effectively fulfill its critical role in the state's multimodal transportation network. MassDOT's vision for passenger and freight service is to "develop an efficient intercity passenger and freight rail system that is the logical mode of choice for travelers and shippers, connects travelers and businesses to the national and global transportation network, encourages sustainable economic growth throughout the state, and enables Massachusetts to compete in the rapidly changing global economy." The plan describes recent improvements to extend the MBTA to T.F. Green Airport, the opportunity of high speed rail service in reducing air traffic congestion, and need for connecting rail to Worcester Regional Airport. The Freight Plan describes the important role that Logan and Worcester play is the air transport of freight and important connections with highway and railway networks.

Massport has a representative on the weMove Massachusetts Stakeholder Advisory Group.

5.7.5 New England Regional Airport System Plan (NERASP)

In fall of 2006, the FAA New England Region, in concert with the New England Airport Directors and New England State Aviation Directors, completed the NERASP. The results of this study describe the foundation of a regional strategy for the air carrier airport system to support the needs of air passengers through 2020. To date, the development of that strategy has been instrumental in facilitating the investment and development of the primary commercial airport system in New England.

The New England state aviation officials, in partnership with the FAA, are currently conducting a study of the GA airport system in New England, including primary commercial service airports that service a GA component. During preparation of the 2006 NERASP study which analyzed the primary commercial airports in New England, the group recognized that a similar evaluation of GA would also prove useful. It would provide state aviation officials with a greater understanding of airport roles and infrastructure investment. Faced with the current struggling economy, rising airport and aircraft operational costs, declining operational activity, an aging infrastructure and with limited state and federal funds to address improvements, the importance of developing both a short-range and long-range perspective on the future performance of the New England GA airport system is clear.

This assessment of the New England GA airport system will provide state aviation officials with a common understanding of their state airport system in relation to the New England region as a whole. Assisted by this information, the FAA will be better positioned to make decisions regarding priority capital investments. Moreover, the NERASP study proved that the geographic boundary of the New England region, as well as its cultural identity, makes an overall study of New England an effective planning approach. Information on the NERASP GA study can be found at http://www.nerasp-ga.com.

5.6.5 Conference of New England Governors and Eastern Canadian Premiers

The Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) is a formally established body which coordinates regional policy programs in the areas of economic development, transportation, environment, energy and health, among others. The NEG/ECP focuses on aviation and intercity passenger rail, particularly in the northeastern coastal mega-region, as part of a larger transportation system that needs modal balance. Efficient use of this multi-state network affects the overall viability of the highway, aviation, freight and commuter rail transportation networks that serve the region and the nation. Improved planning coordination between airports and intercity passenger rail services and related ground transportation offers the potential to achieve complementary investments in airport and rail capacity and services. MassDOT has a representative on the NEG/ECP Transportation and Air Quality Committee which covers regional transportation issues and infrastructure development, use, and efficiency. The NEG/ECP and other policy decision makers throughout the region have been able to utilize strategies and information developed in the NERASP, which provides a framework for integrated regional aviation policy and planning. This organization serves an important function to help achieve a greater balance between air, rail and auto trips, and ultimately help to increase overall transportation capacity without overburdening Logan Airport and the New England aviation system.

In 2011, the NEG/ECP passed a resolution on transportation which provided direction on enhancing alternative-fuel vehicle infrastructure in the region, increasing multi-modal transportation options, and improving freight and passenger rail networks.

In August 2012, the New England Governors’ Conference, Inc. was absorbed into the Coalition of Northeastern Governors (CONEG). The CONEG recognizes the unique characteristics of the Northeast’s transportation system and focuses its priority transportation initiatives on the region’s intercity and commuter passenger rail systems and surface transportation network.

5.7 Regional Rail Transportation

This section reports on recent developments and current long-distance rail service originating in Boston, the status of air-rail linkages in the Northeast Corridor, and the expanding Pilgrim Partnership which provides commuter rail between Massachusetts and Rhode Island.

5.7.1 Amtrak Northeast Corridor High-Speed Rail

Amtrak's Northeast Corridor (NEC) is an intercity rail line that operates between Boston-South Station and Washington, DC via New York City. Other major destinations served by the route include Providence, RI; New Haven, CT; Philadelphia, PA; and Baltimore, MD. Logan Airport passengers can connect directly to Boston-South Station via Silver Line bus rapid transit (BRT) service or via taxi. Amtrak operates two services between Boston and Washington, DC: the Acela Express (high-speed, limited-stop service) and the Northeast Regional (lower-speed service that makes local stops along the route). Travel times on the Acela Express range from 3.5 hours from Boston to New York to just over 6.5 hours from Boston to Washington, DC. Travel times on the Northeast Regional range from about 4.25 hours from Boston to New York to approximately 7.75 hours from Boston to Washington, DC. A total of 19 daily departures are offered from Boston-South Station to Penn Station in New York, of which about half are Acela Express. Most trains continue south to Washington, DC, and a smaller number of Northeast Regional trains continue further south to Newport News, VA.

System-wide Amtrak ridership was 31.2 million one-way trips in Fiscal Year 2012. The NEC represented 37 percent of total system-wide Amtrak ridership. In Fiscal Year 2012, the NEC carried 11.4 million passengers, an increase of 4.8 percent over FY 2011. Acela Express accounted for nearly 3.4 million passengers, while the Northeast Regional accounted for 8.0 million passengers. Overall NEC ridership reached a new record in 2012, surpassing the previous 2011 peak of 10.9 million passengers. Amtrak's share of the Northeast total passenger market has increased substantially since the introduction of Acela service in 2000. Amtrak captures approximately 54 percent of the total air/rail market between Boston and New York, up from 20 percent in 2000, before the introduction of Acela. Several developments and trends have contributed to Amtrak's ridership growth including the introduction of passenger conveniences such as Wi-Fi and eTicketing, high gas prices, overall growth in business travel in the NEC, the growing appeal and acceptance of rail travel, and traveler frustration with increasing highway congestion and the hassles of airline travel.

5.7.2 Northeast Corridor Infrastructure Master Plan and Next-Generation High Speed Rail Plan

The *Northeast Corridor Infrastructure Master Plan*, a new regional rail planning study, was released in May 2010. The Master Plan documents NEC growth needs through 2030, including expanded capacity and improvements in Boston-New York and New York-Washington intercity travel times. A 76 percent increase in rail ridership from 13 million to 23 million, a 36 percent increase in train movements from 154 to 210 average weekday, and the need for $52 billion in additional capital investment is expected over the next 20 years.

Following up on the release of the *Northeast Corridor Infrastructure Master Plan*, Amtrak also unveiled a Next-Generation High-Speed Rail proposal in September 2010 titled *A Vision for High-Speed Rail in the Northeast Corridor*. The proposal outlines a brand-new 426-mile two-track corridor running from Boston to Washington, offering high-speed rail service with sustained maximum speeds of 220 mph. The route would allow for an 84 minute trip time between Boston and New York and a three-hour trip time between Boston and Washington. Under this Next-Generation high speed rail plan, the New York City – Boston market would see a further shift from auto and air to rail due to the dramatic improvements in rail travel times, and projects the air market between the two city-pairs to be nearly eliminated by 2050. This plan states that the traveler shift to high speed rail would reduce delays on competing modes (air and auto) and the shift away from shorter and smaller intraregional flights would free up air transport capacity for higher-value transcontinental and international flights.

An update to the *Northeast Corridor Infrastructure Master Plan* and *A Vision for High-Speed Rail in the Northeast Corridor* was released in July 2012. Since these two documents were released, the two programs have been integrated into a single, coherent service and investment program, called the Northeast Corridor Capital Investment Program. The Northeast Corridor Capital Investment Program would advance the near-term projects outlined in the Master Plan to benefit the NEC while incrementally phasing improvements to the Acela high-speed service to support the next-generation high-speed rail proposed. The near-term NEC improvements are identified to occur between 2012 and 2025 and the long-term Next-Generation High-Speed Rail improvements are identified to occur between 2025 and 2040. The publication of the 2012 update is the first step in “improving the NEC for all users in order to sustainably support the population and economic growth facing the Northeast over the next 30 years” but considerable more planning work is required by all stakeholders.

In 2011, the U.S. DOT awarded Amtrak and the New York State DOT $745 million for two high-speed rail projects on the Northeast Corridor. A major upgrade to tracks and overhead wires will be conducted along a 24-mile stretch in New Jersey, allowing for an improvement in Acela express train speeds from 135 mph today to 160 mph. Improvements to the Harold railroad interlocking in Queens, NY will also be completed, eliminating delays and reducing commuting time for Amtrak riders.

5.7.3 Boston-South Station Expansion

In support of the Northeast Corridor Capital Investment Program, MassDOT is designing and planning the expansion of the Boston-South Station to meet the infrastructure and capacity needs of the NEC. At present, South Station operates above its design capacity for efficient train operations and orderly passenger queuing. Operating with only 13 tracks, the current South Station constrains the current and future rail mobility within Massachusetts and through New England and the NEC. The proposed expansion of South Station will result in the following benefits to rail mobility:

- Improve the performance of existing and future high-speed and intercity passenger rail service to and from Boston. Today’s NEC on-time performance is approximately 85 percent for Acela Express and 75 percent for Northeast Regional trains. The 2030 target for on-time performance is 95 percent for Acela Express and 90 percent for Northeast Regional. Without expanding South Station and its support facilities, not only will these targets be missed, but on-time performance will deteriorate even further in the future.
- Enable growth in high-speed and other intercity passenger rail service in the northeastern U.S., at a time when both the roadway and aviation networks are at or over capacity.
- Support sustainable economic growth and improved quality of life in NEC metropolitan areas, including Boston.
- Support a more attractive and increased MBTA Commuter Rail service, with associated benefits such as increased statewide transportation access, environmental sustainability, and improved personal mobility.

In order for the South Station expansion to move forward, the U.S. Postal Service Distribution Facility located adjacent to South Station must be relocated. Massport is working with MassDOT in evaluating suitable locations, including Massport-owned property, for a relocation site in South Boston.

5.7.4 Amtrak Downeaster Rail Service

The Downeaster is a regional passenger rail service that is managed by the Northern New England Passenger Rail Authority and operated by Amtrak. The service links Boston’s North Station to Brunswick, Maine with 10 intermediate stops. Five daily roundtrips are operated between Boston and Portland, Maine and three trains continue on to Brunswick. In FY 2012, ridership on the Downeaster set a new record increasing by 4.3 percent over the prior year to more than 541,000 passengers.

5.7.5 Pilgrim Partnership Commuter Rail Services

The Pilgrim Partnership is an arrangement between the MBTA and the Rhode Island Department of Transportation (RIDOT), under which RIDOT allocates some of its federal funding to the MBTA in return for commuter rail service between Boston from Rhode Island. Eighteen daily round-trips are provided between Boston and Providence. Expanded commuter rail service to T.F. Green Airport in Warwick, RI was introduced in 2010. Travel time between Boston and Warwick is approximately 1.25 hours, and 10 of the 18 daily Boston-Providence departures currently continue on to Warwick. Expanded service to Wickford Junction Station in Kingstown, RI commenced in 2012.

The extended commuter rail enhances ground access options from the Boston metro area to T.F. Green Airport. Based on the NERASP Study, the passenger catchment areas of T.F. Green and Logan Airport overlap, and this new commuter rail service has the potential to attract passengers in the overlapping catchment area living along the Providence/Stoughton MBTA commuter rail line to T.F. Green Airport.

5.8 Airport Ground Access Improvements

5.8.1 T.F. Green InterLink Facility

The new InterLink, an intermodal transportation hub near T.F. Green Airport, opened on October 27, 2010. The InterLink serves multiple transportation functions, including: Rhode Island Public Transit Authority (RIPTA) bus service; Massachusetts Bay Transportation Authority (MBTA) commuter train service between Warwick, Providence, and Boston; a consolidated car rental facility, and parking (for commuter rail service only); and a direct pedestrian link to the airport terminal. The rail platform is integrated with a consolidated rental car facility that houses airport rental car operations.

5.8.2 Long-term Worcester Roadway Improvements

In 2008, the Central Massachusetts Regional Planning Commission (CMRPC) initiated the Worcester Regional Mobility Study that was envisioned as a transportation plan with the goal of improving the movement of people and goods through the Greater Worcester Region. The final Study was released in May 2011. One of the Study's objectives was to improve ground transportation access between the regional roadways and Worcester Regional Airport within the context of an "economic development corridor" that could benefit other local businesses. Several alternative routes were identified and recommended for further study including a new interchange off the Interstate 90 in the vicinity of Route 56. The Study also assessed a range of alternatives to address regional mobility concerns and recommended thirteen roadway infrastructure improvement intended to reduce congestion, enhance regional mobility and address existing interchange/intersection constraints. The study presented the recommended phasing and packaging of recommended alternatives into short-term (0 to five years), mid-term (five to ten years) and long-term actions (over ten years).

5.8.3 Near-term Worcester Directional Signage Improvement Program

CMRPC also supported Massport's goal to identify immediate actions for improving roadway access to Worcester through a signage improvement program. In collaboration with the MassDOT and the City of Worcester, Massport identified six primary routes now used by travelers to access Worcester. The team also developed a sign design and placement plan. The goal was to improve directional signage on these roads between Worcester and the Massachusetts Turnpike Pike and Interstate 290 by achieving the following objectives:

- To ensure that key decision points would be adequately signed;
- To reduce sign “clutter” by removing old and unnecessary signs; and
- To design and install new airport trailblazer signs consistent with Logan Airport and MassDOT way-finding standards.

MassDOT has installed the desired signs that were produced by the Massport Sign Shop. By 2013, 89 signs had been installed including several signs on Auburn roads approved by the Town of Auburn in March 2011. In 2013, in anticipation of JetBlue starting service in November, four existing best route signs on I-90 were upgraded of which two were upgraded to larger signs and two were supplemented with “x miles” marker tabs.

6 Ground Transportation

Chapter 6 describes the ground transportation system serving Hanscom Field and the relationship between the airport and that system. This chapter (1) compares year 2012 traffic data with data from the *2005 ESPR*, (2) makes a retrospective comparison of existing conditions with forecasts from the *2005 ESPR*, (3) provides a prospective assessment of the 2020 and 2030 future airport activity scenarios and (4) includes potentially beneficial environmental measures.

6.1 Key Findings Since 2005

Hanscom Field is an off-peak generator, meaning that peak traffic for Hanscom Field does not coincide with more general peak traffic in the area. Additionally, Hanscom-related traffic is only a small percentage of the total traffic along the nearby roadways and intersections studied. In fact, Hanscom traffic only contributed three to four percent of total traffic along Route 2A in 2012. Additionally, Hanscom traffic contributes 10% or more of the total traffic at only three of the sixteen nearby intersections studied. These trends are consistent with previous ESPRs and remain so in the 2020 and 2030 forecasted scenarios, which suggests that future ESPRs could study fewer intersections and direct effort to other issues.

This chapter details the minimal traffic impacts from Hanscom Field-related traffic on nearby roadways and intersections. Land use patterns, limited transit service and incomplete pedestrian and bicycle networks contribute to the relatively high percentage of single occupancy vehicle traffic in the area. This chapter explores the current Transportation Demand Management activities in proximity to Hanscom Field, describes current efforts to reduce single occupancy vehicle trips to Hanscom and discusses opportunities for expanding on existing mitigation efforts. The *2012 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 scenarios represent estimates of what could occur related to airport ground transportation (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes.

The traffic forecasts include vehicle trips from Hanscom Field, future background traffic growth, and specific planned developments in the area. Information about recently completed and planned development projects was provided by the town planners from Bedford, Concord, Lexington and Lincoln. The critical finding of this updated traffic analysis is reconfirmation that Hanscom Field is not a significant contributor to traffic volumes on the surrounding roadways. Commercial and residential developments, coupled with the local reliance on single occupancy vehicles, remain the most significant sources of existing and future traffic volumes on area roadways.

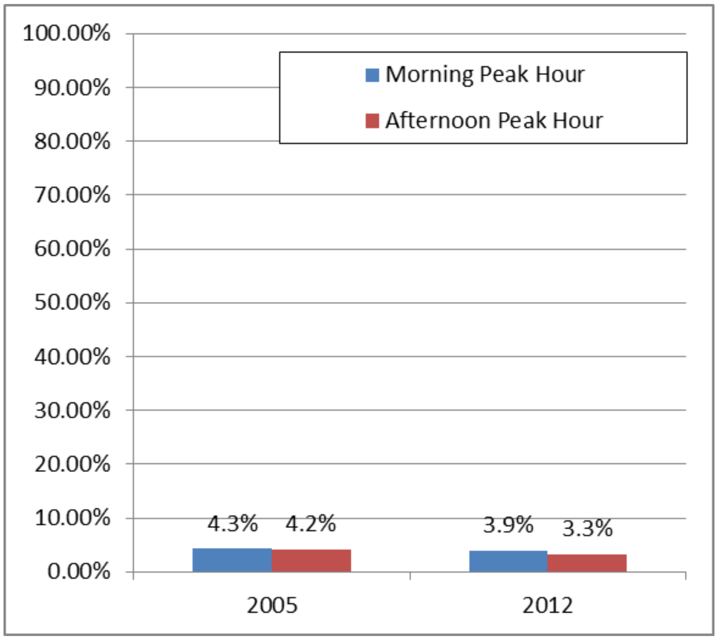


Figure 6-1 Percent of Hanscom Field Traffic on Route 2A East of Hanscom Drive

As Figure 6-1 indicates, Hanscom Field traffic makes up approximately four percent of the traffic on Route 2A during the morning peak hour and approximately three percent during the afternoon peak hour in 2012, which is similar to 2005. Both the Hanscom Field and Route 2A traffic decreased between 2005 and 2012. Furthermore, traffic arrivals and departures by Hanscom Field employees and passengers generally avoid peak hour congestion.

The average daily traffic volumes on Hanscom Drive, the primary access road to Hanscom Field from the surrounding roadways, decreased from 2,600 vehicles in 2005 to 2,200 in 2012, primarily as a result of a reduction in commercial air passenger activity and a reduced class schedule at the flight school (i.e. WyoTech, the predecessor to National Aviation Academy, had a part-time evening program in 2005). Additionally, the amount of peak hour traffic generated in 2012 by Hanscom did not change significantly from the *2005 ESPR* as indicated in Table 6-1.

The increased amount of peak hour traffic in the *2012 ESPR* for the 2020 and 2030 scenarios is attributable to the increased aviation activity that is described in Chapter 3, Airport Activity Levels and other airport-related land uses such as a hotel and museum.

Table 6-1 Hanscom Field Vehicular Trip Generation

Year/Scenario	Morning Peak Hour	Afternoon Peak Hour
2005 Actual	157	154
2012 Actual	165	121
2020 Forecast	220	166
2030 Forecast	384	336

As a result of the refinements to the aviation activity forecasts, these traffic volume estimates are generally less than the increases forecast in the *2005 ESPR*. Hanscom traffic patterns and their effect on local roadways are similar in the 2020 and 2030 scenarios. Hanscom traffic increases would represent a small percentage of Route 2A traffic volumes, and a small portion of the total increase in intersection traffic as compared to 2005 volumes. In addition, intersection analysis with SYNCHRO 7.0 software indicates that most intersections operate at the same level of service (LOS) regardless of the forecast Hanscom Field-related traffic growth.

The results of an employee commute survey indicate that 87 percent of respondents drove alone to Hanscom Field. Despite this large percentage of lone commuters, there are opportunities to reduce the number of single occupancy vehicles commuting each day given that 28% of survey respondents expressed interest in learning about programs and incentives encouraging alternate modes of transportation. Respondents expressed greatest interest in replacing vehicle trips with transit, followed by carpooling/vanpooling, bicycling, and walking.

Environmentally beneficial measures that emphasize Transportation Demand Management (TDM) are detailed at the end of this chapter. Recommended TDM strategies include promoting transit services, exploring partnerships with Hanscom Air Force Base, MassRIDES and the 128 Business Council; supporting carpools and vanpools and increasing the viability of active transportation. The intersection of Route 2A and Hanscom Drive may benefit from the use of additional traffic management approaches, especially if volumes reach the forecasted levels for the 2020 and 2030 scenarios. While the use of a traffic control officer or a traffic signal at Route 2A and Hanscom Drive would improve the operation of the intersection during peak hours, Hanscom Field-related traffic is only a small contributor to the total traffic at the intersection and the remainder is regional traffic and traffic from planned and anticipated projects in the study area.

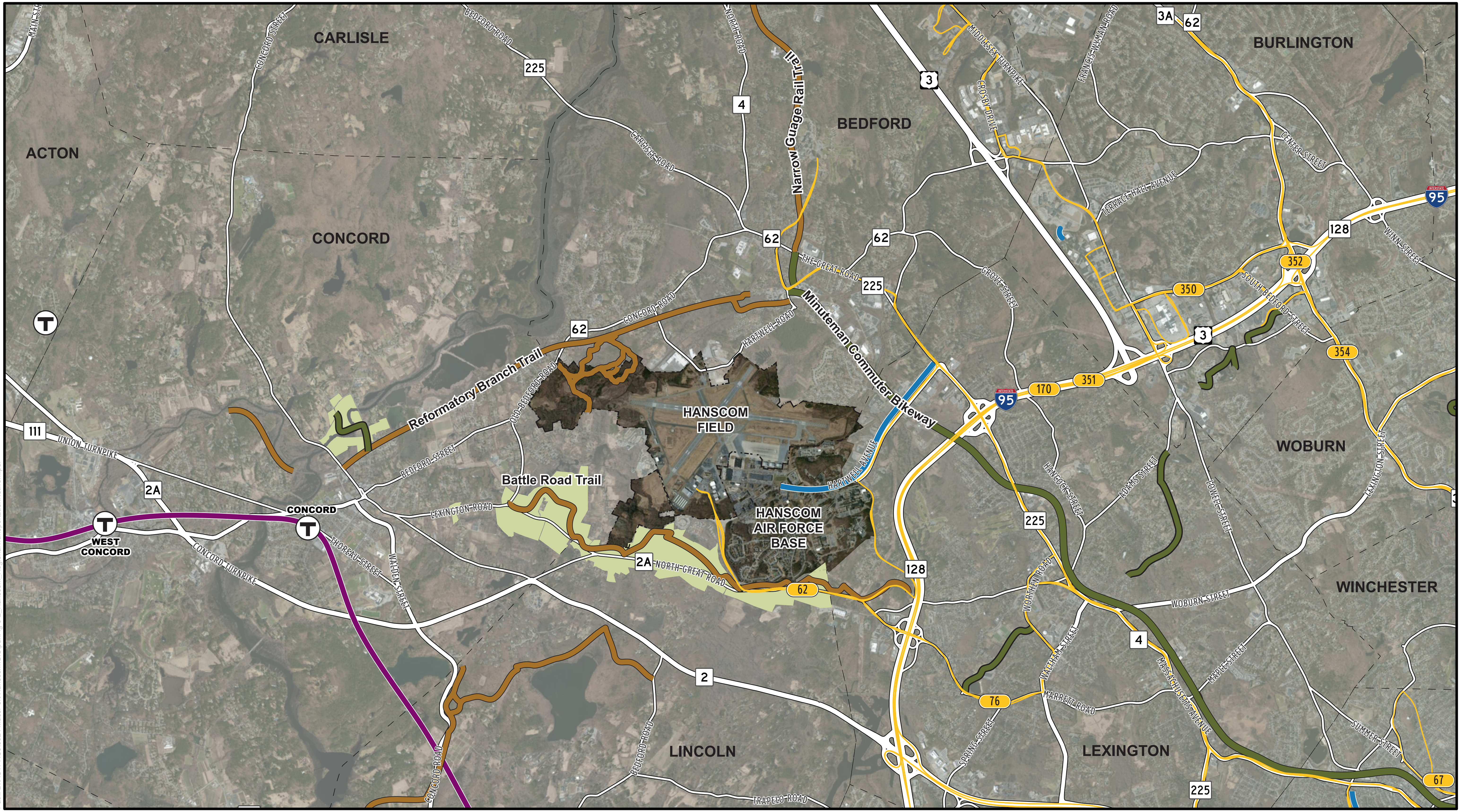
6.2 Regional Ground Transportation System

This section describes the regional ground transportation system surrounding Hanscom Field including (1) regional highway system, (2) transit (commuter rail and local service), (3) regional bicycle network, and (4) existing TDM programs.

6.2.1 Regional highway system

A roadway network of major expressways, including Route 128/I-95, Route 2, Route 3, and the Massachusetts Turnpike (I-90) surrounds Hanscom Field, as Figure 6-2 illustrates. Route 128/I-95 Exit 30 (Route 2A) is the closest highway exit for Hanscom Field, although Exit 31 (at Route 4-225) also provides access to Hanscom. Route 2A, which is designated as the Battle Road Scenic Byway, provides primary east/west access to and from Hanscom with direct access to Hanscom Field provided via Hanscom Drive. Traffic to and from the north may approach Hanscom Field from Route 4-225 and Route 62 or from Route 128/I-95 while traffic to and from the south will primarily use Route 128/I-95. In the vicinity of Hanscom Field, most intersections are unsignalized, with the exception of Massachusetts Avenue. A left-turn lane is provided in the eastbound direction at Hanscom Drive. Traffic flows follow general commuting patterns of the area, with heavier eastbound flows toward Route 128 and Boston during the morning peak hour and heavier westbound traffic flows during the afternoon peak hour.

(This page intentionally left blank)



North

0 0.5 1 2 Miles

Data Sources: MassGIS Basemap Layers, MAPC Bike/Ped Facilities 2013

- Airport Property Boundary
- Municipal Boundary
- Minuteman National Historical Park
- Interstate Route
- Major Arterial
- Minor Arterial
- Bike Lane (on-road)
- Hard Surface Path
- Natural Surface Path
- MBTA Commuter Rail Station
- MBTA Commuter Rail Line (Fitchburg/South Acton Line)
- MBTA Bus Route

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Hanscom Field
Regional Transportation Network

Figure **6-2**

(This page intentionally left blank)

6.2.2 Regional rail and transit

Public transportation around Hanscom Field is relatively limited. Hanscom Field itself is served by MBTA Bus Route 76. The nearest commuter rail station to Hanscom Field is located at Concord Center. The area is also served by other bus services such as Lexington's LEXPRESS, as well as point-to-point shuttle services (described in more detail below).

6.2.2.1 Commuter rail

The Fitchburg Line Commuter Rail station in Concord, located at 90 Thoreau Street, provides the nearest rail access to Hanscom Field. Service at the Concord Station operates from 6:00 a.m. to 1:00 a.m. The station is served by 16 inbound and 16 outbound trains daily. Five inbound trains stop in Concord during the morning peak periods and four outbound trains stop during afternoon peak. The station has 86 parking spaces and 10 spaces for bicycles. Crosby's Market, located across from the Concord Center commuter rail station has designated a small supplemental parking area for motorists using the commuter rail. The Town of Concord Parking Study (2013) indicated that the commuter parking near Concord Station is nearly 100% utilized. Additionally, field observations indicate that the existing bicycle parking is highly utilized. The Town of Concord Parking Study includes several recommendations to improve management of the Town's parking lots at the Concord commuter rail station such as expanding the existing resident commuter rail parking permit program at the Concord Center commuter rail stop; requiring permits at Crosby's Market lot, on Cottage Lane, and in the Love Lane lot; adding daily pay spaces at the Depot lot; and providing covered, secured bicycle parking to replace existing bicycle parking. This commuter rail station is located about five miles from Hanscom Field and is not served by local bus routes.

6.2.2.2 MBTA surface bus

Hanscom Field is served by MBTA Route 76, which runs between Alewife Station and the Civil Air Terminal. Route 76 operates between 6:00 a.m. and 10:30 p.m. on weekdays with 40 minute headways during morning commute hours, half-hour headways during the evening commute hours and hourly service midday and late evenings. The Route 76 bus combines with MBTA Route 62 for Saturday service between Alewife Station and Bedford V.A. Hospital with a stop at the Civil Air Terminal. Saturday service operates from 7:00 a.m. to 9:00 p.m. with approximately one-hour headways. No MBTA service is provided for these routes on Sundays.

6.2.2.3 Other local bus service

Other bus services in this area include the Alewife Shuttle (sponsored by the South Lexington Management Association), a shuttle service between Cambridge and MIT Lincoln Labs, and a neighborhood bus system called LEXPRESS, which is subsidized by the Town of Lexington and the MBTA, and operated by M&L Transit Systems. LEXPRESS buses start at Depot Square in Lexington and operate on six fixed routes, each with one hour headway, running from 7:00 a.m. to 6:30 p.m. on weekdays. LEXPRESS routes operate almost entirely within Lexington town limits. Several of the LEXPRESS routes cross the MBTA Route 76, which services Hanscom Field. The LEXPRESS routes closest to Hanscom Field are route #4 and route #2, which are approximately two to three miles from Route 2A & Hanscom Drive.

6.2.2.4 Liberty Ride bus tours

The Liberty Ride offers bus tours to historical sites in Lexington and Concord along the Battle Road Trail weekends in April and May and daily from May 28 through October 28. The buses depart from the Lexington Visitors Center at 1875 Massachusetts Avenue at 10:00 a.m., 11:30 a.m., 1:00 p.m. and 2:30 p.m. The bus is accessible by the MBTA Red Line and MBTA bus routes 62 and 76 from Alewife Station.

6.2.3 Regional bicycle network

Hanscom Field is near the Minuteman Commuter Bikeway, an 11 mile paved trail that extends from Alewife Station in Cambridge to Depot Park in Bedford. It is open from 5:00 a.m. to 9:00 p.m. year round. The towns of Arlington, Lexington and Bedford recently partnered to undertake a project called "Navigating the Minuteman Commuter Bikeway." The project developed recommendations for enhancing this popular trail including a new wayfinding system to better connect the trail to the adjacent communities.

There are two other unpaved bike trails that act as extensions to the Minuteman Bikeway, both starting from near the end of the Bikeway in Bedford. The Bedford Narrow Gauge Rail-Trail extends three miles to North Billerica, while the Reformatory Branch Rail-Trail ends near the Old North Bridge in Concord. While the Reformatory Branch is currently unpaved, the town of Bedford has expressed interest in paving the sections of trail within the town of Bedford to make the trail accessible to more types of users.

The six miles of Battle Road Trail in the Minute Man National Historical Park are also a resource for bicycle riders offering cycling, pedestrian and wheelchair access to the National Park Service's historic and natural resources. However, these trails are not paved or directly linked to the other regional trails. The Town of Concord has expressed interest in providing links between these paths. As illustrated in Figure 6-2, connecting existing paths would strengthen the overall network of bicycle and pedestrian paths serving the towns, Minute Man Historical Park and Hanscom Field.

In addition to off-street trails, towns around Hanscom Field have been making bicycle improvements to their street networks. Lexington has recently installed shared lane markings on town streets and Bedford is working to have bicycle lanes installed on Hartwell Road.

6.2.4 Transportation Demand Management

The purpose of TDM is to make better use of existing transportation facilities with the objective of reducing the peak hour demand for automobile trips. TDM is a cost-effective alternative to increasing roadway capacity to accommodate increasing peak demand. Examples of TDM measures include augmented transit service, carpool/vanpool programs, employee rideshare programs, bike/walk incentive programs, and staggered work hours. Often it is possible to combine TDM programs with other near-by businesses. Transportation Management Associations (TMAs) organize participants to share the costs of TDM programs and maximize the potential benefits.

There are several organizations involved with TDM programs in the Hanscom Field area. These include MassRIDES, the 128 Business Council, MAGIC, and Hanscom AFB, which are described below.

6.2.4.1 MassRIDES

Since January 2004, MassRIDES has provided free TDM planning assistance for commuters and employers statewide. MassRIDES, administered by MassDOT, currently offers a comprehensive package of transportation information and an array of incentives designed to encourage commuters to travel to work together. MassRIDES has administered the Transportation Management Initiative (TMI) on behalf of MassDOT since January 2006. This program funds a MassRIDES staff coordinator to plan and administer TDM actions with members. Benefits are provided based on the level of participation in TDM with employees of partner companies. One of the key incentives is eligibility for the MassRIDES Emergency Ride Home program to provide frequent alternative mode users with dedicated transportation for unexpected occurrences like sickness or child care schedule changes.

MassRIDES services include a ridesharing program (through NuRide), employer outreach, assessment of travel options at large worksites, the Emergency Ride Home Program, training and guidance, and coordination of over 40 vanpools. In addition to these features, employers may choose to provide additional incentives for ridesharing, such as parking cash out (which is when an employee is reimbursed for the cost of a parking space he/she does not use); preferential parking for registered carpools and vanpools; bicycle racks; employee lockers and showers; commuter tax benefits, or other financial incentives.

NuRide, partnered with MassDOT, is a commuter-side rewards program for individuals who choose greener forms of transportation including walking, bicycling, carpooling, vanpooling, public transportation, and telecommuting. The free service is supported by sponsors who provide commuters with special offers for taking trips that reduce environmental impacts and traffic congestion. NuRide provides trip planning, ride-matching with other “NuRiders,” and information about transportation options.

6.2.4.2 The 128 Business Council

The 128 Business Council (128BC) is a TMA that offers a variety of alternative transportation services in the towns of Lexington, Waltham, Needham, Newton, Weston, Woburn and Burlington. The 41-member organization provides transportation planning services, shuttle services, corporate assistance, commuter planning, alternative commuting programs, and ridesharing coordination for organizations with a large number of employees. Their current programs include shuttle services from Lexington and Waltham to Alewife, Bentley College shuttle services in Waltham, two local Waltham shuttles, a Needham shuttle from the Green Line, and the MetroNorth shuttle service from Woburn, Burlington, and Lexington to the Anderson Regional Transportation Center (ARTC). The Council recently added a new shuttle called “The Rev” to service businesses along Hartwell Avenue.

6.2.4.3 Minuteman Advisory Group on Interlocal Coordination

The Minuteman Advisory Group on Interlocal Coordination (MAGIC) is a sub-group of the Metropolitan Area Planning Council (MAPC). MAGIC addresses community planning issues that are of interest to its member communities. This group meets monthly, and as necessary, assists with TDM for thirteen towns in the MAGIC sub-region, including Lexington, Lincoln, Bedford and Concord. MAGIC supports the development of alternative solutions to single occupancy vehicles, as well as education about and promotion of their programs.

6.2.4.4 Hanscom Air Force Base

TDM measures have been used at Hanscom AFB as part of its efforts to reduce the number of single occupant vehicles commuting to the Base. The Base has partnered with vRides to promote vanpooling among employees. There is currently a vanpool coming from Nashua, NH that provides four trips per day and officials at the AFB are looking into starting new vanpools to accommodate the influx of new employees associated with the recent National Guard relocation to the Base.

MIT Lincoln Labs has a mini-bus from Alewife station that is available to all employees at the Base. MIT also has a very active bicycle commuting population and provide services including covered bike parking and a self-service bike repair station.

The Base currently offers a Transportation Incentive Program that reimburses employees who use transit or carpool. There are discussions about installing a bike share on Base for people to use when going to meetings at other buildings. In addition, the Base held a bike challenge during the month of June 2013 to encourage more employees to commute on their bike.

6.3 Regional Transportation Planning Context

The relatively high level of single occupant vehicle commuting has influenced the transportation planning context for the area around Hanscom Field. The lack of residential and commercial density limits the effectiveness of mass transportation, other than trips into and out of Boston, and challenges the development of effective regional TDM approaches. However, the regional transportation planning process has fostered the creation of regional bike paths and the emergence of shuttle services to make more effective use of existing resources. More recently, efforts have begun to focus on transit-oriented development approaches that encourage the types of densities and mixes of uses that support transit use, walking and bicycling. Regional transportation planning is conducted through the Boston MPO, which was established to oversee federally funded transportation plans and programs. This section describes the structure of the MPO planning process and the key planning documents affecting ground transportation access at Hanscom Field.

6.3.1 Metropolitan Planning Organization

The Boston MPO region encompasses 101 cities and towns, including Bedford, Concord, Lexington and Lincoln. The MPO has 19 voting members which include:

- State agencies: MassDOT, MBTA and Massport;
- Regional organizations: Metropolitan Area Planning Council, and the Regional Transportation Advisory Council;
- Six cities: Boston, Beverly, Everett, Newton, Somerville, and Woburn;
- Seven towns: Arlington, Bedford, Braintree, Framingham, Lexington, Medway, Norwood;
- Two ex-officio members: Federal Highway Administration and Federal Transit Administration, working jointly with the MBTA Advisory Board, administer the municipal nomination and election process.

6.3.2 Transportation planning documents

Federal surface transportation legislation sets forth the requirements for the metropolitan planning process that is overseen by the MPO agencies. The MPO receives input from the Regional Transportation Advisory Council (RTAC), which ensures citizen participation, and the Central Transportation Planning Staff (CTPS), which provides technical and policy analysis to the MPO. The following are metropolitan planning documents that affect access to Hanscom Field.

6.3.2.1 2012-2035 Long Range Transportation Plan

Paths to a Sustainable Region is the regional long-range transportation plan (LRTP) that identifies transportation facilities, programs and major investments to support and expand the region's multimodal transportation system. The plan includes both a financial plan to demonstrate how the measures included in the plan can be implemented as well as an air quality analysis to demonstrate conformity with federal standards. The plan was adopted by the MPO in September 2011, and was updated most recently in June 2012. The LRTP is used by the MPO to set transportation priorities among various roadway and transit projects and to consider improvements to the region's multimodal transportation system in broad terms. The LRTP does not prioritize any projects in close proximity to Hanscom.

6.3.2.2 Program for Mass Transit

The Program for Mass Transit (PMT) is a long-range transit plan that evaluates and recommends transit projects to preserve, enhance and expand the MBTA system. The PMT describes the MBTA's fiscally-unconstrained capital investment plan. Any transit project eligible for federal funds must be included in the PMT. The PMT was last revised in January 2004. There are no projects within the PMT that would affect access to Hanscom Field.

6.3.2.3 Transportation Improvements Plan

The MPO programs federally fund roadway and transit projects through the Transportation Improvement Plan (TIP). The TIP is a five-year plan that is updated annually by the MPO. The most recent TIP was updated by the MPO on June 28, 2012. The TIP includes funding for Limited Access Highway Improvements at Route 2 & 2A between Crosby's Corner and Bedford Road, which is currently under construction. Improvements include construction of new neighborhood service roads parallel to Route 2 and a new bridge on Route 2. The TIP also includes funding to replace a bridge at Route 2A and I-95 in Lexington. The proposed bridge will maintain the current alignment and facilities, including four 11.5 foot travel lanes, two 11.5 foot speed change lanes, a 6 foot median and a 6 foot northerly sidewalk. This interchange was included in the list of top 25 crash locations in the Boston region between 2006 and 2008 and is approximately three miles from Hanscom.

6.3.2.4 Mobility in the Boston Region: the 2004 Congestion Management System Report

The Congestion Management System (CMS) report identified mobility concerns for each subregion in the MPO region including the MAGIC subregion. The report recommended further study of Route 2A from Lincoln to Route 3/3A in Arlington with an emphasis on traffic signal control and pedestrian and bicycle movement. The report listed three specific recommendations for the MAGIC subregion:

1. Continue to investigate improvements along Route 2 between the Concord Rotary and the Piper/Taylor Road intersection in Acton.
2. Proceed with production of the environmental documents and design for the grade separation at the Concord Rotary, following the completion of the CTPS study entitled *Route 2 Improvements from Route 111 in Acton to Baker Avenue in Concord: A Feasibility Study.*
3. Complete the final design and construct a grade separated interchange at Crosby’s Corner at Route 2 at Cambridge Turnpike-Concord Turnpike, following the recommendations of the MassHighway Environmental Impact Report for Crosby’s Corner. (Note: this project is currently under construction.)

6.3.2.5 MAGIC Subregional Area Study: Phase II Report

The MAGIC subregion includes the towns of Bedford, Concord, Lexington, Lincoln and nine other adjacent communities. The Phase II Report made specific suggestions based on the economic and transportation data presented in the Phase I Report. The principal task of the Phase II report was to investigate the potential for remote or satellite parking near existing MAGIC-area commuter rail stations. The report found that Concord, with its relatively dense town center, is a good candidate for a small bus or van connection between Concord Center and Concord Commuter Rail Station.

6.3.2.6 MAGIC Suburban Mobility Study

The MAGIC Suburban Mobility Study completed in 2011 incorporates the MAGIC Subregional Area Study Phase II Report and makes recommendations for transit improvements in the subregion. The 128 Business Council, one of two TMAs in the region expressed interest in expanding their services past Lexington to nearby communities on the 128 corridor, which could include Hanscom Field. The report recommends individual municipalities reach out to the 128BC to initiate coordination of services.

6.3.2.7 The Battle Road Scenic Byway Corridor Management Plan

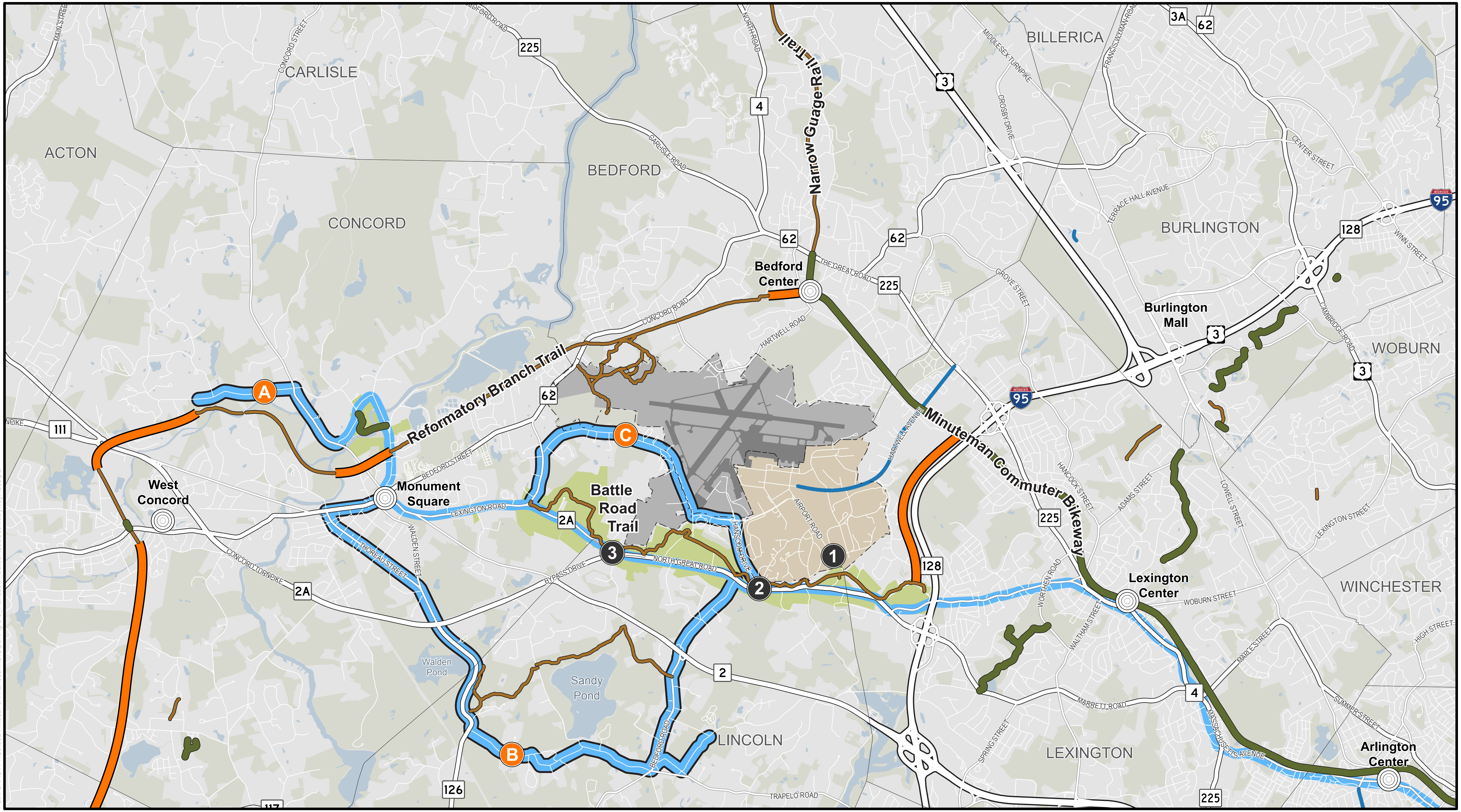
MAPC, along with the MassDOT, the Minute Man National Historic Park, and four towns (Arlington, Lexington, Lincoln, and Concord) have collaborated on The Battle Road Scenic Byway Corridor Management Plan. The plan proposes strategies to highlight the historical, cultural, recreational, scenic, and natural resources along the route through transportation and land use management and tourism. Figure 6-3 illustrates the recommendations and issues from the plan.

Among the plan's transportation recommendations, the working group proposed:

- Extending the Battle Road Scenic Byway three miles, including 0.8mi to the eastern end that would reach Alewife Brook Pkwy (outside the extents of Figure 6-3) in Cambridge, and 2.2mi in Concord from Liberty Road to Barrett's Mill Road (see "A" on Figure 6-3); if extended, the cohesive byway would connect Cambridge to West Concord;
- Creating two loops: a "southern loop" (see "B" on Figure 6-3) that connects Concord Center to Hanscom Drive in Lincoln, and a "northern loop" (see "C" on Figure 6-3) that connects Hanscom Drive to 2A at North Great Road; and Expanding the network of shared-use paths paralleling the Byway to increase bicycle and pedestrian traffic where feasible.

The northern loop would begin at the western edge of Hanscom Field. The report suggests highlighting several landmarks near Hanscom, including Lincoln Laboratories, and the AFB. If realized, the scenic loops would potentially increase traffic at Hanscom Field.

The report details transit accessibility and ridership trends along the byway, including MBTA bus routes 62, 67, 76, 77, 79, and 350; the LEXPRESS bus; and private shuttles operated by Hanscom AFB, MIT, and the 128 Business Council. Both the LESPRESS and 128BC shuttles saw increasing ridership between 2005 and 2009 (serving 70,000 and 90,000 annual riders respectively), and the Hanscom AFB shuttles saw a 66% increase over the same period (in 2009 providing 30,000 rides).



North

0 0.5 1 Mile

Data Sources: MassGIS Basemap Layers, MAPC Bike/Ped Facilities 2013, Battle Road Scenic Byway Corridor Management Plan

Hanscom Field
Hanscom Air Force Base
Municipal Boundary
Town Center
Minuteman National Historical Park
Hard Surface Path
Natural Surface Path
Bike Lane
Proposed Path
Battle Road Scenic Byway
Proposed Addition to Battle Road Scenic Byway
A Proposed Improvement
1 Area of Traffic Concern

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Battle Road Scenic Byway Corridor Management Plan (MAPC, 2011) Summary of Recommendations

Figure **6-3**

Path: B:\ACTPROJ\6024 MassPort Hanscom\GIS\pdf\Fig 6-3_Hanscom_BattleRoadScenicBywayRecs.pdf

(This page intentionally left blank)

The report also names fourteen “areas of traffic concern,” or sections and intersections where there is a need to address and modify the design and conditions. Three locations are at entries/exits to Hanscom Field: Airport Road and Marrett Street (see “1” on Figure 6-3); North Great Road (Route 2A) and Hanscom Drive (see “2” on Figure 6-3); and North Great Road and Bypass Road (see “3” on Figure 6-3). Recommended modifications are not specific, but may include updating signal timing, creating lower-stress crossings for pedestrians and bicyclists, and improving sight lines. Each of the locations is in Lincoln, and would require collaboration with the Town of Lincoln and MassDOT as primary stakeholders.

The plan’s transportation recommendations focus on cultivating comfortable bicycle and pedestrian facilities to promote enjoyment of the scenic route (including separated and on-road bicycle facilities, and traffic calming measures); maintaining high quality pavement; creating a Scenic Byway signage program; considering a reconfiguration of Hanscom Drive to eliminate slip lanes and slow turning vehicles; and improving continuous transit access to all parts of the Byway.

6.3.2.8 Statewide GreenDOT Initiative

The MassDOT launched the GreenDOT Initiative in June 2010, a comprehensive sustainability initiative that explicitly aims to reduce single-occupancy vehicle trips in Massachusetts 25% by 2020, and triple the rates of bicycling, walking, and transit use by 2030. GreenDOT is driven by three goals:

- Reduce greenhouse gas (GHG) emissions;
- Promote the healthy transportation options of walking, bicycling, and public transit; and
- Support smart growth development.

The initiative was designed in response to several major state legislative requirements, including the Global Warming Solutions Act of 2008, and the Healthy Transportation Compact in 2009. The Global Warming Solutions Act sets forth targets of reducing greenhouse gas emissions economy-wide 25% from 1990 levels between 2010 and 2020. The Healthy Transportation Compact requires inter-agency cooperation in transportation projects to decrease greenhouse gas emissions; increase pedestrian and bicycle trips; increase access for travelers with mobility impairments; work with an advisory board to ensure projects meet complete streets criteria; implement health impact assessments on transportation systems; and increase public-private partnerships that support healthy transportation decisions. GreenDOT is meant to assist MassDOT in satisfying these requirements.

GreenDOT sets forth sixteen goals in seven categories that aim to embed sustainability into MassDOT’s core business practice, and together will turn the focus of transportation planning and design statewide to include all potential transportation modes while increasing project effectiveness and reducing negative environmental impact.

6.4 Year 2012 Traffic Conditions

Different factors influence 2012 ground transportation conditions at Hanscom Field and within the surrounding study area roadway network. This section describes the (1) vehicular trip generating characteristics of Hanscom Field, (2) traffic volumes for study area roadways, (3) traffic volumes for study intersections, and (4) intersection operating level of service. Supporting data is provided in Appendix C.

6.4.1 Hanscom Field trip characteristics

There are a variety of activities at Hanscom Field that generate automobile traffic and create ground transportation needs, including general aviation, commercial aviation, employment, students programs at National Aviation Academy and the flight schools and other business activities that support Hanscom Field operations. Employers include Massport, FAA, Linear Air, Jet Aviation, Signature Flight Support, East Coast Aero Club, Executive Flyers Aviation, and Corporate Limousine, among others.

6.4.1.1 Travel modes

Automobile use is the primary ground mode of travel to and from the Hanscom Field. Massport conducted a survey of employees and students in July 2013 as a part of the *2012 ESPR* to understand the general travel patterns. Table 6-2 provides a comparison of survey results between a similar survey conducted for the *2005 ESPR* and the 2012 survey. The results of the survey, which are reported in Appendix C, indicate that 87 percent of respondents drove alone to Hanscom Field. The remainder took public transportation or bicycled. None of the employees said they carpooled or were dropped off. These results are consistent with the 2005 survey of employees and students in that the majority drive personal vehicles. The percentage of employees and students who took public transportation or rode a bicycle to work increased since the 2005 survey. The 2005 survey found that some respondents carpooled or were dropped off, while the 2012 found that no respondents did. The high level of auto use is consistent with general travel patterns in the area. Additional details on the results of the summary can be found in Appendix C.

Table 6-2 Hanscom Field mode choice

Mode	*2005 ESPR* Survey (2005)	*2012 ESPR* Survey (2013)
Drove alone	87%	86%
Dropped off	1%	0%
Car pool	10%	0%
Public Transportation	2%	12%
Bicycle	0%	2%
Total	100%	100%

Source: Massport, Hanscom Field 2005 Draft Environmental Status and Planning Report, (2006) and *2012 ESPR* Travel Survey.

6.4.1.2 Vehicle occupancy survey

Vehicle occupancy data was also collected on Monday, December 17 and Wednesday, December 19, 2012 to quantify the number of persons per vehicle entering and exiting Hanscom Field. Additional information is provided in Appendix C. The number of persons and vehicles entering and exiting Hanscom Field were counted from 6:00 to 9:00 a.m. and 3:00 to 6:00 p.m. on Monday, December 17 and Wednesday, December 19, 2012 to estimate the Vehicle Occupancy Rate (VOR) for the airport. This study indicates that the airport had a total VOR of 1.11 passengers (MBTA buses ridership was not included). The VOR in the morning peak period was 1.06 (1.11 entering and 1.02 exiting) compared to 1.15 in the *2005 ESPR*. The VOR was 1.12 (1.09 entering and 1.13 exiting) in the afternoon peak period compared to 1.13 in the *2005 ESPR*. This reduction in vehicle occupancy may be a result in fewer people carpooling or being dropped off.

6.4.1.3 Parking survey

A parking demand survey was conducted from 11:00 a.m. to 1:00 p.m. on Thursday, August 22, 2013. Vehicles were counted at the parking lots located at Hanscom Field and are described in Chapter 2, Facilities and Infrastructure. The parking demand survey assessed 1,369 of the 1,567 spaces at Hanscom Field. The remaining parking spaces include 110 spaces inside T-hangars, 70 spaces associated with the Hangar 24 site that is currently under construction and 18 spaces associated with storage building used by FAA. The parking demand survey indicated that forty-one percent of the 1,369 assessed spaces were occupied. Thirty-five percent of the 667-space Civil Air Terminal Lot was occupied during the survey period. This lot is a shared parking facility that serves the Civil Air Terminal and various tenants throughout the airport. The results of this parking survey indicate that there is currently surplus of parking at Hanscom Field.

6.4.1.4 Hanscom Field trip generation

The number of trips generated by Hanscom during the peak hour is needed to determine the traffic impacts of Hanscom-related traffic to intersections in the study area. The peak hours for the analysis represent the time of day when traffic volumes along the adjacent roadways are highest. The morning and afternoon peak hour vehicular trip generation for Hanscom Field is presented in Table 6-3. This data indicates that the number of morning and afternoon peak hour vehicle trips to and from Hanscom Field in 2012 is comparable to the 2005 vehicle trips. During the morning peak hour, entering traffic accounts for 82 percent of the peak hour volumes. The afternoon peak hour showed a similar split favoring the exiting vehicles with 69 percent and 31 percent entering.

Table 6-3 also includes the *2005 ESPR* projections for the 2010 Moderate and High Growth scenarios. Comparison of actual year 2012 traffic data with year 2010 projections from the *2005 ESPR* show that actual 2012 traffic volumes are below the *2005 ESPR* projections for the morning and afternoon peak hours. This difference can be attributed to the fact that the actual total aircraft operations at Hanscom Field in 2012 were 13 to 18 percent below the forecast ranges presented in the *2005 ESPR*. Specifically, the two 2010 scenarios from the *2005 ESPR* included a significant amount of commercial air passengers (190,548 and 234,440) when commercial air travel was very low and eventually discontinued in September 2012. Commercial air passengers dropped from 17,457 in 2005 to 8,609 in 2012. Further, general aviation operations in 2012 were 70 to 85% of the forecasts for year 2010 projections in the *2005 ESPR*.

Table 6-3 Hanscom Field peak hour trip generation 1996, 2002, 2005, and 2012

Traffic Count Data	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	Total	In	Out	Total
1996	61	33	94	43	70	113
2002	109	52	161	47	112	159
2005	115	42	157	75	79	154
2012	136	29	165	37	84	121
2005 ESPR **Scenarios**						
2010 Moderate Growth	143	63	206	65	113	178
2010 High Growth	196	111	307	100	165	265

Source: Massport, Hanscom Field 2005 Draft Environmental Status and Planning Report, EOEA #5484/8696 (2006).

6.4.1.5 Hanscom trip making by time of day

Hanscom Field is an off-peak traffic generator, meaning that the peak traffic for many Hanscom activities occurs at a different time from the peak hours of the adjacent street traffic. The scheduling of businesses and schools at Hanscom avoid peak commuting hours. As shown in Figure 6-4, the peak hours of overall traffic on Route 2A occur from 7:30 to 8:30 a.m. and from 4:45 to 5:45 p.m. While Hanscom Field experiences a relatively steady flow of traffic throughout the day, the morning peak for Hanscom Field occurs from 6:45 to 7:45 a.m. and the afternoon peak occurs from 2:30 to 3:30 p.m. One reason for this trip-making pattern at Hanscom Field is the traffic generated by the National Aviation Academy that has classes that run from 7:30 a.m. to 3:00 p.m.

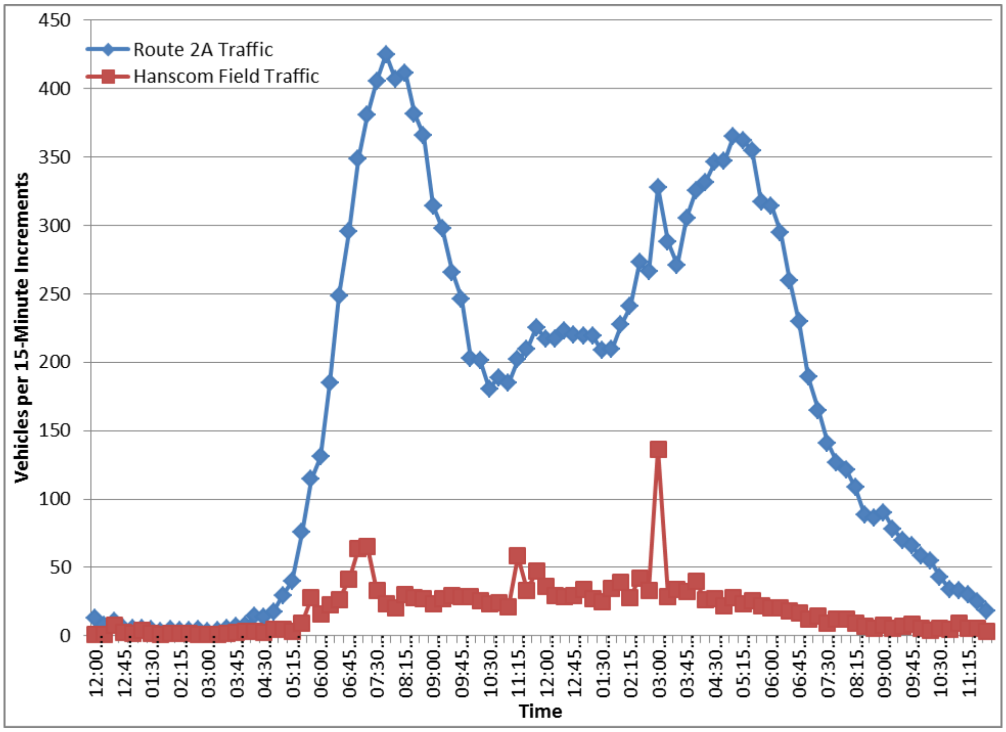


Figure 6-4 Peaking characteristics of Hanscom Field vehicle traffic study area

6.4.2 Study area roadways

The study area for ground transportation surrounding Hanscom is bordered in the northwest by Route 62 (Concord Road/Bedford St), in the northeast by Route 4-225 (Great Road/Bedford Street), in the east by Route 128/I-95 and in the south by Route 2A (Lexington Road/North Great Road). The roadways that are part of the study area are Route 62, Route 4-225, Route 2A, Massachusetts Avenue, Old Massachusetts Avenue, Airport Road, Hanscom Drive, Old Bedford Road, Virginia Road, Bedford Road, Hartwell Avenue, Lexington Road, South Road and Wood Street. This study area was used to analyze the effects of current and potential future traffic generated by Hanscom Field. Table 6-4 summarizes the study area roadway characteristics and functional classifications. The general characteristics of each roadway type, as described by the MassDOT Highway Design Manual, are as follows.

- **Arterial roadway** – This class of roadway provides a high level of mobility and access control. Arterial roadways provide the highest level of service at the greatest vehicle speed for the longest uninterrupted distance.

Table 6-4 Study area roadways

(See Figure 6-5 for locations)

Roadway (location)	Roadway type/ land use	Directional flow	Number of lanes	Posted Speed limit	Notes
Route 2A (Lexington/Lincoln)	Arterial - Primarily open space (Minute Man National Historic Park)	East/West	One in each direction	40 mph	Eastbound left turn lane at Hanscom Drive.
Route 62 (Concord/Bedford)	Arterial - Commercial/ Residential	Northeast/ Southwest	One in each direction	30-40 mph	Connection between Bedford and Concord centers.
Route 4-225 (Bedford)	Arterial - Commercial/ Residential	Northwest/ Southeast	One in each direction	30-40 mph	Turning lanes at some signalized intersections. Connection between Bedford and Lexington centers.
Hanscom Drive (Lincoln)	Collector - Open Space	North/South	Two in each direction with wide median	30 mph inbound; 20 mph outbound (North of Old Bedford Road)	Main access for Hanscom Field and secondary access for the USAF Base (Vandenberg Gate). Access to Old Bedford Road in Lincoln, which connects with Virginia Road. Speed limit not posted south of Old Bedford Road.
Virginia Road (Concord/Lincoln)	Local - Residential/ Office/Research	East/West	One in each direction	25-30 mph	Alternative access route to Hanscom Field without using Route 2A. Pavement is in poor condition and road is narrow and winding.
Bedford Road (Lincoln)	Collector - Residential	North/South	One in each direction	35 mph	Connections to Route 2 and 2A.
Lexington Road/Route 2A (Concord)	Arterial - Open Space (Minute Man National Historic Park)/Residential	East/West	One in each direction	30 mph WB; 40 mph EB	Route 62 connection west of Hanscom Field in Concord.
Old Bedford Road (Concord)	Collector - Residential	North/South	One in each direction	30 mph	Connection between Route 62 and Routh Road.
Hartwell Avenue (Bedford)	Collector - Residential /Office/Research	East/West	One in each direction	25-30 mph	Connection between Route 62 and South Road.
South Road (Bedford)	Collector - Residential	North/South	One in each direction	30 mph	Connections to Hartwell Road in Bedford, Hartwell Avenue in Lexington, and Route 4-225.
Hartwell Avenue (Lexington)	Collector - Primarily Office/Research and Industrial	North/South	One in each direction	40 mph	Connection between Route 4-225 and Wood Street. Access to USAF Base. Functions as two lanes in each direction in some segments.
Wood Street (Lexington)	Collector - Residential	North/South	One in each direction	30 mph	Connection between Hartwell Avenue and Massachusetts Avenue (to Route 2A). Provides access to USAF Base.
Massachusetts Avenue (Lexington)	Collector - Residential	East/West	One in each direction	35 mph	Connection between Lexington Center and Route 2A.
Old Massachusetts Ave. (Lexington)	Local - Open Space (Minute Man National Historic Park)/Residential	East/West	One in each direction	35 mph	Connection between Wood Street and Route 2A.
Airport Road (Lincoln/Lexington)	Collector - Residential	North/South	One in each direction	30 mph	Former entrance to USAF Base. Speed limit not posted.

- **Collector roadway** – Collectors provide a less highly developed service at a lower speed for shorter distances. Compared to arterials, collector roads provide both mobility and land access. Vehicles traveling on local roadways meet, and traffic funnels onto collector roads.

- **Local roadway** – Local roads provide access to abutting land with little or no through movement. This classification includes all roads not classified as either arterial or collector. Local roadways provide little mobility and a great deal of land access and local circulation at low speeds.

Traffic counts were collected on roadways in the study area during a 7-day period from Tuesday, November 13, 2012 through Monday, November 19, 2012 by automated traffic recorders (ATRs). These counts provide a better understanding of the current traffic patterns in certain areas surrounding Hanscom Field. The locations were chosen based on previous report counts and to confirm traffic volumes at intersections. The year 2012 ATR count locations are shown in Figure 6-5 and include:

- **Location A:** Route 2A, east of Airport Road (Lexington)

  Due to an error in the recording device at this location, an additional 72-hour ATR count was taken from Tuesday, February 26, 2013 through Monday, March 4, 2013 and included in the 2012 network.
- **Location B:** Bedford Road, south of Route 2A (Lincoln)
- **Location C:** Cambridge Turnpike Cutoff, southwest of Lexington Road (Lincoln, near Concord line)
- **Location D:** Old Bedford Road, north of Virginia Road (Concord)
- **Location E:** Route 62, west of Old Bedford Road (Concord)
- **Location F:** Hanscom Drive, north of Old Bedford Road (Lincoln)

6.4.2.1 Daily traffic volumes

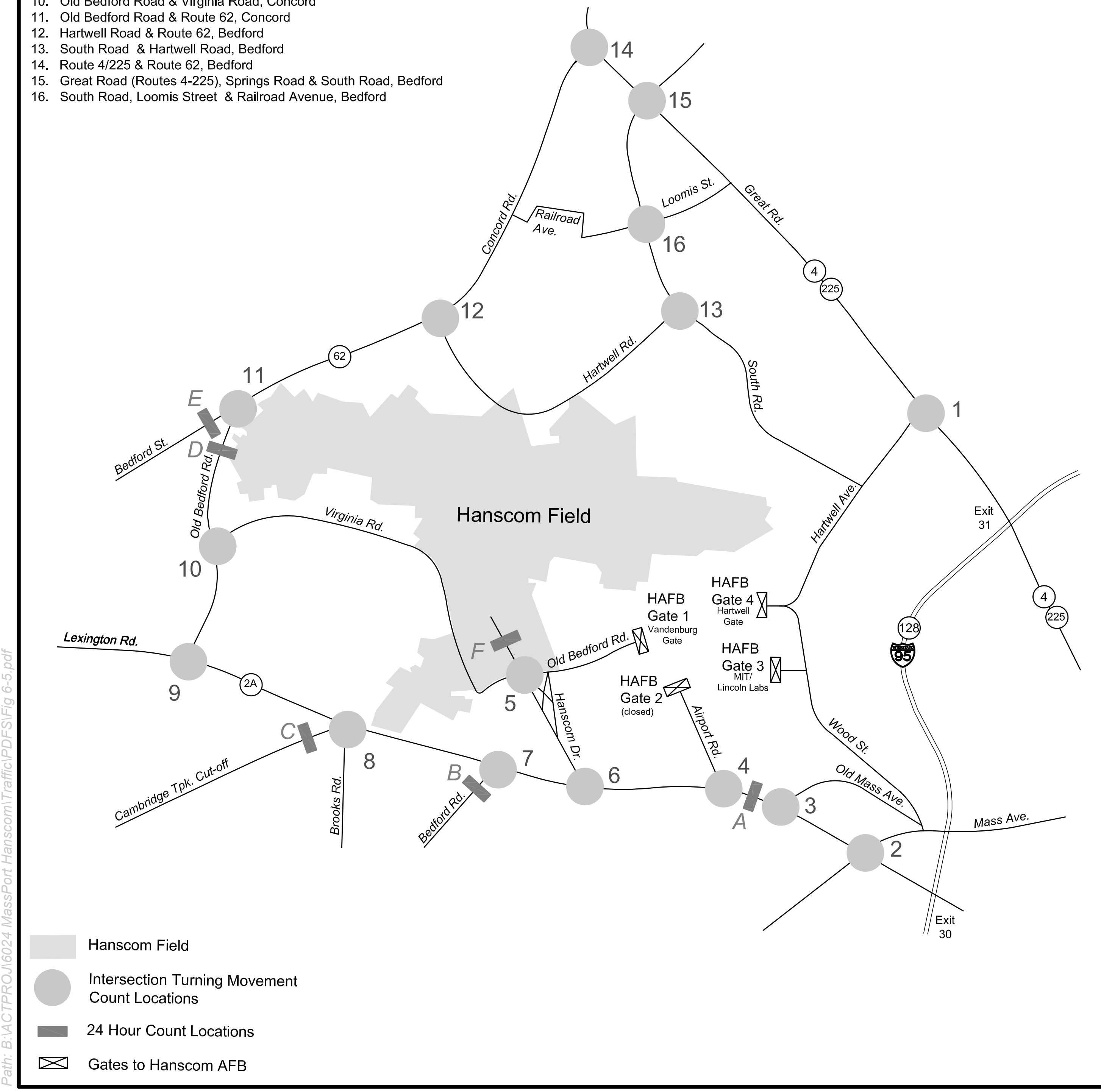
Year 2012 daily traffic volumes are presented in Figure 6-6, and compared with daily traffic volumes from the *2005 ESPR* for 2002 and 2005 in Figure 6-7. Average daily traffic volumes on Hanscom Drive are approximately 2,200 vehicles per day, 15 percent less than the 2005 volumes. This decrease may be attributable to the discontinuation of commercial air travel and a reduced class schedule (i.e. WyoTech, the predecessor to NAA, had a part-time evening program in 2005). Route 2A, Bedford Road and Cambridge Turnpike Cut-off all experienced a small decrease (approximately 1-2% per year) between 2005 and 2012, which is consistent with other recent counts available from MassDOT. The former Raytheon facility on Hartwell Road was taken over and occupied by Instrumentation Labs which likely resulted in increased traffic volumes along both Route 62 and Old Bedford Road.

Study Intersections:

1. Route 4/225 & Hartwell Avenue (signalized), Lexington
2. Massachusetts Avenue & Route 2A, Lexington
3. Old Massachusetts Avenue & Route 2A, Lexington
4. Airport Road & Route 2A, Lexington
5. Hanscom Drive & Old Bedford Road (main Hanscom Field entrance), Lexington
6. Hanscom Drive & Route 2A, Lincoln
7. Bedford Road & Route 2A, Lincoln
8. Cambridge Turnpike Cut-Off, Brooks Road, Lexington Road & Route 2A, Lincoln/Concord
9. Old Bedford Road & Lexington Road (Route 2A), Concord
10. Old Bedford Road & Virginia Road, Concord
11. Old Bedford Road & Route 62, Concord
12. Hartwell Road & Route 62, Bedford
13. South Road & Hartwell Road, Bedford
14. Route 4/225 & Route 62, Bedford
15. Great Road (Routes 4-225), Springs Road & South Road, Bedford
16. South Road, Loomis Street & Railroad Avenue, Bedford

Daily Count Locations:

A. Route 2A, east of Airport Road (Lexington)
B. Bedford Road, south of Route 2A (Lincoln)
C. Cambridge Turnpike Cutoff, southwest of Lexington Road (Lincoln, near Concord line)
D. Old Bedford Road, north of Virginia Road (Concord)
E. Route 62, west of Old Bedford Road (Concord)
F. Hanscom Drive (Main Entrance of Hanscom Field), north of Old Bedford Road (Lincoln)



North

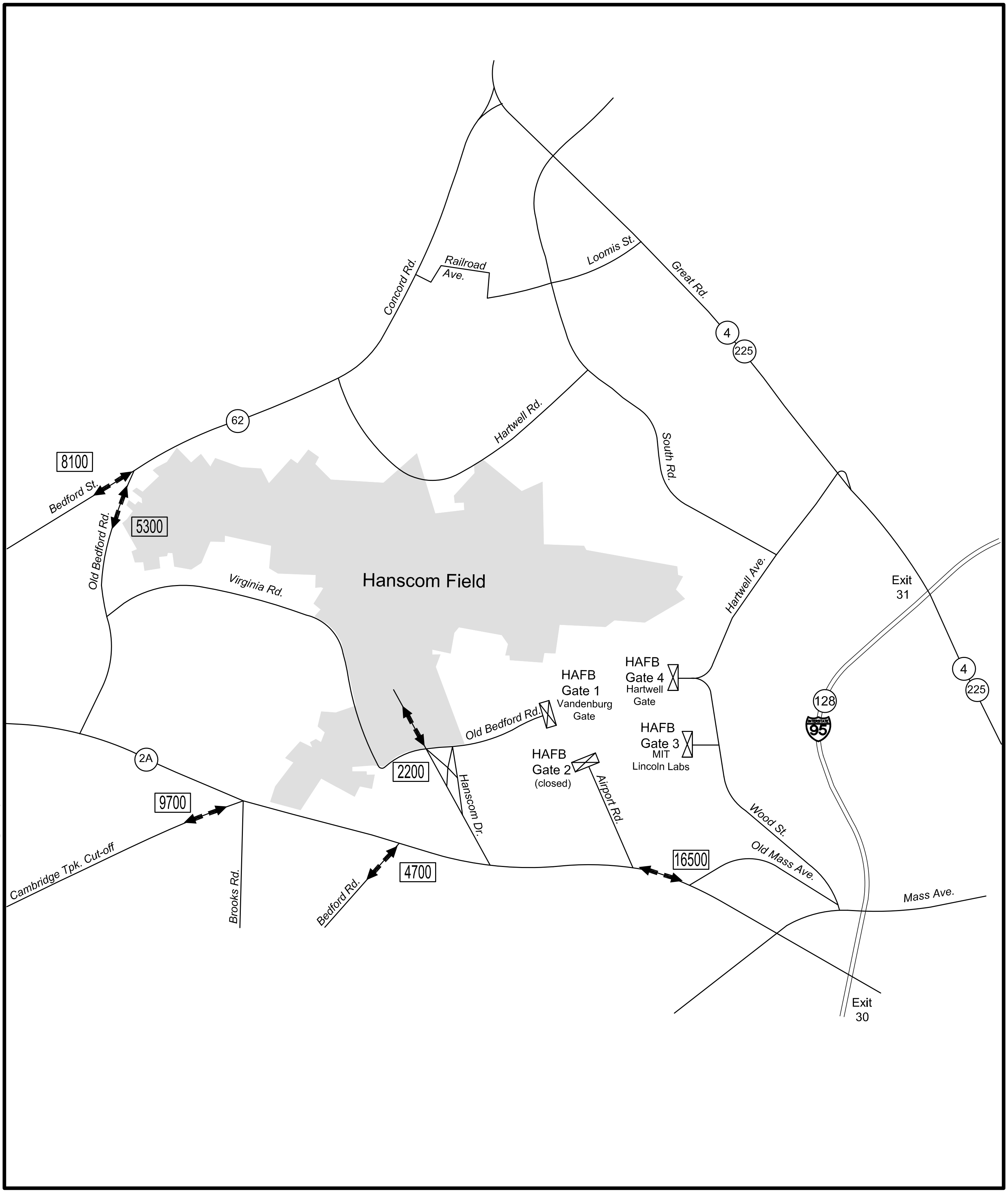
NOT TO SCALE

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Traffic Study Area
Count Locations

Figure **6-5**



NOT TO SCALE

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 Average Weekday Traffic Volumes

Figure **6-6**

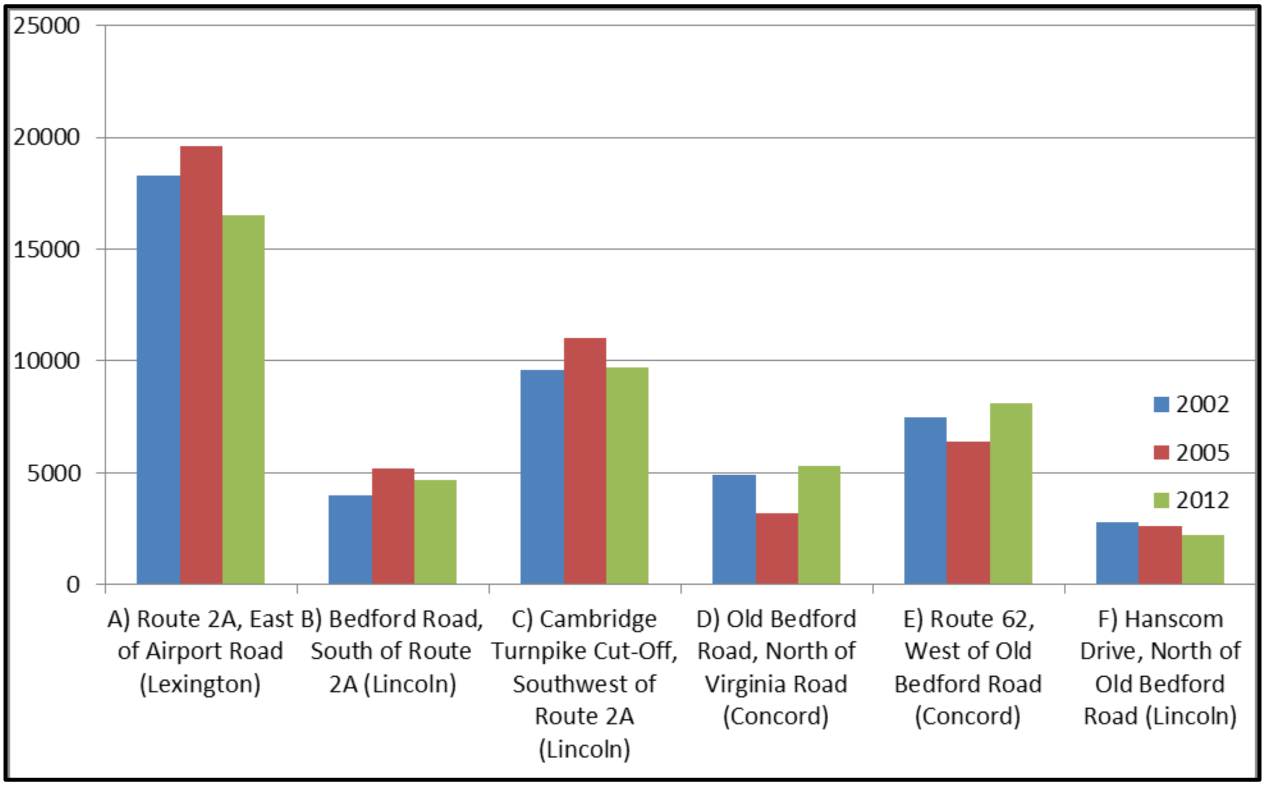


Figure 6-7 Comparison of 2002, 2005, and 2012 average weekday traffic volumes*

Source: Massport, *Hanscom Field 2005 Draft Environmental Status and Planning Report*, EOEA #5484/8696 (2006) and new traffic data collected for *2012 ESPR*. Refer to Figure 6-5 for locations map.

6.4.2.2 Seasonal traffic variations

The adequacy of the 2012 November traffic data was confirmed through comparisons with MassDOT counts and information from studies of Minute Man National Historical Park. MassDOT data for the most recent year indicate that traffic volumes along Route 2A (just west of Route 2, Cambridge Turnpike) in November are typically one percent lower than the average month. As indicated in Figure 6-8, visitations to the Minute Man National Historic Park vary by month. Visitation trends relate to weather conditions, length of daylight and availability of facilities. The North Bridge Visitor Center is open year-round; the Minute Man Visitors Center from April through December, the Hartwell Tavern Memorial Day through October and The Wayside is currently closed for renovations. Based on 2012 Recreational Visitor data obtained from the National Park Service Visitor Use Statistics database, visitation levels in November represent 77% of the 2012 monthly average. The "Minute Man National Park: Route 2A traffic analysis and Its Impact on the Park's Visitor Experience" (2002) indicates that the Minute Man National Historical Park contributes 1.4% of daily traffic on Route 2A. Using the information described above, the 2012 traffic volumes were increased by a factor of 1.014, or 1.4% to account for seasonal variation from MassDOT data and the Minute Man National Historic Park.

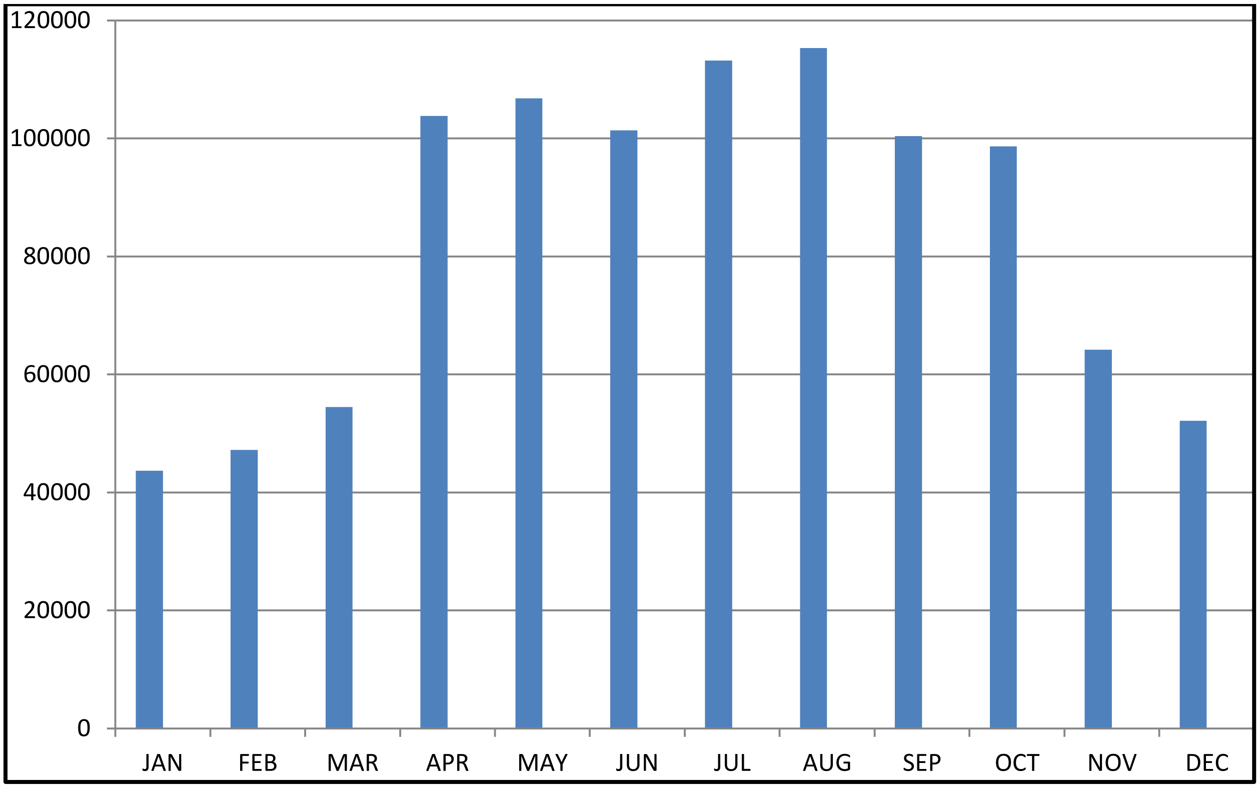


Figure 6-8 2012 Minuteman National Historical Park monthly visitations

Source: National Park Service, *Annual Recreation Visits Report: Minuteman National Historical Park*, 2013. http://irma.nps.gov/Stats/SSRSReports/Park Specific Reports/All Recreation?Park=MIMA.

6.4.3 Study area intersections

Detailed analyses of peak hour intersection operations and traffic conditions were conducted for the roadway network illustrated in Figure 6-5 (see Figure 6-5 for intersection locations).

6.4.3.1 Intersection locations

Manual turning movement counts were collected for 16 study intersections on Wednesday, November 9 and Tuesday, November 13, 2012 from 6:00 to 9:00 a.m. and 3:00 to 6:00 p.m. This data was used with the automatic traffic count data to determine the morning and afternoon peak hours for the study area. Peak period traffic volumes were collected at the following intersections (see Figure 6-5 for locations) to create the 2012 morning and afternoon peak hour traffic networks that are a basis for this analysis:

1. Route 4-225 & Hartwell Avenue, Lexington
2. Massachusetts Avenue & Route 2A, Lexington
3. Old Massachusetts Avenue & Route 2A, Lexington
4. Airport Road & Route 2A, Lexington
5. Hanscom Drive & Old Bedford Road (main Hanscom Field entrance), Lincoln
6. Hanscom Drive & Route 2A, Lincoln
7. Bedford Road & Route 2A, Lincoln
8. Cambridge Turnpike Cut-Off, Brooks Road Lexington Road & Route 2A, Lincoln/Concord
9. Old Bedford Road & Lexington Road, Concord
10. Old Bedford Road & Virginia Road, Concord7
11. Old Bedford Road & Route 62, Concord

12. Hartwell Road & Route 62, Bedford
13. South Road & Hartwell Road, Bedford
14. Route 4-225 & Route 62, Bedford
15. Great Road (Routes 4-225), Springs Road & South Road, Bedford
16. South Road, Loomis Street & Railroad Avenue, Bedford

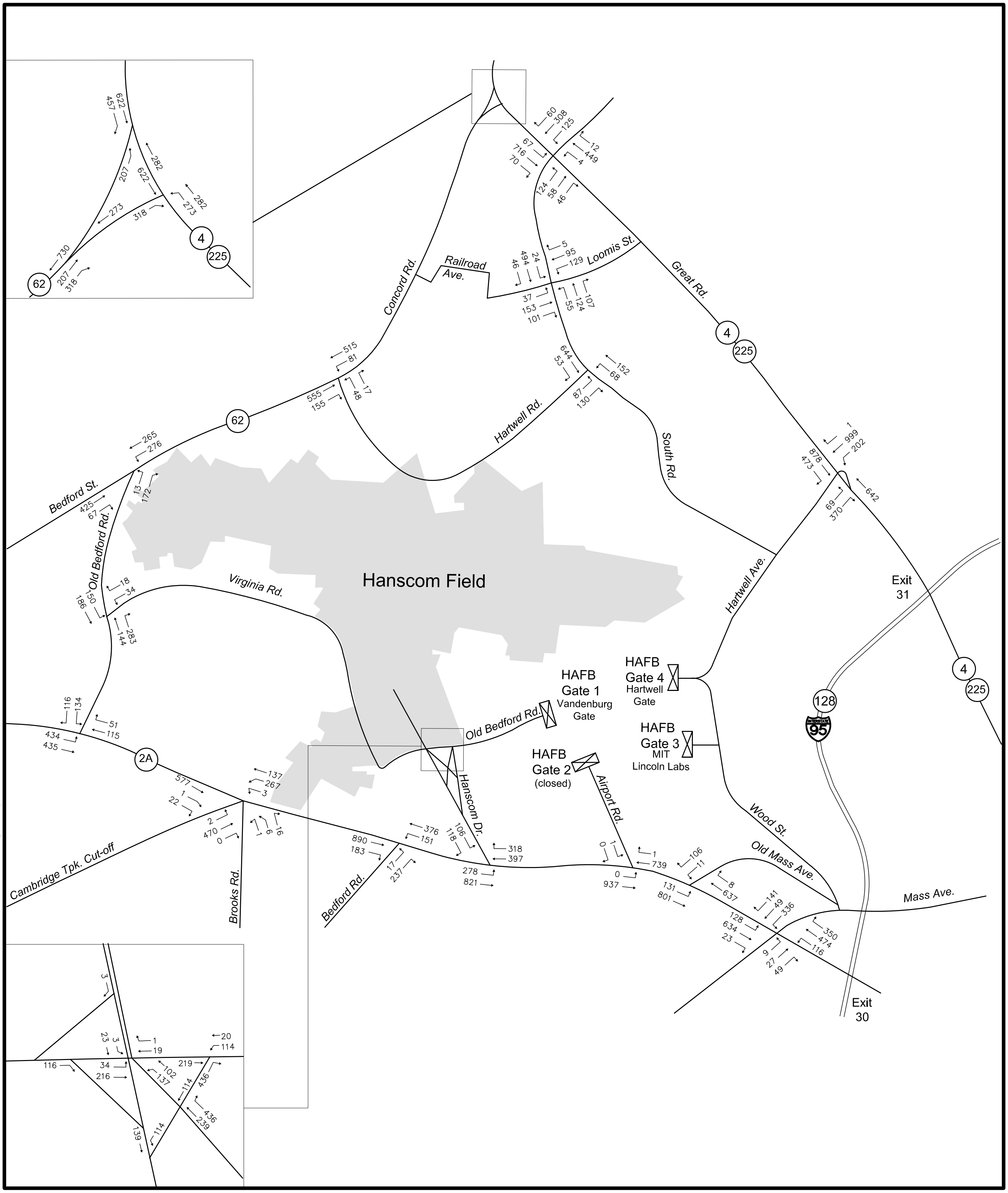
6.4.3.2 Peak hour traffic networks

Figures 6.9 and 6.10 present the 2012 morning and afternoon peak hour volumes for the study intersections. In the morning, most of the traffic on Routes 2A, 62 and 4-225 travels eastbound to Route 128/I- 95. In the afternoon, most traffic on these corridors is traveling westbound from Route 128/I-95. This primarily reflects commuting patterns from the towns to regional employment centers along and within Route 128/I-95.

Traffic flows to employment centers west of Route 128/I-95 such as Hartwell Avenue and Hanscom AFB are another consideration. Specifically, the directional split along Route 2A is more balanced east of Hanscom Drive compared to west of Hanscom Drive. For example, during the morning peak hour, traffic volumes on Route 2A east of Hanscom Drive are split 55 percent in the eastbound direction and 45 percent in the westbound direction, while west of Hanscom Drive volumes are split 70 percent in the eastbound direction and 30 percent in the westbound direction. The higher percentage of traffic traveling in a westbound direction on Route 2A near the interchange reflects the effects of employees commuting home from the area around Hanscom Field.

6.4.3.3 Hanscom Field traffic distribution

Figures 6.11 and 6.12 present the 2012 peak hour trip distribution and traffic volumes for Hanscom Field-related traffic for morning and afternoon peak hours, respectively. The existing trip distribution of Hanscom Field traffic was determined based on Hanscom main entrance directional peak hour traffic volumes and modeling of the distribution of peak hour traffic volumes at intersections within the study area.



Path: B:\ACTPROJ\6024 MassPort Hanscom\Traffic\PDFS\Fig 6-9.pdf

North

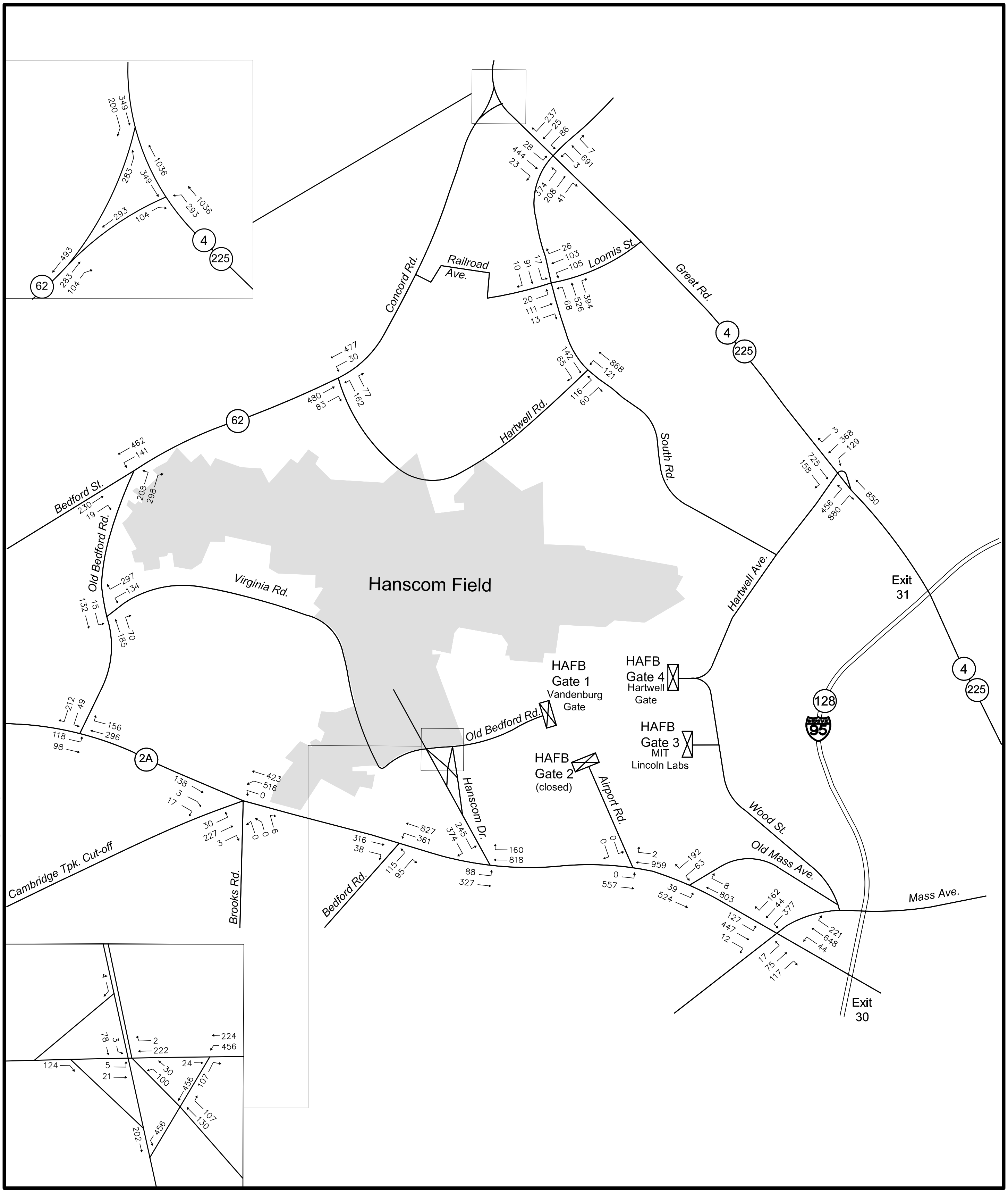
NOT TO SCALE

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 Morning Peak Hour Traffic Volumes

Figure **6-9**



North

NOT TO SCALE

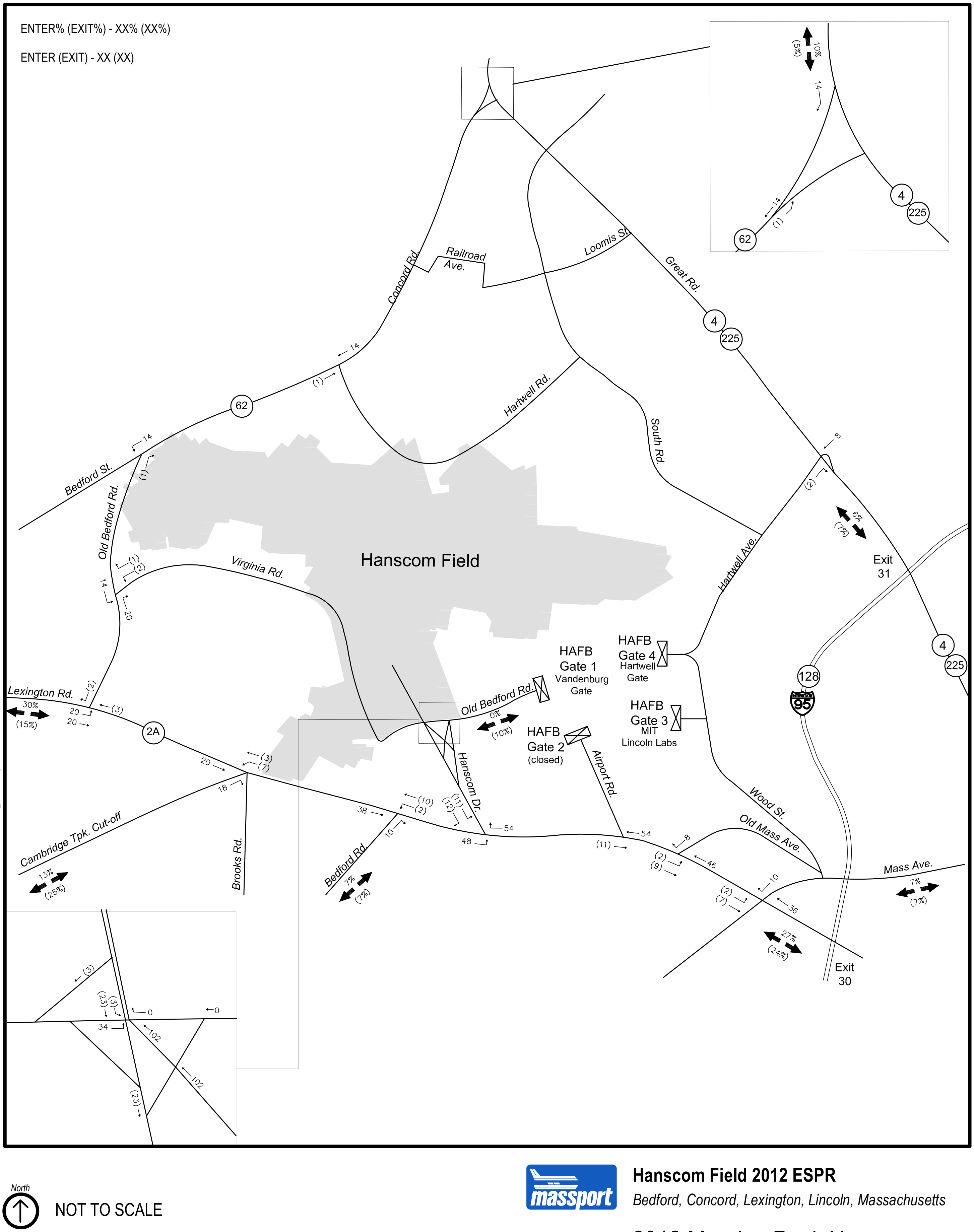
massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 Afternoon Peak Hour Traffic Volumes

Figure **6-10**



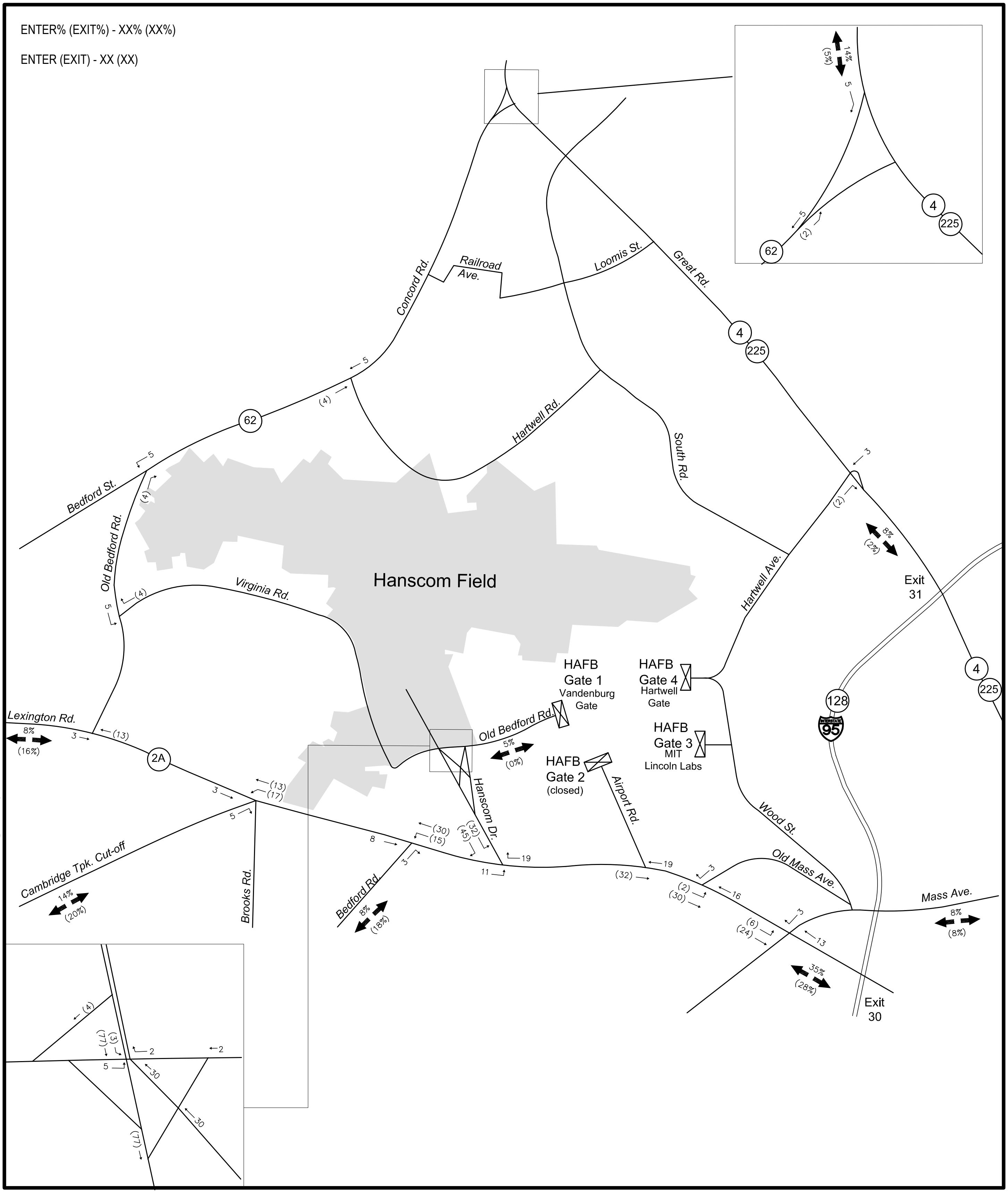
Path: B:\ACTPROJ\6024 MassPort Hanscom\Traffic\PDFS\Fig 6-11.pdf

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 Morning Peak Hour Trip Distribution

Figure **6-11**



Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 Afternoon Peak Hour Trip Distribution

Figure **6-12**

6.4.3.4 Hanscom Drive traffic volumes

Figure 6-13 illustrates the different traffic contributors on Hanscom Drive in 2012 during the morning and afternoon peak hours using data from the turning movement counts. Hanscom Field-related traffic accounts for 14 percent during the morning peak hour and 13 percent during the afternoon in 2012, as compared to 15 percent in both the morning and the afternoon peak hours for the 2005 peak periods. The drop in Hanscom's contribution reflects a decrease in traffic traveling to and from Hanscom Field due to reduced commercial air travel and reduced flight class schedule (i.e. the discontinuance of the part-time evening program since 2005). Hanscom AFB traffic is the largest component on Hanscom Drive in 2012 at 59 percent in the morning peak hour and 62 percent in the afternoon peak hour, as compared to 50 and 49% in 2005. A factor in this increase is the recent relocation of the Massachusetts National Guard to the Base.

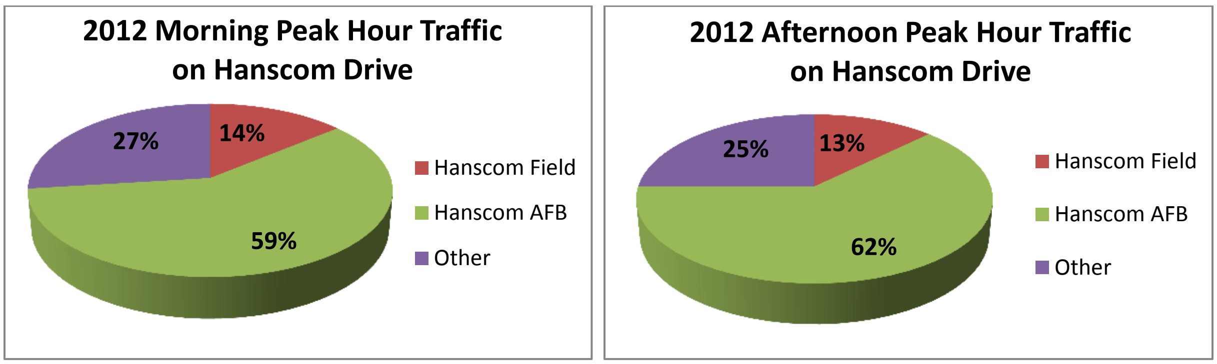


Figure 6-13 2012 Peak hour traffic on Hanscom Drive

6.4.4 Intersection screening process

MEPA has established a threshold for identifying intersections with significant impacts related to Hanscom Field. Hanscom Field traffic is considered to impact an intersection if one or more of the intersection's individual peak hour traffic movement(s) consists of ten or more percent Hanscom Field-related traffic. The traffic volumes at each of the 16 study intersections were assessed to determine which intersections had individual turning movements that met or exceeded the ten percent MEPA threshold. Table 6-5 lists the intersections that have exceeded the ten percent threshold for the four analysis years. Intersection operations were calculated for year 2012 conditions for intersections that exceeded the threshold.

Table 6-5 Intersections exceeding ten-percent threshold: 1996–2012

Intersection	Peak Hour	Analysis years			
		1996	2002	2005	2012
#5 Hanscom Drive/Old Bedford Road (Lincoln)	Morning	√	√	√	√
	Afternoon	√	√	√	√
#6 Hanscom Drive/Route 2A (Lincoln)	Morning	√	√	√	√
	Afternoon		√	√	√
#10 Old Bedford Road/Virginia Road (Concord)	Morning	√	√	√	
	Afternoon	√	√	√	√
#11 Old Bedford Road/Route 62 (Concord)	Morning				
	Afternoon			√	

Source: Massport, Hanscom Field 2005 Draft Environmental Status and Planning Report, EOEA #5484/8696 (2006), see Figure 6-5 for location map.

Prior ESPRs indicate that Hanscom Field traffic accounted for more than ten percent of the traffic volume for individual movements at only three or four of the 16 intersections studied. Given this trend, it may be feasible to study fewer intersections in future ESPRs. As shown in Table 6-5, Hanscom Field-related traffic accounted for more than ten percent of individual traffic movements at the same three intersections in 1996, 2002, 2005 and 2012. Additionally, the afternoon peak hour Hanscom Field traffic volumes in 2005 accounted for more than ten percent of traffic movements on the left-turn from Route 62 to Old Bedford Road in the intersection of Old Bedford Road and Route 62.

6.4.5 Analysis of intersection operations

This section provides level of service calculations, volume-to-capacity ratios and seconds delay at the screened intersections. Appendix C provides the level of service calculation sheets.

6.4.5.1 Level of service

The performance of the study intersections was analyzed in SYNCHRO 7.0 and measured using Levels of Service (LOS), which is determined based on the process specified in the 2000 Highway Capacity Manual (HCM). Levels of Service range from ‘A’ to ‘F’ where LOS ‘A’ represents optimal conditions with fewer than 10 seconds of delay, while ‘F’ represents failing conditions where delay exceeds 50 seconds at unsignalized intersections or 80 seconds at signalized intersections. Table 6-6 shows the delay thresholds for LOS at signalized and unsignalized intersections based on the 2000 HCM.

Table 6-6 Intersection level of service criteria

	Average delay per vehicle (seconds)	
LOS	Signalized intersections	Unsignalized intersections
A	<10.0	<10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	>80.0	>50.0

LOS for signalized intersections is based on the average delay experienced by motorists traveling through the intersection. Delay is based on capacity analysis and other variables such as quality of signal progression, cycle length, and ratio of green time. LOS for two-way stop-controlled intersections is based on delay as a function of capacity of the approach and degree of saturation. LOS is determined for motorists entering from the minor road or turning left from the major road, movements in which motorists must use judgment to select an adequate gap in conflicting traffic. The performance of the study intersections was also measured by 95th percentile queue length; that is the queue length in feet with only a 5% probability of being exceeded during the time period, particularly at locations where queues from one intersection could impact another nearby intersection.

6.4.5.2 Existing Intersection Operations

The procedures described above were used to determine existing weekday peak hour operating LOS at the study intersections where Hanscom Field traffic represented more than ten percent of any traffic movement. Tables 6.7 and 6.8 summarize the 2012 peak hour traffic operations for these intersections. Detailed traffic capacity analysis reports are included in Appendix C.

At the intersection of Hanscom Drive and Route 2A, the analysis indicates that southbound Hanscom Drive experiences significant delays during both the morning and afternoon peak hours. However, it appears that the analysis is not accurately representing actual operating conditions. Based on observations at the intersection, there are several unique behaviors occurring at this intersection requiring additional interpretation. First, motorists are offering other motorists "courtesy gaps". For example, motorists on Route 2A were observed stopping to allow motorist to turn left from Hanscom Drive onto Route 2A. Additionally, westbound motorists on Route 2A were observed stopping to allow motorists on Route 2A to turn left onto to Hanscom Drive. Second, motorists in both the left turn lane and right turn lane were doing "rolling stops", or not stopping fully before going through the intersection. Both these factors result in Synchro over estimating the delay and queues at this intersection. Furthermore, due to the wait that sometimes occurs for left-turning vehicles on Hanscom Drive, a few vehicles were observed taking "risky" turns, or turns during a gap in vehicles that is smaller than considered safe. At the current volumes, this intersection meets the peak-hour threshold for a traffic signal according to Figure 4C-4 of the 2009 Manual of Uniform Traffic Control Devices.

Table 6-7 (SYNCHRO) at screened intersections: morning peak hour

Refer to Figure 6-5 for locations map.

Intersection	Weekday morning peak hour		
	LOS	Delay	v/c
#5 Hanscom Drive/Old Bedford Road			
Hanscom Dr NB LT	A	4.3	0.1
Hanscom Dr SB LT	A	0.6	0
Old Bedford Rd EB LT	C	19.1	3.5
Old Bedford Rd EB T	C	20.1	4.0
Old Bedford Rd WB LT	B	14.2	0.05
Old Bedford Rd EB T	B	13.2	0.03
#6 Hanscom Drive/Road 2A			
Rt. 2A EB L	A	9.6	0.29
Hanscom Dr. SB L	F	>200	3.69
Hanscom Dr. SB R	C	16.7	0.34

Table 6-8 (SYNCHRO) at screened intersections: afternoon peak hour

Refer to Figure 6-5 for locations map.

Intersection	Weekday afternoon peak hour		
	LOS	Delay	v/c
#5 Hanscom Drive/Old Bedford Road			
Hanscom Dr NB LT	A	1.7	0.02
Hanscom Dr SB LT	A	0.3	0
Old Bedford Rd EB LT	B	13.7	0.04
Old Bedford Rd EB T	B	11	0.0
Old Bedford Rd WB LT	B	13.6	0.32
Old Bedford Rd EB T	B	11.9	0.16
#6 Hanscom Drive/Road 2A			
Rt. 2A EB L	B	10.3	0.13
Hanscom Dr. SB L	F	>200	2.68
Hanscom Dr. SB R	F	>200	1.41
#10 Old Bedford Road/Virginia Road			
Virginia Road WB LR	D	27.3	0.78
Old Bedford Road SB LT	A	1.1	0.02

6.4.6 Traffic Safety

The crash history of the three screened study intersections, which are located in MassDOT District 4, were evaluated to identify safety deficiencies and determine if any location experiences a higher than average annual crash rate. The crash data was obtained from MassDOT's Highway Division for the five most recent years available (2006-2010) and is contained in Appendix C. The safety data are summarized in Table 6-9.

The MassDOT Crash Rate Worksheet was used to determine whether the crash frequencies at the three screened study intersections were higher than other intersections. The MassDOT Crash Rate Worksheet calculates a crash rate expressed in crashes per million entering vehicles. The calculated rate is then compared to the average crash rates for signalized and unsignalized intersections statewide and within the MassDOT District. The statewide rates are 0.60 for unsignalized intersection and 0.80 for signalized intersections. The MassDOT District 4 crash rates are 0.58 crashes per million entering vehicles for unsignalized intersections and 0.77 crashes per million entering vehicles for signalized intersections. The MassDOT Crash Rate Worksheets for each study intersection are provided in Appendix C.

Twenty-one crashes were reported at the three screened unsignalized intersections from 2006 to 2010. Approximately 33% of the crashes involved personal injury. No fatalities were reported at the screened intersections during the time period evaluated. Angled crashes, rear-end crashes and single vehicle crashes each were approximately 30% of the crashes at the intersections. The 17 crashes at Hanscom Drive/Route 2A (Lincoln) ranked highest among the three screened intersections, or an average of 3.4 crashes per year, which is lower than an average 6.4 crashes per year as reported in the *2005 ESPR*. The crash rate at this intersection was lower than the statewide and district-wide averages for unsignalized intersections. The most common type of crash at his intersection was a rear-end collision (41 percent). A crash at the intersection of Old Bedford Road/Virginia Road (Concord) involved a bicyclist.

Table 6-9 Crash summary: 2005 – 2010

	#5) Hanscom Drive/ Old Bedford Road (Lincoln)	#6) Hanscom Drive/ Route 2A (Lincoln)	#10) Old Bedford Road/Virginia Road (Concord)
Traffic Control:	Unsignalized	Unsignalized	Unsignalized
Year			
2006	0	1	0
2007	0	5	1
2008	0	3	0
2009	2	6	0
2010	0	2	1
Total	2	17	2
Type			
Angle	2	5	1
Rear-End	0	7	0
Head-on	0	0	1
Sideswipe	0	1	0
Single Vehicle	0	4	0
Total	2	17	2
Severity			
Property Damage Only	1	12	1
Personal Injury	1	5	1
Fatality	0	0	0
Other	0	0	0
Total	2	17	2
Weather			
Clear	1	13	2
Cloudy	1	2	0
Rain	0	2	0
Snow	0	0	0

	#5) Hanscom Drive/ Old Bedford Road (Lincoln)	#6) Hanscom Drive/ Route 2A (Lincoln)	#10) Old Bedford Road/Virginia Road (Concord)
Unknown/Other	0	0	0
Total	2	17	2
Time			
7:00 a.m. to 9:00 a.m.	0	1	0
9:00 a.m. to 4:00 p.m.	2	6	1
4:00 p.m. to 6:00 p.m.	0	8	0
6:00 p.m. to 7:00 a.m.	0	2	1
Total	2	17	2
State Wide Rate	0.60	0.60	0.60
District Wide Rate	0.58	0.58	0.58
Intersection Rate	0.09	0.45	0.14

Source: Massachusetts Department of Transportation, MassHighway Crash Data Worksheet.

6.5 Analysis of Future Scenarios

This section describes the background assumptions and methodology used to evaluate future roadway and volume conditions within the study area for the 2020 and 2030 scenarios. The *2012 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes.

Future increases in weekday peak hour vehicular traffic were estimated for the 2020 and 2030 scenarios and were added to the study area roadway network to evaluate their effects. The potential vehicular traffic volume increases include vehicle trips generated by assumed future background growth, specific planned non-Hanscom developments in the area reported by the towns, as well as forecast growth at Hanscom Field. In addition to the components of future traffic growth, this section describes planned roadway improvements in the area and their expected effects on the transportation network.

The analysis identified traffic increases on key roadways such as Route 2A and conducted LOS analysis for study area intersections where Hanscom Field traffic represents ten percent or more for any traffic movement, as required by MEPA.

6.5.1 Future background growth

Future growth in traffic volumes occurs because of regional background growth and the traffic associated with specific plans/developments in the individual towns. This section describes background growth trends and planned developments within the towns of Bedford, Concord, Lexington, and Lincoln.

6.5.1.1 Regional background growth

In order to determine a background growth rate for traffic volumes in the study area, the following sources were consulted:

- When comparing 2005 ATR counts with 2012 ATR counts, the traffic volumes along Route 2A, Bedford Road and Cambridge Turnpike Cutoff have decreased (approximately 1-2% per year). Traffic volumes along Route 62 and Old Bedford Road increased; however, the majority of this increase can be attributed to the former Raytheon facility on Hartwell Road being taken over and occupied by Instrumentation Labs which likely resulted in increased traffic volumes along both Route 62 and Old Bedford Road.

- MAPC produced population and employment projections to support the development of *Paths to a Sustainable Region,* the Boston MPO's long range transportation plan. The projections estimate that population and employment will have limited growth (less than 0.5% per year) through 2030.
- A MassDOT traffic count on Route 2A west of Cambridge Turnpike showed a modest increase (less than 0.5% per year) in traffic volume between 2011 and 2012.

Based on these three sources, a growth rate of 0.5% per year, compounded annually, was used to account for background growth in traffic volume for both the 2020 and 2030 forecast years.

6.5.1.2 Planned and potential future developments

Planning officials from Bedford, Concord, Lexington, and Lincoln were contacted to identify specific proposed or planned development projects within those towns that could potentially impact traffic volumes in the vicinity of Hanscom Field. These projects include planned projects as well as potential projects that might be built in the future.

Table 6-10 lists the specific background developments that are included in the analysis of the 2020 and 2030 scenarios. Estimated traffic volumes generated by specific proposed projects in Table 6-10 were added to the study intersections.

Table 6-10 Planned development projects

Project	Description	Status	2020	2030
Town of Bedford				
Café at the Red Barn	Restaurant in Depot Park	On hold		
54 Loomis St.	Mixed-use development (19 condos and 2,860 sq.ft. retail)	Approved	√	√
Blake Block	Mixed-use development (7 condos and 26,000 sq. ft. retail)	Under Construction	√	√
Town of Concord				
506 Old Bedford Road	8-unit Planned Residential Development	Under Construction	√	√
Monsen Road	8-lot subdivision	Under Construction	√	√
Town of Lexington				
113 Hartwell Avenue	Medical Marijuana Treatment Center	Proposed	√	√

In the Town of Bedford, the Café at the Red Barn is currently on hold so this development was not included in future forecasts. 54 Loomis Street and Blake Block are two mixed-used developments in the Town of Bedford included in both the 2020 and 2030 forecast years. Given the size of the proposed development at 54 Loomis Street, this development was assumed to be captured in the background growth. For the Blake Block project that is currently under construction, specific trips were generated and assigned to the study intersections. The Town of Concord has two small residential developments under construction (i.e. 506 Old Bedford Road and Monsen Road), which were assumed to be captured in the background growth. The Town of Lexington has a Medical Marijuana Treatment Center proposed at 113 Hartwell. Specific trips were generated and assigned for this development to the study intersections, which were included in both the 2020 and 2030 forecast years.

6.5.1.3 Special generators

Additional special generators were considered that include Hanscom AFB and the Minute Man National Historical Park. The additional vehicle trips associated with these special generators were included in the future background growth as described below.

- The Hanscom AFB borders the southeast side of Hanscom Field. Between the *2005 ESPR* and the *2012 ESPR*, the Massachusetts National Guard Joint Force Headquarters opened at the Base and the Air Force Research Laboratory left the Base, resulting in a considerable area of vacant property. There are plans for MIT Lincoln Labs to take over and occupy up to 300,000 square feet of the space vacated by the Air Force Research Laboratory. Specific trips were generated and assigned for this development to the study intersections, which were included in both the 2020 and 2030 forecast years. Hanscom AFB has three operating gated entrances (see Figure 6-5). The Vandenberg Gate (Gate 1) is located at Vandenberg Drive east of the intersection of Hanscom Drive/Old Bedford Road, which serves traffic to and from Route 2A. Gate 2 is no longer being used. Gate 3 located on Wood Street provides direct access to the Lincoln Laboratory via Route 4-225 or Route 2A. Gate 4 is located at Barksdale Street/Hartwell Avenue and serves traffic to and from Routes 4-225 via Hartwell Avenue. The trip distribution for the MIT Lincoln Labs expansion assumed that approximately half of motorists would access the Hanscom AFB via the Vandenberg Gate (Gate 1) and the other half would travel to/from the Base via either Gate 3 or Gate 4.
- Much of the Minute Man National Historical Park runs parallel to Route 2A (Battle Road) south of Hanscom Field. The Minute Man National Historical Park attracts about one million visitors per year. The April 2005 *Minute Man Alternative Transportation Evaluation* indicates that few visitations occur during the peak commuting times. Additionally, the records of recreation visitors from the National Park Service Visitor Use Statistics database indicate that the number of yearly visitors has been consistent the last five years. Therefore, the analysis in the *2012 ESPR* does not include any specific trips for the park and assumes that the future peak hour traffic growth from Minute Man National Historical Park is accounted for in the background growth rate of 0.5 percent per year.

6.5.2 Hanscom Field traffic projections

To assess the future traffic impacts of Hanscom Field, trips generated by possible future activity at Hanscom Field for the 2020 and 2030 forecasts were estimated. Vehicular traffic at Hanscom Field is generated by both general and commercial aviation activities, and other airport-related land uses. General aviation (GA) includes flights for training, personal use, and business/corporate use. In 2012, GA accounted for most (99%) of the civilian operations with the remaining being commercial air passenger services. In 2005, civilian operations were 97% GA and 3% commercial. Future growth estimates for airside operations (GA, commercial aviation, and light cargo operations) were based on aviation forecasts presented in Chapter 3, Airport Activity Levels. Future growth based on these forecasts was applied to existing peak hour activity levels at Hanscom Field to estimate the number of new weekday morning and afternoon vehicular trips generated by aviation activities under each of the two future scenarios. Ground-side trip generation for other land uses at Hanscom Field was estimated based on standard Institute of Transportation Engineers (ITE) trip rates.

Table 6-11 shows vehicle trip generation for 2012 and the 2020 and 2030 scenarios. In general, the *2012 ESPR* Hanscom Field trip generation is similar to the 2010 and 2020 Moderate Growth scenario from the

2005 ESPR and lower than the 2010 and 2020 High Growth scenarios. These differences reflect reduced forecasts for GA and commercial activity and increases in airport-related land uses. Trip generation characteristics of GA, commercial aviation, based cargo operations, and other airport-related land uses are described below. Detailed trip generation summaries are provided in Appendix C.

Table 6-11 Hanscom Field Trip Generation for 2020 and 2030 Scenarios

Intersection	Morning peak hour			Afternoon peak hour		
	In	Out	Total	In	Out	Total
2012	136	29	165	37	84	121
2020 Forecast	178	42	220	46	120	166
2030 Forecast	291	99	390	122	223	345

6.5.2.1 General Aviation

GA includes single engine local flights for training; single engine piston itinerant for personal flying; single, twin, turbo and jet operations for business and corporate use; and helicopters for personal and business uses. Vehicle trips associated with GA were estimated using information from the "Hanscom Trip Generation Model" developed in the *2005 ESPR* and future growth in GA operations as presented in Chapter 3, Airport Activity Levels. There are modest increases in GA operations anticipated (i.e. 1% growth between 2012 and 2020 and 14% growth between 2020 and 2030). The results of the 2020 and 2030 scenarios indicate that future GA operations could results in up to nine new morning peak hour vehicular trips and up 11 new afternoon peak hour vehicular trips.

6.5.2.2 Commercial operations

Commercial aviation at Hanscom Field includes all commercial passenger flights. For each future scenario, the forecasted number of commercial passengers from Chapter 3, Airport Activity Levels was used to estimate the number of vehicle trips during the morning and afternoon peak hours. Since there was no commercial activity at the time of the 2012 intersection turning movement counts, 2005 peak hour trips and the number of commercial passengers in 2005 were used to estimate the number of peak hour trips for the 2020 and 2030 scenarios. The results of the 2020 and 2030 scenarios indicate that future commercial operations could result in 12 to 22 new morning peak hour vehicular trips and six to 11 new afternoon peak hour vehicular trips. These trip estimates are lower than the forecast trips from the *2005 ESPR* given the reductions in forecasts for potential commercial activity.

6.5.2.3 Cargo operation

There are no traditional cargo operations included in the 2020 or 2030 Forecasts.

6.5.2.4 Airport-related land use

Other airport-related traffic generators at Hanscom Field include the National Aviation Academy (NAA), a potential hotel and the proposed Massachusetts Air and Space Museum.

- Based on conversations with staff from the NAA, there are currently no specific plans for expanding the student body. Current daytime classes begin at 7:30 a.m. and end at 3:30 p.m. so students typically arrive and depart outside the peak hours at the study intersections. NAA has held nighttime classes in the past and staff is interested in offering those classes if there is interest from students. Nighttime students arrive before the afternoon peak hour and depart after the afternoon peak hour. Therefore, no additional vehicle trips were assumed for the NAA.

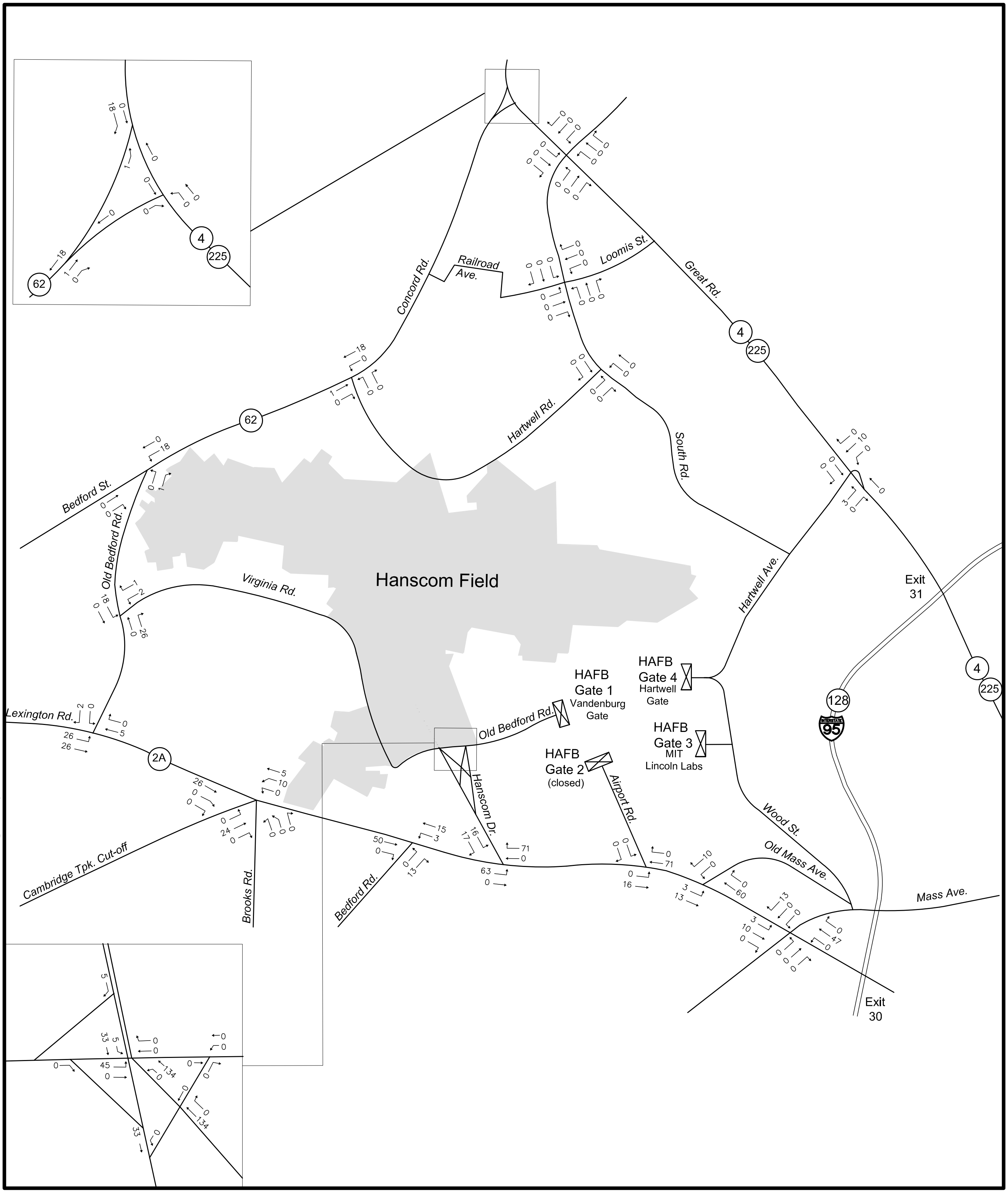
- The trip generation for a potential hotel is based on the Hotel land use (LU #310) from the Institute of Transportation Engineer's (ITE) Trip Generation Manual, 9th Edition. It assumes that the 200-room hotel will be operational by 2030 and that 5% of all trips to the hotel are internal trips from Hanscom Air Field (i.e. 5% would arrive/depart by plane).
- The Massachusetts Air and Space Museum representatives continue to work on fundraising efforts for a future museum at Hanscom Field. The museum trip generation assumes that half of the museum's 161,000 square feet will open by 2020 and the remaining half will open by 2030. The ITE Trip Generation Manual only provides data for one museum of 45,000 square feet in Tennessee, so the trip generation rates from this site were averaged with those from a 2008 study of a California museum of 69,500 square feet. (Source: "Draft Environmental Impact Report for the Museum of Tolerance Project")

6.5.2.5 Hanscom Field trip distribution

Anticipated vehicular traffic volume increases due to future background growth, specific proposed or planned developments in the area, and future changes at Hanscom Field were added to the existing peak hour traffic volume to estimate future peak hour traffic volumes for the 2020 and 2030 forecast scenarios. Trips to and from Hanscom Field were distributed based on existing trip distribution patterns. The following entrance locations were also considered:

- On the south side of the site, the existing main entrance to the terminal area on Hanscom Drive would continue to be used under all future scenarios as the primary access.
- Virginia Road will be used to access the new Rectrix hangar.
- Access to the north side of Hanscom Field (North Airfield and the Navy Parcel) is assumed to occur from South Road and Hartwell Road. These entrances would be available for access to potential GA hangars, buildings and T-hangars identified in the growth scenarios for the north area of the site.

The number of vehicle trips to/from Rectrix, North Airfield Area and the Navy Parcel will be minimal during the morning and afternoon peak hours. As such, all vehicle trips are assumed to travel to/from Hanscom Field via the main entrance on Hanscom Drive. Figures 6.14 through 6.17 present the 2020 and 2030 forecast volumes for Hanscom Field Traffic Only. Figures 6.18 through 6.21 present the 2020 and 2030 forecast volumes including background growth, proposed or planned developments and Hanscom Field traffic.

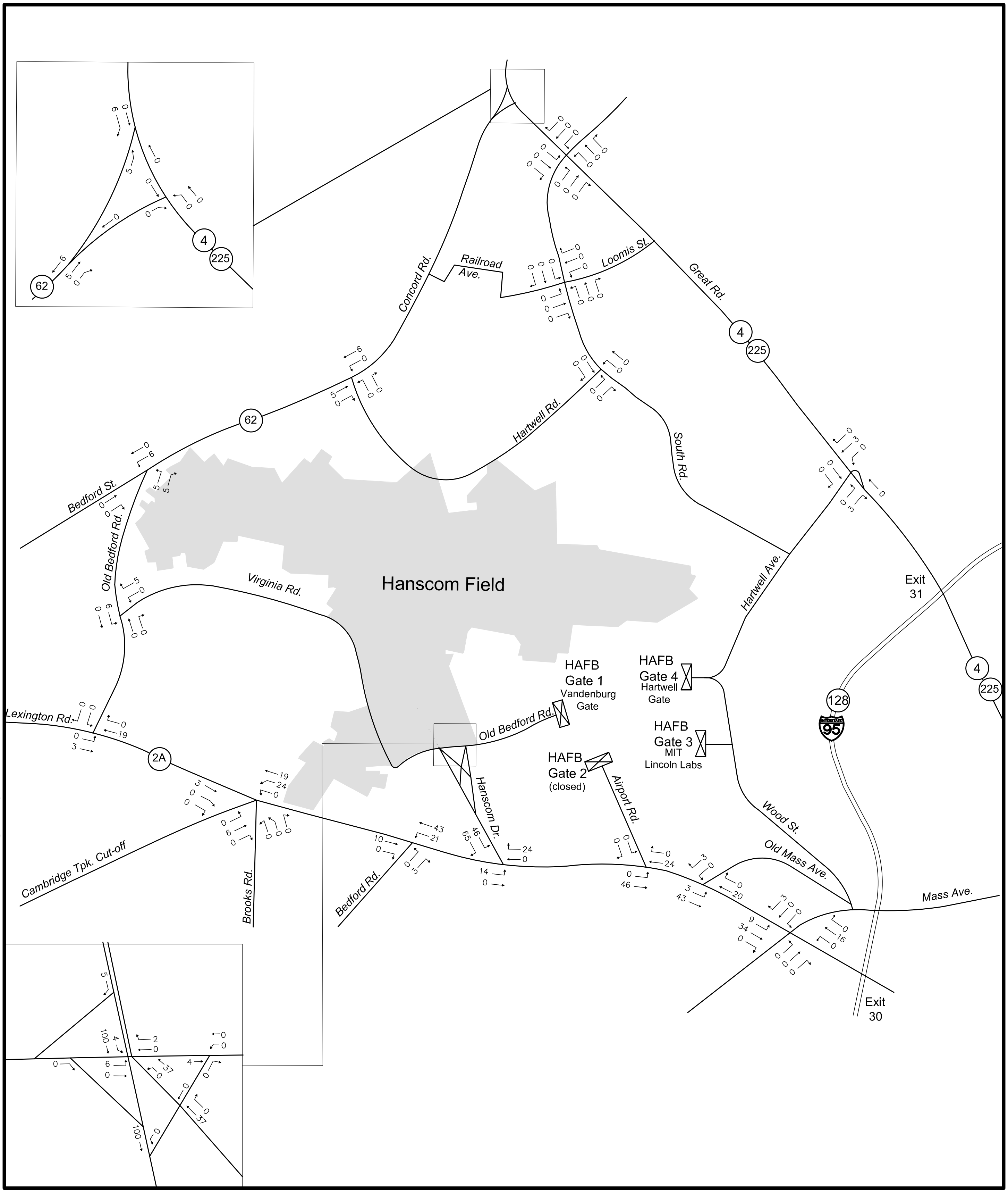


North
NOT TO SCALE

Hanscom Field 2012 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

2020 Morning Peak Hour Traffic Volumes (Hanscom Field Only)

Figure **6-14**



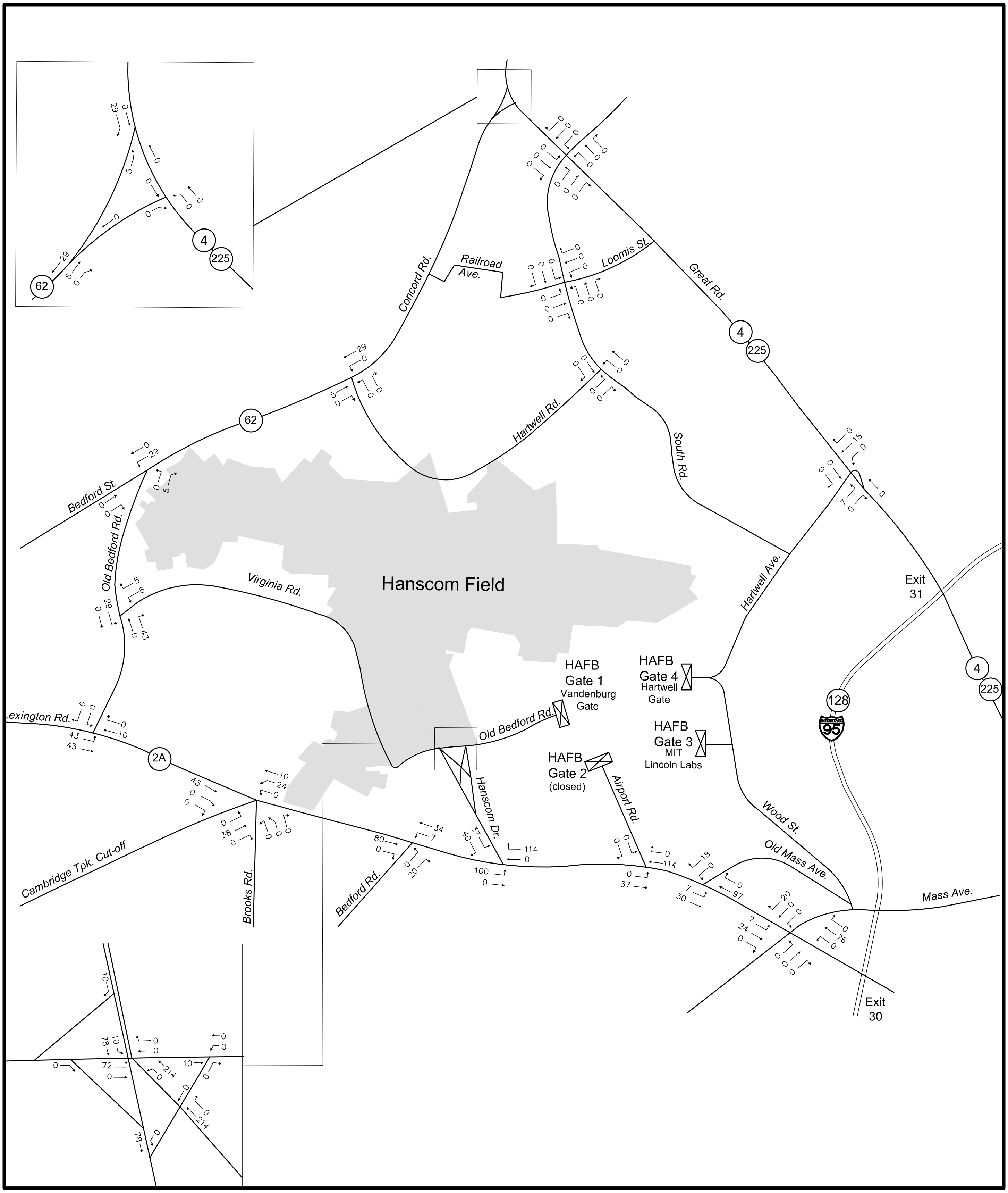
Path: B:\ACTPROJ\6024 MassPort Hanscom\Traffic\PDFS\Fig 6-15.pdf

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2020 Afternoon Peak Hour Traffic Volumes (Hanscom Field Only)

Figure **6-15**



North

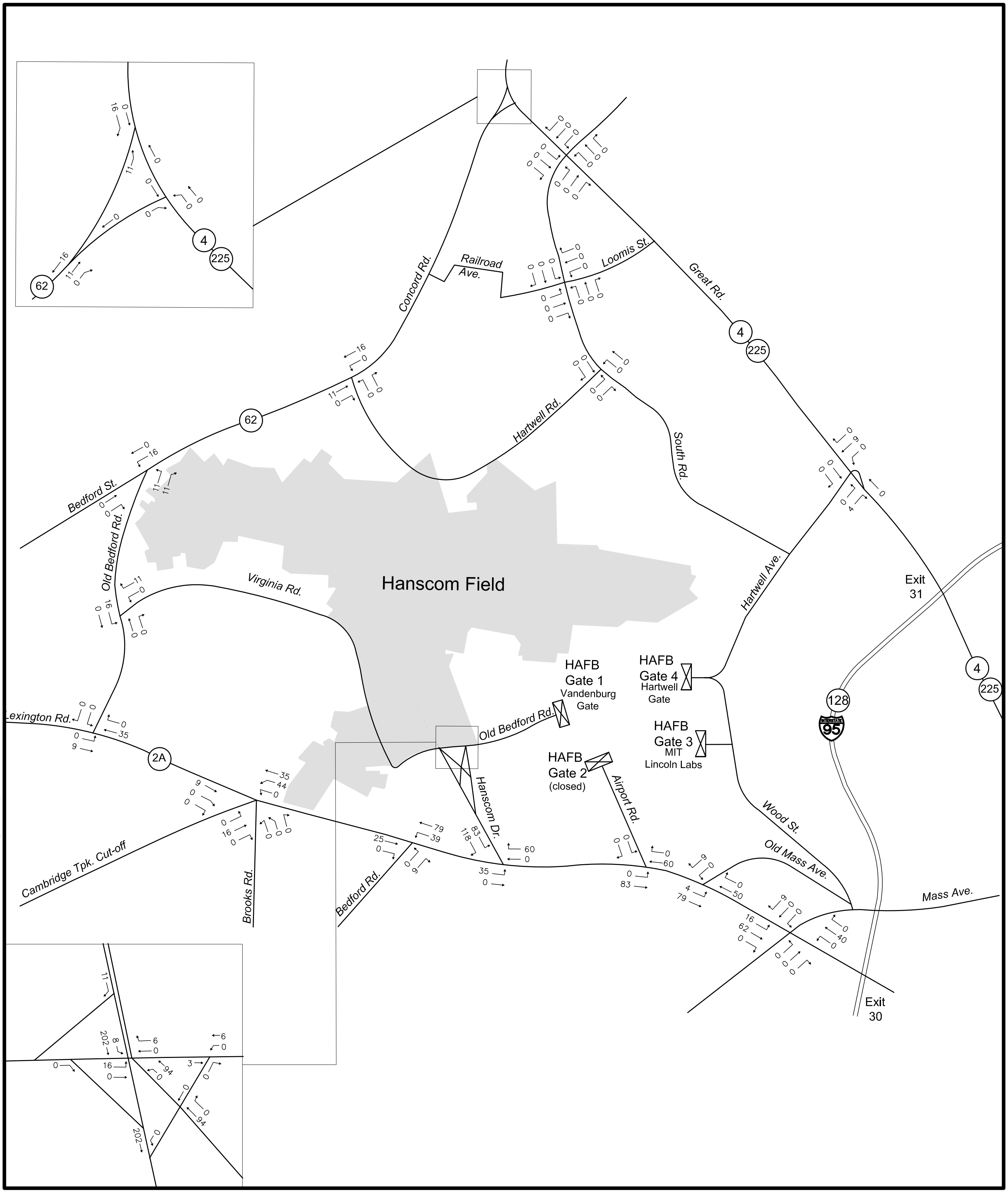
NOT TO SCALE

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2030 Morning Peak Hour Traffic Volumes (Hanscom Field Only)

Figure **6-16**



North

NOT TO SCALE

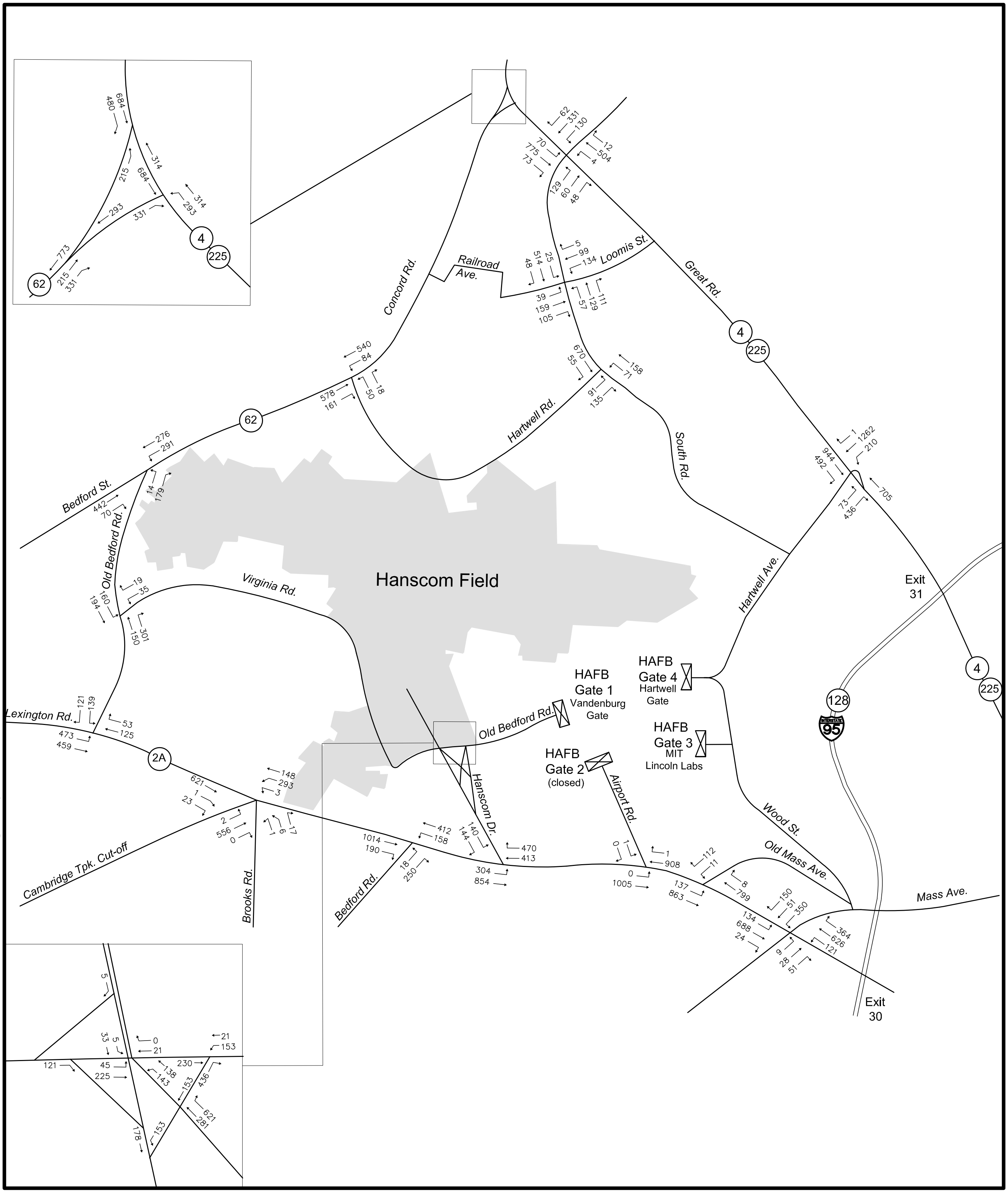
massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2030 Afternoon Peak Hour Traffic Volumes (Hanscom Field Only)

Figure **6-17**



North

NOT TO SCALE

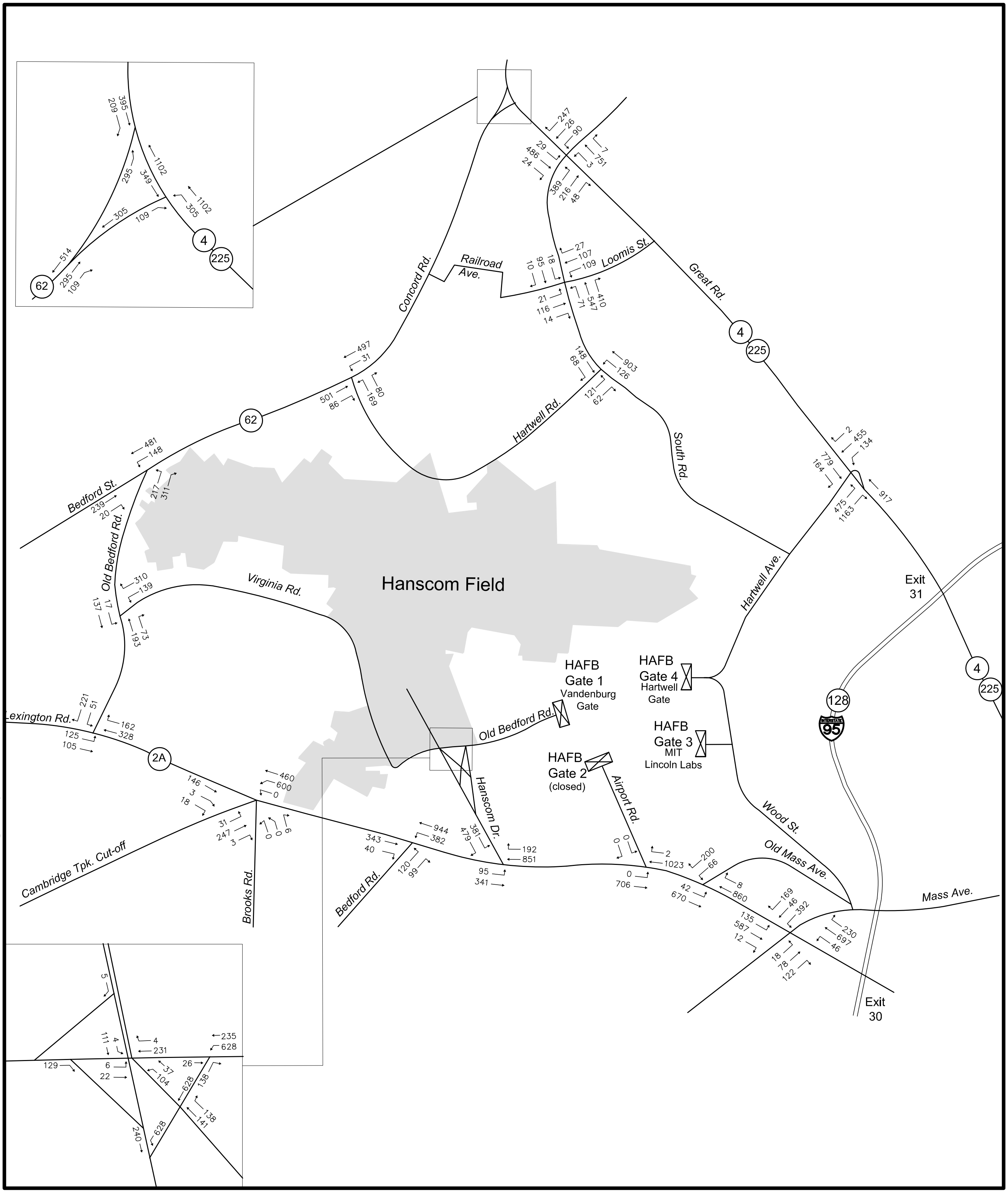
massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2020 Morning Peak Hour Traffic Volumes

Figure **6-18**



North

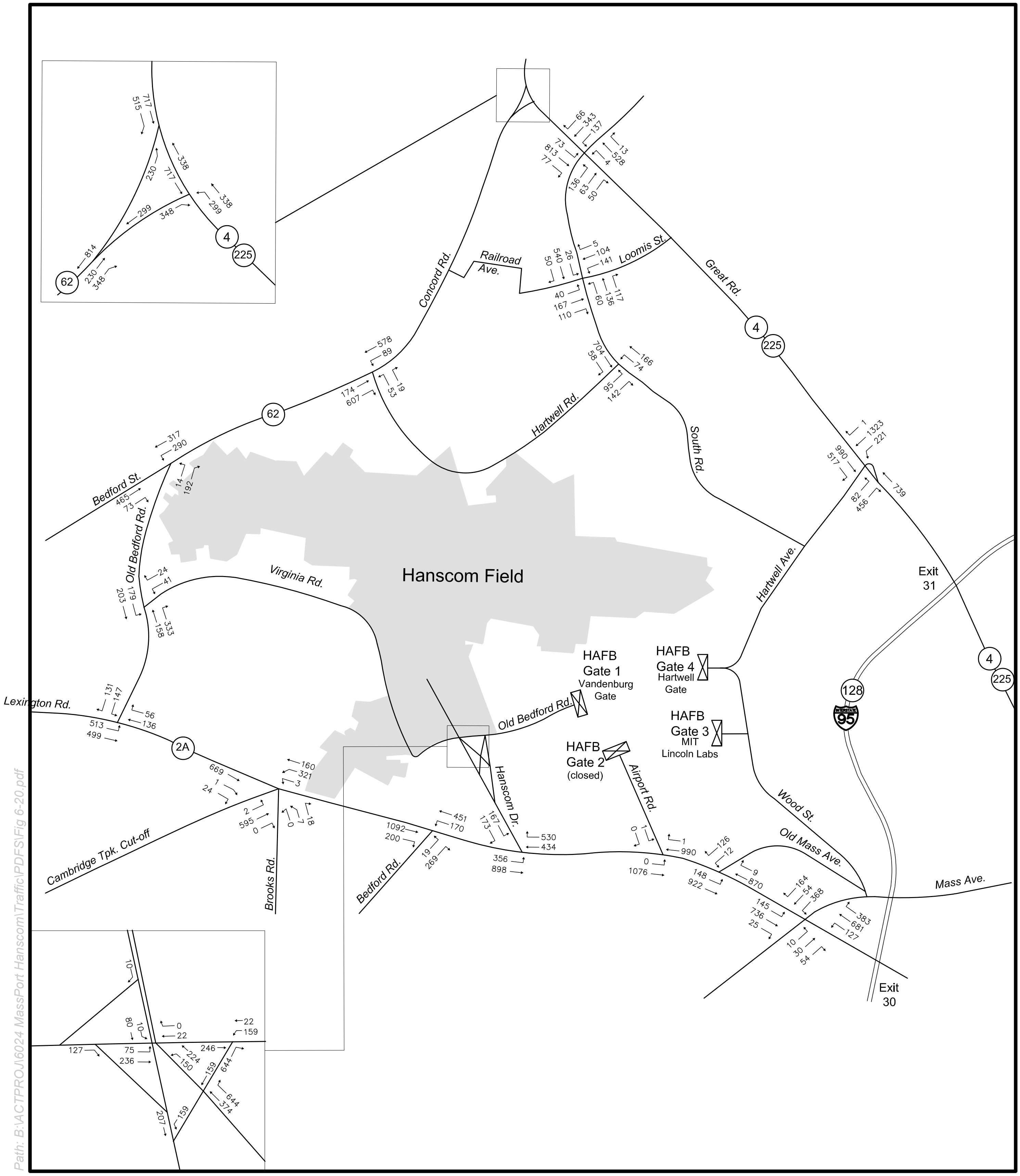
NOT TO SCALE

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2020 Afternoon Peak Hour Traffic Volumes

Figure **6-19**



North

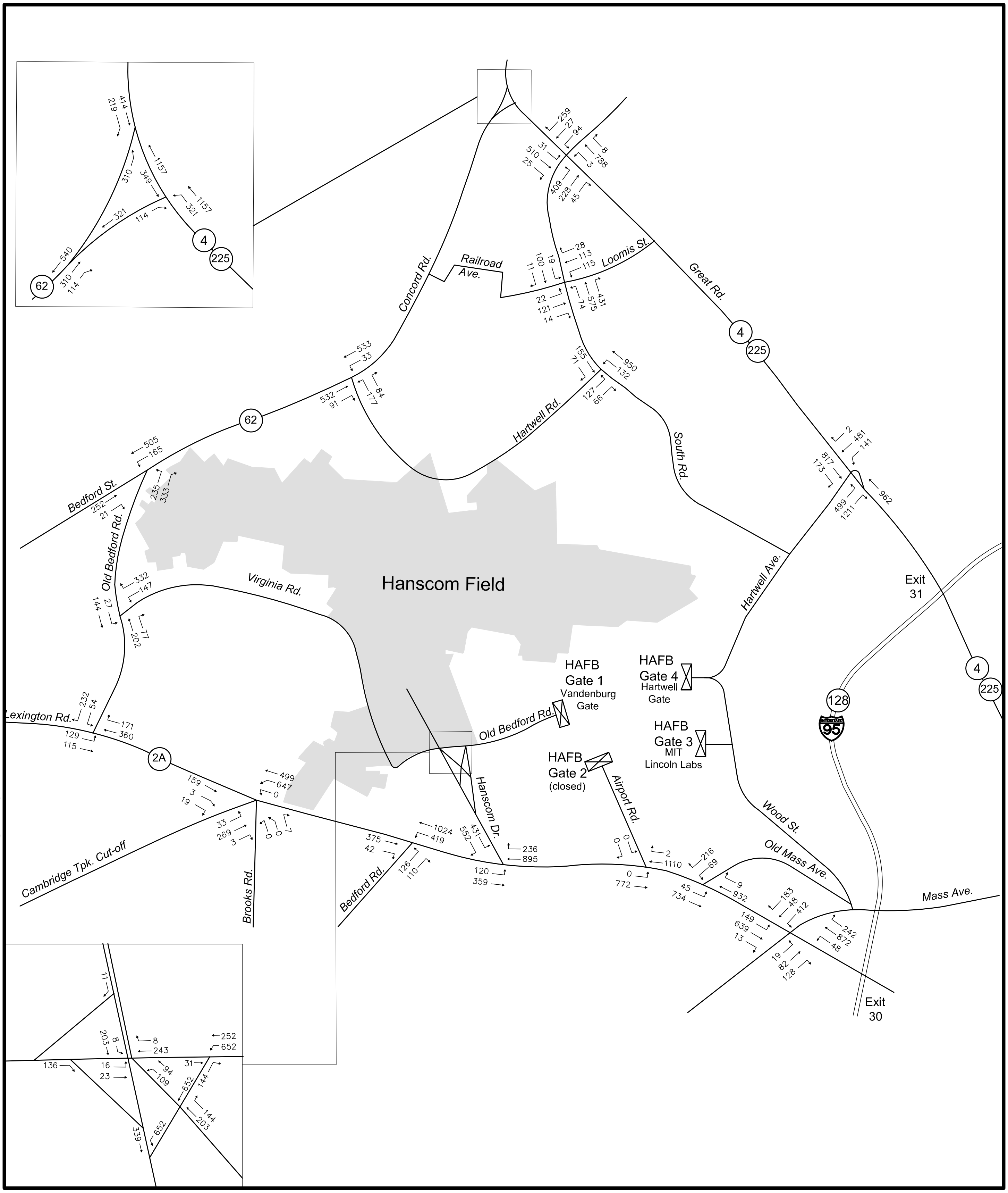
NOT TO SCALE

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2030 Morning Peak Hour Traffic Volumes

Figure **6-20**



North

NOT TO SCALE

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2030 Afternoon Peak Hour Traffic Volumes

Figure **6-21**

6.5.3 Planned roadway improvements

The future roadway networks for the 2020 and 2030 scenarios include planned and proposed roadway improvements as described below. Planning officials from Bedford, Concord, Lexington, and Lincoln were contacted to identify specific roadway improvements that are planned or are under construction within the vicinity of Hanscom Field. Table 6-12 summarizes the roadway improvement projects that were identified (see Figure 6-22 for corresponding locations). None of these projects are anticipated to have a significant impact on traffic operations and circulation in the study area during the morning or afternoon peak hours.

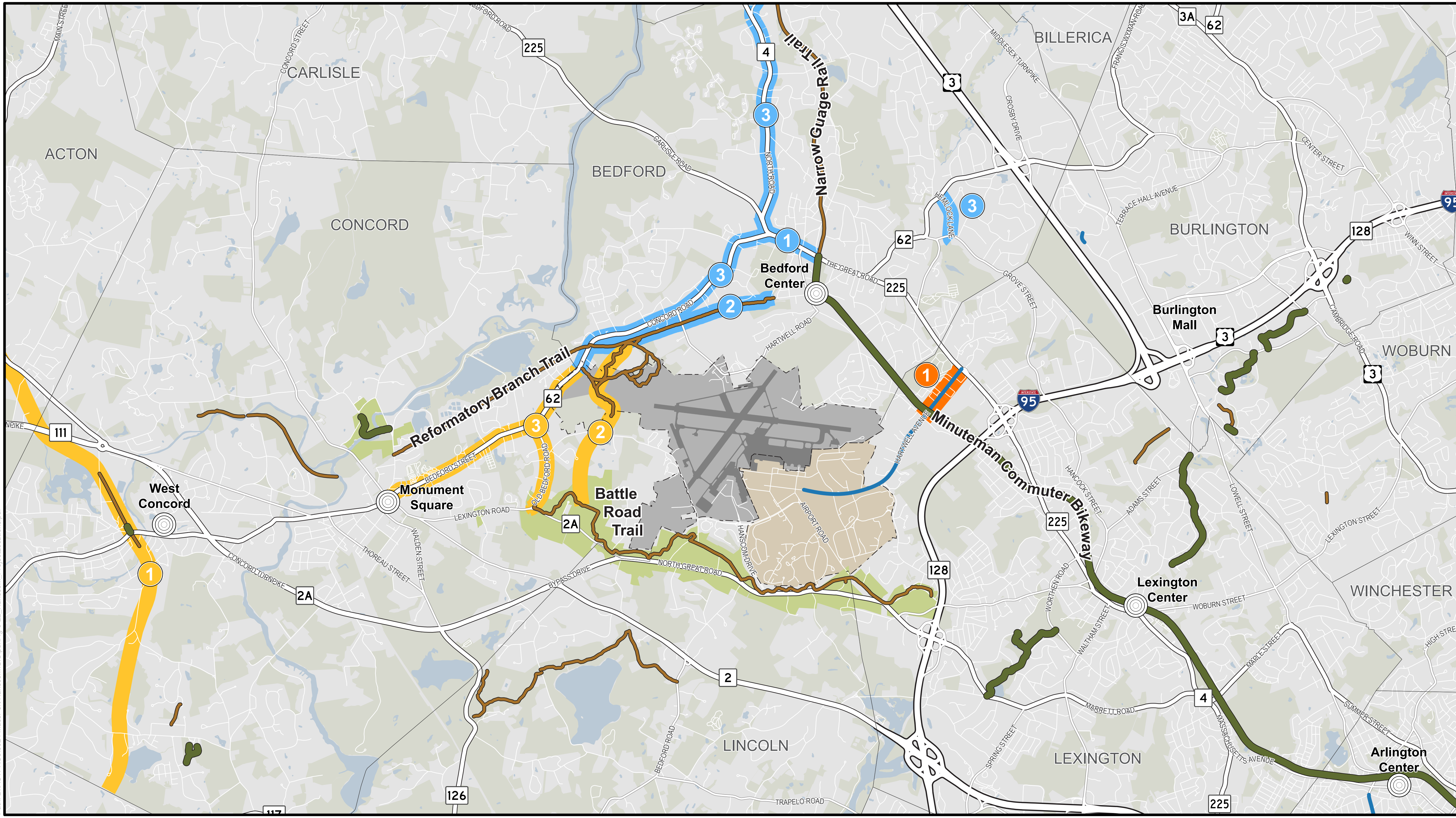
Table 6-12 Planned Transportation Capital Improvement Projects

Map #	Project	Description	Status	2020	2030
Town of Bedford					
1	The Great Road Master Plan	Along The Great Road and North Road between Veterans Memorial Park to the intersection with Carlisle Road. Improvements to pedestrian and bicycle access; streetscape improvements; access management; possible traffic signals at Fletcher Road and Mudge Way	Planning / Conceptual Design	√	√
2	Minuteman Enhancement Project	Pave existing Reformatory Branch railroad corridor from Depot Park to Concord Road	Preliminary Design	√	√
3	Sidewalk construction	Feasibility of constructing sidewalks on Hemlock Lane, Concord Road, North Road	Planning	√	√
Town of Concord					
1	Bruce Freeman Rail Trail	Phase 2 of the trail through West Concord along 25-mile shared-use path between Lowell and Framingham	Planning / Preliminary Design	√	√
2	Concord Land Trust to Gaining Ground Trail Connection	The Natural Resource Commission plans to blaze a trail through land owned by the non-profit organization Gaining Ground to connect the trail system at Massport and then to Reformatory Branch Trail to the Minuteman National Historic Park and Battle Road Trail and eventually connect to Concord and Bedford's larger trail networks	Planning	√	√
3	Sidewalk/ADA Compliance Program	Install new ADA compliant ramps on Old Bedford Road and Bedford Street from the Bedford Town Line to Monument Square	Under Construction	√	√
Town of Lexington					
1	Hartwell Avenue between Bedford Street and Maguire	Reconstruct and widen for four travel lanes, center left-turn lane, bike lanes and sidewalks. Signalize the Hartwell Avenue & Maguire intersection. Update signal at Minuteman Bikeway crossing.	Design	√	√

Source: Personal Communications with staff from the towns of Bedford, Concord, Lexington, and Lincoln

A project currently under construction is the Crosby's Corner project on Route 2 at the Concord/Lincoln town line to allow uninterrupted through movements for eastbound and westbound traffic on Route 2 and improve safety. The project will provide a limited-access roadway with a grade separated connection and service roads. As described in the *2005 ESPR*, the potential impacts of the Crosby's Corner project were evaluated through the CTPS transportation demand mode, which indicated that the proposed grade separation at Crosby's Corner would have minor impacts on Route 2A demand because Routes 2 and 2A are not generally used as parallel and substitutable routes. The model suggests that after the project is completed, Route 2A may experience minor reductions in peak hour traffic volumes. These adjustments were not included in the *2012 ESPR* analysis to provide a conservative analysis.

(This page intentionally left blank)



North

0 0.5 1 Mile

Data Sources: MassGIS Basemap Layers, MAPC Bike/Ped Facilities 2013

- Hanscom Field
- Hanscom Air Force Base
- Municipal Boundary
- Town Center
- Minuteman National Historical Park
- Hard Surface Path
- Natural Surface Path
- Bike Lane
- Proposed Path
- Battle Road Scenic Byway
- Proposed Addition to Battle Road Scenic Byway
- 1 Town of Bedford, Ongoing Project
- 1 Town of Concord, Ongoing Project
- 1 Town of Lexington, Ongoing Project

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Ongoing Projects in Adjacent Jurisdictions

Figure **6-22**

(This page intentionally left blank)

6.5.3.1 Analysis of future traffic volumes

Analysis of the anticipated traffic increases indicates that most of the increases from year 2012 levels occur as a result of regional background traffic growth and traffic from planned and anticipated projects near Hanscom Field. Hanscom Field-related traffic represents approximately 7 to 22 percent of traffic volumes at study area intersections closest to Hanscom Field and less at locations further from the study area in the forecast scenarios.

6.5.3.2 Hanscom Drive traffic volumes

Figure 6-23 illustrates the percent of Hanscom Field-related peak hour traffic volumes on Hanscom Drive for the Existing (2012) and the 2020 and 2030 forecast scenarios. In the existing and 2020 forecast scenarios, Hanscom Field-related traffic makes up between 12 and 14% of traffic and it increases to 22% of traffic in the 2030 forecast scenario. The increase in percentage of Hanscom Field-related traffic in the 2030 forecast scenario is attributable to the trips associated with the full-build out of the museum and hotel.

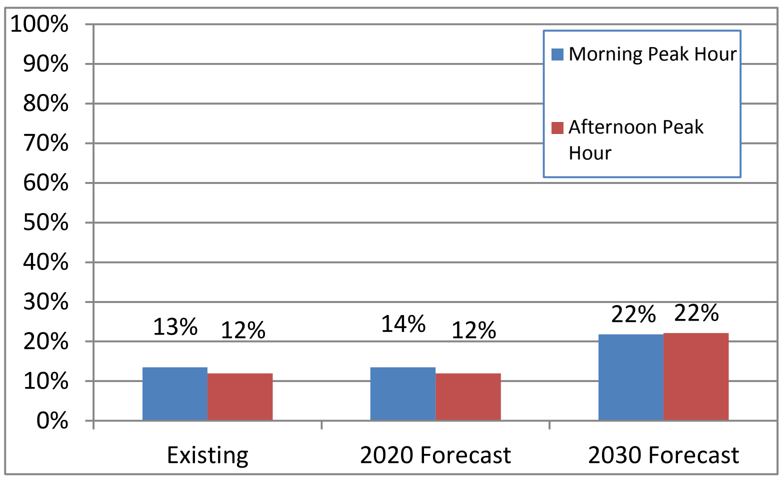


Figure 6-23 Hanscom Field 2020 and 2030 Peak Hour Traffic Volumes as a Percent of Hanscom Drive Traffic Volumes

6.5.3.3 Route 2A traffic volumes

Figure 6-24 illustrates the percent of Hanscom Field-related peak hour traffic volumes on Route 2A for Existing (2012) and the 2020 and 2030 forecast scenarios. In the existing and 2020 forecast scenarios, Hanscom Field-related traffic makes up between 3% and 5% of traffic and increases to 7% of traffic in the 2030 forecast scenario. The increase in percentage of Hanscom Field-related traffic in the 2030 forecast scenario is attributable to the trips associated with the full-build out of the museum and hotel.

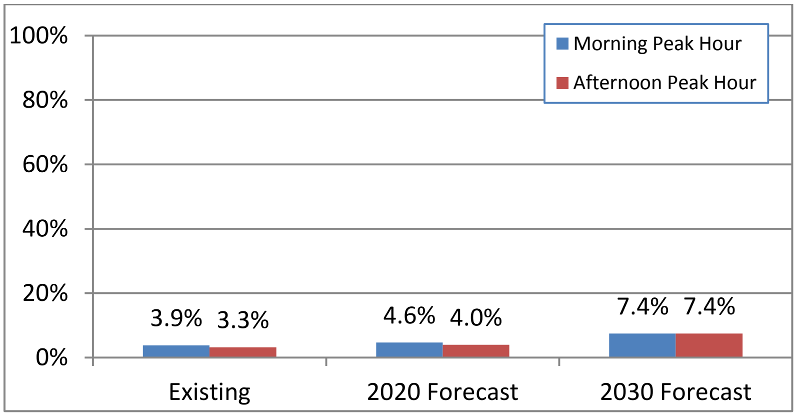


Figure 6-24 Hanscom Field 2020 and 2030 Peak Hour Traffic Volumes as a Percent of Route 2A (East of Hanscom Drive) Traffic Volumes

6.5.4 Future intersection analysis

Future intersection operations were evaluated for study intersections with movements that exceed the ten percent threshold under the 2020 and 2030 forecasts. Table 6-13 shows the intersections that could have one or more traffic movements with ten or more percent Hanscom Field-related traffic volumes under future scenarios. The procedures described earlier in this chapter were used to determine future weekday peak hour intersection operations. To identify effects related to Hanscom Field and those that would be regional in nature, an analysis was also conducted for 2020 and 2030 scenarios assuming no growth in Hanscom Field traffic volumes. These "background growth only" scenarios were compared with the forecast scenarios for each future analysis year. Detailed traffic capacity analysis reports are included in Appendix C.

Table 6-13 Intersections exceeding ten-percent threshold

Refer to Figure 6-5 for locations map.

Intersection	Peak Hour	Analysis Years & Scenarios		
		2012 Existing	2020 Forecast	2030 Forecast
#2 Massachusetts Avenue & Route 2A (Lexington)	Morning			√
	Afternoon			√
#3 Old Massachusetts Avenue & Route 2A (Lexington)	Morning			√
	Afternoon			√
#4 Airport Road & Route 2A (Lexington)	Morning			√
	Afternoon			√
#5 Hanscom Drive/Old Bedford Road (Lincoln)	Morning	√	√	√
	Afternoon	√	√	√
#6 Hanscom Drive/Route 2A (Lincoln)	Morning	√	√	√
	Afternoon	√	√	√
#9 Old Bedford Road/Lexington Road (Concord)	Morning			
	Afternoon			√
#10 Old Bedford Road/Virginia Road (Concord)	Morning		√	√
	Afternoon	√	√	√

6.5.4.1 2020 forecast scenarios

Tables 6-14 and 6-15 present the comparison of traffic operations for the 2020 forecast scenarios with and without potential increases in Hanscom Field traffic increases for the morning and afternoon peak hours, respectively. These results indicate that most intersections would operate at the same LOS or with only slight increases in delay regardless of the amount of Hanscom Field-related traffic growth. At the intersection of Route 2A and Hanscom Drive, the analysis indicates that the southbound movements are operating with delay during the morning and afternoon peak hours. However, as described in Section 6.3.5.2 Existing Intersection Operations, the analysis is not accurately representing actual operating conditions based on observations of several unique behaviors at this intersection. However, the additional Hanscom Field-related traffic only contributes 3 to 4% of traffic to these movements. As such, these operational deficiencies are likely a result of regional background traffic growth and traffic from planned and anticipated projects near Hanscom Field, not Hanscom-field related traffic.

Table 6-14 Level of Service for 2020 Forecast: Morning Peak Hour

Refer to Figure 6-5 for locations map.

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay	v/c	LOS	Delay	v/c
#5 Hanscom Drive/Old Bedford Road						
Hanscom Dr NB LT	A	4.3	0.11	A	3.9	0.11
Hanscom Dr SB LT	A	0.6	0.00	A	0.8	0.00
Old Bedford Rd EB LT	C	20.2	0.39	C	24.9	0.49
Old Bedford Rd EB T	C	22.2	0.48	D	25.5	0.53
Old Bedford Rd WB LT	B	14.6	0.06	C	15.6	0.07
Old Bedford Rd EB T	B	14.3	0.03	C	15.3	0.03
#6 Hanscom Drive/Route 2A						
Rt. 2A EB L	A	9.8	0.31	A	9.9	0.32
Hanscom Dr. SB L	F	>200	>1.20	F	>200	>1.20
Hanscom Dr. SB R	C	21.1	0.46	C	22.0	0.49
#10 Old Bedford Road/Virginia Road						
Virginia Road WB LR	C	21.0	0.26	C	21.5	0.27
Old Bedford Road SB LT	A	5.0	0.17	A	5.1	0.18

Table 6-15 Level of Service for 2020 Forecast: Afternoon Peak Hour

Refer to Figure 6-5 for locations map.

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay	v/c	LOS	Delay	v/c
#5 Hanscom Drive/Old Bedford Road						
Hanscom Dr NB LT	A	5.9	0.07	A	5.6	0.08
Hanscom Dr SB LT	A	0.3	0.00	A	0.3	0.00
Old Bedford Rd EB LT	C	16.5	0.05	C	18.6	0.06
Old Bedford Rd EB T	B	12.1	0.03	B	12.6	0.03
Old Bedford Rd WB LT	C	16.1	0.39	C	17.4	0.41
Old Bedford Rd EB T	B	13.3	0.20	B	14.0	0.21
#6 Hanscom Drive/Route 2A						
Rt. 2A EB L	B	10.5	0.14	B	10.5	0.14
Hanscom Dr. SB L	F	>200	>1.20	F	>200	>1.20
Hanscom Dr. SB R	F	>200	>1.20	F	>200	>1.20
#10 Old Bedford Road/Virginia Road						
Virginia Road WB LR	D	32.8	0.83	D	33.2	0.83
Old Bedford Road SB LT	A	1.2	0.02	A	1.2	0.02

6.5.4.2 2030 forecast scenarios

Tables 6.16 and 6.17 present the comparison of traffic operations for the 2030 forecast scenarios with and without potential increases in Hanscom Field traffic for the morning and afternoon peak hours, respectively. These results indicate that most intersections would operate at the same LOS or with only slight increases in delay with Hanscom Field-related traffic growth compared to with background only. There are several intersections that would operate with one or more movements at LOS F during one or more peak hours. All movements that operate at LOS F in the build scenario also operate at LOS F in the no build scenario. Furthermore, Hanscom Field-related traffic has no or a minimal contribution to these movements, as described below. As such, these operational deficiencies are likely a result of regional background traffic growth and traffic from planned and anticipated projects near Hanscom Field, not Hanscom-field related traffic.

- Mass Avenue/Route 2A - Several movements (Route 2A eastbound left, Route 2A westbound through and Mass Avenue southbound left) operate at LOS F both with background traffic only and with Hanscom Field traffic. The additional Hanscom Field-related traffic only contributes from 0 to 7% on each of these movements.
- Old Mass Avenue/Route 2A - The southbound approach operates at LOS F for the morning and afternoon peak hour with background traffic only and with Hanscom Field traffic. The additional Hanscom Field-related traffic only contributes 3 to 8% of traffic to this movement.
- Airport Road/Route 2A - The southbound approach operates at LOS F for the morning peak hour in both the 2030 With Background Only and 2030 Forecast scenarios. However, the gate to Hanscom AFB on Airport Road was closed in 2011 and this road does not provide access to other properties. Therefore, there is only one vehicle turning left from Airport Road during the morning peak hour and no cars during the afternoon peak hour. The additional Hanscom Field-related traffic does not contribute any traffic to this movement.
- Hanscom Drive/Route 2A - The analysis indicates that the southbound movements are operating with significant delay during the morning and afternoon peak hours. However, as described in section 6.3.5.2 Existing Intersection Operations, the analysis is not accurately representing actual operating conditions based on observations of several unique behaviors at this intersection. The additional Hanscom Field-related traffic only contributes 12 to 16% of traffic to these movements.

At Hanscom Drive/Old Bedford Road, the eastbound approach operates at LOS B or C with Background Only and LOS E or F with Hanscom Field Traffic. While Hanscom Field would not contribute a large percentage of traffic to these eastbound movements, Hanscom Field traffic would contribute to the northbound and southbound movements, which conflict with the eastbound movements. As such, the changes in LOS may be attributed to forecasted Hanscom Field traffic volume increases. The plans for redesign of the Vandenburg Gate include in the construction of a roundabout at this intersection, which would result in improved LOS.

Table 6-16 Level of Service for 2030 Forecast: Morning Peak Hour

Refer to Figure 6-5 for locations map.

Intersection	2030 With Background Only			2030 with Hanscom Field Traffic		
	LOS	Delay	v/c	LOS	Delay	v/c
#2 Mass Avenue/Route 2A						
Rt. 2A EB L	F	173.4	1.20	F	190.2	>1.20
Rt. 2A EB TR	B	16.3	0.73	B	16.9	0.74
Rt. 2A WB L	C	23.8	0.65	C	27.3	0.69
Rt. 2A WB TR	F	121.9	1.19	F	141.6	>1.20
Mass Ave NB LTR	B	29.6	0.13	C	29.6	0.13
Mass Ave SB L	F	143.5	1.17	F	143.5	1.17
Mass Ave SB TR	B	31.4	0.30	C	31.5	0.32
#3 Old Mass Avenue/Route 2A						
Rt. 2A EB LT	A	7.3	0.23	A	8.1	0.24
Old Mass Ave SB LR	F	86.1	0.86	F	114.6	0.96
#4 Airport Road/Route 2A						
Airport Rd SB LR	F	85.7	0.02	F	98.5	0.03

Intersection	2030 With Background Only			2030 with Hanscom Field Traffic		
	LOS	Delay	v/c	LOS	Delay	v/c
#5 Hanscom Drive/Old Bedford Road						
Hanscom Dr NB LT	A	4.7	0.11	A	3.7	0.12
Hanscom Dr SB LT	A	0.7	0.00	A	0.8	0.01
Old Bedford Rd EB LT	C	20.7	0.41	F	61.0	0.83
Old Bedford Rd EB T	C	22.5	0.49	E	39.3	0.67
Old Bedford Rd WB LT	B	14.6	0.06	C	18.4	0.08
Old Bedford Rd EB T	B	13.6	0.03	C	16.7	0.04
#6 Hanscom Drive/Route 2A						
Rt. 2A EB L	B	10.0	0.33	B	10.5	0.38
Hanscom Dr. SB L	F	>200	>1.20	F	>200	>1.20
Hanscom Dr. SB R	C	23.2	0.51	D	29.7	0.63
#10 Old Bedford Road/Virginia Road						
Virginia Road WB LR	C	23.1	0.30	D	26.3	0.36
Old Bedford Road SB LT	A	5.2	0.19	A	5.6	0.21

Table 6-17 Level of Service for 2030 Forecast: Afternoon Peak Hour

Refer to Figure 6-5 for locations map.

Intersection	2030 With Background Only			2030 with Hanscom Field Traffic		
	LOS	Delay	v/c	LOS	Delay	v/c
#2 Mass Avenue/Route 2A						
Rt. 2A EB L	F	>200	>1.20	F	>200	>1.20
Rt. 2A EB TR	C	25.0	0.67	C	26.5	0.71
Rt. 2A WB L	C	22.8	0.24	C	23.5	0.27
Rt. 2A WB TR	F	162.2	>1.20	F	177.0	>1.20
Mass Ave NB LTR	C	34.6	0.37	C	34.6	0.37
Mass Ave SB L	F	>200	>1.20	F	>200	>1.20
Mass Ave SB TR	C	33.1	0.27	C	33.2	0.28
#3 Old Mass Avenue/Route 2A						
Rt. 2A EB LT	A	2.1	0.08	A	2.2	0.08
Old Mass Ave SB LR	F	>200	>1.20	F	>200	>1.20
#4 Airport Road/Route 2A						
Airport Rd SB LR	-	-	-	-	-	-
#5 Hanscom Drive/Old Bedford Road						
Hanscom Dr NB LT	A	6.2	0.09	A	4.4	0.09
Hanscom Dr SB LT	A	0.1	0.00	A	0.3	0.01
Old Bedford Rd EB LT	C	24.6	0.08	F	59.3	0.34
Old Bedford Rd EB T	B	13.9	0.04	C	15.1	0.05
Old Bedford Rd WB LT	C	22.0	0.51	D	26.8	0.57
Old Bedford Rd EB T	C	16.1	0.26	C	17.7	0.30
#6 Hanscom Drive/Route 2A						
Rt. 2A EB L	B	10.6	0.15	B	10.8	0.18
Hanscom Dr. SB L	F	>200	>1.20	F	>200	>1.20
Hanscom Dr. SB R	F	>200	>1.20	F	>200	>1.20
#10 Old Bedford Road/Virginia Road						
Virginia Road WB LR	D	27.1	0.75	D	29.0	0.77
Old Bedford Road SB LT	A	1.1	0.02	A	1.8	0.03

6.6 Potential Environmentally Beneficial Measures

6.6.1 Traffic management approaches

The intersection of Route 2A and Hanscom Drive may benefit from the use of additional traffic management approaches, especially if volumes reach the forecasted levels for the 2020 and 2030 scenarios. However, as described previously, Hanscom Field-related traffic is only a small contributor to the total traffic at the intersection with the remainder resulting from regional traffic and traffic from planned and anticipated projects in the study area. The use of a traffic control officer at Hanscom Drive and Route 2A during the morning peak hour and afternoon would improve the operation of the intersection. Additionally, a traffic signal would improve operations at the intersection and the current traffic volumes meet peak-hour thresholds warranting a traffic signal according to Figure 4C-4 of the 2009 Manual of Uniform Traffic Control Devices.

The intersection of Hanscom Drive and Old Bedford Road may benefit from additional traffic management approaches if the volumes reach the forecasted levels for the 2030 scenarios. The use of a traffic control officer or the installation of an all-way stop control may be considered at this intersection. Additionally, the plans for redesign of the Vandenburg Gate include a roundabout at the intersection, which would result in improved level of service.

6.6.2 Transportation Demand Management

The goal of Transportation Demand Management (TDM) is to reduce the number of single occupancy vehicles to increase the capacity of the transportation network and to reduce traffic congestion, traffic delay, and vehicle miles travelled during peak travel times. As part of the development of this report, the potential for expansion of TDM programs was explored at a regularly scheduled tenant meeting held at the Civil Air Terminal. Staff continues to discuss TDM strategies at these meetings to ensure that as programs are implemented they continue to meet the needs of students and employees at Hanscom and are effective in reducing single occupant vehicle use. Furthermore, Massport is planning TDM strategies for Hanscom Field including promoting transit service, initiating collaborations with Hanscom AFB, developing partnerships with MassRIDES, encouraging car pools, supporting vehicle sharing, increasing the viability of active transportation and additional strategies, which are described below. Additional information on how these recommendations will be implemented is provided in the sections below.

6.6.2.1 Travel survey findings

In a travel survey administered in July 2013 to employees and students at Hanscom Field, Massport sought to identify opportunities for environmentally beneficial measures that could reduce single-occupancy vehicle trips to and from the study area. Of the 65 respondents, 86% drive alone for their commute, while 12% use transit to reach the campus and 2% bicycle. 90% of respondents were employees, while 10% were students. Of the transit riders who responded, nearly all use the MBTA's 76 bus for at least the final leg of their trip.

Even though a large share of employees and students at Hanscom Field drive alone, there are opportunities to reduce the number of single-occupancy vehicles commuting each day. 28% of survey respondents expressed interest in learning about programs and incentives encouraging alternate modes of transportation. Respondents expressed greatest interest in replacing vehicle trips with transit, followed by carpooling/vanpooling, bicycling, and walking.

The most significant barrier to commuters using transit is the perception of convenience. 63% of respondents stated that lack of direct transit service between their homes and Hanscom Field was a deciding factor. 43% report not having a bus stop within convenient distance of their homes. 39% were dissuaded by irregular or infrequent service. On the flipside, those who drive alone overwhelmingly cite their commute time and convenience as their primary reasons for driving. Weighted for preference, these two factors were valued almost twice as much as irregular work schedules and needing a car for personal errands, the next two highest responses. Those who drive alone also enjoy free and convenient parking at

Hanscom Field (87% park in unrestricted lots). While respondents reported that they drive alone for the convenience and time savings, there is still an opportunity to replace trips and encourage alternate modes of transportation. The average one-way commute time reported was approximately 49 minutes. Given this duration, the additional time required to detour to pick up additional passenger is relatively small and the combination of the high cost of fuel and the relatively high average length of commutes suggest a potential to promote ridesharing as a way to reduce single occupancy vehicle trips. The majority (57%) of commuters rarely or never leave Hanscom Field during the day. These responses further suggest that if commuters who drive alone found a transit route or rideshare that was competitive in duration and at a suitable time, they could be motivated to replace at least some of their vehicle trips.

35% of respondents expressed they may be interested in carpooling if the schedule was accommodating. When visitors currently take alternative modes, most often they report either being dropped off or carpooling. Respondents reported that most motivating would be either financial incentives or finding suitable carpool partners to meet their scheduling demands. Also, having a program like Guaranteed Ride Home was listed as a valued motivator, as employees and students may be worried about not having the same flexibility to come and go that comes with a vehicle. The responses suggest that benefits associated with TMA membership might be prime motivators to reducing single occupancy vehicle trips.

Finally, 30% of respondents expressed interest in bicycling to commute—among those interested, they reported that incentives like shower and locker facilities, and low-stress bike paths would be the most likely to encourage them to bike. 23% expressed interest in combining biking and walking with transit; 75% of respondents feel they live too far to bicycle to work, but providing amenities like route planning services and transit stop bike parking might create multi-modal trips to replace vehicle trips.

6.6.2.2 Promoting transit service at Hanscom Field

Primary transit service to Hanscom Field is provided by the MBTA route 76 bus, which makes stops at the Civil Air Terminal and the intersection of Hanscom Field Drive and Old Bedford Road. However, several transit opportunities also occur in the area. The LEXPRESS Bus, which serves routes in the Town of Lexington between Lexington Center and Depot Square, operates a route that comes within a mile of the study area.

To promote use of transit, schedules for the MBTA buses that serve Civil Air Terminal are posted at the main entrance to the terminal building. In addition, information about using the MBTA bus to access the terminal is available on Massport's "Get U There" on-line application. Massport will continue to seek additional strategies and disseminate information about nearby transit access, such as transit hubs in Lexington Center (MBTA bus, LEXPRESS bus), Concord Center (MBTA bus and commuter rail), and Depot Square (LEXPRESS bus), so that commuters can plan to park-and-ride, bike, or walk parts of their commutes.

Strategies to increase transit ridership will continue current efforts to post information for employees, including on-line, at transit stops, and at regular Transportation Fairs (see Section 6.6.2.3 TDM Partnerships with Hanscom Air Force Base). Additionally, employees and students who completed the travel survey named one of the primary barriers to using transit was the lack of suitable service at times when they needed service. Massport will explore with municipal and regional partners the feasibility of expanding bus frequency throughout the day to make transit viable for more visitors to the study area. Massport will also participate in discussions with neighboring towns, Chambers of Commerce, the 128 Business Council, and the MBTA to review current bus service and amenities, and opportunities to expand service to Hanscom Field. Massport will initiate this discussion through its participation in the Hanscom Field Advisory Committee (HFAC) at a regularly scheduled meeting.

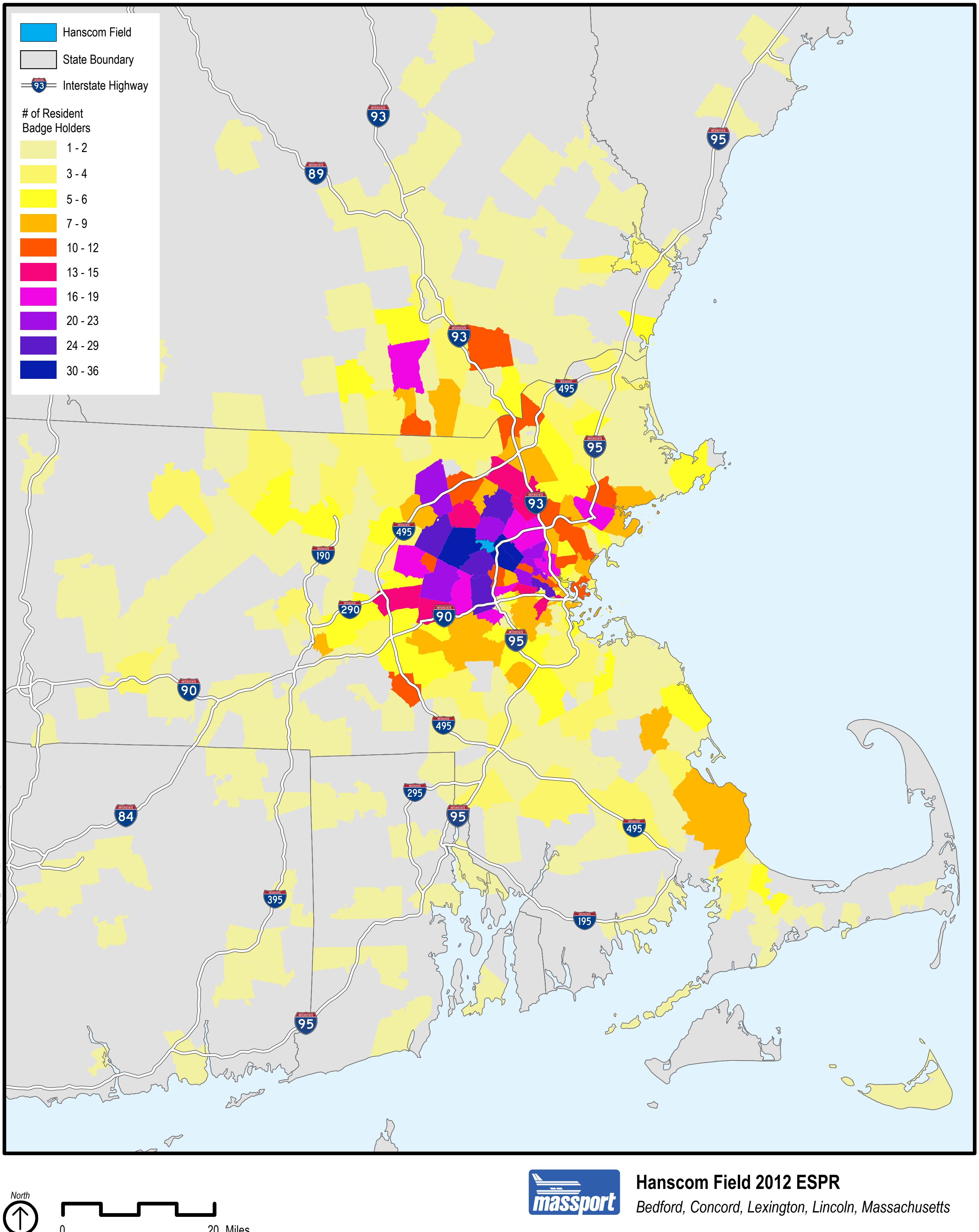
6.6.2.3 TDM partnerships with Hanscom AFB

Hanscom AFB has over 8,000 employees at the Base itself, and 2,000 to 3,000 additional employees at MIT Lincoln Labs (located on Hanscom AFB and operated by MIT). The Base has research and development space, residences, retail and commercial space, a medical facility, and childcare facilities. As part of its environmental permitting, the Base is required to develop and submit an annual rideshare report and identify potential strategies to reduce drive alone commute trips. The Base currently deploys a wide range of TDM measures and recently has seen an increased interest and participation in carpooling and vanpools. For vanpooling, the Base has partnered with the private company vRides. vRides operates by certifying individuals to drive company-owned vans home and pick up other members along predetermined routes. The Base maintains a ride-matching database of interested employees, who can be matched with other employees based on their location and commute time.

Massport has begun to collaborate with ground transportation coordinators at the AFB to provide information about TDM programs to employees and students working at Hanscom Field. Beginning in the winter of 2014, Massport and the AFB, in partnership with MassRIDES, will co-host a Transportation Fair on Hanscom Field to promote carpools, vanpools and available reward programs. Hanscom AFB, in partnership with MassRIDES and vRides, began hosting regular Transportation Fairs for its employees and visitors in 2013. The fairs serve to promote transportation alternatives and provide people with information about transit options, trip planning, and incentives to reduce single occupancy vehicle trips. As part of the event, MassRIDES provides information about existing and potential carpools and vanpools with maps showing the originating zip codes of people commuting to the Base. At fairs held during warmer months, there is increased focus on walking and bicycling including route planning assistance. Massport and AFB staff should continue to communicate regularly to identify additional partnership opportunities such as bicycle sharing (see below).

6.6.2.4 Partnership with MassRIDES

Massport is also pursuing opportunities to work with MassRIDES to reduce the number of single occupancy vehicles traveling to and from Hanscom Field. Massport has become an official program partner with MassRIDES which will allow employees on Hanscom Field to access commute options programs such as ride matching for carpools and vanpools, NuRide rewards for green commuters and an emergency ride home service. To promote the partnership, Massport will work with MassRIDES to deliver an email communication to all employees outlining the services offered. In addition, Massport has invited MassRIDES to attend and present at a monthly tenant meeting to educate tenants on available programs and services. Massport is also planning to partner with MassRIDES to host a table during the transportation fair at the Hanscom Civilian Terminal during an upcoming Transportation Fair in conjunction with Hanscom AFB. Figure 6-25 illustrates the home zip codes of badge holders at Hanscom Field, which shows the potential for carpooling and vanpooling.



Path: B:\ACTPROJ\6024 MassPort Hanscom\GIS\pdf\Fig 6-25_Hanscom_ZIPS.pdf

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Hanscom Field Badge Holders: Resident Count by Zip Code

Data Sources: ESRI (US ZIP Codes) Sept. 2013, National Atlas State Boundaries and Roads, Sept. 2013, Hanscom Field Badge Holder Survey, 2013

Figure **6-25**

6.6.2.5 Participation in TMA

Massport will also continue to consider opportunities to work with the 128BC, which is the Transportation Management Association (TMA) that serves Burlington, Lexington, Needham, Newton, Waltham, Wellesley, Weston, and Woburn. 128BC offers member services such as shuttle service access; guaranteed Ride Home; commuter survey, analysis, and incentive programs; individual route planning assistance; carpool/vanpool matching; bike-to-work/walk-to-work planning and supportive services (including bike repair discounts at MyBike); and many other services to help reduce single occupancy vehicle trips.

The provision of shuttle service is provided to member businesses based on an assessment by the 128BC for the potential viability of new service at an additional cost to the employer and individual shuttle user. Due to logistical challenges, it is not likely feasible to extend one of the existing shuttles to serve Hanscom Field.

6.6.2.6 Strategies to increase carpooling

The most viable alternative mode, given the spatial diffusion of commuters to the base and required up-front cost to add transit service, is carpooling and vanpooling expansion. While partnering with Hanscom AFB, MassRIDES or 128BC would assist employees at Hanscom Field in locating carpool options, Massport is also exploring opportunities to promote carpooling including:

- Collaborating with the MBTA, neighboring towns, 128BC, MIT, and Hanscom AFB to improve transit access and park-and-ride connections
- Offering parking incentives to carpool participants
- Promoting NuRide tools to provide ride-matching services
- Encouraging employees to log non-single occupancy vehicle trips through NuRide
- Creating parking space for car-share vehicles.

Massport is investigating opportunities to incentivize vanpools and carpools. In addition to encouraging rewards, the agency is considering designating priority parking spaces in front of the Civil Terminal and other locations for vehicles used for vanpools and carpools. While there are currently no parking fees at Hanscom Field, in 2005 Massport installed infrastructure necessary to collect parking fees. If parking at Hanscom Field does transition to a fee-based structure, vanpools and carpools could still be allowed to park free of charge.

Massport can also connect commuters with the NuRide online tool. NuRide can assist commuters with ride-matching, and also provides a portal for logging non-single occupancy vehicle trips and mileage. As commuters begin logging miles of alternative modes of transportation, Massport can both encourage mode-shift (commuters will receive incentives for meeting benchmarks, and take pride in reducing their carbon footprint), and track the reduction of single occupancy vehicle trips and associated impacts on pollution across Hanscom Field.

6.6.2.7 Vehicle sharing

Massport sees opportunities to work with car-sharing providers to provide parking spaces for short-term car rentals. While the majority of employees do not leave Hanscom Field during the day, many cited the desire of having a vehicle available for when they need to run personal and work-related errands as reason for driving alone to work. Having car-share vehicles available provides an alternative that removes the barrier of not having a car when needed, and will help encourage mode-shift.

6.6.2.8 Active transportation

In addition to promoting transit and other vehicle-based alternatives to single occupancy vehicles, Massport is working to increase the viability of bicycling and walking.

Bicycle Network Expansion

The Minuteman Commuter Bikeway connects Alewife Station in Cambridge with Bedford Depot, and is easily accessible in Arlington Center, Lexington Center, and along the Massachusetts Ave corridor. It terminates at the Bedford Depot, where it connects to two unpaved rail trails: the Reformatory Branch Trail, which continues around the northern boundary of Hanscom Field to Concord Center; and the Bedford Narrow Gauge Trail, which continues to Billerica. The communities along the trail have also been expanding bicycle facilities which have helped increase access to and from the trail. Paving the Reformatory Branch Trail, currently in development, would increase the comfort-level for all types of cyclists to travel on the trail. In 2011, to help expand the regional trail system, Massport partnered with the towns of Bedford and Concord to help create an expanded network of hiking trails that connects trails in Bedford to Gaining Ground in Concord.

Other improvements to roadways around Hanscom Field would further support bicycling as a viable form of transportation and recreation. Route 2A (North Great Road) currently provides unique east-west access south of Hanscom Field. Between Massachusetts Avenue in Lexington and Lexington Road in Concord, North Great Road (Route 2A) has a pavement width of 24’, divided into two 11’ travel lanes and 1’ marked shoulder. The ROW is typically 40’ in this section and the speed limit is 40 mph. Where feasible, additional shoulder width should be considered to improve conditions for bicycling. Providing 3 additional feet on either side of the roadway would permit the creation of 4’ wide bike lanes. If sufficient width is not available to mark as an exclusive bike lane, a wider lane can be established to improve conditions for bicycling. Providing wider shoulders would also help reduce the lifecycle costs associated with roadway maintenance as the edge of the roadway would be subject to less load and risk of deterioration. Additional shoulder width should be provided where feasible if physical constrains make it practical to achieve throughout the entire corridors. These changes will also improve connections between the Minute Man National Historical Park and the Minuteman Bike Trail.

Hanscom Drive will be reconstructed as part a project to improve the Hanscom Visitor Control Center at the Vandenberg Gate to Hanscom AFB. While Hanscom Drive currently has no dedicated bicycle or pedestrian facilities, the proposed plans for the redesign of the Vandenberg Gate include the provision of wide shoulders for bicycle access as well as pedestrian accommodations. To support walking and bicycling between Hanscom Field, Old Bedford Road and Route 2A, dedicated facilities should be provided as part of this project. As anticipated pedestrian volumes are relatively low, a combined shared use facility separate from the roadway may be appropriate. Crossing treatments should also be provided to allow bicyclists and pedestrians to cross ramps, access roads and the roundabout.

Finally, while some bicycle parking is currently available, these facilities should be improved and expanded to better serve employees and visitors to Hanscom Field. There are currently two bicycle racks visibly located in the parking lot immediately adjacent to the Civil Air Terminal; Massport will look at replacing the existing racks with units that comply with the guidelines in the AASHTO Guide for the Development of Bicycle Facilities to provide proper two points of support for the bicycle frame and support easy locking. To further encourage bicycling, consideration is also being given to providing cover to the racks.

Massport is also exploring opportunities to provide indoor parking for employees to place their bicycles in a secure location for protection from weather and elements. In addition to any existing opportunities, this will also be considered as a part of any future development projects. In addition to bicycle parking, Massport is considering other facilities and amenities to encourage bicycling. Other potential facilities may include the self-service repair station similar to what is provided at MIT Lincoln Labs. Massport will also work with other tenants at Hanscom to promote the use of facilities to encourage and support bicycling. Another important amenity to encourage bicycling that was identified in the Travel Survey is the availability of lockers and showers. Showers are currently available for Massport employees and Hanscom Field tenants at the Civil Terminal and should be better promoted to staff.

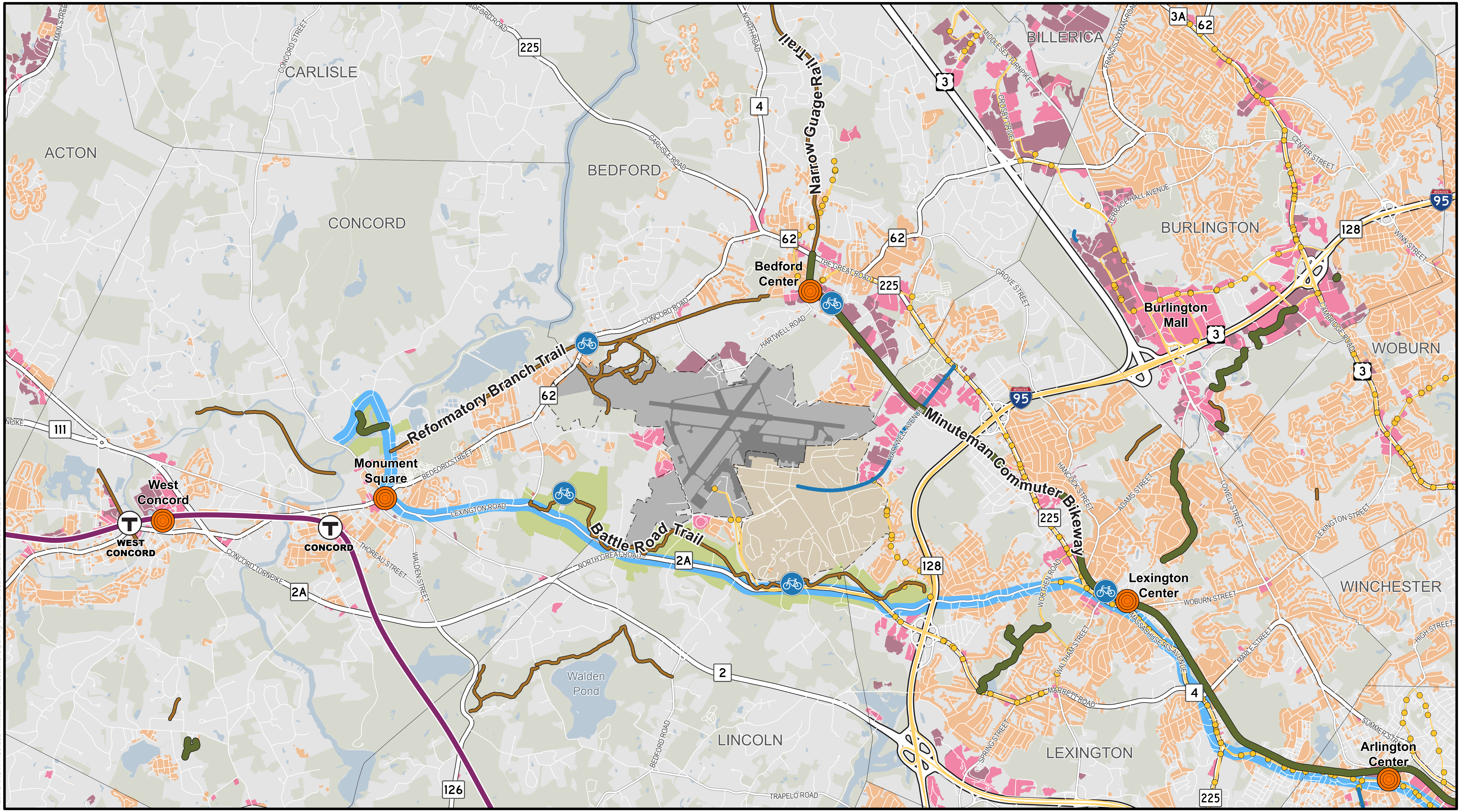
Bicycle Sharing

Massport sees the potential to promote bicycle sharing as a means to encourage bicycling at Hanscom Field as well as in surrounding areas. In meetings with transportation coordinators from the AFB, initial discussions have been held to explore the potential benefits of such a program for Hanscom Field and the Base as well as to surrounding areas. Compared to traditional bicycle rental, the primary benefit of bicycle sharing is the ability for the user to make one-way trips and lower the cost of shorter term uses.

As bicycle share provides an additional mobility option for ‘last mile’ connections to and from transit, existing programs have reported an increase in the overall number of transit users. For example the Concord MBTA commuter rail station is an approximately 25 minute bicycle ride from the Civil Air Terminal. While there are no exclusive facilities along this route, the existing network includes streets with wide curb lanes and relatively low traffic volumes. Bicycle sharing could also be used in conjunction with MBTA commuter rail for visitors to use bicycles to visit historic properties such as the Wayside and sites along the Battle Road and Minuteman National Historical Park. Figure 6-26 illustrates many of the destinations that a bicycle system could potentially be accessed in the area surrounding Hanscom Field. In considering the potential for bicycle share, Massport sees two primary options 1) a ‘campus’ program approach focused on Hanscom Field and the AFB; and 2) a regional program with neighboring towns and other agencies.

There are two basic bicycle share system types: either station-based on fixed location docking stations or stationless systems. The “Hubway” system used in Boston, Cambridge, Somerville and Brookline relies on bicycle availability at docking stations. Users can rent bicycles using two different methods: 1) register on-line for annual or monthly membership and receive a key which unlocks bicycles at any station, or 2) pay at a station for a 1 day or 3 day pass and receive a code which will unlock a bike at any station during that period. Rates are structured to promote a short trip and high levels of circulation. By contrast, stationless systems require users to register on-line to receive a code that will unlock an individual bicycle. Bicycles in stationless systems typically feature GPS so that users and managers can locate individual bikes. Stationless systems also require that ample bicycle parking be made available in the service area.

Bicycle sharing stations locations should be both convenient to potential users and placed in visible locations. Potential locations surrounding Hanscom Field include: Arlington, Bedford, Concord (i.e. West Concord and Monument Square), Lexington and Lincoln town centers; commuter rail train stations in Concord and Lincoln; and Minute Man National Historical Park (i.e. North Bridge Visitor Center and Minute Man Visitor Center). On Hanscom Field, potential locations include the Civil Air Terminal and the National Aviation Academy. For Hanscom Air Force Base, potential locations include the Minuteman Commons, Fitness and Sports Center, Lincoln Labs and other residential, office and commercial locations that generate relatively significant trips on the base.



North

0 0.5 1 Mile

- Hanscom Field
- Hanscom Air Force Base
- Municipal Boundary
- Minuteman National Historical Park
- Retail Land Use
- Industrial Land Use
- Medium-Density Residential
- Hard Surface Path
- Natural Surface Path
- Bike Lane
- Trailhead or Major Trail Entry Point
- Battle Road Scenic Byway
- MBTA Commuter Rail Station
- MBTA Commuter Rail Line
- MBTA Bus Route
- MBTA Bus Stop
- Town Center

Data Sources: MassGIS Basemap Layers, MAPC Bike/Ped Facilities 2013, Battle Road Scenic Byway Corridor Management Plan

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Bikeshare Suitability Map

Figure **6-26**

(This page intentionally left blank)

A key consideration that would need to be explored involves structures for a regional agreement regarding the program's operational model. A further feasibility study for the program will also need to consider how such a program could be funded, the potential for a relationship with the existing Hubway network, maintenance, and a more in depth analysis of the potential demand for bicycle sharing in the area given the relative low density. One strategy that has been used in other suburban programs is to provide longer usage periods to reflect the greater distances traveled compared to urban environment.

6.6.2.9 Additional Strategies to promote TDM at Hanscom Field

Administrative staff at Hanscom Field is developing a community and airport user outreach program. As part of this effort, staff is creating a stand-alone web site for Hanscom Field, in addition to developing a social media presence for the airport. One goal of the effort is to improve Massport's online and social media presence. As one of the key strategies of TDM efforts is the creative use of communication tools to promote alternatives, staff will be considering how best to integrate information and resources about alternatives to single occupancy vehicles. Potential improvements include links to existing carpools and vanpools that are accepting new riders and providing information and support on using bicycles to access the Hanscom Field.

6.6.2.10 Conclusion

Massport is committed to seeking opportunities to reduce single occupancy vehicle travel to Hanscom Field. Travel surveys indicate that there is the potential to increase ridesharing as an alternative for some trips. However, the combination of suburban land use patterns, limited transit service and long average distances traveled limit the ability to promote transit and bicycling and walking as alternatives for a significant number of trips.

(This page intentionally left blank)

7 Noise

This chapter presents the noise conditions at Hanscom Field for 2000, 2005 and 2012 to illustrate recent trends in noise up to present conditions, and for the 2020 and 2030 scenarios to predict future noise for the airport activity levels forecasted. A broad array of metrics is used to describe noise conditions including Day-Night Sound Level (DNL), Time Above a decibel threshold (TA), Total Noise Exposure (EXP) and Distribution of Sound Exposure Levels (SEL). Noise levels for each of the metrics are evaluated at noise sensitive receptors including hospitals schools, religious sites, public facilities, and National Register of Historic Places and/or State Register of Historic Places presented in the chapter by municipality. Massport’s noise abatement program is also described, including how Massport is working with local stakeholders to assess noise and mitigate impacts.

The *2012 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 scenarios are estimates of what *could* occur (not what *will occur*) in the future using certain planning assumptions and are not necessarily recommended outcomes. The future service scenarios are fully consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

7.1 Key Findings Since 2005

In general, noise levels at Hanscom Field decreased over the last several years, due primarily to quieter and better performing aircraft and decreases in operations. The 2020 and 2030 scenarios, with the increases in general aviation (GA) jet activity to about 190,000 operations drive a projected increase in overall noise levels in the future though remaining below historical peak operations and reaching levels last experienced nearly a decade ago.

Massport has also made operational changes that have minimized noise impacts. In 2009, Massport began a new initiative to reduce noise over the Minute Man National Historical Park (MMNHP). Most touch-and-go operations circled to the south of the airport often taking the aircraft over areas of the Battle Road Trail that are used by the Park for outdoor programs and interpretive talks. A partnership of Massport, National Park Service (NPS), the Federal Aviation Administration (FAA), the flight schools and Hanscom pilots determined that small aircraft could increase the use of a tight touch-and-go pattern that keeps the aircraft over the airfield rather than over sensitive park areas. Using radar data, Massport staff monitors the number of touch-and-go operations over the MMNHP. This data is a critical part of ongoing quarterly meetings between Massport, FAA air traffic control tower, and flight school staff to review touch-and-go flight paths. Since the initiation of this program, flights over MMNHP have been reduced by an average of 21%.

Comparison of year 2012 DNL noise contours to 2005 contours shows that overall noise levels decreased. Modeled noise values for 2000 are also included in this section and demonstrate longer-term trends of decreasing noise. This is largely due to overall lower activity levels, lower activity levels by jets, much lower activity by Stage 2 GA jets, and a decrease in nighttime operations. FAA land use compatibility guidelines, assume that individuals exposed to greater than 65 dB DNL are considered significantly affected by noise. None of the Hanscom Field noise analysis location sites is currently exposed to a DNL value above the FAA land use compatibility criterion of 65 dB.

Overall, noise levels have decreased from 2000 to 2005 and again in the base year 2012. With the forecasted level of aircraft operations, noise is anticipated to increase in 2020 over 2012 and then again in 2030. However, 2020 noise will remain lower than what was experienced in 2005, and 2030 noise will be comparable to 2005. The following statistics illustrate the decrease in noise:

- Total population exposed to DNL greater than 65 dB was reduced to zero in 2012 from 17 in 2005 (all in Bedford) and 26 in 2000. The total population in the four towns exposed to DNL values of 55 dB or greater decreased from 2,953 residents in 2005 (up slightly from 2,848 in 2000) to 1,041 in 2012 (see Table 7-1). While the 2030 scenario generates the highest noise levels of this analysis, in all future scenarios, there are no residents exposed to noise levels exceeding 65 dB or greater. Forecast noise levels for the 2030 scenario show increases in DNL up to 2 dB at some noise analysis locations. Table 7-1 presents the population estimates within the 65 and 55 DNL contours for 2000, 2005, 2012, and the 2020 and 2030 scenarios.

Table 7-1 Summary of U.S. Census Population Counts within DNL Contours

Year/Scenario	Population[1]	
	65 dB or Greater[2]	55 dB orGreater[3]
2000	26	2,848
2005	17	2,953
2012	0	1,041
2020	0	1,176
2030	0	1,859

Notes:
1. Based on the 2010 U.S. Census except for 2005 which was computed for the *2005 ESPR* using the 2000 U.S. Census
2. These population estimates fall within the 65 and 70 DNL contours.
3. These population estimates include population within the 55, 60, 65 and 70 DNL contours.

- The few historic sites within the 60 DNL contour for the *2005 ESPR* today have lower noise levels and there are no historic sites within the 65 DNL contour. There are only two historic sites that have DNL values greater than 55 dB in 2012: Deacon John Wheeler/Capt. Jonas Minot Farmhouse (NC-18) in Concord at 58.4 dBA, which had a DNL value of 60.4 dBA in 2005; and Wheeler-Meriam House (NC-19) in Concord at 58.1 dBA, which had a DNL value of 59.9 dBA in 2005. No noise analysis locations would experience a DNL value greater than 60 dB under any scenario. Three historic sites would experience noise levels between 55 and 60 dB: the Deacon John Wheeler/Capt. Jonas Minot Farmhouse in Concord would range from 58.7 dBA in the 2020 scenario to 59.8 dBA in the 2030 scenario; the Wheeler-Meriam House in Concord would range from 58.4 dBA in the 2020 scenario to 59.4 dBA in the 2030 scenario; and the Ripley School (SC-7) in Concord is forecast at 55.0 dBA in the 2030 scenario. None of the sites in the MMNHP would experience a DNL value greater than 55 dB for 2012 or any future scenario.
- No portion of the MMNHP is located in the 65 DNL contour in 2012 or in the 2020 and 2030 planning scenarios. Furthermore, no portion of the MMNHP is in the 55 DNL contour in 2012, down from 1.7 acres in 2005. MMNHP is not forecast to include any 55 DNL area in the 2020 planning scenario and 0.4 acres in the 2030 scenario.

7.2 Noise Terminology

Noise, often defined as unwanted sound, is an environmental issue associated with aircraft operations. Aircraft are not the only sources of noise in an urban or suburban environment where interstate and local roadway traffic, rail, industrial, and neighborhood sources also intrude on the everyday quality of life. Nevertheless, aircraft are readily identified by their noise and are typically singled out for special attention and criticism. Consequently, aircraft noise often dominates analyses of environmental impacts. To help understand and interpret these impacts, it is important to be familiar with the various metrics that are used to describe the noise from an aircraft and from the collection of noise events that comprise an airport noise environment. This introductory section describes those commonly used noise metrics, in increasing complexity. They include the:

- Decibel (dB)
- A-weighted decibel, or sound level (dBA)
- Sound Exposure Level (SEL)
- Equivalent Sound Level (L_{eq})
- Day-Night Sound Level (DNL)
- Total Noise Exposure (EXP)
- Time Above (TA)

The *2012 ESPR* reports noise levels at Hanscom Field in terms of these metrics, including SELs for typical individual events, and Time Above contours and DNL contours for typical 24-hour exposure periods. All three of these metrics utilize A-weighted sound levels as their basic unit of measurement. The *2012 ESPR* uses the highlighted metrics (i.e., SEL, EXP, and TA) to supplement DNL contours and DNL values at noise analysis locations. A discussion of the effects of aircraft noise on people is provided in Appendix D.

7.2.1 The Decibel (dB)

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (e.g., music) or unpleasant (e.g., jackhammer) depends largely on the listener's current activity, experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The loudest sounds the human ear can comfortably hear have one trillion (1,000,000,000,000) times the acoustic energy of sounds the ear can barely detect. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes unwieldy. As a result, a logarithmic unit called the decibel is used to represent the intensity of sound. This representation is called a sound pressure level.

A sound pressure level of less than 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet conditions. Normal conversational speech has a sound pressure level of approximately 60 to 65 dB. Sound pressure levels above 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

7.2.2 A-weighted Sound Level (dBA)

Additionally, not all sound pressures are heard equally well by the human ear. Some tones are easier to detect than others and are perceived as being louder or noisier. Thus, in measuring community noise, frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's reduced sensitivity to those frequencies. This adjustment is called "A-weighting" and is commonly used in measurements of environmental noise.

Figure 7-1 shows A-weighted sound levels for some common sounds. In this document, all sound pressure levels are A-weighted and, as is customary, are referred to simply as "sound levels," where the adjective "A-weighted" has been omitted. Sound levels are designated in terms of A-weighted decibels, abbreviated dBA. With A-weighting, a noise source having a higher sound level than another is generally perceived as louder. Also, the minimum change in sound level that people can detect outside of a laboratory environment is on the order of 3 dB. A change in sound level of 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relationship remains so for loud sounds as well as for quieter sounds.

7.2.3 Sound Exposure Level (SEL)

A further complexity in judging the impact of a sound is how long it lasts. Long duration noises are more annoying than short ones. The period over which a noise is heard is accounted for in noise measurements and analyses by integrating sound pressures over time. In the case of an individual aircraft flyover, this can be thought of as accounting for the increasing noise of the airplane as it approaches, reaches a maximum, and then falls away to blend into the background (see Figure 7-2). The total noise dose, or exposure, resulting from the time-varying sound is normalized to a one-second duration so that exposures of different durations can be compared on an equal basis. This time-integrated level is known as the Sound Exposure Level, measured in A-weighted decibels.

Because aircraft noise events last longer than one second, the time-integrated SEL always has a value greater in magnitude than the maximum sound level of the event – usually about 7 to 10 dB higher for most airport environments. SELs are used in this study as a means of comparing the noise of several significant aircraft types; they are also highly correlated with sleep disturbance, an impact that is discussed in Appendix D.

The remaining noise metrics discussed in this section refer to the accumulation of exposure caused by multiple noise events over time. While such metrics are often viewed as downplaying the importance of individual aircraft operations, they are extremely good indicators of community annoyance with complex noise environments, and they have become widely accepted as the most appropriate means of evaluating land use planning decisions.

Figure 7-1 Common A-weighted Sound Levels

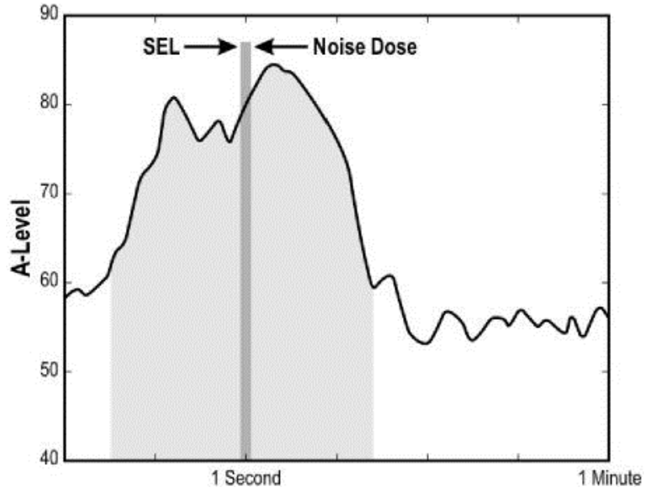


Figure 7-2 Illustration of Sound Exposure Level

7.2.4 Equivalent Sound Level (L_{eq})

The most basic measure of cumulative exposure is the Equivalent Sound Level. It is a measure of exposure resulting from the accumulation of A-weighted sound levels over a particular period (as opposed to an event) of interest such as an hour, an eight-hour school day, nighttime, a single 24-hour period, or an average 24-hour period. Because the length of the period can differ, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example L_{eq} (8) or L_{eq} (24).

Conceptually, the L_{eq} may be thought of as the constant sound level occurring over the designated period of interest and having as much sound energy as that created by the actual rising and falling sound pressures from multiple noise sources as they become more or less pronounced. This is illustrated in Figure 7-3 for the same representative one-minute of exposure shown earlier in Figure 7-2. Both the dark and light gray shaded areas have a one-minute L_{eq} value of 76 dBA. It is important to recognize, however, that the two representations of exposure (the constant one and the time-varying one) would sound very different from each other were they to occur in real life.

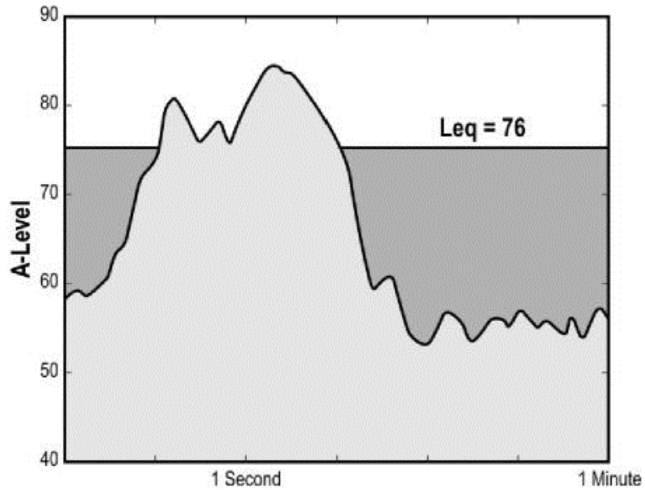


Figure 7-3 Illustration of Equivalent Sound Level

Often the L_{eq} is referred to misleadingly as an "average" sound level. This is not accurate in the traditional sense of the term average. Because decibels are logarithmic quantities, loud events dominate the calculation of the L_{eq}. For example, if an aircraft produced a constant sound level of 85 dBA for 30 seconds of a minute then immediately disappeared, leaving only ambient noise sources to produce a level of 45 dBA for the remaining 30 seconds, the Leq for the full minute would be 82 dBA – just 3 dBA below the maximum caused by the aircraft, not the 65 dBA suggested by normal averaging.

More typical timeframes of interest are daytime, nighttime, and annual average 24-hour exposure levels, but all of these same principles of combining sound levels apply to those periods as well. Loud noise events occurring during any timeframe are going to have the greatest influence on the overall exposure for the period.

7.2.5 The Day-Night Sound Level (DNL)

The most widely used cumulative noise metric is a variant of the 24-hour Leq known as the Day-Night Sound Level, or DNL, a measure of noise exposure that is highly correlated with community annoyance. The long-term (yearly) average DNL is also associated with a variety of FAA land use guidelines that suggest where incompatibilities are expected to exist between the noise environment and various human activities. Because of these strengths, the metric is required to be used on airport noise studies funded by the FAA.

In simple terms, DNL is the equivalent sound level for a 24-hour period, modified so that noises occurring at night (defined specifically as 10:00 p.m. to 7:00 a.m.) are artificially increased by 10 dB. This "penalty" reflects the added intrusiveness of nighttime noise events as community activity subsides and ambient noise levels get quieter. The penalty is mathematically equivalent to multiplying the number of nighttime noise events by a factor of ten.

The U.S. Environmental Protection Agency (EPA) identified DNL as the most appropriate means of evaluating airport noise based on its criteria, as follows:[30]

- The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods of time.
- The measure should correlate well with known effects of the noise environment and on individuals and the public.
- The measure should be simple, practical and accurate. In principal, it should be useful for planning as well as for enforcement or monitoring purposes.
- The required measurement equipment, with standard characteristics, should be commercially available.
- The measure should be closely related to existing methods currently in use.
- The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.
- The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods of time.

Despite these origins, the lay public often criticizes the use of DNL as not accurately representing community annoyance and land use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the measurement or calculation of DNL. One frequent criticism is based on the feeling that people react more to single noise events than to "meaningless" time-average sound levels. In

[30]Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, U.S EPA Report No. 550/9-74-004, September 1974.

fact, DNL takes into account both the noise levels of all individual events occurring during a 24-hour period and the number of times those events occur. The logarithmic nature of the decibel causes noise levels of the loudest events to control the 24-hour average, just as they were shown to do in the previous discussion of shorter-term L_{eq}s.

Most federal agencies dealing with noise have formally adopted DNL, though they also encourage the use of supplemental noise metrics to aid the public in understanding the complex noise environment of an airport. For example, Massport frequently uses the Sound Exposure Level, maximum sound level, or times above threshold sound levels to help describe the environments around Hanscom Field and Logan International Airport.

Even so, the Federal Interagency Committee on Noise (FICON), comprising of member agencies such as the FAA, Department of Defense (DoD), U.S. EPA, Department of Housing and Urban Development (HUD), National Aeronautics and Space Administration (NASA), Council on Environmental Quality (CEQ), and the Department of Veterans Affairs, reaffirmed the appropriateness of DNL in 1992. The FICON summary report stated, "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric".[31] The Federal Interagency Committee on Aviation Noise (FICAN) recently supported the use of supplemental metrics in its statement that "supplemental metrics provide valuable information that is not easily captured by DNL".[32]

DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for a relatively limited number of points, and, except in the case of a permanently installed noise monitoring system, only for relatively short time periods. Most airport noise studies are based on computer-generated DNL estimates, depicted in terms of equal-exposure noise contours, much as topographic maps have contours of equal elevation.

7.2.6 Total Noise Exposure (EXP)

The EXP metric was developed in 1982 as a screening tool for Massport to assess changes in the fleet mix of aircraft operating at Hanscom Field over time. Although EXP does not show how noise levels change in specific communities, it does indicate changes in total noise exposure and expected resultant changes in DNL, without the need to prepare noise contours. The 2012 EXP uses the FAA aircraft noise database from the most recent version of the INM, version 7.0c. This is an upgrade over INM 6.1 which has been used to compute EXP since the *2005 ESPR*.

This supplemental metric is calculated by logarithmically summing the representative SELs for each departure of an airplane assuming it flies over a single point on the ground. Similar aircraft types are grouped together in the calculations, creating a "partial EXP" for the group. Partial EXP values for each group are then summed to obtain a single number estimate of departure noise exposure at that reference location. Similar calculations are performed for arrival operations. Separate computations are performed for civil and military operations.

Massport maintains a comprehensive database of operations conducted by aircraft heavier than single engine piston aircraft. EXP uses the same summation formula as DNL: logarithmic summation of all

[31]Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Analysis Issues, August 1992.
[32]Federal Interagency Committee on Aviation Noise, The Use of Supplemental Noise Metrics in Aircraft Noise Analyses, February 2002.

noise events over a 24-hour day, with a 10 dB penalty applied to events occurring between 10:00 p.m. and 7:00 a.m.

7.2.7 Time Above a Threshold (TA)

Because analyses of decibels are complex and often unfamiliar to the public, the FAA has developed a supplemental noise metric that is non-logarithmic: the amount of time (in minutes or seconds) that the noise source of interest exceeds a given A-weighted sound level threshold. Every time a noise event goes above a given threshold, the number of seconds is accumulated and added to any previous periods that the noise exceeded the threshold. These time-above-thresholds, or Time Above, are usually reported for a 24-hour period.

Note that Time Above does not tell the loudness of the various noise events. Just as a single value of the A-weighted sound level ignores the dimension of time, so the Time Above ignores the dimension of loudness. Nevertheless, Time Above can be helpful in better understanding a noise environment.

7.3 Year 2012 Noise Prediction Methodology

This section documents the noise prediction methodology for preparing DNL and Time Above calculations for 2012 and discusses changes in the FAA's Integrated Noise Model (INM). The INM is a complex computer program that calculates aircraft noise levels around an airport from user input data and an extensive internal database of aircraft noise and performance statistics. Outputs can include DNL contours and other metrics such as Time Above and DNL values at specific points.

The FAA developed the INM as the primary tool for analyzing and evaluating noise impacts from aircraft operations. Its use is prescribed for all FAA-sponsored projects requiring environmental evaluation. The INM contains a set of noise and profile databases, which can be altered by the analyst to enable input of data for new aircraft and engine types, and account for specific changes in flight procedures. The FAA requires that any changes to these databases be approved prior to use on any FAA-related project.

The preparation of airport noise exposure contours requires compilation of several categories of information about the operation of an airport:

- Airfield Geometry – Location, length, orientation, elevation, and thresholds of all runways
- Flight Tracks – Paths followed by aircraft departing from, or arriving to, each runway
- Runway Use – Percentage of operations by each type of aircraft that occur on each runway
- Flight Track Usage – Percentage of operations by each aircraft type that use each flight track
- Operations Numbers – Numbers of departures, arrivals, and pattern operations by each type of aircraft during the year
- Aircraft Noise and Performance – Specific noise and performance data must be entered for each aircraft.

The INM interprets this input and computes the noise exposure around an airport as a grid of values for many different metrics including the DNL. The grid information is the input for a contouring program. This study used the most recent version of the INM at the time of analysis, Version 7.0c (INM 7.0c).

7.3.1 Physical Input

The first two categories of INM input, airport layout and flight tracks, are categorized as the physical input. They determine the paths on the runways and in the air where the aircraft travel in the noise model.

7.3.1.1 Airfield Geometry

The layout of an airfield is an important modeling input. Accurate runway information places modeled flights in the correct locations. Elevation data allow the INM to calculate runway gradients, which influence modeled take-off roll and landing distances. The runway end locations, elevations, displaced thresholds and the location and elevation of the airport reference point were taken from the FAA's Form 5010 airport data system. The Form 5010 data do not contain a helipad nor does Hanscom have a designated helipad, though helicopters operate at Hanscom Field. The location of a representative helipad was chosen through the examination of helicopter radar tracks, aerial photographs, and the FAA airport diagram. This is discussed in the section on Runway Use.

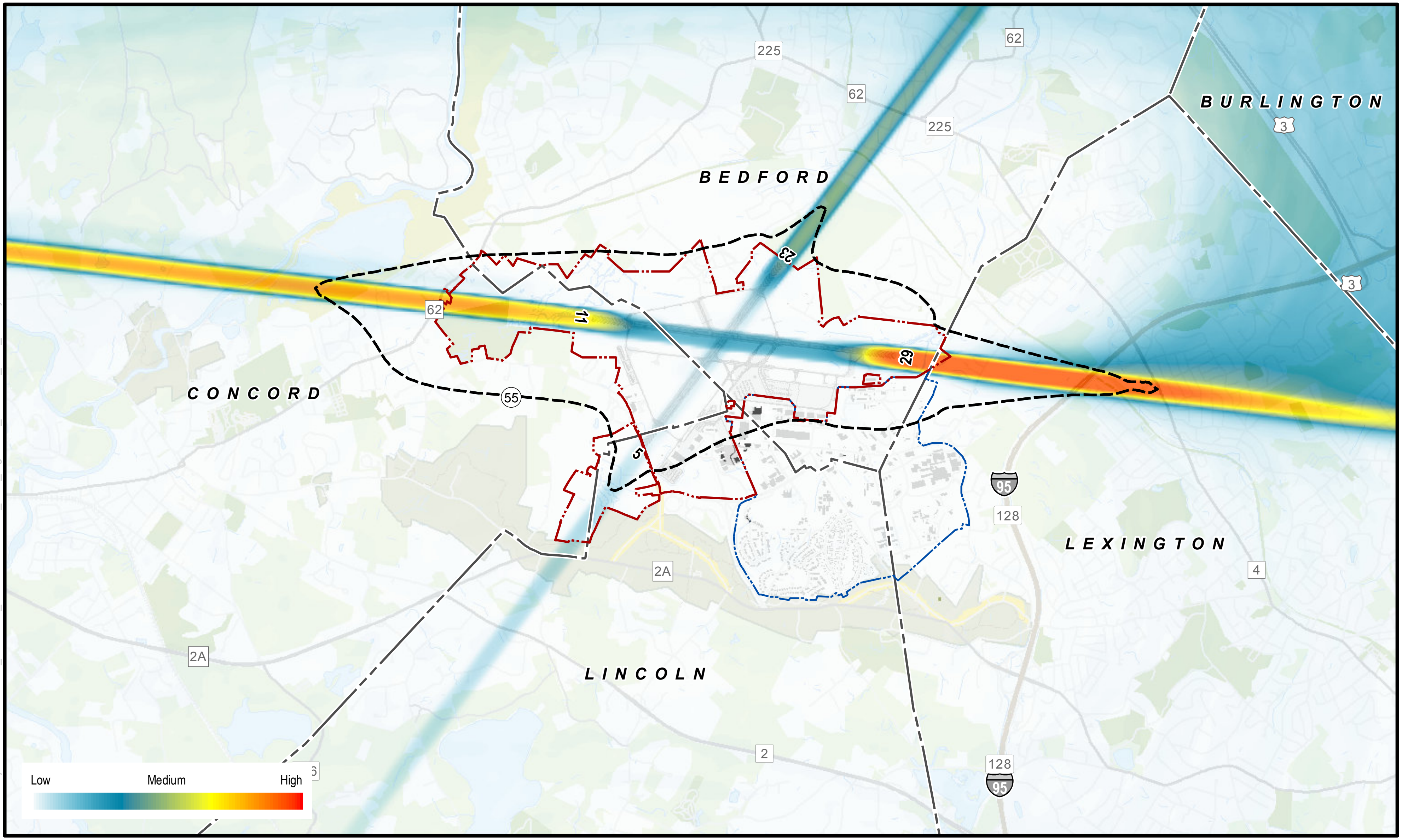
7.3.1.2 Flight Tracks

Flight tracks represent the ground projection of paths flown by aircraft at an airport. In previous ESPRs, the very broad range of operations and conditions actually occurring at Hanscom were represented using a set of average or model tracks. For the *2012 ESPR*, every individual flight track from Massport's NOMS was used. HMMH prepared the 2012, 2020, and 2030 contours using an INM pre-processor, named RealContours™. RealContours converts aircraft flight track data into FAA's INM input data, runs the INM, and provides the INM results based on the modeling of each individual flight track. RealContours prepares each available aircraft flight track during the course of the year for input into INM.

Flight tracks were provided from Massport's NOMS. In summary, 71,363 individual flight tracks were directly used for the preparation of the 2012 contours and the operations were scaled to the 167,845 operations total. The difference between the number of flight tracks modeled and the total operations counts are expected and can occur because RealContours filters data to make sure it is suitable for modeling. Each flight track must meet several criteria, including having a runway assignment, valid aircraft type designator and enough suitable flight track points. The most important of these factors at Hanscom is the presence of a valid aircraft type designator. Operations by piston aircraft are often unidentified in the radar data. Over 70,000 local and over 50,000 itinerant operations were conducted by piston aircraft at Hanscom in 2012. The over 40,000 valid radar tracks modeled in the ESPR for these aircraft represent an excellent sample showing the distribution of flight paths off of all runway ends.

It should be emphasized that the INM is used for all noise calculations. RealContours provides an organizational structure to model individual flight tracks in INM.

Figure 7-4 and Figure 7-5 present density plots for jet arrivals and departures in and out of Hanscom Field. Figure 7-6 and Figure 7-7 are arrival and departure density plots for propeller aircraft, including piston propeller aircraft, turbo-propeller aircraft, and helicopters. Figure 7-8 shows the tracks for the touch-and-go activity by light propeller aircraft. Areas of red represent the highest density of flight paths. Areas of blue show the lowest density. Appendix D provides additional flight track graphics, showing samples of the individual flight paths for jet aircraft arrivals and departures, propeller aircraft arrivals and departures, and touch-and-go tracks by propeller aircraft.



Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-4_TurbojetARR_Density.mxd

North

0 2,000 4,000 Feet

2012 - 55 dB DNL Contour
Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

massport

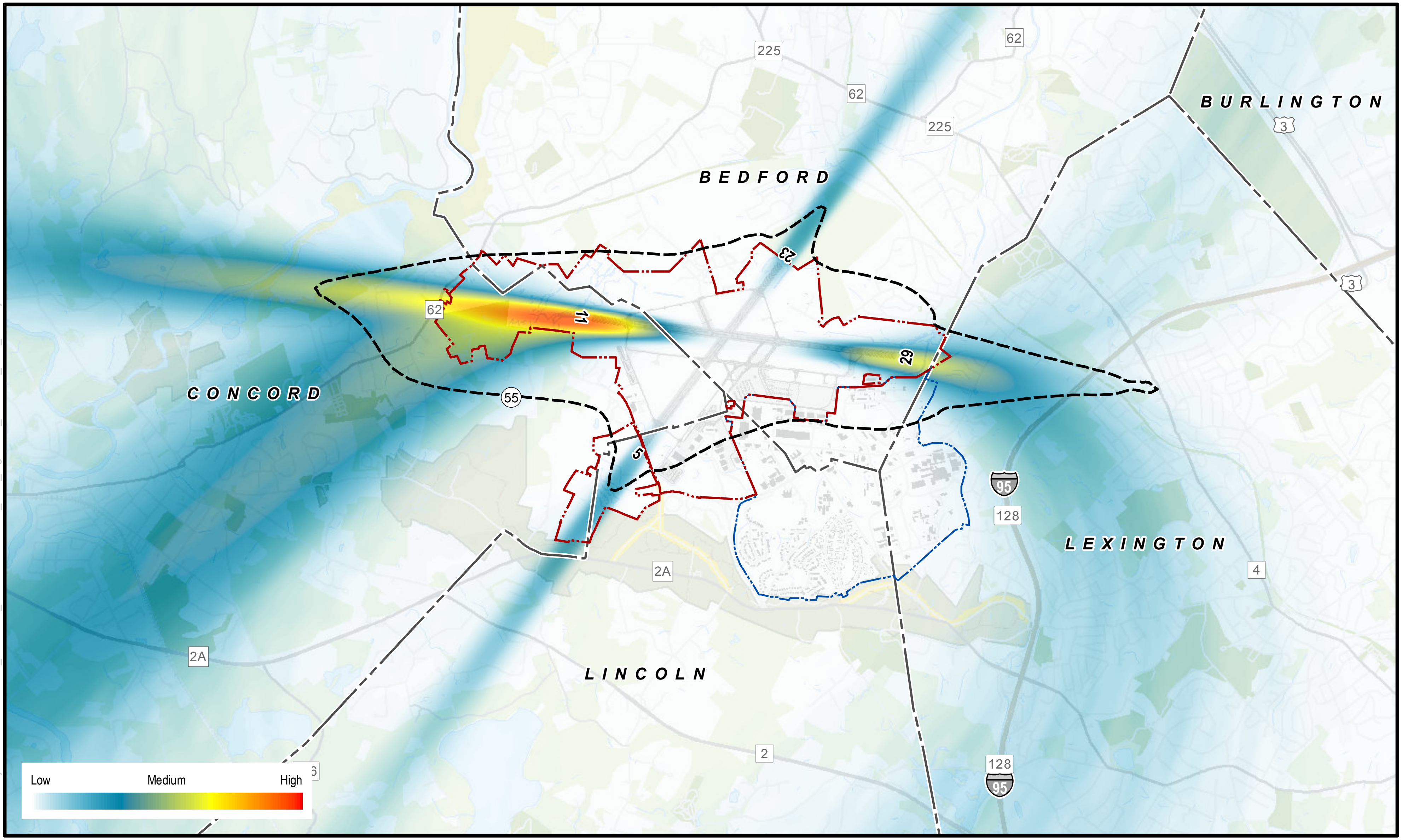
Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Turbojet Radar Track Density Plot - Arrivals

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Figure **7-4**



North

0 2,000 4,000 Feet

2012 - 55 dB DNL Contour
Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

massport

Hanscom Field 2012 ESPR

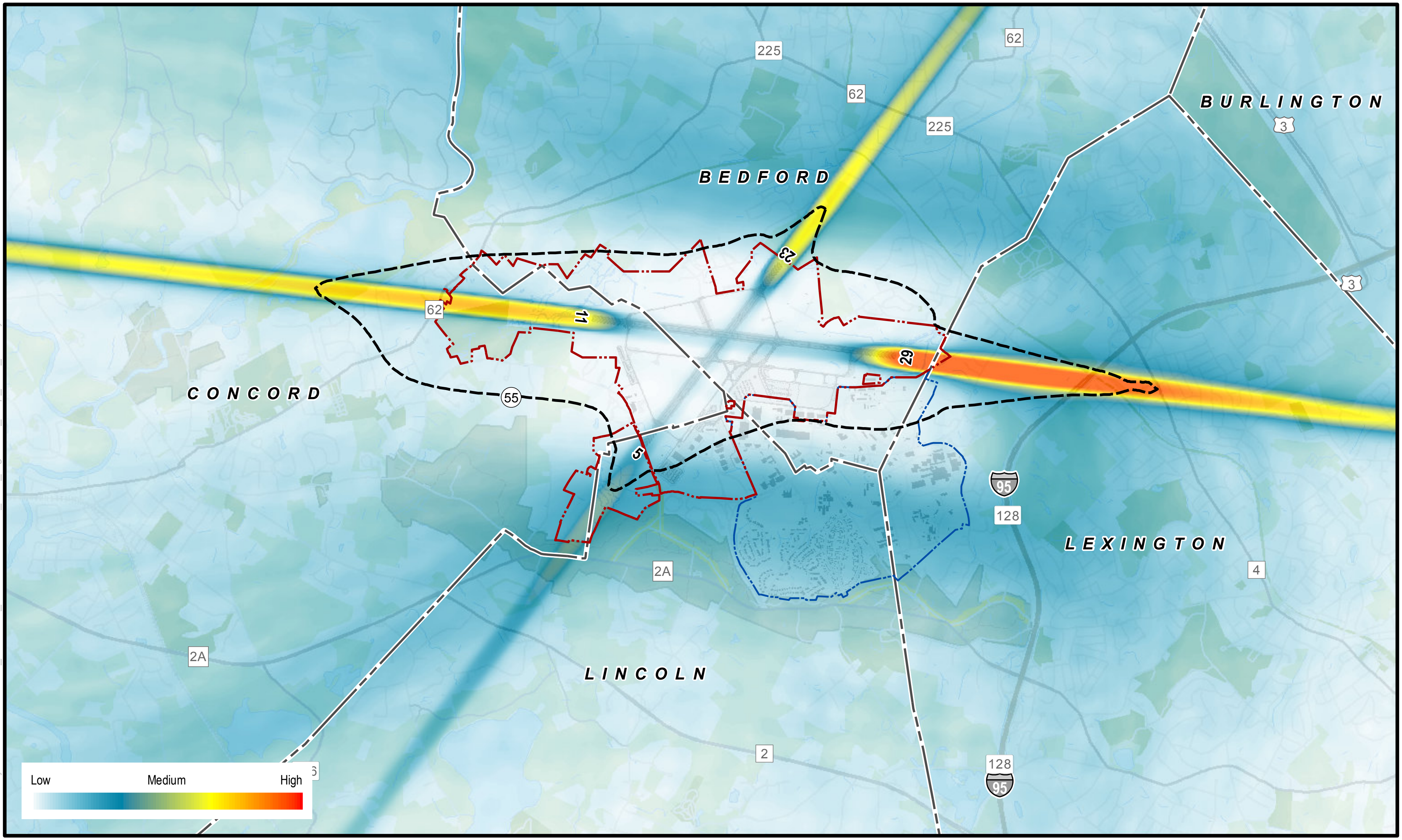
Bedford, Concord, Lexington, Lincoln, Massachusetts

Turbojet Radar Track Density Plot - Departures

Figure **7-5**

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-6_Prop_ARR_Density.mxd



North

0 2,000 4,000 Feet

2012 - 55 dB DNL Contour
Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

massport

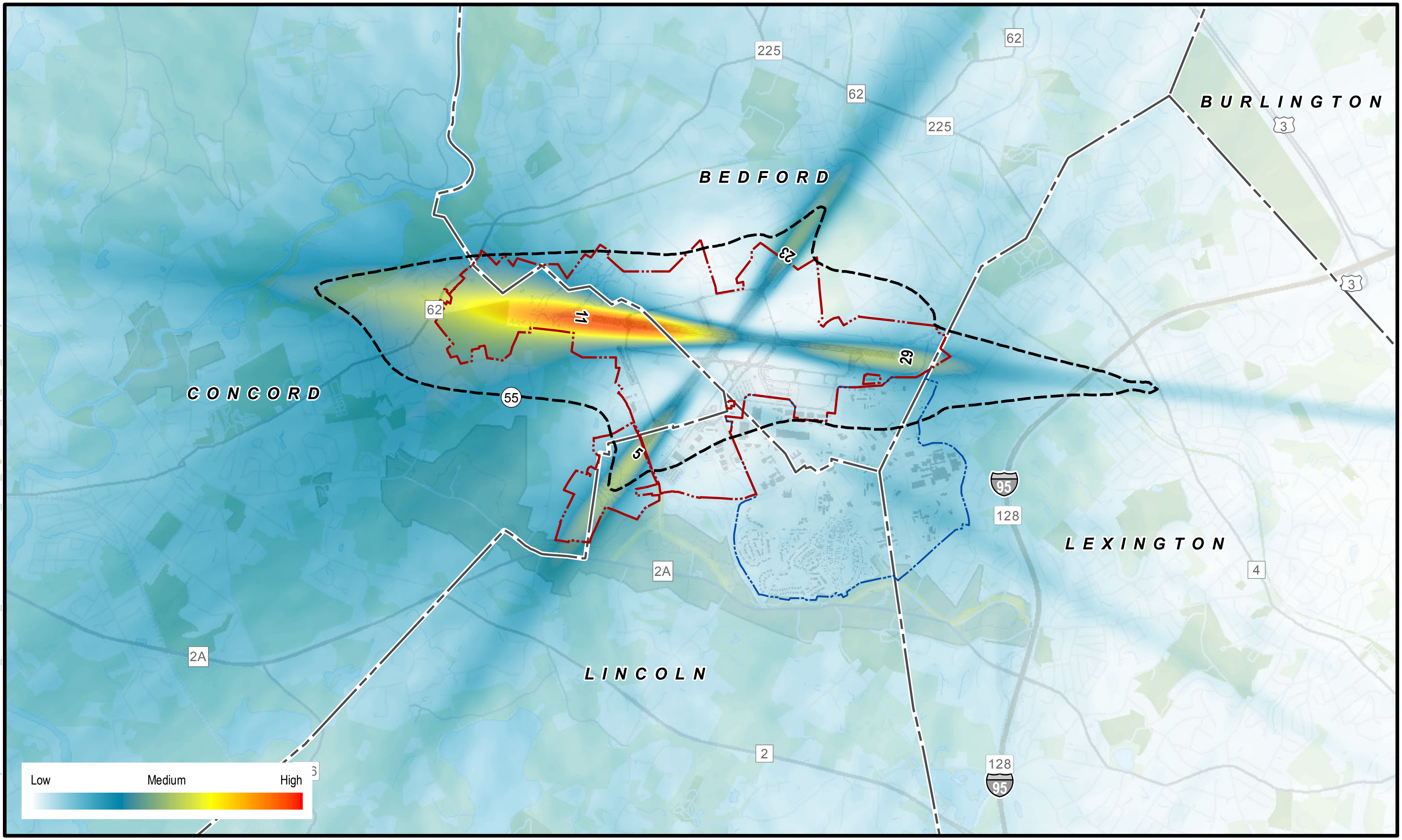
Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Propeller Aircraft Radar Track Density Plot - Arrivals

Figure **7-6**

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013



North

0 2,000 4,000 Feet

2012 - 55 dB DNL Contour
Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

massport

Hanscom Field 2012 ESPR

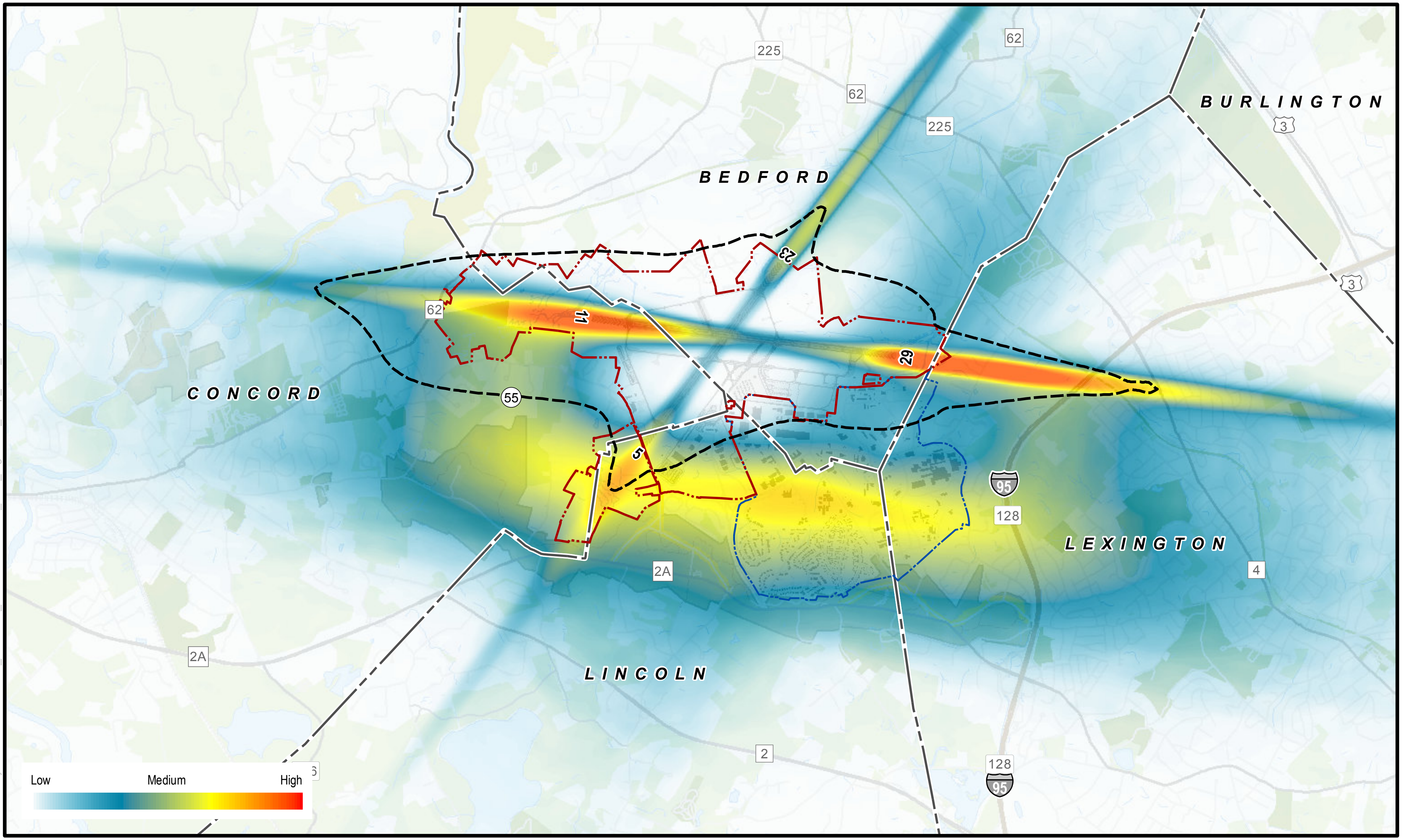
Bedford, Concord, Lexington, Lincoln, Massachusetts

Propeller Aircraft Radar Track Density Plot - Departures

Figure **7-7**

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-7_Prop_DEP_Density.mxd



Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-8_Prop_TGO_Density.mxd

North

0 2,000 4,000 Feet

2012 - 55 dB DNL Contour
Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Propeller Aircraft Radar Track Density Plot - Touch and Go

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Figure **7-8**

7.3.2 Operational Input

The remaining INM input falls under the category of operational input and includes runway use, operations, and aircraft noise and performance data. These data determine the number, type, flight time, and other characteristics of the aircraft traveling on the paths defined in the physical input.

7.3.2.1 Runway Use

The operational runway use of the airport is a critical component in the computer modeling of aircraft noise. As described in section 7.3.1.2, all valid individual flight tracks from Massport's NOMS for the entire year of 2012 were used in the noise modeling. This large sample of over 70,000 flight tracks provides an excellent estimate of runway use for 2012 at Hanscom. For reporting purposes, each flight track was assigned to a category based on the type of propulsion and size of the aircraft. Once in these categories, the data were used to calculate runway use percentages.

Table 7-2 through Table 7-6 show the calculated runway use by operation and aircraft group. Helicopter runway use is not included in Table 7- through Table 7-6. Table 7-6 Touch-and-Go Runway Utilization is not differentiated by aircraft group as all pattern activity was modeled by using piston aircraft.

Many of the helicopters in the radar sample followed runway headings on arrival and dispersed quickly off of the runway centerline after departure, similar to light propeller aircraft. However, with their maneuverability, helicopters often hover along taxiways and depart or land from ramp areas as well as runway ends, and no hard data on arrival and departure locations on the airfield are maintained, by Massport or the FAA. To simplify the modeling of these conditions, helicopter operations were assumed to originate or terminate at a single point just north of the control tower. The remainder of the modeled flight path was fully defined by the radar flight track.

Table 7-2 Daytime (7:00 a.m. to 10:00 p.m.) Departure Runway Utilization

Runway	Aircraft Group				
	Stage 2 Corporate Jet	Stage 3 Corporate Jet	Large Jet	Turboprop	Piston
05	4.5%	4.4%	1.8%	9.7%	7.5%
11	18.2%	22.9%	23.9%	22.6%	14.7%
23	0.0%	4.5%	2.8%	6.9%	12.9%
29	77.4%	68.3%	71.5%	60.8%	64.9%

Source: Massport Noise and Operations Monitoring System flight tracks

Table 7-3 Nighttime (10:00 p.m. to 7:00 a.m.) Departure Runway Utilization

Runway	Aircraft Group				
	Stage 2 Corporate Jet	Stage 3 Corporate Jet	Large Jet	Turboprop	Piston
05	0.0%	6.4%	0.0%	9.2%	32.3%
11	0.0%	21.2%	29.4%	20.9%	19.3%
23	0.0%	1.1%	1.5%	0.0%	7.0%
29	100.0%	71.3%	69.0%	69.9%	41.4%

Source: Massport Noise and Operations Monitoring System flight tracks

Table 7-4 Daytime (7:00 a.m. to 10:00 p.m.) Arrival Runway Utilization

Runway	Aircraft Group				
	Stage 2 Corporate Jet	Stage 3 Corporate Jet	Large Jet	Turboprop	Piston
05	0.0%	1.2%	0.4%	1.1%	3.9%
11	17.0%	28.7%	28.7%	25.5%	20.2%
23	5.5%	8.5%	4.7%	13.7%	13.4%
29	77.5%	61.7%	66.2%	59.6%	62.5%

Source: Massport Noise and Operations Monitoring System flight tracks

Table 7-5 Nighttime (10:00 p.m. to 7:00 a.m.) Arrival Runway Utilization

Runway	Aircraft Group				
	Stage 2 Corporate Jet	Stage 3 Corporate Jet	Large Jet	Turboprop	Piston
05	0.0%	0.4%	0.0%	2.4%	4.5%
11	33.3%	54.1%	49.8%	38.7%	36.8%
23	0.0%	2.5%	0.2%	10.0%	10.8%
29	66.7%	43.1%	50.0%	48.9%	47.9%

Source: Massport Noise and Operations Monitoring System flight tracks

Table 7-6 Touch-and-Go Runway Utilization

Runway	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 11:00 pm)
05	3.3%	0.0%
11	13.1%	27.6%
23	12.0%	14.9%
29	71.6%	57.4%
Note: 1. Touch-and-go operations are not allowed from 11:00 p.m. to 7:00 a.m. 2. Aircraft other than single engine pistons are not allowed to perform touch-and-go operations.		

Source: Massport Noise and Operations Monitoring System flight tracks

7.3.2.2 Operations

Massport's database of operations at Hanscom Field described in the EXP section provided the information necessary for the calculation of the average daily operations by aircraft type for 2012. Table 7-7 presents a summary of the 2012 operations modeled for the noise analysis. Appendix D provides a refined breakdown of the activity by individual aircraft types with their corresponding noise model representation.

Table 7-7 Year 2012 Average Daily Operations Summary by Group

Group	Departures		Arrivals		Total
	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)	
Stage 2 Jets	0.2	0.0	0.2	0.0	0.4
Stage 3 Jets	31.7	1.6	30.8	2.6	66.7
Turboprops	4.4	0.1	4.4	0.1	9.1
Piston	177.5	0.5	177.2	0.8	356.1
Military	0.3	0.0	0.3	0.0	0.6
Helicopters	10.0	0.2	9.9	0.2	20.4
All Groups	224.1	2.5	222.9	3.7	453.2

Source: Massport, HMMH

7.3.2.3 Aircraft Noise and Performance Data

Specific noise and performance data are necessary for each aircraft type to be modeled. Noise data are included in the form of SELs at a range of distances (from 200 feet to 25,000 feet) from a particular aircraft with engines at a specific thrust level. Performance data include thrust, speed, and altitude profiles for takeoff and landing operations. The INM database contains standard noise and performance data for 274 different fixed wing aircraft types, most of which are civil aircraft. The INM also has 271 substitutions for aircraft that are not specifically defined in the INM database.

The program automatically accesses the applicable noise and performance data for departure and approach operations by those aircraft. For aircraft not included in the database, aircraft with incomplete information in the database, or aircraft using non-standard flight profiles, the data must be manually entered into the model. Due to the addition of new data for many aircraft in the INM database since the last study, there were no such non-standard aircraft included in this study.

7.3.3 Noise Model Differences

All noise calculations in the *2012 ESPR* were prepared with INM 7.0c, which was the most current version available at the time of the analysis. The *2005 ESPR* calculations used INM 6.1. The prior analyses of EXP were prepared with previous versions: Version 3.9 was used from 1987 through 1996, and Version 5.1 was used from 1996 through 1999. Table 7-8 summarizes some of the major differences between the different versions of the INM.

Table 7-8 Differences between Versions of the Integrated Noise Model

Version	Release Date	Updates/Enhancements over Previous Version	Massport Use
3.9	May 1987		First use of INM by Massport at Hanscom Field.
3.10	June 1992	▪ Updated noise and performance data for all aircraft included in the previous database ▪ Eighteen new aircraft types. ▪ No computational changes between Versions 3.9 and 3.10.	Massport continued to use INM 3.9 for consistency with prior calculations of EXP.
4.11	December 1993	▪ Noise calculation improvements ▪ Expanded database ▪ Incorporation of algorithms that alter aircraft performance assumptions depending on user-defined temperature and airport elevation parameters.	Massport continued to use INM 3.9 for consistency with prior calculations of EXP.
5.0	August 1995	▪ New graphics user interface ▪ New data preparation and data input aids ▪ New graphics and plotting capabilities ▪ Improved and faster noise calculation algorithms	Massport upgraded to this version for noise calculations in the 1995 GEIR.
5.1	February 1997	▪ Incorporation of parts of the preprocessor program and access to NOISEMAP (USAF) data.	Massport upgraded to this version for new calculations of EXP beginning with 1996.
5.2	May 1998	▪ Three new aircraft and twenty new substitution aircraft ▪ Data for four aircraft modified to correct various problems.	Massport continued to use INM 5.1 for consistency with prior calculations of EXP.
6.0	October 1999	▪ First release in a new series of the INM. ▪ One new aircraft type ▪ Many algorithm improvements, including the ability to take atmospheric absorption into account. ▪ New version of the contour plotting program, NMPlot ▪ Addition of several new options to the model	Massport continued to use INM 5.1 for consistency with prior calculations of EXP.

Version	Release Date	Updates/Enhancements over Previous Version	Massport Use
6.0a	May 2000	▪ Noise and performance data for the Airbus 340 and Embraer 120	Massport continued to use INM 5.1 for consistency with prior calculations of EXP.
6.0b	January 2001	▪ Noise and performance data for the Airbus 330, Boeing 737- 700, the Cessna Citation 550 Bravo and several Cessna piston engine aircraft	Massport continued to use INM 5.1 for consistency with prior calculations of EXP.
6.0c	September 2001	▪ Noise and performance data for the A319-121 and A320-232; the Boeing 717-200, 777-300, and 767-400; the Cessna Citation X; and the Gulfstream GII, GIII, GIV, and GV	Massport upgraded to this version for noise calculations in the *2000 ESPR* and for new calculations of EXP.
6.1	March 2003	▪ New lateral attenuation algorithms that increase the sideline noise levels of aircraft with wing mounted engines ▪ Updated noise data for 114 of 115 military aircraft and added new profiles for 84 military aircraft ▪ Noise and performance data for 15 commercial aircraft	Massport upgraded to this version for noise calculations in the *2005 ESPR* and for new calculations of EXP.
6.2	May 2006	▪ Updated noise and performance data for the Boeing 757-200 (PW and RR), 737-700, 777-200, and 747-400 ▪ Noise and performance data for the Piper PA28-161 Warrior, PA30 Twin Comanche, and PA31 Navajo, Raytheon Beech 1900D, Maule M-7-235, Eurocopter EC-130, and Robinson R-22	Massport continued to use INM 6.1 for consistency with prior calculations of EXP.
6.2a	November 2006	▪ Updated noise and/or profile information for nine Airbus aircraft, three MD80 series aircraft, and three Boeing 737 aircraft	Massport continued to use INM 6.1 for consistency with prior calculations of EXP.
7.0	May 2007	▪ Complete integration of helicopters ▪ New algorithms to compute lateral attenuation, determine noise due to thrust reverse, and account for aircraft bank angle	Massport continued to use INM 6.1 for consistency with prior calculations of EXP.
7.0a	October 2008	▪ Updates to noise/performance data for commercial aircraft ▪ Updates to substitutions, including several Piper aircraft ▪ Noise and performance data for the first Very Light Jet (VLJ) to be added to the INM database: the Cessna Mustang Model 510	Massport continued to use INM 6.1 for consistency with prior calculations of EXP.
7.0b	September 2009	▪ Noise and performance data for fourteen new aircraft including the Airbus A-380, two CRJ models, the Eclipse 500 VLJ, and three helicopters ▪ Updated aircraft performance data	Massport continued to use INM 6.1 for consistency with prior calculations of EXP.
7.0c	January 2012	▪ Updated noise data for nineteen aircraft ▪ Updated substitutions for sixty-eight aircraft ▪ revised profiles for twenty-one aircraft ▪ Noise and performance data for eleven new aircraft, including five Cessna jets, four Bell helicopters, and two single engine floatplanes	Massport upgraded to version 7.0c for noise calculations in the *2012 ESPR* and for new calculations of EXP

The EXP for 2012 was computed in both INM 6.1 and INM 7.0c to aid in comparing current and future calculations of EXP to past values. Civil Departure EXP, used to track trends in total noise exposure at Hanscom, was 108.4dB INM 6.1 and 107.4 dB for INM 7.0c. This difference reflects improvements in the INM's database of general aviation jets.

Thirty-four of the EXP aircraft groups had changes to their SELs plus or minus 1.0 dB or less. Four aircraft groups had changes ranging from minus 7.9 dB to plus 6.5 dB due to changing the INM aircraft which represents the group. These changes were primarily due to recent updates in the FAA recommended substitutions. The two helicopters, the civil SA365N and the military S70, changed by minus 4.1 dB and plus 7.7 dB, respectively, due to changes in the INM's noise and performance database. Additionally, five new EXP groups, all Cessna jets, were added due to the addition of these types to the

INM. These five aircraft represent thirteen percent of the non-single engine piston civil operations in 2012 and have been previously been assigned to other aircraft groups using FAA recommended substitutions.

7.4 Year 2012 Noise Levels

Noise exposure levels resulting from 2012 operations at Hanscom Field are depicted in terms of DNL contours in Figure 7-9. The figure shows contour values from 55 to 70 dB in 5 dB increments. DNL contours are a graphical representation of how the noise from Hanscom Field's aircraft operations is distributed over the surrounding area on an average day of a given year. The *2005 ESPR* DNL contours are included in Figure 7-9 for comparison. Table 7-9 presents the acreage within each contour for 2005 and 2012 and indicates a general reduction in the size of the 2012 contours as compared with the 2000 and 2005 contours.

Table 7-9 Area within Year 2012 DNL Contours

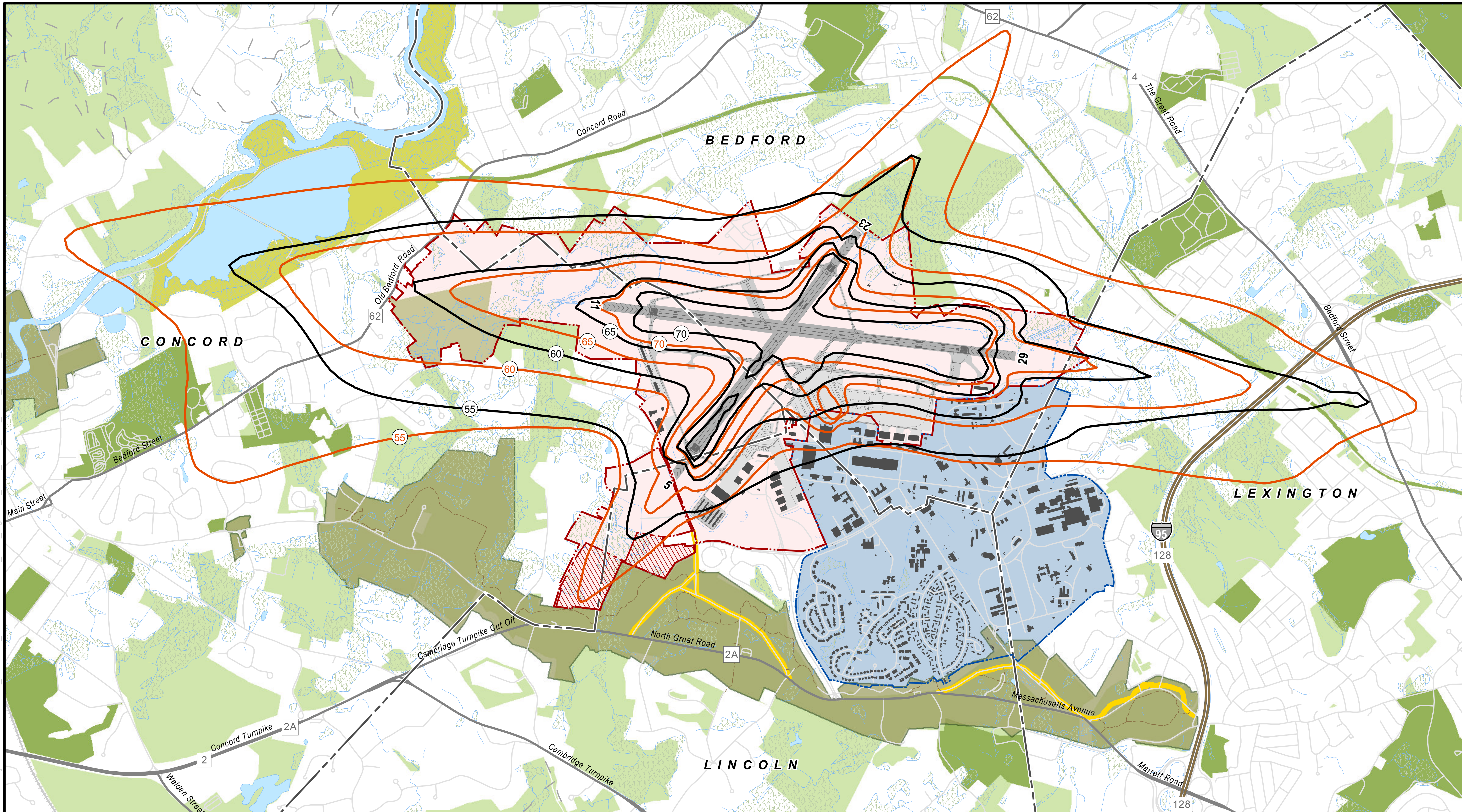
DNL Contours (dB)	Cumulative Area[1]		
	2000	2005	2012
70	334 acres	311 acres	181 acres
65	688 acres	635 acres	391 acres
60	1,550 acres	1,437 acres	856 acres
55	3,480 acres	3,291 acres	2,045 acres

Note:
1. Area within contour includes all greater DNL values.

7.4.1 Comparison of Year 2012 Contours with 2005 Contours

The differences between the Year 2012 contours and the Year 2005 contours are influenced by a number of factors, as discussed below:

- The number of total operations decreased in the past five years. The average number of daily operations dropped from 471 in 2005 to 457 in 2012. Daily jet operations decreased from 92 operations per day in 2005 to 73 in 2012
- The percentage of Stage 2 jets decreased from three percent of civil jet operations in 2005 to less than one percent in 2012.
- The number of daily operations between 10 pm and 7 am decreased by 35 percent from 2005 to 2012.



North

0 2,000 4,000 Feet

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Community Boundaries), March 5, 2013; NPS (Park Boundary), March 8, 2013; ArcGIS - Bing Online (Bing ArcGIS Online, 2011), May 06, 2013

- 2012 DNL Noise Contour
- 2005 DNL Noise Contour
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service
- Open Water
- Wetland/Marsh
- Stream
- MNNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2005 and 2012 DNL Noise Contour Comparison

Figure 7-9

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-9_2005_2012_DNL_Noise_Contour_Comparison.mxd

(This page intentionally left blank)

7.4.2 Measured vs. Modeled Noise Levels

Hanscom Field has a system of six permanent noise monitors (see Figure 7-10). Table 7-10 presents the minimum, the mean and the maximum DNL values measured at each of these locations in 2012, as well as the modeled value at each point.

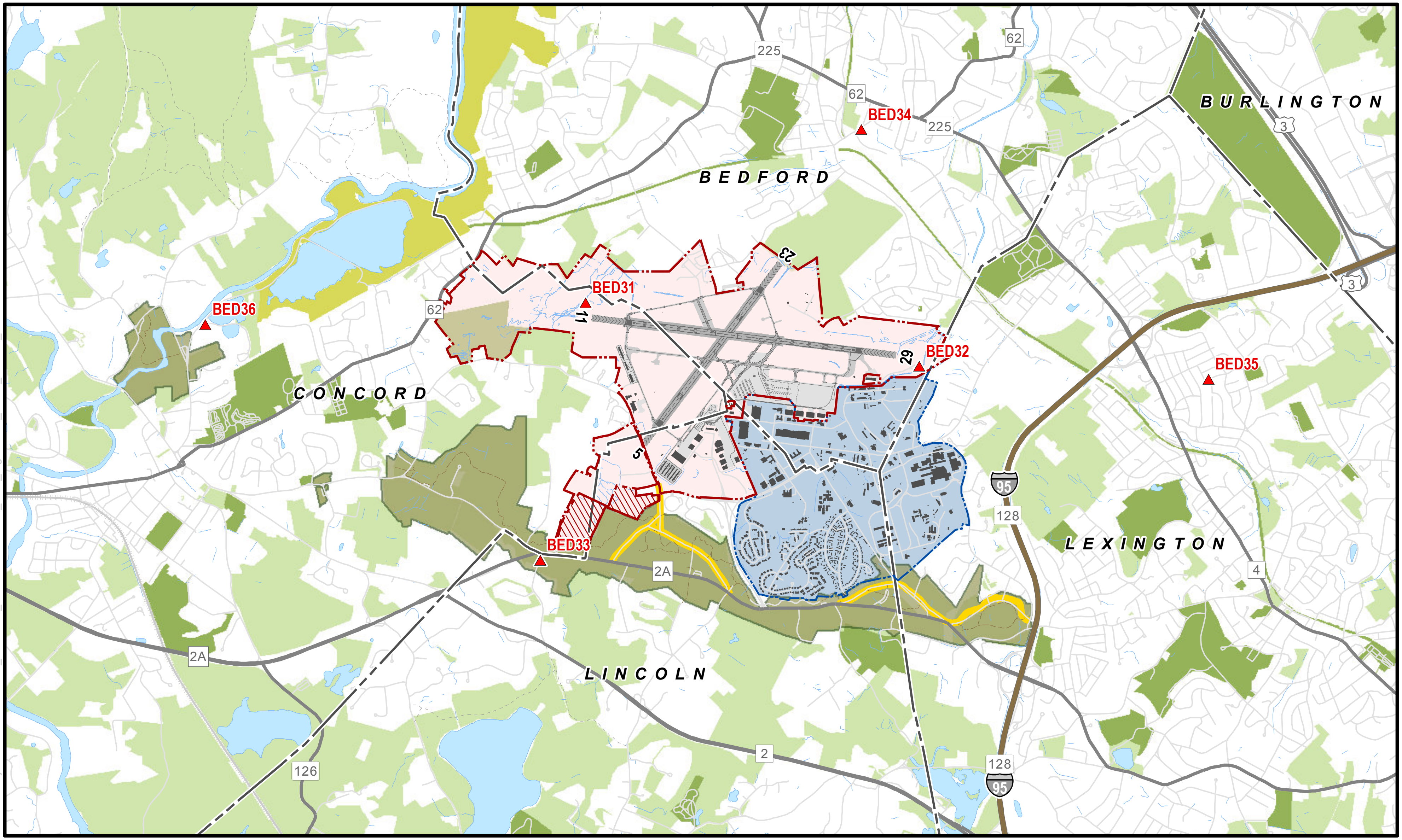
Table 7-10 Measured and Modeled DNL Values (in dB) at Permanent Monitoring Locations

Site Number	Location	Measured Noise (Aircraft and Ambient Sources)			Modeled Aircraft Noise (Aircraft Only)	Measured Minus Modeled
		Minimum	Mean	Maximum		
31	Concord Localizer	54.3	65.1	77.9	63.1	2.0
32	Bedford Localizer	55.8	63.0	73.7	61.0	2.0
33	Lincoln Brooks Road	49.8	55.7	65.1	50.4	5.3
34	Bedford De Angelo Road	54.2	59.2	67.0	50.3	8.9
35	Lexington Preston Road	52.9	60.1	69.9	52.4	7.7
36	Concord Wastewater	58.2	62.0	67.3	49.9	12.1

Source: Massport, HMMH

Table 7-10 shows that the modeled values are in closest agreement with the measured mean values for the sites closest to Hanscom Field, sites 31 and 32. However, the agreement between measured and modeled values decreases as the points get farther from the airfield with the measured values being higher than the corresponding modeled values. This is normal and expected. The reason for these differences is that all noise events are added into the measured DNL regardless of source.

Near the airport, where aircraft noise dominates, agreement with the modeled values is best. Farther from Hanscom Field, where community noise is a significant contributor to the total DNL, agreement is not as good because the measured value includes all noise sources and the modeled value only includes aircraft-related noise. Massport is in the process of working with the community to relocate one of the noise monitors. Massport has already agreed that Site 36 in Concord would be moved. The first noise monitor that was moved was in Bedford and has been relocated. This site has the lowest correlation between measured and modeled noise because of local noise from a wastewater treatment facility. The new location will upgrade the accuracy, usefulness, and reliability of the data.



North

0 2,000 4,000 Feet

Noise Monitoring Locaitons
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Noise Monitoring Locations

Figure **7-10**

7.5 Residential Land Use Impacts

The following sections describe the assessment of land use impacts around Hanscom Field using techniques and criteria based on scientific research, federal law, and FAA recommended guidelines.

7.5.1 Land Use Compatibility Standards

Based on the relationships between noise and the collective response of people to their environment, DNL values have become accepted as a standard for evaluating community noise exposure and as an aid in decision-making regarding the compatibility of alternative land uses by most federal agencies in the U.S. In their application to airport noise in particular, DNL projections have two principle functions:

- To provide a means for comparing existing noise conditions with those that may result from the implementation of noise abatement procedures and/or from forecast changes in airport activity
- To provide a quantitative basis for identifying and judging potential effects of aviation noise on people.

Both of these functions suggest the need for objective criteria. Government agencies dealing with environmental noise have devoted significant attention to this issue, and thus have developed noise/land use compatibility guidelines to help federal, state, and local officials with this evaluation process.

To help address land use planning issues, the FAA has determined that DNL is the official cumulative noise exposure metric for use in airport noise analyses, as prescribed by FAR Part 150. FAR Part 150 includes FAA's recommended guidelines for noise/land use compatibility evaluation, based on a compilation of extensive scientific research into noise-related activity interference and attitudinal response. These guidelines suggest that DNL values of 65 dBA and lower are compatible with residential land use.

7.5.1.1 Research by the U.S. EPA

Pursuant to the Noise Control Act of 1972, the U.S. EPA initiated this effort by publishing scientific data on the effects of noise on people under various levels of exposure. The Agency's preliminary findings were followed in 1974 by a technical report entitled Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, otherwise known as the “Levels Document.” This document is still widely cited for its applicability to environmental assessments, and many of its original findings, while refined in more recent years, remain pertinent to understanding how people respond to noise.

EPA is careful to point out that the Levels Document in no way constitutes a regulation or standard. The report, which is the first report to identify a DNL value of 55 dB as a relevant noise level, offers no guidelines for determining land use compatibility. The Levels Document is informational only, and makes no attempt to account for economic or technological feasibility or for peoples' attitudes regarding the desirability of undertaking a project that produces impacts caused by noise. Appendix D discusses additional implications of various DNL levels and their effects on people.

7.5.1.2 Land Use Analysis Methodology

The number of people residing in the DNL contours for 2012 was estimated from existing land use data and 2010 census data obtained from the U.S. Census Bureau. A detailed discussion of this methodology is provided in Appendix D. Table 7-11 presents the population by town exposed to DNL ranges of 65 dB and above (the FAA's compatibility guideline), and also within lower DNL ranges of 60 to 65 dB, and 55 to 60 dB. The information generated for Year 2012 is compared to past analyses for 2000 and 2005.

Table 7-11 Estimated Population within Hanscom Field 2012 DNL Contours

Town	Total Population between DNL Contours:				
	70 dB or Greater	65 to 70 dB	60 to 65 dB	55 to 60 dB	Total 55 dB or Greater
2000					
Bedford	0	26	270	881	1,177
Concord	0	0	313	839	1,152
Lexington	0	0	0	519	519
Lincoln	0	0	0	0	0
Total	0	26	583	2,239	2,848
2005					
Bedford	0	17	256	872	1,145
Concord	0	0	209	1,075	1,284
Lexington	0	0	0	524	524
Lincoln	0	0	0	0	0
Total	0	17	465	2,471	2,953
2012					
Bedford	0	0	87	369	456
Concord	0	0	0	542	542
Lexington	0	0	0	43	43
Lincoln	0	0	0	0	0
Total	0	0	87	954	1,041

Total population exposed to DNL greater than 65 dB decreased from 26 residents in 2000, 17 residents in 2005, to zero in 2012. The total population in the four towns exposed to DNL values of 55 dB or greater decreased from 2,953 in 2005 (up slightly from 2000) to 1,401 in 2012, reflecting decreases in all four towns, except Lincoln which had no population within the 55 dB DNL contour in 2005.

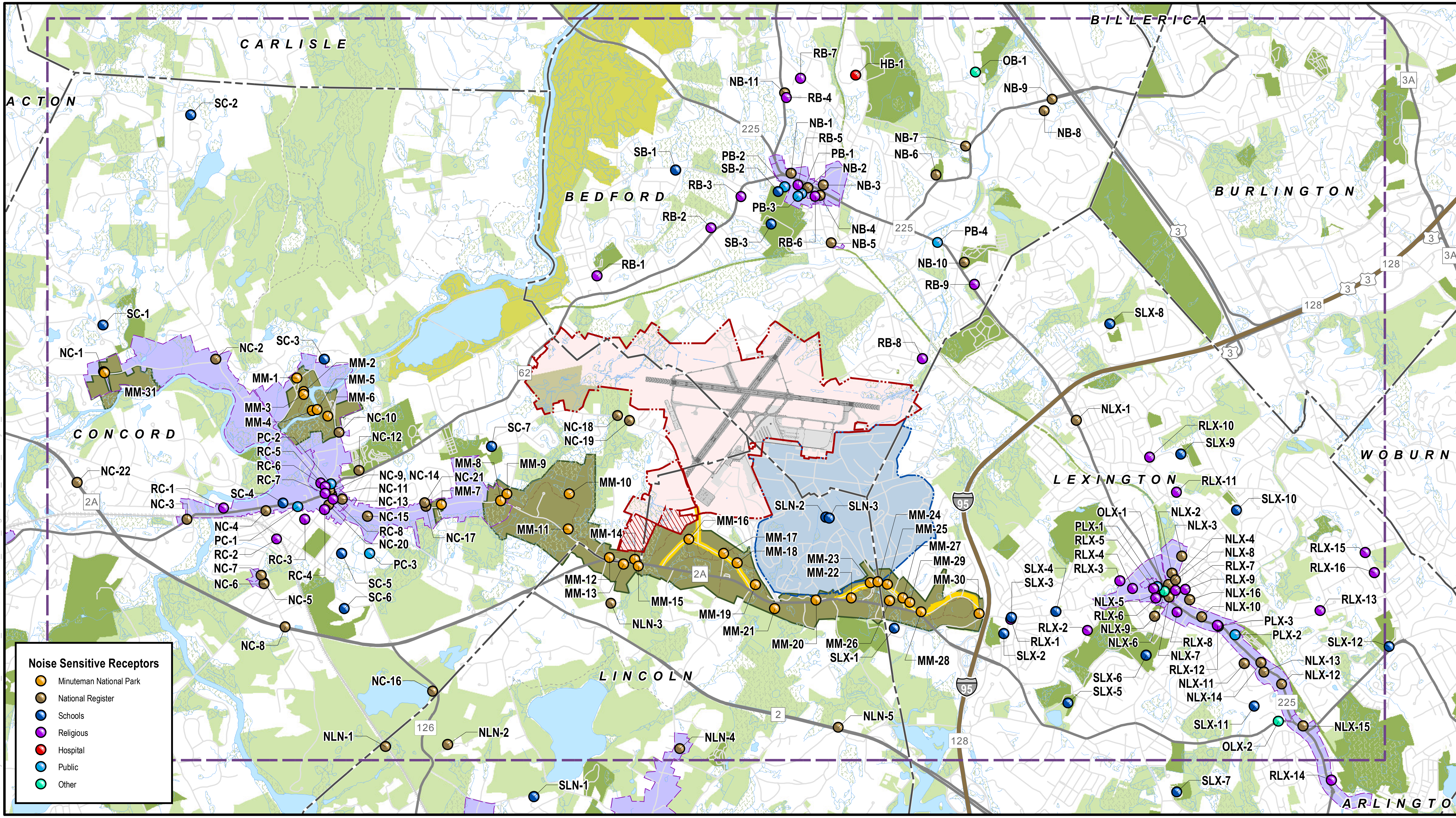
7.5.2 DNL at Noise Analysis Locations

Figure 7-11 shows the locations of noise analysis locations within the vicinity of Hanscom Field. Table 7-12 through 7-15 present the INM-modeled DNL at these locations for 2012 organized by town and includes data previously reported for 2000 and 2005 for comparison. The *2005 ESPR* labels are provided in these tables for reference purposes.

Information from the *2005 ESPR* was reviewed and updated to confirm use and address location and identify new facilities. Further input was solicited from the Town Planners and Historic Commissions of Bedford, Concord, Lexington, and Lincoln and the National Park Service. The labeling format of the noise analysis locations indicates their use. Consistent with the *2005 ESPR*, this format also delineates the location of the site by town.

None of these sites is currently exposed to a DNL value above the FAA land use compatibility criterion of 65 dB and none is within the 60 dB DNL contour. In fact, predicted 2020 and 2030 aircraft noise levels at many of the locations are likely to be below ambient (non-aircraft) levels. One site, the Wheeler-Meriam House in Concord, was modeled at 62.6 dB in 2000 but that has dropped in both 2005 and 2012. It is one of two sites (both in Concord) that have DNL values greater than 55 dB in 2012.

- Deacon John Wheeler/Capt. Jonas Minot Farmhouse in Concord at 58.4 dBA
- Wheeler-Meriam House in Concord at 58.1 dBA



North

0 3,500 7,000 Feet

Historic Districts
Historic Study Area Boundary
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary
Historic Road
Interstate
Highway
Road
Trail
Active Rail Service
Open Water
Wetland/Marsh
Stream
MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Noise Analysis Locations

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

Figure 7-11

(This page intentionally left blank)

Table 7-12 2012 DNL at Noise Analysis Locations in Bedford (in dB)

Label		Name[3]	Address/Town	DNL Value		
2012[1]	2005[2]			2000	2005[2]	2012
HB-1	HB-1	Veterans Administration Medical Center*	200 Springs Rd, Bedford	44.9	43.1	41.8
NB-1	NB-1	Bedford Historic District	Great Rd., Bedford	47.3	44.3	44.6
NB-2	NB-2	Old Bedford Center Historic District	Great Rd., Bedford	47.3	46.0	45.4
NB-3	NB-3	Old Burying Ground	7 Springs Rd., Bedford	-	47.0	45.7
NB-4	NB-4	Old Town Hall	16 South Rd., Bedford	-	47.5	46.1
NB-5	NB-5	Bedford Depot Park Historic District	80 Loomis St./120 South Rd., Bedford	-	53.7	49.8
NB-6	NB-6	Nathaniel Page House	89 Page Rd., Bedford	49.1	50.7	45.9
NB-7	NB-7	Christopher Page House	50 Old Billerica Rd., Bedford	46.8	48.9	44.2
NB-8	NB-8	Bacon-Gleason-Blodgett Homestead	118 Wilson Rd., Bedford	43.7	44.2	41.5
NB-9	NB-9	Historic Wilson Mill-Old Burlington Road Historic Dist.	Old Burlington and Wilson Rds., Bedford	-	44.1	41.3
NB-10	OB-2	Shawsheen Cemetery **	Shawsheen Rd., Bedford	-	46.4	45.2
NB-11	-	David Lane House	137 North Rd., Bedford	-	-	42.1
OB-1	OB-1	Old Billerica Road Area ** (NR nomination form in process)	Old Billerica Rd, Bedford	-	48.0	44.0
PB-1	PB-1	Town Hall *	10 Mudge Way, Bedford	47.3	45.9	45.5
PB-2	PB-2	Library **	7 Mudge Way, Bedford	47.3	44.7	45.0
PB-3	PB-3	Bedford School District	11Mudge Way, Bedford	47.3	45.9	45.6
PB-4	PB-4	Department of Public Works	314 Great Rd., Bedford	-	47.8	45.4
RB-1	RB-1	The Lutheran Church of the Savior	426 Davis Rd., Bedford	52.0	50.4	48.6
RB-2	RB-2	First Baptist Church of Bedford	155 Concord Rd., Bedford	46.5	44.8	46.0
RB-3	RB-3	St. Michael's Church	90 Concord Rd., Bedford	46.0	43.7	44.9
RB-4	RB-4	Boston Buddha Vararam Temple	125 North Rd., Bedford	-	41.7	42.2
RB-5	RB-5	The First Church of Christ Congregational/ United Church of Christ *	25 Great Rd., Bedford	47.3	45.2	45.1
RB-6	RB-6	The First Parish in Bedford Unitarian Universalist *	75 Great Rd., Bedford	47.3	47.1	46.0
RB-7	RB-7	St. Paul's Episcopal Church	100 Pine Hill Rd., Bedford	44.9	41.6	41.8
RB-8	RB-8	March for Jesus	54 Summer St., Bedford	55.7	54.7	52.2
RB-9	RB-9	Immanuel Baptist Church/ Zion Korean Alliance Church[4]	400 Great Rd., Bedford	46.9	47.1	45.8
SB-1	SB-1	Davis School	Davis Rd., Bedford	49.0	42.5	43.1
SB-2	SB-2	Bedford High School **	9 Mudge Way, Bedford	47.2	44.6	45.1
SB-3	SB-3	John Glenn Middle School	99 McMahon Rd., Bedford	48.5	45.9	46.7

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. The labels have been updated for the 2012 ESPR. The 2005 ESPR labels are provided for reference purposes. Blanks indicate new locations that have been added to the 2012 ESPR list of noise analysis locations.
3. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as “N” sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Old Bedford Center Historic District.
4. The Immanuel Baptist Church and Zion Korean Alliance Church are at the same address.
5. The boundary of the Old Bedford Center Historic District has slightly expanded, the Old Bedford Center Historic District Boundary Extension, since the last study in 2005.

Table 7-13 2012 DNL at Noise Analysis Locations in Concord (in dB)

Label		Name[3]	Address/Town	DNL Value		
2012[1]	2005[2]			2000	2005[2]	2012
NC-1	NC-1	Barrett Farm Historic District†	Barrett's Mill Rd., Concord	49.9	46.6	43.5
NC-2	NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd., Concord	49.9	50.3	47.4
NC-3	NC-3	Joseph Hosmer House	572 Main St., Concord	45.7	45.0	44.3
NC-4	NC-4	Thoreau-Alcott House	255 Main St., Concord	48.6	47.9	46.1
NC-5	NC-5	Hubbardville Historic District†	324-374 Sudbury Rd., Concord	48.6	49.2	46.5
NC-6	NC-6	Hubbard-French Historic District	324-374 Sudbury Rd., Concord	48.6	49.2	46.5
NC-7	NC-7	Deacon Thomas Hubbard/ Judge Henry French House	342 Sudbury Rd., Concord	-	49.0	46.4
NC-8	NC-8	Pest House	158 Fairhaven Rd., Concord	48.3	49.9	46.3
NC-9	NC-9	Main Street Historic District†	Main St. between Monument Sq. and Wood St., Concord	48.8	50.8	48.0
NC-10	NC-10	North Bridge-Monument Square Historic District†	Monument St., Liberty St. and Lowell St., Concord	50.6	50.5	48.2
NC-11	NC-11	Wright Tavern	Lexington Rd. & Main St., Concord	50.9	51.0	48.2
NC-12	NC-12	Sleepy Hollow Cemetery	24 Court Ln., Concord	-	52.2	49.0
NC-13	NC-13	American Mile Historic District†	Lexington Rd., Concord	50.9	51.7	48.5
NC-14	NC-14	Concord Monument Square-Lexington Road Historic District	Monument Sq. and Lexington Rd., Concord	50.9	50.9	48.1
NC-15	NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike, Concord	51.3	52.9	49.1
NC-16	NC-16	Walden Pond[4]	MA Rte 126 (Main Beach), Concord	45.1	45.8	43.4
NC-17	NC-17	Orchard House	399 Lexington Rd., Concord	52.6	53.8	50.2
NC-18	NC-18	Deacon John Wheeler/ Capt. Jonas Minot Farmhouse	341 Virginia Rd., Concord	-	60.4	58.4
NC-19	NC-19	Wheeler-Meriam House	477 Virginia Rd., Concord	62.6	59.9	58.1
NC-20	-	Concord Armory-Concord Veteran's Building	51 Walden St., Concord	-	-	48.1
NC-21	-	Concord School of Philosophy	391 Lexington Rd., Concord	-	-	50.3
NC-22	-	Hosmer Homestead	138 Baker Ave., Concord	-	-	41.6
PC-1	PC-1	Library **	129 Main St., Concord	49.6	49.4	47.1
PC-2	PC-2	Town Hall ††	22 Monument Sq., Concord	50.9	50.8	48.1
PC-3	PC-3	Middlesex County Court House	305 Walden St., Concord	49.9	52.4	48.4
RC-1	RC-1	Trinity Episcopal Church **	81 Elm St., Concord	47.4	46.0	45.0
RC-2	RC-2	Redeemer Presbyterian Church	191 Sudbury Rd., Concord	49.1	49.0	46.7
RC-3	RC-3	New Life Community Church (meeting at the Emerson School Building **)	40 Stow St., Concord	50.9	50.0	47.4
RC-4	RC-4	Trinitarian Congregational Church **	54 Walden St., Concord	50.9	50.9	48.0
RC-5	RC-5	First Church of Christ Scientist††	7 Lowell Rd., Concord	50.9	50.2	47.7
RC-6	RC-6	St. Bernard's Parish††	70 Monument Square, Concord	50.9	50.5	47.9
RC-7	RC-7	Christian Science Reading Room	20 Main St., Concord	49.0	50.7	47.9
RC-8	RC-8	First Parish in Concord ††	20 Lexington Rd., Concord	50.9	51.2	48.2
SC-1	SC-1	Nashoba/Brooks School	200 Strawberry Hill Rd., Concord	45.0	49.3	46.5
SC-2	SC-2	Middlesex School**	1400 Lowell Rd., Concord	46.8	41.3	40.4
SC-3	SC-3	Fenn School **	498-516 Monument St., Concord	54.1	53.7	50.9
SC-4	SC-4	Concord Academy **	166 Main St., Concord	49.6	48.6	46.6
SC-5	SC-5	Alcott School	91 Laurel Rd., Concord	50.1	51.8	48.1
SC-6	SC-6	Concord/Carlisle High School	500 Walden Rd., Concord	48.5	50.8	46.8
SC-7	SC-7	Ripley School	120 Meriam Rd., Concord	55.7	56.4	53.6

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. The labels have been updated for the 2012ESPR. The 2005 ESPR labels are provided for reference purposes. Blanks indicate new locations that have been added to the 2012 ESPR list of noise analysis locations. The Old Manse and the Wayside (Samuel Whitney House) are included in the Minute Man National Historical Park list of noise analysis locations.

Label		Name[3]	Address/Town	DNL Value		
2012[1]	2005[2]			2000	2005[2]	2012

3. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Concord Monument Square-Lexington Road Historic District.
4. The Walden Pond State Reservation is located in Concord and Lincoln. This site is located at the main beach in Concord.

Table 7-14 2012 DNL at Noise Analysis Locations in Lexington (in dB)

Label		Name[3]	Address/Town	DNL Value		
2012[1]	2005[2]			2000	2005[2]	2012
NLX-1	NLX-1	Simonds Tavern	331 Bedford St., Lexington	55.7	55.5	53.0
NLX-2	NLX-2	Hancock-Clarke Historic District†	Hancock St., Lexington	43.5	47.0	42.8
NLX-3	NLX-3	Hancock-Clarke House	35 Hancock St., Lexington	43.5	46.6	42.6
NLX-4	NLX-4	Garrity House	9 Hancock St., Lexington	-	47.1	42.7
NLX-5	NLX-5	Lexington Green Historic District	Mass. Ave., Harrington Rd. and Bedford St., Lexington	44.5	47.4	42.9
NLX-6	NLX-6	Lexington Green	Mass. Ave., Harrington Rd. and Bedford St., Lexington	44.5	47.2	42.7
NLX-7	NLX-7	Buckman Tavern	1 Bedford St., Lexington	44.5	46.9	42.5
NLX-8	NLX-8	General Samuel Chandler House	8 Goodwin Rd., Lexington	44.5	46.8	42.5
NLX-9	NLX-9	Hancock School	33 Forest St., Lexington	44.1	47.3	42.6
NLX-10	NLX-10	U.S. Post Office Building	1661 Mass. Ave., Lexington	41.0	44.9	40.8
NLX-11	NLX-11	Warren E. Shelburne House	11 Percy Rd., Lexington	37.4	42.0	38.4
NLX-12	NLX-12	Munroe Tavern Historic District†	Mass. Ave., Lexington	35.4	39.5	36.6
NLX-13	NLX-13	Sanderson House-Munroe Tavern	1314 & 1332 Mass. Ave., Lexington	35.4	40.7	37.4
NLX-14	NLX-14	John Mason House	1303 Mass. Ave., Lexington	35.4	41.0	37.7
NLX-15	NLX-15	East Village Historical District†	Mass Ave., Lexington	32.6	37.7	35.3
NLX-16	-	M.H. Merriam and Company	7-9 Oakland Ave., Lexington	-	-	41.6
OLX-1	OLX-1	Battle Green Historic District**	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave. and B&M Railroad, Lexington	44.5	47.2	42.8
OLX-2	OLX-2	National Heritage Museum	33 Marrett Rd., Lexington	-	39.2	36.2
PLX-1	PLX-1	Library **	1874 Mass. Ave., Lexington	44.5	47.7	43.1
PLX-2	PLX-2	Town Hall **	1625 Mass. Ave., Lexington	38.1	42.9	39.3
PLX-3	PLX-3	Lexington School District Administration **	1557 Massachusetts Ave., Lexington	40.0	43.9	40.0
RLX-1	RLX-1	Lexington United Methodist Church/ St. John's Korean United Methodist Church[4]	2600 Massachusetts Ave., Lexington	46.9	48.1	45.9
RLX-2	RLX-2	Temple Isaiah	55 Lincoln St., Lexington	46.6	48.5	44.2
RLX-3	RLX-3	Grace Chapel of Lexington	59 Worthen Rd., Lexington	46.2	49.3	44.6
RLX-4	RLX-4	St. Brigid's Parish *	2001 Mass. Ave., Lexington	44.5	48.7	44.0
RLX-5	RLX-5	First Parish-Unitarian Church††	7 Harrington Rd., Lexington	44.5	47.8	43.2
RLX-6	RLX-6	Hancock United Church of Christ ††	1912 Mass. Ave., Lexington	44.5	47.5	43.0
RLX-7	RLX-7	Church of Our Redeemer	6 Meriam St., Lexington	44.5	46.7	42.3
RLX-8	RLX-8	Christian Science Reading Room	10 Muzzy St. #12, Lexington	42.8	46.3	41.8
RLX-9	RLX-9	Greek Orthodox Church of St. Nichols **	17 Meriam St., Lexington	44.5	46.1	42.0
RLX-10	RLX-10	Chabad Center **	9 Burlington St., Lexington	-	52.0	49.9
RLX-11	RLX-11	Pilgrim Congregational Church	55 Coolidge Ave., Lexington	46.3	48.0	44.9
RLX-12	RLX-12	First Baptist Church of Lexington **	1580 Mass. Ave., Lexington	38.1	44.0	40.1
RLX-13	RLX-13	Jehovah's Witnesses	196 Woburn St., Lexington	35.1	38.1	36.7
RLX-14	RLX-14	Follen Church Society- Unitarian Universalists *	755 Massachusetts Ave., Lexington	-	35.6	34.0
RLX-15	RLX-15	Countryside Bible Chapel	480 Lowell St., Lexington	37.3	39.2	37.3
RLX-16	RLX-16	St. Paul Evangelical Church	451 Lowell St., Lexington	36.2	37.4	36.2
SLX-1	SLX-1	Minuteman Regional Vocational High	758 Marrett Rd., Lexington	43.9	45.9	44.8

Label		Name[3]	Address/Town	DNL Value		
2012[1]	2005[2]			2000	2005[2]	2012
		School				
SLX-2	SLX-2	Maria Hastings School	2618 Mass. Ave., Lexington	46.9	47.8	45.4
SLX-3	SLX-3	Methodist Weekday School	2600 Massachusetts Ave., Lexington	46.9	48.1	46.0
SLX-4	SLX-4	Community Nursery School	2325 Massachusetts Ave., Lexington	47.3	48.9	45.8
SLX-5	SLX-5	Bridge Elementary School**	55 Middleby Rd., Lexington	45.1	47.1	42.2
SLX-6	SLX-6	Lexington High School	251 Waltham St., Lexington	43.8	46.7	41.7
SLX-7	SLX-7	Jonas Clarke Middle School	17 Stedman Rd., Lexington	40.3	43.5	37.6
SLX-8	SLX-8	Estabrook School**	117 Grove St., Lexington	49.9	48.6	44.5
SLX-9	SLX-9	Diamond Middle School	99 Hancock St., Lexington	51.3	51.5	50.1
SLX-10	SLX-10	Fiske Elementary School	146 Maple St., Lexington	42.9	44.8	42.4
SLX-11	SLX-11	Armenian Sisters Academy	20 Pelham Rd., Lexington	35.8	40.7	37.2
SLX-12	SLX-12	Harrington Elementary School	148 Maple St., Lexington	31.9	34.4	33.5

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories, or historic districts that are not on the National Register of Historic Places. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. The labels have been updated for the 2012 ESPR. The 2005 ESPR labels are provided for reference purposes. Blanks indicate new locations that have been added to the 2012 ESPR list of noise analysis locations.
3. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Lexington Green Historic District.
4. The Lexington United Methodist Church and St. John's Korean United Methodist Church are at the same address.

Table 7-15 2012 DNL at Noise Analysis Locations in Lincoln (in dB)

Label		Name[3]	Address/Town	DNL Value		
2012[1]	2005[2]			2000	2005[2]	2012
NLN-1	NLN-1	Walden Pond[4]	Rte. 126, Walden St., Concord Rd., Lincoln	-	45.9	42.6
NLN-2	NLN-2	Henry Higginson House	44 Baker Farm Rd., Lincoln	-	45.1	42.5
NLN-3	NLN-3	Daniel Brooks House	Brooks Rd., Lincoln	51.0	49.5	48.4
NLN-4	NLN-4	Lincoln Center Historic District	Bedford Rd. Lincoln Rd., Old Lexington Rd. Sandy Pond Rd. Trapelo Rd. Weston Rd., Lincoln	40.4	41.0	41.0
NLN-5	NLN-5	Hoar Tavern	268 Cambridge Tpke., Lincoln	41.9	43.0	41.8
SLN-1	SLN-1	Carroll School	25 Baker Bridge Rd., Lincoln	49.3	41.7	40.8
SLN-2	SLN-2	Hanscom Middle School	Hanscom AFB, Lincoln	50.1	49.1	50.2

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. The labels have been updated for the *2012 ESPR*. The *2005 ESPR* labels are provided for reference purposes. Blanks indicate new locations that have been added to the 2012 ESPR list of noise analysis locations.
3. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS.
4. The Walden Pond State Reservation is located in Concord and Lincoln. This site is in Heywood's Meadow.

The DNL generally decreased between 2005 and 2012 for the noise analysis locations common to the *2005 ESPR* and the *2012 ESPR*. The average decrease in DNL across all sites was 2.5 dBA, with sites in Bedford recording an average of decrease of 1.2 dBA, minus 2.7 dBA in Concord, minus 3.5 dBA in Lexington, and minus 0.9 in Lincoln.

The largest individual DNL increases were an increase of 1.2 dBA from 44.8 dBA to 46.0 dBA at the First Baptist Church of Bedford (RB-2) and an increase of 1.2 dBA from 43.7 dBA to 44.9 dBA at St. Michael's Church (RB-3), both on Concord Rd in Bedford. The largest individual DNL decreases were a decrease of 5.9 dBA from 43.5 dBA to 37.6 dBA at the Jonas Clarke Middle School (SLX-7) in Lexington and a decrease of 5.0 dBA from 46.7 dBA to 41.7 dBA at the Lexington High School (SLX-6). Areas with lower noise levels are more susceptible to larger changes due to normal shifts in runway and flight corridor utilization.

The largest changes for sites with a *2005* or *2012 ESPR* DNL of 50 dBA or more was a decrease of 4.8 dBA from 50.7 dBA to 45.9 dBA at the Nathaniel Page House (NB-6) in Bedford and an increase of 1.1 dBA from 49.1 dBA to 50.2 dBA at the Hanscom Middle School (SLN-2) on the Hanscom AFB in Lincoln.

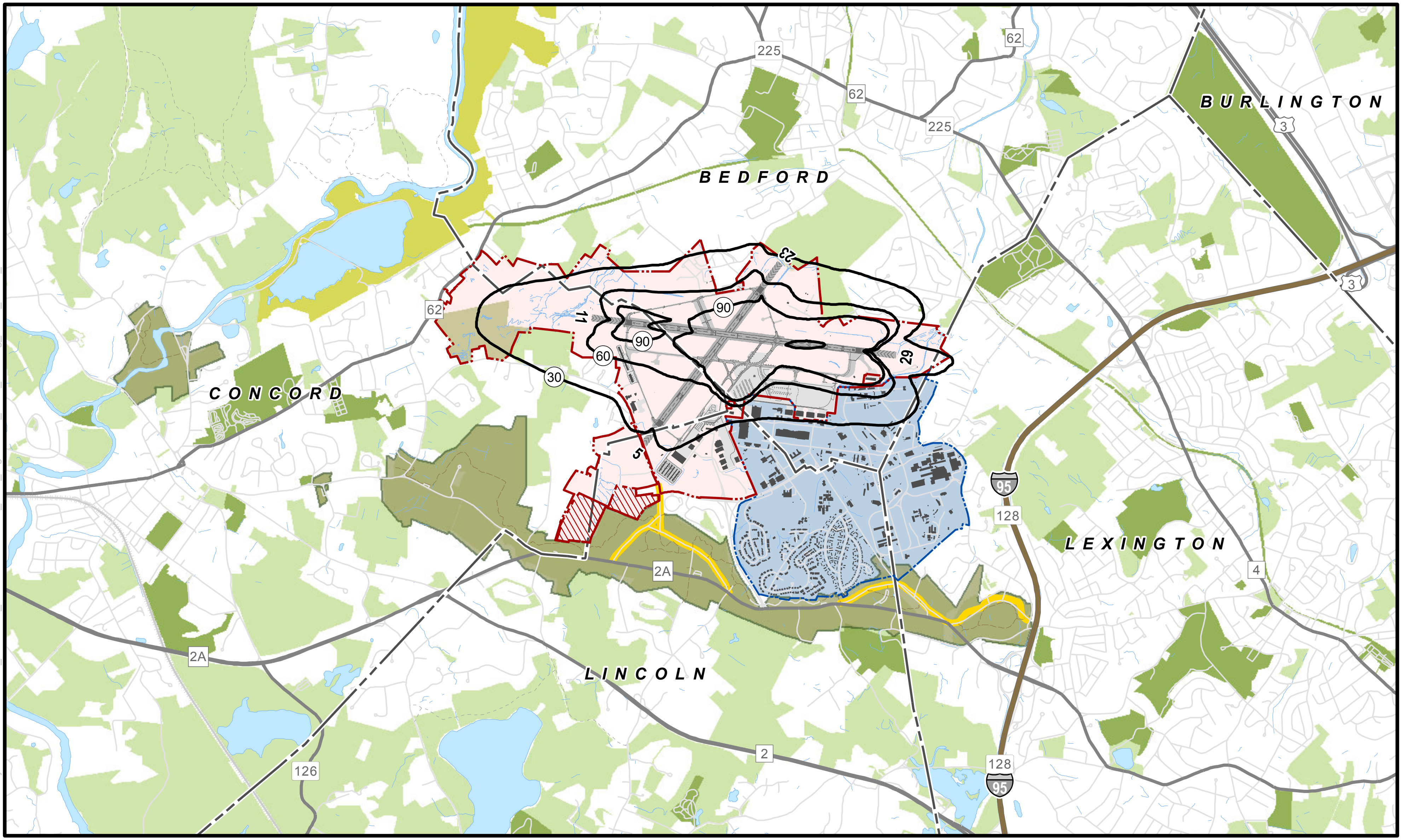
7.5.3 Time Above

A Time Above threshold level of 65 dBA is considered useful by acousticians when considering speech interference. People can generally carry on acceptable outdoor conversations in a normal voice at typical communication distances of three to four feet as long as the background noise (in this case, aircraft) remains less than 65 dBA. Also, in a house with open windows, a 65 dBA sound level outdoors produces an indoor sound level that is low enough to permit relaxed conversation at communication distances up to about six feet.

In the *2012 ESPR*, like the *2000* and *2005 ESPRs*, Massport has also provided information on times above a lower threshold of 55 dBA. Outdoor conversations at a normal voice effort in the presence of these lower levels are typically acceptable to distances of ten to 15 feet, and indoors with windows open conversations would be acceptable using a normal voice effort at distances of 15 feet or more (see Appendix D).

The *2012 ESPR* reports the results in the form of contours showing areas where aircraft noise exceeds the two threshold sound levels of 65 and 55 dBA for periods of 30, 60, and 90 minutes per day.[33] Figure 7-12 presents TA 65 dBA contours and Figure 7-13 presents the TA 55 dBA contours. The cumulative areas within the TA contours for 2000, 2005 and 2012 are presented in Table 7-16. The data is divided between Massport property, Hanscom AFB, and off property (meaning outside Hanscom Field and Hanscom AFB). The sizes of the TA 55 dBA and TA 65 dBA contours generally decreased in 2012 relative to 2005 for the 30 minute contours and increased for the 60 minute and 90 minute contours.

[33]Note that nighttime noise sources are not assessed an additional penalty in the Time Above metric.



North

0 2,000 4,000 Feet

2012 Time Above 65 dBA Contours (Minutes)

Hanscom Field Property Boundary

Massport Property within MMNHP Congressional Boundary

Hanscom AFB Property Boundary

Municipal Boundary

Historic Road

Interstate

Highway

Road

Trail

Active Rail Service

MMNHP Boundary

Great Meadows

Open Space Non-protected

Open Space Protected in Perpetuity

Open Water

Stream

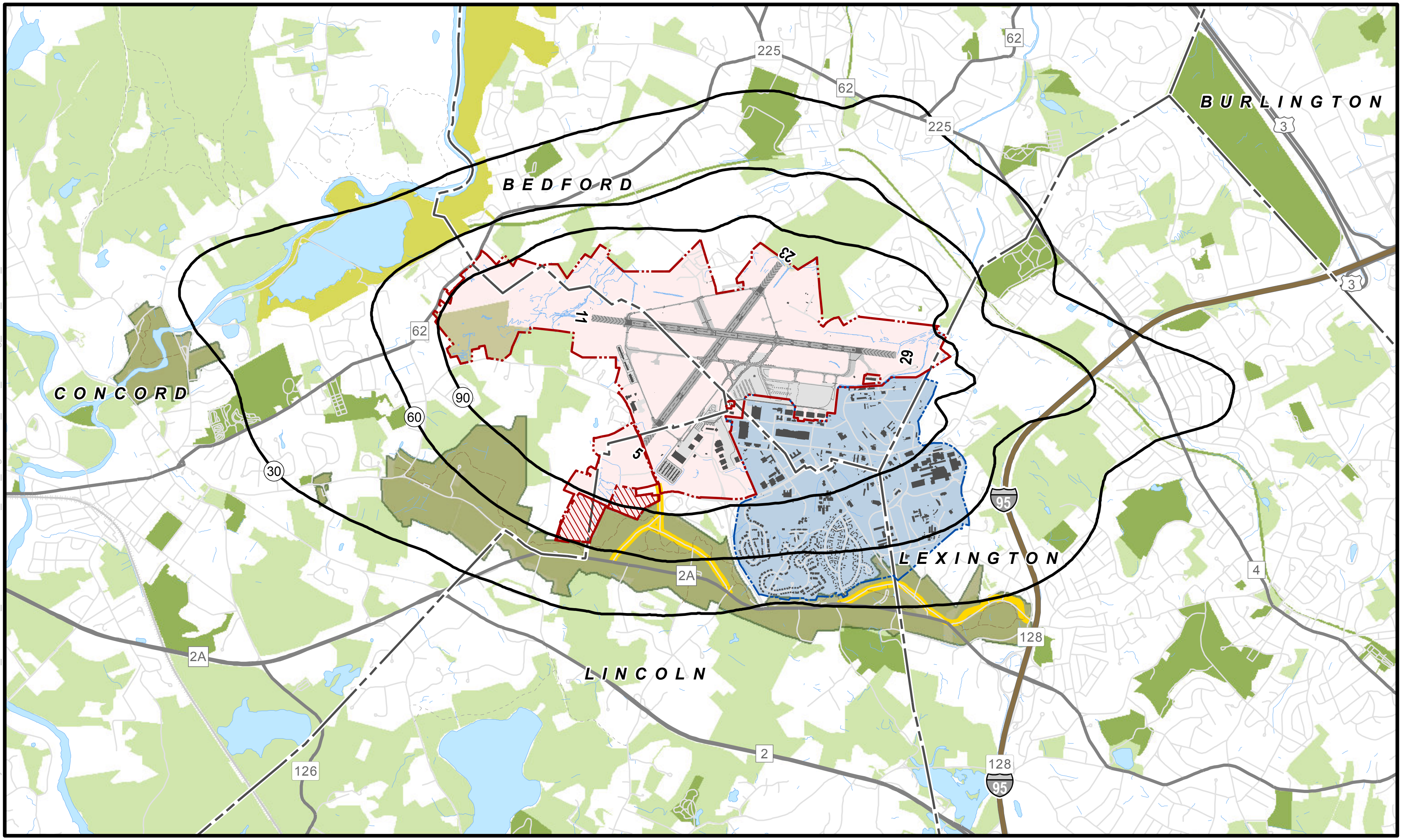
Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 Time Above 65 dBA Contours

Figure **7-12**



North

0 2,000 4,000 Feet

2012 Time Above 55 dBA Contours (Minutes)

Hanscom Field Property Boundary

Massport Property within MMNHP Congressional Boundary

Hanscom AFB Property Boundary

Municipal Boundary

Historic Road

Interstate

Highway

Road

Trail

Active Rail Service

MMNHP Boundary

Great Meadows

Open Space Non-protected

Open Space Protected in Perpetuity

Open Water

Stream

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 Time Above 55 dBA Contours

Figure **7-13**

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-13_2012_Existing_TA55_Noise_Contour.mxd

Table 7-16 2012 Area within Time Above 65 and 55 dBA Contours

Time Above Contour Level	Cumulative Area (Acres)											
	2000	2000 Massport	2000 AFB	2000 Off Airport	2005	2005 Massport	2005 AFB	2005 Off Airport	2012	2012 Massport	2012 AFB	2012 Off Airport
TA 65 dBA Contour												
90 minutes	**169**	158	11	0	**281**	279	0	2	**289**	275	0	14
60 minutes	**468**	436	22	10	**498**	468	8	22	**526**	489	12	25
30 minutes	**1,120**	883	75	162	**1,326**	956	78	292	**1,238**	933	89	216
TA 55 dBA Contour												
90 minutes	**1,619**	1,073	139	407	**1,828**	1,060	166	602	**2,362**	1247	336	779
60 minutes	**3,171**	1,299	468	1404	**3,551**	1,254	447	1850	**4,006**	1301	640	2065
30 minutes	**6,798**	1,302	744	4752	**8,405**	1,302	761	6342	**7,542**	1,302	782	5458

Table 7-17 presents the population between the contour levels for the TA 65 and 55 dBA metrics for 2005 and 2012. Appendix D describes the methodology used to compute these population counts based on the contour geometry, US Census data, and land use polygons.

Table 7-17 2012 Population within Time Above 65 and 55 dBA Contours

Time Above Contour Level	Population between Contours		
	2000	2005	2012
TA 65 dBA Contour			
90 minutes or greater	0	0	0
60 to 90 minutes	1	50	52
30 to 60 minutes	353	470	349
Total 30 Minutes or Greater	354	520	401
TA 55 dBA Contour			
90 minutes	641	937	1,139
60 minutes	1,234	1,301	2,610
30 minutes	7,107	9,112	6,234
Total 30 Minutes or Greater	8,982	11,350	9,983

7.5.4 Total Noise Exposure (EXP)

Table 7-18 presents the EXP for 2012 at Hanscom Field. Appendix D presents detailed results of the 2012 EXP calculation. The total EXP for civil departures was 107.4 dB using INM Version 7.0c presents a historic comparison of EXP values from 1987 to 2012 using increasingly updated versions of the INM as discussed earlier in this chapter.

Table 7-18 Year 2012 Total Noise Exposure (EXP) (in dB)

Groups	Departure Only	Arrival Only	Total
All civil aircraft except single piston	106.2	106.6	109.5
All civil aircraft	107.4	108.0	110.7
All military aircraft	91.3	87.8	92.9
All civil and military aircraft except single piston	106.3	106.6	109.5
All civil and military aircraft	107.5	108.0	110.8

Table 7-19 Historic Trends in EXP

Year	Civilian Aircraft Departure EXP	Noise Model
1987	112.0	INM Version 3.9
1988	112.4	
1989	111.6	
1990	110.8	
1991	110.7	
1992	111.4	
1993	110.6	
1994	111.4	
1995	111.6	
1996	112.0	INM Version 5.1
1997	112.3	
1998	113.1	
1999	113.0	
2000	112.3	INM Version 6.0c
2001	111.6	
2002	112.4	
2003	111.9	
2004	111.9	
2005	111.4	INM Version 6.1
2006	111.0	
2007	111.3	
2008	110.2	
2009	109.2	
2010	109.2	
2011	109.1	
2012	107.4	INM Version 7.0c

Source: Massport

7.5.5 SEL Contours

Figure 7-14 and Figure 7-15 depict contours for comparison of single-event noise levels for some common aircraft types at Hanscom Field. Figure 7-14 presents SEL contours for departure and arrival of four typical general aviation jets: the Lear 25, the Lear 35, the Gulfstream IV, and the Canadair Regional Jet. The Lear 25 is a typical Stage 2 Corporate Jet, whereas the Lear 35 (the most common jet operating at Hanscom Field), the Gulfstream IV, and the Canadair Regional Jet are Stage 3 Corporate Jets.[34] The Canadair Regional Jet is a modified business jet that is often used in commuter operations.

Figure 7-14 shows that at any given location, SELs for Stage 2 aircraft are typically 10 to 15 dB higher than the Stage 3 aircraft. Keeping in mind the logarithmic nature of decibels, a single operation by one of the Stage 2 jets will have 10 times the influence on the total noise level (DNL or EXP) as a Stage 3 jet. Figure 7-15 shows the departure single-event noise contours for the most common propeller aircraft at

[34]As a result of the Airport Noise and Capacity Act of 1990, the only Stage 2 jets that are allowed to fly in the U.S. since December 1999 are those weighing less than 75,000 pounds. This includes most general aviation jets. In 2012, Congress passed the FAA Modernization and Reform Act, which included the phase out of all non-stage 3 aircraft by December 31, 2015.

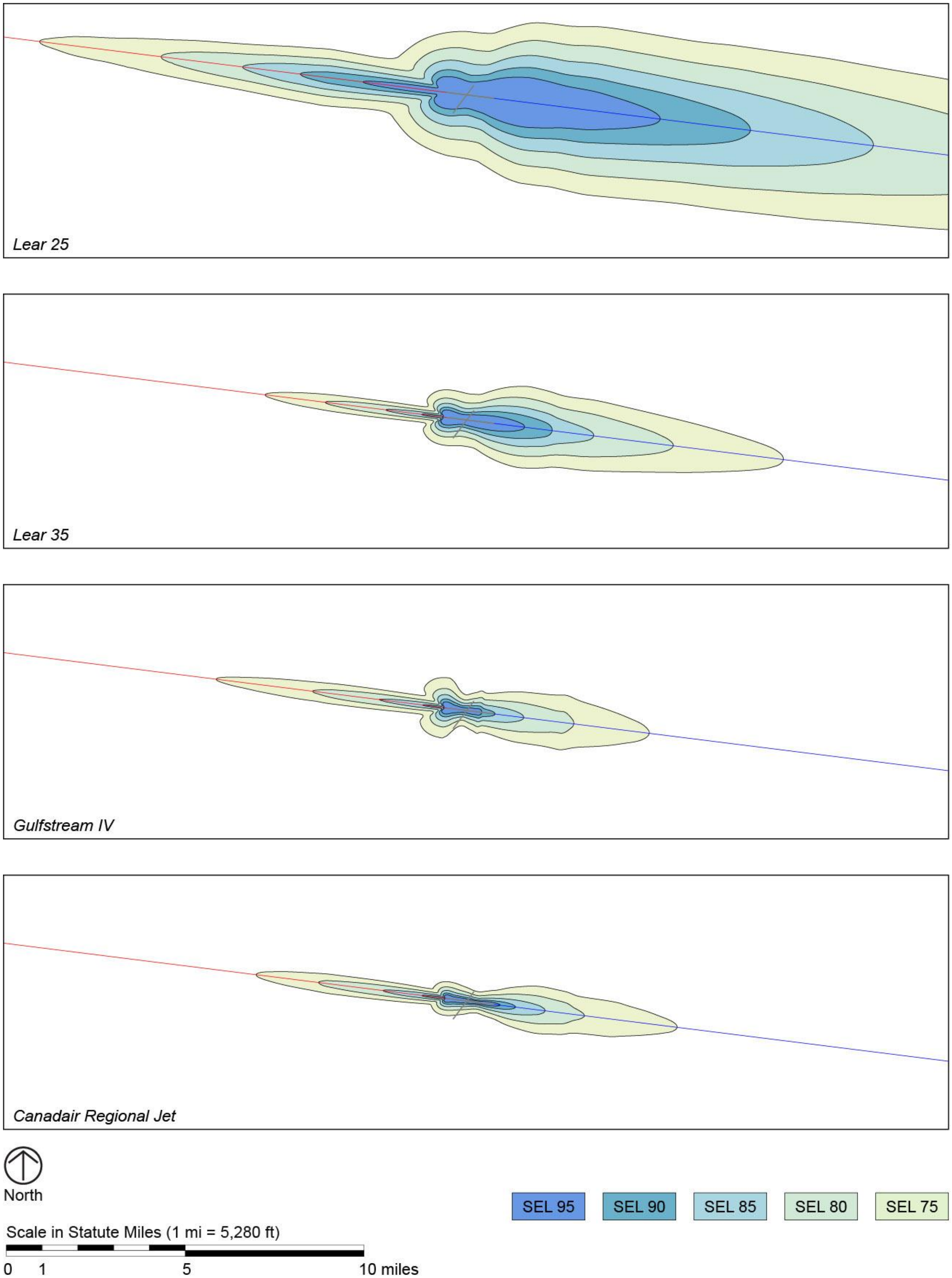


Figure 7-14 SEL Contours for Common General Aviation Jet Aircraft

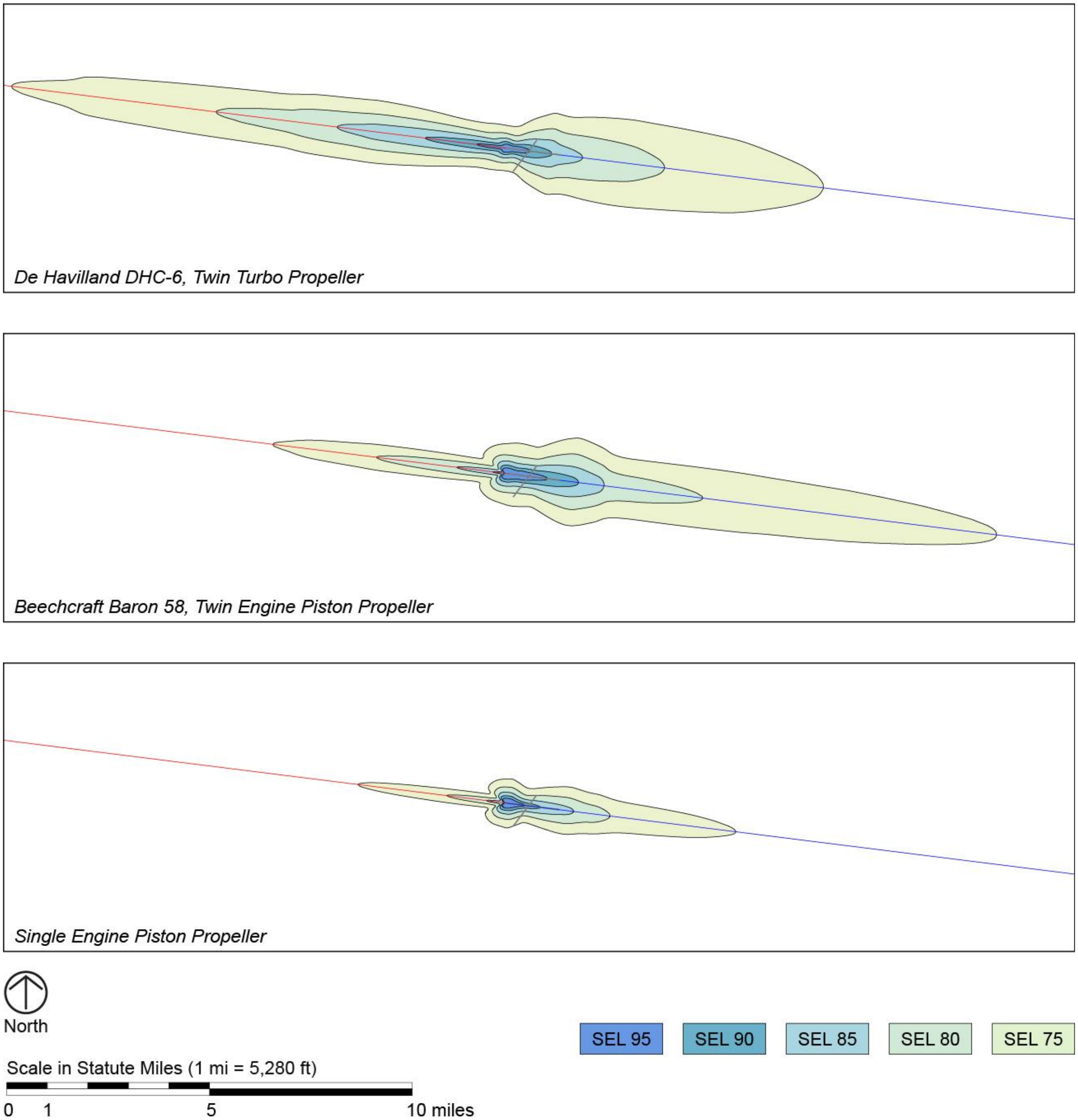


Figure 7-15 SEL Contours for Common Propeller Aircraft

Hanscom Field: a de Havilland DHC-6 twin turbo propeller, a Beechcraft Baron 58 twin-engine piston propeller, and a single engine piston propeller.

A recommendation of the Hanscom Noise Workgroup was to evaluate the distribution of "noise events" at Hanscom Field. For this purpose, the INM-computed SEL for each aircraft departing the airport (the same metric used in the computation of EXP) was grouped into a 5-decibel increment with all other aircraft producing similar noise levels, and the number of daily occurrences was tallied for each future scenario in the *2012 ESPR*.

Figure 7-16 presents a plot of the distribution of the SEL values for historical data: 1987, 1990, 1995, 2000, 2005, and 2012. Data were derived from Massport's Annual Noise Reports for 1987 and 1990, the 1995 GEIR for 1995, and the ESPRs for 2000 and 2005. Single engine piston propeller aircraft were excluded from the presentation so that differences between the numbers of operations by louder aircraft for the various scenarios would be clear. Inclusion of these departures (172 per day in 2012) would have compressed the y-axis to the point that these differences would have been unreadable. The figure shows that operations by the noisiest aircraft types (SEL greater than 95 dBA) decreased over time, while operations by relatively quieter aircraft types increased during that same period.

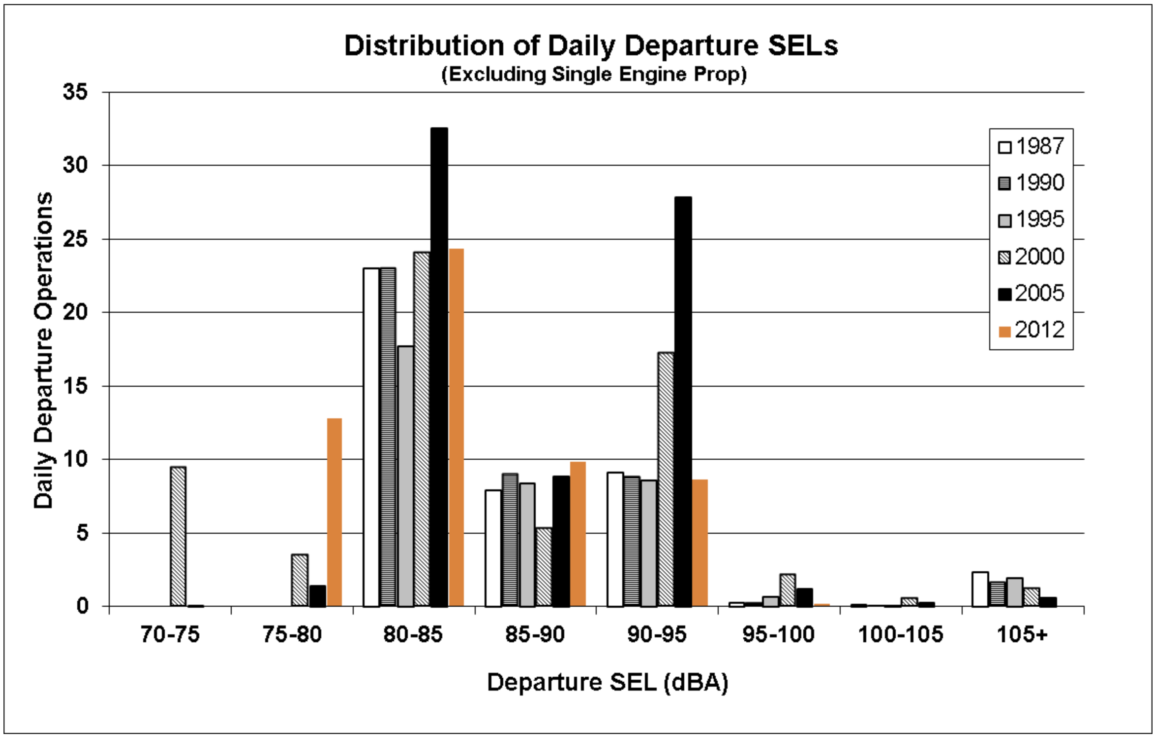


Figure 7-16 Historical Distribution of Daily Departure SELs (Excluding Single Engine Prop)

7.5.6 Aircraft Overflights of Minute Man National Historical Park

In 1991, Congress directed the National Park Service to conduct research on the impacts of aircraft overflying the National Park System in Public Law 100-91, the National Parks Overflights Act. The National Park Service issued Director's Order 47 (DO47) "Soundscape Preservation and Noise Management" in December 2000. The purpose of the order is to "articulate National Park Service operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources."

DO47 directs park managers to develop soundscape preservation and noise management plans that are consistent with the individual objectives for the park set forth in the Park General Management Plan. The individual park superintendent is tasked with identifying appropriate noise levels and criteria, as well as a plan for noise management and soundscape preservation. Massport met with National Park Service staff to discuss their soundscape preservation and noise management plans at Minute Man National Historical Park. At this time, the soundscape management plan for Minute Man National Historical Park has not been completed, though the National Park Service has begun its soundscape management planning process and collected noise measurements at several locations.

In order to address noise levels at various locations in Minute Man National Historical Park, thirty-one locations were included in the list of noise analysis locations. The sites that were included in the *2005*

ESPR were reviewed and updated with input from the National Park Service. These locations are illustrated on Figure 7-11.

Table 7-20 presents the computed DNL at these sites for 2012. As shown in Table 7-20 and Figure 7-9, none of these thirty-one locations fell within either the 65 dB DNL or 55 dB DNL contours. No portion of the park fell within the 65 dB DNL contour or the 55 dB DNL contour. None of Historic Battle Road Interpretive Trail fell within either the 65 dB DNL or 55 dB DNL contours. As discussed earlier, Time Above computations with thresholds of 65 dBA and 55 dBA estimate the length of time during an average day in which people could experience outdoor speech interference at distances of three to four and ten to 15 feet, respectively. This is relevant to activities such as outdoor interpretive programs within Minute Man National Historical Park.

Table 7-21 and Table 7-22 present the time above 65 dBA and 55 dBA values for thirty-one points within Minute Man National Historical Park. Sites within the park experienced one to eight minutes per day with noise levels over 65 dBA. At the lower threshold of 55 dBA, the total time per day ranged from 12 to 84 minutes. The highest times above 55 dBA were in the range of 51 to 84 minutes per day and occurred in an area stretching from the western end of the Battle Road Unit at sites near Meriam's Corner to the Sgt. Samuel Hartwell House Site, directly south of the intersection of Runways 11/29 and 5/23. These are the closest sites in the Park to Hanscom Field's runways, and receive noise from several types of aircraft operations including departures turning south off of Runway 29, aircraft departing Runway 23, and pattern operations on Runway 11/29. The establishment of revised Touch-and-Go routes that limit flights over the MMNHP has contributed to a decrease in Time Above results.

Massport first developed a fly friendly program in 2001. This program encourages pilots to use the quietest flying techniques that are safe and practical. Inserts for pilot manuals continue to be made available for pilots of all aircraft (including commercial aircraft), outlining the Aircraft Owners and Pilot Association's and National Business Aircraft Association's quiet flying recommendations. Framed posters describing noise abatement procedures are hanging in the flight school offices and FBOs. Massport also periodically reminds these offices to encourage the pilots to use quiet flying techniques including through quarterly meetings.

Additionally, videos that discuss the concepts are incorporated into the training required to get a Hanscom security badge. As a result, pilots based at Hanscom are being exposed and re-exposed to the program, increasing awareness and an understanding of the quiet flying techniques. Security badges were instituted after September 11, 2001. There is a continued effort to implement multiple reminders to pilots to establish and maintain a culture of quiet flying.

In 2009, Massport began a new initiative to reduce noise over the Minute Man National Historical Park. Most touch-and-go operations circle to the south of the airport, potentially taking the aircraft over areas of the Battle Road Trail that are used by the Park for outdoor programs and interpretive talks. In a partnership with the Park, the FAA, the flight schools and Hanscom pilots, it was determined that small aircraft could increase the use of a tight touch-and-go pattern that keeps the aircraft over the airfield rather than over sensitive park areas.

Using radar data, Massport staff monitor the number of touch-and-go operations over the park. This data is a critical part of ongoing quarterly meeting between Massport, FAA air traffic control tower, and flight school staff to review touch and go flight paths. Since the initiation of this program, overflights over the park have been reduced by an average of 21%.

Table 7-20 2012 DNL at Noise Analysis Locations in the Minute Man National Historical Park (in dB)

Label		Name[3]	Unit/Town[4]	DNL Value		
2012[1]	2005[2]			2000	2005[2]	2012
MM-1	MM-1	Major John Buttrick House	North Bridge Unit / Concord	51.9	51.2	48.7
MM-2	MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	-	50.5	48.3
MM-3	MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	51.4	50.3	48.2
MM-4	MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	50.8	49.7	47.9
MM-5	MM-5	North Bridge	North Bridge Unit / Concord	50.9	49.9	48.0
MM-6	MM-6	Old Manse *	North Bridge Unit / Concord	51.4	50.2	48.1
MM-7	MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	52.6	53.6	50.3
MM-8	MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	52.2	51.9	50.3
MM-9	MM-9	Meriam House	Battle Road Unit / Concord	52.7	52.1	50.6
MM-10	MM-10	Historic Farming Fields	Battle Road Unit / Concord	53.4	51.4	50.7
MM-11	MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	50.5	50.5	49.2
MM-12	MM-12	Samuel Brooks House	Battle Road Unit / Concord	53.1	52.5	50.8
MM-13	MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	54.2	53.4	51.4
MM-14	MM-14	Job Brooks House	Battle Road Unit / Lincoln	54.5	53.0	51.5
MM-15	MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	54.0	51.7	50.7
MM-16	MM-16	Bloody Angle	Battle Road Unit / Lincoln	51.4	50.1	50.9
MM-17	MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	48.3	47.8	49.2
MM-18	MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	47.7	47.1	48.5
MM-19	MM-19	Captain William Smith House	Battle Road Unit / Lincoln	45.6	45.8	47.0
MM-20	MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	45.5	45.2	45.8
MM-21	MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	-	44.5	45.5
MM-22	MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	-	45.9	46.0
MM-23	MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	46.8	47.2	47.0
MM-24	MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	46.9	47.5	47.1
MM-25	MM-25	Parkers Revenge	Battle Road Unit / Lexington	46.6	47.6	47.0
MM-26	MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	45.3	46.9	46.1
MM-27	MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	-	47.6	46.4
MM-28	MM-28	The Bluff and Monument	Battle Road Unit / Lexington	44.9	47.7	45.9
MM-29	MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	-	47.7	46.2
MM-30	MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	46.4	48.4	46.2
MM-31	-	Col. James Barrett Farm*	Barrett Farm Unit/Concord	-	-	43.5

Notes:
1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. The *2005 ESPR* labels are provided for reference purposes. Blanks indicate new locations that have been added to the *2012 ESPR* list of noise analysis locations.
3. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
4. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner.

Table 7-21 2012 Time-Above 65 dBA at Noise Analysis Locations in the Minute Man National Historical Park

Label		Name[3]	Unit/Town[4]	TA-65 (Minutes)		
2012[1]	2005[2]			2000	2005[2]	2012
MM-1	MM-1	Major John Buttrick House	North Bridge Unit / Concord	5.6	5.9	3.1
MM-2	MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	-	5.1	2.8
MM-3	MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	5.2	4.9	2.7
MM-4	MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	4.3	4.5	2.5
MM-5	MM-5	North Bridge	North Bridge Unit / Concord	4.4	4.7	2.7
MM-6	MM-6	Old Manse *	North Bridge Unit / Concord	4.7	5.1	2.9
MM-7	MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	5.1	8.8	5.7
MM-8	MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	6.5	8.4	5.7
MM-9	MM-9	Meriam House	Battle Road Unit / Concord	7.2	8.8	6.2
MM-10	MM-10	Historic Farming Fields	Battle Road Unit / Concord	11.8	8.0	7.0
MM-11	MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	6.2	4.9	4.7
MM-12	MM-12	Samuel Brooks House	Battle Road Unit / Concord	7.2	4.2	6.6
MM-13	MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	7.5	4.1	7.3
MM-14	MM-14	Job Brooks House	Battle Road Unit / Lincoln	7.7	4.4	8.0
MM-15	MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	7.1	4.0	7.1
MM-16	MM-16	Bloody Angle	Battle Road Unit / Lincoln	7.1	4.2	7.3
MM-17	MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	3.3	2.8	4.1
MM-18	MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	2.5	2.1	2.9
MM-19	MM-19	Captain William Smith House	Battle Road Unit / Lincoln	1.0	1.2	1.5
MM-20	MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	1.4	1.1	1.1
MM-21	MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	-	0.8	1.0
MM-22	MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	-	1.4	1.3
MM-23	MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	2.3	2.2	1.8
MM-24	MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	2.3	2.6	1.9
MM-25	MM-25	Parkers Revenge	Battle Road Unit / Lexington	2.3	2.5	1.9
MM-26	MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	1.6	2.2	1.4
MM-27	MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	-	2.8	1.6
MM-28	MM-28	The Bluff and Monument	Battle Road Unit / Lexington	1.4	2.9	1.5
MM-29	MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	-	2.8	1.6
MM-30	MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	1.7	3.6	2.0
MM-31	-	Col. James Barrett Farm*	Barrett Farm Unit/Concord	-	-	0.7

Notes:
1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. The *2005 ESPR* labels are provided for reference purposes. Blanks indicate new locations that have been added to the *2012 ESPR* list of noise analysis locations.
3. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
4. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner.

Table 7-22 2012 Time-Above 55 dBA at Noise Analysis Locations in the Minute Man National Historical Park

Label		Name[3]	Unit/Town[4]	TA-55 (Minutes)		
2012[1]	2005[2]			2000	2005[2]	2012
MM-1	MM-1	Major John Buttrick House	North Bridge Unit / Concord	26.4	38.5	26.6
MM-2	MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	-	35.5	26.1
MM-3	MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	24.8	34.5	25.8
MM-4	MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	21.3	30.1	25.1
MM-5	MM-5	North Bridge	North Bridge Unit / Concord	21.5	31.0	25.8
MM-6	MM-6	Old Manse *	North Bridge Unit / Concord	22.0	30.6	26.3
MM-7	MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	29.9	43.8	34.4
MM-8	MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	44.9	53.8	47.0
MM-9	MM-9	Meriam House	Battle Road Unit / Concord	49.4	55.6	51.0
MM-10	MM-10	Historic Farming Fields	Battle Road Unit / Concord	75.3	70.8	77.2
MM-11	MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	53.2	53.2	57.1
MM-12	MM-12	Samuel Brooks House	Battle Road Unit / Concord	46.8	38.9	52.3
MM-13	MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	44.3	34.8	51.1
MM-14	MM-14	Job Brooks House	Battle Road Unit / Lincoln	47.1	37.0	57.2
MM-15	MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	43.9	32.9	53.2
MM-16	MM-16	Bloody Angle	Battle Road Unit / Lincoln	64.9	46.9	84.4
MM-17	MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	47.0	42.9	72.5
MM-18	MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	41.9	39.4	63.5
MM-19	MM-19	Captain William Smith House	Battle Road Unit / Lincoln	28.9	28.7	45.7
MM-20	MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	15.9	21.0	31.0
MM-21	MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	-	17.7	25.9
MM-22	MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	-	26.5	32.7
MM-23	MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	31.8	36.6	42.6
MM-24	MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	32.0	38.4	43.1
MM-25	MM-25	Parkers Revenge	Battle Road Unit / Lexington	29.9	38.2	41.1
MM-26	MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	18.9	31.6	31.3
MM-27	MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	-	35.3	32.5
MM-28	MM-28	The Bluff and Monument	Battle Road Unit / Lexington	14.5	29.5	24.4
MM-29	MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	-	34.1	29.7
MM-30	MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	10.4	30.7	19.8
MM-31	-	Col. James Barrett Farm*	Barrett Farm Unit/Concord	-	-	11.9

Notes:
1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. The *2005 ESPR* labels are provided for reference purposes. Blanks indicate new locations that have been added to the *2012 ESPR* list of noise analysis locations.
3. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
4. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner.

7.6 Analysis of Future Scenarios

All aspects of model input required for the 2012 calculations were also necessary for analysis of future impacts. No changes were made to the airfield layout, flight tracks, runway use, or aircraft noise and performance data for the future cases. Only the operations data, which consist of the types of aircraft and number of operations, were changed.

The *2012 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes. The future service scenarios are consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats. Table 7-23 summarizes the average daily operations for the two forecast scenarios. A more detailed breakdown of operations by individual aircraft types is included for each scenario in Appendix D.

Table 7-23 Forecast Average Daily Operations

Group	Departures		Arrivals		Total
	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)	
2020					
Stage 2 Jets	0.0	0.0	0.0	0.0	0.0
Stage 3 Jets	44.1	2.5	42.7	3.8	93.1
Turbo Prop	5.0	0.1	5.0	0.2	10.4
Piston	165.7	0.5	165.4	0.8	332.4
Military	1.0	0.0	1.0	0.0	2.0
Helicopters	10.0	0.2	10.0	0.2	20.5
All Groups	225.9	3.3	224.2	5.0	458.4
2030					
Stage 2 Jets	0.0	0.0	0.0	0.0	0.0
Stage 3 Jets	58.8	3.3	57.0	5.1	124.3
Turbo Prop	6.5	0.9	6.4	0.2	14.0
Piston	182.1	0.6	181.8	0.9	365.4
Military	1.0	0.0	1.0	0.0	2.0
Helicopters	10.0	0.2	10.0	0.2	20.5
All Groups	258.5	5.0	256.2	6.5	526.2

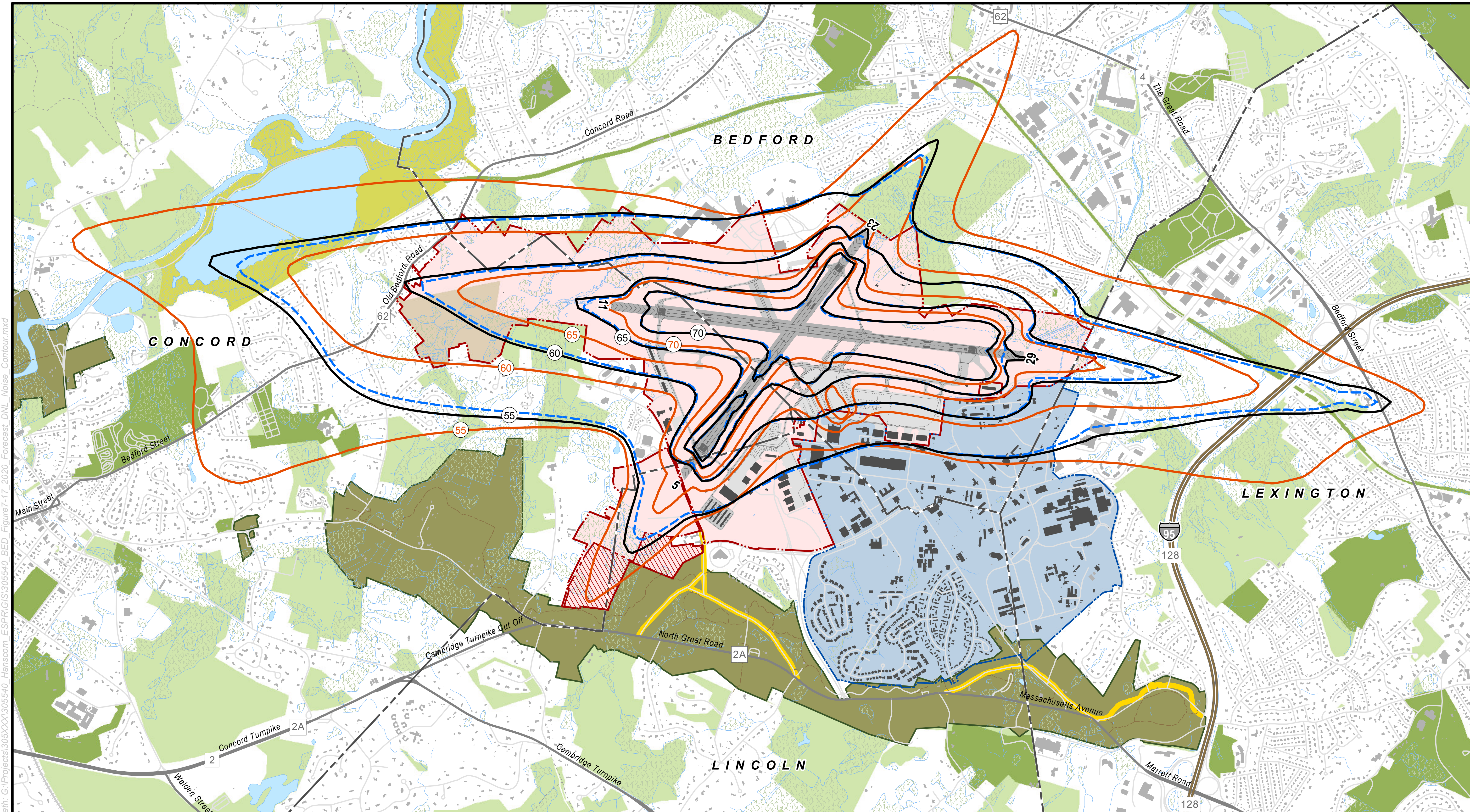
7.6.1 DNL Contours

Figure 7-17 and Figure 7-18 depict the 55, 60, 65, and 70 dB DNL contours for the two future scenarios. In each figure the 2005 and 2012 contours are also shown for comparison. In both figures, the area within each contour level increases in the future scenarios, but remains confined within the 2005 contour. The growth in the contours occurs fairly evenly. Another notable feature is the growth in the contour despite phase out of operations by the older, noisier Stage 2 aircraft such as the Lear 25. The overall increase in operations offsets any reductions resulting from fleet mix changes. The area within each contour interval is presented in Table 7-24 for 2005 and 2012 for comparison to the forecast years of 2020 and 2030. The data show that DNL contours for 2020 is only increase marginally above 2012 and contours for 2030 will affect less area than in 2005.

Table 7-24 Forecast Area within DNL Contours

DNL Contours (dB)	Cumulative Area (Acres)			
	2005	2012	2020	2030
70	311	190	195	222
65	635	391	400	457
60	1,437	857	890	1,043
55	3,291	2,045	2,159	2,585

(This page intentionally left blank)



North

0 2,000 4,000 Feet

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013;
MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013;
NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

- 2005 DNL Noise Contour
- 2012 DNL Noise Contour
- 2020 DNL Noise Contour
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service
- Open Water
- Stream
- Wetland/Marsh
- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity

massport

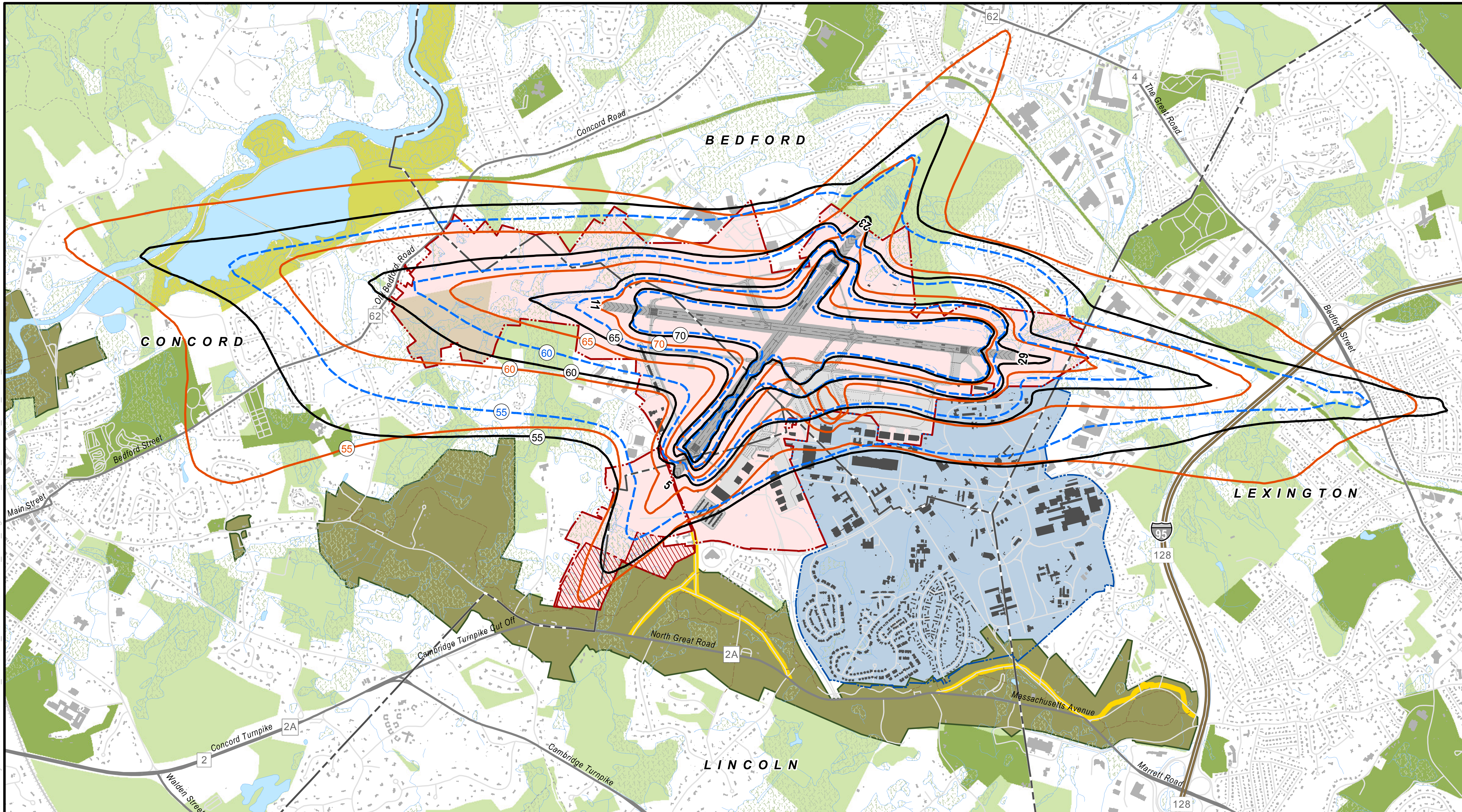
Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2005 and 2012 DNL Noise Contours Compared to 2020 Forecast DNL Noise Contours

Figure 7-17

(This page intentionally left blank)



North

0 2,000 4,000 Feet

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013;
MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013;
NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-18_2030_Forecast_DNL_Noise_Contour.mxd

- 2005 DNL Noise Contour
- 2012 DNL Noise Contour
- 2030 DNL Noise Contour
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service
- Open Water
- Wetland/Marsh
- Stream
- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2005 and 2012 DNL Noise Contours Compared to 2030 Forecast DNL Noise Contours

Figure **7-18**

(This page intentionally left blank)

7.6.2 Residential Land Use Impacts

Population estimates were prepared for the forecast cases using year 2010 U.S. Census data and the same Geographic Information Systems (GIS) techniques described previously for the 2012 operating conditions. Table 7-25 presents the population within the 55, 60, 65, and 70 dB DNL contours for the forecast cases in 2020 and 2030. The values calculated for 2005 and 2012 are included for comparison. The areas of future growth in the contours relative to 2012 shown in Figure 7-17 and Figure 7-18 are reflected in Table 7-25. In the future, the population between the 55 dB and 60 dB DNL contours is projected to increase in Bedford, Concord, and Lexington and the population between the 60 dB and 65 dB DNL contours is projected to increases in Bedford and Concord relative to 2012. In both forecast years the population within the 65 dB DNL contour remains zero in all four towns. No population in Lincoln is exposed to a DNL of 55 dB or higher in either of the future scenarios. Population affected by specific contour intervals in 2012 was smaller than occurred in 2005 and will continue to be smaller in both 2020 and 2030 than occurred in 2005.

Table 7-25 U.S. Census Population Counts within Current and Forecast DNL Contours

Town	Total Population between DNL Contours:				
	70 dB or Greater	65 to 70 dB	60 to 65 dB	55 to 60 dB	Total 55 dB or Greater
2005					
Bedford	0	17	256	872	1,145
Concord	0	0	209	1,075	1,284
Lexington	0	0	0	524	524
Lincoln	0	0	0	0	0
Total	**0**	**17**	**465**	**2,471**	**2,953**
2012					
Bedford	0	0	87	369	456
Concord	0	0	0	542	542
Lexington	0	0	0	43	43
Lincoln	0	0	0	0	0
Total	**0**	**0**	**87**	**954**	**1,041**
2020					
Bedford	0	0	91	400	491
Concord	0	0	2	594	596
Lexington	0	0	0	89	89
Lincoln	0	0	0	0	0
Total	**0**	**0**	**93**	**1,083**	**1,176**
2030					
Bedford	0	0	128	510	638
Concord	0	0	23	840	863
Lexington	0	0	0	358	358
Lincoln	0	0	0	0	0
Total	**0**	**0**	**151**	**1,708**	**1,859**

7.6.3 DNL for Existing and Forecasts Years at Noise Analysis Locations by Town

Table 7-26 through Table 7-29 present the INM-computed DNL values at the noise analysis locations in the vicinity of Hanscom Field for the two forecast scenarios. The values calculated for 2012 are included for comparison. The tables show consistent results with the DNL contours and population assessments. The 2030 forecast scenario would yield the highest DNL values.

While all future contour areas, population counts, and noise levels at noise analysis locations are predicted to increase relative to the year 2012, the importance of any differences from one scenario to the next depends both on the absolute value of the projected DNL as well as on the magnitude of the change. Noise impact criteria are used to determine areas for further analysis and possible mitigation when completing environmental documentation for a specific project at an airport. Though the *2012 ESPR* is not an environmental permitting document for a specific project, the use of these criteria help to highlight notable changes in the noise environment at Hanscom Field.

FAA Order 1050.1E CHG1, "Environmental Impacts: Policies and Procedures"[35], identifies a change of 1.5 dB or more at a "noise-sensitive area"[36] as a threshold for further analysis. FICON clarifies the FAA position by recommending a tiered approach be used to screen noise impacts. The 1.5 dB threshold of significance for noise-sensitive areas within the 65 dBA DNL contour is used for initial screening, but if such changes are found to occur, additional analysis of noise analysis locations is to be conducted between DNL values of 60 and 65 dBA to determine whether those noise analysis locations would experience changes of three or more dB. Such sites, if they are found to exist, are eligible for federal agency mitigation options.[37]

No noise analysis locations are exposed to a DNL of 60 dBA or above. From two to three sites would be exposed to DNL values between 55 and 60 dBA depending upon the scenario. The higher number of locations is associated with the 2030 scenario.

[35]U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Environmental Impacts: Policies and Procedures, FAA Order 1050.1E CHG1, Washington, DC.
[36]Using FAA guidelines, "noise-sensitive areas" are generally assumed to be residential areas within the DNL 65 dB contour.
[37]Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Analysis Issues, August 1992. FICON did not address noise levels below DNL 60 dBA because it considered noise predictions below that level to be less reliable.

Table 7-26 Existing and Forecast DNL at Noise Analysis Locations in Bedford (in dB)

Label[1]	Name[2]	Address/Town	2012	2020	2030
HB-1	Veterans Administration Medical Center*	200 Springs Rd, Bedford	41.8	42.2	43.2
NB-1	Bedford Historic District	Great Rd., Bedford	44.6	44.8	45.7
NB-2	Old Bedford Center Historic District	Great Rd., Bedford	45.4	45.7	46.7
NB-3	Old Burying Ground	7 Springs Rd., Bedford	45.7	46.1	47.1
NB-4	Old Town Hall	16 South Rd., Bedford	46.1	46.5	47.4
NB-5	Bedford Depot Park Historic District	80 Loomis St./120 South Rd., Bedford	49.8	50.3	51.3
NB-6	Nathaniel Page House	89 Page Rd., Bedford	45.9	46.5	47.5
NB-7	Christopher Page House	50 Old Billerica Rd., Bedford	44.2	44.8	45.8
NB-8	Bacon-Gleason-Blodgett Homestead	118 Wilson Rd., Bedford	41.5	42.0	43.0
NB-9	Historic Wilson Mill-Old Burlington Road Historic Dist.	Old Burlington and Wilson Rds., Bedford	41.3	41.8	42.8
NB-10	Shawsheen Cemetery **	Shawsheen Rd., Bedford	45.2	45.4	46.7
NB-11	David Lane House	137 North Rd., Bedford	42.1	42.5	43.4
OB-1	Old Billerica Road Area ** (NR nomination form in process)	Old Billerica Rd, Bedford	44.0	44.7	45.7
PB-1	Town Hall *	10 Mudge Way, Bedford	45.5	45.8	46.7
PB-2	Library **	7 Mudge Way, Bedford	45.0	45.2	46.1
PB-3	Bedford School District	11Mudge Way, Bedford	45.6	45.8	46.7
PB-4	Department of Public Works	314 Great Rd., Bedford	45.4	45.6	46.9
RB-1	The Lutheran Church of the Savior	426 Davis Rd., Bedford	48.6	48.8	49.8
RB-2	First Baptist Church of Bedford	155 Concord Rd., Bedford	46.0	46.0	46.8
RB-3	St. Michael's Church	90 Concord Rd., Bedford	44.9	45.0	45.7
RB-4	Boston Buddha Vararam Temple	125 North Rd., Bedford	42.2	42.6	43.5
RB-5	The First Church of Christ Congregational/ United Church of Christ *	25 Great Rd., Bedford	45.1	45.4	46.3
RB-6	The First Parish in Bedford Unitarian Universalist *	75 Great Rd., Bedford	46.0	46.3	47.3
RB-7	St. Paul's Episcopal Church	100 Pine Hill Rd., Bedford	41.8	42.2	43.1
RB-8	March for Jesus	54 Summer St., Bedford	52.2	52.5	53.4
RB-9	Immanuel Baptist Church/ Zion Korean Alliance Church[3]	400 Great Rd., Bedford	45.8	46.1	47.3
SB-1	Davis School	Davis Rd., Bedford	43.1	43.2	44.0
SB-2	Bedford High School **	9 Mudge Way, Bedford	45.1	45.3	46.1
SB-3	John Glenn Middle School	99 McMahon Rd., Bedford	46.7	46.7	47.5

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as “N” sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Old Bedford Center Historic District.
3. The Immanuel Baptist Church and Zion Korean Alliance Church are at the same address.
4. The boundary of the Old Bedford Center Historic District has slightly expanded, the Old Bedford Center Historic District Boundary Extension, since the last study in 2005.

Table 7-27 Existing and Forecast DNL at Noise Analysis Locations in Concord (in dB)

Label[1]	Name[2]	Address/Town	2012	2020	2030
NC-1	Barrett Farm Historic District†	Barrett's Mill Rd., Concord	43.5	43.9	44.9
NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd., Concord	47.4	48.2	49.1
NC-3	Joseph Hosmer House	572 Main St., Concord	44.3	43.9	45.1
NC-4	Thoreau-Alcott House	255 Main St., Concord	46.1	46.1	47.4
NC-5	Hubbardville Historic District†	324-374 Sudbury Rd., Concord	46.5	46.6	47.9
NC-6	Hubbard-French Historic District	324-374 Sudbury Rd., Concord	46.5	46.6	47.9
NC-7	Deacon Thomas Hubbard/ Judge Henry French House	342 Sudbury Rd., Concord	46.4	46.5	47.8
NC-8	Pest House	158 Fairhaven Rd., Concord	46.3	46.5	47.8
NC-9	Main Street Historic District†	Main St. between Monument Sq. and Wood St., Concord	48.0	48.1	49.4
NC-10	North Bridge-Monument Square Historic District†	Monument St., Liberty St. and Lowell St., Concord	48.2	48.2	49.4
NC-11	Wright Tavern	Lexington Rd. & Main St., Concord	48.2	48.3	49.5
NC-12	Sleepy Hollow Cemetery	24 Court Ln., Concord	49.0	49.2	50.4
NC-13	American Mile Historic District†	Lexington Rd., Concord	48.5	48.7	49.9
NC-14	Concord Monument Square-Lexington Road Historic District	Monument Sq. and Lexington Rd., Concord	48.1	48.2	49.4
NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike, Concord	49.1	49.3	50.5
NC-16	Walden Pond[3]	MA Rte 126 (Main Beach), Concord	43.4	43.8	44.9
NC-17	Orchard House	399 Lexington Rd., Concord	50.2	50.4	51.6
NC-18	Deacon John Wheeler/ Capt. Jonas Minot Farmhouse	341 Virginia Rd., Concord	58.4	58.7	59.8
NC-19	Wheeler-Meriam House	477 Virginia Rd., Concord	58.1	58.4	59.4
NC-20	Concord Armory-Concord Veteran's Building	51 Walden St., Concord	48.1	48.2	49.5
NC-21	Concord School of Philosophy	391 Lexington Rd., Concord	50.3	50.6	51.8
NC-22	Hosmer Homestead	138 Baker Ave., Concord	41.6	41.3	42.3
PC-1	Library **	129 Main St., Concord	47.1	47.2	48.4
PC-2	Town Hall ††	22 Monument Sq., Concord	48.1	48.2	49.4
PC-3	Middlesex County Court House	305 Walden St., Concord	48.4	48.6	49.9
RC-1	Trinity Episcopal Church **	81 Elm St., Concord	45.0	44.8	46.0
RC-2	Redeemer Presbyterian Church	191 Sudbury Rd., Concord	46.7	46.8	48.0
RC-3	New Life Community Church (meeting at the Emerson School Building **)	40 Stow St., Concord	47.4	47.5	48.7
RC-4	Trinitarian Congregational Church **	54 Walden St., Concord	48.0	48.1	49.3
RC-5	First Church of Christ Scientist††	7 Lowell Rd., Concord	47.7	47.8	49.0
RC-6	St. Bernard's Parish††	70 Monument Square, Concord	47.9	48.0	49.2
RC-7	Christian Science Reading Room	20 Main St., Concord	47.9	48.0	49.3
RC-8	First Parish in Concord ††	20 Lexington Rd., Concord	48.2	48.3	49.6
SC-1	Nashoba/Brooks School	200 Strawberry Hill Rd., Concord	46.5	47.3	48.3
SC-2	Middlesex School**	1400 Lowell Rd., Concord	40.4	40.9	41.7
SC-3	Fenn School **	498-516 Monument St., Concord	50.9	51.6	52.5
SC-4	Concord Academy **	166 Main St., Concord	46.6	46.6	47.8
SC-5	Alcott School	91 Laurel Rd., Concord	48.1	48.3	49.6
SC-6	Concord/Carlisle High School	500 Walden Rd., Concord	46.8	47.0	48.3
SC-7	Ripley School	120 Meriam Rd., Concord	53.6	53.8	55.0

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State

Label[1]	Name[2]	Address/Town	2012	2020	2030
Register of Historic Places. Sites marked with a (††) contribute to the Concord Monument Square-Lexington Road Historic District. 3. The Walden Pond State Reservation is located in Concord and Lincoln. This site is at the main beach in Concord.					

Table 7-28 Existing and Forecast DNL at Noise Analysis Locations in Lexington (in dB)

Label[1]	Name[2]	Address/Town	2012	2020	2030
NLX-1	Simonds Tavern	331 Bedford St., Lexington	53.0	53.6	54.7
NLX-2	Hancock-Clarke Historic District†	Hancock St., Lexington	42.8	43.1	44.3
NLX-3	Hancock-Clarke House	35 Hancock St., Lexington	42.6	42.9	44.1
NLX-4	Garrity House	9 Hancock St., Lexington	42.7	43.0	44.3
NLX-5	Lexington Green Historic District	Mass. Ave., Harrington Rd. and Bedford St., Lexington	42.9	43.2	44.5
NLX-6	Lexington Green	Mass. Ave., Harrington Rd. and Bedford St., Lexington	42.7	43.1	44.3
NLX-7	Buckman Tavern	1 Bedford St., Lexington	42.5	42.8	44.1
NLX-8	General Samuel Chandler House	8 Goodwin Rd., Lexington	42.5	42.8	44.1
NLX-9	Hancock School	33 Forest St., Lexington	42.6	43.0	44.3
NLX-10	U.S. Post Office Building	1661 Mass. Ave., Lexington	40.8	41.1	42.5
NLX-11	Warren E. Shelburne House	11 Percy Rd., Lexington	38.4	38.8	40.3
NLX-12	Munroe Tavern Historic District†	Mass. Ave., Lexington	36.6	36.9	38.6
NLX-13	Sanderson House-Munroe Tavern	1314 & 1332 Mass. Ave., Lexington	37.4	37.8	39.3
NLX-14	John Mason House	1303 Mass. Ave., Lexington	37.7	38.0	39.6
NLX-15	East Village Historical District†	Mass Ave., Lexington	35.3	35.6	37.3
NLX-16	M.H. Merriam and Company	7-9 Oakland Ave., Lexington	41.6	41.9	43.2
OLX-1	Battle Green Historic District**	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave. and B&M Railroad, Lexington	42.8	43.1	44.4
OLX-2	National Heritage Museum	33 Marrett Rd., Lexington	36.2	36.5	38.2
PLX-1	Library **	1874 Mass. Ave., Lexington	43.1	43.5	44.7
PLX-2	Town Hall **	1625 Mass. Ave., Lexington	39.3	39.6	41.0
PLX-3	Lexington School District Administration **	1557 Massachusetts Ave., Lexington	40.0	40.3	41.7
RLX-1	Lexington United Methodist Church/ St. John's Korean United Methodist Church[3]	2600 Massachusetts Ave., Lexington	45.9	46.5	47.7
RLX-2	Temple Isaiah	55 Lincoln St., Lexington	44.2	44.7	45.9
RLX-3	Grace Chapel of Lexington	59 Worthen Rd., Lexington	44.6	44.9	46.1
RLX-4	St. Brigid's Parish *	2001 Mass. Ave., Lexington	44.0	44.3	45.5
RLX-5	First Parish-Unitarian Church††	7 Harrington Rd., Lexington	43.2	43.6	44.8
RLX-6	Hancock United Church of Christ ††	1912 Mass. Ave., Lexington	43.0	43.3	44.6
RLX-7	Church of Our Redeemer	6 Meriam St., Lexington	42.3	42.7	43.9
RLX-8	Christian Science Reading Room	10 Muzzy St. #12, Lexington	41.8	42.2	43.5
RLX-9	Greek Orthodox Church of St. Nichols **	17 Meriam St., Lexington	42.0	42.3	43.5
RLX-10	Chabad Center **	9 Burlington St., Lexington	49.9	50.3	51.4
RLX-11	Pilgrim Congregational Church	55 Coolidge Ave., Lexington	44.9	45.1	46.2
RLX-12	First Baptist Church of Lexington **	1580 Mass. Ave., Lexington	40.1	40.4	41.8
RLX-13	Jehovah's Witnesses	196 Woburn St., Lexington	36.7	36.8	38.2
RLX-14	Follen Church Society- Unitarian Universalists *	755 Massachusetts Ave., Lexington	34.0	34.2	35.9
RLX-15	Countryside Bible Chapel	480 Lowell St., Lexington	37.3	37.4	38.5
RLX-16	St. Paul Evangelical Church	451 Lowell St., Lexington	36.2	36.3	37.5
SLX-1	Minuteman Regional Vocational High School	758 Marrett Rd., Lexington	44.8	45.1	46.0
SLX-2	Maria Hastings School	2618 Mass. Ave., Lexington	45.4	46.0	47.2
SLX-3	Methodist Weekday School	2600 Massachusetts Ave., Lexington	46.0	46.6	47.7
SLX-4	Community Nursery School	2325 Massachusetts Ave., Lexington	45.8	46.3	47.4
SLX-5	Bridge Elementary School**	55 Middleby Rd., Lexington	42.2	42.8	44.2
SLX-6	Lexington High School	251 Waltham St., Lexington	41.7	42.3	43.6

Label[1]	Name[2]	Address/Town	2012	2020	2030
SLX-7	Jonas Clarke Middle School	17 Stedman Rd., Lexington	37.6	38.1	39.7
SLX-8	Estabrook School**	117 Grove St., Lexington	44.5	45.1	46.4
SLX-9	Diamond Middle School	99 Hancock St., Lexington	50.1	50.5	51.6
SLX-10	Fiske Elementary School	146 Maple St., Lexington	42.4	42.5	43.6
SLX-11	Armenian Sisters Academy	20 Pelham Rd., Lexington	37.2	37.6	39.2
SLX-12	Harrington Elementary School	148 Maple St., Lexington	33.5	33.7	35.3

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories, or historic districts that are not on the National Register of Historic Places. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as “N” sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Lexington Green Historic District.
3. The Lexington United Methodist Church and St. John's Korean United Methodist Church are at the same address.

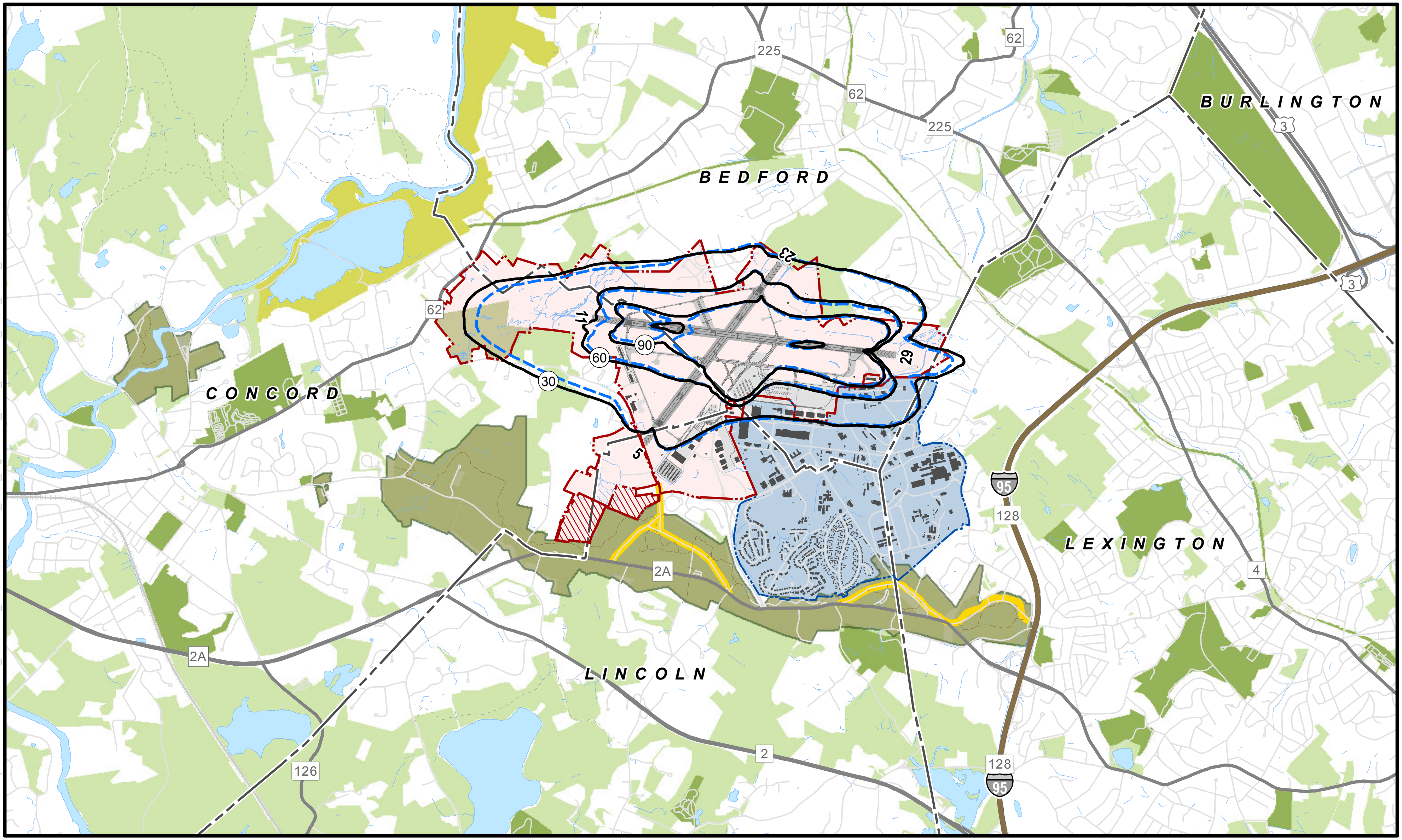
Table 7-29 Existing and Forecast DNL at Noise Analysis Locations in Lincoln (in dB)

Label[1]	Name[2]	Address/Town	2012	2020	2030
NLN-1	Walden Pond[3]	Rte. 126, Walden St., Concord Rd., Lincoln	42.6	43.0	44.1
NLN-2	Henry Higginson House	44 Baker Farm Rd., Lincoln	42.5	43.0	44.1
NLN-3	Daniel Brooks House	Brooks Rd., Lincoln	48.4	49.1	50.0
NLN-4	Lincoln Center Historic District	Bedford Rd. Lincoln Rd., Old Lexington Rd. Sandy Pond Rd. Trapelo Rd. Weston Rd., Lincoln	41.0	41.2	42.0
NLN-5	Hoar Tavern	268 Cambridge Tpke., Lincoln	41.8	42.2	43.3
SLN-1	Carroll School	25 Baker Bridge Rd., Lincoln	40.8	41.2	42.2
SLN-2	Hanscom Middle School	Hanscom AFB, Lincoln	50.2	50.1	50.7

Notes:
1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise analysis location list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln.
2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as “N” sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS.
3. The Walden Pond State Reservation is located in Concord and Lincoln. This site at the main beach in Concord.

7.6.4 Time Above (TA)

The amount of time that aircraft noise is projected to be above the 65 and 55 dBA thresholds was also computed for the two forecast scenarios using the INM. Figure 7-19 through Figure 7-22 display the contours for areas where aircraft noise exceeds each threshold of 65 and 55 dBA for 30, 60, and 90 minutes per day for each future scenario. Each figure also includes the 2012 contours for comparison. The cumulative area within each contour interval is presented for each forecast scenario in Table 7-30, with 2012 values for comparison. TA increases in area coverage for both the 65 and 55 dBA thresholds overtime which is expected with increasing activity levels. The table shows existing and future levels as well as those for 2005 for comparison. This shows that 2020 levels will be similar to 2005 (above for 60 and 90 minute threshold but below for 30 minute) and then will uniformly increase for 2030. Table 7-31 presents the population estimates for the forecast cases using the same techniques described earlier for the DNL contours. The impacts of TA thresholds on population will be similar to area, that is 2020 will be similar to what was experienced in 2005 and then will increase from 2005 levels in 2030. Appendix D provides additional detail on the methodology.



North

0 2,000 4,000 Feet

- 2020 Time Above 65 dBA Contours (Minutes)
- 2012 Time Above 65 dBA Contours (Minutes)
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service
- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water
- Stream

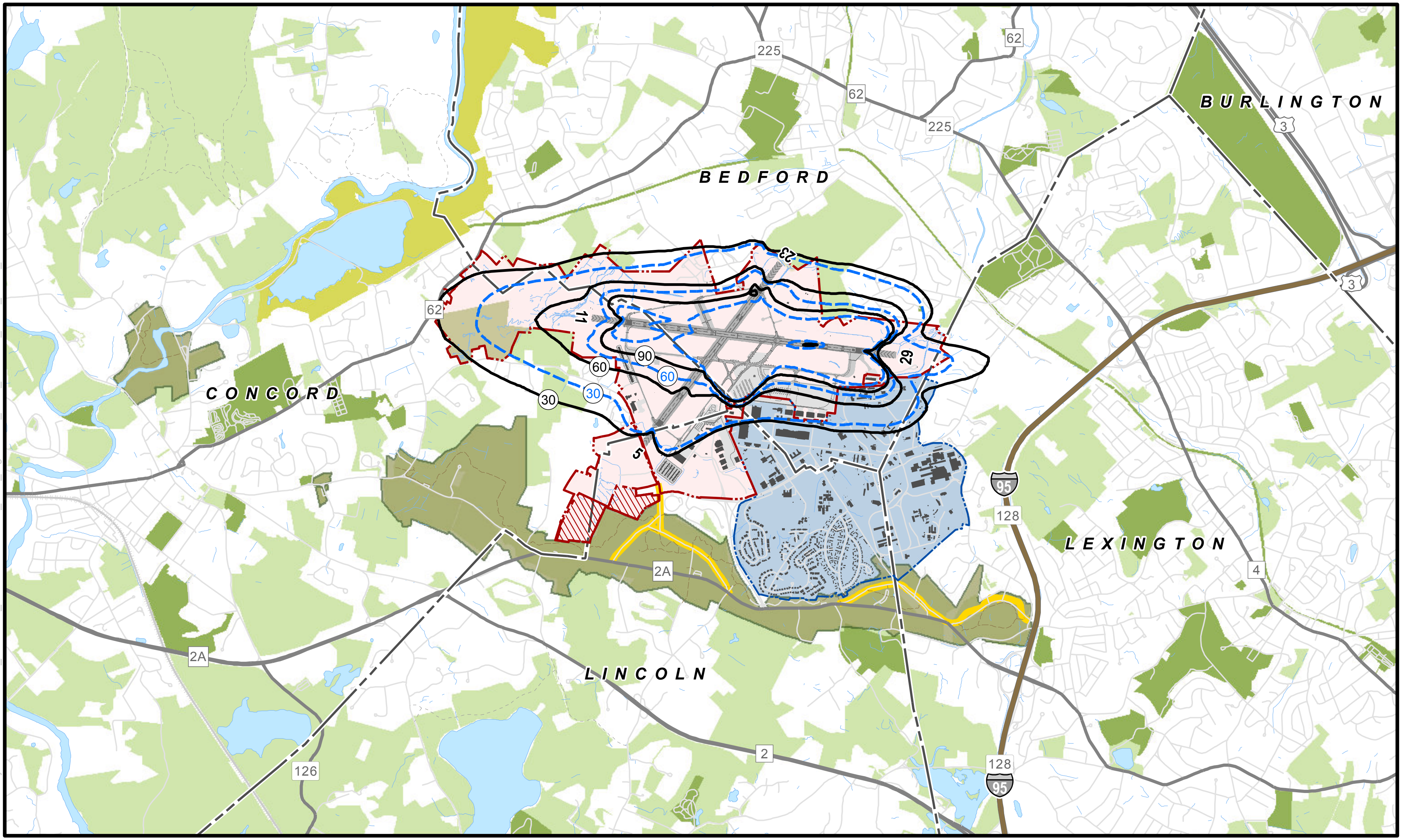
Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 and 2020 Forecast Time Above 65 dBA Contour Comparison

Figure **7-19**



Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-20_2030_Forecast_TA65_Noise_Contour.mxd

North

0 2,000 4,000 Feet

2030 Time Above 65 dBA Contours (Minutes)
2012 Time Above 65 dBA Contours (Minutes)
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

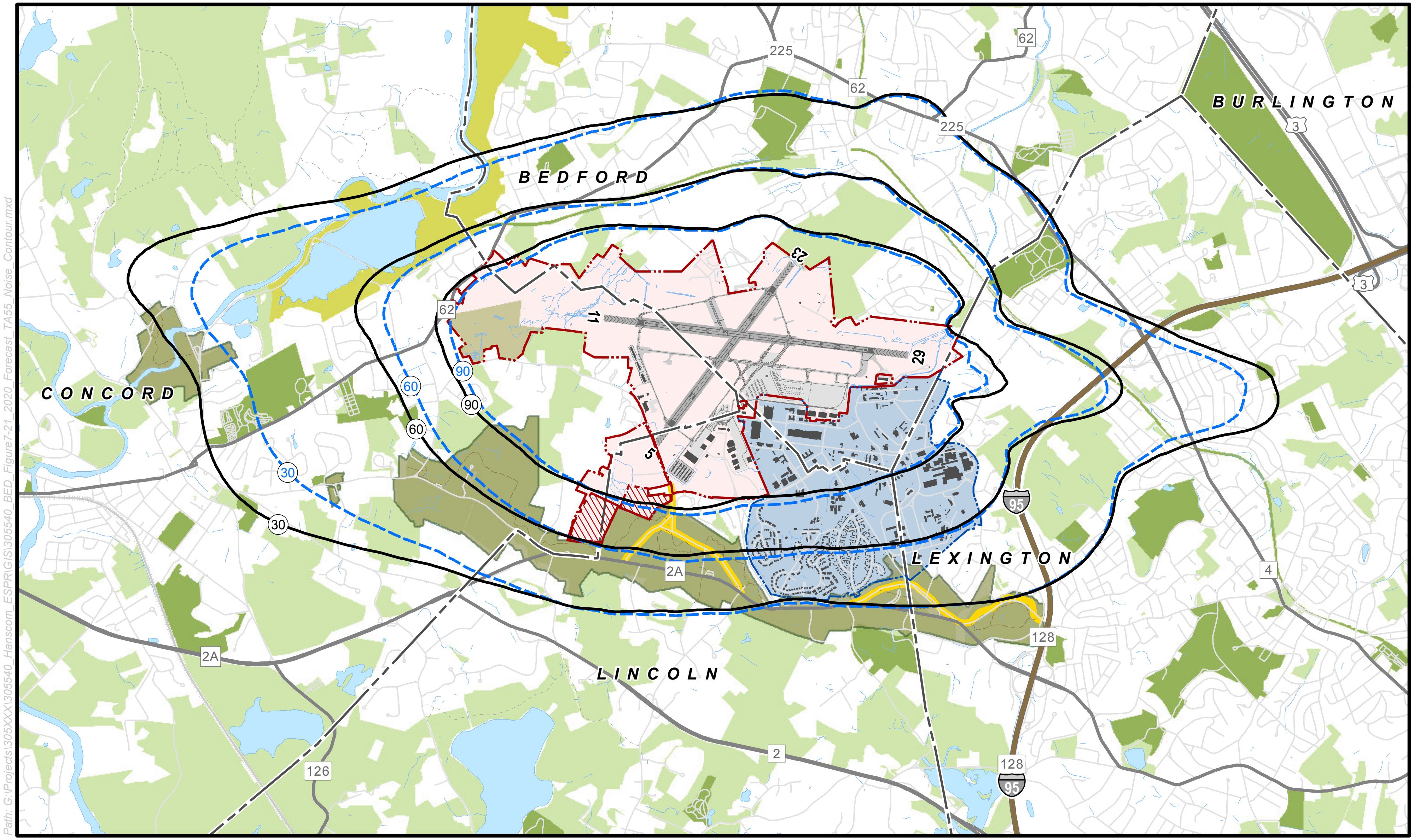
Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 and 2030 Forecast Time Above 65 dBA Contour Comparison

Figure **7-20**



North

0 2,000 4,000 Feet

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

2020 Time Above 55 dBA Contours (Minutes)
2012 Time Above 55 dBA Contours (Minutes)
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

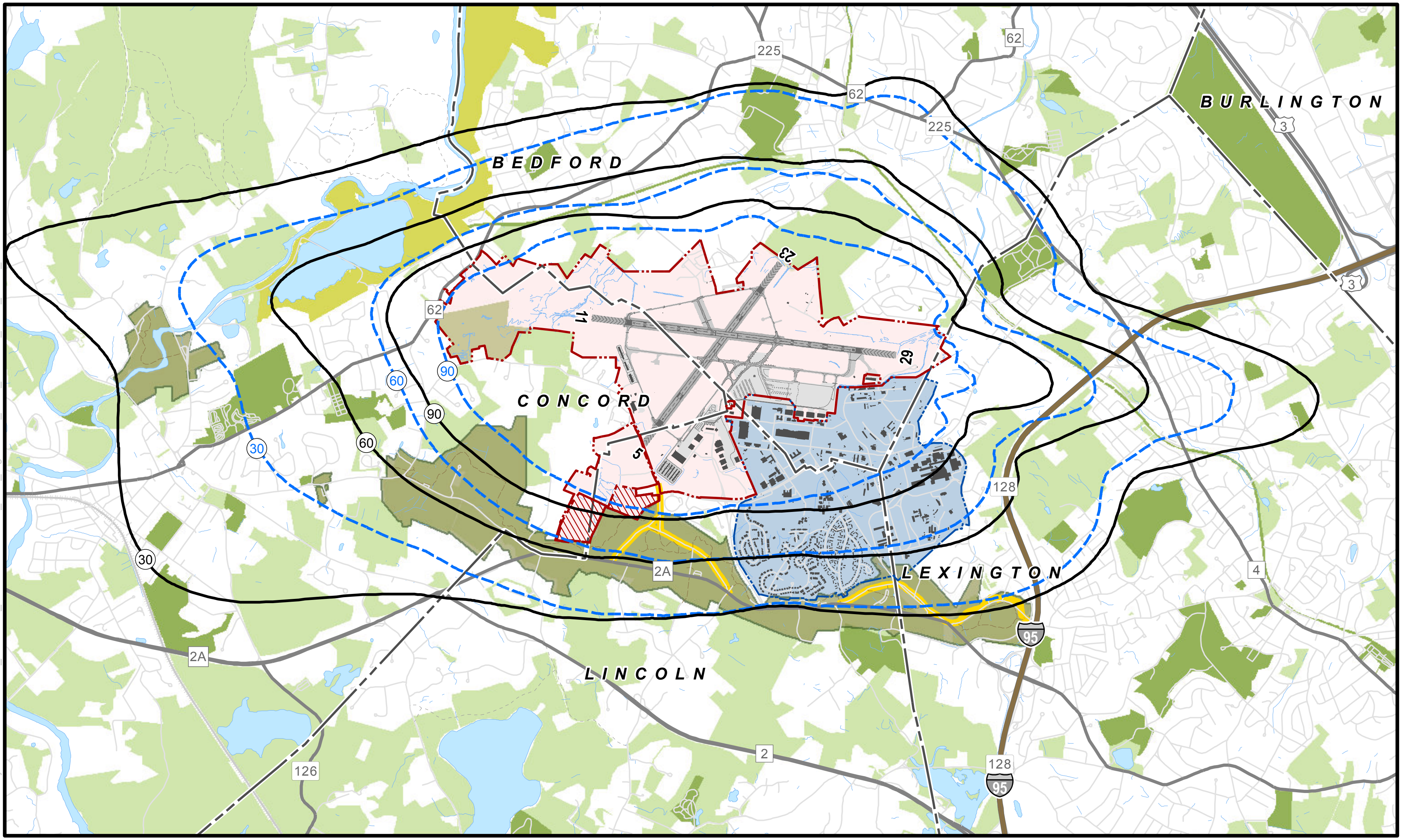
massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2012 and 2020 Forecast Time Above 55 dBA Contour Comparison

Figure **7-21**



North

0 2,000 4,000 Feet

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (DEP Wetlands), March 8, 2013; NPS (Park Boundary), March 8, 2013; NPS (Streets and Trails), March 8, 2013; MassGIS (Building Footprints), March 7, 2013

2030 Time Above 55 dBA Contour
2012 Time Above 55 dBA Contour
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail
Active Rail Service

MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water
Stream

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

2030 Forecast Time Above 55 dBA Contour

Figure **7-22**

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure7-22_2030_Forecast_TA55_Noise_Contour.mxd

No federal or other criteria exist for judging the relevance of these reported numbers. Both the acreage and the selected TA contour levels serve primarily as a secondary means of helping to judge the change in noise environment that is expected under the forecast scenarios.

Table 7-30 Areas within Time Above 65 and 55 dBA Contours for Existing and Forecast Operations

Contour Level	Cumulative Area (Acres)			
	2005	2012	2020	2030
Time Above 65 dBA				
90 minutes	281	289	325	408
60 minutes	498	526	555	692
30 minutes	1,326	1,238	1,302	1,529
Time Above 55 dBA				
90 minutes	1,828	2,362	2,449	3,055
60 minutes	3,551	4,006	4,159	4,940
30 minutes	8,405	7,542	8,175	9,794

Table 7-31 Population within Time Above 65 and 55 dBA Contours for Existing and Forecast Operations

Contour Level	Population between Time Above Contours			
	2005	2012	2020	2030
Time Above 65 dBA				
90 Minutes or Greater	0	0	0	21
60 to 90 Minutes	50	52	74	119
30 to 60 Minutes	470	349	366	440
Total 30 Minutes or Greater	520	401	440	580
Time Above 55 dBA				
90 Minutes or Greater	937	1,139	1,216	1,965
60 to 90 Minutes	1,301	2,610	2,691	3,016
30 to 60 Minutes	9,112	6,234	7,208	9,064
Total 30 Minutes or Greater	11,350	9,983	11,115	14,045

7.6.5 Total Noise Exposure (EXP)

The operations forecasts were also analyzed to compute EXP values. Table 7-32 summarizes the results. The primary means of tracking the metric is through civil air departures, highlighted in bold in the table. As expected, the EXP computations show the same trends as the DNL forecasts. Compared to 2012, the component attributable to civil departures is projected to increase for both the 2020 and 2030 forecasts from 107.4 dB in 2012 and to 107.6 in 2020 and 108.7 dB in 2030, respectively. These are broadly indicative of the change in DNL values among the various scenarios, consistent with the original reason for developing EXP in the first place.

Table 7-32 Year 2012 Total Noise Exposure (EXP) for Existing and Forecast Operations (in dB)

Groups	Departure Only	Arrival Only	Total
2012			
All civil aircraft except single piston	106.2	106.6	109.5
All civil aircraft [1]	**107.4**	108.0	110.7
All military aircraft	91.3	87.8	92.9
All civil and military aircraft except single piston	106.3	106.6	109.5
All civil and military aircraft	107.5	108.0	110.8
2020			
All civil aircraft except single piston	106.5	107.4	110.0
All civil aircraft [1]	**107.6**	108.6	111.1
All military aircraft	93.9	90.7	95.6
All civil and military aircraft except single piston	106.7	107.5	110.1
All civil and military aircraft	107.8	108.6	111.2
2030			
All civil aircraft except single piston	107.8	108.5	111.2
All civil aircraft [1]	**108.7**	109.5	112.1
All military aircraft	93.9	90.7	95.6
All civil and military aircraft except single piston	108.0	108.6	111.3
All civil and military aircraft	108.8	109.6	112.2

Note:
1. Civil air departures, which are the primary means of tracking EXP, are highlighted in bold.

Source: HMMH

7.6.6 Distribution of Noise Events

Figure 7-23 shows the forecasted distribution of daily departure SELs for each of the two future scenarios with the values for 2012 shown for comparison. As with the historical data, single engine piston operations are excluded for the clarity of the figure. The figure illustrates the changes in fleet mix over time: the greatest growth is forecasted for operations in the 80 to 85 dBA categories while operations in the noisiest groups (greater than 95 dB) are generally very small in number and are expected to remain small or decrease over time. The noise increases are the result of increased operations overall but particularly for GA aircraft.

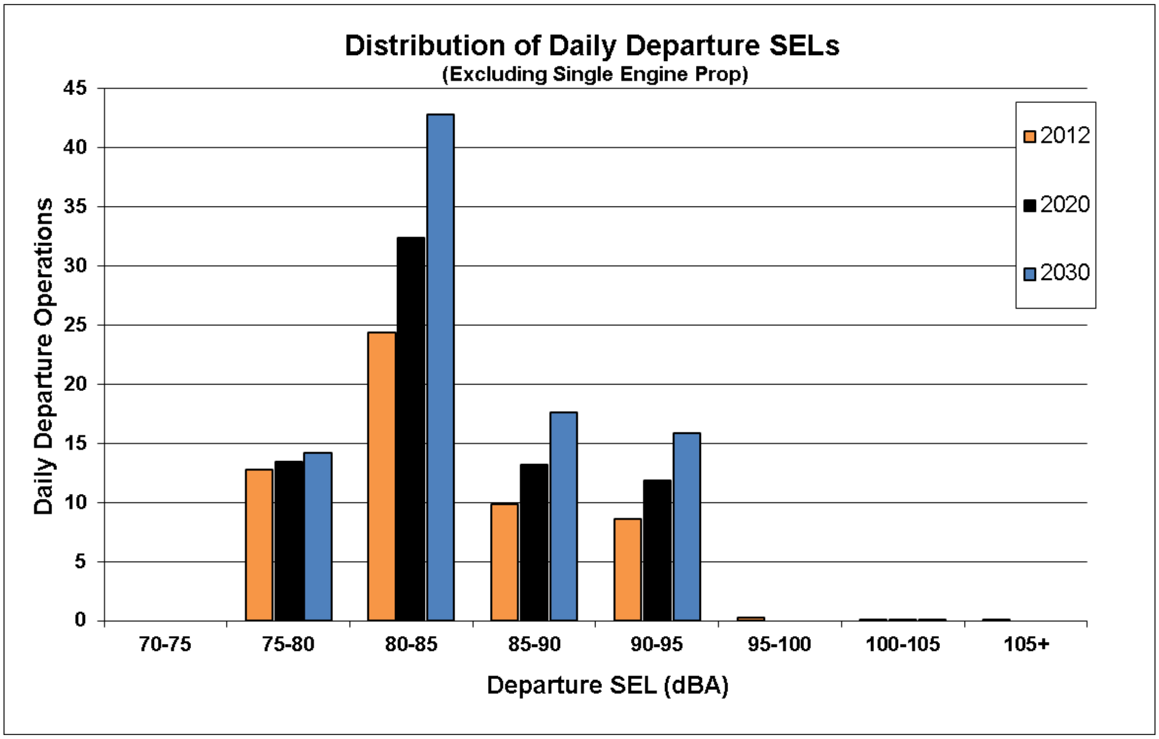


Figure 7-23 Existing and Forecast Distribution of Daily Departure SELs (Excluding Single Engine Prop)

7.6.7 DNL for Existing and Forecast Years at Noise Analysis Locations in Minute Man National Historical Park

Table 7-33 presents computed DNL at locations within the Minute Man National Historical Park for the two future scenarios with 2012 included for comparison. In the future scenarios all locations within the Park are exposed to levels below 55 dB DNL.

No part of the 4.9-mile Battle Road Interpretive Trail is located within the 65 dB DNL contour for year 2012 or either of the forecast scenarios. None of the Battle Road Interpretive Trail is in the 55 dB DNL contour in year 2012 or either of the forecast scenarios.

Table 7-34 and Table 7-35 present the results of the Time Above 65 dBA and Time Above 55 dBA computations for sites within Minute Man National Historical Park. Current TA 65 values at the Minute Man National Historical Park are at most eight minutes per day at all sites. These are times when aircraft noise may cause speech disruption or require use of a raised voice. These sites are expected to experience TA 65 for the future scenarios, ranging from one to eight minutes for the 2020 scenario and one to ten minutes per day for the 2030 scenario. The highest times above 65 dBA were in the range of eight to ten minutes per day and occurred at the Wayside Unit and in the western end of the Battle Road Unit at sites near Meriam’s Corner and in Lincoln near the Brooks Tavern and houses. These are among the closest sites in the Park to Hanscom Field’s runways, and receive noise from several types of aircraft operations including departures turning south off of Runway 29, aircraft departing Runway 23, and pattern operations on Runway 11/29.

Available research data suggest that noticeability of aircraft occurs at the point at which aircraft noise equals or exceeds the ambient levels. Given that daytime ambient levels in many areas in the Minute Man National Historical Park range from high-30s to mid-40s dBA, the Time Above 55 data suggest that these are times when park visitors could notice aircraft. The highest times above 55 dBA were in the range of

63 to 84 minutes per day and occurred at the Historic Farming Fields (MM-10) in Concord and in the area stretching from Bloody Angle to the Sgt. Samuel Hartwell House Site (MM-18).

Table 7-33 DNL at Noise Analysis Locations in the Minute Man National Historical Park for Existing and Forecast Operations (in dB)

Label[1]	Name[2]	Unit/Town[3]	2012	2020	2030
MM-1	Major John Buttrick House	North Bridge Unit / Concord	48.7	49.1	50.0
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	48.3	48.5	49.4
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	48.2	48.3	49.2
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	47.9	47.8	48.8
MM-5	North Bridge	North Bridge Unit / Concord	48.0	48.0	49.0
MM-6	Old Manse *	North Bridge Unit / Concord	48.1	48.1	49.2
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	50.3	50.6	51.8
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	50.3	50.7	51.8
MM-9	Meriam House	Battle Road Unit / Concord	50.6	51.1	52.2
MM-10	Historic Farming Fields	Battle Road Unit / Concord	50.7	51.0	52.0
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	49.2	49.4	50.3
MM-12	Samuel Brooks House	Battle Road Unit / Concord	50.8	51.3	52.1
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	51.4	52.0	52.8
MM-14	Job Brooks House	Battle Road Unit / Lincoln	51.5	52.0	52.8
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	50.7	51.2	52.0
MM-16	Bloody Angle	Battle Road Unit / Lincoln	50.9	51.0	51.6
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	49.2	49.1	49.6
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	48.5	48.3	48.8
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	47.0	46.8	47.4
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	45.8	45.8	46.4
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	45.5	45.4	46.0
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	46.0	46.0	46.7
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	47.0	47.0	47.7
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	47.1	47.1	47.9
MM-25	Parkers Revenge	Battle Road Unit / Lexington	47.0	47.1	47.8
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	46.1	46.2	47.0
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	46.4	46.5	47.4
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	45.9	46.2	47.1
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	46.2	46.4	47.3
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	46.2	46.7	47.8
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	43.5	43.9	44.9

Notes:
1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner.

Table 7-34 Time-Above 65 dBA at Noise Analysis Locations in the Minute Man National Historical Park for Existing and Forecast Operations (in minutes)

Label[1]	Name[2]	Unit/Town[3]	2012	2020	2030
MM-1	Major John Buttrick House	North Bridge Unit / Concord	3.1	3.9	5.0
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	2.8	3.5	4.5
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	2.7	3.4	4.4
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	2.5	3.2	4.2
MM-5	North Bridge	North Bridge Unit / Concord	2.7	3.4	4.4
MM-6	Old Manse *	North Bridge Unit / Concord	2.9	3.7	4.8
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	5.7	7.1	9.3
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	5.7	6.8	8.8
MM-9	Meriam House	Battle Road Unit / Concord	6.2	7.4	9.5
MM-10	Historic Farming Fields	Battle Road Unit / Concord	7.0	7.9	9.5
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	4.7	5.0	5.8
MM-12	Samuel Brooks House	Battle Road Unit / Concord	6.6	6.7	7.6
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	7.3	7.3	8.4
MM-14	Job Brooks House	Battle Road Unit / Lincoln	8.0	8.0	9.0
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	7.1	7.1	8.1
MM-16	Bloody Angle	Battle Road Unit / Lincoln	7.3	7.2	8.1
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	4.1	4.0	4.3
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	2.9	2.8	3.0
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	1.5	1.5	1.6
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	1.1	1.1	1.2
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	1.0	1.0	1.1
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	1.3	1.3	1.4
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	1.8	1.8	2.0
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	1.9	1.9	2.1
MM-25	Parkers Revenge	Battle Road Unit / Lexington	1.9	1.9	2.2
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	1.4	1.5	1.7
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	1.6	1.7	2.0
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	1.5	1.7	2.1
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	1.6	1.7	2.0
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	2.0	2.4	3.1
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	0.7	0.9	1.2

Notes:
1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner.

Table 7-35 Time-Above 55 dBA at Noise Analysis Locations in the Minute Man National Historical Park for Existing and Forecast Operations (in minutes)

Label[1]	Name[2]	Unit/Town[3]	2012	2020	2030
MM-1	Major John Buttrick House	North Bridge Unit / Concord	26.6	31.5	39.8
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	26.1	31.0	39.0
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	25.8	30.6	38.6
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	25.1	29.7	37.4
MM-5	North Bridge	North Bridge Unit / Concord	25.8	30.5	38.4
MM-6	Old Manse *	North Bridge Unit / Concord	26.3	31.0	39.0
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	34.4	39.6	49.2
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	47.0	52.0	63.1
MM-9	Meriam House	Battle Road Unit / Concord	51.0	56.0	67.8
MM-10	Historic Farming Fields	Battle Road Unit / Concord	77.2	80.6	94.5
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	57.1	59.6	69.9
MM-12	Samuel Brooks House	Battle Road Unit / Concord	52.3	52.7	60.3
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	51.1	50.8	57.4
MM-14	Job Brooks House	Battle Road Unit / Lincoln	57.2	56.5	63.5
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	53.2	52.3	58.6
MM-16	Bloody Angle	Battle Road Unit / Lincoln	84.4	80.7	88.7
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	72.5	67.9	73.6
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	63.5	59.2	64.0
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	45.7	42.7	46.1
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	31.0	29.6	32.7
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	25.9	24.6	27.0
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	32.7	31.7	35.6
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	42.6	41.4	46.3
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	43.1	42.0	47.0
MM-25	Parkers Revenge	Battle Road Unit / Lexington	41.1	40.2	45.2
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	31.3	30.9	35.0
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	32.5	32.2	36.6
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	24.4	24.8	28.5
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	29.7	29.7	33.8
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	19.8	20.6	24.3
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	11.9	14.0	17.4

Notes:
1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam’s Corner and MM-29 is approximately four miles east of Meriam’s Corner.

7.7 Status of Hanscom Field Noise Workgroup Recommendations

Following the filing of the 1995 GEIR in 1997, the Secretary of Environmental Affairs asked Massport to organize and meet with a community and aviation-based workgroup for six months. The committee, known as the Hanscom Field Noise Workgroup, met for a period of two years, and published its findings in a report entitled "Report of the Hanscom Field Noise Workgroup," dated September 22, 1999. Its report summarizes the series of meetings by the committee and its two task groups, one devoted to abatement and mitigation, the other to metrics and modeling. Together, the two task groups developed a comprehensive list of recommendations that are presented in Table 7-36 and Table 7-37.

Massport has responded to all of the metric recommendations as indicated in Table 7-36. Nearly ninety percent of the recommendations have been implemented or are in the process of implementation. Eight of the fourteen measures were included in the *2005 ESPR* and updated in the *2012 ESPR*. Four other recommendations related to noise monitoring and the correlation of complaints with noise events are being addressed through updates to the Noise and Operations Monitoring System.

Table 7-37 includes a list of recommended noise abatement actions; Massport was primarily responsible for implementing a number of these recommendations. Table 7-37 presents the entire list from the Hanscom Field Noise Work Group report (using the same numbering methodology). All of the recommendations for which Massport was responsible for implementing have been addressed.

7.8 Existing Environmentally Beneficial Measures

In addition to the measures included in Table 7-36 and 7-37, Massport has a long history of noise abatement at Hanscom Field, dating back to at least 1978, when it introduced measures to minimize noise. These measures were officially adopted as a Massport regulations in 1980[38] and included restrictions on operations on touch-and-go training activity; and nighttime field use surcharge to discourage operations between 11:00 p.m. and 7:00 a.m. More recently, Massport has implemented measures to monitor and reduce noise in the communities near Hanscom Field. These include guidelines for run-ups and the use of Auxiliary and Ground Power Units, a Noise and Operations Monitoring system, a Fly Friendly program, and membership in Sound Initiative. In 2009, Massport made some adjustments to the touch-and-go flight tracks which reduced the amount of direct flights over the MMNHP and nearby residences. A brochure describing the changes was jointly released by Massport and the NPS and is distributed to pilots and the public directly and through Massport's website.

[38] Part F of the General Rules and Regulations for Laurence G. Hanscom Field Effective July 31, 1980.

Table 7-36 Hanscom Noise Workgroup Metrics Recommendations

Number	Description	Status
M1	The workgroup should continue in existence and make additional suggestions for changes to the ESPR.	The Noise Workgroup contributed substantially to the formulation of the scope of work that formed the basis for the ongoing Hanscom Field ESPR analyses.
M2	The ESPR should include Time-Above (TA) contours and their areas.	Included. Figure 7-12, Figure 7-13 and Figure 7-19 to Figure 7-22 illustrate the contours and Table 7-16 and Table 7-30 present the estimated areas within the contours.
M3	The ESPR should show Single Event Level Distributions.	Included as Figure 7-16 and Figure 7-23.
M4	The next GEIR [ESPR] should include a linear dimensionless metric to show exposure to noise energy.	Not included. No such metric is used regularly in the evaluation of aircraft or other environmental noise.
M5	Future GEIRs (ESPRs) should include discussion of impacts with reference to the EPA level of 55 dB DNL and avoid the implication that DNL less than 65 (the Federal Aviation Administration mitigation threshold) has no impact.	Included.
M6	Future GEIRs (ESPRs) should include three Community Summary Metrics - Loud Event Count, Area of 55 dB DNL contour, and Area of the 30- minute TA 55 dBA contour.	Included. Figure 7-16 and Figure 7-23 present SEL distributions; Table 7-9 and Table 7-24 present the estimated areas within the DNL contours; Table 7-11 and Table 7-25 present the population estimates within the current and forecasted 55 dB DNL contour; Figure 7-13, Figure 7-21 and Figure 7-22 present the area of the 30-minute TA 55 dBA contour
M7	Documentation should include a detailed list of assumptions and model parameters used in the noise modeling.	Included.
M8	The ESPR should include a section discussing the estimated variation in Integrated Noise Model (INM) results due to different modeling assumptions, and Massport should adopt the standard practice of reporting "error bands." The ESPR should also include a comparison of measured and modeled results and an explanation of the differences.	Not included. The noise analyses in the ESPR are intended to evaluate the range of noise exposure due to existing and forecast fleet and airport development assumptions. Measured noise values are compared to modeled noise values for the six permanent noise monitors.
M9	Future ESPRs should explain expected short-term variations in noise from long-term averages.	Included.
M10	The ESPR should document how changes in the INM data [base] affect predicted noise exposure.	Included.
M11 and M12	Three of the six permanent noise monitoring sites should be relocated and more sites should be added to the system.	Following an incident in 2009 in which a vehicle struck the Site 34 noise monitor on DeAngelo Drive in Bedford, Massport relocated the monitor nearby and further off of the road. Massport is evaluating the feasibility of relocating Site 36.
M13 and M14	A procedure or system should be developed to correlate noise events with flight data and complaints, and the noise data should be stored in a publicly accessed location such as a web site.	Recent updates to the Noise and Operations Monitoring System are described in Section 7.8.4.

Table 7-37 Status of the Hanscom Noise Workgroup Noise Abatement Recommendations

Number	Measure	Detail	Massport Actions to Date
A1	Voluntary Noise Abatement Procedures	Massport will formalize, publish, distribute and post existing noise abatement procedures drafted by Massport, HART, and HPA.	Massport distributed handouts and posters describing noise abatement procedures to all tenants, fixed base operators, and flight training schools. Massport mailed AOPA Fly Friendly videos to all hangar and tie-down tenants. Additionally, Massport installed AOPA and NBAA noise abatement procedures in its badge training program. All based pilots are required to watch the AOPA or NBAA video when getting or renewing a security badge. The program has been in place for about 6 years.
A2	Distribution to Renters	Massport will duplicate and deliver to flights schools voluntary noise abatement procedures in sufficient quantity for schools to distribute to all aircraft renters.	Massport distributes handouts and posters describing noise abatement procedures to all tenants, fixed based operators, and flight training schools.
A3	Informative Page Markers	Massport will print and distribute informative page markers for noise abatement information in Jeppesen and Flight guide handbooks to local and transient pilots.	Massport distributes flight manual inserts describing noise abatement procedures to all tenants, fixed base operators, and flight training schools.
A4	Flight School Briefings	Hanscom flight schools will display and distribute local noise abatement procedures to their pilots, brief all flight instructors at least annually on local noise abatement procedures and AOPA Fly Friendly program, and require all students to view the AOPA Fly Friendly video.	Massport discusses noise abatement with the flight schools and makes the AOPA Fly Friendly video available. Handouts are replenished. Flight school pilots and student pilots watch the AOPA video when getting or renewing a security badge.
A5	Flight Training Center Briefings	The Hanscom AFB Flight Training Center will display in its flight planning room, and distribute to its members local noise abatement procedures brief the AOPA Fly Friendly program and local noise abatement procedures at its safety meetings at least annually, and require new club members to view the AOPA Fly Friendly video.	Massport provided the Hanscom AFB Flight Training Center with posters, flight manual inserts, and AOPA Fly Friendly videos. Flight manual inserts continue to be made available.
A6	FBO Guest Follow-up	Each FBO at Hanscom will institute a guest sign-in sheet and send each transient pilot a follow-up letter describing the voluntary noise abatement procedures at Hanscom.	Massport works with FBOs to implement this measure. Massport makes inserts available which the FBOs display in their flight preparation rooms.
A7	Massport Website	Massport will include the voluntary noise abatement procedures for Hanscom on its public access website with mutual links to the USAF and other web-based pre- flight planning resources.	Massport's website includes the voluntary noise abatement procedures for Hanscom Field. The "Activity Monitor" has also been added to the website which allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance.
A8	ATIS Broadcast	The Automatic Terminal Information System (ATIS) broadcast will include a reminder that voluntary noise abatement procedures are in effect and whenever workload permits the Tower, Ground, and Clearance Delivery will follow with reminders.	Massport is not the primary entity responsible for implementing this measure. The ATIS is managed by the FAA.
A9	Hanscom AFB Leader Briefings	Hanscom AFB representatives to the Hanscom Noise Workgroup will brief Electronic Systems Center and 66th Air Base Wing leaders on local noise abatement procedures, sensitivities, and issues.	Massport is not the primary entity responsible for implementing this measure. However, Massport will provide Hanscom AFB with information as needed to support this measure.
A10	Military Flight Crews	Hanscom AFB Transient Alert will display and distribute local noise abatement procedures and information to military flight crews utilizing their facility.	Massport is not the primary entity responsible for implementing this measure. Massport distributed handouts and posters describing noise abatement procedures and continues to make handouts available.

Number	Measure	Detail	Massport Actions to Date
A11	ESC Web page	The Hanscom AFB Electronic Systems Center will create a web page dealing with noise abatement issues at Massport for both military and civilian pilots.	Massport is not the primary entity responsible for implementing this measure. However, Massport will provide Hanscom AFB with information as needed to support this measure.
A12	ESC Press Releases	The Hanscom AFB Electronic Systems Center Office of Public Affairs will send area newspapers regular (biweekly or monthly) news releases updating area residents on Air Force flight operations, subject to security considerations.	Massport is not the primary entity responsible for implementing this measure. However, Massport will provide Hanscom AFB with information as needed to support this measure.
A13	ESC Website News Releases	The Hanscom AFB Electronic Systems Center Office of Public Affairs will add information about Air Force flight operations to the public access section of the Hanscom AFB web site, subject to security considerations.	Massport is not the primary entity responsible for implementing this measure. However, Massport will provide Hanscom AFB with information as needed to support this measure.
A14	AOPA Video Distribution	Massport will purchase and distribute the AOPA Fly Friendly video to all Hanscom pilots.	Massport distributed the video to all tenants, fixed based operators, and flight training schools. Pilots are required to watch the AOPA or NBAA video when getting or renewing a security badge. This program has been in place for the past six years.
A15	Hanscom User Group	Massport will provide support to ensure that a representative user group be available to all users, pilots, and businesses.	Massport is supportive of aviation user groups and encourages aviation participation at HFAC.
A16	Selectmen and Town Briefings	HNWG will brief Town Selectmen on the group's findings.	Massport is not the primary entity responsible for implementing this measure. However, Massport will provide the HNWG with information as needed to support this measure.
A17	Part 150 Study	A group representing local pilots, business interests, surrounding communities and Massport will be formed to investigate the possibility and implications of re-opening the Part 150 Study at Hanscom Field.	Massport is not the primary entity responsible for implementing this measure. Massport does not believe a Part 150 study is warranted or advisable. However, it will provide information to the group as needed to support the responsible evaluation of this measure.
A18	Model Quiet Airport Study	A group representing local pilots, business interests, surrounding communities and Massport will be formed to define the scope and purpose of a Model Quiet Airport Study at Hanscom Field.	Massport is not the primary entity responsible for implementing this measure. However, it will provide information to the group as needed to support the responsible evaluation of this measure.
A19	Non-Profit Organization	A group representing local pilots, business interests, surrounding communities and Massport will be formed to explore the idea of establishing a non-profit organization to raise funds to support various noise reduction awareness programs.	Massport is not the primary entity responsible for implementing this measure. However, it will provide information to the group as needed to support the responsible evaluation of this measure.
A20	Noise Abatement Officer	A group representing local pilots, business interests, surrounding communities and Massport will be formed to explore the idea of establishing a Noise Abatement Officer position at Hanscom Field.	Massport has a Noise Abatement Coordinator who ensures continued distribution of noise abatement materials, talks to pilots, and responds to comments concerning noise. In addition, Massport's Office of Noise Abatement (at Logan) supports Hanscom's noise monitoring system.
A21	Noise Overlay Zones	A group including representatives of the Planning Boards of the towns of Lincoln, Lexington, Bedford, and Concord will be formed to study the issues associated with the creation of Noise Overlay Zoning Districts.	Massport is not the primary entity responsible for implementing this measure. However, it will provide information to the group as needed to support the responsible evaluation of this measure.
There are a number of recommendations for which Massport is not the primary entity responsible.			

7.8.1 Run-up Procedures

Massport has a well-defined aircraft engine maintenance run-up procedure for Hanscom Field. Aircraft are directed to the "Run-up Pad" located due south of Runway 11-29, west of the intersection with Runway 05-23. At the Run-up Pad, aircraft are directed to maintain a west heading when conducting run-ups; there is a short "blast fence" on the east side of the pad which deflects jet exhaust, prop wash, and debris. Furthermore, Massport discourages operators from conducting nighttime run-ups.

After Shuttle America began performing regular aircraft maintenance at Hanscom Field, there were times when nighttime run-ups occurred for maintenance purposes. After receiving multiple complaints, mostly from residents in newly constructed homes along Virginia Road, Massport re-located those nighttime run-ups to the east end of the East Ramp, away from this residential community. Shuttle America has since discontinued service to Hanscom Field, and subsequently there have been no regular nighttime maintenance run-ups at Hanscom.

Massport will continue to direct operators to the run-up pad during the day and to the East Ramp at night should extenuating circumstances require such activities. The optimal orientation for run-ups at the East Ramp is a magnetic heading of approximately 230 degrees, aligned with Runway 05-23, whenever feasible based on wind conditions. This heading will minimize sound levels at homes north of the approach end of Runway 11-29, while providing a substantial reduction in sound levels at the newly constructed homes along Virginia Road, relative to levels during run-ups conducted at the run-up pad. This heading is desirable for use regardless of aircraft type, though jet aircraft are likely to be more sensitive to crosswind conditions and may not be able to use the preferred heading as often as propeller aircraft can.

7.8.2 Auxiliary Power Units and Ground Power Units

Massport has additional ground noise procedures in effect minimizing the use of on-board Auxiliary Power Units (APUs) and Ground Power Units (GPUs). APUs and GPUs provide electricity, heat and air conditioning to an aircraft when its engines are off.

At Hanscom Field, APU and GPU use is prohibited outside of hangars between 11:00 p.m. and 7:00 a.m. unless part of takeoff procedures or necessary maintenance procedures. Between 7:00 a.m. and 11:00 p.m., the use of APUs is limited to 30 minutes.

When operationally feasible, the use of GPUs is preferred over APUs. Although the noise levels produced by GPUs are not insignificant (they are similar to an idling diesel truck), they are considerably lower than the noise levels produced by a typical APU. In addition, GPUs generally are more fuel efficient than APUs and less expensive to run from a maintenance standpoint. Reduction of APU use may also have the benefit of reducing emissions. It should be noted that it is not feasible to completely eliminate APU use because APUs may be needed to start the aircraft main engines, and maintenance requiring operation of the APU may sometimes need to be performed at locations where alternative power is not readily available.

7.8.3 Field Use Fee

Although the FAA control tower is closed from 11:00 p.m. to 7:00 a.m., Hanscom Field is a public facility and is open for use 24 hours a day. In the summer of 1980, an 11:00 p.m. to 7:00 a.m. “nighttime field use fee” was a surcharge instituted to discourage the use of the field between 11:00 p.m. and 7:00 a.m. The fee is based on aircraft weight and doubles for aircraft that conduct more than five night operations in a calendar year. In 1980 the surcharge were $20 for aircraft weighing 12,500 pounds or fewer and $150 for aircraft weighing more than 12,500 pounds.

In 1989, the Massport Board voted to increase the surcharge to reflect the Consumer Price Index (CPI) increase between 1980 and 1989 and to institute an annual CPI increase, effective each July 1. This schedule coincides with Massport's Fiscal Years, which run from July 1st to June 30th annually. As a result, the surcharges were $55 and $401 for the first six months of 2012 and $56 and $412 for the second half of 2012.

Some operations are exempted from the fee. The overwhelming majority of exemptions are medical flights, which are dominated by the medical evacuation service based at Hanscom. Exemptions also included military, FAA, and Civil Air Patrol operations, as well as Hanscom based aircraft that used the airport between 11 p.m. and 7 a.m. due to unavoidable circumstances, such as weather, mechanical, or FAA delays.

7.8.4 Noise and Operations Monitoring System

Massport's current Noise and Operations Monitoring System (NOMS) was installed in 1989. It includes six permanent noise monitors near Hanscom Field. In 2004, Massport selected Rannoch Corporation, now ITT Exelis Corporation, to replace the system's microphones and software. The replacement NOMS incorporates state-of-the-art capabilities that have improved the accuracy, efficiency, usefulness, reliability, and user-friendliness of the system.

Hanscom staff members began experiencing the benefits of the new system in 2007 and have been able to provide callers with more information about disturbing flights than had been available in the past. An interactive website has been developed for public use[39]. This website includes:

- Complaint entry
- Near-real-time[40] and historical aircraft flight tracks
- Customized reports for any time period for DNL, hourly Leq, and noise events at the permanent noise monitors

In April of 2009, the Site 34 monitor on DeAngelo Drive in Bedford was hit by a vehicle, which caused substantial damage. Because a tree that had grown near the site could potentially contaminate data and because there had been similar incidents in prior years, Massport determined that a new location needed to be identified for installing a replacement. This led to a review of possible locations, which included discussions with Bedford representatives and taking noise measurements and analyzing flight tracks at numerous alternative sites. It was determined that DeAngelo Drive was the best acoustical location, which led to selecting a site that was close to the old site but away from trees and set back from the road. This work was completed in 2010.

7.8.5 Fly Friendly Program

Massport first developed a fly friendly program in 2001. This program encourages pilots to use the quietest flying techniques that are safe and practical. Inserts for pilot manuals continue to be made available for pilots of all aircraft (including commercial aircraft), outlining the Aircraft Owners and Pilot Association's and National Business Aircraft Association's quiet flying recommendations. Framed

[39] http://www.massport.com/hanscomfield /Overview/Airport-Activity-Monitor/
[40] Flight track data is delayed by ten minutes for security purposes.

posters describing noise abatement procedures are hanging in the flight school offices and FBOs. Massport also periodically reminds these offices to encourage the pilots to use quiet flying techniques including through quarterly meetings. More details on the Fly Friendly Program are provided in Section 7.5.6.

7.8.6 Sound Initiative

Massport was an active participant in Sound Initiative, a coalition that supported the federal phase out of Stage 2 aircraft weighing less than 75,000 pounds. Stage 2 aircraft were manufactured before today's stringent noise standards were adopted for new airplanes. The use of Stage 2 aircraft weighing over 75,000 pounds was phased out nationally by 2000, but most of Hanscom's jets weigh less than 75,000 pounds. In 2012, Congress passed the FAA Modernization and Reform Act, which included the phase out of all non-stage 3 aircraft by December 31, 2015. Section 506 of the Act prohibits the operation, within the 48 contiguous states, of jets weighing 75,000 pounds or less that do not comply with Stage 3 noise levels. Military aircraft are exempt from the Stage 3 Rule.

(This page intentionally left blank)

8 Air Quality

This chapter of the *2012 ESPR* describes year 2012 and projected future air quality and air emissions in the study area. The *2012 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 growth scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes.

8.1 Key Findings Since 2005

Up to 25 years of Massachusetts Department of Environmental Protection (MassDEP) air monitoring data for the Greater Boston area were used to evaluate air quality trends for years up to and including the year 2012. These data reveal that:

- Air quality in the Greater Boston area, including the Hanscom communities, has improved substantially over the past 25 years and has improved since the *2005 ESPR* was published.
- The Greater Boston area, including the Hanscom Field communities, is currently in attainment with all Massachusetts and National Ambient Air Quality Standards (NAAQS) except for the 1997 8-hour ozone NAAQS which was designated as moderate non-attainment by the EPA.
- Ozone levels for the Boston area, including the Hanscom Field community were designated as attainment/unclassifiable with the new 2008 eight-hour ozone standard by U.S. EPA.[41]

Annual emissions from aircraft operations and motor vehicles accessing the airport were calculated for the year 2012. These emissions were compared to emissions for 1985, 1995, 2000 and 2005 which were previously presented in the *2005 ESPR*. These emission calculations demonstrate that emissions associated with Hanscom Field activity are a very small fraction of regional emissions. Aircraft emissions for all pollutants decreased between 2005 and 2012; these changes are a result of the changes in the mix of aircraft operating at Hanscom Field as well as a reduction in the number of operations. Roadway emissions for all pollutants declined between 2005 and 2012 due to the effects of more stringent emission controls on motor vehicles. The emission levels for the future scenarios are not predicted to result in adverse air quality effects near or away from the airport. For all scenarios, air quality concentrations in Bedford, Concord, Lexington, Lincoln, Minute Man National Historical Park and Great Meadows National Wildlife Refuge will be in compliance with the Massachusetts and National Ambient Air Quality Standards.

8.2 Air Quality Terminology

The Clean Air Act (CAA) contains timeframes and milestones for states to meet and maintain National Ambient Air Quality Standards (NAAQS) for criteria pollutants. EPA sets NAAQS at levels to protect

[41] EPA recently implemented the 2008 eight-hour ozone NAAQS where EPA designated Middlesex County as attainment/unclassifiable in April of 2012.

public health and the environment. MassDEP is the state agency responsible for monitoring outdoor air quality in Massachusetts and developing plans and regulatory programs to reduce emissions of pollutants that adversely affect public health, welfare, and the environment.

8.2.1 Air Pollutants

Certain pollutants (known as "criteria" pollutants) are subject to National Ambient Air Quality Standards (NAAQS). The criteria pollutants monitored are:

- sulfur dioxide (SO_2): SO_2 combines with water vapor to form acidic aerosols harmful to the respiratory tract, aggravating symptoms associated with lung diseases such as asthma and bronchitis. SO_2 is a primary contributor to acid deposition. Impacts of acid deposition include: acidification of lakes and streams, damage to vegetation, damage to materials, and diminution of visibility. SO_2 is a product of fuel combustion (e.g., the burning of coal and oil that contains sulfur). Sources include power plants, and business and residential sources burning heating oil.
- ozone (O_3): Ground-level, or Tropospheric O_3 and Stratospheric O_3 in the upper atmosphere are the same chemical compound, just found at different places in the atmosphere. Stratospheric O_3 found at greater than 30,000 feet above the surface of the earth is beneficial to all life because it filters out the sun's harmful UV radiation before it reaches the earth's surface. Ground-Level O_3 on the other hand is a health and environmental problem. This report pertains exclusively to ground-level O_3. O_3 is a respiratory irritant and can reduce lung function and cause asthma attacks, nasal congestion, and throat irritation, and reduce resistance to infection. It can inflame and damage (possibly permanently) cells that line the lungs, and aggravate chronic lung diseases. In addition, a number of studies have found a strong link between increases in ground-level O_3 and increased risk of premature death. O_3 is toxic to vegetation, inhibiting growth and causing leaf damage. O_3 deteriorates materials such as rubber and fabrics. Ground-level O_3 is unique in that it is formed by the reactions that occur between certain pollutants in the presence of intense, high-energy sunlight during the hot summer months. The complexity of the reactions and the amount of time needed to complete these reactions can result in the buildup of ground-level ozone concentrations far downwind from the original source of the precursors. Sources of ground-level O_3 precursors, i.e., nitrogen oxides and hydrocarbons, include motor vehicles, lawn and garden equipment, power plants and other industrial sources.
- carbon monoxide (CO): CO binds with hemoglobin in the blood, reducing the amount of oxygen carried to organs and tissues. Symptoms of high CO exposure include shortness of breath, chest pain, headaches, confusion, and loss of coordination. The health threat is most severe for those with cardiovascular disease. Motor vehicle emissions are the largest source of CO, which is produced from incomplete combustion of carbon in fuels. Industrial processes and non-transportation fuel combustion (e.g., boilers, lawn and garden equipment) also are sources of CO.
- nitrogen dioxide (NO_2): NO_2 lowers resistance to respiratory infections and aggravates symptoms associated with asthma and bronchitis. NO_2 contributes to acid deposition. Impacts of acid deposition include: acidification of lakes and streams, damage to vegetation, damage to materials, and diminution of visibility. NO_2 and NO contribute to the formation of ozone. NO_2 is formed from the oxidation of nitric oxide (NO). Major sources of NO are fuel combustion, space heating, power plants and motor vehicles.
- lead (Pb): Lead is an elemental metal that is found in nature. Exposure to lead can occur by inhalation or ingestion with food, water, soil or dust particles. Children, infants, and fetuses are the most susceptible to the effects of lead exposure. Lead causes mental retardation, brain damage,

and liver disease. It may be a factor in high blood pressure and damages the nervous system. Lead enters the atmosphere from the incineration of lead containing materials and from the manufacture and processing of lead containing products or materials like storage batteries, smelting and removal of paint that contained lead.

- particulate matter ≤10 microns (PM_{10}) and ≤ 2.5 microns ($PM_{2.5}$): Particulate matter is tiny airborne particles or aerosols, which include dust, dirt, soot, smoke, and liquid droplets. Fine particulate matter (mostly below 2.5 microns in size) are not only the result of direct emissions, but can be formed in the atmosphere by chemical reactions involving gaseous pollutants. The numbers 2.5 and 10 refer to the particle size, measured in microns, collected by the monitors. For example, several thousand $PM_{2.5}$ particles could fit on the period at the end of this sentence. The small size of these particles allows easy entry into the human respiratory system. Long-term exposure causes the particles to accumulate in the lungs and affects breathing and produces respiratory symptoms. The small particles can migrate through the lungs and into the circulatory system and potentially produce cardio-vascular symptoms, as well as impacts from toxic components contained in the particulate matter. Particulate matter causes soiling and corrosion of materials. Particulate matter contributes to atmospheric haze that degrades visibility. Sources of particulates include industrial process emissions, motor vehicles, incinerators, power plants, and other fuel combustion sources.

Non-criteria pollutants do not have National Ambient Air Quality Standards, but can contribute to the formation of ozone and particulate matter and/or be toxic. The non-criteria pollutants monitored by MassDEP include: total suspended particulates (TSP), and air toxics which include certain volatile organic compounds (VOCs), a precursor to ozone, and toxic metals.

8.2.2 Air Quality Standards

Five principal air pollutants are emitted by aircraft: carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NO_x), particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). Massachusetts and National Ambient Air Quality Standards (NAAQS) exist for CO, sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, lead, and nitrogen dioxide (NO_2), one of the NO_x compounds. There are no standards for VOC, which is regulated as a precursor to ozone (O_3), for which an air quality standard has been established. Aircraft also emit carbon dioxide (CO_2), which is not classified by EPA as an air pollutant under the NAAQS, however EPA asserts that carbon dioxide and five other greenhouse gases from both stationary and mobile sources pose a threat to human health. The EPA also found that GHG emissions from on-road vehicles contribute to that threat.

Table 8-1 Annual Frequency of Wind Speed, Wind Direction and Atmospheric Stability Observed at Hanscom Field

Wind Speed (knots)[1]	Percent		Wind Direction	Percent
<1	22.3%		N	3.9%
1-4	7.9%		NNE	3.4%
4-7	27.0%		NE	4.1%
7-11	26.8%		ENE	2.8%
11-17	14.5%		E	2.7%
17-21	1.2%		ESE	2.4%
>22	0.3%		SE	1.9%
			SSE	1.8%
			S	3.5%
			SSW	6.2%
			SW	8.8%
			WSW	8.2%
			W	8.1%
			WNW	7.9%
			NW	6.9%
			NNW	4.9%

Note:
1. Approximate speed ranges. Actual categories are based on knots, not mph.

Source: MassDEP AERMOD Surface Meteorological Files, Station #14702, Hanscom Field, Bedford, Mass., (2005-2009).

The U.S. EPA has established air quality standards for outdoor (ambient) air to protect the public's health and welfare with a margin for safety. The NAAQS are summarized in Table 8-2. Concentration units for the NAAQS shown in Table 8-2 are given in parts per million (ppm) and micrograms of pollutant per cubic meter of air ($\mu g/m^3$). The one-hour value for NO_2 is a MassDEP policy guideline (not a regulatory standard) that is only applicable to major stationary sources emitting over 250 tons per year of NO_2. Although it is not applicable to Hanscom Field in a regulatory sense (since airports are not stationary sources), Massport has used the guideline value in the past in other airport air quality assessments, and so its use is continued in the *2012 ESPR*. It should be noted the new federal 1-hour NO_2 NAAQS is applicable to Hanscom and was included in the compliance of modeling concentrations with standards in Section 8.2.13.

Since 2005, the EPA has established new standards as well as strengthened existing standards. The 24-hour $PM_{2.5}$ standard was strengthened in September 2006 from 65 ug/m^3 to 35 ug/m^3 and the annual $PM_{2.5}$ standard was strengthened to 12 $\mu g/m^3$ along with the 3-month lead standard which was strengthened to 0.15 $\mu g/m^3$. EPA has established a new eight-hour ozone standard of 0.075 ppm, a new one-hour NO_2 standard of 100 ppb, and a new one-hour SO_2 standard of 75 ppb. The primary annual and 24-hour SO_2 standards were revoked in June of 2010 along with the annual PM_{10} standard in October of 2006.

Air quality in Bedford, Concord, Lexington, and Lincoln is very good and is in compliance with all existing NAAQS as classified by the EPA[42] except the 1997 eight-hour ozone standard. While ozone levels remain in compliance with the new eight-hour standard, a few exceedances of the eight-hour NAAQS have been measured at the Stow and Chelmsford monitors. Ozone concentrations in Eastern Massachusetts are greatly affected by air pollution transport from the New York/New Jersey/Connecticut metropolitan area, and these changes are likely influenced by conditions to the west.

[42] 40 CFR 81.322

Table 8-2 Massachusetts and National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Time	Primary Standards	Secondary Standards	MAAQS Standard
CO	8-Hour[1]	9 ppm (10 mg/m3)	None	9 ppm (10 mg/m3)
	1-Hour[1]	35 ppm (40 mg/m3)	None	35 ppm (40 mg/m3)
NO_2	Annual	0.053 ppm (100 ug/m3)	Same as Primary	100 ug/m3
	1-Hour[2]	0.1 ppm (188 ug/m3)	None	320 ug/m3
PM_{10}	Annual[3]	None	None	50 ug/m3
	24-Hour[1]	150 ug/m3	Same as Primary	150 ug/m3
$PM_{2.5}$	Annual[4]	12 ug/m3	15 ug/m3	None
	24-Hour[5]	35 ug/m3	Same as Primary	None
SO_2	Annual	None	None	80 ug/m3
	24-Hour[1]	None	None	365 ug/m3
	3-Hour[1]	None	0.5 ppm (1,300 ug/m3)	0.5 ppm (1,300 ug/m3)
	1-Hour	75 ppb (196 ug/m3)	None	None
Lead	Rolling 3-Month Average	0.15 ug/m3	Same as Primary	1.5 ug/m3
Ozone	8-Hour[6] (2008 Standard)	0.075 ppm	Same as Primary	None
	8-Hour (1997 Standard)	0.08 ppm	Same as Primary	None
	1-Hour[7]	None	None	235 ug/m3 (0.12 ppm)

Notes:
1. Not to be exceeded more than once a year.
2. MassDEP NO2 Policy Guideline level not to be exceeded more than one day per year.
3. The annual PM10 standard was revoked nationwide in 2006.
4. Three-year average of annual PM2.5 arithmetic needs.
5. Three-year average of 98th percentile 24-hour PM2.5 concentrations.
6. Three-year average of annual 4th highest daily maximum 8-hour ozone concentration.
7. The 1-hour ozone standard was revoked for most areas nationwide in 2005.

Source: 40 CFR 50, 310 CMR 6.0

8.3 Year 2012 Conditions

The sections that follow provide climate data, discuss ambient air quality standards and present air quality data for Hanscom Field. Emission inventories for the year 2012 have been developed for both aircraft operations and vehicular traffic.

8.3.1 Climate

The climate for Hanscom Field is determined in part by its proximity to the Atlantic Ocean. Lying 16 miles inland and at an elevation of approximately 130 feet above mean sea level, wind patterns at Hanscom Field are different from those in Boston, including a greater occurrence of calm winds, which are characteristic of inland locations. On a large scale, Hanscom Field is subject to the rapid weather changes typical to southern New England. The largest storms move up the east coast from the Carolinas and in most cases pass to the south and east of the area, resulting in northeast and east winds with rain, snow, and fog. Annual winds are predominantly from the west, with winter winds from the northwest and summer winds from the southwest. Determinant factors include:

- **Wind direction -** determines where emissions will travel as they are diluted and dispersed in the atmosphere.
- **Wind speed -** determines the dilution rate, with higher speeds resulting in greater dilution and lower air pollutant concentrations.
- **Atmospheric stability -** determines the rate at which pollutants released near the ground are mixed and dispersed in the atmosphere, with a neutral to unstable atmosphere providing rapid dispersion and a stable atmosphere providing slower dispersion. Stable conditions occur, by

definition, only at night when there is no solar heating of the ground to produce thermal air turbulence.

The annual frequency of wind speed and direction at Hanscom Field are summarized in Table 8-1. These data are based on a five-year climatological average of hourly measurements taken at Hanscom Field from 2005 to 2009.

8.3.2 Historical Air Quality Monitoring Data

MassDEP monitoring data were used to conservatively estimate existing background air quality levels in the Hanscom Field communities. Historical records from these same stations were used to provide a perspective on how air quality in the region today compares with that in the recent past. For the purposes of the *2012 ESPR*, MassDEP monitoring data were used to estimate existing background air quality concentrations and then form total concentrations (Hanscom Field effects plus background levels) for comparison with air quality standards. Following EPA guidance,[43] background concentrations were determined using monitoring data from regional state monitoring sites that have collected over a year of continuous measurements

Site-specific monitoring to establish background air quality levels is generally not done for air quality impact studies and was not done for this *2012 ESPR*. Instead, MassDEP monitoring stations were selected to ensure that the monitoring data are conservative for this purpose, i.e. the levels are higher than existing concentrations in the Hanscom Field communities. This approach was approved by both the MassDEP and the Secretary of Energy and Environmental Affairs as part of the scoping process for this *2012 ESPR*. Conservative monitoring data from state monitoring stations in the project region (e.g., Kenmore Square) are normally used to establish existing background air quality. Since the background data are chosen to be conservatively elevated, their use in forming total predicted concentrations, which are then compared to air quality standards, serves to protect public health with an added margin of safety.

8.3.3 DEP Monitoring Data

As required by MEPA, the appropriateness of MassDEP's monitoring data from the Greater Boston area for use as background levels in the ESPR air quality analysis was confirmed. A review of MassDEP monitoring records showed a more than ample selection of available monitoring data from the region that could conservatively represent air quality background levels. The MassDEP Division of Air Quality Control was contacted when the *1995 GEIR* was being prepared and the selected monitoring data were reviewed with MassDEP staff to ensure that they were conservative for the Hanscom Field communities; MassDEP replied that the selected monitoring data were both conservative and acceptable for use in the *1995 GEIR*.[44]The Hanscom Field community consultants for the *1995 GEIR* also independently contacted MassDEP and confirmed that MassDEP had approved the use of monitoring data from their stations for background conditions in air quality studies at Hanscom Field, and that MassDEP considered the data selected to be conservative.[45]The sophisticated monitoring equipment used by MassDEP coupled with rigorous quality assurance and quality control procedures, including EPA audits, ensure that the collected data are consistently accurate.

[43]U.S. EPA, *Guideline on Air Quality Models (Revised)*, 40 CFR 51, Appendix W, November 9. 2005.
[44]Personal communication, Mr. Charles Mentos, MassDEP Division of Air Quality Control, Boston, July 9 and 30, 1996.
[45]Personal communication, Ms. Elizabeth Racca, Dames & Moore, Boston, August 19, 1996.

Site-specific monitoring for NO_2 was performed for the *1995 GEIR* to test the accuracy of the analysis for the *1995 GEIR*. This monitoring was not performed to establish background levels in the Hanscom Field communities. Its purpose was to test and confirm the assumption that MassDEP's monitoring data from Boston represented conservative estimates of local Hanscom Field community air quality. The monitoring data demonstrated that NO_2 concentrations close to the airport were safely in compliance with the air quality standard and well below those measured by MassDEP at Kenmore Square. Thus, the Kenmore Square data were proven to be conservative, and the MassDEP did not recommend additional air quality monitoring be performed for the *2000 ESPR*.[46] The air quality analysis for the *2012 ESPR* is consistent with this approach approved by MassDEP for the *2000* and *2005 ESPR*.

8.3.4 Location of Monitoring Stations

There are no MassDEP monitoring stations in the four Hanscom Field communities. The MassDEP stations selected to represent the Hanscom Field communities are those in the Greater Boston area that have historically had the highest pollution levels and the longest historical records. Monitoring data are presented in this section for the pollutants CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, lead, and ozone. No monitoring data for VOC are presented; MassDEP does not perform VOC monitoring on a regular basis because there is no state or national air quality standard for VOC. While some special VOC monitoring programs have been undertaken by MassDEP in the past, these were limited in their scope and duration and are not applicable to the Hanscom Field communities. No monitoring is performed for CO_2, as it is not a regulated air pollutant under the NAAQS. Year 2012 emission inventories of VOC emissions from Hanscom Field aircraft operations and motor vehicular traffic are, however, presented in this chapter.

Table 8-3 Background Air Quality Levels (ug/m3)

Pollutant[1]	Averaging Time	Levels Measured In:			Background Selected
		2010	2011	2012	
CO	8-Hour	1,035	1,380	1,495	1,495
	1-Hour	2,070	1,725	1,035	2,070
NO2	Annual	36	38	36	38
	1-Hour	96.8	99.4	92.1	99.4
PM10	Annual	16	17	16	17
	24-Hour	37	38	28	38
PM2.5	Annual	9.3	9.4	9.0	9.2
	24-Hour	20.7	21.2	22.1	21.3

Note:
1. Data for all pollutants are from Kenmore Square, Boston. Concentrations for 1-hour, 8-hour, and 24-houraverages are annual second-highest values, except for 1-hour NO2 and 24-hour average PM2.5 which are 98th percentile values. Selected PM2.5 background values are the three-year averages. For all other pollutants the selected background values are the highest of the value measured in the three year period.

Source: Massachusetts DEP Air Monitoring Reports (http://www.mass.gov/eea/agencies/massdep/air/quality/air-monitoring-reports-and-studies.html)

The data for CO, NO_2, PM_{10}, and $PM_{2.5}$, are from the Kenmore Square monitoring station in Boston.[47]Data for ozone are from the Chelmsford and Stow[48]monitors. For all pollutants except ozone, the selected monitor is in the City of Boston where emission densities are higher than in the Hanscom Field

[46]Memorandum. From: Christine Kirby, MassDEP, To: EOEA Secretary Durand, Subject: *EOEA NO. 5484/8696 – Review of the Draft Scope for the 2000 Hanscom Field ESPR*, November 27, 2001.

[47]Source: Massachusetts DEP Air Monitoring Reports (http://www.mass.gov/eea/agencies/massdep/air/quality/air-monitoring-reports-and-studies.html).

[48]These are the closest ozone monitoring stations to Hanscom Field. The Massachusetts DEP discontinued ozone monitoring at the Sudbury location after 1998, and commenced monitoring at the Stow location in 1998 which was discontinued in 2011. Monitoring commenced in 2012 at the EPA Chelmsford location.

communities. Ozone is not directly emitted from any source, and tends to have higher concentrations downwind of large urban areas. An air quality monitoring station near Hanscom Field, operated by the EPA at their Lexington laboratory from 1991 to 1993, measured ozone and recorded levels approximately 10 percent below those in Sudbury/Stow, where MassDEP discontinued conducting ozone monitoring in 2011 and began monitoring at the EPA site in Chelmsford. No violations of the ozone standard were ever recorded at the Lexington monitoring site near Hanscom Field.

8.3.5 Existing Air Quality Concentrations

Background air quality for CO, NO_2, PM_{10}, and $PM_{2.5}$ was determined using measurements from Kenmore Square for the most recent three-year period (2010-2012). These four pollutants are the principal ones emitted by aircraft engines for which air quality standards have been set. The background levels presented in Table 8-3 represent all of the existing air pollution sources (natural and man-made).

Historical records for CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, lead, and ozone from the most representative MassDEP monitoring stations are summarized in Figures 8-1 through 8-9. These figures show that large reductions in pollutant emissions and in the levels of air pollution have occurred over the past 25 years. The aggressive efforts undertaken since 1970 by government and industry to reduce air pollution have resulted in cleaner air today for most of the Greater Boston area (defined as the six counties mainly within I-495).

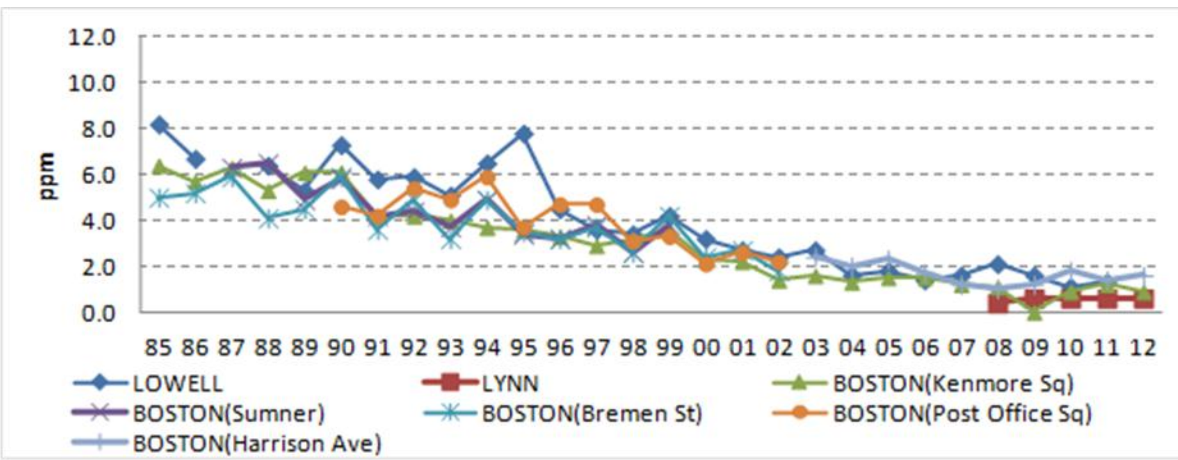


Figure 8-1 8-Hour CO Concentrations Measured at MassDEP Greater Boston Monitors – Kenmore Square and Other Measurement Locations

Source: MassDEP 2012 Annual Air Quality Report

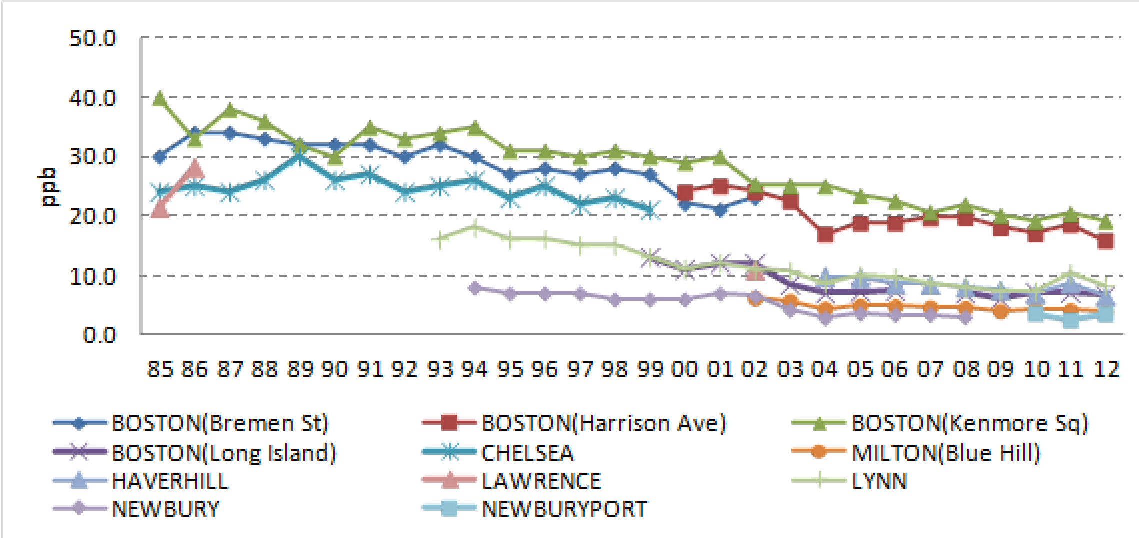


Figure 8-2 Annual NO2 Concentrations Measured at MassDEP Greater Boston Monitors – Kenmore Square and Other Measurement Locations

Source: MassDEP 2012 Annual Air Quality Report

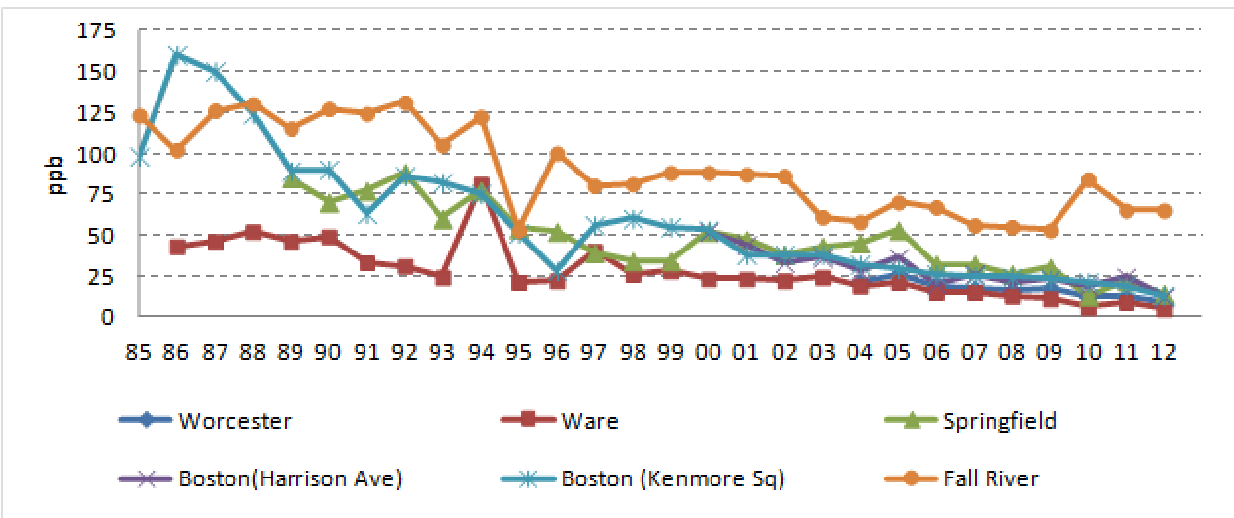


Figure 8-3 1-Hour SO2 Concentrations Measured at MassDEP Greater Boston Monitors – Kenmore Square and Other Measurement Locations

Source: MassDEP 2012 Annual Air Quality Report

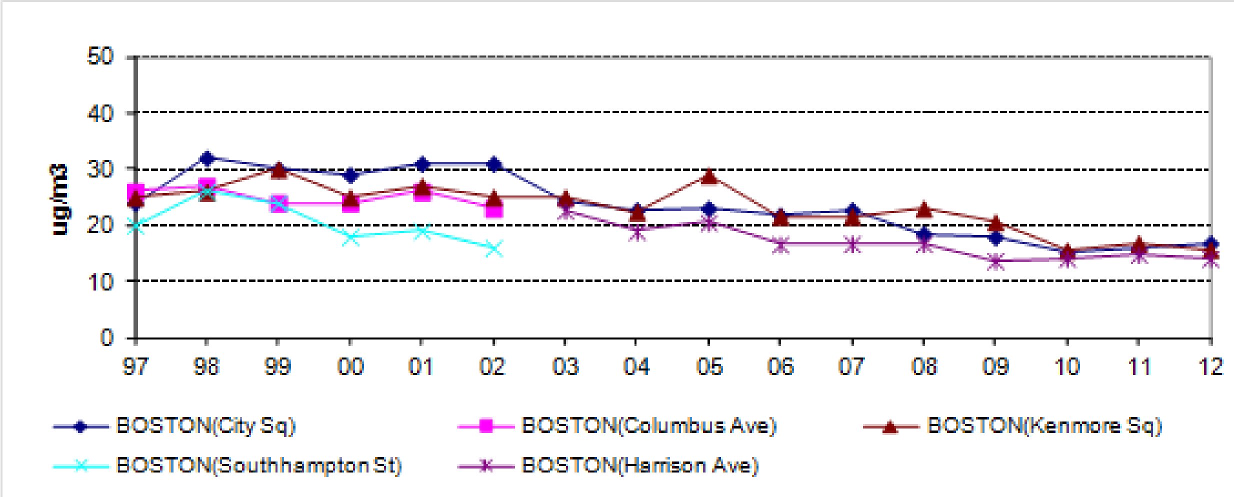


Figure 8-4 Annual PM10 Concentrations Measured at MassDEP Greater Boston Monitors – Kenmore Square and Other Measurement Locations

Source: MassDEP 2012 Annual Air Quality Report

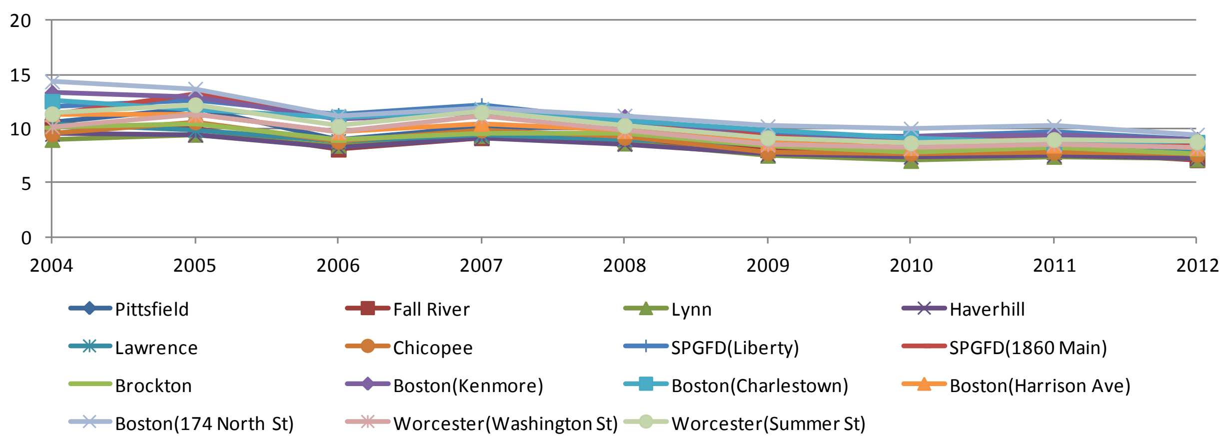


Figure 8-5 Annual PM2.5 Concentrations Measured at MassDEP Greater Boston Monitors – Stow/Kenmore Square and Other Measurement Locations

Source: MassDEP 2012 Annual Air Quality Report

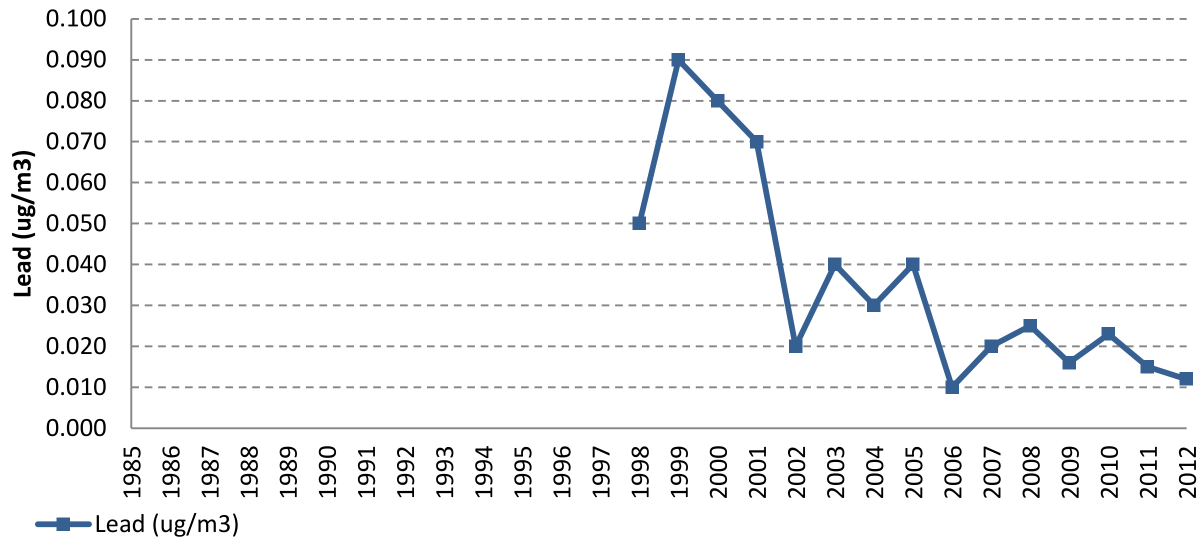


Figure 8-6 Calendar Quarter Lead Concentrations Measured at MassDEP Monitoring Station in Kenmore Square and Harrison Avenue, Boston

Source: MassDEP Annual Air Quality Reports (1998-2012)

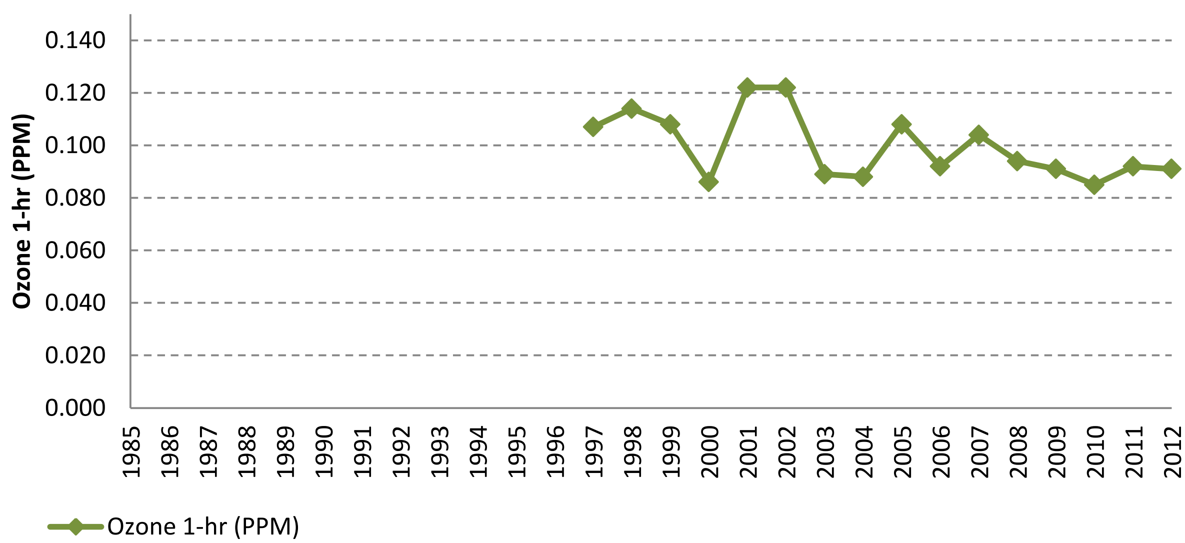


Figure 8-7 1-Hour Ozone Concentrations Measured at MassDEP Greater Boston Monitors – Sudbury/Stow/Chelmsford

Source: MADEP Annual Air Quality Reports (1997-2012)

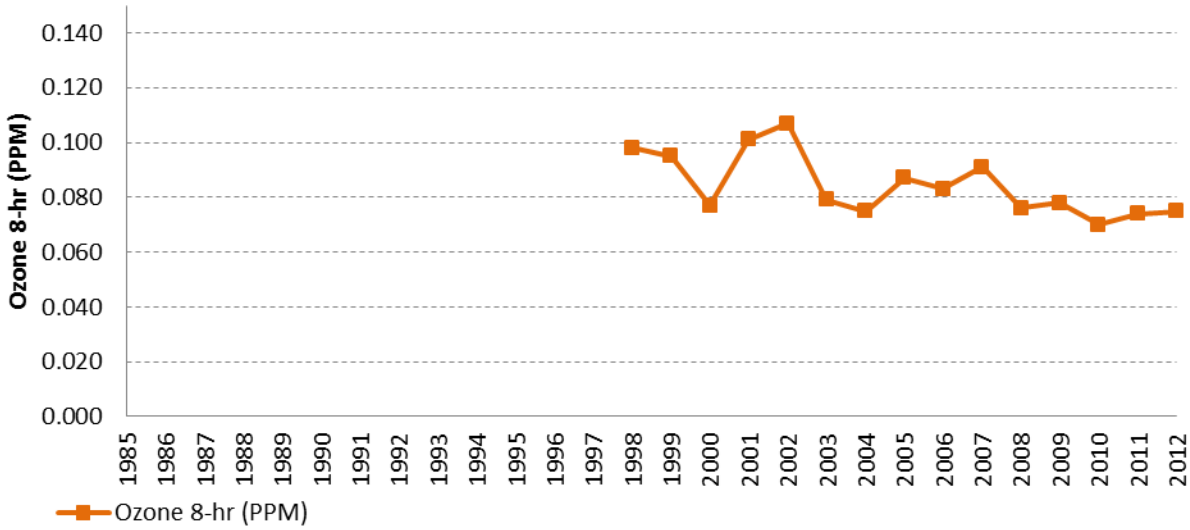


Figure 8-8 8-Hour Ozone Concentrations Measured at MassDEP Greater Boston Monitors – Sudbury/Stow/Chelmsford

Source: MADEP Annual Air Quality Reports (1998-2012)

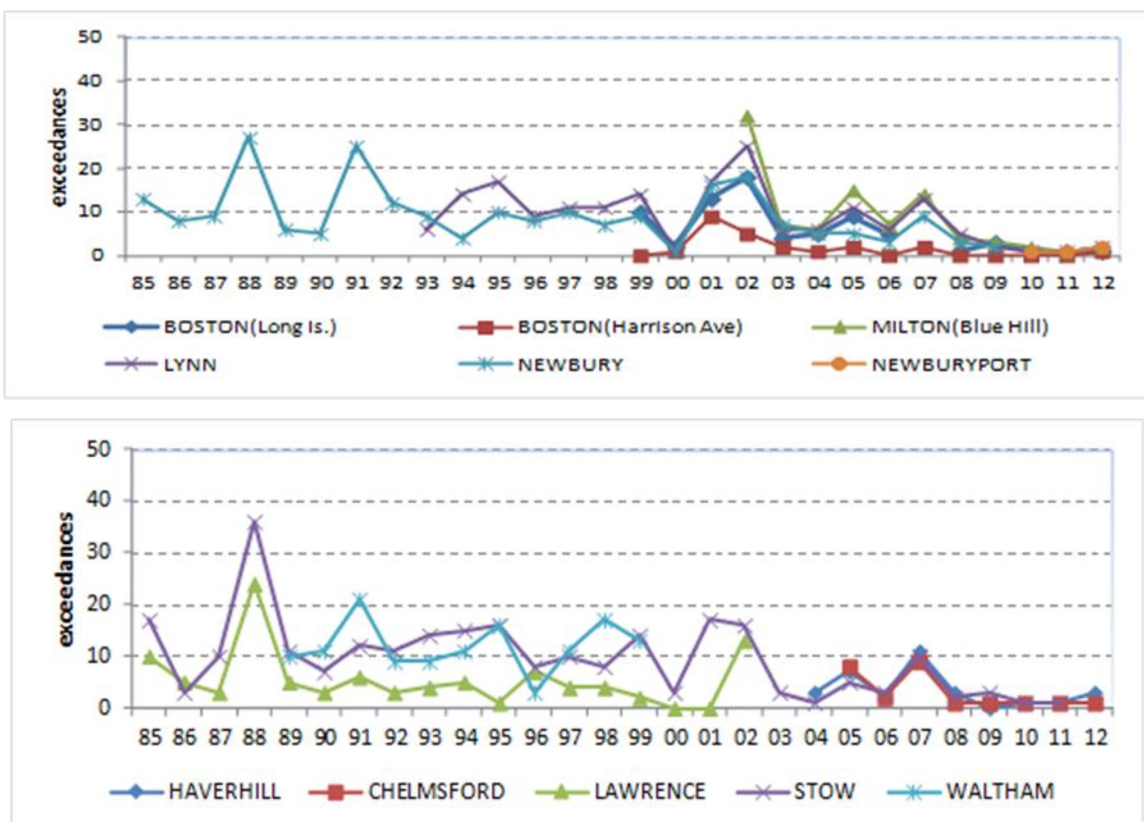


Figure 8-9 Number of Exceedances of 8-Hour Ozone Concentrations Measured at MassDEP Greater Boston Monitors – Sudbury/Stow and Other Measurement Locations

Source: MADEP 2012 Annual Air Quality Report

EPA has established NAAQS for seven major air pollutants to protect public health and welfare with an adequate margin of safety. These standards have been periodically reviewed and updated, as necessary, over time. The Greater Boston area has had "clean air" (i.e., no violations of the air quality standards for these pollutants) for six of the seven major air pollutants:

- PM_{10}, NO_2, SO_2 and lead for over 25 years
- CO for over 20 years
- $PM_{2.5}$ since 1999 when monitoring for this pollutant commenced

For the seventh pollutant, ozone, Massachusetts was designated as a non-attainment area for the 1997 eight-hour ozone standard of 0.08 ppm. Measurement data now shows that all monitors meet the 1997 standard statewide. In addition, EPA tightened the eight-hour ozone standard in 2008 to 0.075 ppm and designated all of Massachusetts except Dukes County as unclassifiable/attainment with the new standard. A few exceedances of the new eight-hour ozone standard have been measured at various locations in Eastern Massachusetts in recent years, however there have been no violations of the standard in the region since compliance is based on a 3-year average. It should be noted that cleaner air has been achieved since 1996, with regard to the old 1-hour NAAQS (EPA revoked the 1-hour standard in 2005), for all locations in the Greater Boston area, including the Hanscom Field communities.

Using actual air quality measurements collected throughout the region by the MassDEP over the last 25 years, the following progress has been documented:

- CO levels in the Greater Boston area have steadily declined since their peak in the 1970s. The last violation of the CO air quality standard occurred in 1986 in Boston over 25 years ago (see Figure 8-1). The entire state has been considered in attainment with the standard since April 2002.
- NO_2 levels in the Greater Boston area have declined since their peak in the late 1970s (see Figure 8-2). In January of 2010, EPA established a new 1-hour NO_2 standard of 100 ppb. In January of 2012, EPA designated all of Massachusetts as attainment/unclassifiable with the new standard.
- SO_2 levels in the Greater Boston area have also steadily declined since their peak in the early 1970s. The last violation of the SO_2 air quality standard occurred in 1972 in Boston. In June of 2010, EPA established a new 1-hour standard of 75 ppb along with new monitoring requirements that just began in January of 2013. All six monitors in the Commonwealth show levels that meet the new 1-hour standard (See Figure 8-3).
- PM_{10} levels in the Greater Boston area have declined since the mid-1980s. In 2006, the EPA revoked the annual PM_{10} standard. There have been no violations of the PM_{10} air quality standard recorded in the Hanscom area (See Figure 8-4).
- $PM_{2.5}$ levels in the Greater Boston area have declined since monitoring of this pollutant began in 1999. The daily standard was tightened in 2006 from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. In December of 2012, the EPA tightened the annual standard from 15 ug/m^3 to 12 ug/m^3. No violations of the $PM_{2.5}$ air quality standard have been recorded in the Hanscom area (see Figure 8-5).
- Lead levels in the air have declined 98 percent since the early 1980s mostly due to the removal of lead in gasoline. In October of 2008, the EPA tightened the lead standard from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$ averaged over a 3-month period. In February of 2012, EPA required lead monitoring for one year at the Nantucket Memorial Airport as part of their effort to improve the existing lead monitoring network at airports and industrial facilities. The highest daily value recorded at the airport in 2012 was 0.04 $\mu g/m^3$, well below the new standard of 0.15 $\mu g/m^3$. No violations of the lead air quality standard have ever been recorded in the Greater Boston area (see Figure 8-6).
- Ozone levels in the Greater Boston area have declined since their peak in the 1970s (see Figures 8-7 and 8-8). In 1997, EPA promulgated a new 8-hour ozone standard of 0.08 ppm. In 2008, EPA tightened the 8-hour standard to 0.075 ppm. Exceedances of the new 8-hour ozone standard have

been monitored at various locations in the Greater Boston area over recent years (see Figure 8-9), however no violations of the new standard have occurred in the Middlesex County area. The area is considered non-attainment with the 1997 standard and unclassifiable/attainment with the new 2008 standard. It should be noted that ozone monitoring show that Massachusetts meets the 1997 standard.

8.4 Effect of Federal and Massachusetts Regulations

Additional reductions in air pollution levels, specifically ozone, are assured over the next 20 years due to the following regulations that are already or will be in place:

8.4.1 Vehicle Standards and Regulations

EPA has enacted various vehicle and emission fuel standards to improve the average fuel economy of cars and light trucks.

EPA recently proposed draft rules on low-sulfur gasoline for 2017 which will reduce the fuel sulfur content down to 10 ppm along with stricter limits on tailpipe exhaust. This proposal known as the Tier 3 Vehicle Emission and Fuel standards will reduce the sulfur content in gasoline by 60 percent compared to the existing Tier 2 sulfur gasoline standard of 30 ppm. Based on EPA estimates, the proposed rule would decrease nitrogen oxides and volatile organic compounds by 80% and particulate matter by 70%.

The Corporate Average Fuel Economy (CAFE) standards enacted in 1975 and regulated by the National Highway Traffic Safety Administration (NHTSA) and EPA is intended to improve the average fuel economy of cars and light trucks and encourage consumers to purchase more fuel efficient vehicles. The recent agreement in 2011 with the government and thirteen automakers will increase fuel economy to 54.5 miles per gallon by 2025. These new standards will reduce mobile source emissions through more efficient and cleaner vehicles and reduced fuel usage.

In addition to regulations and standards, the increase of cleaner burning vehicles such as hybrid, electric, and alternative fuel vehicles in the fleet mix will further reduce mobile source emissions. These types of vehicles are more efficient with emissions much lower compared to conventional gasoline and diesel vehicles. Furthermore, with the implementation of electric, hybrid, and newer more efficient vehicles, future emissions will be lower when compared to today with the removal of older less efficient vehicles.

8.4.2 Massachusetts Vehicle Emission Regulations

Massachusetts has implemented an enhanced motor vehicle Inspection & Maintenance (I/M) program. The program includes an expansion to include diesel cars, trucks, and buses. It consists of an on-board diagnostic test (OBD) which checks the vehicles on-board computer, downloads the data and checks for any systems malfunctions. There is also an opacity test for medium and heavy-duty vehicles not equipped with OBD systems. Under the enhanced I/M program, testing is conducted annually and is designed to ensure vehicles are operating efficiently and identify and fix high polluting vehicles.

Massachusetts has also adopted the California Low Emissions Vehicle (LEV) program that imposes emission limits more stringent than the Federal Motor Vehicle Control Program (FMVCP) in 1995 and newer motor passenger cars and light-duty trucks. Massachusetts' law requires the Commonwealth to adopt the stricter of the federal or California emission standards for motor vehicles. Massachusetts has adopted the California zero emissions vehicle (ZEV) program, effective in 2007. This program requires percentages of new vehicles (passenger cars, light-duty trucks, and medium-duty vehicles), sold in

Massachusetts starting in 2007, and must be certified to meet certain emissions limits. The MassDEP revised the ZEV program in 2009, where automobile manufacturers were required to comply with fleet average greenhouse gas emissions levels in Massachusetts. The amendments in 2009 provide additional flexibility and incentives to automobile manufacturers to meet the mandate.

8.4.3 Greenhouse Gas Emissions

Climate change refers to shifts in weather patterns resulting from an increase in the average global temperature. These changes have both natural and man-made causes, and the latter are thought to be the result of increasing atmospheric concentrations of CO_2, methane (CH_4), NO_2 and other heat-trapping gases, commonly referred to as greenhouse gases (GHG). Human activities that produce these gases include energy production and transportation activities.

The Commonwealth has acknowledged climate change as an important environmental and economic issue and has developed an initial plan to begin to address greenhouse gas emissions. Massport was one of 15 state agencies and authorities that participated in development of the action plan, with specific attention to transportation system planning and transportation technology and operations. The first Massachusetts Climate Protection Plan was published in 2004 by the Office for Commonwealth Development.[49]The Massachusetts Climate Protection Plan is the state's initial step towards reducing emissions of greenhouse gases and improving energy efficiency. It proposes near-term actions aimed at protecting the climate, reducing pollution, reducing energy demand, and stimulating job growth through the development of sustainable energy resources and advanced technologies. Massport is participating on two of the Action Plan Teams associated with the plan, (i.e., Transportation System Planning and Transportation Technologies and Operations) with a focus on emissions reduction associated with airport operations.

In 2008, the Governor signed the Massachusetts Global Warming Solutions Act which sets targets for reducing GHG levels by 25 percent by 2020 and 80 percent by 2050 compared to 1990 levels. To aid in implementing the Global Warming Solutions Act, the MassDEP issued rules in December of 2008 for mandatory GHG reporting requirements on a wide array of sources. The rule required certain facilities register with the MassDEP by April of 2009 and report, certify, and verify emissions annually starting in April of 2010. In addition to the above programs, Massachusetts participates in the Regional Greenhouse Gas Initiative (RGGI) which commenced in September of 2008. The purpose of RGGI is to reduce GHG emissions from power plants through a cap and trade program. Massachusetts is one of nine northeastern states that participate in the program. Massachusetts also adopted the Green Communities Act in 2008 which provided legislation to increase energy efficiency, encourage investment in renewable energy, encourage green building design, and mandates that 15 percent of the electricity supplied by 2020 must be from renewable energy sources.

In addition, the Massachusetts Executive Office of Energy and Environmental Affairs revised the "MEPA Greenhouse Gas Emissions and Protocol" effective May of 2010. The revised policy requires certain projects under MEPA review, not specific to this *2012 ESPR*, to quantify potential annual GHG emissions for the baseline and preferred alternative and identify and conduct an alternatives analysis to evaluate mitigation measures to minimize or mitigate potential GHG emissions from the preferred alternative.

[49]The complete Massachusetts Climate Protection Plan is available on-line at http://www.mass.gov/Eocd/docs/pdfs/maclimateprotectionplan.pdf.

8.4.4 Reformulated Gasoline and Vapor Recovery Systems

Massachusetts has adopted the federal regulations for reformulated gasoline. Reformulated gasoline (RFG) is designed to produce lower emissions of toxic substances from evaporation and to burn cleaner than conventional gasoline. Phase II of the reformulated gasoline program, with more stringent standards, began in the year 2000. In 2006, Massachusetts phased out the use of methyl tert-butyl ether (MTBE) which was a gasoline additive designed to boost the octane level. MTBE was being found in the groundwater due to leaky underground tanks and legislation was introduced to substitute MTBE with ethanol. Currently, RFG is being blended with ethanol in Massachusetts.

Massachusetts recently required that Stage II gasoline vapor recovery systems be decommissioned at gasoline dispensing stations based on the EPA rule that Stage II vapor recovery was no longer cost effective. Massachusetts has proposed Stage I regulatory revisions that certain gas dispensing facilities install a Stage I system that meets the California Air Resource Board requirements for Stage I Enhanced Vapor Recovery (CARB EVR) as well as monitoring system for vapor leaks.

8.4.5 Diesel Engines

In 2004, the EPA implemented a non-road diesel rule that requires more stringent controls on non-road diesel engines. These standards followed the Tier 3 emissions standards for nitrogen oxides and hydrocarbons for non-road vehicles that were introduced in 1998 and are to be phased into use between 2006 and 2008. The new Tier 4 exhaust emission standards, which are being phased-in between 2008 and 2014, will cut air pollution emissions from non-road diesel engines by over 90 percent. As part of these regulations, ultra-low sulfur diesel fuel (15 ppm sulfur content) for on-road diesel vehicles was phased-in from 2006 to 2010 and is expected to reduce exhaust emissions by 90 percent.

8.4.6 Stationary Source Emissions

Massachusetts has adopted regulations that will reduce stationary source (e.g., industrial sources and power plants) emissions of NO_x, a prime component of ground-level ozone (smog). These regulations included Reasonably Available Control Technology (RACT), Lowest Achievable Emission Rate (LAER), included in the Ozone Transport Region, NO_x Cap and Allowance trading program, and the U.S. EPA's Ozone Transport NO_2 State Implementation Plan (SIP).

8.4.7 Year 2012 Aircraft Emissions

This section and the next provide estimates of total annual air emissions generated by activities associated with Hanscom Field for the year 2012. The primary air pollutant sources at Hanscom Field are aircraft operations and groundside roadway traffic. Other sources include space heating emissions and fugitive emissions from fuel storage, fuel spillage, and aircraft refueling activities. Prior studies have shown that emissions from these latter sources are very small compared to the aircraft and groundside roadway traffic, and thus consistent with previous ESPRs are excluded with little effect on the results.[50] Annual aircraft emissions were calculated for the year 2012 at Hanscom Field. Pollutants associated with aircraft engines are CO, NO_x, PM_{10}, $PM_{2.5}$, CO_2, and VOC. The methodology for calculating the aircraft emissions is outlined below.

[50] Speas Associates, with Bolt, Berenek & Newman, "Alternative Futures for Hanscom Field Policy Planning," 1977.

According to the EPA,[51] an airport emissions inventory should concentrate on the emission characteristics of aircraft relative to the vertical column of air that ultimately affects ground level pollutant concentrations. This portion of the atmosphere, which begins at the earth's surface and is simulated in air quality models, is often referred to as the mixing zone. The aircraft operations of interest within this layer are defined as the landing and takeoff (LTO) cycle. The cycle begins when the aircraft approaches the airport on its descent from cruising altitude, lands, and taxis to the gate. It continues as the aircraft taxis back out to the runway for subsequent takeoff and climb out as it heads back up to cruising altitude. Thus, the five specific operating modes in an LTO are:

- Approach from 3,000 feet
- Taxi/idle-in
- Taxi/idle-out
- Takeoff
- Climb out to 3,000 feet

Actual numbers of aircraft operations at Hanscom Field for the years 1990, 1995, 2000, 2005 and 2012 are described in Chapter 3, Airport Activity Levels and shown in Table 8-4. The data in Table 8-4 show that the number of aircraft operations at Hanscom Field in 2012 decreased by 1.6 percent compared to the 2005.

The annual aircraft operations data provided for the air quality analysis were consistent with the operations presented in the noise analysis (See Chapter 7, Noise). To convert the aircraft operations for use in EDMS, the INM type for each aircraft from the noise analysis was assigned an aircraft and engine type using the databases provided within EDMS. Annual emissions were calculated by multiplying the number of operations for each noise classification by the emission factor for that classification for each mode of the LTO cycle.

Table 8-4 Aircraft Operations at Hanscom Field

Year	Number of Operations
1990	232,700
1995	190,300
2000	212,400
2005	169,955
2012	167,845
Percent Change: 1990 to 2005	-27%
Percent Change: 1995 to 2005	-11%
Percent Change: 2000 to 2005	-20%
Percent Change 2005 to 2012	-1.6%

Source: Massport

The aircraft emission factors for CO, NO_x, PM_{10}, $PM_{2.5}$, CO2, and VOC used to calculate the annual aircraft emissions at Hanscom Field in the *2012 ESPR* were taken primarily from the FAA Emissions and Dispersion Modeling System (EDMS) model (Version 5.1.4.1).[52] An earlier version of EDMS (4.3) was used for the previous ESPR's and has been updated ten times since the *2005 ESPR*. The differences in aircraft emission rates between these versions of EDMS are significant, especially for smaller general

[51]U.S. EPA, Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, Office of Air and Radiation, EPA-450/4-81-026d (Revised), 1992.
[52]FAA, Emissions and Dispersion Modeling System (EDMS) Reference Manual, Prepared for the FAA by CSSI, Washington, D.C., June, 2013.

aviation (GA) aircraft. When EDMS converted to Version 5.0 in January of 2007, the upgrade represented a significant improvement in capabilities and functionality over previous versions. Among the many updates to the model included two significant changes from the previous versions: 1) new, dynamic emissions module computes aircraft LTO emissions based on performance parameters and weather conditions, and 2) Boeing Fuel Flow Method 2 is used to scale emissions for a contiguous range of weather conditions, rather than just standard atmospheric conditions. The Version 5 update changed the methodology for calculating fuel flow and time in mode for each of the modes of the LTO cycle. This is especially apparent for the smaller GA aircraft like the Cessna 150 which comprise approximately 75 percent of the total operations at Hanscom in 2012. Because of the numerous updates to EDMS over the past years, the 2005 operations where updated with the newer version of EDMS which results in aircraft emissions that are significantly higher for the same fleet and level of operations compared to emissions calculated using the older EDMS Version 4.3. This will allow for a more accurate comparison of 2005 and 2012 aircraft emissions. The emissions shown in Table 8-5 for 2005 (Version 5.1.4.1) are the recalculated results. It should also be noted that in 2005, emission factors for CO2, PM_{10} and $PM_{2.5}$ were not available for all types of aircraft, and therefore emissions were calculated separately with spreadsheets. However, with the improvements to EDMS, emissions for these pollutants were calculated for each of the aircraft operations for 2005 and 2012 and are presented in Table 8-5.

Table 8-5 Emissions from Aircraft Operations at Hanscom Field (1,000s of kg/yr)

Year	CO	NOx	VOC	PM10[1]	PM2.5[1]	CO2[3]
1985[2]	698.8	14.2	38.3	2.6	2.6	7,280.6
1995[2]	409.2	14.9	27.9	2.3	2.3	6,727.8
2000[2]	591.2	25.4	39.4	2.3	2.3	10,108.1
2005 (EDMS Version 4.3)	483.6	28.0	58.1	3.0	3.0	11,806.6
2005 (EDMS Version 5.1.4.1)[3]	1,670	34.1	112.7	13.5	13.5	19,233.1
2012	1,123	31.9	80.4	9.9	9.9	16,356.0
Percent Change: 1985 to 2005	-31%	+97%	+52%	+15%	+15%	+62%
Percent Change: 1995 to 2005	+18%	+88%	+108%	+30%	+30%	+75%
Percent Change: 2000 to 2005	-18%	+10%	+47%	+30%	+30%	+17%
Percent Change: 2005 to 2012[4]	-33%	-7%	-29%	-27%	-27%	-15%

Notes:
1. PM10 and PM2.5 emissions for some aircraft and CO2 emissions for all aircraft were calculated separately with a spreadsheet. The EDMS does not contain PM emission rates for some aircraft and does not include CO2 emission for any aircraft.
2. Emissions for 1985, 1995, and 2000 were revised from the *2000 ESPR* using the EDMS Version 4.3.
3. Emissions for 2005 were revised from the *2005 ESPR* using EDMS Version 5.1.4.1.
4. Percent Change is based on 2005 and 2012 EDMS Version 5.1.4.1.

Aircraft engine emission factors in mass per time (e.g. grams per second or kilograms per hour) were based on the EDMS default factors for each aircraft and engine type for idle, takeoff, climb out, and approach movements which are a function of the engine's power setting and resultant fuel flow. EDMS default time-in-mode (TIM) data were also used for each of the phases of the LTO cycle. Aircraft emissions for each of the modes of the LTO were calculated for each type of aircraft by multiplying the number of operations by the emission factor for each operation phase and the TIM. These calculations were performed by EDMS.

Table 8-5 shows the estimates of the total emissions of CO, NO_x, VOC, PM_{10}, $PM_{2.5}$, and CO_2 at Hanscom Field for 1985, 1995, 2000, 2005, and 2012. The data in Table 8-5 reveal that emissions for all six pollutants decreased between 2005 and 2012 based on revising the 2005 inventory for the current EDMS version model. The percentage changes in the aircraft emissions between the different years shown in Table 8-5 do not correlate with the percent changes in the number of aircraft operations shown in Table 8-4 because the mix of the aircraft types is different in each of the five years and the aircraft emissions for 1990, 1995, 2000, and 2005 were developed using an older version of the EDMS model as well as external emission factors for PM10 and CO2.

The changes in the emissions of the six air pollutants between 2005 and 2012 shown in Table 8-5 are the result of differences in the number of operations of different types of aircraft. The emission rates for each type of aircraft do not change with time, rather the relative amount of each type of aircraft in the mix using Hanscom Field changes for each of the different years. The operations in 2012 included a different mix of aircraft from 2005, and the emissions depend on the aircraft type, the time spent in each mode of the LTO cycle at the airport (a characteristic that varies by aircraft type), and the passenger-carrying capacity of the aircraft. Similarly, for comparisons between 1990, 1995, 2000 and 2005, the changes in the aircraft emissions are the result of differences in the number of operations of different type aircraft which varies for each year, including the time spent in each mode of the LTO cycle at the airport.

To provide some perspective on the relative contribution of Hanscom Field aircraft emissions to regional air quality and to demonstrate that the increases that have occurred are small, Table 8-6 shows the total air emissions for Middlesex County. The emissions data for Middlesex County were obtained from the U.S. EPA National Emission Inventory (http://www.epa.gov/ttnchie1/net/2011inventory.html) for the most recent available year 2011. The 2012 aircraft emission totals in Table 8-5 as a percent of the Middlesex County emissions in Table 8-6 are as follows:

- CO = 0.80 percent
- NO_x = 0.14 percent
- VOC = 0.30 percent
- PM_{10} = 0.06percent
- $PM_{2.5}$ = 0.21 percent
- CO_2 = 0.26 percent

Table 8-6 2011 Emissions from All Sources in Middlesex County, Massachusetts (1,000s of kg/yr)

Source Type1	CO	NOx	VOC	PM10	PM2.5	CO2
Point	9,380	5,457	15,321	15,151	3,642	655,608
Mobile	132,931	17,887	11,296	1,311	1,014	5,566,911
Total	142,311	23,352	26,617	16,462	4,657	6,222,519

8.4.8 Year 2012 Motor Vehicle Emissions

A mesoscale air quality analysis was conducted for the motor vehicle traffic associated with activities at Hanscom Field. A mesoscale analysis calculates emissions over a larger area compared to a microscale analysis which calculates impacts from a much smaller area (e.g. roadway intersections). Consistent with MassDEP guidance for performing a mesoscale analysis[53] (DEP, 1991), total annual emissions of CO, NO_x, PM_{10}, $PM_{2.5}$, CO_2, and VOC were calculated using the most recent version of U.S. EPA's MOBILE emission model, MOBILE6.2. The mesoscale air quality study area is the same as the traffic study area analyzed for the *2005 and 2012 ESPRs*.

The vehicle miles traveled (VMT) for each roadway segment in the study area was calculated by multiplying the length of each segment by the average weekday daily Hanscom Field traffic volume on

[53]Massachusetts Department of Environmental Protection, *Guidelines for Performing Mesoscale Analysis of Indirect Sources*, Division of Air Quality Control, May 1991.

the segment. These calculations were performed in an excel spreadsheet using emission rates predicted by the MOBILE6.2 model with Massachusetts specific inputs. Average 24-hour traffic volumes were based on peak AM and PM volumes assuming the peak volumes represents 10 percent of the daily traffic. The average weekday daily traffic volumes, which are typically greater than the average daily volumes for an entire week including weekends, were multiplied by 365 to conservatively estimate the annual emissions for the study area.

The air pollutant emissions for each roadway segment were calculated by multiplying the VMT on each segment by the MOBILE6.2 predicted pollutant specific emission factor in grams per mile. The MOBILE6.2 model was run using inputs that were provided by the MassDEP. These emission factors were calculated for the time of year of concern for each pollutant (winter-CO and PM_{10}/$PM_{2.5}$, summer-VOC, NO_x, CO_2) using an average daily speed for each roadway link of 25 to 40 mph. For this analysis, PM_{10} and $PM_{2.5}$ emissions are composed of organics, sulfates, and lead salts from tailpipe, brake wear, and tire wear.

The results of the mesoscale analysis are presented in Table 8-7 and show that emissions from Hanscom Field traffic for 2012 declined significantly for all pollutants, compared to 1985, 1995, 2000, and 2005 except emissions of CO_2which are higher than those calculated for 2005. The general decline in motor vehicle emissions with time is a result of the upgrading of the fleet mix through the replacement of older vehicles with new cleaner vehicles that must meet more-strict emission standards. The traffic generated by Hanscom Field increased between 2005 and 2012. Generally the reduction in motor vehicle emission rates more than compensates for the increase in traffic, resulting in net emission decreases. For CO_2, the MOBILE6.2 reductions in emission rates are smaller and do not fully offset the higher traffic volumes, resulting in a slight emissions increase compared to 2005.

Table 8-7 Emissions from Hanscom Field Vehicular Traffic (1,000s of kg/yr)

Year	CO	NOx	VOC	PM10	PM2.5	CO2
1985[1]	49.2	5.1	5.0	0.4	0.4	-
1995[1]	30.3	3.9	2.9	0.6	0.6	-
2000[2]	60.8	6.9	3.0	0.21	0.16	1,495.5
2005	36.1	4.1	1.6	0.14	0.10	1,312.3
2012	19.05	2.18	0.86	0.10	0.06	1,555.4
Percent Change: 1985 to 2005	-27%	-20%	-68%	-65%	-75%	-
Percent Change: 1995 to 2005	+19%	+5%	-45%	-77%	-83%	-
Percent Change: 2000 to 2005	-41%	-41%	-47%	-33%	-38%	-12%
Percent Change: 2012 to 2005	-47.2%	-46.8%	-46.3%	-28.6%	-40.0	+18.5%

Notes:
1. Data were not available to update the 1985 and 1995 emissions to MOBILE6.2 or to calculate CO2 emissions for those years.
2. The 2000 Emissions were revised from the *2000 ESPR* using the MOBILE6.2 model with MassDEP model inputs.

8.4.9 Total Year 2012 Emissions

The combined pollutant emissions from both aircraft operations and groundside motor vehicle travel at Hanscom Field are shown in Table 8-8 for each of the six pollutants in 1985, 1995, 2000, 2005, and 2012. Table 8-8 shows that the sum of emissions for aircraft operations and motor vehicle traffic for NOx, CO, VOC, PM_{10}, $PM_{2.5}$ and CO_2 have decreased between 2005 and 2012.

8.4.10 Analysis of Future Scenarios

As discussed earlier in this chapter, the future air quality effects of Hanscom Field are predicted based on an emissions burden analysis of airside operations and groundside motor vehicle traffic for the 2020 and

2030 future planning scenarios. The *2012 ESPR* planning scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes. The future service scenarios are consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

Table 8-8 Total Air Emissions at Hanscom Field (1,000s of kg/yr)

Pollutant/Source	Year						Percent Change (Total)			
	1985	1995	2000	2005 (EDMS 4.3)	2005 (EDMS 5.1.4.1)	2012	1985 to 2005	1995 to 2005	2000 to 2005	2005 to 2012
CO										
Aircraft	698.8	409.2	591.2	483.6	1,670	1,123				
Ground Vehicles	49.2	30.3	60.8	36.1	36.1	19.05				
Total	**748.0**	**439.5**	**652.0**	**519.7**	**1,706.1**	**1,142.1**	**-31%**	**+18%**	**-20%**	**-33.1%**
NO_x										
Aircraft	14.2	14.9	25.4	28.0	34.1	31.9				
Ground Vehicles	5.1	3.9	6.9	4.1	4.1	2.18				
Total	**19.3**	**18.8**	**32.3**	**32.1**	**38.2**	**34.1**	**+66%**	**+71%**	**-1%**	**-10.7%**
VOC										
Aircraft	38.3	27.9	39.4	58.1	112.7	80.4				
Ground Vehicles	5.0	2.9	3.0	1.6	1.6	0.86				
Total	**43.3**	**30.8**	**42.4**	**59.7**	**114.3**	**81.3**	**+38%**	**+94%**	**+41%**	**-28.9%**
PM_{10}										
Aircraft	2.6	2.3	2.3	3.0	13.5	9.9				
Ground Vehicles	0.4	0.6	0.21	0.14	0.14	0.10				
Total	**3.0**	**2.9**	**2.51**	**3.14**	**13.6**	**10.0**	**+5%**	**+8%**	**+25%**	**-26.5%**
$PM_{2.5}$										
Aircraft	2.6	2.3	2.3	3.0	13.5	9.9				
Ground Vehicles	0.4	0.6	0.16	0.10	0.10	0.06				
Total	**3.0**	**2.9**	**2.46**	**3.10**	**13.6**	**9.96**	**+3%**	**+7%**	**+26%**	**-27%**
CO_2										
Aircraft	7,280.6	6,727.8	10,108.1	11,806.6	19,233	16,356				
Ground Vehicles	-	-	1,495.6	1,312.3	1,312.3	1,555.4				
Total	**-**	**-**	**11,603.6**	**13,118.9**	**20,545**	**17,911**	**-**	**-**	**+13%**	**-12.8%**

Note:
1. Data to calculate the ground vehicle CO2 emissions for 1985 and 1995 were not were available; therefore, total CO2 emissions for these years are not available for comparison with later years
2. Percent total based on EDMS 5.1.4.1 to estimate aircraft emissions for 2005 and 2012.

Since all future scenarios assume more aircraft operations, increases from current emission levels for the airport are expected. However, it should be noted that there are limitations in predicting future emissions beyond 20 years from the baseline for aircraft operations using EDMS. The EDMS model is constantly reviewed and updated to include new aircraft and engine types along with the latest emission factors from the International Civil Aviation Organization (ICAO) engine exhaust emission data bank. It does not incorporate future year technology changes such as the use of alternative fuels, more efficient engines or future regulatory emissions standards. Therefore, the predicted 2020 and 2030 year emission levels represent a conservative estimate of the future conditions. Estimated emission level increases and their associated impacts on air quality under the future scenarios are described below.

8.4.11 Future Aircraft Emissions

The estimation of future aircraft emissions followed the methodology outlined earlier in this chapter. For comparative purposes, Table 8-9 shows the annual number of operations and passengers for 2012 and the future planning scenarios. Tables containing the aircraft data used for the emissions calculations can be found in Appendix E.

Table 8-9 Aircraft Operations at Hanscom Field for 2012 and Forecast Scenarios

Year/Scenario	Number of Operations	Number of Passengers
2005	169,955	17,457
2012	167,845	8,609
2020	170,244	20,280
2030	195,892	35,490
Percent Change:		
2012 to 2020	+1.7%	+135%
2020 to 2030	+15.0%	+75%
1. The nighttime operations presented in the 2012 ESPR differ slightly from those published in the Hanscom Field Annual Noise Report. This discrepancy is due to the difference in the timing of the preparation for the two reports. Each report used the best available data at the time of the analysis for that report. The difference of approximately 0.3 daily nighttime operations or 0.07% of all daily operations would change computed noise levels by less than 0.1 dB, which is imperceptible and would not change the analysis presented.		

Table 8-10 summarizes the annual aircraft emissions for CO, NO_x, PM_{10}, $PM_{2.5}$, CO_2, and VOC, for the 2020 and 2030 future planning scenarios, and compares these emissions to year 2012. In general, aircraft emissions forecasted for each of the future scenarios would be higher than those for the year 2012 based on a predicted growth in operations. The exception is emissions of CO for 2020 which show a slight decrease compared to 2012. The largest increases in aircraft emissions are predicted for NO_x, VOC and CO_2, with the smallest increases predicted for CO, PM_{10} and $PM_{2.5}$.

As expected, emissions of all six pollutants, except 2020 CO emissions, for the two future planning scenarios would be higher than the emissions calculated for the year 2012. These emission changes would occur for two reasons: (1) increase in the total number of aircraft operations and the number of passengers carried, and (2) changes in the aircraft fleet mix. The air pollutant emission rates for each aircraft/engine combination are assumed not to change with time.

The percent decrease in CO for 2020 is approximately 2.2 percent while the percent increase in 2030 is approximately 13.2 percent. The percent increase in emissions from 2020 to 2030 is similar to the percent increase in the number of operations during the same time. The emissions changes for all pollutants would result from changes in the mix of the aircraft for each scenario. The emissions of each pollutant would vary with the type of aircraft and by the mode and time of operation of the aircraft during the LTO cycle.

Table 8-10 Emissions from Aircraft Operations at Hanscom Field for 2012 and Forecast Scenarios (1,000s of kg/yr)

Year	CO	NOx	VOC	PM10	PM2.5	CO2
2005	1,670	34.1	112.7	13.5	13.5	19,233
2012	1,123	31.9	80.4	9.9	9.9	16,356
2020	1,096	41.1	105.4	10.1	10.1	20,666
2030	1,262	53.2	134.3	11.8	11.8	26,519
Note: All calculations generated using EDMS v5.1.4.1.						

Even under the highest emissions scenario (2030 future year), the total Hanscom Field aircraft emissions would still be a very small percentage of total Middlesex County emissions (as a percent of Massachusetts emissions for CO_2) (see Table 8-6) and lower than historic levels.

- CO = 0.89 percent
- NO_x = 0.23 percent
- VOC = 0.50 percent
- PM_{10} = 0.07 percent
- $PM_{2.5}$ = 0.25 percent
- CO_2 = 0.43 percent

8.4.12 Future Vehicular Emissions

A mesoscale air quality emissions analysis was done for Hanscom Field motor vehicle traffic for the same future planning scenarios used to estimate aircraft emissions. The study area and methodology for calculating groundside vehicular emissions is the same as described earlier for 2012. Table 8-11 summarizes the annual emissions from groundside vehicular traffic for CO, NO_x, PM_{10}, $PM_{2.5}$, CO_2, and VOC for the future growth scenarios. Tables showing the data used to calculate the motor vehicle emissions are included in Appendix E. Emissions for 2020 are estimated to decrease for all pollutants when compared to 2012 except CO and CO_2 which are estimated to increase.

The predicted increases in motor vehicle emissions reflect projected increases in Hanscom Field-related traffic associated with the higher number of aircraft passengers for the future scenarios listed in Table 8-9. The motor vehicle emission rates predicted with the MOBILE6.2 model for all pollutants except CO_2 are predicted to decrease between 2012 and 2030 with the largest decrease predicted for NO_x emissions. A slight increase in motor vehicle CO_2 emission rates is predicted over this period. Even though vehicle emission rates are predicted to decrease, the additional traffic volumes predicted in 2020 and 2030 is greater than the lower emissions generated by MOBILE6.2 for each year and pollutant which is attributing to the predicted increases.

The smallest percent increase in motor vehicle emissions would occur for CO, and the largest percent increase would occur for CO_2. The percent increases in VOC, PM_{10}, and $PM_{2.5}$ emissions from motor vehicles are predicted to be between those for CO and CO_2.

Table 8-11 Emissions from Hanscom Field Vehicular Traffic for 2012 and Forecast Scenarios (1,000s of kg/yr)

Year	CO	NOx	VOC	PM10	PM2.5	CO2
2005	36.1	4.1	1.6	0.14	0.10	1,312,3
2012	19.05	2.18	0.86	0.10	0.06	1,555.0
2020	20.12	0.92	0.69	0.10	0.05	1,984.7
2030	34.29	0.98	1.05	0.16	0.07	3,335.7

As Hanscom Field generated traffic is only a small percent of the total traffic in the nine square mile traffic study area (e.g., approximately three percent of the total traffic in the year 2012), the increase in total area wide emissions associated with any future Hanscom Field scenario is quite small. For example, although Table 8-11 suggests CO emissions from Hanscom Field traffic could double over an 18-year period for the 2030 growth scenario, total CO emissions within the local traffic study area would increase only about three percent for this future scenario and still remain below historic levels.

8.4.13 Total Future Emissions and Air Quality Concentrations

The combined emissions from both aircraft operations and motor vehicle traffic at Hanscom Field are shown in Table 8-12 for the six parameters. Table 8-13 summarizes the predicted changes in total emissions per passenger between the two future scenarios and the year 2012. These data are the sum of the emissions calculated in the previous two sections.

Table 8-12 shows that with the exception of CO in the 2020 scenario, total emissions will increase each year compared to 2012 emissions. Aircraft operations dominate the emission totals, and as one would expect, the highest emissions for both future planning years would occur for the 2030 scenario. The predicted increases in pollutant emissions and slight decreases in CO in total emissions for 2020 and 2030 are a result of the assumed changes in the fleet mix, the assumed increase in aircraft operations and passengers carried, and the assumed increase in associated motor vehicle traffic.

Table 8-13 shows that the emissions per passenger for each air pollutant would decrease significantly for each of the two future planning scenarios compared to 2012. Emissions per passenger for each scenario were calculated by dividing the total emissions for each pollutant by the projected number of passengers carried for each future planning scenario. The largest decrease in emissions per passenger would occur for CO.

Even under the highest emissions scenario (2030), the total future Hanscom Field aircraft and motor vehicle emissions would still be less than one percent of the total emissions for Middlesex County:

- CO = 0.91 percent
- NOx = 0.23 percent
- VOC = 0.51 percent

Table 8-12 Total Air Emissions at Hanscom Field for 2012 and Forecast Scenarios (1,000s of kg/yr)

Pollutant/Source	2012	2020	2030
CO			
Aircraft	1,123	1,096	1,262
Ground Vehicles	19.05	20.1	34.3
Total	**1,142.1**	**1,116.1**	**1,296.3**
NO_x			
Aircraft	31.9	41.1	53.2
Ground Vehicles	2.18	0.92	0.98
Total	**34.1**	**42.0**	**54.2**
VOC			
Aircraft	80.4	105.4	134.3
Ground Vehicles	0.86	0.69	1.05
Total	**81.3**	**106.1**	**135.4**
PM_{10}			
Aircraft	9.9	10.1	11.8
Ground Vehicles	0.10	0.10	0.16
Total	**10.0**	**10.2**	**12.0**
$PM_{2.5}$			
Aircraft	9.9	10.1	11.8
Ground Vehicles	0.06	0.05	0.07
Total	**9.96**	**10.2**	**11.9**
CO_2			
Aircraft	16,356	20,666	26,519
Ground Vehicles	1,555.0	1,984.7	3,355.7
Total	**17,911**	**22,650.1**	**29,874.7**

Table 8-13 Percent Change in Total Air Pollution Emissions per Passenger at Hanscom Field for Forecast Scenarios Compared to 2012 Baseline

Year	CO	NOx	VOC	PM10	PM2.5	CO2
2020	-59%	-48%	-45%	-57%	-57%	-46%
2030	-72%	-61%	-60%	-71%	-71%	-60%

- PM_{10} = 0.07 percent
- $PM_{2.5}$ = 0.25 percent
- CO_2 = 0.48 percent

Maximum air quality concentrations in 2030 for CO, NO_2, PM_{10}, and $PM_{2.5}$ were estimated at the same ten community receptors surrounding the airport that were assessed in the *2005 ESPR*:

1. Concord: closest residential area
2. Bedford: closest residential area
3. Lexington: closest residential area
4. Lincoln: closest residential area
5. Minute Man National Historical Park
6. Great Meadows National Wildlife Refuge
7. Concord Center
8. Bedford Center
9. Lexington Center
10. Lincoln Center

The first six receptors were located at the closest downwind distance from the center of the airfield to residential or conservation land outside the Massport boundary in the respective towns. Since air pollutant concentrations due to Hanscom Field operations decrease with distance from the airfield, concentrations at any other sensitive receptor in one of the four adjoining towns will be less than those predicted for receptors one through four.

The maximum concentrations calculated for the ten community locations for the year 2005 presented in the *2005 ESPR*[54] were scaled with the emissions calculated for the *2012 ESPR* to obtain year 2012 results. Scaling is appropriate given that modeling parameters (i.e. source and receptor locations) have not changed from the *2005 ESPR* and only the emission rate for each pollutant is changing. The scaling was achieved by multiplying the maximum predicted concentration for each air pollutant and averaging the period for the year 2005 in the *2005 ESPR* by a scaling ratio. The total emissions predicted in this *2012 ESPR* for the scenario with the largest total emissions (i.e., the 2030 Growth scenario) was divided by the 2005 total emissions presented in the *2005 ESPR* to create the scaling ratio. After adding in revised background concentrations (see Table 8-3), the maximum predicted concentration for each air pollutant for the 2030 growth scenario was obtained (see Table 8-14).

The concentration levels given in Table 8-14 are conservative since they are derived from the SCREEN3 dispersion modeling originally presented in the *1995 GEIR* that assumes all airborne emissions up to 3,000 feet are simulated as being released at ground level (see *1995 GEIR*, p. 2-152). Actual air concentrations from Hanscom Field operations will be less than these estimates. Note that the majority of the total predicted concentrations in Table 8-14 come from the conservative background levels assumed

[54] Massachusetts Port Authority, *2000 L. G. Hanscom Field Environmental Status and Planning Report*, EOEA # 5484/8696, July 2002.

in the analysis (see Table 8-3), not Hanscom Field operations. Thus, maximum concentrations for the 2030 planning scenario will be less than those listed in Table 8-14 if activity levels reach those of the future scenarios.

Table 8-14 Predicted Maximum Air Concentrations in 2020 at Ten Community Receptors (µg/m3)

	Receptor	CO 1 Hour	CO 8 Hour	NO2 1 Hour	NO2 Annual	PM10 24 Hour	PM10 Annual	PM2.5 24 Hour	PM2.5 Annual
Concentration from Hanscom Operations[1]	1	3073.1	2064.0	67.9	4.7	8.4	1.3	8.6	1.3
	2	2549.7	1784.3	57.9	4.1	8.4	1.3	8.6	1.3
	3	1596.3	1117.0	36.3	2.9	4.2	0.8	4.3	0.9
	4	1545.6	1081.1	33.4	2.9	4.2	0.8	4.3	0.9
	5	1897.2	1272.4	43.3	3.5	4.2	0.8	4.3	0.9
	6	1100.7	770.3	24.6	1.8	2.1	0.6	2.1	0.6
	7	744.2	521.7	17.0	1.8	2.1	0.6	2.1	0.6
	8	1455.6	1018.9	31.6	2.9	4.2	0.6	4.3	0.6
	9	732.7	511.9	17.0	1.8	2.1	0.6	2.1	0.6
	10	750.7	526.6	17.0	1.8	2.1	0.6	2.1	0.6
Total Concentration Including Background[2]	1	5143.1	3559.0	167.3	42.7	46.4	18.3	29.9	10.5
	2	4619.7	3279.3	157.3	42.1	46.4	18.3	29.9	10.5
	3	3666.3	2612.0	135.7	40.9	42.2	17.8	25.6	10.1
	4	3615.6	2576.1	132.8	40.9	42.2	17.8	25.6	10.1
	5	3967.2	2767.4	142.7	41.5	42.2	17.8	25.6	10.1
	6	3170.7	2265.3	124.0	39.8	40.1	17.6	23.4	9.8
	7	2814.2	2016.7	116.4	39.8	40.1	17.6	23.4	9.8
	8	3525.6	2513.9	131.0	40.9	42.2	17.6	25.6	9.8
	9	2802.7	2006.9	116.4	39.8	40.1	17.6	23.4	9.8
	10	2820.7	2021.6	116.4	39.8	40.1	17.6	23.4	9.8
Air Quality Standard or Guideline (µg/,[3])		40,000	10,000	188/320[3]	100	150	50	35	12

Notes:
1. Air concentrations are derived from the SCREEN3 dispersion modeling from Hanscom Field operations that assumes all airborne emissions up to 3,000 feet are simulated as being released at ground level. Actual air concentrations will be less than these estimates because emissions above ground level will have a significantly reduced impact on ground-level locations.
2. Background levels measured at conservative urban location (Kenmore Square, Boston), see Table 8-3
3. The 188 ug/m3 represents the EPA 1-hour NAAQS, while the 320 ug/m3 represents the MassDEP 1-hour NO2 Policy Guideline.

The estimated maximum concentrations predicted for 2030 would be in compliance with the NAAQS and the MassDEP 1-hour NO_2 Policy Guideline. Concentration levels for the 2020 future growth scenario would be lower because emissions for this case are lower. Thus, it can be concluded that the air pollutant emissions shown in this *2012 ESPR* for aircraft and motor vehicles at Hanscom Field for all future planning scenarios would not have an adverse impact on local air quality in Bedford, Lexington, Concord, and Lincoln. Aircraft emissions currently comprise less than one percent of regional air emissions from all sources within Middlesex County and that will remain so in the future operating scenarios.

Residents in Bedford near Runway 29 have expressed concerns about particulate deposition. Visible particles that settle from the air onto surfaces like outdoor lawn furniture or cars originate from many other sources aside from Hanscom operations in the vicinity of Hanscom Field. These sources include motor vehicles on Route 128/I-95 and local roads, aircraft, and fuel oil combustion used to heat homes and businesses. Emissions from motor vehicles on Route 128/I-95, especially diesel trucks, are the largest nearby source of airborne particulate matter and are significantly greater than particulate emissions from Hanscom.

Air Quality monitoring performed on four sides of Hanscom Field in 1996 did not reveal any effect on local air quality from the airfield's operations, but did suggest that local air quality is affected by traffic on nearby Route 128/I-95 (see *1995 GEIR*, p. 2-151).

Conservative air concentration estimates of 24-hour PM10 levels at the homes near the end of Runway 29

reveal relatively low levels of particulate matter from aircraft operations equal to only one to five percent of the NAAQS for the 2030 planning scenario.

8.5 Potential Environmentally Beneficial Measures

Maximum air quality concentrations for all future planning scenarios will comply with the NAAQS. Still, Massport intends to continue implementing beneficial measures to reduce on-site emissions from all sources. These are discussed below for fuel handling, ground service equipment, building heating/cooling, aviation support, airside operations, and the clean fuel vehicle program.

8.5.1 Fuel Handling Emission Controls

Massport does not own or operate fuel distribution facilities at Hanscom Field, but does fuel its vehicles on-site. A survey of fixed based operators (FBOs) at Hanscom Field found that vapor recovery is being used on all fuel storage tanks subject to MassDEP regulation and that Stage II vapor controls are used at all gasoline-dispensing facilities. Massachusetts has recently proposed an upgrade to Stage I vapor recovery systems that meets the California Air Resource Board requirements for Stage I Enhanced Vapor Recovery (CARB EVR) as well as systems for monitoring vapor leaks. Hanscom will adhere to the future MassDEP regulations in fuel handling emissions when promulgated.

8.5.2 Fuel Conversion of Ground Service Equipment and Massport Groundside Vehicles

An inventory of current ground service equipment (GSE) and Massport groundside fleet vehicles at Hanscom Field is provided in Table 8-15. At present, eight percent of the GSE and fleet vehicles at Hanscom Field are alternatively fueled, either by electricity or propane, which is a slight decrease compared to *2005 ESPR* of eleven percent, but an increase from the three percent level reported in the *2000 ESPR*.

Table 8-15 Ground Service Equipment and Fleet Vehicles by Fuel Type at Hanscom Field

Type of Vehicle or Equipment	Gasoline	Diesel[1]	Propane	Electric
Massport Fleet				
Cars/Vans/SUVs/Pick-up Trucks	8	3		
Golf Carts				4
Massport Ground Service Equipment				
Snowplow Trucks/Snowblowers/Sweepers	1	16		
Large Field Tractors	2	2		
Front-end Loaders		3		
Forklifts			1	
Small Tractors/Mowers/Bobcat		1		
FBO: Signature				
Cars/Vans/Pickup Trucks	12			
Snowplows/Deicing Trucks		3		
Fuel Tanker Trucks		7		
Belt Loader/Tugs/Air Stairs	5	5		2
Golf Carts				2
Ground Power Units		3		
FBO: Jet Aviation				
Cars/Vans/Pickup Trucks	5			
Tugs/Belt Loaders/Air Stairs	8	3		6
Deicing Trucks	2	1		
Fuel Tanker Trucks		6		
Golf Carts				
Ground Power Units	2	6		
Forklifts			1	
Small Tenants[2]				
Cars/Vans/SUVs	36	2		
Tugs	1	6		
Heavy Equipment-Trucks/Loaders/Ambulances	1	26		
Forklifts	1			
Total[3]	**84**	**93**	**2**	**14**

Notes:
1. As part of EPA regulations, ultra-low sulfur diesel fuel for on-road diesel vehicles was phased-in starting in 2006.
2.Tenant vehicles not specifically addressed as part of the Jet Aviation or Signature Flight support fleet.
3.Electric and propane represent 8.3 percent of total Ground Service Equipment and fleet vehicles (16 of 192).

Source: Massport .

Ground service and landside conversions to alternative fuels were considered and discussed in the *2005 ESPR*. Due to the limited amount of GSE in operation at Hanscom Field, this category is not a significant source of air pollution. The majority of GSE operations with Massport-owned equipment involve airport maintenance (e.g. snow plowing, snow blowing and runway sweeping) with large vehicles that, given their power needs, are not presently candidates for conversion to alternate fuels. Fleet vehicles are more likely candidates for the use of alternative fuels as discussed in Section 8.5.5 below along with electric ground support equipment (GSE) and gate electrification. Alternative fuels include electric, hybrid, biodiesel, propane, and natural gas.

As cited above, Massport has made progress in this area and will consider additional Alternative Fueled Vehicles (AFVs), including electric and hybrid for new vehicle purchases in the future. There are no electric recharging stations at Hanscom; however, tenants have electric-only vehicles in their fleet that require 110/220v wall plug connections. GSE operations by the tenants involve a mix of large and small equipment, some of which are electric-powered. While power needs for some of this equipment (e.g. the snow plows, tanker fuel trucks) preclude their use of alternative fuels, Massport will encourage tenants to consider alternatively fueled GSE, where appropriate, when making purchases of new equipment.

8.5.3 Building Heating and Cooling

Massport does not operate a central energy plant for facilities at Hanscom Field. Buildings that use natural gas for space heating are the Civil Air Terminal (15), Hangars 10, 11, 11A, 12, 13, 14, 15, 16 and 21. Buildings that use propane for space heating are Hangars 1 (Floor heat), 2, 3, the Customs Trailer (30) and the Sand Storage Building (9A). The offices of Hangar 1, the two Maintenance Garages (7 and 20) and Hangar 12A use #2 oil for space heating. Hangar 24 is currently under redevelopment by Rectrix Aviation as a LEED Silver facility, which will utilize clean burning natural gas. Building 22, the Jet Aviation vehicle maintenance shop, uses a recycled oil-fired burner for space heating. The office portions of Massport buildings use electricity for air conditioning. In summary, Massport buildings at Hanscom Field only use clean fuels for heating, namely natural gas, propane, and #2 oil. Building heating and cooling emissions are already minimized through the exclusive use of clean fuels. A small amount of waste oil is used in the winter months at the vehicle maintenance shop space heater. The burning of recycled waste oil is conducted consistent with the MassDEP policy for "Safe Handling of Waste Oil in Space Heaters"[55].

In October of 2011, Hanscom installed 222 PV solar panels mounted on the roof and side of the Civil Air Terminal building. The panels are located on the south facing side of the building roof including a series of wall mounted panels on the façade of the building. The system is expected to produce over 52,000 kWh of electricity per year or roughly 10 percent of the buildings annual electricity consumption.

8.5.4 Other Aviation Support Emission Reductions

On-board Auxiliary Power Units (APUs) and Ground Power Units (GPUs) provide power for avionics electricity, heat and air conditioning to an aircraft when its engines are off. Pilots of small jets run their APU (or a GPU) to heat or cool the aircraft while they wait for passengers. These aircraft operate primarily through the two FBOs at Hanscom Field: Signature and Jet Aviation. A third FBO, Rectrix is scheduled to commence operation in early 2014. APUs and GPUs produce relatively small amounts of air pollutant emissions in comparison to aircraft engines. While Massport neither owns nor directly controls the operation of these small power units, the Authority recognizes the air quality benefit of minimizing APU/GPU operations.

In the *2000 and 2005 ESPR*, Massport examined airside operations and concluded that Hanscom Field already operates without any appreciable taxiway delays that could produce excess emissions and this situation would not change even for a future planning scenario. Emissions from aircraft are exclusively within the jurisdiction of the federal government, and aircraft operations are subject to the exclusive jurisdiction of FAA controllers. One area where a few aircraft are briefly delayed on some summer days is Golf North Taxiway at Runway 23. In the *2005 ESPR*, Massport identified a potential project to install a paved aircraft holding area at the approach end of Runway 23 to reduce these minor delays. This project has not commenced construction; however, Massport is still planning to include this in a future construction project.

8.5.5 Clean Fuel Vehicle Program

Massport has made progress in bringing AFVs into its fleet at Hanscom Field. At present, Massport owns fifteen fleet vehicles at Hanscom Field, four of which are electric. Massport will continue to consider AFVs for any new vehicle purchase in the future. Also, since Massachusetts has adopted the California

[55] http://www.mass.gov/dep/recycle/laws/spacehtr.pdf

Low Emission Vehicle program, any new conventional-fueled vehicle added to the Hanscom fleet in the future will have very low emissions and will automatically comply with the low emission goals of the federal Clean Fuel Fleet Program (40 CFR Part 88).

8.5.6 Lead Emissions

With the strengthening of the lead National Ambient Air Quality Standard (NAAQS) by EPA in October of 2008, many communities living near general aviation (GA) airports have become concerned about lead and emissions from GA aircraft using aviation gasoline (avgas). Typical avgas grade fuel used at Hanscom is of the 100 low lead (100 LL) type. 100LL is the only fuel in the US that continues to contain lead. Unlike automobiles, many older GA aircraft cannot operate using lead-free fuel and the US GA fleet contains many such aircraft.

Many of the GA airports, like Hanscom Field, use leaded aviation gasoline with limited amount of jet fuel service operations compared to larger commercial airports. Aviation gasoline is primarily used in GA aircraft with piston engines used for instructional flying, air taxi activities, and personal transportation. Lead is not used in commercial fuel such as jet fuel, the fuel utilized by most commercial aircraft. A fuel additive, tetraethyl lead (TEL) is added to piston engine aircraft to help boost avgas fuel octane, prevent knocks, and prevent valve seat recession. The resultant engine emissions from burning fuel with TEL include lead.

Based on 2013 operations at Hanscom (as of October 2013), there are a total 246 reciprocating (piston) engines requiring 100 LL fuel or 69 percent of the current based aircraft count[56]. It is expected for future year operations this percentage to gradually increase, however lead emissions from the airport are expected to decline once the FAA introduces engine standards and an alternative fuel replacement.

8.5.6.1 Status of Lead NAAQS

EPA strengthened the lead NAAQS in 2008 from 1.5 ug/m^3 to 0.15 ug/m^3 (measured over a rolling 3-month average), finding that serious health effects occur at much lower levels in the blood stream than previously identified. Lead emissions from GA aircraft are primarily emitted into the air through aviation exhaust using avgas 100 LL, the most commonly used aviation fuel, and can enter the body through inhalation or ingested via plants, water or soil. Children are particularly vulnerable to the effects of lead and it can affect their IQ, learning, memory and behavior.

In March of 2012, the environmental group Friends of the Earth (FOE) filed a lawsuit against the EPA stating that EPA has unreasonably delayed its response to FOE's 2006 petition asking the agency to make an endangerment finding and propose standards for lead emissions of aircraft. Since the FOE 2006 petition, the EPA has promulgated new lead standards (see above) and has also mandated lead monitoring at 15 selected airports. Although initially considered by the EPA, Hanscom Field was not included in the list.[57] Nantucket Memorial Airport is the closest airport to Hanscom on the EPA list with an estimated lead emission level of 0.76 tons per year based on the 2008 National Emissions Inventory. For comparison, lead emissions at Hanscom were estimated at 0.47 tons per year (a reduction of 38 percent compared to Nantucket) based on the 2008 emission inventory. As discussed earlier, EPA and MassDEP commenced a year-long lead monitoring program at Nantucket in February of 2012. To date, the highest

[56] Information provided by Massport.
[57] http://www.epa.gov/otaq/regs/nonroad/aviation/memo-selc-airport-mon-stdy.pdf

reported 3-month lead concentration is 0.0209 ug/m^3 and the highest 24-hour concentration is 0.04 ug/m^3 well below the new standard of 0.15 ug/m^3.

The EPA has summarized and made available the partial results of the monitoring data from 17 airports[58]. It is anticipated that a full year of data should be available from all airports by May of 2014. Massport will update this section in the next ESPR to include the final results of the study.

As a result of the partial findings, the FAA on June 19, 2013 issued interim guidance on mitigating public risks from lead emissions associated with avgas[59]. The guidance is provided for FAA identified airports of concern based on a review of the EPA partial monitoring results and for any operator concerned about lead emissions. Based on the guidance, the FAA is working with airport operators to reduce lead emissions in the short-term by:

- Promoting the use of currently available reduced lead and unleaded fuel formulations;
- Identifying and considering operational changes at the airport that could mitigate lead exposure;
- Consider implementation of vapor controls for fuel storage and dispensing stations;
- Shifting orientation of run up activities for areas where the public could be exposed to propeller wash. Move these operations to non-public locations where emissions can be better contained or minimize public exposure;
- Minimize the public outdoor exposure to lead emissions by moving fences to increase the distance from run-up areas and public observation area, and/or post signs to discourage loitering near areas where potential to exposure to lead from piston engine emissions could occur.

Hanscom is not identified as an airport of concern based on the FAA preliminary monitoring studies. In the long-term, the FAA is working with the aviation industry and EPA to develop an unleaded fuel replacement by 2018 as part of the transition from leaded avgas[60].

8.5.6.2 EPA and FAA Next Steps

In addition to FAA's efforts toward developing an alternative fuel replacement by 2018, the EPA is conducting an analysis, including modeling and monitoring to evaluate whether lead emissions from avgas could cause or contribute to air pollution which could endanger the public health and welfare. Any endangerment finding would be subject to public notice and comment, and final determination is not expected until 2015. If EPA makes an endangerment finding, the agency would establish standards for lead emissions from piston engine aircraft. FAA ultimately would develop regulations to ensure compliance with the standards and would be required to establish fuel standards to control lead emissions. Massport will provide an update in the next ESPR.

8.5.6.3 Massachusetts Ambient Lead Concentrations

There are no ambient lead monitors at or near Hanscom Field; however, MassDEP does operate monitors that measure lead in Boston and Nantucket Airport. A review of lead monitoring data from the Harrison Avenue monitor in Boston shows maximum value of 0.014 ug/m^3 which is well below the new lead standard. In addition, maximum quarterly measured values of 0.02 ug/m^3 at Nantucket are also well

[58] http://www.epa.gov/otaq/regs/nonroad/aviation/420f13032.pdf
[59] http://www.faa.gov/airports/environmental/policy_guidance/media/leadMitigationMemoJune2013.pdf
[60] http://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Avgas.ARC.RR.2.17.12.pdf.

below the lead standard of 0.15 ug/m^3. As discussed earlier, the 2008 National Emissions Inventory showed that lead emissions at Hanscom were 37 percent lower than Nantucket and was not identified by EPA as an airport that required mandatory lead monitoring. Future lead emissions may rise with increased operations at Hanscom but will eventually decline once the FAA introduces engine standards and an alternative fuel replacement. EPA and FAA are still reviewing the results of the airport monitoring study and Massport will provide an update in the next ESPR.

8.5.6.4 Summary of Lead Studies

The EPA and the California South Coast Air Quality Management District (SQAQMD) have conducted lead studies at Santa Monica and Van Nuys airports. These studies were reviewed and summarized to document the state of investigations and findings of public health.

The first study was conducted by EPA in 2010 near the Santa Monica airport entitled "Development and Evaluation of an Air Quality Modeling Approach for Lead Emissions from Piston-Engine Aircraft Operating on Leaded Aviation Gasoline"[61]. This study included both monitoring and modeling of lead emissions and showed that off property receptor (i.e. beyond the fence line) concentrations were below the lead NAAQS.

The SCAQMD conducted a study entitled "General Aviation Airport Air Monitoring Study"[62] for the Santa Monica and Van Nuys airports. The results of the study show that lead concentrations were also below the NAAQS at sites beyond the fence line at both airports.

As stated earlier, as part of the Proposed Revision to the Lead Ambient Monitoring Requirements, EPA is conducting lead measurements at 17 selected airports including Nantucket. The EPA has summarized and made available the partial results of the monitoring data from the 17 airports and a full year of data should be available from all airports by May of 2014 and will be reported in the next ESPR.

8.5.6.5 Status of Lead Free AvGas in the US

As stated earlier, FAA is committed to developing a replacement fuel for leaded aviation gasoline by 2018. On June 10, 2013, FAA issued a request for candidate fuel producers to submit alternative fuel formulations to be evaluated as potential replacement to 100LL. This announcement is a formal request by FAA to sample candidate fuels for testing to evaluate potential fuel alternatives in order to select the best unleaded fuel with the least impact on the GA fleet. Currently there is no unleaded fuel replacement that meets the needs of the entire GA fleet. There has been some progress in developing alternatives to 100 LL, however, the alternative fuels developed to date are either still being tested or only available for specific engine types. Examples of some of the new unleaded fuel grades currently being reviewed are:

- 93UL - Airworthy AutoGas, LLC has developed an ethanol free, 93 octane premium unleaded fuel. It has been tested on the Piper Archer 180 hp Lycoming engine airplane. The 93UL is not designed to replace 100LL, but rather an alternative to certain engines that do not require 100 LL.
- 94UL is the removal of the tetraethyl lead additive completely from 100 UL which results in 94 octane fuel or 94UL. Continental Motors is modifying their engines to run on 94 UL, however, not all engine manufacturers are on board with 94UL as a viable alternative fuel. Skeptics are concerned with performance and retrofit cost and prefer continued development of 100 octane replacement fuels.

[61] http://www.epa.gov/nonroad/aviation/420r10007.pdf
[62] http://www.aqmd.gov/tao/AQ-Reports/GA_Report.pdf

- 100SF Swift Fuels, LLC along with Purdue University is developing an alternative to 100LL by fermenting cellulose into acetone to make fuel. The product is still in the development phase; however, the fuel is designed to replace 100LL for use in both high compression and low compression engines with only minor modifications. The product is currently being tested at Embry Riddle Aeronautical University.
- G100UL General Aviation Modification Inc. (GAMI) is developing an unleaded fuel replacement to known as G100 UL (unleaded) by blending existing refinery products with an additive to recover the octane level of low lead avgas. The product is currently being tested at Embry-Riddle Aeronautical University. The company goal is to have G100 UL be a drop in fuel replacement for 100LL.

Two alternative fuels which have showed some promise in Europe are UL91 and 91/96UL. UL 91 is gaining some support in Europe, but its use is limited to engines approved to operate on automotive specific fuels. UL91 is not a replacement to 100LL, but is an alternative to automotive gasoline and is available in the United Kingdom, France and Switzerland. Wider support has centered around Swedish oil refiner, Hjelmco Oil. Hjelmco has developed avgas 91/96UL avgas which contains no lead and was approved for use by the European Aviation Safety Agency (EASA) in 2010 where the engine manufacturer has approved the use of the fuel. The company's website claims that 90 % of the entire piston powered General Aviation fleet of the world is certified to use Hjelmco AVGAS 91/96 UL[63].

Applications in the U.S. could be difficult since there is a large number of high performance aircraft that utilize the majority of 100LL avgas and could not operate on 91/96 UL without modifications.

Canada is also looking into 100 LL avgas alternatives. On June 17, 2013, the National Research Council Canada (NRC) commenced efforts to assist in the development of and test potential 100 LL alternatives. Currently two lower lead octane certified fuels are available for use in Canada, however, they are not a viable alternative to 100 LL.

8.5.7 Ultrafine Particulate (UFP) Matter

Ultrafine particles (UFP) are defined as particle sizes less than 0.1 microns in diameter. To date, there are no EPA or MassDEP air quality regulations that exist for UFP due to limited health studies to substantiate an air quality standard. For perspective, EPA and MassDEP currently have ambient standards for inhalable coarse particles and fine particles. Inhalable course particles are defined as particles smaller than 10 micron and larger than 2.5 microns in diameter (PM10) and are found near roadways and dusty industries[64]. Fine particles are particles that are 2.5 microns in diameter and smaller (PM2.5) and are directly emitted from sources such as forest fires, or can form when gases emitted from power plants, industries, and automobiles react in air.[65]

The primary sources of UFP are from the combustion process, manufacturing process, secondary atmospheric transformation, or occur naturally in the environment. For perspective, aircraft emissions are one of many potential sources of UFP sources in the region around Hanscom along with vehicle traffic energy generation, and manufacturing processes. However, in urban areas, particularly in proximity to major roads, motor vehicle exhaust is often identified as the major contributor to UFP concentrations.

[63] http://www.hjelmco.com/pages.asp?r_id=13395
[64] EPA http://www.epa.gov/air/particlepollution/
[65] EPA http://www.epa.gov/air/particlepollution/

Diesel vehicles have been found to contribute substantially, sometimes in disproportion to their numbers in the vehicle fleet.[66]

There are relatively few reports published on the health effects of UFPs, however, it is generally understood that smaller particles which are inhaled into the lungs pose a greater health risk impact compared to larger particles. Therefore, there is growing need to gather more information on UFPs and their potential health effects.

The Los Angeles World Airports (LAWA) recently released an Air Quality and Source Apportionment Study (June 18, 2013) which measured pollutant concentrations in the vicinity of LAX to assess potential airport-related contribution of emissions on the ambient air quality around the airport. Included in the study was measurement of number concentrations, used to estimate UFP emissions, to examine the chemical nature in jet exhaust and source contributions of UFP in the communities east of LAX. The study found higher concentrations east of the airport when compared to other locations in the South Coast air basin. In addition, the study found that small UFP particles were mainly attributed to sulfuric acid aerosol from jet exhaust, while the larger UFP particles appeared to be related to vehicle exhaust from local traffic. Future health impact studies from airport related sources will need to consider the UFP sizes and effects from jet and vehicle exhaust.

In addition to the LAWA study, the Transportation Research Board under the Airports Cooperative Research Program (ACRP) has conducted or is in the process of conducting research in the UFP and particulate matter area. Relevant studies pertaining to particulate matter and aviation are ACRP Report 6 “Research Needs Associated with Particulates at Airports” and Report 9 “Summarizing and Interpreting Aircraft Gaseous and Particulate Emissions Data”. Ongoing studies include Project 02-42 “Understanding Air Quality and Public Health Studies Related to Airports”. The next ESPR will provide an update on these ongoing studies.

[66] Understanding the Health Effects of Ambient Ultrafine Particles, Health Effects Institute, 2013. http://pubs.healtheffects.org/getfile.php?u=893

9 Wetlands/Wildlife/Water Resources

This chapter provides information about wetlands, wildlife and water resources. The information establishes year 2012 conditions by reporting data from various sources that include the 1998 Hanscom Field Wetlands Delineation Location Map and updates, the 2004- 2008 and 2009-2013 Hanscom Field Vegetation Management Plan (VMP), the Massachusetts Natural Heritage and Endangered Species Program's (NHESP) current inventory of rare species, and reports to the National Wildlife Strikes Database. This section reports on the status of the VMP, the Stormwater Pollution Prevention Plan (SWPPP), the Shawsheen River water quality monitoring program and the 2009 National Pollutant Discharge Elimination System (NPDES) permit that includes nine Hanscom Field tenants.

9.1 Changes Since 2005

Wetlands, wildlife and water resource areas at Hanscom Field are fundamentally unchanged from the *2005 ESPR*. New wetland resource areas have been delineated in areas where new development projects have been planned and implemented. The NHESP has indicated that four species listed under the Massachusetts Endangered Species Act have been found on Hanscom property including Blanding's and Wood Turtle, which have been identified since 2005.

In 2004, Massport implemented the VMP to address the goals of aviation safety and natural resource management, which required some vegetation removal to remove obstructions to airspace. Since then, the VMP was updated in 2008 to maintain the goals of the first Five Year VMP. Massport is currently revising the VMP which is not required until 2016 due to the enactment of the Massachusetts Permit Extension Act of 2010.

The concept plans for potential future development in the 2020 and 2030 scenarios presented in Chapter 4, Airport Planning, have the potential to affect wetland resources but not protected species habitat or vernal pools. Specifically, wetlands recently delineated in the Terminal Area as part of the Jet Aviation Hangar Project would be adjacent to a new access road between the Terminal access road and the West Ramp. Also, potential development projects (the Air and Space Museum, and a hotel) on either side of the Terminal Access road would be sited near wetlands. In addition, an access road from Hartwell Avenue to the East Ramp which was part of the *2005 ESPR* and remains an option would likely intersect with the Riverfront Area associated with the Shawsheen River. In all cases, future development proposals would need to be reviewed for compliance with the Massachusetts Wetlands Protection Act and its implementing regulations including compliance with the stormwater management regulations.

Massport continues to implement its Spill Prevention Control and Countermeasure (SPCC) Plan and maintains contracts with emergency response cleanup contractors to respond to Massport or tenant spill events. The "State of Hanscom" reports indicate that there has been one spill at Hanscom Field since 2005; however, Massport was not responsible for this spill. The spill was reported to Massachusetts Department of Environmental Protection (MassDEP) and appropriate measures were taken to protect the environment. During 2003 and 2004, Massport conducted a deicing study and monitoring effort at Hanscom Field. That study showed that neither current nor future scenario deicing efforts at Hanscom will adversely affect the water supply for Bedford, Burlington or any other nearby communities. Hanscom does not use more than 100,000 gallons of deicing fluid on an average annual basis, and is therefore not subject to benchmark monitoring that is typically required as part of the National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit (see Runway Deicing section for more details). Since future scenario deicing efforts are not expected to change, the conclusion of no adverse outcomes remains.

9.2 Year 2012 Conditions

The following sections describe the existing Hanscom Field environment in terms of geographic and geologic characteristics, wetlands and surface water features, wildlife habitat, rare and endangered species, and groundwater. It also describes Massport's efforts to maintain and improve the quality of stormwater runoff from the site. In addition, an update on the environmental auditing programs, MassDEP-listed sites, and the Hanscom Air Force Base (AFB) environmental restoration program is provided.

9.3 Geographic and Geologic Characteristics

A general discussion of the geographic and geologic characteristics is provided below.

9.3.1.1 Geography and Topography

Hanscom Field is situated in the Eastern Plateau Physiographic Region, a low-lying and well-dissected region of eastern Massachusetts. Primary drainage for this region is provided by the Merrimack, Parker, Rowley, Ipswich, Concord, Sudbury, Assabet, Charles and Neponset Rivers. The United States Geological Survey (USGS) maps the elevation of Hanscom Field ranging from a high of about 250 feet above mean sea level (AMSL) just west of the airfield to a low of approximately 118 feet AMSL east of the runways, with the majority of the study area below 150 feet AMSL.

9.3.1.2 Geology and Soils

Hanscom Field is underlain by a complex assortment of Pleistocene Epoch glacial and recent deposits that overlay Silurian and Ordovician Period igneous and metamorphic bedrock. Repeated advances and retreats of continental glaciers removed the pre-glacial deposits, shaped the bedrock, and deposited unconsolidated material in the form of glacial till and outwash deposits. Following retreat of the last glacier approximately 13,000 years ago, peat was deposited in wetland areas, and fill material was added during the development of the airfield in the last century.

Native soils within the perimeters of Hanscom Field have been disrupted by construction and associated earth-moving activities. The Soil Conservation Service has classified most of the soils on the airfield as "made land". The existing soils are generally a mixture of native soils, and their physical and chemical properties resemble the undisturbed soils.

9.4 Wetlands

The following section describes the current status of the state and federally-protected wetland resource areas at Hanscom Field in the towns of Bedford, Concord, Lexington, and Lincoln. Descriptions of wetland resource types and the criteria for their identification follow. Descriptions of the individual Hanscom Field wetland area's vegetation, soils, and hydrology are presented in Table 9-1. Wetland areas are depicted in Figure 9-1. This information was derived from a review of existing documents including the *2005 ESPR*, wetland delineations performed for the 2004-2008 Hanscom Field Vegetation Management Plan, and wetland delineations performed in 2010 and 2012 in association with onsite activities.

Table 9-1 Description of Wetland Resources

2002-2006 Hanscom Field Vegetation Management Plan, 2013 Jet Aviation Draft Environmental Assessment

Wetland I.D.	Resource Areas[1]	Wetland Type[2]	Soil Type[3]	Notes
1-1	BVW, Bank, LUWB, Riverfront	PFO1, PSS, R3	Saco	This wetland complex is comprised of forested and scrub/shrub wetland types with several channelized drainage swales. Dominant species include red maple, trembling aspen, glossy buckthorn, highbush blueberry, silky dogwood, speckled alder, and cinnamon fern.
1-2	BVW, Bank	PFO1, PSS1, R4, PEM	Scarboro, Freetown	This wetland complex is primarily a red maple swamp with scrub/shrub and emergent portions. Dominant vegetation includes red maple, highbush blueberry, glossy buckthorn, tussock sedge, soft rush, and Sphagnum. Beaver activity has flooded a portion of this wetland.
1-3	Non-Jurisdictional	PSS1	Udorthents-Sandy	This scrub/shrub wetland wraps around the end of Runway 23. It is disturbed, isolated, and presumed to be non-jurisdictional under the Massachusetts WPA. The dominant shrubs in the wetland are speckled alder and elderberry.
1-4	BVW, Bank	PFO1, PSS1, PEM1	Scarboro, Udorthents-Sandy	Wetland 1-4 is a detention basin that borders on a larger red maple swamp.
1-5	Non-Jurisdictional	PSS1	Udorthents-Sandy	This wetland is a relatively small isolated depression within a mowed area. It is not a state jurisdictional area.
2-1	BVW, Bank, LUWB, Riverfront	PFO1, PSS1, PEM1, R3, R4,	Freetown, Wareham, Scarbor, Swansea	This wetland complex is associated with Elm Brook. It contains forested, scrub/shrub and emergent wetland types. Dominant species include red maple, highbush blueberry, glossy buckthorn, northern arrowwood, woolgrass, tussock sedge, soft rush, and Sphagnum.
2-2	Non-Jurisdictional	PSS1, PEM1	Udorthents-Sandy	Not a state-jurisdictional wetland area.
2-3	Non-Jurisdictional	PUB3	Deerfield	This is an isolated non-jurisdictional wetland area with limited wetland vegetation. This area was previously identified in the *1995 GEIR* and *2000 ESPR* as a possible vernal pool.
2-4	Certified Vernal Pools	PSS1, PUB PEM1	Windsor, Deerfield	This wetland area is composed of several isolated wetlands apparently formed within depressions created by past earth moving activities. They are scrub/shrub and emergent wetlands dominated by willow, silky dogwood, purple loosestrife, and sensitive fern. According the Massachusetts Natural Heritage Atlas 13th edition, this area contains two certified vernal pools.
2-5	Certified Vernal Pool	PSS1	Deerfield	This isolated wetland area is also apparently formed in a man-made depression and contains purple loosestrife and Sphagnum. According the Massachusetts Natural Heritage Atlas, this area has been certified as a vernal pool.
2-6	Non-Jurisdictional	PSS1	Deerfield	This isolated wetland has possibly formed in a manmade depression in a disturbed area. It is a forested and scrub/shrub wetland type dominated by red maple, American elm, glossy buckthorn, silky dogwood, arrowwood, and multiflora rose.
2-7	Non-Jurisdictional	PFO1	Scarboro	This isolated wetland has possibly formed in a manmade depression in a disturbed area. It is a forested and scrub/shrub wetland type dominated by red maple, American elm, glossy buckthorn, silky dogwood, arrowwood, and multiflora rose.

Wetland I.D.	Resource Areas[1]	Wetland Type[2]	Soil Type[3]	Notes
2-8	BVW	PFO1, PSS1, PEM1,	Scarboro	This wetland is a red maple swamp that also contains portions of scrub/shrub wetland and emergent wetland. It receives road drainage from Old Bedford Road.
2-9	Bank	R4	Udorthents-Loamy	This area is an open drainage ditch that outlets to Elm Brook.
3-1	ILSF possible	PFO1	Canton	With the exception of wetland areas 3-5, areas 3-1 through 3-7 all appear to be man-made either inadvertently or for stormwater management purposes. Wetland 3-5 appears to be relatively undisturbed forested wetland dominated by red maple, trembling aspen, and winterberry. Wetlands 3- 1, 3-2, 3-4, and 3-6 are forested and scrub/shrub wetlands with small emergent areas. Dominant species in the forested and scrub/shrub areas include red maple, glossy buckthorn, gray birch, trembling aspen, speckled alder, and cinnamon fern. Wetlands 3-3 and 3-7 are vegetated swales dominated by emergent species such as cattail and purple loosestrife.
3-2	Non-Jurisdictional	PFO1	Canton	
3-3	Non-Jurisdictional	PEM1	Canton	
3-4	Non-Jurisdictional	PSS1, PEM1, PUB	Canton	
3-5	Non-Jurisdictional	PFO1	Canton	
3-6	BVW, Bank	PFO1	Canton	
3-7	BVW	PEM1, PSS1	Canton	
3-8	BVW, Bank, BLSF	PFO1, PSS1, PEM1, R4	Freetown, Wareham, Deerfield, Birdsall	This relatively large and undisturbed wetland complex consists of forested, scrub/shrub, and emergent communities. It is also within the Elm Brook floodplain. Forested red maple swamp with a glossy buckthorn understory is the dominant type of wetland in this complex. Portions of the complex also include purple loosestrife dominated marsh and farmed areas.
Wetland No. 1	BVW	PEM1	Canton	This wetland consists of an emergent plant community, with a large number of soft rush present. Hydric soils are present with abundantly mottled and saturated at the surface, with some standing water.
Wetland No. 2	BVW	PSS1, PEM1, PFO1	Canton	This wetland contains forested, scrub/shrub and emergent wetlands. It is located south of Wetland 3-9 but is not connected to it. The most abundant canopy species includes red maple and cottonwood. The most common understory species includes alder, pussy willow, oriental bittersweet, jewel weed, and cattail. Within a portion of this wetland, the characteristics of a certified vernal pool have been observed. To date the pool has not been certified by the Massachusetts Natural Heritage and Endangered Species Program.
Wetland No. 3	BVW	PFO 1	Canton	This wetland is primarily forested and drains in a westerly direction to the drainage channel adjacent to the existing T hangars. Dominant canopy species include red maple and yellow birch, while understory species consist of arrowwood, spicebush, skunk cabbage, and sensitive fern. Within a portion of this wetland, the characteristics of a certified vernal pool have been observed. To date the pool has not been certified by the Massachusetts Natural Heritage and Endangered Species Program.
Wetland No. 4	BVW	PSS 1 PEM 1	Canton	This wetland is primarily scrub/shrub and emergent wetland. Dominant species include pussy willow, blue vervain, woll grass, and tussock sedge. Groundwater and surface runoff flow in the direction of the drainage channel adjacent to the existing T-hangars.

Wetland I.D.	Resource Areas[1]	Wetland Type[2]	Soil Type[3]	Notes

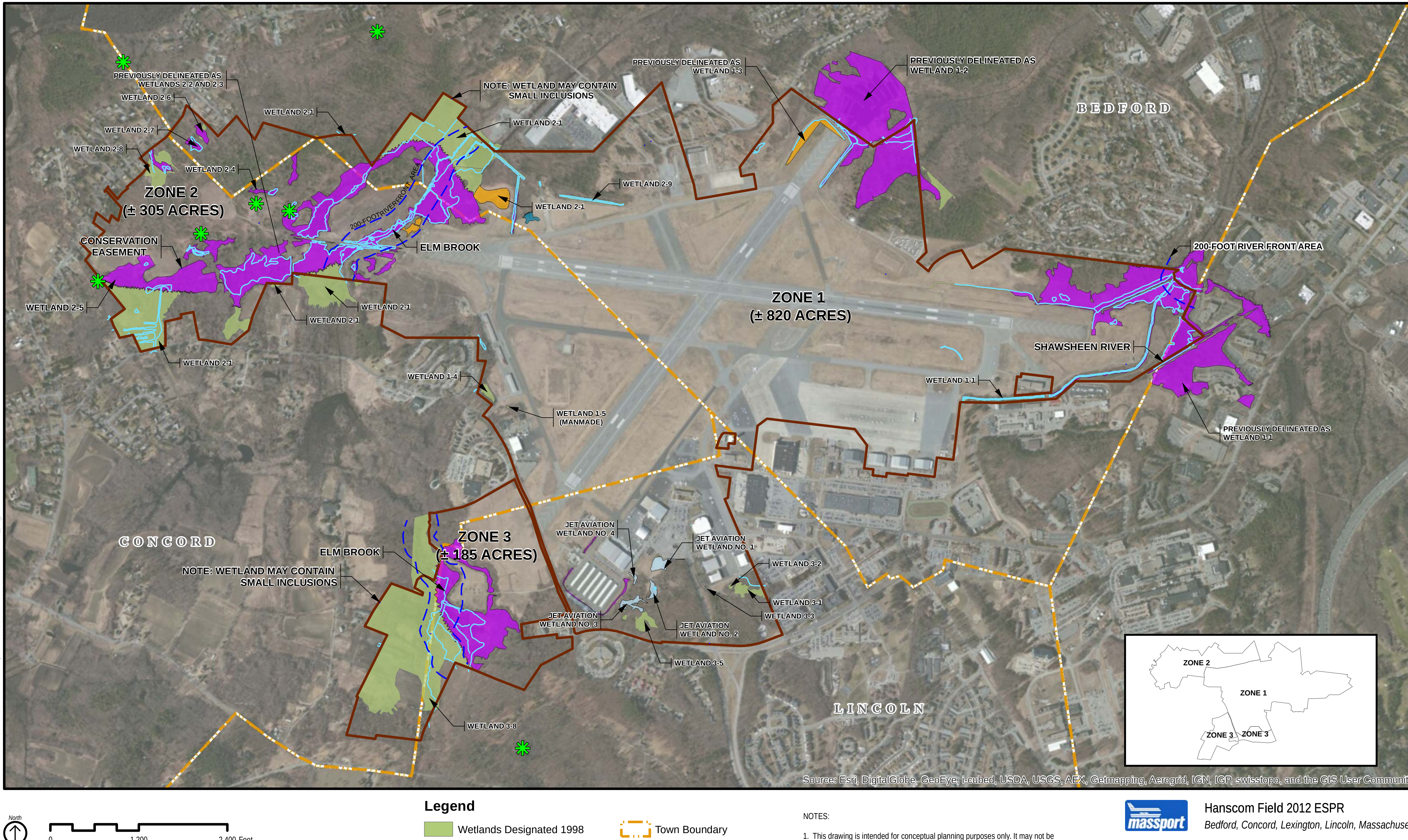
Notes:
1. Massachusetts WPA Resource Areas (310 CMR 10.00):
   RA 200 Foot Riverfront Area
   BVW Bordering Vegetated Wetland
   Bank Bank (Land which abuts and confines a water body)
   LUWB Land Under Water Bodies Waterways
   ILSF Isolated Land Subject to Flooding
   Isolated Wetland is hydrologically isolated (Not a Massachusetts WPA Resource Area)
2. Wetland Type (Cowardin et al, 1977)
   PFO 1 Palustrine Forested/Broad-Leaved Deciduous PFO 4 Palustrine Forested/Needle-Leaved Evergreen
   PSS 1 Palustrine Scrub-Shrub/Broad-Leaved Deciduous
   PEM 1 Palustrine Emergent/Persistent
   PUB Palustrine Unconsolidated Bottom (unvegetated wetland)
   R3 Riverine (perennial)
   R4 Riverine (intermittent)
   B Beaver influence
3. Soil series Mapped by USDA SCS (Middlesex Conservation District, 1986)

The wetland resources at Hanscom Field were delineated and described in the 1998 Hanscom Field Wetlands Delineation Location Map ("1998 Wetlands Map") that was presented in the *2005 ESPR*. This delineation effort included all of the Hanscom Field property except land within runway and taxiway areas. The wetlands within the vegetation management areas were delineated in August of 2001 for the 2004-2008 Hanscom Field Vegetation Management Plan (VMP). The delineated wetland boundaries within the vegetation management areas were certified by the conservation commissions of the respective towns in December 2001 through the MassDEP's Abbreviated Notice of Resource Area Delineation (ANRAD) process.

Three wetland delineation surveys have been completed and documented as part of the VMP. The revised boundaries are shown in Figure 9-1 along with labels for the original wetland ID given for the VMP. Except where noted, the descriptions provided in Table 9-1 remain applicable to the updated wetlands. For the most recent wetland survey completed in October 2012, updated information is provided in Table 9-1. The jurisdictional determination for four newly delineated bordering vegetated wetlands (wetlands No. 1 through No. 4) were approved by the Lincoln Conservation Commission through an ANRAD. Previously delineated wetlands (3-4 and 3-5) in proximity to these four wetlands were considered non-jurisdictional and should be revisited if any development or other activity is proposed within their boundaries.

The boundaries and regulatory status of the wetlands beyond the vegetation management areas would be subject to review and approval by the applicable conservation commission(s) through the submission of appropriate applications under the Massachusetts Wetlands Protection Act (WPA) for any future proposed work within a jurisdictional area. Since the VMP delineations, three additional areas have undergone this process as indicated in Figure 9-1. Any wetland permits issued between August 15, 2008 and August 15, 2012 receive an automatic four year extension under the Massachusetts Permit Extension Act passed by the State legislature to mitigate for the effects of the economic recession.

(This page intentionally left blank)



Path: F:\ESIES\HanscomField\MapFiles\305540\Wetlands\Wetland_Fig09-01.mxd

Legend

- Wetlands Designated 1998
- Wetlands (H153-C1, Feb. 2010)
- Wetlands (H212-C1, Apr. 2010)
- Wetlands (H234-C1, March 2012)
- Wetlands (Jet Aviation, Oct. 2012)
- Town Boundary
- Property Line
- Certified Vernal Pool
- 200-foot Riverfront Area
- Hydrology

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

NOTES:

1. This drawing is intended for conceptual planning purposes only. It may not be used without the express written permission of the Massachusetts Port Authority ("Massport"). Massport does not certify the accuracy, information or title to the properties contained in this plan nor make any warranties of any kind, express or implied, in fact or by law, with respect to any boundaries, easement, restrictions, claims, overlaps or other encumbrances affecting such properties.

2. Characteristics of a certified vernal pool have been observed in Wetland No. 2 and No. 3 by Jet Aviation; to date have not been certified by Massachusetts Natural Heritage and Endangered Species Program.

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Wetlands Location Map
October 2012

Figure 9-1

(This page intentionally left blank)

The wetland resource areas at Hanscom Field include wetlands subject to regulation by both the Commonwealth of Massachusetts and U.S. Army Corps of Engineers (USACE). The regulations of the Massachusetts WPA (310 CMR 10.00 et seq.) define five freshwater wetland resource areas subject to protection: Banks, Bordering Vegetated Wetlands, Land Under Waterbodies/Waterways, Bordering/Isolated Land Subject to Flooding, and Riverfront Area. Each of these resource area types is defined as follows:

- **Banks** are land areas that normally abut and confine a water body. Banks occur between a waterbody and a vegetated wetland or adjacent floodplain, or between a waterbody and an upland.
- **Bordering Vegetated Wetlands (BVW)** include those vegetated freshwater wetlands that border on water bodies and waterways. The technical criteria and methodology utilized to identify and delineate BVW is set forth in Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act (DEP, 1995). Criteria for identifying and delineating this resource area include the presence of a plant community dominated by wetland indicator species, and signs of hydrology. The presence of hydric soils within the wetland is considered an indicator of hydrology.
- **Land Under Water Bodies/Waterways (LUWB)** is the land area under any creek, river, stream, pond, or lake and is a resource area subject to protection under the Massachusetts WPA.
- **Bordering Land Subject to Flooding (BLSF)** is an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. BLSF extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland. BLSF boundaries are the maximum lateral extent of floodwater, which will theoretically result from the statistical 100-year storm. The extent of Bordering Land Subject to Flooding is typically derived from examining FEMA Flood Insurance Rate Maps.
- **Isolated Land Subject to Flooding (ILSF)** are isolated depressions or closed basins without an inlet or outlet. It is an area which, at least once per year, confines standing water to a volume of at least one-quarter acre-feet and an average depth of at least six inches.
- **Riverfront Area** is land between a perennial river's mean annual high-water line and a parallel line located 200 feet away, measured horizontally outward from the river's mean annual high-water line. The perennial status of a waterway is generally determined by examination of the USGS topographic map.

A 100-foot buffer zone is associated with regulated Bank and Bordering Vegetated Wetland.

The USACE regulations that accompany the Federal Clean Water Act [33 CFR Parts 321-330 (November 12, 1986)] define waters of the United States as aquatic habitats that include open water areas and wetlands. Wetlands are further defined as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands generally include swamps, marshes, bogs, and similar areas [33 CFR 328.3(b)]. This definition emphasizes a wetland's attributes of hydrophytic vegetation, hydric soils, and hydrology. Pursuant to the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) (the Manual), the mandatory technical criteria that characterize these parameters are outlined as follows:

- **Hydrophytic Vegetation:** The predominant vegetation consists of macrophytes, which typically grow in soils that are periodically deficient in oxygen as a result of excessive water content. The U.S. Fish and Wildlife Service (USFWS) publication, “National List of Plant Species that Occur in

Wetlands: Northeast (Region 1)" (Reed, 1988) and its 1995 supplement, were used to classify plant species according to their frequency of occurrence in wetlands.

- **Hydric Soils:** These are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions (typified by thick organic surface layers, gleying, or mottles) within a depth of 18 inches.
- **Hydrology:** This addresses areas that are saturated to the surface or inundated at some time during the growing season of the prevalent vegetation. Typical indicators include surface-scoured areas and water-stained leaves.

Based on a review of the existing site and relevant information, the current status of the wetland resource areas at Hanscom Field is relatively unchanged from those identified in the *2005 ESPR.* A description of the vegetation, soils, hydrology, and presumed values of these areas is provided in Table 9-1 (Large wetland complexes are described as single wetlands on the figure and in the table.).

9.5 Vernal Pools

Three vernal pools have been certified at Hanscom Field by the NHESP. These three vernal pools (within Wetlands 2-4 and 2-5), all of which are located within the town of Concord to the west of Runway 11-29, are shown on Figure 9-1. A fourth area with potential vernal pool characteristics occurs within Wetland 2-3 in the same vicinity as the three certified vernal pools in Concord. During 2012 wetland delineations, characteristics of certified vernal pools were identified in wetlands No. 3 and No. 4. However, to date these areas have not been certified by the NHESP. A plan to protect the certified vernal pools during vegetation management operations was developed as part of the current Hanscom Field VMP.

9.6 Perennial Streams

Two perennial waterways exist at Hanscom Field: the Shawsheen River in Bedford and Elm Brook in Bedford, Concord, and Lincoln. The USGS topographic map (Maynard Quadrangle, 1987) indicates that both the Shawsheen River and Elm Brook are perennial waterways. Elm brook is tributary of the Shawsheen River meaning it flow into the Shawsheen. Additionally, the Massachusetts WPA specifically states that the entire length of the Shawsheen River, a major river, has an associated Riverfront Area. As such, both the Shawsheen River and Elm Brook have a 200-foot wide Riverfront Area extending landward from each Bank within which work is subject to regulation under the Massachusetts WPA.

9.7 Vegetation and Wildlife

Native vegetation in the vicinity of Hanscom Field is composed of a mixture of hardwood-forested uplands and wetlands with scattered softwoods, upland and wetland shrub stands, and mowed grasslands. Wetlands including forested swamps, shrub swamps, emergent marshes, and streams are situated around much of the perimeter of Hanscom Field. The airport infield areas are grasslands mowed to maintain visibility for operational safety.

The variety of vegetative cover types, presence of wetlands and waterways, and undeveloped parcels on and in the vicinity of Hanscom Field provide potential habitat for wildlife species capable of coexisting with human activities and development. Wildlife that may be expected to inhabit the area includes larger mammals such as whitetail deer and red fox, and smaller mammals such as gray squirrel and various species of mice, voles, and shrews.

Bird species that would typically populate such habitat include various insectivorous and seed-eating passerines, ground-oriented species such as woodcock, and predators such as hawks. Various reptiles and amphibians may be expected to occupy portions of the property as well. Perennial streams (Elm Brook, Shawsheen River) around the periphery of Hanscom Field are Class B surface waters according to Massachusetts Surface Water Quality Standards (314 CMR 4.06), suitable as "habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation" [314 CMR 4.05 (3)(b)].

9.7.1 Rare and Endangered Species

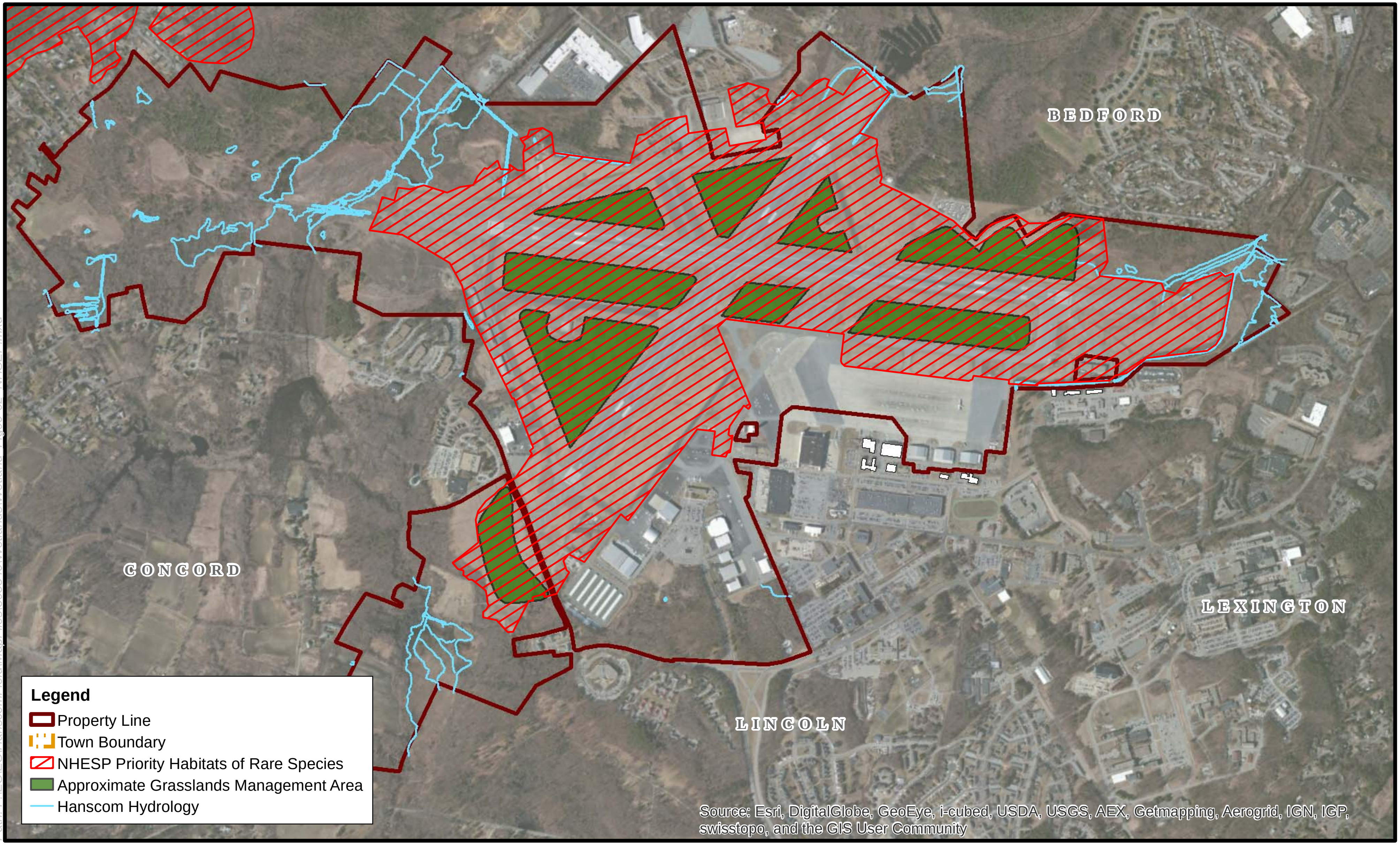
Portions of Hanscom Field are situated within an area identified in the NHESP as a Priority Habitat of Rare Species and are shown on Figure 9-2. Pursuant to the Massachusetts Endangered Species Act (M.G.L. Ch. 131A) and implementing regulations (321 CMR 10.05), all state agencies are required to "review, evaluate, and determine the impact to endangered, threatened, or special concern species or their habitats for all works, project, or activities conducted by them."

Work within mapped Estimated Habitat of Rare Species (a subset of Priority Habitat within the jurisdiction of the WPA) or certified vernal pools would need to be reviewed by the NHESP through the submission of a copy of a Notice of Intent prepared as part of the WPA filing process for work in or near wetlands.

The implementing regulations for the Massachusetts Endangered Species Act define three categories of species [321 CMR 10.03(6)]:

- **Endangered:** “any species of plant or animal in danger of extinction throughout all or a significant portion of its range, and species of plants or animals in danger of extirpation as documented by biological research and inventory."
- **Threatened:** "any species of plant or animal likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and any species declining or rare as determined by biological research and inventory and likely to become endangered in the foreseeable future."
- **Special Concern:** "any species of plant or animal which has been documented by biological research and inventory to have suffered a decline that could threaten the species if allowed to continue unchecked or that occurs in such small numbers or with such a restricted distribution or specialized habitat requirements that it could easily become threatened within Massachusetts."

The NHESP was contacted to obtain updated information on known occurrences of rare or endangered species of wildlife at Hanscom Field. Known occurrences of two birds (Upland Sandpiper and Grasshopper Sparrow) have remained the same since the *2000 ESPR*. Since the *2005 ESPR*, two additional species (Blanding’s Turtle and Wood Turtle) have been observed at Hanscom Field. As listed in Table 9-2, these four species identified as endangered or threatened, have been observed at Hanscom by the NHESP or others (Appendix F).



Path: E:\ES\ES\HanscomField\MapFiles\305540\Wetlands\Wetland_Fig09-02_NHSEP.mxd

North

0 1,800 3,600 Feet

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Massachusetts Natural Heritage and Endangered Species Program Priority Habitat at Hanscom Field

Figure 9-2

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Table 9-2 Endangered, Threatened, or Special Concern Species at Hanscom Field

Common Name	Latin Name	Status[1]
Upland Sandpiper	*Bartramia longicauda*	Endangered
Grasshopper Sparrow	*Ammodramus savannarum*	Threatened
Blanding's Turtle	*Emydoidea blandingii*	Threatened
Wood Turtle	*Glyptemys insulpta*	Special Concern

Notes:
1. In accordance with the Massachusetts Endangered Species Act (M.G.L. Ch. 131A) and regulations (321 CMR 10.03)

Source: Natural Heritage and Endangered Species Program, January 31, 2013 letter

The upland sandpiper and grasshopper sparrow have previously been observed within several areas of maintained grassland vegetation between runways and taxiways at Hanscom Field. The specific locations of nesting pairs of these species have varied somewhat over the years based on previous Massachusetts Audubon Society observations at Hanscom Field.

Fact sheets for all four species obtained from the NHESP are included in Appendix F. As the fact sheets note, both bird species require grassland habitat (e.g. hayfields and pastures), such as those found adjacent to airfields. The Blanding's Turtle requires a variety of wetland and terrestrial habitat, including marshes, scrub-shrub wetlands, and open uplands. The Wood Turtle requires riparian areas, such as stream bottoms and banks. During the spring and summer, Wood Turtles will spend time in mixed or deciduous forests, fields, and wet meadows. During the *2005 ESPR* planning, the NHESP also confirmed that three species of Special Concern occupy habitat near, but not on, Hanscom Field.

As part of its commitment to help protect the Upland Sandpiper and other listed grassland species, Massport completed a Grassland Management Program in 2004 that also minimizes risks associated with wildlife species that can create hazards when they are on the airfield. Massport continues to follow the guidelines of the Grassland Management Program, which is included in Appendix F. Figure 9-1, depicts the approximate grassland management areas at Hanscom Field.

9.7.2 Other Species of Concern

In the past, there have been observations of other grassland bird species of interest at Hanscom Field including American kestrel, bobolink, and eastern meadowlark.

The shrub stands at Hanscom Field provide habitat for five bird species with declining populations, presented in Table 9-3. While Massport understands the value of habitat protection under federal law, the airport's primary responsibility is to maintain aviation safety. When habitat management can be implemented in compliance with federal safety standards, Massport will continue to strive to achieve balance between those objectives.

Table 9-3 Bird Species Inhabiting Shrub Stands at Hanscom Field

Common Name	Latin Name
Field Sparrow	*Spizella pusilla*
Brown Thrasher	*Toxostoma rufum*
Prairie Warbler	*Dendroica discolor*
Indigo Bunting	*Passerina cyanea*
Blue-winged Warbler	*Vermivora pinus*

Source: Massachusetts Audubon Society, 2000 ESPR

9.7.3 Wildlife Hazards to Aircraft

Massport must balance the maintenance of wildlife habitat with protection of public safety. In response to increasing concern about the risk posed to aircraft from certain of wildlife species, the FAA issued an Advisory Circular on Hazardous Wildlife Attractants on or near Airports (AC 150/5200-33B) to provide guidance on land uses that have the potential to attract hazardous wildlife. [A revision "33C" is currently in draft form.] The FAA also maintains a wildlife strikes database and provides guidance to pilots on reporting strikes to gather more information about the number of strikes and species that pose the greatest risk to life and property.

The National Wildlife Strike Database is also a source of information for wildlife that occurs at particular airports. Table 9-4 provides a list of wildlife strikes that have been reported at Hanscom Field between September 1990 and June 2013. 154 strikes have been recorded during that time though not all strikes include a confirmed wildlife species.

Table 9-4 Species Reported in the National Wildlife Strike Database at Hanscom Field (1990-2013)

Common Name	Scientific Name	Animal Type	Number of Strikes
American Crow	*Corvus brachyrhynchos*	Bird	1
American golden-plover	*Pluvialis dominica*	Bird	1
American kestrel	*Falco sparverius*	Bird	14
Bank swallow	*Riparia riparia*	Bird	1
Barn swallow	*Hirundo rustica*	Bird	10
Big brown bat	*Eptesicus fuscus*	Bat	1
Black-bellied plover	*Pluvialis squatarola*	Bird	1
Black poll warbler	*Dendroica striata*	Bird	1
Bobolink	*Dolichonyx oryzivorus*	Bird	2
Canada goose	*Branta canadensis*	Bird	3
Cedar waxwing	*Bombycilla cedrorum*	Bird	1
Chimney swift	*Chaetura pelagica*	Bird	3
Coyote	*Canis latrans*	Mammal	1
Crows	*Corvus*	Bird	2
Dark-eyed junco	*Junco hyemalis*	Bird	1
Ducks	*Anatidae (Family)*	Bird	5
Eastern meadowlark	*Sturnella magna*	Bird	3
European starling	*Sturnus vulgaris*	Bird	10
Geese	*Anatidae (family)*	Bird	1
Great horned-owl	*Bubo virginianus*	Bird	2
Gulls	*Laridae (family)*	Bird	8
Gulls/terns/kittiwakes	*Laridae/Sternidae /Laridae (family)*	Bird	1
Hawks	*Buteo sp., Accipiter sp.*	Bird	3
Horned lark	*Eremophilia aplestris*	Bird	1
Killdeer	*Charadrius vociferous*	Bird	2
Mallard duck	*Anas platyrhynchos*	Bird	1
Mourning dove	*Zenaida macroura*	Bird	5
Peregrine falcon	*Falco peregrinus*	Bird	1
Red tailed hawk	*Buteo jamaicensis*	Bird	3
Ring-billed gull	*Larus delawarensis*	Bird	1
Sandpipers	*Scolopacidae (family)*	Bird	1
Savannah sparrow	*Passerculus sandwichensis*	Bird	1
Snow bunting	*Plectrophenax nivalis*	Bird	2
Sparrows	*Passeridae (family)*	Bird	2
Striped skunk	*Mephitis mephitis*	Mammal	1
Swainsons thrush	*Catharus ustulatus*	Bird	1
Swallows	*Hirundinidae (family)*	Bird	3
Tree swallow	*Tachycineta bicolor*	Bird	8
Turkey vulture	*Cathartes aura*	Bird	1

Common Name	Scientific Name	Animal Type	Number of Strikes
Unknown bird or bat	--	Bird or bat	3
Unknown bird - large	--	Bird	2
Unknown bird - medium	--	Bird	12
Unknown bird - small	--	Bird	27

Source: National Wildlife Strike Database, 2013

9.8 Status of Vegetation Management Plan

Massport developed a comprehensive VMP in 2004, which was updated in 2008, in order to comply with FAA regulations and Massachusetts General Laws regarding protected airspace. The next update is subject to the Massachusetts Permit Extension Act and therefore is not required until 2016. The 2008 update will serve as a guide for current and future vegetation removal projects conducted at the airport through 2016. Notices of Intent (NOIs) were submitted to the Conservation Commissions of Bedford, Concord, Lexington and Lincoln under the limited project provisions of the Massachusetts WPA for airport vegetation removal [310 CMR 10.53(n)]. The NOIs were for Phase 1 of the 2004 and the 2009 VMP updates. They clearly described the elements of the VMP and proposed mitigation.

Massport received Orders of Conditions from the Bedford, Concord, Lexington, and Lincoln Conservation Commissions. The initial phase of the VMP was completed in 2004. In accordance with the environmental permits, most of the work was completed while the ground was frozen; work in remaining areas was completed in the spring and fall.

Massport performed a new obstruction analysis for the airport in 2007 as part of its five year VMP update. The 2007 aerial photogrammetric mapping of all four runways concluded the following:

- The first Five Year VMP had minimized the need for additional vegetation removal in the areas that had removal in 2004;
- Vegetation removal was required in areas that were not part of the first five year VMP; and
- Using the FAA-approved 20:1 approach surfaces for Runway 23, there were obstructions in Bedford's Jordan Conservation Area (JCA), but no obstructions in the Bedford Hartwell Town Forest.

Work associated with the VMP within or adjacent to the three certified vernal pools in Concord was reviewed by the NHESP through the submission of a copy of the NOIs prepared under the Massachusetts WPA for work in or near wetlands. A plan to protect the certified vernal pools during vegetation management operations is incorporated in the VMP.

A 34:1 approach surface analysis was initially prepared for the Runway 23 end, as required by the FAA. In response to Massport and community concerns regarding the extent of vegetation removal needed to maintain a 34:1 surface off-airport in the Bedford Town Forest and the JCA, Massport worked with the FAA and prepared a 20:1 approach surface analysis. Based on this 20:1 approach surface analysis, FAA agreed that required safety margins could be maintained while reducing impact on the JCA and eliminating all impacts on the Hartwell Town Forest.

These conclusions were used to develop the second Five Year VMP (2009-2013), which was submitted to the four towns' Conservation Commission along with NOIs for the required vegetation removal in wetland areas on Massport property. Vegetation removal began in 2009 following the receipt of Orders of Conditions from the town Conservations Commissions. The Orders of Conditions required that wetland work be conducted in frozen or dry ground conditions.

Shortly after the 2009-2013 VMP update received its Order of Conditions, Massport worked with the Town of Bedford to develop an agreement to remove obstructions from the JCA. As part of this agreement, Massport made available trails across its property to make trail connections between Bedford and Concord conservation lands. The planned vegetation removal was completed in 2011, and also included the removal of several obsolete obstruction light poles at the end of Runway 23. By February of 2011, all obstructions identified in the 2007 airspace analysis had been removed. Throughout 2012, Massport continued with maintenance of vegetation removal areas and the trail system, which was opened in September 2011. In 2012, Massport also performed aerial photogrammetric mapping of the airport for the next VMP update.

9.9 Grassland Management Plan

As described above, significant areas of Hanscom Field are mapped as Priority Habitat under the Massachusetts Endangered Species Act. Many of these areas require regular mowing as required by the FAA to meet aviation safety standards. Massport has developed a plan to meet both goals of aviation safety and habitat management.

In 1996, a series of grassland management recommendations were implemented at Hanscom with a limited haying operation. The management strategies were noted to result in an increase in grassland birds, and the program was suspended in 1999 due to an increase in bird strikes (notably barn swallows) at Hanscom Field.

In 2004, Massport developed the Grassland Management Plan. The goal of the Grassland Management Plan is to provide safe operating conditions at Hanscom Field while protecting listed grassland bird species. The plan was finalized with input from the U.S. Department of Agriculture/Wildlife Services (USDA), FAA, and the NHESP. The Grassland Management Plan is included in Appendix F.

The Grassland Management Plan includes the following guidelines for maintenance of portions of the grass infield areas between runways and taxiways at Hanscom Field as well as selected grassed approach areas.

1. Conduct annual pre-breeding season review of grassland management procedures and protected grasslands identification with operations staff.
2. Develop an annual mowing schedule that would maintain managed grassland areas at a height of four to 14 inches.
3. Develop a plan of the managed areas.
4. Mow runway and taxiway areas prior to May 1, when feasible, to avoid conflicts with breeding season.
5. Maintain mowed strips along runways (250 feet from runway centerlines) and taxiways (85 feet from taxiway centerline) throughout the breeding season to discourage birds from nesting in these areas.
6. Restrict mowing during the breeding (nesting and brood-rearing) season (May 1 to July 31) on designated portions of airfield not directly adjacent to runways and taxiways.
7. Conduct pre-mowing field reconnaissance to observe and mark locations of nesting birds in “critical areas” along runways and taxiways.
8. Inspect grassland management areas for young prior to mowing.
9. Avoid, as practical, activities on grassland portions of airfield and approach area not directly adjacent to runways and taxiways during breeding season (May 1 to July 31).

If, after implementation of these recommendations, there is a documented increase in wildlife hazards, bird strikes, or other safety issues, the plan will be modified immediately. NHESP would be notified of any modifications of the plan and the process will involve timely notification of the Conservation Commissions in Bedford, Concord, Lexington, and Lincoln.

9.10 Water Resources

The locations of public water supplies within Bedford, Concord, Lexington, and Lincoln are shown on Figure 9-3. Table 9-5 presents the name, location, type (well or surface water), and community served by each public water supply facility, as well as the approximate distance from the water supply to Hanscom Field. As shown in the table, the municipal water supplies vary in distance from Hanscom Field from 0.9 to 7.3 miles. There have been changes in the public water resources since the *2005 ESPR*.

Table 9-5 Public Water Supply in Bedford, Concord, Lexington, and Lincoln

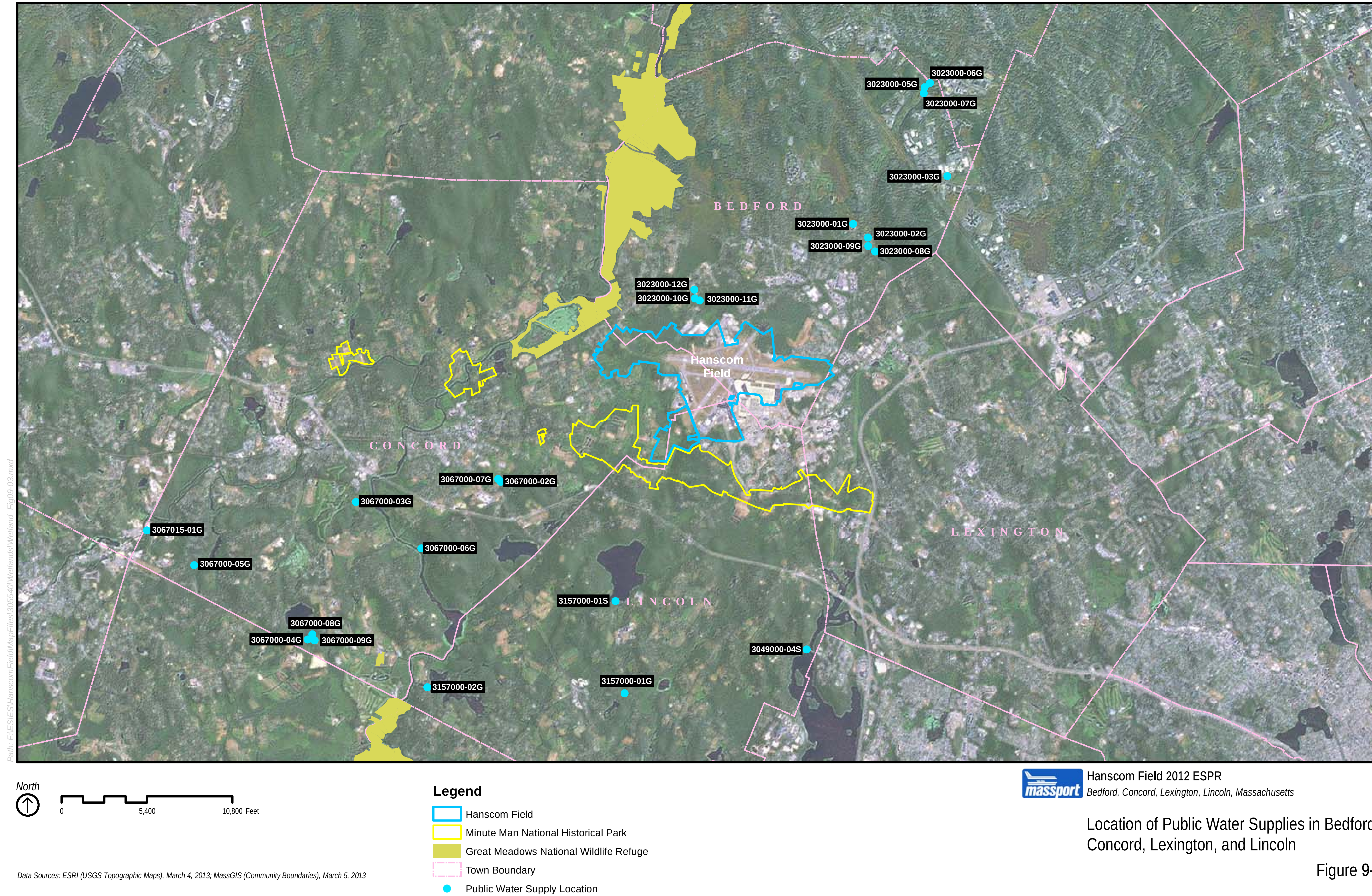
Town[1]	Source ID Number	Site Name	Type	Approximate Distance from Hanscom Field[2]
Bedford	3023000-11G	Well # 11 (Hartwell Rd. G.P. Well #11)	Groundwater	0.9 miles
	3023000-10G	Well # 10 (Hartwell Rd. Well #10)	Groundwater	0.9 miles
	3023000-12G	Well # 12 (Hartwell Rd. G.P. Well #12)	Groundwater	1.0 miles
	3023000-09G	Well # 5 (Shawsheen G.D. Well #5)	Groundwater	2.2 miles
	3023000-08G	Well # 4 (Shawsheen G.D. Well #4)	Groundwater	2.2 miles
	3023000-02G	Well # 2 (Shawsheen Rd. G.P. Well)	Groundwater	2.3 miles
	3023000-01G	Well # 1 (Page School G.P. Well)	Groundwater	2.3 miles
	3023000-03G	Well # 3 (MITRE/Rte. 62 G.P. Well)	Groundwater	3.5 miles
	3023000-05G	Well # 7 (Turnpike G.P. Well #7)	Groundwater	4.0 miles
	3023000-07G	Well # 9 (Turnpike G.P. Well #9)	Groundwater	4.0 miles
	3023000-06G	Well # 8 (Turnpike G.P. Well #8)	Groundwater	4.2 miles
Concord	3067000-02G	Hugh Cargill G.P. Well	Groundwater	3.1 miles
	3067000-07G	Hugh Cargill Wellfield (Replacement)	Groundwater	3.2 miles
	3067000-06G	Robinson G.P. Well	Groundwater	4.3 miles
	3067000-03G	Deaconess GP Well	Groundwater	4.7 miles
	3067000-01G	Jennie Dugan Well	Groundwater	5.9 miles
	3067000-04G	White Pond Well	Groundwater	6.0 miles
	3067000-08G	White Pond Satellite #1 GP Well	Groundwater	6.0 miles
	3067000-09G	White Pond Satellite #2 GP Well	Groundwater	6.0 miles
	3067000-05G	Second Division GP Well	Groundwater	6.8 miles
	3067015-01G	Valley Sports Inc.	Transient Non-	7.3 miles
Lincoln	3157000-02G	Farrar Pond GP Well	Groundwater	3.1 miles
	3157000-01S	Flints Pond	Surface Water	3.1 miles
	3049000-04S	Hobbs Brook Res. Upper	Surface Water	3.5 miles
	3157000-01G	Tower Rd. GP Well	Groundwater	5.3 miles

Notes:
1. Lexington is served by the Massachusetts Water Resource Authority and has no municipal water supply resources
2. Approximate distances measured from Hanscom Field runway intersection

Source: MassGIS, 2012

- Bedford is served in part by the Massachusetts Water Resources Authority (MWRA), and in part by eleven public water supply sources. Since the *2005 ESPR*, one groundwater well, 3023000-04G, is no longer used.
- Concord is served by ten public water supply sources. Since the *2005 ESPR*, two of these wells (3067003-01G and 3067016-01G) are no longer used. However, two additional groundwater wells (306700-08G and 3067000-9G), which are co-located next to 30600-04G, have been developed.
- Lexington is served by the MWRA and has no municipal water supply sources.
- Lincoln is served by four public water supply sources.

(This page intentionally left blank)



Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Location of Public Water Supplies in Bedford, Concord, Lexington, and Lincoln

Figure 9-3

(This page intentionally left blank)

Wellhead Protection Areas, which are also known as Zone II areas, are approved under the MassDEP's Drinking Water Program to protect the recharge area around public water supply ground water sources. The Massachusetts Drinking Water Regulations require that public water suppliers delineate Zone IIs and restrict certain land uses and activities in Zone IIs which may result in the contamination of a groundwater drinking supply. Figure 9-4 shows the approved Zone II Wellhead Protection Area that overlaps Hanscom Field. The Zone II area is associated with three Hartwell Road wells in Bedford: Well #10, Well #11, and Well #12. There are no Surface Water Supply Protection Areas (Zone A, B, C) in Hanscom Field.

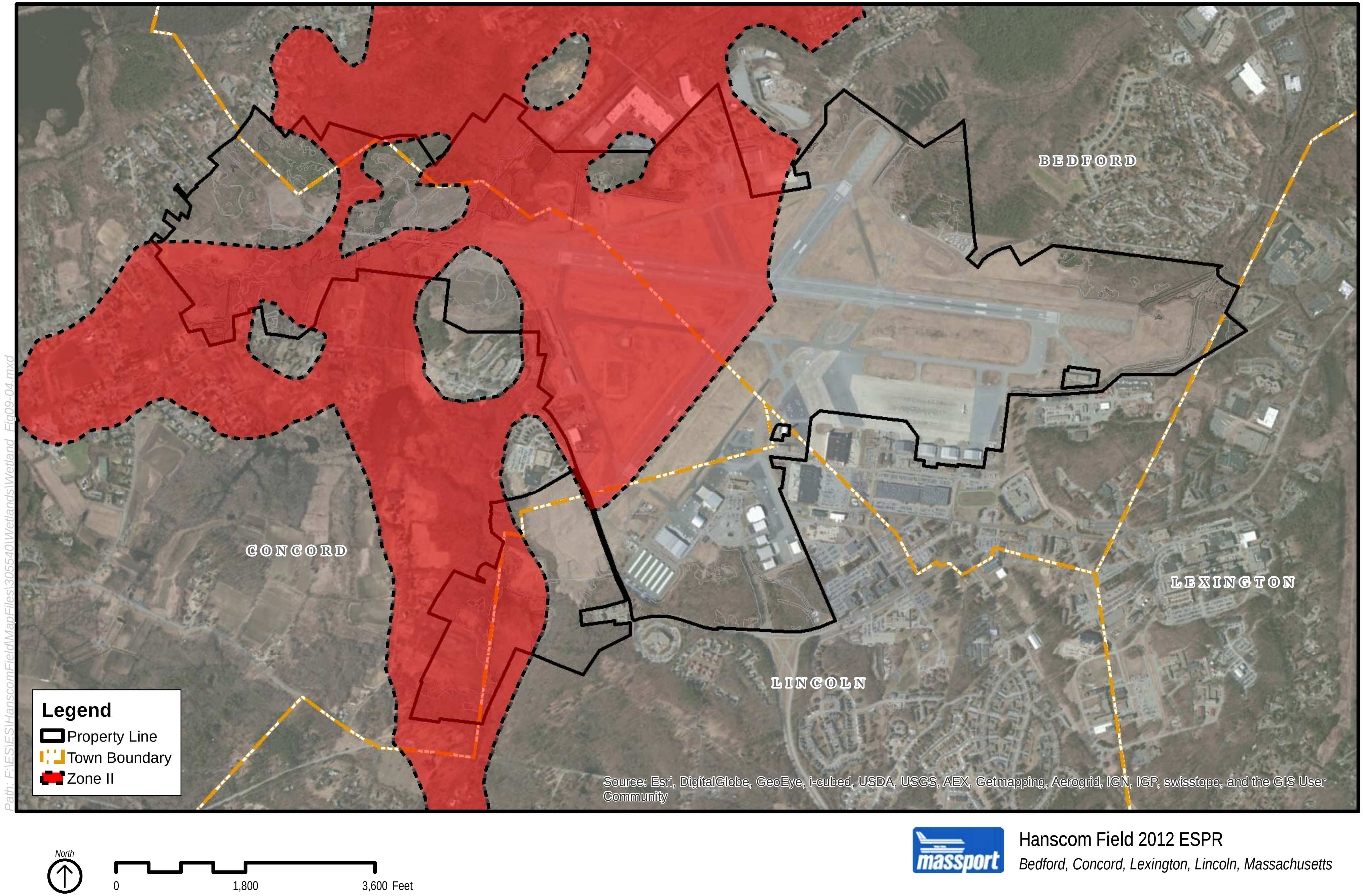
Rectrix is developing a new above-ground fuel storage facility which will be completed in early 2014 adjacent to the existing Jet Aviation current fuel farm. All fuel storage facilities are subject to the regulatory requirements of 527 CMR 9.00, "Board of Fire Prevention Regulations: Tanks and Containers." Massport's Fire Chief required that the new Rectrix fuel farm meet regulatory standards of the MassDEP at 310 CMR 22.21(2)(b)5, applicable to fuel storage. These measures, as well as elements of Massport's spill prevention program, are designed to protect the recharge area of the Bedford public wells.

9.11 Regulated Remediation Sites

9.11.1 Hanscom Field

Currently, there are no active MassDEP-listed disposal sites that Massport is responsible for bringing to regulatory closure under the Massachusetts Contingency Plan (MCP). As reported in 2005, there had been only one site, Release Tracking Number (RTN) 3-13953, that was active during the time of the *2005 ESPR*. As of 2006, this site has been brought to regulatory closure.

For this study, an online search was conducted for sites where a release of oil or hazardous material was reported to the MassDEP. Table 9-6 shows a listing of the MassDEP-listed disposal sites for locations at Hanscom Field for which releases are either still open or were reported since the beginning of 2005. The table indicates which sites are reported as Massport sites and which sites are Massport tenants' sites. There have been several sites at Hanscom Field listed with the MassDEP since the year 2005; however, none of those sites remains open.



Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Zone II Wellhead Protection Areas

Figure 9-4

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013

Table 9-6 2005-2012 MassDEP Reported Releases at Hanscom Field that Reached Response Action Outcome (RAO) Status

RTN[1]	Listed Release Address	Town	Notification Date	Compliance Status	MPA	Tenant
3-13953[2]	200 Hanscom Drive, Civil Air Terminal Maintenance Garage	Bedford	6/28/1996	RAO	X	
3-24535	380 Hanscom Drive-HAFB	Bedford	1/2/2005	RAO		X
3-24594	Hanscom AFB, Building 1201 Heating Plant	Lexington	1/27/2005	RAO		X
3-24856	230 Hanscom Drive, Liberty Mutual Hangar	Lincoln	5/11/2005	RAO		X
3-26380	150 Hanscom Drive, Building #11 West Ramp	Bedford	11/11/2006	RAO		X
3-26954	LG Hanscom Field at 180 Hanscom Dr	Bedford	7/18/2007	RAO		X
3-26720	145 Randolph Road	Lexington	4/2/2007	RAO		
3-27770	180 Hanscom Drive, terminal ramp in front of Building #13	Bedford	6/16/2008	RAO		X
3-27792	Grenier at Barksdale Street	Bedford	6/24/2008	RAO		X
3-27839	Hanscom Drive, North of RW11 Safety Area	Bedford	7/7/2008	RAO		X
3-28281	Eglin and Chenault	Bedford	1/19/2009	RAO		X
3-28933	54 Dow Street, Building 1827	Bedford	12/3/2009	RAO		X
3-29126	104 Barksdale Street Building 1520	Bedford	3/15/2010	RAO		X
3-29203	Eglin Street	Bedford	4/13/2010	RAO		X
3-29456	70 Chennault Street Building 1642	Bedford	8/19/2010	RAO		X
3-30410	180 Hanscom Drive, Signature Flight Support Services Term	Bedford	10/27/2011	RAO		X
3-31035	180 Hanscom Drive	Bedford	8/10/2012	RAO		X

Notes:
1. Release Tracking Number. Includes those releases reported since the year 2005.
2. This release is included as it was still active during the time of the *2005 ESPR*.

Source: Massachusetts Department of Environmental Protection

None of the spills since 2005 were at Massport occupied locations. All of the releases occurred on tenant-occupied locations (Table 9-6). Class A-1 or A-2 RAOs have been submitted to the MassDEP documenting that the eleven release conditions have reached regulatory closure with the permanent solution as defined in the MCP.

9.11.2 Hanscom Air Force Base

Hanscom AFB maintained and operated Hanscom's airfield until 1974 and retains responsibility for any required clean-up that stems from this time as well as for any sites on Hanscom AFB property. Hanscom AFB is conducting environmental restoration efforts under the U.S. Air Force Installation Restoration Program (IRP), a federal Comprehensive Environmental Liability Act (CERCLA)-based program. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is the primary IRP response process for releases identified under this program. However, because petroleum releases are excluded from the CERCLA program, the MCP is the primary IRP response process at the sites where a release of petroleum has occurred. The U.S. EPA is the lead agency for the NCP sites and the MassDEP is the regulatory agency for the MCP sites.

The objectives of the Hanscom AFB IRP program are generally summarized as the following: protect human health and the environment; characterize risks associated with the release sites; commence restoration as soon as practicable; initiate removal actions as necessary; develop remedial actions as necessary; conduct long term operation and maintenance of remedial systems implemented for cleanup; and comply with all deadlines, commitments, and regulations applicable to the program.

As part of the IRP, initial field investigations commenced in the summer of 1982. The preliminary assessment/site investigation phase of the IRP resulted in the identification of 22 specific sites as areas with the potential for environmental contamination from past waste management practices. Of the 22 sites, eight are located on Massport property. Investigations and appropriate response actions have been completed at 16 IRP Sites and one IRP Area of Concern, and they have been closed out within the applicable regulatory framework (includes four IRP Sites on Hanscom Field). In addition, investigations have been completed and long-term remedies are in place at the six remaining IRP Sites.

There have been no additional sites added to the IRP list since the *2005 ESPR*. Figure 9- 5 illustrates the location of the IRP sites/Operable Units (OUs). All of the waste sites identified through the IRP studies have been investigated and, where deemed necessary, have been or are currently being remediated.

Five-Year Reviews of ongoing remedial actions will be conducted as long as any hazardous pollutants or contaminants remain at the site above levels that allow for unlimited and unrestricted exposure as required by CERCLA. The most recent (third) "Five-Year Review for the Hanscom Field/Hanscom AFB Superfund Site" was completed in August 2007. Hanscom AFB Records of Decision (RODs), other Decision Documents, including an MCP Licensed Site Professional (LSP) Opinions/Response Action Outcome (RAO) Statements, and Five-Year Review Reports issued for IRP actions are all subject to concurrence from the U.S. EPA and/or MassDEP. Site Close-Out designation indicates that all required actions are complete and the USAF has received concurrence from the regulatory agencies to that effect, as applicable.

An Interim Record of Decision (IROD) was issued for NPL OU-1 (NPL OU-1 includes IRP Sites 1, 2, and 3) in January 2001 by the USAF, which set forth the requirements for the continued operation of the existing groundwater treatment system, the implementation of institutional controls, and the monitoring of the groundwater and surface water at Hanscom Field/Hanscom AFB. Groundwater beneath OU-1 is contaminated with dissolved-phase chlorinated volatile organic compounds (VOCs) as a result of airfield maintenance and training activities, and the remedy includes a vacuum-enhanced recovery (VER) system and groundwater treatment. Current data indicate that the OU-1 remedial action has been and continues to be effective, and that as of December 31, 2006, the system had treated over 1.6 billion gallons of water.

In August 2002, a ROD was issued selecting the final remedy for NPL OU-3/IRP 21 (former aviation fuel receiving, storage and dispensing site on Hanscom AFB) and, in 2003, the remedial design and construction of the selected remedy was completed. The remedy includes interceptor trenches, a groundwater and petroleum recovery and treatment system with active and passive recovery wells, long-term monitoring, and institutional controls

In November 2000, a ROD was issued for NPL OU3/IRP Site 6 (former filter bed/landfill site on Hanscom AFB) and in 2001, the remedial design and construction of the selected remedy was completed. The remedy included the containment (pervious caps) of three landfill areas, removal of contaminated sediments and landfill debris and placing this material within the capped landfill area, long-term monitoring, institutional controls, and a groundwater compliance boundary.

The assessment of the 2002 five-year review found that the remedy at NPL OU-2/IRP Site 4, a former USAF landfill in the Runway 5 Approach Area that has been capped, continues to be protective of human health and the environment.

9.12 Groundwater Monitoring

Currently, groundwater monitoring is only conducted in association with MCP site cleanup activities. There are no active MCP sites at Hanscom Field and no effects resulting from soil contamination have been observed in the groundwater. Massport's spill prevention program includes development, and implementation of an SPCC Plan, maintenance of contracts with emergency response contractors, and implementation of annual environmental health and safety training that includes spill prevention training.

9.13 Stormwater

Massport encourages new development within areas of existing impervious surfaces that takes advantage of existing infrastructure to enhance groundwater recharge and minimize runoff.

Chapter 2, Facilities and Infrastructure presents information about impervious surfaces at Hanscom Field. The following sections describe the stormwater management program for Hanscom Field, including stormwater modeling, stormwater-related permitting and monitoring programs undertaken by Massport.

9.13.1 Stormwater Modeling

Massport has undertaken a comprehensive stormwater modeling study, which is being coordinated with the MassDEP for the Shawsheen River watershed. The purpose of the modeling effort is to assess current peak and base flows within the river and to evaluate potential Best Management Practices (BMPs) and stormwater controls to reduce the peak flows and increase base flows.

9.13.2 National Pollution Discharge Elimination System Permit

Airports in the United States, including Hanscom Field, are required to apply for coverage under a Stormwater Multi-sector General Permit (MSGP) in accordance with the NPDES permit program, a part of the federal Clean Water Act (33 USC 1251 et seq.). Under this permit program administered by the U.S. EPA, owners and/or operators of airports must satisfy specific requirements for operations conducted at the facility that may affect stormwater quality. Massport applied for coverage under the current MSGP in 2009. Tenants who lease property on Hanscom Field and engage in activities covered under the permit program (see Table 9-7).

Table 9-7 Massport Tenants Covered under the Hanscom Field NPDES Permit

Tenant	Address
Stream Enterprises	140 Hanscom Drive, Bedford
East Coast Aero Club	200 Hanscom Drive, Bedford
Executive Flyers Aviation	200 Hanscom Drive, Bedford
Jet Aviation of America, Inc.	380 Hanscom Drive, Bedford
Liberty Mutual Insurance	230 Hanscom Drive, Bedford
Signature Flight Support	180 Hanscom Drive, Bedford
Nagle Aircraft	145 Hanscom Drive, Bedford
National Aviation Academy	150 Hanscom Drive, Bedford
North Star Aviation	130 Hanscom Drive, Bedford

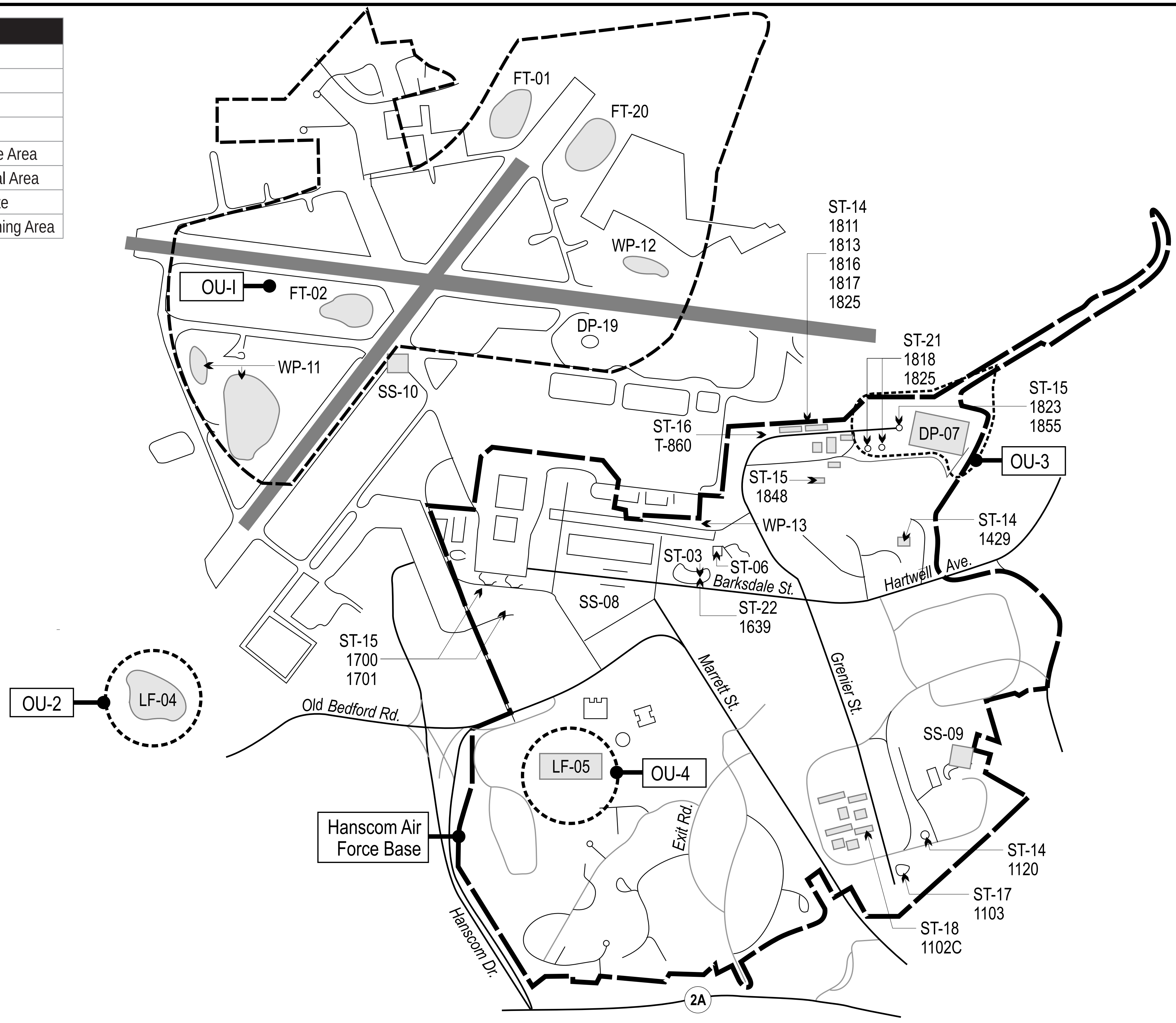
Source: Hanscom Field NPDES Permit MAR05C14

The current NPDES Permit Tracking Number is MAR05CY14; the permit effective date was February 4, 2009, and it remains valid for five years. Hanscom Field still operates under this multi-sector general permit.

(This page intentionally left blank)

Hanscom Field Sites		
Site#	WIMS-ES No.*	Description
1	FT-01	Fire Training Area II
5	FT-02	Fire Training Area I
11	SS-10	Multiple Fuel Spills
3	WP-11	Jet Fuel/Tank Sludge Area
2	WP-12	Paint Waste Disposal Area
19	DP-19	Suspected Dump Site
20	FT-20	Temporary Fire Training Area

Sites 1, 2, and 3 are currently active.



Hanscom Air Force Base Sites		
Site#	WIMS-ES No.*	Description
12	ST-03	AAFES Gasoline Leak (UST Site)
4	LF-04	Sanitary Landfill
8	LF-05	Scott Circle Landfill
13	ST-06	Motor Pool Gasoline Leak (UST Site)
6	DP-07	Former Filter Beds
9	SS-08	Administration Building Jet Fuel Spill
10	SS-09	Mercury Spill at Building 1128
7	WP-13	Industrial Waste Treatment System
14	ST-14	Multi-Site Underground Storage Tank Investigation (UST Site)
15	ST-15	Multi-Site Underground Storage Tank Removal (UST Site)
16	ST-16	Contamination at Building T-660 (UST Site)
17	ST-17	Contamination at Building 1103 (UST Site)
18	ST-18	Contamination at Building 1102C (UST Site)
21	ST-21	Unit 1 Petroleum Spill (UST Site)
22	ST-22	AAFES Spill Site Investigation (UST Site)

Note: Sites 4, 6, and 21 are currently active.

Legend

Hanscom Air Force Base

Operable Unit

FIGURE09-05.ai Hanscom_Field_2013_ESPR_Wetlands

2000 0 500 1000 2000

Approximate Scale In Feet

Data Source: USAF

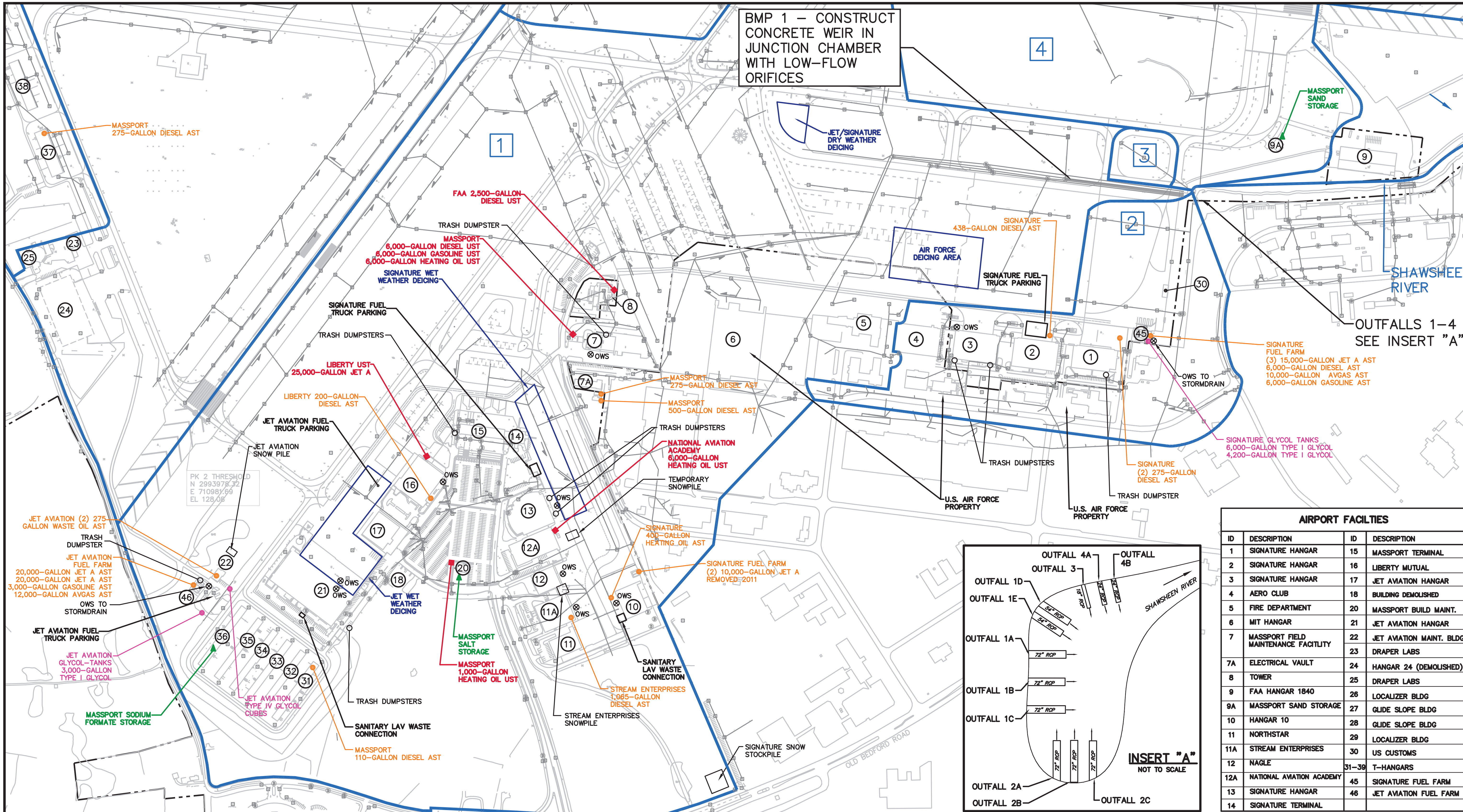
Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Installation Restoration Program Sites / Operable Units

Figure 9-5

(This page intentionally left blank)



AIRPORT FACILTIES

ID	DESCRIPTION	ID	DESCRIPTION
1	SIGNATURE HANGAR	15	MASSPORT TERMINAL
2	SIGNATURE HANGAR	16	LIBERTY MUTUAL
3	SIGNATURE HANGAR	17	JET AVIATION HANGAR
4	AERO CLUB	18	BUILDING DEMOLISHED
5	FIRE DEPARTMENT	20	MASSPORT BUILD MAINT.
6	MIT HANGAR	21	JET AVIATION HANGAR
7	MASSPORT FIELD MAINTENANCE FACITLITY	22	JET AVIATION MAINT. BLDG
		23	DRAPER LABS
7A	ELECTRICAL VAULT	24	HANGAR 24 (DEMOLISHED)
8	TOWER	25	DRAPER LABS
9	FAA HANGAR 1840	26	LOCALIZER BLDG
9A	MASSPORT SAND STORAGE	27	GLIDE SLOPE BLDG
10	HANGAR 10	28	GLIDE SLOPE BLDG
11	NORTHSTAR	29	LOCALIZER BLDG
11A	STREAM ENTERPRISES	30	US CUSTOMS
12	NAGLE	31–39	T-HANGARS
12A	NATIONAL AVIATION ACADEMY	45	SIGNATURE FUEL FARM
13	SIGNATURE HANGAR	46	JET AVIATION FUEL FARM
14	SIGNATURE TERMINAL		

North

400 0 400 800 1200

SCALE: 1" = 400'

- Overland Flow Direction
- Pavement Edge
- Property Boundary
- Permiter Fence
- Buildings
- Brook
- Tree Line
- Underground Storage Tank (UST)
- Glycol Storate Tank
- Above Ground Fuel Storage Tank
- Miscellaneous Materials
- Drainage Area Boundary
- Oil/Water Separator (OWS)
- 9 Building Number
- 9 Drainage Area Designation
- Aircraft Fueling And/Or Deicing areas

REFERENCES:
1. Horizontal: NAD 83 Vertical: CA/T & NGVD 29.
2. This plan is intended for informational purposes only, and no use may be made of the same without the express written permission of the Massacusetts Port Authority ("The Authority"). The Authority does not certify the acuuracy, information or title to the properties contained in this plan nor make any warranties of any kind, express or implied, in fact or by law, with respect to any boundaries, easements, restrictions, claims, overlaps or other encumbrances affecting such properties.

NOTE:
Best management practices (BMP) currently under construction (2008) are noted as "BMP 1" and "BMP 2".

Data Source: Massachusetts Port Authority, Boston, Massachusetts

massport

Hanscom Field 2012 ESPR
Bedford, Massachusetts

Storm Water Pollution Prevention Plan Site Plan

Figure 9-6

(This page intentionally left blank)

9.13.3 Stormwater Pollution Prevention Plan (SWPPP)

Massport updated and revised the Hanscom Field SWPPP in June 2013 in compliance with the Stormwater Multi-sector General Permit for Airports program under NPDES. The SWPPP is included in Appendix F. To achieve this goal, the responsibilities of Massport and the tenants include the following:

- Implementing the policies and procedures presented in the SWPPP for the facilities and operations;
- Conducting periodic reviews of policies and procedures to evaluate the effectiveness of the current SWPPP;
- Updating the SWPPP and related information whenever there is a significant physical change at the facility and/or a significant change in the operational procedures of a facility that could result in the discharge of toxic or hazardous pollutants to stormwater or an increased risk of such discharge; and
- Maintaining records of required inspections, operations, materials use, etc. as required in the SWPPP.

The Hanscom Field SWPPP also identifies the following:

- Site drainage areas and stormwater outfall locations (shown on Figure 9-6);
- Activities occurring at the airport and inventory of materials having the potential to affect stormwater quality;
- Recorded significant leaks and spills;
- Observations of dry-weather flow conditions ("non-stormwater discharges") from the storm drainage system;
- Descriptions of potential pollutant sources and risks; and
- Best Management Practices Plan.

Best Management Practices (BMPs) identified in the SWPPP are divided into two sections: Baseline BMPs and Activity-specific BMPs. Baseline BMPs include general procedures to reduce stormwater pollution regardless of the type of operation at Hanscom Field. These BMPs are to be implemented by all tenants covered by the SWPPP. Activity-specific BMPs address particular features or operations at a facility, and are to be applied to a tenant’s specific operational situation. The two types of BMPs are identified in Table 9-8.

Table 9-8 Best Management Practices for Stormwater Protection at Hanscom Field

Baseline Best Management Practice	Activity-specific BMPs
• Good Housekeeping	• Emergency Spill Cleanup Plans
• Preventative Maintenance	• Elimination of non-stormwater discharges to storm drains
• Materials Compatibility and Inventory System	• Aircraft, vehicle and equipment maintenance
• Spill prevention and Response Plan	• Aircraft, vehicle and equipment fueling
• Employee Training	• Aircraft, vehicle and equipment washing
	• Aircraft deicing
	• Outdoor handling of material
	• Outdoor material storage
	• Waste handling and disposal
	• Building and grounds maintenance
	• Annual stormwater pollution prevention education

Baseline Best Management Practice	Activity-specific BMPs
	• Lavatory service operations
	• Equipment cleaning/degreasing
	• Runway maintenance
	• Oil/water separators
	• Maintenance of existing drainage systems

Source: Hanscom Field Stormwater Pollution Prevention Plan, January 2009 (last update 5/12).

9.13.4 NPDES Visual Inspection Program

Massport has a visual inspection program, as required under the NPDES Multi-sector General Permit for Hanscom Field, for monitoring the quality of stormwater discharges. The NPDES Multi-sector General Permit for Hanscom Field does not require laboratory water quality monitoring.

The visual inspections are conducted on a quarterly basis (January, April, July, and October).

The inspection procedures consist of collecting samples at stormwater outfall locations at Hanscom Field and visually inspecting the samples for color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other indications of storm water pollution. A visual assessment is performed on samples from the following outfall locations: 1, 2, 4, and 10. Because Outfalls 3, 5, 6, 9, and 10 are from similar drainage areas, only a sample from Outfall 10 is required. A data form is then completed for each observation (see SWPPP for blank data form). If contaminants are observed during the inspections, follow-up investigations are to be performed to determine the probable source of contamination. The results of such investigations are also to be recorded and appropriate actions taken to address the situation.

9.13.5 Stormwater Monitoring Program

Massport conducted a surface water quality monitoring program at stormwater outfalls from Hanscom Field to the Shawsheen River and Elm Brook from 1998 to 2001. Six rounds of surface water samples from three specified locations were collected over the four-year period and submitted for laboratory analysis. The samples were analyzed for the following parameters:

- Temperature
- pH
- Dissolved oxygen
- Five-day biochemical oxygen demand
- Ammonia nitrogen
- Nitrate nitrogen
- Total phosphate
- Priority pollutant 3 metals
- Total petroleum hydrocarbons (TPH)
- Polycyclic aromatic hydrocarbons

Samples were collected during each round from three locations: directly from Elm Brook near the Hanscom Field property boundary; a composite sample from two stormwater outfalls discharging to Elm Brook; and a composite sample from the four Massport outfalls discharging to the Shawsheen River at the Hanscom Field boundary. This monitoring plan was reviewed and approved by the MassDEP. Surface water sampling was conducted on the following dates: October 7, 1998; February 17, 1999; October 12, 1999; June 28, 2000; April 4, 2001; and August 30, 2001.

The report and the tabular summary of the sampling program are included in Appendix F. Water quality parameters observed in the sampling program are shown in the report along with several benchmark monitoring values. There are no applicable standards that apply to Hanscom Field. The benchmark values are included solely for comparison purposes. The benchmark values are examples of typical concentrations that may be found in inland surface waters and stormwater.

Metal concentrations were below benchmark values for nearly all sample dates and locations. Fecal coliform exceeded thresholds at the Shawsheen River outfalls twice and at the Elm Brook outfalls once, but did not do so at the upstream Elm Brook location on any of the sampling dates. TPH levels were lower at the Hanscom Field stormwater outfalls than in the Elm Brook samples taken from upstream of Hanscom Field stormwater outfalls. Nitrates slightly exceeded benchmarks for some dates at the Shawsheen River and Elm Brook outfalls, and at the upstream Elm Brook location once.

Biochemical and chemical oxygen demand at the upstream Elm Brook location exceeded benchmarks on several sampling dates but rarely did so at the Hanscom Field outfalls. Also, dissolved oxygen was lower than benchmarks at the upstream Elm Brook sampling location for several dates but less frequently at the Hanscom Field outfalls. Overall, samples from the Elm Brook location upstream from Hanscom Field outfalls exceeded benchmarks more frequently, and for more contaminants, than did those from either Hanscom Field's Elm Brook or Shawsheen River outfalls.

9.13.6 Impaired Waters Monitoring

Elm Brook is considered a waterbody requiring a total maximum daily loads (TMDL) in Massachusetts and is listed on the “Massachusetts Year 2008 Integrated List of Waters.” Annual monitoring for Total Suspended Solids (TSS) is required from either outfall 8 or 9. In April 2010, a sample was collected from Outfall 9 for impaired waters monitoring per the SWPPP. The sample was analyzed for TSS, and had a result of <5.0 micrograms per liter. Because this result was below natural background levels, further impaired waters monitoring is not required and EPA was notified that sampling was terminated.

9.13.7 Stormwater Mitigation

Massport requires all Hanscom Field site development, including that performed by tenants, to conform to the MassDEP Stormwater Management Guidelines when feasible or applicable. Improved stormwater runoff control has been achieved through the requirement that compensatory storage for stormwater be provided for any projects resulting in increases in impervious surfaces, in order to not increase peak runoff rates.

9.13.8 Spill Prevention Efforts

Massport has maintained a SPCC Plan for Hanscom Field since the *1995 GEIR*. The SPCC, which was updated in 2012, is a plan outlining the steps to be taken in the event of an accidental petroleum release. Massport tenants are responsible for maintaining their own individual SPCC plans specific to their operations, as needed.

The SPCC plan identifies potential discharge or spill activities that may result in a release, as well as spill prevention measures, control methods and an action plan in the event of a release including notification procedures, key personnel, a listing of available response equipment, tank and fuel delivery checklists, and contact numbers in case of an emergency. The plan includes a listing of all active oil storage tanks owned and operated by Massport as well as a general listing of other types of smaller volume (55-gallon drum) storage of petroleum-based products including motor oil, waste oil, and hydraulic fluid.

Massport maintains contracts with emergency response cleanup contractors that will respond to Massport or Massport tenant spill events at Hanscom Field. In addition, the Hanscom AFB Fire Department is responsible for responding to emergency situations, including hazardous material spills, at Hanscom Field. The Fire Department maintains detailed spill reports for all reported spills at Hanscom.

The “State of Hanscom” reports indicate that there was one spill at Hanscom Field since 2005. Massport was not responsible for this spill, which occurred in 2008. A tenant reported to Massport and MassDEP that an aircraft had vented fuel, resulting in about one gallon entering the storm drain. As indicated in the 2009 “State of Hanscom,” the storm drain was cleaned, and booms were installed downstream from the storm drain as a safety measure. All MassDEP regulations were followed for cleanup and closure of the incident.

Massport also requires annual environmental health and safety training for its employees at Hanscom Field. The training is designed to review hazardous materials used at the facilities, hazardous waste management, stormwater pollution prevention and SPCC requirements, first responder procedures and general environmental health and safety information. In addition, Massport has developed an Environmental Management Policy and has implemented an Environmental Management System (EMS) at Hanscom Field, which provides the framework for tracking, managing and improving environmental performance. As part of the EMS, spill prevention and emergency preparedness and response procedures were reviewed. A more detailed discussion of the EMS is included in Chapter 11, Sustainable Development and Environmental Management Systems.

9.14 Environmental Audits

Beginning in the late 1980s, Massport has conducted environmental audits for all tenants located at Hanscom Field. The purpose of this program is to ensure that Massport's tenants are operating their businesses in compliance with applicable laws and regulations. Massport works closely with each tenant to ensure that regulatory compliance is achieved and maintained. Any issues raised during the audits are followed up with the tenant until all compliance issues have been resolved.

The tenant audits focus on hazardous waste management, water management, storage tank programs, record keeping practices, training requirements and spill response procedures. Additionally, tenants receive information on BMPs that focus on pollution prevention. Massport tenant facilities have been audited annually since 2001 and biannually for Massport operations at Hanscom Field to ensure compliance as part of Hanscom's EMS.

No significant events relative to tenant noncompliance have been reported since the *2005 ESPR.*

9.15 Deicing Activities

Chemical deicers (i.e., sodium formate) are periodically used on Hanscom runways or taxiways to supplement mechanical equipment such as plows and blowers to enhance safety during inclement winter weather. Sand is applied to increase traction. Sodium formate has shown its effectiveness in snow and ice removal, and has been found to have significantly fewer environmental effects compared with traditional glycol-based deicers.

Aircraft deicing and anti-icing activities at Hanscom Field are currently conducted by Jet Aviation and Signature Flight Support. These entities use products that are a dilute solution of propylene glycol. Most aircraft deicing is conducted near the Civil Air Terminal or the hangars.

Massport employs BMPs both as a part of its sustainability efforts to manage stormwater runoff quality at Hanscom Field, and as a component of its NPDES permit. Aircraft deicing is listed as an Activity-Specific component of Hanscom Field's Best Management Practices. Aircraft deicing is done during snow and ice events by commercial and business aircraft operators, using propylene glycol, which is included in the NPDES permit.

9.15.1 2003 Deicing Study

In April 2003, Massport conducted a computer modeling study of proposed airfield and existing aircraft deicing at Hanscom Field.[67] The purpose of the study was to summarize existing aircraft deicing practices, evaluate potential airfield deicing alternatives and assess current and potential effects on receiving waters from deicing activities. Neither the EPA nor the MassDEP has identified an "unsafe" concentration of deicing fluid.

The study found that the deicing compounds that were used or were under consideration for use at Hanscom Field at the time of the study exhibited little to no human toxicity and that none was considered harmful by ingestion or has known long-term health effects. The study showed that neither current nor future scenario deicing activities at Hanscom Field would adversely affect the water supply for Bedford, Burlington or any other nearby communities.

9.15.2 Stormwater and In-stream Monitoring Program

After public review and comment on the modeling study, Massport conducted a stormwater and in-stream monitoring program between November 2003 and March 2004 to assess any actual impacts from deicing activities and to confirm the results of the modeling study. No additional sampling has occurred since then. The sampling program consisted of seven sampling events for nine parameters. One event determined background concentrations while five events targeted stormwater and in-stream water quality during storm events when sodium formate and propylene glycol were being applied at the airport. One event quantified sodium concentrations in stormwater discharged to the Shawsheen River from road salt (sodium chloride) applications.

During each event, several rounds of samples were collected from up to ten locations (three in-stream locations, five outfall locations, one manhole location, and one culvert location). Samples were analyzed for propylene glycol concentration, sodium concentration, dissolved oxygen, chemical oxygen demand, carbonaceous biological oxygen demand, salinity, conductivity, temperature, and pH. Sodium measurements were used to calculate the sodium formate concentration in the aqueous samples. Dissolved oxygen, chemical oxygen demand and carbonaceous biological oxygen demand were used to determine the potential environmental effects of the use of the deicers. Salinity, conductivity, temperature and pH were used to monitor changes in the general characteristics of the stormwater and surface water bodies. Data from the monitoring program are presented in Appendix F.

The data collected during the monitoring program indicate that the concentrations of sodium formate and propylene glycol in the Shawsheen River and Elm Brook do not exceed aquatic toxicity levels. The data

[67] Massachusetts Port Authority, "Hanscom Field Deicing Study," CDM, April 15, 2003

also demonstrate that water quality parameters, such as dissolved oxygen, are not affected by the discharge of the sodium formate and propylene glycol to the surrounding aqueous environments. The sodium concentrations measured in stormwater flow from the airfield ranged between 2.2 milligrams per liter and 92 milligrams per liter. When the highest sodium concentration of 92 milligrams per liter is converted to a sodium formate equivalent, the corresponding sodium formate concentration is 272 milligrams per liter, which is well below the established aquatic toxicity level of 1,000 milligrams per liter.

Propylene glycol was found to be discharged primarily at one outfall located at the headwaters of the Shawsheen River. The in-stream propylene glycol concentrations found in the Shawsheen River ranged between not detected (with a detection limit of 2 milligrams per liter) and 270 milligrams per liter. The highest in-stream propylene glycol concentration found in the Shawsheen River, 270 milligrams per liter, is well below the reported aquatic toxicity level of 3,200 milligrams per liter. Propylene glycol was not detected in the Elm Brook.

Decreases in dissolved oxygen in the Shawsheen River due to propylene glycol discharge were not observed. The lowest dissolved oxygen measurement at the in-stream location of the Shawsheen River on Hanscom AFB during the study was 7.1 milligrams per liter, which is comparable to the background concentration of 7.3 milligrams per liter and above the state minimum standard of 5.0 milligrams per liter. Levels of chemical oxygen demand and carbonaceous biological oxygen demand above background concentrations at this location were observed to be directly correlated to propylene glycol discharge. The dissolved oxygen data suggests that this aquatic system is able to buffer the oxygen demand imposed by discharges of propylene glycol.

Based on the data collected during the Hanscom Field deicing study, it was determined that the concentrations of both sodium formate and propylene glycol in the Shawsheen River and Elm Brook do not exceed established levels for aquatic toxicity and do not adversely affect other aquatic parameters (e.g. dissolved oxygen). Therefore, the use of these deicing/ anti-icing agents does not result in adverse effects on the receiving waters.

9.16 Analysis of Future Scenarios

The *2012 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 scenarios are estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes. The 2020 and 2030 master planning scenarios are presented in Chapter 4, Airport Planning. Massport encourages that new development be focused within areas with existing impervious surfaces that take advantage of available infrastructure and minimize impacts on habitat and water quality.

The 2020 and 2030 scenarios would not be expected to result in impacts on vernal pools, rare or endangered species, or water quality. Each of the planning concepts assumed to occur over these time periods would be situated more than one-half mile from any of the certified vernal pools at Hanscom which are located in the western portion of the airport. None of the facilities described in these scenarios would occupy nesting areas of the rare species of grassland birds in the infields of the airport runways or aquatic areas and adjacent uplands utilized by Blanding's and Wood Turtles. Indirect impacts from projects in the vicinity of these nesting areas would not be expected to disrupt these populations since these species currently occupy an active airport environment. Potential water quality impacts would be avoided through the continued implementation of the SWPPP and conformance with applicable standards for stormwater management required for site development or redevelopment by the MassDEP.

Some of the planning areas in the 2020 and 2030 scenarios contain wetland resources or are located near wetlands. Massport would make every effort to avoid, minimize, and mitigate potential wetland impacts for future Massport or tenant projects. Projects involving work within wetland resource areas or their buffer zones would require applications to the appropriate conservation commissions for permitting under jurisdiction of the WPA. Potential effects of the planning scenarios on wetlands, wildlife and water resources are described below.

9.16.1 Wetlands

The assessment of potential wetland impacts is a worst-case analysis assuming all the facilities described in the Planning Year Scenarios were constructed for each study year. Table 9-9 shows the facilities and the potential wetlands affected.

Table 9-9 Potential Work near Wetlands in 2020 and 2030 Scenarios

Location	Planning Concepts	Location of Potential Wetland Impacts	
		2020 Scenarios	2030 Scenarios
Terminal Area	GA facilities with new parking spaces Salt storage/maintenance facility Jet Aviation to replace Hangar 17 with associated ramp and parking Civil Air Terminal enhancements Air & Space Museum Hotel Parking	Wetlands 3-1 Wetlands 3-2 Wetland 1 Wetland 4	Wetland 3-1 Wetland 3-2 Wetland 3-3 Wetland 3-5 Wetland 1 Wetland 2 Wetland 3 Wetland 4
ATCT Apron	Relocation option for customs facility Expansion of the airport maintenance facility Alternative landside access GA hangar development	None	None
East Ramp Area	GA/corporate hangars Cargo hangar/facility T-hangars Access Road from Hartwell Avenue Relocation option for customs facility	Riverfront Area adjacent to Shawsheen River Wetland 1-1 buffer zone	Riverfront Area adjacent to Shawsheen River Wetland 1-1 buffer zone
North Airfield Area	GA/corporate hangars (Hartwell Road site)	Wetland 2-9	Wetland 2-9 Wetlands 1-3

Projects undertaken at Hanscom Field that involve work within wetland resource areas (including Riverfront Area) or buffer zones would require review and approval by the applicable conservation commission(s) through the submission of appropriate applications (NOI, Requests for Determination of Applicability, etc.) under the WPA. Approval of work within a resource area generally requires conformance with WPA performance standards identified in 310 CMR 10.54 through 10.58 for each resource area category, and an Order of Conditions issued by the conservation commission(s). Impacts to wetlands regulated under the Federal Clean Water Act, but not by the WPA, or impacts exceeding the area thresholds established in the WPA performance standards, could also require a Section 404 Individual Permit from the USACE, and/or Water Quality Certification from the MassDEP under Section 401 of the Federal Clean Water Act. Massport would work to refine plans to avoid or minimize potential wetlands impacts.

9.16.1.1 2020 Scenario

Work may occur near wetlands in three of the four planning areas in the 2020 scenario. In the Terminal Area, plans to expand hangars and work on the first phase of the Air and Space Museum could affect wetlands in the south part of the area. While all work considered for the East Ramp would be on impervious area, the access road from Hartwell Avenue could occur in the Riverfront Area. In the North Airfield, work could be located in the buffer zone of drainage wetlands located in the infield.

9.16.1.2 2030 Scenario

For the 2030 scenario, conditions are the same as described above for both the East Ramp and the North Airfield. As for the Terminal, additional work in the undeveloped area west of the Terminal access road could result in wetlands and buffer zone impacts.

9.16.2 Vernal Pools

Any future projects proposed within or adjacent to the certified vernal pools would need to be reviewed by the NHESP through the submission of a copy of a NOI prepared under the WPA. None of the proposed projects contemplated in either the 2020 or 2030 scenarios is located near the three vernal pools and therefore no impacts will occur.

The certified vernal pools are located near the end of Runway 11 where vegetation management operations may occur. As with the current VMP, which details vegetation management at Hanscom Field, future vegetation removal projects developed for the period from 2012 through 2020 will be based on the VMP and will incorporate plans to protect vernal pools. These future projects, which are within the guidelines established in the VMP, would also undergo review by the appropriate conservation commissions and the NHESP. A plan to protect the certified vernal pools during vegetation management operations has been incorporated in the Hanscom Field VMP, which was approved by the four conservation commissions.

9.16.2.1 2020 Scenario

No impacts to three certified vernal pools near the western end of Runway 11-29, or their wildlife habitat value, would result from the potential locations for new facilities in the 2020 scenario. The potential location of a facility nearest to the vernal pools would be GA hangar development in the North Airfield Area, situated approximately 3,400 feet to the east.

9.16.2.2 2030 Scenario

No impacts on wetlands will occur from development in the 2030 scenario. Development areas are the same as the 2020 scenario (just augmented) and therefore risk of impact is the also the same.

9.16.3 Rare and Endangered Species

No potential action considered under the 2020 or 2030 scenarios would impact habitat of rare and endangered species.

As noted in the Rare and Endangered Species section above, two rare species of grassland birds have been observed at Hanscom Field: upland sandpiper (endangered) and grasshopper sparrow (threatened). Each of these species nests within runway infield areas that are periodically mowed to maintain grassland vegetation for safe aircraft operation. In addition, two turtle species have also been identified. These amphibians inhabit aquatic areas and the adjacent uplands. Any project proposed in the buffer zone of a wetland or in the Riverfront Area associated with a perennial stream must file a NOI with the conservation commission. Should any work be proposed in areas previously utilized by Blanding's or Wood Turtles, the project will also be reviewed by the NHESP. No development is contemplated near the brooks and streams where they occur.

9.16.3.1 2020 Scenario

Proposed development considered in the 2020 scenario is not proposed in areas mapped as Priority Habitat for Rare Species. Grassland bird species are located in the grassy airfields areas which are not included in the 2020 planning scenarios. One site, the GA/Corporate hangar development in the North Airfield Area, would be situated across a taxiway from an infield where grasshopper sparrows have been observed in the past. Since the nesting activity has occurred under the existing and higher historic activity levels at the airport, the GA hangar development in this location would be expected to have no effect on the continued usage of the infield as a nesting site. Similarly, the anticipated increases in aircraft landings and takeoffs through 2020 would not be expected to affect usage of the runway infields as nesting sites by these rare bird species.

Turtle species are located in brooks and streams and occur in adjacent uplands. These species are primarily associated with Elm Brook and the Shawsheen River on Hanscom which occur on the western and northern part of the airport and flow north. No work in the 2020 scenario is proposed across or adjacent to either of these waterways. The closest area is again the North Airfield which is approximately 1,000 feet from Elm Brook at its closest point.

9.16.3.2 2030 Scenario

No impacts to rare and endangered species will occur from development in the 2030 scenario. Development areas are the same as the 2020 scenario (just augmented) and therefore risk of impact is the also the same.

9.16.4 Water Quality

Since all components under the 2020 or 2030 scenarios would be required to meet requirements of the NPDES Permit and applicable MassDEP standards for stormwater management, the potential for water quality impacts under the planning year scenarios are expected to be similar to each other. In addition, most of the development contemplated in the Master Planning areas will occur in areas of existing impervious development and will minimize water quality and quantity impacts.

9.16.4.1 2020 Scenario

Massport will continue to follow, and will require tenants at Hanscom Field to follow, the development and facility operational requirements under the then-current NPDES Permit. All potential new facilities in the 2020 scenarios would also continue to be required to meet applicable MassDEP standards for stormwater management, when feasible. Therefore, the 2020 scenario is not anticipated to result in any impacts to water quality, and the continued Best Management Practice efforts would be expected to result in improvements to water quality over time. Ongoing groundwater remediation efforts noted in the Groundwater Conditions and Water Quality portion of this chapter would also be expected to improve water quality on and off site. In addition, the majority of any new development would be located in existing impervious areas. Areas where impervious surfaces could increase include the Terminal (2.1 acres) and the North Airfield (7.0 acres). Massport will review areas where existing pavement can be removed to achieve no net increase in impervious surface if these projects are to move forward.

The potential GA/corporate hangar sites in the North Airfield are located in the Zone II Wellhead Protection Area for the Bedford wells. Massport would work with potential developers of the GA/corporate hangar sites in the North Airfield to ensure that any potential facilities are designed to protect the recharge area of the Bedford public wells. These measures, as well as elements of Massport's spill prevention program, are designed to protect the recharge area of the Bedford public wells.

9.16.4.2 2030 Scenario

Conditions for the 2030 scenario will be similar to those described for 2020. Impervious surface will potentially increase should additional areas contemplated for development become developed. The incremental increase in impervious surface from the 2020 scenario would be 5.1 acres in the Terminal and 2.4 acres in the North Airfield. Massport will review areas where existing pavement can be removed to achieve no net increase in impervious surface if these projects are to move forward.

10 Cultural and Historical Resources

This chapter provides information about existing cultural and historical resources, as well as recreational, conservation, and agricultural resources, at Hanscom Field and in areas adjacent to Hanscom Field.

The documentation of historical and archaeological resources in Bedford, Concord, Lexington, and Lincoln includes resources currently listed in the State and National Registers of Historic Places (State and National Registers), the Inventory of the Historic and Archaeological Assets of the Commonwealth (Inventory), and the Massachusetts Cultural Resource Information System (MACRIS) that are maintained by the Massachusetts Historical Commission (MHC). This review was based on the detailed analysis in the *2005 ESPR*, updated with current information and supplemented through discussions with the historic commissions for each of the four towns and the incorporation of any information they provided.

The inventory update of existing cultural and historical resources included a review of the status of historic buildings and landscapes in Minute Man National Historical Park (MMNHP). The National Park Service (NPS) also provided updates on the status of its activities including soundscape goals, management plans, and interagency workgroup that was formed to review impacts on the MMNHP.

Conservation and recreational resources were identified through a review of available MassGIS data, research of town plans, and follow-up discussions with Town Planners in Bedford, Concord, Lexington, and Lincoln.

This updated information is used as a basis for the evaluation of the cumulative environmental effects of Hanscom Field in 2012. The *2012 ESPR* describes the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3, Airport Activity Levels. The 2020 and 2030 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes. The future commercial service scenarios are consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

The EEA Scope Certificate of May 18, 2012 for the *2012 ESPR*, directed Massport review the existing data on historic and archaeological resources at Hanscom Field, including the most current version of the State Register, the files of the MHC, and consultation with the towns. In addition, the Certificate stated that the *2012 ESPR* should describe Massport’s efforts to address concerns raised by NPS and the U.S. Fish and Wildlife Service (USFWS). It should address NPS concerns about the potential impacts of noise on the waterfowl, shore birds, marsh birds, and turtles that use the Concord River basin. The ESPR should report on the status and any published recommendations of the Federal Interagency Working Group that was formed to review impacts on the MMMNHP and on the NPS’s soundscape goals and plans for the Park. The ESPR should also identify how it will work with the four communities and the Massachusetts Department of Agricultural Resources (MDAR) to protect Massport-owned agricultural land from conversion to non-agricultural uses.

10.1 Key Findings Since 2005

Based in input from the four host towns and independent research of state files and in the field, there have been a few additions to the cultural and historic resources inventory for the area. The analysis of potential impacts on cultural and historical resources demonstrates that impacts have decreased since 2005 as a result of a decline in aircraft operations, advances in aircraft technology, and operational measures that have been implemented including the Fly Friendly Program in 2009.

Based upon the recent update of the status of historic resources within and around Hanscom Field, there are currently a total of 61 historic properties (i.e., 39 individual resources and 22 districts (with the MMNHP counted as one district)), that are included in or determined eligible for the National and State Registers in the 6,000-acre general study area for the *2012 ESPR*[68]. The resources range from individual houses to large historic districts with structures and associated landscape settings, including 12 National Historic Landmarks. The NPS has identified 106 resources that contribute to the historic significance of the MMNHP.

The *2012 ESPR* also updates the *2005 ESPR* reconnaissance survey of resources that are 50 years or older and the noise analysis for historic properties within the area with the maximum forecasted noise values for each of the ESPRs. In 2005, the reconnaissance survey area was defined as the area inside the 2020 high growth 55 dB DNL noise contour line, and in 2012 it is the area within the 2030 planning year 55 dB DNL noise contour line. The 2005 reconnaissance survey and the 2012 update also encompassed the areas within a 200-foot radius of the 16 Traffic Study Areas located at various road intersections outside of the Hanscom Field boundary. Since the projected 2030 noise contour in the *2012 ESPR* covers a smaller area than the forecasted 2020 high growth noise contour in the *2005 ESPR*, the numbers of historic properties are significantly reduced. Within the defined area, the reconnaissance survey encompassed properties listed or eligible for inclusion in the National and State Registers, and resources included in the MHC's Inventory and MACRIS. It also provided a preliminary identification of resources that are 50 years old or older which have not been previously surveyed. The analyses included properties on Hanscom Field and Hanscom AFB.

The 2012 survey update for the area inside the 2030 55 dB DNL noise contour line identified three individual historic properties (Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace), 341 Virginia Road in Concord; Wheeler-Meriam House, 477 Virginia Road in Concord; and Simonds Tavern, 331 Bedford Street in Lexington) and a small section of MMNHP that are listed in or eligible for inclusion in the National and State Registers (versus 32 individual properties and 20 districts in 2005). All four towns have extensive entries of historical resources in the MHC Inventory and MACRIS. The 2012 update of the *2005 ESPR* reconnaissance survey found that there are currently 54 individual historic properties and 7 districts that are included in the MHC Inventory and MACRIS (versus 359 individual properties and 51 areas in 2005). The reconnaissance survey of properties that are 50 years or older completed for the *2005 ESPR* had identified an additional 336 individual properties and 11 locations within that survey area that had not been previously documented. The 2012 reconnaissance survey update confirmed the findings of the earlier reconnaissance survey for the new defined area; consisting of approximately five individual properties and portions of three survey areas.[69]

---

[68]The general study area consists of the portions of the towns of Bedford, Concord, Lexington, and Lincoln that are shown as a rectangular area in the map figures in this chapter

[69]Adams et al. (PAL), *Historic Resources Reconnaissance Survey Information in Support of 2005 Hanscom Field Environmental Status and Planning Report, Bedford, Concord, Lincoln, and Lexington, Massachusetts*, 2006.

The survey update for the *2012 ESPR* included a review of State Register, MHC site files Inventory, and MACRIS to amend the identification of recorded archeological sites within Hanscom Field or near the sixteen traffic study intersections that are described in Chapter 6, Ground Transportation. The review completed for the *2005 ESPR* identified one recorded site outside Massport property that is near the intersection of Hanscom Drive and Old Bedford Road. An additional 39 sites that have not been evaluated for eligibility on the State and National Register were identified in Bedford, Concord, Lexington and Lincoln. This included six sites completely or partially within the property line of Hanscom Field. A 2005 archaeological overview and assessment of MMNHP reported that there were more than 100 prehistoric and historic period archaeological sites identified within the Park.[70]

The reconnaissance archaeological survey conducted for the *2005 ESPR* found that most of Hanscom Field, however, has been previously disturbed by construction. The reconnaissance survey was conducted within the 2005 55 dB DNL noise contour line that included Hanscom Field, Hanscom AFB, and sections of Bedford, Concord, Lexington, and Lincoln. Areas of high pre-contact archaeological sensitivity in the project area include previously undisturbed, dry, level areas located adjacent to the natural brooks and wetlands in the peripheral portions of the Hanscom Field. The extreme southern section of Hanscom Field and the intersections along Route 2A have moderate to high archaeological sensitivity for post-contact resources associated with the April 19, 1775 engagement along Battle Road, now part of the MMNHP. The update for the *2012 ESPR* determined that existing conditions within the Hanscom area have remained largely unchanged since the *2005 ESPR* and that no new archaeological sites have been identified within project study area.

The *2012 ESPR* describes the environmental effect of traffic and air quality on cultural and historic resources. The findings show that the environmental effects of traffic and air quality on cultural and historic resources have decreased since 2005. In 2012, Hanscom Field represented approximately four percent of peak hour traffic on Route 2A. In 2012, Hanscom Field traffic exceeded the ten percent MEPA threshold at one intersection on Route 2A in the MMNHP: #6) Hanscom Drive/Route 2A in Lincoln. As described in Chapter 8, Air Quality, there were no adverse effects attributable to air quality in 2012.

Chapter 7, Noise reports noise levels at Hanscom Field in terms of DNL contours for 55, 60, 65 and 70 dBA exposure. Table 10-1 summarizes noise exposure on National and State Register properties, the MMNHP, and key conservation and recreational facilities by identifying those resources within the 65 dBA DNL and 55 dBA DNL contours. Of these resources, approximately 0.1 acres of the Hartwell Town Forest/Jordan Conservation Area fell within the 65 dBA DNL contour in 2012 as compared to 1.4 in 2005. Locations within the 55 dBA DNL contour align with runway ends and air traffic patterns to the south and west [e.g., portions of the Concord River and the Great Meadows National Wildlife Refuge (GMNWR)] or within close proximity to Hanscom Field (e.g., historic sites on Virginia Road). Massport and the NPS have been cooperating on the implementation of the Fly Friendly program instituted in 2009 with a noise abatement program and voluntary measures to minimize noise impacts on the MMNHP and residential areas.

The DNL noise exposure levels at National and State Registers historic properties in the 2020 and 2030 scenarios decrease from 1.5 to 2.0 decibels below *2005 ESPR* levels in the 2020 scenario to 0.5 to 1.0

[70] Herbster (PAL), *Archeological Overview and Assessment, Minute Man National Historical Park, Concord, Lincoln, and Lexington, Massachusetts*, 2005. Banister and Herbster (PAL), *Archaeological Reconnaissance Survey, Hanscom Field: 2005 Environmental Status & Planning Report, Bedford, Concord, Lexington, and Lincoln, Massachusetts*, 2006.

decibels below 2005 levels in the 2030 scenario. When compared to 2012 noise levels (which decreased from 2005), noise levels increase by 0.5 dB in 2020 and by 1.5 dB in 2030. As Table 10-1 indicates, only the Hartwell Town Forest/Jordan Conservation Area fell within the 65 dBA DNL contour, with the area impacted ranging from 0.1 acres in the 2020 scenario to 0.9 acres in the 2030 scenario. That increases to 66.4 and 72.1 acres of land in the 2020 and 2030 scenarios respectively for area exposed to the 55 dBA DNL contour. The GMNWR, which had the highest acreage within the 55 dBA DNL contour in 2005, dropped below Hartwell Town Forest/Jordan Conservation Area in 2012 and the forecast years.

In the 2020 and 2030 scenarios, Hanscom Field represents four and seven percent respectively of peak hour traffic on Route 2A. Hanscom Field traffic exceeds ten percent of a single traffic movement at one Route 2A intersection in the 2020 scenarios and four Route 2A intersections in the 2030 scenarios. As described in Chapter 8, Air Quality, there are no adverse effects attributable to air quality in 2012 or the 2020 and 2030 scenarios.

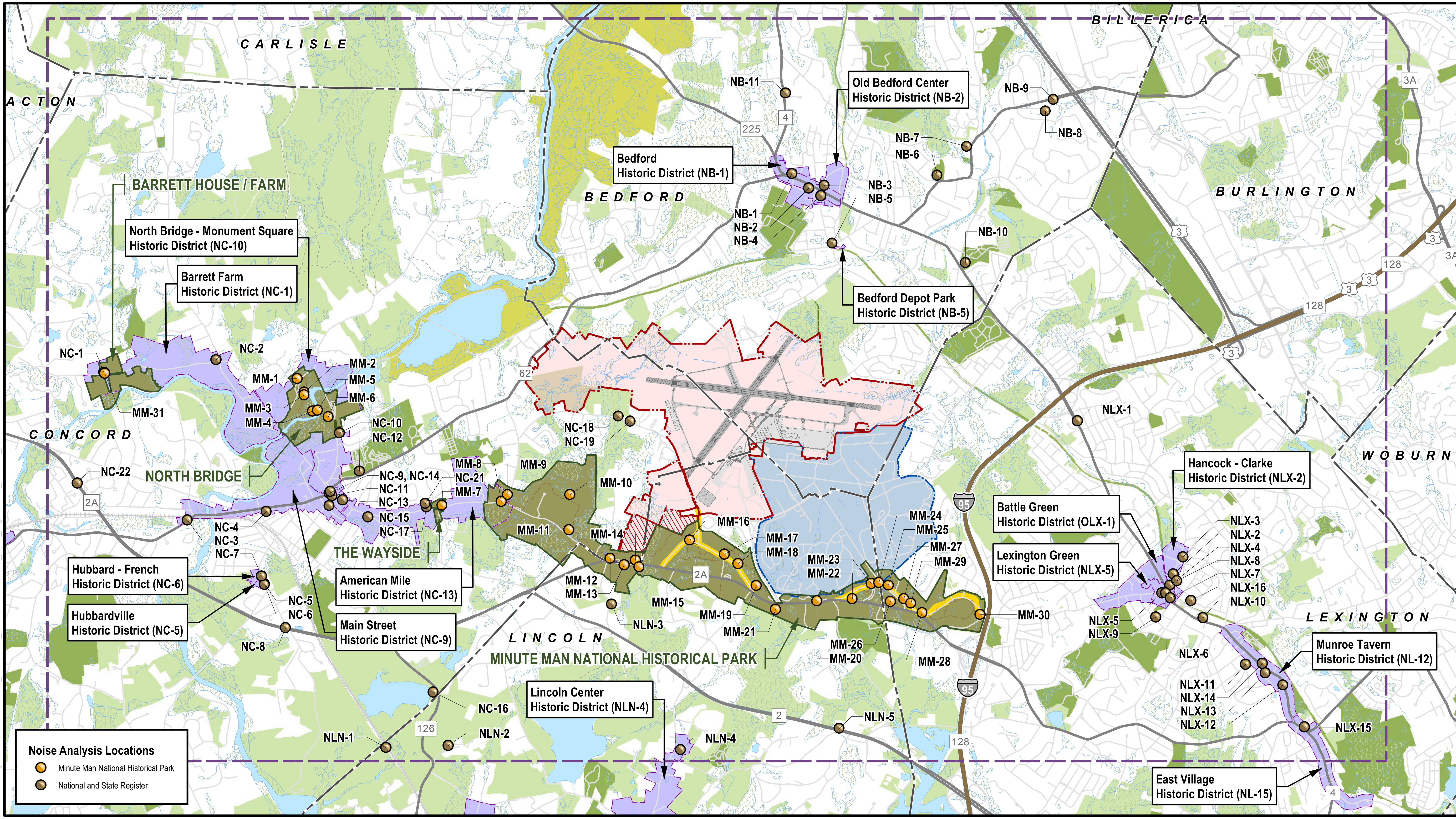
Massport supports Transportation Demand Management (TDM) strategies to reduce its contribution to traffic on area roadways, as well as potential traffic management strategies that do not require physical modification to intersections. No physical modifications are proposed to intersections and, therefore, there are no adverse effects to the identified historic and archeological resources in 2012 or the 2020 and 2030 scenarios. Some of the potential airport facilities in the 2020 and 2030 scenarios would be located within areas assessed as having a high archaeological sensitivity. Additional archaeological investigation within these areas would be recommended if these concepts moved forward to planning and design and if below ground impacts were proposed. The 2006 reconnaissance survey, as updated in 2013, will guide such efforts.

Massport will continue to work with the MDAR to determine appropriate measures to protect Massport-owned agricultural lands from conversion to non-agricultural uses. Massport will inform the towns about actions related to agricultural lands as part of its briefings at HFAC meetings.

10.2 Year 2012 Conditions

This section presents conditions in 2012 for cultural and historical resources within Hanscom Field and in the reconnaissance survey area that is illustrated in Figure 10-1. The noise analysis location labels in this figure are tied to information that is presented in Tables 10-2 through 10-5 and Table 10-13 for the MMNHP. The description of 2012 resources focuses first on historical resources, then archaeological resources, and concludes with MMNHP. This discussion is followed by a survey of recreation and conservation lands in each of the four towns, as well as the GMNWR. The chapter concludes with a review of agricultural resources. Noise and traffic are then assessed. The analysis presented in Chapter 8, Air Quality indicates that there are no adverse effects attributable to air quality in 2012.

The noise analysis evaluates the 65 dB DNL noise contour and the 55 dB DNL noise contour. The 65 dB DNL noise contour was used as a guideline for determining potential land use incompatibilities, in accordance with FAA guidelines. The EEA Scope for the *2012 ESPR* identified the 55 dB DNL noise contour for inclusion in the noise analysis.



North

0 3,500 7,000 Feet

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

- NR / SR Listed or Determined Eligible Historic Districts
- Historic General Study Area Boundary
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service
- Open Water
- Wetland/Marsh
- Stream
- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Historic Resources Included as Noise Analysis Locations

Figure **10-1**

(This page intentionally left blank)

Historic and archaeological resources are identified for areas within 200 feet of the sixteen traffic study intersections to provide baseline data to assess potential traffic effects on these resources. Traffic concerns are related to overall traffic volumes on roadways, particularly Route 2A through the MMNHP, and the operation of intersections with consideration of intersection modifications to improve capacity. Although Hanscom Field traffic made up only four percent of the traffic on Route 2A during the morning peak hour and afternoon peak hour in 2012, Massport is committed to Transportation Demand Management and traffic management approaches that do not involve physical changes to intersections, if potential improvements are warranted to address identified needs. Appendix G summarizes historic resources near the sixteen intersections.

Table 10-1 Summary of Noise Effects on Cultural and Historic Resources

Resource[1]	Total Quantity[2]	Total Properties or Geographic Area within the 65 DNL Contour[3]			
		2005	2012	2020	2030
National and State Registers Individual Properties[4]	39 properties	0 properties	0 properties	0 properties	0 properties
National and State Register Historic Districts[5]	1646. acres	0 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975.4 acres	0 acres	0 acres	0 acres	0 acres
Battle Road Interpretive Trail	4.0 miles	0 miles	0 miles	0 miles	0 miles
Minuteman Commuter Bikeway	10.1 miles	0 miles	0 miles	0 miles	0 miles
Narrow Gauge Rail-Trail	3.0 miles	0 miles	0 miles	0 miles	0 miles
Hartwell Town Forest/ Jordan Conservation Area	165.9 acres	1.4 acres	0.1 acres	0.1 acres	0.9 acres
Great Meadows National Wildlife Refuge	3409.0 acres	0 acres	0 acres	0 acres	0 acres
Concord River[6]	6.5 miles	0 miles	0 miles	0 miles	0 miles
Resource[1]	**Total Quantity[2]**	**Total Properties or Geographic Area within the 55 DNL Contour**			
		2005	**2012**	**2020**	**2030**
National and State Register Individual Properties[4]	39 properties	3 properties	3 properties	3 properties	3 properties
National and State Register Historic Districts[5]	1646.2 acres	2.4 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975.4 acres	1.7 acres	0 acres	0 acres	0.4 acres
Battle Road Interpretive Trail	4.0 miles	0 miles	0 miles	0 miles	0 miles
Minuteman Commuter Bikeway	10.1 miles	1.3 miles	0.3 miles	0.4 miles	0.5 miles
Narrow Gauge Rail-Trail	3.0 miles	1.3 miles	0 miles	0 miles	0 miles
Hartwell Town Forest/ Jordan Conservation Area	165.9 acres	118 acres	26.4 acres	66.4 acres	72.1 acres
Great Meadows National Wildlife Refuge	3409.0 acres	210 acres	26.4 acres	43.1 acres	94.4 acres
Concord River[6]	6.5 miles	0.5 miles	0 miles	0 miles	0.1 miles

Notes:
1. See Tables 10-19 and 10-20 for more detail on National and State Registers individual properties and historic districts.
2. All surveyed historic properties; total acreage of surveyed historic districts, Minute Man National Historical Park, Hartwell Town Forest/Jordan Conservation Area, and Great Meadows National Wildlife Refuge; and, total length of trails and Concord River.
3. This is the exposure level that the FAA identifies as a guideline for determining potential land use incompatibilities.
4. Does not include Minute Man National Historical Park sites. In this table, the noise effects are quantified through the estimation of park acreage within a given contour.
5. Includes Bedford Depot Park Historic Dist., Bedford Historic Dist., and Old Bedford Center Historic Dist. in Bedford; American Mile Historic Dist., Barrett Farm Historic Dist., Concord Monument Square-Lexington Road Historic Dist.,

Hubbard-French Historic Dist., Hubbardville Historic Dist., Main Street Historic Dist., and North Bridge-Monument Square Historic Dist. in Concord; Battle Green Historic Dist., East Village Historic Dist., Hancock-Clarke Historic Dist., Lexington Green Historic Dist. and Munroe Tavern Historic Dist. in Lexington; and, Lincoln Historic Dist. in Lincoln. Areas of overlap in districts are counted once.
6. Concord River is approximately 6.5 miles in length from State Route 2 (South of Airport) to State Route 225 (North of Airport)

10.3 Designation Process

Information on historic and archaeological resources in the *2012 ESPR* is based on updating data that was collected in a series of planning steps for the *2005 ESPR*. This consisted of reviewing the 2005 survey results, updating baseline research, and conducting a drive over/walkover field survey to verify the current conditions. This results in an updated reconnaissance-level preliminary list of known resources and sensitive areas. In the future, an intensive-level survey may be conducted that examines the history, context, and physical characteristics of all or selected historic resources in more detail, culminating in MHC Inventory forms, entry in MACRIS, and evaluation of eligibility for listing in the National and State Registers of Historic Places.

Individual properties and historic districts eligible for listing in the National Register of Historic Places must meet criteria established by the NPS, possess historic integrity, and be significant in local, state, or national history. Properties are nominated through the MHC. The National Register is the nation's official list of historic properties deemed worthy of protection and is overseen by the NPS. The State Register of Historic Places, maintained by the MHC, is an umbrella compilation of historic properties and districts that have been designated as historically significant in one or more different programs at the local, state, and national level. The State Register consists of inventoried historical resources that have been evaluated and formally designated as historically significant due to meeting the criteria for listing in one of the following categories: National Historic Landmark designated by the U.S. Congress; listed or formally determined eligible for inclusion in the National Register of Historic Places; Massachusetts Archaeological or Historic Landmark designated by MHC; Local Landmark or Local Historic District determined by a community; Regional Historic District established by State legislature; or subject to a Preservation Restriction managed by the MHC. MHC updates the State Register regularly, and the January 2013 edition was consulted for current information included in the *2012 ESPR*. Information from the National and State Registers is presented in the section below.

10.4 Historical Resources

This section updates the status of historical resources within Hanscom Field, Hanscom AFB, and an area of approximately 45 square-miles that is depicted in Figure 10-1 and defined as the general study area. Data collection methodologies included review of documents, reports, agency files and databases, archival materials, and historic maps. Interviews and information sharing meetings were conducted with National Park Service representatives from the MMNHP, and the local historical commissions of Bedford, Concord, Lexington, and Lincoln.

Available planning studies conducted within or adjacent to Hanscom Field were also consulted. The results informed the list of noise analysis locations that were the basis of the Chapter 7 noise analysis. Information was also integrated into the reconnaissance historic and archaeological resources survey updates completed in 2013 for the *2012 ESPR*.

10.4.1 National and State Register Resources

The existing conditions for National and State Registers-listed historic resources were assessed for the area shown in Figure 10-1. Both the *1988* and *1995 GEIR*s identified 32 (national, state, and local) historic architectural building resources and districts in the general study area. The *2000 ESPR* identified a total of 43 historic buildings and/or districts included in the State Register. The *2005 ESPR* identified a total of 52 historic resources, or 32 historic buildings and 20 districts (with the MMNHP counted as one district), included in the State Register within the general study area for the *2005 ESPR*. An updated review was completed of the National and State Registers, the MHC Inventory, and MACRIS that are all maintained by the MHC for inclusion in the *2012 ESPR*.

Based upon the recent investigations, a total of 61 historic resources, or 39 individual historic properties and 22 districts (with the MMNHP counted as one district), are currently included in, or determined eligible for inclusion in, the National and State Registers within the general study area for the *2012 ESPR*. These resources are listed in Tables 10-2 through 10-5 and shown in Figure 10-1.

The resources range from individual houses to large historic districts with structures and associated landscape settings, and are distributed as follows in the four towns.

- Bedford contains five historic districts and seven individual properties
- Concord contains eight historic districts (including a portion of the MMNHP) and eighteen individual properties, including six individual National Historic Landmarks
- Lexington contains nine historic districts (including a portion of the MMNHP) and ten individual properties.
- Lincoln contains two historic districts (including a portion of the MMNHP) and four individual properties.

The largest single historic resource is the MMNHP, a National Historic Landmark district with four separate units in Concord, Lexington, and Lincoln that contains numerous historic buildings and places, including individual National Historic Landmarks. The MMNHP is discussed in Section 10.6.

10.4.2 Existing Noise Conditions

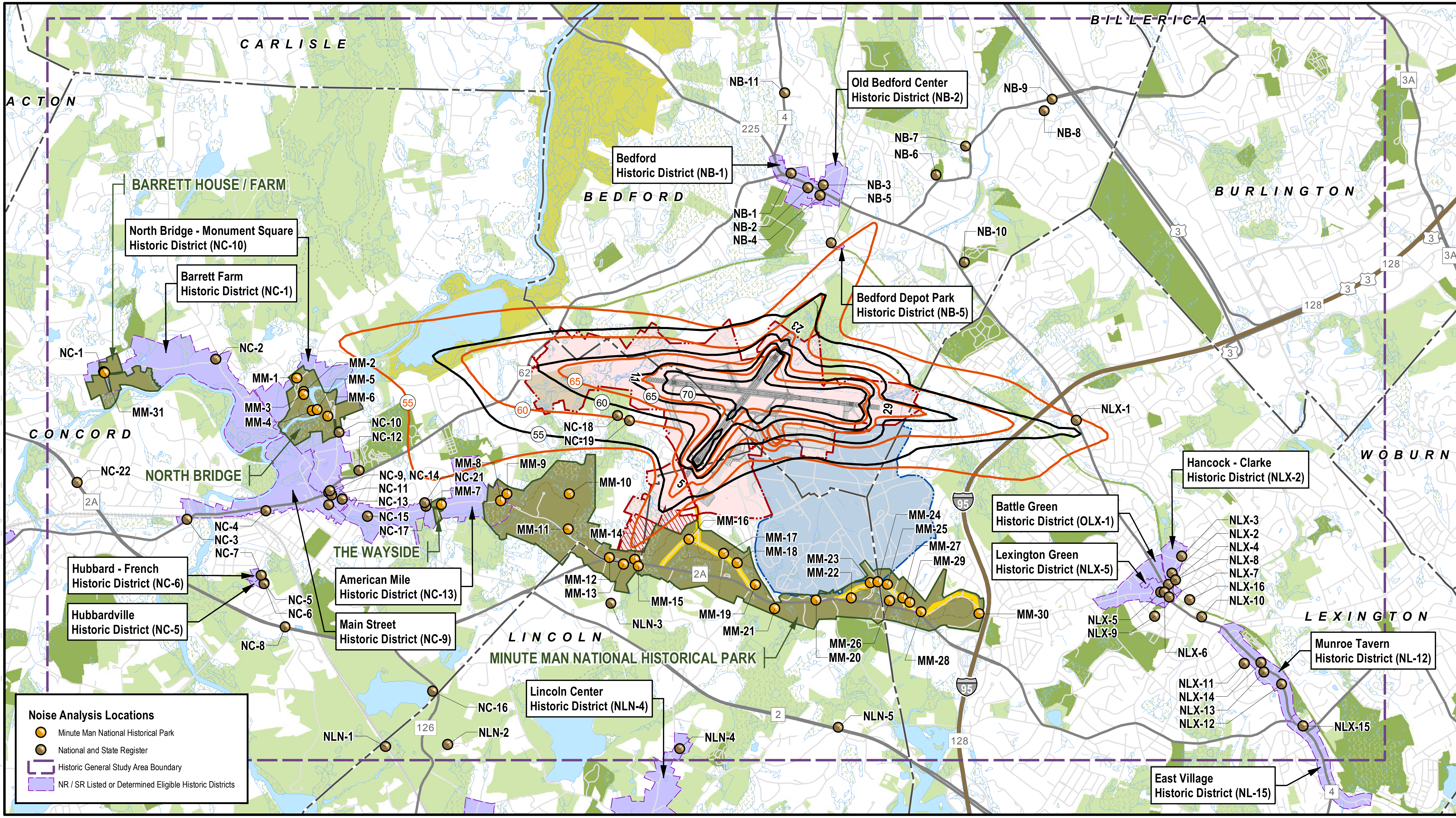
All 39 individual properties and 22 historic districts (including MMNHP) listed in the National and State Registers were evaluated in Chapter 7, Noise. The relationship of these properties to 2005 and 2012 noise levels is shown in Figure 10-2. None of the individual properties or historic districts is within the 65 dB DNL contour in 2005 or 2012, which the FAA views as significant noise exposure.

There are no historic districts within the 55 dB DNL contour in 2012 including the MMNHP, discussed below. Two individual National and State Registers properties have DNL values greater than 55 dBA in 2012. These values are 1.7 to 2.0 dB lower than in 2005:

- The Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace), 341 Virginia Road in Concord at 58.4 dBA
- The Wheeler-Meriam House, 477 Virginia Road in Concord at 58.1 dBA

One additional property, the Simonds Tavern, 331 Bedford Street in Lexington that was included in this group in 2005 has a value lower than 55 dBA (53) in 2012.

(This page intentionally left blank)



North

0 3,500 7,000 Feet

2012 DNL Noise Contour	Historic Road
2005 DNL Noise Contour	Interstate
Hanscom Field Property Boundary	Highway
Massport Property within MMNHP Congressional Boundary	Road
Hanscom AFB Property Boundary	Trail
Municipal Boundary	Active Rail Service
Open Water	Stream
Wetland/Marsh	
MMNHP Boundary	
Great Meadows	
Open Space Non-protected	
Open Space Protected in Perpetuity	

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Historic Resources within the 2005 and 2012 DNL Noise Contours

Figure **10-2**

(This page intentionally left blank)

The highest DNL noise exposure at a historic National and State Registers noise analysis location in 2012 is 58.4 dBA. This level was calculated at the Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace). The 2012 value is 2.0 dBA lower than the 2005 value (60.4 dBA), also the highest DNL exposure level for a historic resource in 2005.

Table 10-2 Historic Architectural Resources Listed in the National and State Registers of Historic Places in Bedford

MHC Number	NAL Label[1]	Name	Street Address	Style-Date	National Register/ State Register Status
BED.V	NB-5	Bedford Depot Park Historic District	80 Loomis St. and 120 South Rd.	Eclectic 1874-1877	National Register of Historic Places
BED.A	NB-1	Bedford Historic District	Great Road	Various ca. 1730-1850	Local Historic District
BED.C	NB-2	Old Bedford Center Historic District	Great Road	Various ca. 1730-1860	National Register of Historic Places
BED.K	NB-9	Old Burlington Road-Wilson Mill Area	Old Burlington, Burlington, and Wilson Roads	Various 1676-1924	National Register of Historic Places
BED.D	HB-1	Veterans Administration Medical Center	Springs Road	Georgian Colonial ca. 1920	National Register Determination of Eligibility
BED.21	NB-8	Bacon-Gleason-Blodgett Homestead	118 Wilson Road	Georgian ca. 1750	National Register of Historic Places
BED.23	NB-4	Bedford Old Town Hall	16 South Road	1856	Local Historic District National Register of Historic Places
BED.37	NB-7	Christopher Page House	50 Old Billerica Road	Federal ca. 1730	National Register of Historic Places
BED.17	NB-6	Nathaniel Page House	89 Page Road	First Period 1687	National Register of Historic Places
BED.800	NB-3	Old Burying Ground	7 Springs Road	1729	Local Historic District National Register of Historic Places

Notes:
1. 2012 Noise Analysis Location label.

Table 10-3 Historic Architectural Resources Listed in the National and State Registers of Historic Places in Concord

MHC Number	NAL Label[1]	Name	Street Address	Style-Date	National Register/ State Register Status
CON.DS	NC-13	American Mile Historic District	Lexington Road	Various ca. 1650-1950	Local Historic District
CON.DT	NC-1	Barrett Farm Historic District	Barrett's Mill and Lowell Roads, Liberty Street	Various ca. 1700-1940	Local Historic District
CON.A	NC-14	Concord Monument Square- Lexington Rd Historic District	Monument Square and Lexington Road	Various ca. 1720-1890	National Register of Historic Places
CON.EA	NC-6	Hubbard-French Historic District	324-374 Sudbury Road	Georgian 1787-1950	National Register of Historic Places
CON.DZ	NC-5	Hubbardville Historic District	324-374 Sudbury Road	Georgian 1787-1950	Local Historic District
CON.DU	NC-9	Main Street Historic District	Main St. bet. Monument Sq. and Wood St.	Various 1757-1976	Local Historic District

Notes:
1. 2012 Noise Analysis Location label.
2. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.
3. Old Manse and The Wayside are individually listed National Historic Landmarks in MMNHP.
4. Walden Pond State Reservation is located in Concord and Lincoln.

Table 10-3 Historic Architectural Resources Listed in the National and State Registers of Historic Places in Concord (continued)

MHC Number	NAL Label[1]	Name	Street Address	Style-Date	National Register/ State Register Status
CON.C CON.DW CON.EC	Multiple	Minute Man National Historical Park	Lexington and North Great Rds., Massachusetts Ave.	Various ca. 1655-1959	National Historic Landmark National Register of Historic Places
CON.DV	NC-10	North Bridge-Monument Square Historic District	Monument Sq., Monument St., Lowell Rd.	Various 1635-1979	Local Historic District
CON.177	NC-18	Deacon John Wheeler-Captain Jonas Minot Farmhouse (Henry David Thoreau Birthplace)	341 Virginia Rd.	Colonial ca. 1730	National Register of Historic Places
CON.405	NC-7	Deacon Thomas Hubbard-Judge Henry French House	342 Sudbury Rd.	Georgian ca. 1787	Local Historic District National Register of Historic Places
CON.241	NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd.	Georgian ca. 1750	Local Historic District National Register of Historic Places
CON.269	NC-3	Joseph Hosmer House	572 Main St.	Colonial 1672	Local Historic District National Register of Historic Places
CON.347 CON.EE	MM-6	Old Manse 3	269 Monument St.	Georgian 1769	Local Historic District National Register of Historic Places National Historic Landmark
CON.170	NC-17	Orchard House	399 Lexington Rd.	Georgian ca. 1750	Local Historic District National Register of Historic Places National Historic Landmark
CON.414	NC-8	Pest House	158 Fairhaven Rd.	Vernacular ca. 1750	National Register of Historic Places
CON.317	NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike	Greek Revival 1828	Local Historic District National Register of Historic Places National Historic Landmark
CON.802 (CON.DY)	NC-12	Sleepy Hollow Cemetery	24 Court Ln.	Burial Ground 1823	National Register of Historic Places
CON.56	NC-4	Thoreau-Alcott House	255 Main St.	Greek Revival 1820	Local Historic District National Register of Historic Places
CON.936	NC-16	Walden Pond 4	MA Rte. 126	Pond 1845	National Register of Historic Places National Historic Landmark
CON.71 CON.EF	MM-7	The Wayside – Samuel Whitney House 3	455 Lexington Rd.	Colonial ca. 1714	Local Historic District National Register of Historic Places National Historic Landmark
CON.178	NC-19	Wheeler-Meriam House	477 Virginia Rd.	Colonial 1690	National Register of Historic Places
CON.329	NC-11	Wright Tavern	1-8 Lexington Rd.	Georgian 1747	Local Historic District National Register of Historic Places National Historic Landmark

Notes:
1. 2012 Noise Analysis Location label.
2. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.
3. Old Manse and The Wayside are individually listed National Historic Landmarks in MMNHP.
4. Walden Pond State Reservation is located in Concord and Lincoln.

Table 10-4 Historic Architectural Resources Listed in the National and State Registers of Historic Places in Lexington

MHC Number	NAL Label[1]	Name	Street Address	Style-Date	National Register/ State Register Status
LEX.AQ	Multiple	Minute Man National Historical Park 2	Lexington and North Great Rds., Mass. Ave.	Various ca. 1655-1959	National Register of Historic Places National Historic Landmark
LEX.B	OLX-1	Battle Green Historic District	Worthen Rd., Woburn St.., Hastings Rd., Mass. Ave., and B&M Railroad	Various 1713-1960	Local Historic District
LEX.E	NLX-15	East Village Historic District	Massachusetts Ave.	Various ca. 1750-1950	Local Historic District
LEX.C	NLX-2	Hancock-Clarke Historic District	12-41 Hancock St., 3-13 Hancock Ave., 8 Goodwin Rd.	Various 1698-1900	Local Historic District
LEX.AG	NLX-6	Lexington Green	Massachusetts Ave., Harrington Rd., Bedford St.	Town Common 1711	Local Historic District National Register of Historic Places National Historic Landmark
LEX.AC	NLX-5	Lexington Green Historic District	Massachusetts Ave., Bedford St., Harrington Rd.	Various 1713-1960	Local Historic District National Register of Historic Places
LEX.D	NLX-12	Munroe Tavern Historic District	Massachusetts Ave.	Various 1700-1900	Local Historic District
LEX.51 LEX.AH	NLX-7	Buckman Tavern	1 Bedford St.	Georgian ca. 1690	Local Historic District National Register of Historic Places National Historic Landmark
LEX.52	NLX-4	Garrity-Col. John Parkhurst Meriam House	9 Hancock St.	Federal/ Greek Revival ca. 1830	Local Historic District National Register of Historic Places National Historic Landmark
LEX.101	NLX-8	General Samuel Chandler House	8 Goodwin Rd.	Italianate 1846	Local Historic District National Register of Historic Places
LEX.119	NLX-3	Hancock-Clarke House	35 Hancock St.	Colonial 1698	Local Historic District National Register of Historic Places National Historic Landmark
LEX.440	NLX-9	Hancock School	33 Forest St.	Victorian 1890	National Register of Historic Places
LEX.129	NLX-14	John Mason House	1303 Massachusetts Ave.	Federal ca. 1715	Local Historic District National Register of Historic Places
LEX.127 LEX.128	NLX-13	Sanderson House - Munroe Tavern	1314-1332 Massachusetts Ave.	Colonial ca. 1720	Local Historic District National Register of Historic Places
LEX.413	NLX-1	Simonds Tavern	331 Bedford Street	Georgian 1795-1810	National Register of Historic Places
LEX.16	NLX-10	United States Post Office	1661 Massachusetts Ave.	Colonial Revival 1938	National Register of Historic Places
LEX.134	NLX-11	Warren E. Sherburne House	11 Percy Rd.	Eclectic 1893	Local Historic District National Register of Historic Places

Notes:
1. 2012 Noise Analysis Location label.
2. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.

Table 10-5 Historic Architectural Resources Listed in the National and State Registers of Historic Places in Lincoln

MHC Number	NAL Label[1]	Name	Street Address	Style-Date	National Register/ State Register Status
LIN.A LIN.D	NLN-4	Lincoln Center Historic District	Bedford, Lincoln, Old Lexington, Sandy Pond, Trapelo, and Weston Rds.	Various ca. 1850	Local Historic District National Register of Historic Places
LIN.F LIN.G	Multiple	Minute Man National Historical Park 1	Lexington and North Great Rds., Massachusetts Ave.	Various ca. 1655-1959	National Historic Landmark National Register of Historic Places
LIN.63	NLN-3	Daniel Brooks House	Brooks Rd.	Colonial 1695	National Register of Historic Places
LIN.182	NLN-2	Henry Higginson House	44 Baker Farm Rd.	Tudor Revival 1905	National Register of Historic Places
LIN.60	NLN-5	Hoar Tavern	268 Cambridge Turnpike	Colonial ca. 1713	National Register of Historic Places
LIN.917	NLN-1	Walden Pond 3	MA Rte. 126	Pond 1845	National Register of Historic Places National Historic Landmark

Notes:
1. 2012 Noise Analysis Location label.
2. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.
3. Walden Pond State Reservation is located in Concord and Lincoln.

Time Above (TA) is a separate metric that calculates the time during a 24-hour period that aircraft noise exceeds either a threshold level of 65 dBA (TA65) or 55 dBA (TA55). Time Above 65 dBA generally indicates periods when speech interference is possible unless the speaker uses a raised voice. Further detail on Time Above analysis is presented in Chapter 7, Noise.

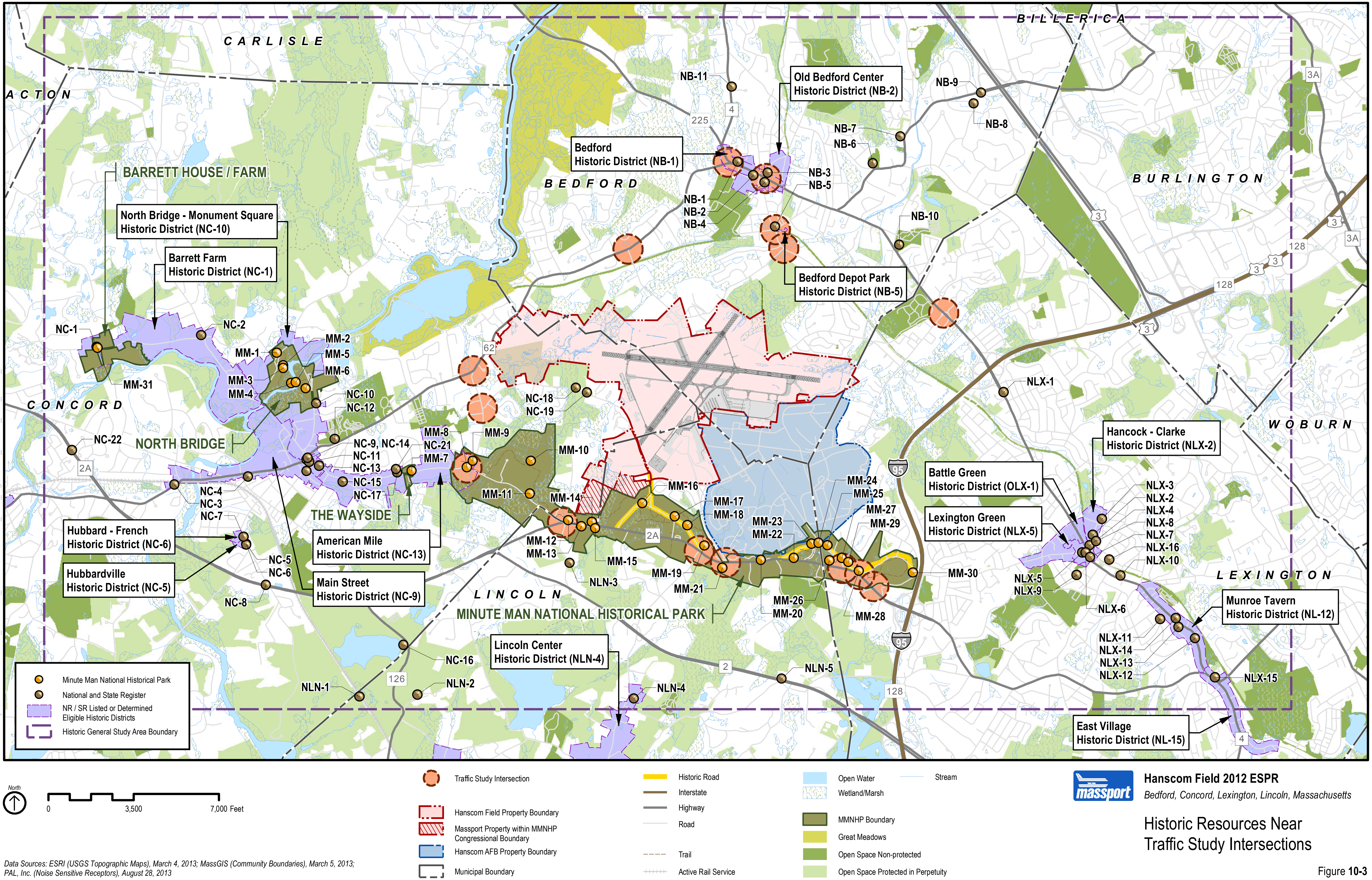
TA values decreased in 2012 when compared to 2005. TA65 values in 2012 range from 0.1 minute a day at the East Village Historic District in Lexington to approximately 32½ minutes a day at the Wheeler-Meriam House on Virginia Road in Concord (compared to 0.3 and 33.4 in 2005). TA55 values in 2012 range from one-half a minute per day at the East Village Historic District to 113 minutes per day at the Wheeler-Meriam House (compared to 2.9 and 141.7 in 2005).

10.4.3 Existing Traffic Conditions

The relationship of National and State Registers properties and the 16 traffic study intersections is shown in Figure 10-3. In accordance with MEPA certificate, traffic associated with Hanscom Field is considered to have a significant impact on an intersection if one or more of the intersection's individual traffic movements consist of ten percent or more of Hanscom Field-related traffic. For the *2012 ESPR* traffic analysis of 2012 conditions, four intersections triggered this threshold: #5) Hanscom Drive/Old Bedford Road, Lincoln; #6) Hanscom Drive/Route 2A, Lincoln; #10) Old Bedford Road/Virginia Road, Concord; and, #11) Route 62/Old Bedford Road, Concord. National and State Registers-listed historic properties are located near #6) Hanscom Drive/Route 2A, Lincoln, which is next to the MMNHP. Mitigation measures will seek to minimize Hanscom's contribution though no physical modifications are proposed for these intersections.

10.4.4 MHC Inventory

The MHC Inventory is a compilation of inventory forms for historical resources that are typically 50 years old or older. It serves as a basic planning tool for communities and for state and federal agencies in the recording, evaluating, and protecting of historical resources. Resources in the MHC Inventory may not have been formally evaluated and designated as historically significant according to specific



Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Historic Resources Near Traffic Study Intersections

Figure 10-3

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

(This page intentionally left blank)

regulatory criteria, but are properties that may be eligible for inclusion in the National and State Registers. The MACRIS is a computerized database listing of the MHC Inventory that is linked to MassGIS.

Within the general study area comprised of more than 6,000 acres that includes Hanscom Field and adjacent properties, there are extensive entries of historical resources in the MHC Inventory and MACRIS. Appendix G includes the full set of historic resources that was updated for the *2012 ESPR*.[71] Twenty-one of the survey areas and 39 of the surveyed individual properties are also included, wholly or partially, in the State Register. These include the following resources in each town.

- Bedford contains 59 individual historic resources and six survey areas. A National Register nomination is in process for one of these areas: the Old Billerica Road Area in Bedford.
- Concord contains 218 individual historic resources and 38 survey areas. Two of the Concord survey areas are sections of MMNHP.
- Lexington contains 63 individual historic resources and one survey area.
- Lincoln contains no individual historic resources and no survey areas

10.4.5 Existing Noise Conditions

Table 10-6 summarizes by town the number of historic resources in the MHC Inventory and MACRIS that were in the 2012 65 dB DNL and 55 dB DNL contour. None of the historic resources in the MHC Inventory and MACRIS are within the 65 dB DNL contour in 2012, which is consistent with the findings of the *2005 ESPR*. Similarly, for both 2005 and 2012, 13 of the 45 survey areas and 99 of the 340 individual properties are within the 55 dB DNL contour.

Table 10-6 Comparing MHC Inventory and MACRIS Historic Resources within the 65 dBA and 55 dBA DNL Contours for 2005 and 2012

Location[1]	2005 MHC Inventory[1]	2005[3]		2012 MHC Inventory[2]	2012[3]	
		65 dBA	55 dBA		65 dBA	55 dBA
AREAS						
Bedford	6	-	5	6	-	5
Concord	38	-	7	38	-	7
Lexington	1	-	1	1	-	1
Lincoln	-	-	-	-	-	0
Total	45	0	13	45	0	13
INDIVIDUAL PROPERTIES						
Bedford	59	-	19	59	-	19
Concord	218	-	47	218	-	47
Lexington	63	-	33	63	-	33
Lincoln	-	-	0	-	-	0
Total	340	0	99	340	0	99

Notes:
1. Based on research for *2012 ESPR*.
2. Appendix G lists these historic resources.
3. The numbers of areas listed are fully or partially within the 55 dBA DNL contour.

[71] The full baseline data set covers more than 6,000 acres defined as the general survey area. Appendix G includes Inventory resources that are noise analysis locations in Chapter 7, but were not in the full baseline data set.

10.4.6 Existing Traffic Conditions

Table 10-7 identifies the historic resources listed in the MHC Inventory and MACRIS at the four intersections that were studied for 2012 conditions. As indicated previously, no physical modifications are proposed for these intersections.

10.4.7 Local Historic Commissions

In addition to consulting MHC files and online databases, Massport met with the local historical commissions in Bedford, Concord, Lexington, and Lincoln and with representatives of the MMNHP to explain the purpose and process of the ESPR and to collect updated data on any additional notable historical resources. Each historic commission provided information about historic districts and individual historic resources that are listed or may be eligible for listing in the National and State Registers for consideration as noise analysis locations for the *2012 ESPR* noise analysis.

Table 10-7 Historic Architectural Resources in the MHC Inventory and MACRIS near 2012 Intersections

Intersection[1]	MHC Number	Name	Designation[2]
#5) Hanscom Dr./Old Bedford Rd. (Lincoln)	None	None	None
#6) Route 2A /Hanscom Dr. (Lincoln)	Multiple	Minute Man National Historical Park	NHL, NR
	LIN.157	Giurleo House	MMNHP
	LIN.158	Giurleo House Garage	MMNHP
#10) Old Bedford Rd./Virginia Rd. (Concord)	CON-BL	Lower Old Bedford Rd./Virginia Rd. Area	MACRIS
	CON.1069	Patrick Dalton House	CON-BL
#11) Old Bedford Rd./Route 62 (Concord)	CON-BN	Old Bedford Road Area II	MACRIS
	CON-BO	Bedford Street Area II	MACRIS
	CON.1090	759 Bedford Street House	CON-BO

Notes:
1. Based on MEPA Scope Certificate for the *2012 ESPR*, Hanscom Field traffic is considered to impact an intersection if one or more of the intersection's individual traffic movement(s) consists of ten or more percent Hanscom Field-related traffic.
2. NHL – National Historic Landmark; NR – National Registers of Historic Places; MMNHP – Minute Man National Historical Park; CON-BL/ CON-BO – survey areas in Concord; MACRIS – Massachusetts Cultural Resource Information System.

Bedford Historical Commission

Bedford noted that two properties that are used as receptors in the noise modeling analysis are now listed in the National and State Registers and that an extension is being proposed for the National Register-listed Old Bedford Historic District.

Concord Historical Commission

Concord provided information about a number of town interests and initiatives. These included interest in the Caesar Robbins House and the initiation of a town-wide archaeological reconnaissance archaeological survey.

Lexington Historical Commission

Lexington described the town's concerns about noise and traffic, and the potential effects to the historic character and the visitor's experience. The town has sponsored several new National Register nomination listings.

Lincoln Historical Commission

Lincoln indicated there are a few mid-twentieth-century modern houses of interest. However, these were already included previously when the 2005 inventory list was prepared.

10.5 Reconnaissance Survey Update

The *2012 ESPR* provides an update on the reconnaissance-level historic survey that was conducted in March 2006 for the *2005 ESPR*, consistent with the Secretary of the Interior and MHC standards, to provide preliminary data about historic resources that are eligible to be included in the National and State Registers and/or MHC Inventory. These resources are buildings and neighborhoods that were present in about 1950, but have not previously been surveyed. The reconnaissance survey was conducted within the 2005 55 dB DNL noise contour line that included Hanscom Field, Hanscom AFB, and sections of Bedford, Concord, Lexington, and Lincoln.

The reconnaissance survey update within the smaller 55 dB DNL noise contour line in 2012 identified a total of 54 individual properties and 7 survey areas with historic resources that are 50 years or older. No previously undocumented historic resources were identified at the study intersections during the reconnaissance survey or the update. The survey and update verified that all historic resources at these intersections were already included in the MHC Inventory and MACRIS or the National and State Registers.

10.5.1 Methodology

The historic resources reconnaissance survey update methodology used background data collection including a review of the Massachusetts state inventory files, online Massachusetts Cultural Resource Information System (MACRIS), and the National and State Register files. The most up-to-date information from the towns included updated material on individual properties and one historic district. The NPS provided information on the expansion of the MMNHP by the addition of the new Barrett Farm Unit in Concord.

A drive-by/walkover of the *2012 ESPR* general study area was completed to identify any changes in historic resources conditions within Hanscom Field and the surrounding communities since the reconnaissance survey in 2006. The field review was conducted within Hanscom Field, the area inside the new 2030 forecast scenario 55 dB DNL noise contour line, and within 200 feet around the 16 traffic study intersections to verify the current status of identified historic resources. In addition, all National and State Register-listed properties outside these defined areas but within the general study area were also field-verified. Information on properties that have been listed in the National or State Register or have reached 50 years of age since 2006, as well as major demolitions, new construction or alterations were recorded in written notes, digital photographs, and on a base map.

The survey update used current Geographic Information System (GIS) mapping, including indicating the boundary of the general study area and reconnaissance study boundary. The locations of National Register properties and historic resources in the MHC Inventory were mapped using the GIS mapping function of the MACRIS online database. The high level of accuracy in current GIS mapping resulted in a few minor corrections to the 2006 survey information. This information is summarized in Appendix G.

Hanscom Field

The reconnaissance survey update completed for the *2012 ESPR* identified a total of nine buildings within Hanscom Field proper that are 50 years old or older. The reconnaissance survey update of Hanscom Field proper identified 10 historic resources that are 50 years old or older. Since the *2005 ESPR*, one historic resource, Hangar 24, has been demolished following an extensive review and approval process, and one building, Hangar 12A, has now reached 50 years of age.

Hanscom Air Force Base

Portions of Hanscom AFB and Massport property leased by the U.S. Air Force are located within the 2012 55 dB DNL contour, including the north one-quarter of the main base. One resource in the general study area, but outside the reconnaissance study boundary, the Air Force Cambridge Research Laboratories Historic District, has been determined eligible for National Register since the *2005 ESPR* (determined eligible 2012). The Bedford Trailer Park (East Section) area off Hartwell Road in Bedford has been demolished by the USAF.

Bedford, Concord, Lexington and Lincoln

The reconnaissance survey update identified six survey areas with approximately five individual properties and portions of three survey areas.

10.5.2 Archaeological Resources

In 2006, an archaeological reconnaissance survey of the Hanscom Field project area in the towns of Bedford, Concord, Lexington, and Lincoln was completed as part of the update for the *2005 ESPR*. The reconnaissance survey was conducted within the Hanscom Field property boundaries and within a 200-foot radius of the 16 traffic study intersections that are described in Chapter 6, Ground Transportation. The primary objectives of the reconnaissance survey were to identify the locations of documented archaeological sites and archaeologically sensitive areas within Hanscom Field and near the traffic study intersections.

The survey included archival research, informant interviews, and a field walkover survey that allowed for the collection of information about known and potential archaeological resource areas. This information was then used to compile environmental and cultural pre-contact and post-contact contexts for the *2005 ESPR* study area in the periods before and after initial European contact with New England, about AD 1500, and to develop sensitivity models for undocumented archaeological sites.

In 2012, a site file review and field walkover were conducted to update recorded archeological sites within Hanscom Field and near 16 traffic study intersections to assess any environmental changes that have occurred since the 2006 survey

10.5.3 National and State Registers

A review of the 2013 National and State Registers, site files of the MHC Inventory, and MACRIS maintained by the MHC was completed for the *2012 ESPR* to identify recorded archaeological sites within and in proximity to Hanscom Field. The review consulted previously conducted cultural resource management studies conducted within or adjacent to Hanscom Field.[72,73,74]

One State Register archaeological site was noted in the *1995 GEIR*, the *2000 ESPR*, and in the updated information for the *2005 ESPR* (see Table 10-12). It is a prehistoric period (late Archaic) site in the Town of Lincoln near the intersection of Hanscom Drive and Old Bedford Road. This site is not within the Hanscom Field property.

The 2012 site file review concluded that no new pre- or post-contact archaeological sites have been recorded within the survey area or the traffic study areas since the *2005 ESPR*. There were also no new recorded survey reports listed.

Tables 10-8 through 10-11 list the archeological sites that have been identified in Bedford, Concord, Lexington, and Lincoln. Other than 19-MD-587, none of these sites has been evaluated for eligibility on the State and National Registers. A total of six archaeological sites have been documented either completely or partially within the Hanscom Field boundaries. These include three pre-contact period sites (Pine Hill [19-MD-474), Fox House [19-MD-1028], and Hartwell Farm [19-MD-119) and three post-contact period sites (Wheeler Mill, Yellow Ochre Mine, and South School). To date, no below-ground archaeological investigations have been conducted for any of these sites and their eligibility for listing in the National Register has not been determined.

Table 10-8 Pre-Contact Archaeological Sites in the MHC Inventory of the Archaeological Assets of the Commonwealth in Bedford near Hanscom Field

MHC Site Number	Site Name	Temporal Association	Site Type
19-MD-77	M-23-54	PaleoIndian	Campsite
19-MD-78	M-23-116	Unknown	Campsite
19-MD-889	Wamesit Crossing	Unknown	Find Spot
19-MD-994	Turf Meadow	Unknown	Lithic Scatter
19-MD-1013	Patriot Place	Unknown	Find Spot
19-MD-1022	Hanscom School Findspot	Middle Archaic	Find Spot
19-MD-1023	Fitch Farm Native American Site	Early Archaic – Late Woodland	Campsite

Table 10-9 Pre-Contact Archaeological Sites in the MHC Inventory of the Archaeological Assets of the Commonwealth in Concord near Hanscom Field

MHC Site Number	Site Name[1]	Temporal Association	Site Type
19-MD-79 19-MD-80	Munson Farm	Late Archaic	Campsite
19-MD-111	Meriam’s Corner (MMNHP)	Middle–Late Archaic	Campsite
19-MD-180	Revolutionary Ridge (MMNHP)	Unknown	Campsite
19-MD-472	Pine Hill (Elm Brook Farm)	Unknown	Campsite
19-MD-687	Ox Pasture (MMNHP)	Unknown	Camp
19-MD-946	Fox House	Middle–Late Archaic	Campsite
19-MD-948	Kaveski Farm	Unknown	Find Spot
19-MD-1008	Joshua Brooks	Unknown	Lithic Workshop
19-MD-1010	Vossberg	Unknown	Find Spot
19-MD-1028	Fox House Site	Early–Late Archaic	Listed as “Cultivated field”; likely campsite

72 King, Archaeological Reconnaissance Survey of Hanscom Air Force Base, 1992
73 Ritchie et al, Archaeological Investigations of Minute Man National Historical Park, 1990.
74 Herbster, Archeological Overview and Assessment, Minute Man National Historical Park, Concord, Lincoln, and Lexington, Massachusetts, 2005.

MHC Site Number	Site Name[1]	Temporal Association	Site Type
	Job Brooks Number 1 (MMNHP)	Unknown	Activity Area/Camp
	Job Brooks Number 2 (MMNHP)	Unknown	Activity Area/Camp
	Job Brooks Number 3 (MMNHP)	Unknown	Activity Area/Camp

Note:
1. MMNHP – Minute Man National Historical Park

Table 10-10 Pre-Contact Archaeological Sites in the MHC Inventory of the Archaeological Assets of the Commonwealth in Lexington near Hanscom Field

MHC Site Number	Site Name[1]	Temporal Association	Site Type
19-MD-685	Thomas Nelson Jr. Farm P1 (MMNHP)	Unknown	Activity Area
19-MD-688	Jacob Whittemore Farm P1 (MMNHP)	Middle Archaic	Campsite/workshop

Note:
1. MMNHP – Minute Man National Historical Park

Table 10-11 Pre-Contact Archaeological Sites in the MHC Inventory of the Archaeological Assets of the Commonwealth in Lincoln near Hanscom Field

MHC Site Number	Site Name[1]	Temporal Association	Site Type
19-MD-119	Hartwell Farm	Woodland	Campsite
19-MD-587	Black Rabbit2	Late/Transitional Archaic	Campsite (fall/winter)
19-MD-588	Black Walnut	Unknown	Campsite
19-MD-589	Perk Site	Unknown	Chipping Station
19-MD-676	William Smith Farm P2 (MMNHP)	Unknown	Campsite
19-MD-677	Joshua Brooks Farm P1 (MMNHP)	Unknown	Campsite
19-MD-678	Ephraim Hartwell Farm P4 (MMNHP)	Unknown	Campsite
19-MD-679	Ephraim Hartwell Farm P3 (MMNHP)	Unknown	Campsite
19-MD-680	William Smith Farm P1 (MMNHP)	Unknown	Campsite
19-MD-681	Aaron Brooks Farm P1 (MMNHP)	Unknown	Campsite
19-MD-682	Ephraim Hartwell Farm P2 (MMNHP)	Unknown	Campsite
19-MD-683	Ephraim Hartwell Farm P1 (MMNHP)	Unknown	Campsite
19-MD-684	Thomas Nelson Jr. Farm P2 (MMNHP)	Unknown	Campsite
19-MD-686	Holt Pasture (MMNHP)	Unknown	Campsite
19-MD-995	Block 2	Unknown	Find Spot
19-MD-996	Captain W. Smith House Findspot 1 (MMNHP)	Unknown	Find Spot
19-MD-997	Rogers Property (MMNHP)	Middle–Late Archaic	Flake Scatter
19-MD-1006	Joseph Mason Site (MMNHP)	Unknown (possibly Woodland)	Campsite

Notes:
1. MMNHP – Minute Man National Historical Park
2. The Black Rabbit Site has a State Preservation Restriction.

10.5.4 Reconnaissance Survey

The 2006 reconnaissance archaeological survey found that a few relatively undisturbed portions of Hanscom Field exist, including tracts of woodland peripheral to the runways, terminal, and supporting facilities. These areas generally contain secondary growth woodlands with both deciduous and coniferous species of trees. Interspersed are wetland areas and some drainage improvements/alterations to the existing waterways.

Most of Hanscom Field, however, has been previously disturbed by construction. Disturbance activities include landfilling, installation of utilities, and construction of buildings, parking lots, roadways, and runways. Areas of high pre-contact archaeological sensitivity in the project area include previously undisturbed, dry, level areas located adjacent to the natural brooks and wetlands in the peripheral portions of the project area. The extreme southern portion of Hanscom Field and the intersections along Route 2A have moderate to high archaeological sensitivity for post-contact resources associated with the April 19, 1775 engagement along Battle Road, now part of the MMNHP.

The 2012 field walkover noted one area where new development has occurred since the 2006 reconnaissance survey. The Edge Sports Center opened in 2007 and two outdoor turf fields are now located in the previous trailer park on the north side of Hartwell Road. There are currently two full size outdoor turf fields that are utilized for soccer, lacrosse and field hockey. During the 2006 survey, this portion of the North Airfield Area contained an existing trailer park campground facility adjacent to Hartwell Road. This portion of the project area was assigned high archaeological sensitivity for pre-contact period resources and moderate archaeological sensitivity for post-contact period resources, based on the presence of a wooded area immediately west of the trailer park. More detailed information collected as part of the 2012 ESPR update determined that the wooded area is located outside of the project area and that the portion of the Edge Sports Center located within the project area was constructed in the previously developed/disturbed trailer park. As a result of this updated information, this portion of the North Airfield was re-designated as a low sensitivity area for both pre and post-contact archaeological resources.

No other portions of the Hanscom Field study area or any areas managed by the Transportation Security Agency (TSA) (e.g. airside secure areas) have undergone new development since the 2006 reconnaissance survey and the sensitivity for these areas remains the same.

10.5.5 Proximity of Sites to Traffic Study Intersections

As presented in Table 10-12, a total of 27 archaeological sites have been documented within a 200 foot-radius at nine of the 16 traffic study intersections. This total includes 15 pre-contact and 12 post-contact period sites. Twenty of the twenty-seven recorded sites are located within the boundaries of the MMNHP. Thirteen of the intersections were determined to have areas that are undisturbed, defined as no obvious signs of previous ground disturbance, except for the immediate intersection right-of-way. The condition of three intersection areas was assessed as unknown due to intersection improvements.

10.6 Minute Man National Historical Park

MMNHP is operated by the NPS. Since 1959, when MMNHP was created within the towns of Concord, Lexington, and Lincoln, the Park and Hanscom have been neighbors. As two regionally and nationally significant land uses, MMNHP and Hanscom Field encounter both shared investment in the improvement of the region and the need for visitor access. Massport met with the NPS on May 23, 2013 to solicit input on the *2012 ESPR* and communicate periodically to discuss Hanscom Field and its relationship to MMNHP.

10.6.1 Visitation Levels

More than one million people visit the facilities and attend the programs of MMNHP annually. The park is recognized as an important asset to the region and the nation. The park sits in the suburbs of a major metropolitan area with modern, vibrant and expanding residential, industrial and commercial sectors. While the park is open year-round, its main season is the seven-month period between April and October.

Major attractions are the North Bridge area in Concord and the Visitor Center off North Great Road in the Battle Road Park unit in Lincoln. Two parking lots at the North Bridge unit and one at the Visitor Center accommodate auto and bus parking; six other parking lots are located in the Park. The early spring, starting with Patriot's Day in Massachusetts, represents the first major influx of park visitors. Fall foliage season is the other very popular period. The park is open daily from sun-up to sundown, but buildings are generally open from 9 a.m. to 5 p.m.

10.6.2 Overview of Park

MMNHP is the largest National and State Registers resource in the vicinity of Hanscom Field. It consists of four discontinuous sections referred to as the Battle Road, Wayside, North Bridge and Barrett Farm Units, which are illustrated in Figures 10-4 and 10-5. The Col. Barrett Farm Unit in Concord, which is individually listed in the National Register as the Col. James Barrett House, is an addition to the MMNHP since the *2005 ESPR*. It was authorized in 2009 and completed in 2012. The park covers approximately 967 acres along Route 2A in Concord, Lexington, and Lincoln and off Monument Street in Concord, plus an additional 3.4 acres in the new Barrett Farm Unit.

When Congress created MMNHP in 1959, Hanscom Field had already been operating for 18 years, having been established by the Commonwealth in 1941. A portion of the Congressional boundaries of the park, comprising 50 acres in Lincoln, is within Massport land at the southwest area of Hanscom Field. There are no buildings or structures on this wooded parcel.

Table 10-12 Archaeological Resources at Traffic Study Intersections

Intersection	Archaeological Sites[1]	Condition[2]
#1) Route 4-225/Hartwell Ave. (Lexington)	None documented	Unknown/intersection improvements
#2) Mass. Ave./Rte 2A (Lexington)	None documented	Unknown/intersection improvements
#3) Old Mass. Ave./Rte. 2A (Lexington)	19-MD-688 (MMNHP) LEX-HA-13 (MMNHP) LEX-HA-15 (MMNHP)	Undisturbed
#4) Airport Rd./Rte. 2A (Lexington)	19-MD-684 (MMNHP) 19-MD-685 (MMNHP) 19-MD-688 (MMNHP) LEX-HA-12 (MMNHP) LEX-HA-13 (MMNHP)	Undisturbed
#5) Hanscom Dr./Old Bedford Rd. (Lincoln)	19-MD-587	Unknown/intersection improvements
#6) Hanscom Dr./Rte. 2A (Lincoln)	19-MD-678 (MMNHP) 19-MD-679 (MMNHP) 19-MD-682 (MMNHP) 19-MD-683 (MMNHP)	North Side = disturbed (recent construction for pedestrian underpass); South Side= Undisturbed
#7) Bedford Rd./Rte. 2A (Lincoln)	19-MD-681 (MMNHP) 19-MD-996 (MMNHP) LIN-HA-54 (MMNHP)	Undisturbed
#8) Cambridge Tpke. Cut-Off/Brooks Rd./ Rte. 2A (Concord/Lincoln)	19-MD-997 (MMNHP) Samuel Brooks House Site (MMNHP) Brooks Hill Fight Sight (MMNHP)	Undisturbed
#9) Old Bedford Rd./Lexington Rd. (Concord)	19-MD-111 (MMNHP) 19-MD-180 (MMNHP) CON-HA-26	Undisturbed
#10) Old Bedford Rd./Virginia Rd. (Concord)	None documented	Undisturbed; possible house lot/landscaping disturbance
#11) Old Bedford Rd./Rte. 62 (Concord)	None documented	Mostly Undisturbed Possible House Lot/Landscaping Disturbance West=Recently Disturbed
#12) Hartwell Rd./Rte. 62 (Bedford)	None documented	Undisturbed; possible house lot/landscaping disturbance
#13) South Rd./Hartwell Rd. (Bedford)	None documented	Undisturbed; possible house lot/landscaping disturbance
#14) Rte. 4-225/Rte. 62 (Bedford)	None documented	Undisturbed; possible house lot/landscaping disturbance
#15) Rte. 4-225/Springs Rd./South Rd. (Bedford)	19-MD-1013 BED-HA-05	West Side= Undisturbed; possible house lot/landscaping disturbance;

Intersection	Archaeological Sites[1]	Condition[2]
	BED-HA-09 BED-HA-10 Old Bedford Center NRDIS Bedford Local Historic District	East Side = Disturbed/modern period construction
#16) South Rd./Loomis St./Railroad Ave. (Bedford)	BED-HA-21 Bedford Depot Park NRDIS	Some disturbance/intersection improvements/parking lots

Notes:
1. MMNHP – Minute Man National Historical Park; NRDIS – National Register Historic District.
2. Undisturbed (no obvious signs of previous disturbance) except for immediate intersection right-of-way.

MMNHP itself and a number of individual historic properties within the Park are historic resources of national significance that are designated National Historic Landmarks. The Park is nationally significant as the site of the Battle of Concord, one of the two battles that marked the beginning of the Revolutionary War; for its association with prominent literary figures of the nineteenth and twentieth centuries; and as one of the earliest places in the nation to be commemorated. The Park was created to " . . . provide . . . for the preservation and interpretation of historic sites, structures, and properties lying along the entire route of battle" in April 1775.

10.7 Battle Road Unit

The Battle Road Unit, the largest unit, covers approximately 849 acres and stretches five miles along present-day Route 2A, consisting of Lexington Road (Concord), North Great Road (Lincoln), and Massachusetts Avenue (Lexington). At the time of the battle, as today, the road was a much traveled regional route that linked the town of Concord with Cambridge, Boston, and the sea. Some sections of the Battle Road have been restored to their unpaved appearance, while others form parts of the paved automobile road (Route 2A). The original route is readily discernible and is lined almost continuously with stone walls in the central and eastern parts of the park unit. Hanscom Field, Hanscom AFB, and its associated military housing abut the northern boundary of the eastern half of the Battle Road Unit. Modern residential developments line much of the southern boundary, and the interstate highway and commercial/office developments mark the east terminus at Route 128/I-95.

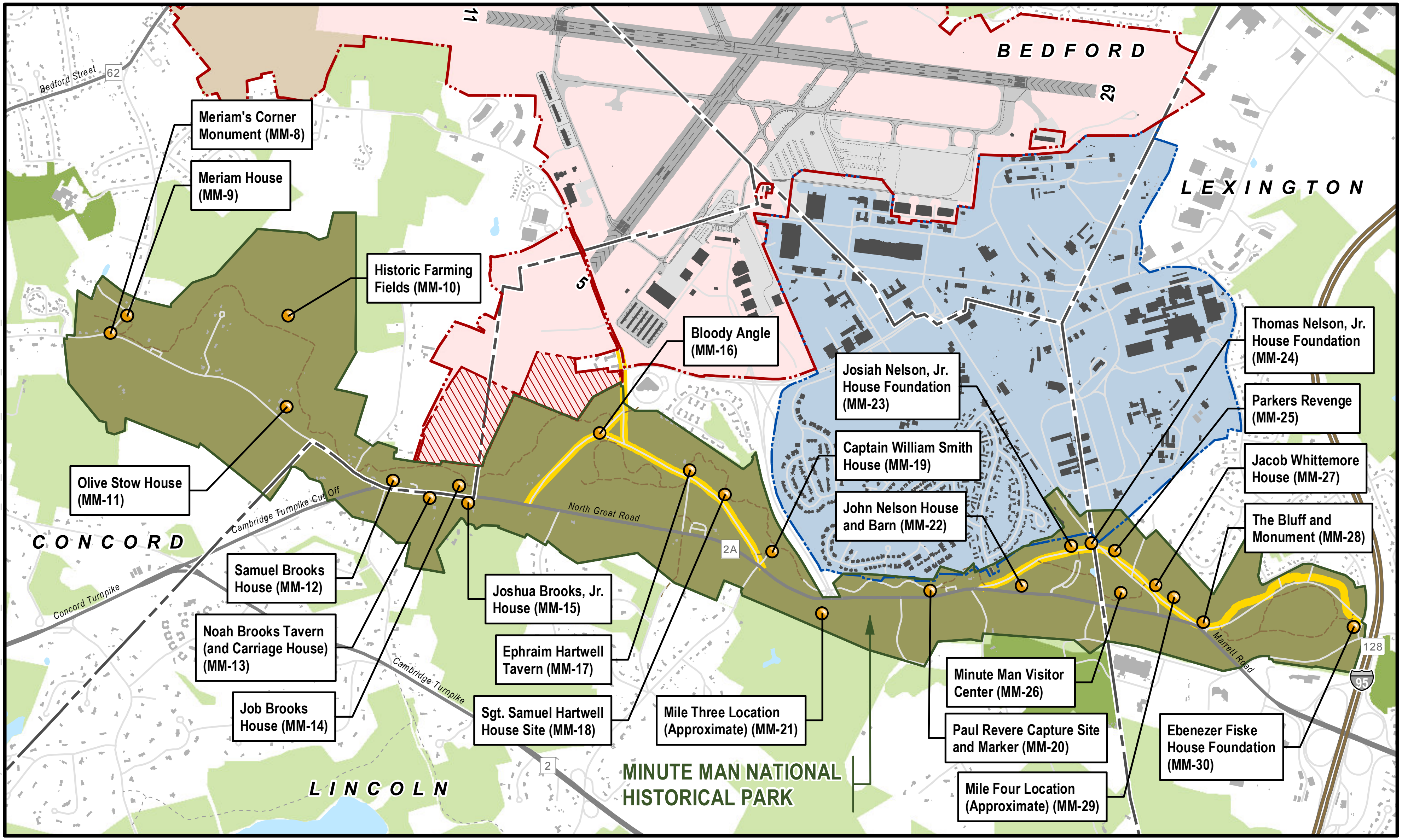
Six of the 16 traffic study intersections are located within the Battle Road Unit of the MMNHP. All of the areas around the intersections encompass historic farming and/or wooded landscapes, and five contain historic buildings.

10.8 The Wayside Unit

The Wayside Unit is the smallest section, containing approximately six acres on the north side of Route 2A in Concord. This unit centers around The Wayside, the home of three notable American authors: Louisa May Alcott, Nathaniel Hawthorne, and Margaret Sidney.

10.9 North Bridge Unit

The North Bridge Unit contains approximately 112 acres in Concord and is crossed by the Concord River. It contains the North Bridge where, on April 19, 1775, Colonial militia men fired the famous "shot heard 'round the world." The surrounding tranquil, commemorative landscape includes Daniel Chester French's Minute Man Statue.



Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure10-4_Historic_MMNHP_Unit.mxd

North

0 1,000 2,000 Feet

Minute Man National Historical Park Resource

Hanscom Field Property Boundary

Massport Property within MMNHP Congressional Boundary

Hanscom AFB Property Boundary

Municipal Boundary

Historic Battle Road

Battle Road Trail

Interstate

Highway

Road

Active Rail Service

MMNHP Boundary

Open Space Non-protected

Open Space Protected in Perpetuity

Open Water

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

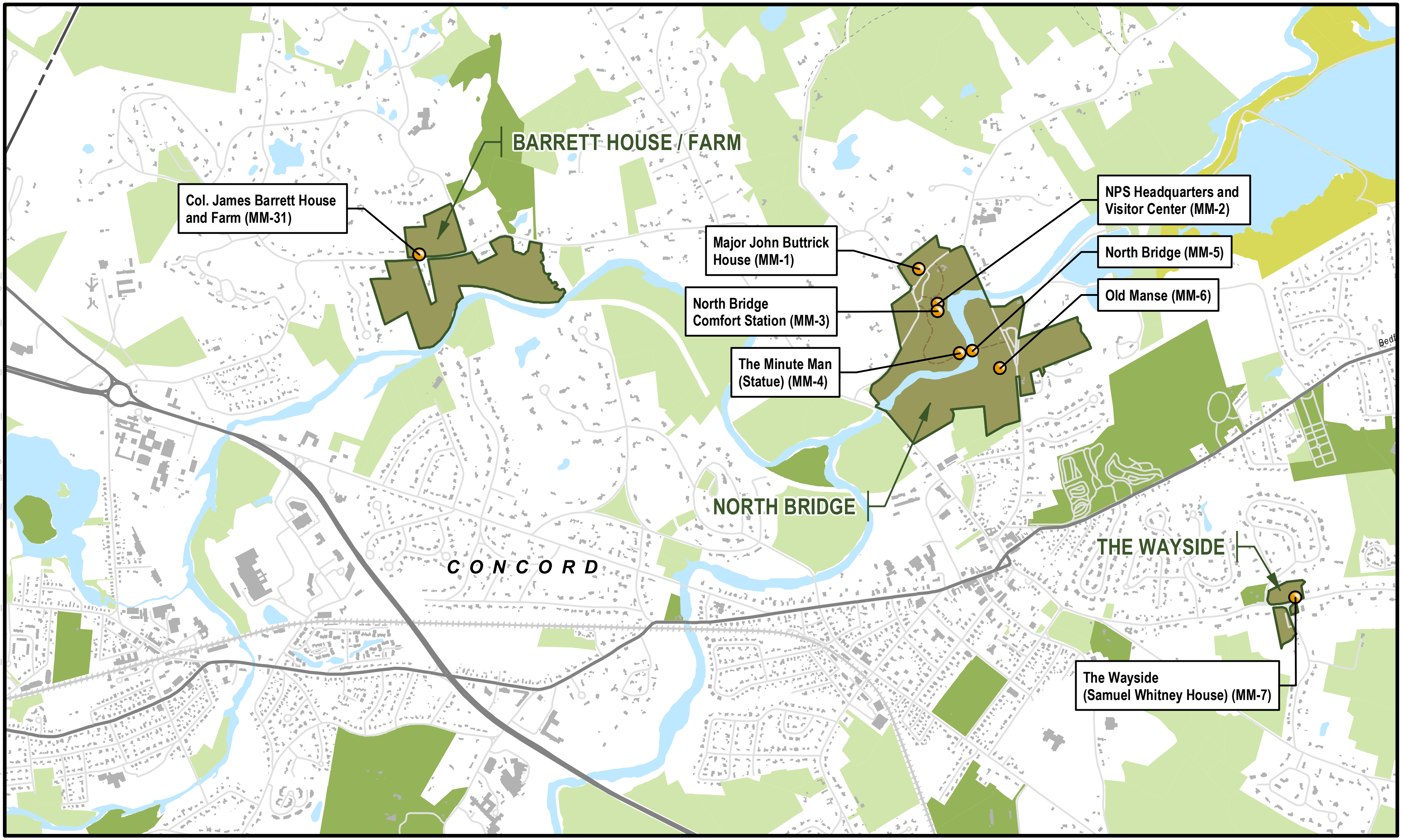
massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Historic Resources
MMNHP Battle Road Unit

Figure **10-4**



North

0 1,000 2,000 Feet

Minute Man National Historical Park Resource

Municipal Boundary

Interstate

Highway

Road

Active Rail Service

MMNHP Boundary

Great Meadows

Open Space Non-protected

Open Space Protected in Perpetuity

Open Water

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013;
MassGIS (Community Boundaries), March 5, 2013;
PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure10-5_Historic_MMNHP_NBridge_Unit.mxd

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Historic Resources
MMNHP North Bridge and
Barrett Farm

Figure **10-5**

10.10 Barrett Farm Unit

The Barrett's Farm Unit contains the Col. James Barrett Farm and 3.4 acres of land at 448 Barrett's Mill Road in Concord. Built in 1705, it was the house of James Barrett, a Colonel of the Concord, Massachusetts Militia during the Battles of Lexington and Concord on April 19, 1775, and a site where colonial militia munitions were stored.

10.11 Park Environs and Landscape Features

The MMNHP landscapes and habitats are dominated by forests that cover approximately 500 acres, including about 200 acres of forested wetlands. Non-forested wetlands, including several ponds, constitute approximately 180 acres within the park. Open meadows and fields cover an additional 250 acres, including approximately 100 acres that are farmed under the park's agricultural leasing program. Shrublands characterize the interface of fields and forests. The remainder of the park contains developed areas, including roads, parking lots, and buildings.

The park today is generally characterized by low-density residential development set in a landscape of open pastures, interspersed with woodland and marshes. However, as noted in the updated National Register nomination dated 2001, areas within the present-day park underwent significant change between 1775 and 1959. The area remained agricultural well into the nineteenth century, but intensive residential development occurred as the area became part of Boston's commuting community during the early and mid-twentieth century. The improvement of existing roads, such as Route 2 and Route 2A for the automobile in the 1920s and 1930s and also the creation of Route 128/I-95 regional highway in the 1950s, supported local growth. This suburbanization trend continues today around the park. Within the park, as part of its mission to preserve and interpret individual resources that contribute to understanding the site’s historical events, the NPS removed approximately 200 structures and nearly 100 percent of commercial development. These reclaimed open spaces provide a backdrop for the remaining historical resources.

10.12 Historic and Archaeological Resources in Minute Man National Historical Park

Included in the MMNHP boundaries are numerous historic buildings, structures, sites, and landscapes. Many of the key historic resources and areas within the park are shown on Figures 10-4 and 10-5 and are summarized in Table 10-13. The NPS completed a comprehensive inventory of all resources in MMNHP as part of an updated National Register nomination.[75] The NPS inventory identified a total of 105 resources that contribute to the historic significance of the park, as well as 24 resources that do not contribute, primarily due to their recent age. The Col. James Barrett Farm has been added to this list as part of the *2012 ESPR* update. The complete NPS inventory for the park is included in Appendix G.

Extant historic farming fields in the park are dominantly clustered at the west end of the Battle Road Unit between the Farwell Jones and the Olive Stow houses and Meriam’s Corner in Concord. Smaller fields also remain at the Trainor field and Fiske Hill fields in Lexington, and at fields near Bloody Angle and the Hartwell Tavern in Lincoln.

[75]Harrington et al. (PAL), Minute Man National Historical Park National Register of Historic Places Nomination, 2001

An archaeological overview and assessment of MMNHP, with emphasis on the Battle Road Unit, was completed in 2005.[76] This study reports that MMNHP contains documented archaeological resources that date from approximately 9,000 years before present to the early twentieth century. More than 100 prehistoric and historic period archaeological sites have been identified within the park, and there is a high probability of additional sites being present in most areas.

10.13 General Management Plan

The *2000 ESPR* reported that the 1989 General Management Plan (GMP) for MMNHP had largely been implemented. These facilities include new parking areas to better control traffic and accommodate visitors, and improvements by the Massachusetts Highway Department to the appearance of the paved sections of the Battle Road on Lexington Road and Route 2A, as well as installation by NPS of appropriate, limited signage, landscaping and rebuilt stonewalls that enhance the visual experience of the park.

Table 10-13 Key Resources in the Minute Man National Historical Park

Town	MHC Number	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status[1]
BATTLE ROAD UNIT						
Concord, Lexington, Lincoln	NA 2	Multiple	Along and off Massachusetts Avenue and Lexington Road	Battle Road	18th-20th centuries	Contributing
Concord, Lexington, Lincoln	NA	Multiple	Off Massachusetts Avenue and Lexington Road	Battle Road Trail	1996-2001	Non-Contributing
Concord	NA	MM-10	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Concord	CON.9015	MM-8	Old Bedford Road	Meriam's Corner Monument	1885	Contributing
Concord	CON.350	MM-9	34 Old Bedford Road	Meriam House	ca. 1705, ca. 1725	Contributing
Concord	CON.357	MM-11	965 Lexington Road	Olive Stow House/Farwell Jones House/Carty Barn	Colonial - ca. 1760	Contributing
Concord	CON.358	MM-12	1175 Lexington Road	Samuel Brooks House	ca. 1692-1728	Contributing
Lexington	LEX.929	MM-28	Old Massachusetts Avenue and Wood Street	Bluff Monument	1885	Contributing
Lexington	NA	MM-30	Old Massachusetts Avenue and Wood Street	Ebenezer Fiske House Foundation	ca. 1729-late19th century	Contributing
Lexington	NA	MM-29	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Lexington	LEX.618 LEX.1536	MM-27	21 Marrett Street	Jacob Whittemore House/John Muzzey House and Hargrove/Whittemore Barn	Georgian-1745 (Barn-1850)	Contributing
Lexington	NA	MM-26	Massachusetts Avenue	Minute Man Visitors Center	Modern-1976	Non-Contributing
Lexington	NA	MM-25	Off Massachusetts Avenue, Fiske Hill	Parkers Revenge	1775	Contributing

[76]Herbster (PAL), Archeological Overview and Assessment, Minute Man National Historical Park, Concord, Lincoln, and Lexington, Massachusetts, 2005

Town	MHC Number	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status[1]
			and Concord Hill			
Lincoln	NA	MM-16	Off Lexington Road	Bloody Angle	1775	Contributing
Lincoln	LIN.70	MM-19	Virginia Road	Captain William Smith House	Colonial – ca. 1750	Contributing
Lincoln	LIN.66	MM-17	Virginia Road	Ephraim Hartwell Tavern	Colonial-1733	Contributing
Lincoln	NA	MM-21	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Lincoln	NA	MM-14	North Great Road	Job Brooks House	Colonial-1740	Contributing
Lincoln	LIN.170 LIN.171	MM-22	200 Massachusetts Avenue	John Nelson House and Barn	Federal-1808, 1810	Contributing
Lincoln	LIN.65	MM-15	37 North Great Road	Joshua Brooks, Jr. House	Federal-1780	Contributing
Lincoln	LIN.929	MM-23	Nelson Road	Josiah Nelson, Jr. House Foundation	ca. 1775	Contributing

Notes:
1. NR – National Register of Historic Places; SR – State Register of Historic Places
2. N/A – Not Applicable
3. Old Manse and The Wayside are individually listed National Historic Landmarks that are also located within MMNHP

Table 10-13 Key Resources in the Minute Man National Historical Park (continued)

Town	MHC Number	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status[1]
BATTLE ROAD UNIT (continued)						
Lincoln	LIN.64	MM-13	33 North Great Road	Noah Brooks Tavern (and Carriage House)	Federal- ca. 1798	Contributing
Lincoln	LIN.940	MM-20	Massachusetts Avenue	Paul Revere Capture Site and Marker	pre 1902	Contributing
Lincoln	LIN.69	MM-18	Virginia Road	Sgt. Samuel Hartwell House Site	1693-1716; burned 1968; shelter 1986	Contributing
Lincoln	LIN.941	MM-24	Nelson Road	Thomas Nelson, Jr. House Foundation	1700-1750	Contributing
NORTH BRIDGE UNIT						
Concord	CON.343	MM-1	231Liberty Street	Major John Buttrick House	ca. 1715; 19th century alterations	Contributing
Concord	CON.941	MM-4	Liberty Street	The Minuteman (Statue)	1875	Contributing
Concord	CON.940	MM-5	Monument Street	North Bridge	1956	Contributing
Concord	NA	MM-3	Monument Street	North Bridge Comfort Station	No Style-1984	Non-Contributing
Concord	CON.347	MM-6	269 Monument Street	Old Manse 3	Colonial-1769-1770	Contributing
Concord	CON.344	MM-2	174 Liberty Street	Steadman Buttrick House (NPS Headquarters and Visitor Center)	Colonial Revival- 1911	Contributing
WAYSIDE UNIT						
Concord	CON.171	MM-7	455 Lexington Road	The Wayside 3 (Samuel Whitney House)	Colonial/ Victorian Eclectic-1716-17; altered mid-1840s; 1860/70	Contributing
BARRETT FARM UNIT						
Concord	CON.256	--	448 Barrett's Mill Road	Col. James Barrett Farm	Colonial-1705	Contributing

Notes:

Town	MHC Number	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status[1]
1. NR – National Register of Historic Places; SR – State Register of Historic Places 2. N/A – Not Applicable 3. Old Manse and The Wayside are individually listed National Historic Landmarks that are also located within MMNHP						

Table 10-13 Key Resources in the Minute Man National Historical Park (continued)

Town	MHC Number	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status[1]
BATTLE ROAD UNIT						
Concord, Lexington, Lincoln	NA 2	Multiple	Along and off Massachusetts Avenue and Lexington Road	Battle Road	18th-20th centuries	Contributing
Concord, Lexington, Lincoln	NA	Multiple	Off Massachusetts Avenue and Lexington Road	Battle Road Trail	1996-2001	Non-Contributing
Concord	NA	MM-10	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Concord	CON.9015	MM-8	Old Bedford Road	Meriam's Corner Monument	1885	Contributing
Concord	CON.350	MM-9	34 Old Bedford Road	Meriam House	ca. 1705, ca. 1725	Contributing
Concord	CON.357	MM-11	965 Lexington Road	Olive Stow House/Farwell Jones House/Carty Barn	Colonial - ca. 1760	Contributing
Concord	CON.358	MM-12	1175 Lexington Road	Samuel Brooks House	ca. 1692-1728	Contributing
Lexington	LEX.929	MM-28	Old Massachusetts Avenue and Wood Street	Bluff Monument	1885	Contributing
Lexington	NA	MM-30	Old Massachusetts Avenue and Wood Street	Ebenezer Fiske House Foundation	ca. 1729-late19th century	Contributing
Lexington	NA	MM-29	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Lexington	LEX.618 LEX.1536	MM-27	21 Marrett Street	Jacob Whittemore House/John Muzzey House and Hargrove/Whittemore Barn	Georgian-1745 (Barn-1850)	Contributing
Lexington	NA	MM-26	Massachusetts Avenue	Minute Man Visitors Center	Modern-1976	Non-Contributing
Lexington	NA	MM-25	Off Massachusetts Avenue, Fiske Hill and Concord Hill	Parkers Revenge	1775	Contributing
Lincoln	NA	MM-16	Off Lexington Road	Bloody Angle	1775	Contributing
Lincoln	LIN.70	MM-19	Virginia Road	Captain William Smith House	Colonial – ca. 1750	Contributing
Lincoln	LIN.66	MM-17	Virginia Road	Ephraim Hartwell Tavern	Colonial-1733	Contributing
Lincoln	NA	MM-21	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Lincoln	NA	MM-14	North Great Road	Job Brooks House	Colonial-1740	Contributing
Lincoln	LIN.170 LIN.171	MM-22	200 Massachusetts Avenue	John Nelson House and Barn	Federal-1808, 1810	Contributing
Lincoln	LIN.65	MM-15	37 North Great Road	Joshua Brooks, Jr. House	Federal-1780	Contributing
Lincoln	LIN.929	MM-23	Nelson Road	Josiah Nelson, Jr. House Foundation	ca. 1775	Contributing
Notes: 1. NR – National Register of Historic Places; SR – State Register of Historic Places						

2. N/A – Not Applicable
3. Old Manse and The Wayside are individually listed National Historic Landmarks that are also located within MMNHP

Table 10-13 Key Resources in the Minute Man National Historical Park (continued)

Town	MHC Number	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status[1]
BATTLE ROAD UNIT (continued)						
Lincoln	LIN.64	MM-13	33 North Great Road	Noah Brooks Tavern (and Carriage House)	Federal- ca. 1798	Contributing
Lincoln	LIN.940	MM-20	Massachusetts Avenue	Paul Revere Capture Site and Marker	pre 1902	Contributing
Lincoln	LIN.69	MM-18	Virginia Road	Sgt. Samuel Hartwell House Site	1693-1716; burned 1968; shelter 1986	Contributing
Lincoln	LIN.941	MM-24	Nelson Road	Thomas Nelson, Jr. House Foundation	1700-1750	Contributing
NORTH BRIDGE UNIT						
Concord	CON.343	MM-1	231Liberty Street	Major John Buttrick House	ca. 1715; 19th century alterations	Contributing
Concord	CON.941	MM-4	Liberty Street	The Minuteman (Statue)	1875	Contributing
Concord	CON.940	MM-5	Monument Street	North Bridge	1956	Contributing
Concord	NA	MM-3	Monument Street	North Bridge Comfort Station	No Style-1984	Non-Contributing
Concord	CON.347	MM-6	269 Monument Street	Old Manse 3	Colonial-1769-1770	Contributing
Concord	CON.344	MM-2	174 Liberty Street	Steadman Buttrick House (NPS Headquarters and Visitor Center)	Colonial Revival- 1911	Contributing
WAYSIDE UNIT						
Concord	CON.171	MM-7	455 Lexington Road	The Wayside 3 (Samuel Whitney House)	Colonial/ Victorian Eclectic-1716-17; altered mid-1840s; 1860/70	Contributing
BARRETT FARM UNIT						
Concord	CON.256	--	448 Barrett's Mill Road	Col. James Barrett Farm	Colonial-1705	Contributing

Notes:
1. NR – National Register of Historic Places; SR – State Register of Historic Places
2. N/A – Not Applicable
3. Old Manse and The Wayside are individually listed National Historic Landmarks that are also located within MMNHP

The NPS has indicated to Massport that annual visitations at MMNHP are currently stabilized at levels of about one million, and that little, if any, expansion of park boundaries or buildings is planned. Individual programs at various sites within the park continue to be advertised to attract audiences, but general promotions to encourage large increases in total attendance are not part of the current or future management plans.

In 2005, the NPS had begun to develop the preliminary scope for a new General Management Plan. This planning process is ongoing. The scope of the plan and ongoing work in the park focuses on several areas. The preservation, rehabilitation, and adaptive reuse of historic structures addresses cyclical and deferred maintenance needs and should improve the visitor experience. Landscape enhancements include supporting active agricultural uses and incorporating interpretive opportunities through clearing of historic farming fields and leasing them for cultivation.

The NPS was also completing review of archaeological resources and conducting mammal and vegetative studies. An important focus of the plan is transportation, safety, and access for visitors and employees in the Battle Road Unit, which comprises 80 percent of the park. The NPS anticipates that there will be more uses, special events, and access needs at MMNHP facilities in future years that may exceed existing capacity. The NPS will be evaluating pedestrian crossing needs on Route 2A to connect existing town paths and pedestrian patterns with the MMNHP trail system in the safest possible locations.

Several projects being planned in the park have been completed since the *2005 ESPR*: the rehabilitation of the Jacob Whitmore House and Barn as an educational center, continuing efforts to restore historic fields and vistas, and restoration of the stream feeding Elm Brook near the Noah Brooks Tavern. Restoration of the cultural landscape at the Wayside Tavern is nearly complete.

10.13.1 Soundscape Goals for the Minute Man National Historical Park

At the time of the *2000 ESPR*, the NPS headquarters was initiating preparation of a generic model document that would provide a nationwide approach to identifying desired noise criteria in national parks. Park Managers would use the guidance in developing their own Soundscape Management Plans, each tailored to the unique activities, land uses and environmental needs of their individual parks. A Draft Manual for Conducting Acoustics and Soundscape Studies in National Parks was released in August 2005. In addition, nationally, the NPS explored the issue of aircraft overflights in the 1994 Report on Effects of Aircraft Overflights on the National Park System, which recommended the continuation of the federal interagency working group that is described in the next section. The NPS issued Director’s Order 47 (DO47) “Soundscape Preservation and Noise Management” in December 2000.

The NPS has completed an internal draft soundscape plan for MMNHP in 2010, including noise monitoring with professional and volunteer staff. Sound monitoring was conducted in 2008-09 at MMNHP by the NPS Natural Sounds Division and is included in the internal draft plan. The scope for the soundscape plan at MMNHP incorporates aspects of approaches that have been used at other NPS properties.

10.13.2 Interagency Working Group

The federal Interagency Working Group was established by the U.S. Department of Transportation, the U.S. Department of the Interior and the Advisory Council on Historic Preservation. A local Regional Working Group includes participation by the FAA, Federal Highway Administration and the National Park Service. Massport is not a member of the group. The Volpe Transportation Systems Center facilitates meetings of the Regional Working Group. The group meets locally on an as needed basis to maintain relationships among the member federal agencies. The NPS has indicated that the group is ongoing.

10.13.3 Current Status and Future Concerns

At the May 2013 coordination meeting between Massport and the NPS, the MMNHP Superintendent indicated ongoing concerns regarding how noise from aircraft affects park programming. Massport and the NPS discussed the Fly Friendly program instituted since the *2005 ESPR* with a noise abatement program and voluntary measures.

The NPS noted the trend at Hanscom Field for continued business air travel in leased or company owned jet aircraft. Business jets are general aviation traffic and part of Hanscom Field's role as a reliever for

Logan Airport. Noise from these and other aircraft taking off and landing, especially to the west and southwest from Hanscom Field, affects the North Bridge Unit, which lies nearly in line with Hanscom Field's east-west runway (Runway 11-29). Aircraft leaving or approaching Hanscom Field in this area can affect the intended park experience. Single engine piston aircraft operations, representing proportionately more take-offs and landings, have less effect because these aircraft generally make less noise over this area.

The analysis of noise exposure levels created by aircraft flying over the MMNHP includes: 65 and 55 dB DNL contours; Time Above 65 dBA and Time Above 55 dBA contours; and DNL, TA65, and TA55 calculations at 30 noise analysis locations in the park. The FAA considers 65 dBA as the onset of significant impact. In 2012, none of the noise analysis locations exceeded 55 dB DNL.

The NPS is also concerned about safety and safe access for employees and visitors along Route 2A. Their goal of protecting and restoring Battle Road includes confining adjacent Route 2A traffic to two lanes and establishing an appropriate visual environment for the visitor that is compatible with the ambiance of the park. Reducing congestion is important to the NPS as well. Among the concerns identified in their GMP regarding Route 2A traffic is the potential for traffic in excess of what the road is designed to handle. Redistributing parking facilities within the park has been effective, as have measures to keep the Battle Road portion of Route 2A at two lanes except at major intersections.

Studies conducted for the NPS considered the appropriate level of traffic volumes on Route 2A that would be acceptable from the perspective of a visitor's experience at the MMNHP[77] and alternative transportation options.[78] These studies reviewed approaches that would have a beneficial effect on the visitor experience by encouraging access rather than mobility. More recently, MAPC has coordinated the formation of a working group to develop a corridor management plan and possible designation of Route 2A as a Scenic Byway. The NPS also updated information on the status of individual buildings and landscapes within the park, including the addition of the Barrett Farm Unit. Other projects completed since 2005 include rehabilitation of the North Bridge and surrounding landscape, rehabilitation of the Jacob Whitmore House and installation of interactive educational exhibits, restoration of the John Nelson House and Barn, installation of new exhibits and video program in the North Bridge Visitor Center, rehabilitation of the historic Buttrick Gardens overlooking the North Bridge, restoration of 58 acres of historic fields and vistas in the Battle Road unit, and "daylighting" restoration of the formerly buried stream at Sunnyside Lane that feeds Elm Brook.

10.13.4 Environmental Effects in Minute Man National Historical Park

The noise analysis for the *2012 ESPR* has been refined since the *2005 ESPR*. Thirty-one locations within MMNHP were evaluated as noise analysis locations. The analysis of 2012 conditions indicates that noise exposure levels created by aircraft flying over MMNHP ranged from 45 dB to 52 dB. The highest level (51.4 dB) occurred at the Noah Brooks Tavern (and Carriage House) (MM-13). No areas of the MMNHP were within the 65 dB DNL contour in 2005 or 2012. No areas of the MMNHP were within the 55 dB DNL contour in 2012 as compared to 1.7 acres in 2005. TA65 values ranged from one to nine minutes at the thirty noise analysis locations, with the highest levels occurring at The Wayside-Samuel Whitney

[77]John A. Volpe National Transportation Systems Center, Minute Man National Park: Rte 2A Traffic Analysis and Its Impact on the Park's Visitor Experience, June 2002
[78]John A. Volpe National Transportation Systems Center, Minute Man Alternative Transportation Evaluation, April 2005

House (MM-7) and the Meriam House (MM-9). TA55 values ranged from 18 to 71 minutes, with the highest levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels.

In 2012, Hanscom Field traffic represented approximately four percent of the peak hour traffic on Route 2A. Only at one of the six traffic study intersections in the MMNHP (Hanscom Drive/Route 2A) did traffic associated with Hanscom Field represent more than ten percent of traffic movements.

As described in Chapter 8, Air Quality, all air pollutant concentrations are safely in compliance with health-based air quality standards. Therefore, this analysis concluded that no adverse air quality effects to historic resources including MMNHP are anticipated now or in future analysis years from activities at Hanscom Field.

10.13.5 Battle Road (Interpretative) Trail

The Battle Road Trail is an interpretive, multi-use trail that provides cycling, walking, and wheelchair access to the MMNHP's historical and natural resource areas. The route of the Battle Road Trail is shown on Figure 10-4. The stone-dust trail extends five and one-half miles from Fiske Hill in Lexington, through Lincoln, to Meriam's Corner in Concord. The trail contains 25-foot wide portions of the historic Battle Road from April 19, 1775 that are restored and linked together by seven-foot wide sections of trail that traverse landscapes that evoke the past. Other portions of the historic Battle Road Trail follow the route of today's Route 2A.

The DNL, TA65 and TA55 values at noise analysis locations along the Battle Road Trail were plotted in Figures 10-6 through 10-8. None of the five and one-half mile trail was within the 65 dB DNL contour in 2000 or 2005. None of the trail was within the 55 dB DNL contour in 2005 as compared to 0.1 miles in 2000. Figures 10-6 through 10-8 indicate that DNL and Time Above values are highest to the west of the Hartwell Tavern, reflecting the proximity of this area to runways at Hanscom Field. It should be noted that a visitor to the Battle Road portion of the park is also affected by the background noise of road traffic from Route 128/I-95 and Route 2A throughout most of the day, and that Hanscom Field-related vehicular traffic contributes approximately four percent to the traffic volumes on Route 2A.

As presented in Chapter 4, Airport Planning, Hanscom field is not visible from the Battle Road Trail with a few exceptions where the Air Traffic Control Tower may be seen. Figure 4-1 through 4-4 provide a visibility analysis at specific points along the trail in both a leaf-on and leaf-off condition.

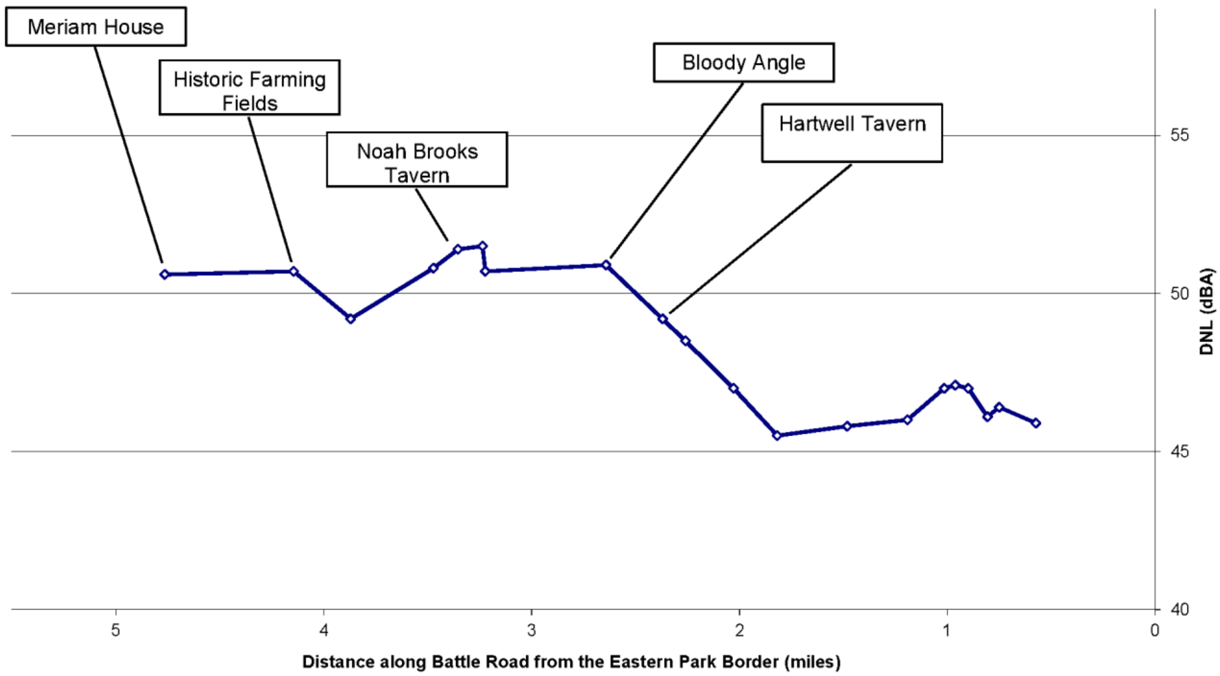


Figure 10-6 2012 DNL at Minute Man National Historic Park Battle Road Unit Location

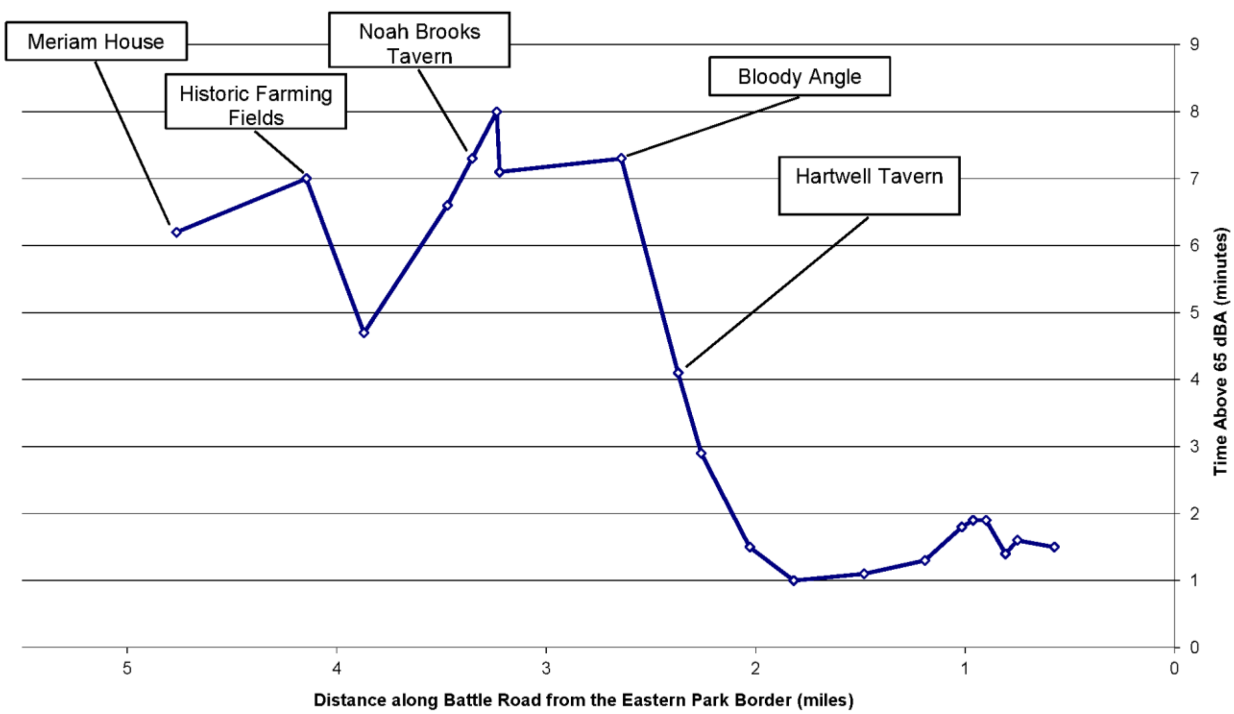


Figure 10-7 2012 Time Above 65 dBA at Minute Man National Historic Park Battle Road Unit Locations

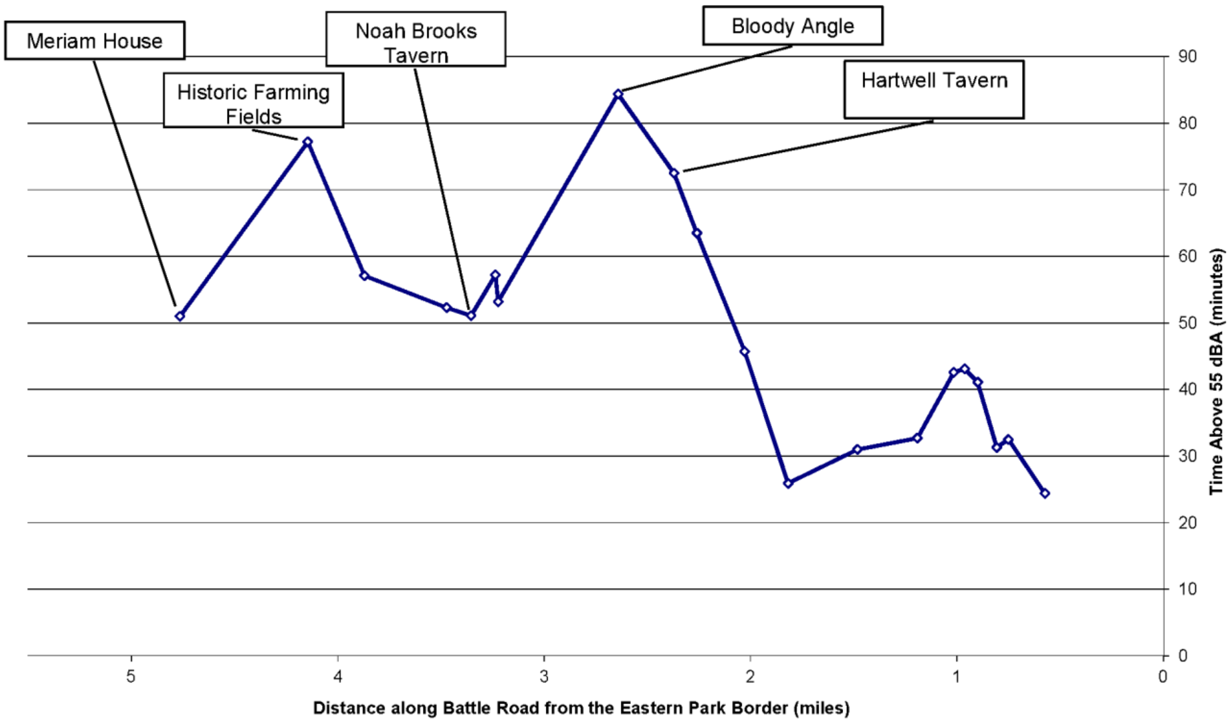


Figure 10-8 2012 Time Above 55 dBA at Minute Man National Historic Park Battle Road Unit Locations

10.14 Recreational and Conservation Lands

A review of the four towns' most recent Open Space and Recreation plans was undertaken to gain an understanding of the goals and objectives of the plans and any recommendations for acquiring additional lands and expanding recreational opportunities. Changes in recreational and conservation land since the *2005 ESPR* were identified through discussions with Town Planners and review of MassGIS database. Specific information on the Great Meadows National Wildlife Refuge is presented below, following the sections about the four towns. Recreational and conservation lands, and the Great Meadows National Wildlife Refuge, are shown in Figure 10-9. Additional information about the plans of the four towns is presented in Chapter 4, Airport Planning.

10.14.1 Bedford

The Town of Bedford, which abuts Hanscom Field along its northern boundary, includes 1,870 acres of public and private conservation lands, which represent 21percent of the town's total land area. 870 acres are owned and managed by the Town through its Conservation Commission with assistance from a volunteer group of residents referred to as the Bedford Land Stewards, 672 acres are part of Great Meadows Wildlife Management Area, and the remainder comprises privately owned conservation lands.

The town's open space plan was most recently updated in 2004. The document emphasizes the importance of providing good linkages between historic, recreation and conservation resources throughout the town, and identifies athletic fields as a resource in need of greater consideration. It also includes a population analysis for recreational land use. The Open Space Goals identified in 2004 are listed below:

Goal 1: Preserve the small town New England character of Bedford.

Goal 2: Protect valuable water resources, aquifer recharge areas and unique wildlife habitat areas.

Goal 3: Enhance the potential of the Town's existing open space and conservation resources.

Goal 4: Preserve and protect historic and cultural properties and sites.

Goal 5: Preserve large tracts of undeveloped lands.

Goal 6: Develop and improve a network of trails, sidewalks and bikepaths between neighborhoods, public facilities, conservation and recreation lands and commercial areas.

Goal 7: Enhance the quality and variety of recreational opportunities, both passive and active, for all age groups and abilities in the Town of Bedford.

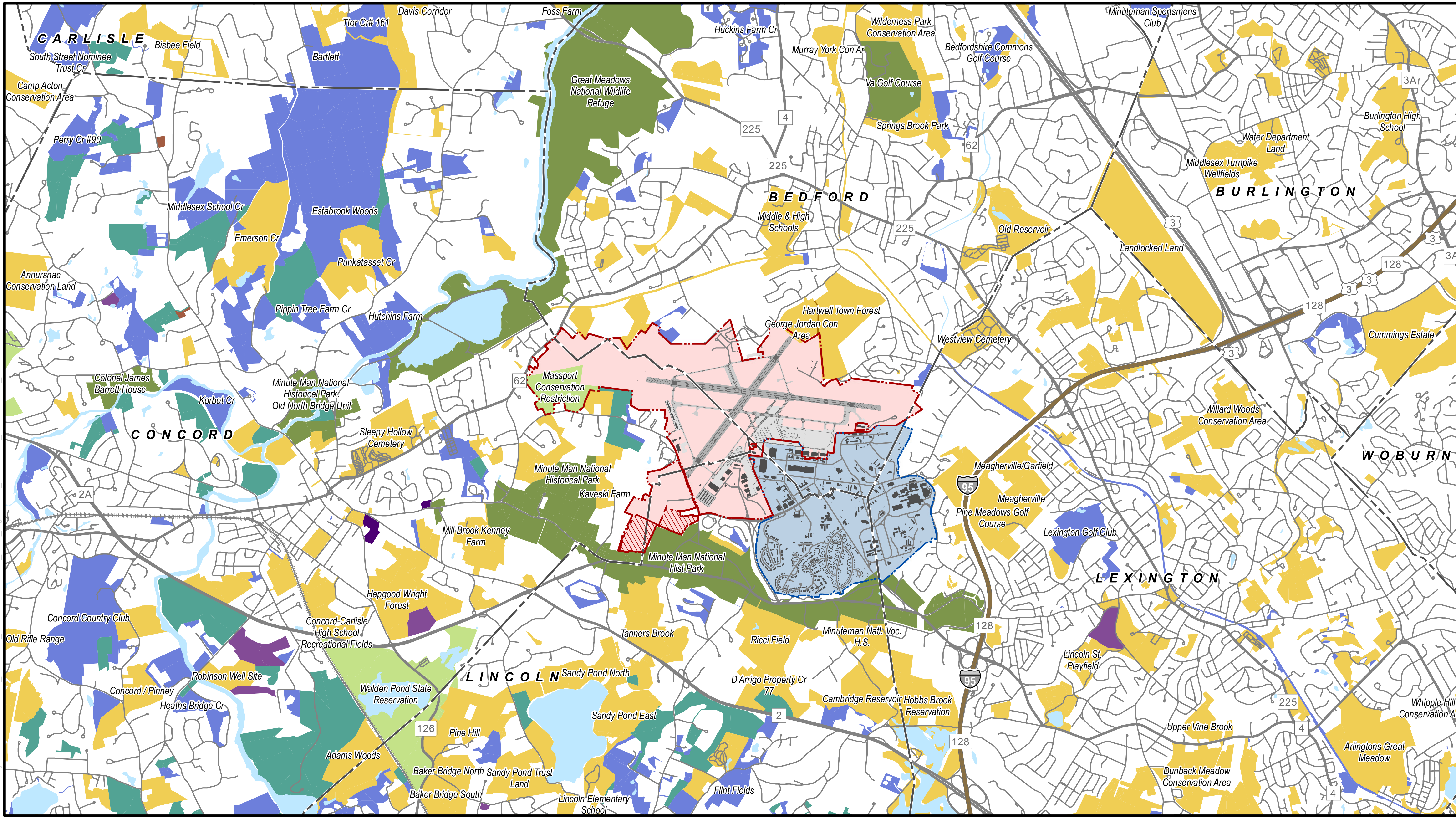
Three sites that currently abut Hanscom Field to the north include the Elm Brook Conservation Area, Hartwell Forest and the Jordan Conservation Area. The Town of Bedford purchased the Elm Brook Conservation Area (19 acres) in 1978 to protect valuable wetland resources, establish nature trails and provide a vegetative buffer for area neighborhoods. This site offers a potential trail link between the Minute Man Bikeway, which terminates in Bedford, and the existing east-west railroad bed.

The Hartwell Town Forest is Bedford's largest conservation area with over 118 acres of mature forest, open fields and wetland resources. Hartwell Town Forest is located between the Hartwell Road residential neighborhood and Hanscom Field's northern boundary. This was the first piece of town property to be dedicated for conservation purposes back in 1940. Key natural features include Hartwell Brook, wetlands, mature white pine forest, and open fields. In addition to its natural attributes, Hartwell is used for hiking and cross-country skiing along its extensive trail system. The forest, which includes two camping and picnic areas, is used for overnight camping by scout troops.

The Jordan Conservation Area (37 acres) is located adjacent to and west of Hartwell Town Forest. This site provides outdoor recreational opportunities including a nature trail system for local residents. The trail system extends through the Jordan Conservation Area from the Hartwell Forest and connects to the Air Force family campground on the north side of Hanscom Field. This site also includes several areas of diverse wildlife habitat. Approximately 0.1 acres of the Hartwell Town Forest/Jordan Conservation Area fell within the 65 dBA DNL contour in 2012 as compared to 4.8 in 2005.

Massport's Vegetation Management Plan (VMP) described vegetation obstructions including areas of the Hartwell Town Forest/Jordan Conservation Area. In the context of the VMP, Massport determined the extent of tree cutting required to remove obstructions in accordance with the FAA's airspace safety standards. In 2010, delineated wetlands in the area where work was required. In strict compliance with conditions issued by the Town's Conservation Commission, Massport hired an experienced forestry company to remove the obstructions with minimal impact on wetland resources. As part of the mitigation, Massport created new recreational trails across the northern part of Massport property to improve trail connections between Bedford and Concord Conservation Lands.

Other properties located near Hanscom include the Mary Putnam Webber Wildlife Preserve, the Vanderhoof Conservation Area, and the Dellovo Conservation area. These parcels abut the western edge of Hanscom Field and the Narrow-Gauge Rail-Trail in Bedford. The Open Space Plan notes that additional land acquisitions are planned in this area to provide for conservation land buffers along the Hanscom Field boundary.



North

0 3,500 7,000 Feet

Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary
Federal
State
Municipal
Privare for Profit
Public Non-Profit
Non-Profit
Land Trust
Conservation Organization
Open Water
Interstate
Highway
Road
Active Rail Service

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (Areas of Environmental Critical Concern, Protected and Recreational Open Space, Scenic Landscape Inventory), March 7, 2013;

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Recreational and Conservation Lands

Figure **10-9**

(This page intentionally left blank)

10.14.2 Concord

In 2004, the Town of Concord completed the Open Spaces and Recreation Plan.[79] The plan preceded the completion of the much larger Comprehensive Long Range Plan: A Vision for 2020.[80]The town established a committee to update the Open Space Plan which has convened meetings in 2013. The focus of both documents is on the continued preservation of Concord's historic and scenic character. The Open Spaces and Recreation Plan identifies 15 primary planning goals:

1. Incorporate the Open Spaces and Recreation Plan in Town and community decision-making.
2. Think regionally and work collaboratively with towns in Concord's region.
3. Protect Concord's large natural areas.
4. Protect Concord's large agricultural areas and farming.
5. Protect major wildlife and water-protection corridors.
6. Strengthen neighborhoods in Town.
7. Manage water-related issues to protect the Town's groundwater and surface water.
8. Protect and monitor Concord's streams, rivers, ponds and wetlands.
9. Monitor wildlife and biodiversity and protect key habitats.
10. Reduce the major impacts of Route 2.
11. Meet intensive-use recreational needs consistent with Concord's open space frame work.
12. Solidify the local/regional trail network for transportation and nature-based recreation.
13. Provide handicap access to open space resources.
14. Manage all land in Town consistent with open space objectives.
15. Secure funding and partner with other entities for open-space land protection.

According to the Open Space Plan, there is 5,803 acres of protected open space in Concord, which represented 37 percent of the town's total land area. The town manages 1,320 acres of that land and the private non-profit Concord Land Conservation Trust owns 850 acres. The Open Spaces and Recreation Plan identifies seven large natural areas that are particularly important open space resources for the Town of Concord. In addition, the Town of Concord and Massport agreed in 1990 to place a conservation restriction on a Massport-owned parcel of land that is approximately 50 acres in size near the west end of the airfield. In 1996, the Town of Concord obtained additional parcels of land as part of the Concord Farms Limited partnership. These parcels abut Massport's southern property line.

Estabrook Woods Area is the largest natural area in Concord consisting of 1,475 acres. Nine hundred of those acres, most of which are owned by Harvard University for educational and research purposes, have been set aside since 1992. The Estabrook Woods Area also includes Middlesex school land, Bateman's pond, Punkatasset town conservation land, and areas north to Carlisle. Estabrook Woods is a significant

[79]Natural Resources Commission, Town of Concord, Open Space and Recreation Plan 2004, Concord, Massachusetts, October 2004.
[80]Comprehensive Long Range Plan Committee, Town of Concord, Comprehensive Long Range Plan: A Vision for 2020, Concord, Massachusetts, March 2005.

open space resource for wildlife, geological and archeological sites, hiking, cross country skiing and horseback riding. As well, the Massachusetts Division of Fish and Game has identified the Estabrook Woods as a “significant wildlife area due to habitat diversity and area size.” Preserving its unique natural character is a special priority for the Town of Concord.

The Great Meadows/Ball’s Hill area includes Great Meadows National Wildlife Refuge and continuous vegetation to the north and west of the Concord River. It consists of 738 acres of land in Concord. This natural area around the “wild and scenic” Concord River is a resource for wildlife, particularly migratory birds. The scenic beauty found at this natural area makes it a desirable place for hiking, canoeing and photography.

Walden Woods/Town Forest area is made up of approximately 1,180 acres and includes Fairyland Pond, the Town Forest, Brister’s Hill, Walden Pond State Reservation (202 acres) and Fairhaven Hill. The setting for Henry David Thoreau’s Walden, the area is a National Historic Landmark and on the National Register of Historic Places. Walden Woods allows for a great diversity of recreational activities including swimming, year round fishing, and hiking. The Open Spaces and Recreation Plan identifies four major threats to Walden Woods: 1) The use of the former landfill area; 2) housing developments; 3) heavy recreation use; and 4) the effects of Route 2 and Route 126.

Virginia Road Woods is located primarily on Massport property and is made up of Bedford Levels, Elm Brook, Pine Hill, and areas north to the Bedford line. The area is managed as an airport buffer and therefore occasionally experiences vegetation management by Massport. The Town of Concord wishes to continue to work with Massport to ensure the area continues to function as a “large natural area” for species benefiting from the lack of public access.

Annursnac Hill/Strawberry Hill Road natural area consists of the Annursnac Town Conservation Land to the south and the woodland north of Strawberry Hill Road (118 acres). In the long term, the Town of Concord is interested in further evaluation of better wildlife connectivity between the two sections.

Of the conservation areas in Concord that are described, only Great Meadows is subject to the 55 DNL noise contour. In 2012, the 55 DNL occupied 26.4 acres of Great Meadows which was a decrease from 197.6 acres in 2005. The Jennie Dugan Kames area includes the brook, golf course and woods within Concord Country Club, and extends eastward across the Sudbury River towards the Concord Land Conservation Trust’s Soutter Land. It is the only large natural area located in the center of town and serves as a valuable bridge between various other conversation areas. The Jennie Dugan Kames area contains many wetland resources, including a large vernal pool, and habitat and species diversity is high.

10.14.3 Lexington

The Town of Lexington has an estimated 2,842 acres of public and privately owned open space, which represents approximately 27 percent of the town's total land area. The town owns and manages 1,840 acres of that land for passive and active recreation purposes. Several conservation and recreation areas are located near Hanscom Field.

Lexington produced an updated Open Space Plan in 2009. The goals of the plan are:

1. Establish and implement a land management program that will assure optimal maintenance and use of conservation lands.
2. Protect Lexington’s natural environment, both within and beyond the borders of open space and recreational properties.

3. Promote public use of recreational facilities and open space among a wide variety of user types.
4. Provide a balance of recreational activities for all of Lexington's citizens.
5. Preserve and enhance the scenic and historical value of Lexington.
6. Enhance connectivity between open space and recreation areas.
7. Acquire parcels that are important from an environmental, recreational, or historical perspective.
8. Protect and maintain Lexington's brooks.
9. Preserve, protect, and improve Lexington's recreational infrastructure.

When considering the acquisition of additional parcels in the community, the Conservation Commission has placed a strong emphasis on the establishment of wildlife corridors. Tophet Swamp and Kiln Brook, totaling 60 acres, are located between Hartwell Avenue and Route 128/I-95. These conservation areas are considered significant ecological areas and serve as wildlife corridors.

From a recreation standpoint, the Town of Lexington has two areas near Hanscom Field: the Pine Meadows Country Club (90 acres) and Katahdin Woods. The Pine Meadows Golf Course, situated near Route 95 and approximately one mile southeast of Hanscom Field, was purchased by the Town of Lexington in 1990 and is the largest recreational land holding owned by the town. Katahdin Woods, located adjacent to Kiln Brook, is a 38-acre conservation area that offers passive recreation in the form of hiking and nature viewing.

The central portion of the Minute Man Commuter Bikeway is located in Lexington. It provides access to many recreational areas, including the Adams School playground. The town would like to promote additional linkages to this highly acclaimed bikeway to provide additional recreational opportunities for its residents. No areas conservation areas in Lexington will be subject to the 55 DNL noise contour.

10.14.4 Lincoln

The Town of Lincoln has preserved 2,859 acres of land, representing approximately 31 percent of the town's total land area. When including state and federal land associated with Walden Pond, Great Meadows, and MMNHP, the amount of protected land is 3,282 acres or 35% of land in town. The two conservation properties that are near Hanscom Field are the Tanners Brook and Ricci properties. Tanners Brook, located south of Hanscom Field across Route 2A, is a 110-acre tract of land consisting of woodlands, wetlands and the headwater of Elm Brook. This parcel contains a series of winding hiking trails that are available to the public. The Ricci property consists of 94 acres of agricultural fields, woods and wetlands. Hobbs Brook runs through the southern portion of the property.

The Lincoln Conservation Commission has had responsibility for acquiring and managing environmentally sensitive lands throughout the community since 1958. The Commission currently has several additional large parcels under review for purchase as well as a few smaller properties that would provide trail linkages.

In addition to the Commission's efforts, the Lincoln Land Conservation Trust was formed in 1957 for the purpose of maintaining open space in the community through holding certain lands in trust. Over time, the Lincoln Land Conservation Trust has contributed to the protection of over 1,000 acres of land in Lincoln. The Trust currently protects and maintains approximately 375 acres of land and over 60 miles of trails located on existing conservation lands and traversing private properties. Lincoln is the first town in the Commonwealth to establish a land conservation trust.

In January 2010, the Lincoln Conservation Commission established a seven-year action plan. The plan establishes the following goals:

1. Preserve Lincoln's agricultural, recreational and natural resource values
2. Promote active stewardship of existing agriculture and conservation land
3. Maximize recreational opportunities on recreational and conservation land
4. Foster a sense of coordination, education and outreach regionally and locally

Each goal includes action items and responsible parties for achieving the goal.

10.14.5 Great Meadows National Wildlife Refuge

The Great Meadows National Wildlife Refuge is located approximately 20 miles west of Boston within the corporate boundaries of Concord, Sudbury, Billerica, Bedford, Carlisle, Lincoln, and Framingham (see Figure 10-9). The Great Meadows National Wildlife Refuge is situated due west of Hanscom Field, approximately 1.5 miles from the approach end of Runway 11. The Great Meadows Wildlife Refuge was established in 1944 as a migratory bird sanctuary with additional purposes of natural resource protection, fish and wildlife recreational development and protection of rare and endangered species.

The Great Meadows National Wildlife Refuge consists of 3,863 acres of freshwater wetland resources and wildlife habitat along the Concord and Sudbury Rivers from the Route 4 Bridge in Billerica to the Framingham/Wayland Line. The Concord River emanates at the confluence of the Sudbury and Assabet Rivers located in the Town of Concord. It flows to the north where it eventually merges with the Merrimack River in Lowell. According to the USFWS, the Refuge preserves historic landscapes used by Native Americans and early settlers and inspired the thoughts of writers and environmental philosophers including Henry David Thoreau and Ralph Waldo Emerson.

According to the U.S. Fish and Wildlife Service, over 500,000 people visit the area on an annual basis. Numerous outdoor educational programs are available at the refuge site for school children and the public at large. In 2005, the U.S. Fish and Wildlife Service prepared a Comprehensive Conservation Plan for the Great Meadows National Wildlife Refuge.[81] The plan developed five goals to support the mission of the Refuge System and Gulf of Maine Ecosystem Priorities:

1. Protect and enhance habitats that support self-sustaining populations of federal trust species and wildlife diversity
2. Recover threatened and endangered species of the complex
3. Build a public that understands, appreciates and supports refuge goals for wildlife
4. Adequately protect cultural resources that occur in the complex
5. Maintain a well-trained, diverse staff working productively toward a shared refuge vision

Riverine habitat (i.e., habitat associated with the river) and floodplains comprise approximately 80 percent of the refuge land with eight percent consisting of forested wetlands. The remaining 20 percent can be characterized as upland resources, including forested areas and open fields. Most of this land was formerly in agriculture that has since converted to overgrown fields and white pine forests.

The Great Meadows National Wildlife Refuge is divided into two divisions, including the Concord Division (1,542 acres), which is land drained by the Concord River, and the Sudbury Division (2,321

---

[81]U.S. Fish and Wildlife Service, Great Meadows National Wildlife Refuge Final Comprehensive Conservation Plan, January 2005

acres), which is land drained by the Sudbury River, and associated tributaries as established by the U.S. Fish and Wildlife Service. Several pond impoundments are located along the river corridor in Concord, as well as the Strand and Headquarters Ponds in Sudbury.

Over 220 species of reptiles, amphibians and mammals have been documented within the Great Meadows National Wildlife Refuge corridor. Many species of migratory birds use the refuge as a stopover during the fall and spring migration periods, including peregrine falcons and bald eagles. No federally protected endangered or threatened species are known to reside in the Great Meadows National Wildlife Refuge on a permanent basis.

None of the Great Meadows National Wildlife Refuge was within the 65 dB DNL contour in 2005 or 2012. Approximately 26 acres of Refuge land are located within the 55 dB DNL contour in 2012 as compared to 197 acres in 2005.

10.14.6 Concord River

Chapter 9, Wetlands Wildlife and Water Resources discusses the Concord River, which is a designated Wild and Scenic River. The Concord River, located northwest of Hanscom Field, is a component of the Sudbury-Assabet-Concord (SuAsCo) Wild and Scenic River System, and flows roughly southwest to northeast. As illustrated in Figure 10-9, the segment of the Concord River nearest to Hanscom Field is approximately one-half mile northwest from Hanscom Field, and slightly more than one mile from the nearest Hanscom Field runway (11-29). None of the Concord River was within the 65 dB DNL contour in 2005 or 2012. No segment of the Concord River is in the 2012 55 dB DNL contour as compared to 0.5 miles in 2005.

10.14.7 Minuteman Commuter Bikeway

The Minuteman Commuter Bikeway is a ten-mile paved bikeway that connects Bedford at the Bedford Depot Park with Lexington, Arlington and Cambridge, terminating at the MBTA Alewife Red Line station where connections can be made to the Red Line Linear Bikepath through Cambridge and Somerville. The bikeway was constructed by the Massachusetts Highway Department and is maintained by the four towns of Arlington, Bedford, Cambridge and Lexington. The bikeway opened in 1993 and was extended from East Lexington to Alewife Station in 1998. The bikeway is twelve-feet wide and is open year-round from 5:00 a.m. to 9:00 p.m.

None of the ten mile Minuteman Commuter Bikeway was within the 65 dB DNL contour in 2005 or 2012. Approximately 1.3 miles of the Minuteman Commuter Bikeway was within the 55 dB DNL contour in 2005 and that decreased to 0.3 miles in 2012. It should be noted that users in some sections of the Minuteman Commuter bikeway are affected by the background noise of road traffic from Route 128/I-95 and other roadways that cross or parallel the bikeway. Hanscom Field-related traffic contributes only a small percentage to this traffic.

10.14.8 Narrow Gauge Rail-Trail

The Narrow-Gauge Rail-Trail is a three-mile trail that runs from a point near the Bedford Depot at Loomis Street to the Billerica town line. The trail is paved asphalt between Loomis Street and the Great Road and is a stone-dust trail in the other section. The entire Narrow-Gauge Rail-Trail is located outside the 65 dB DNL and the 55 dB DNL contour.

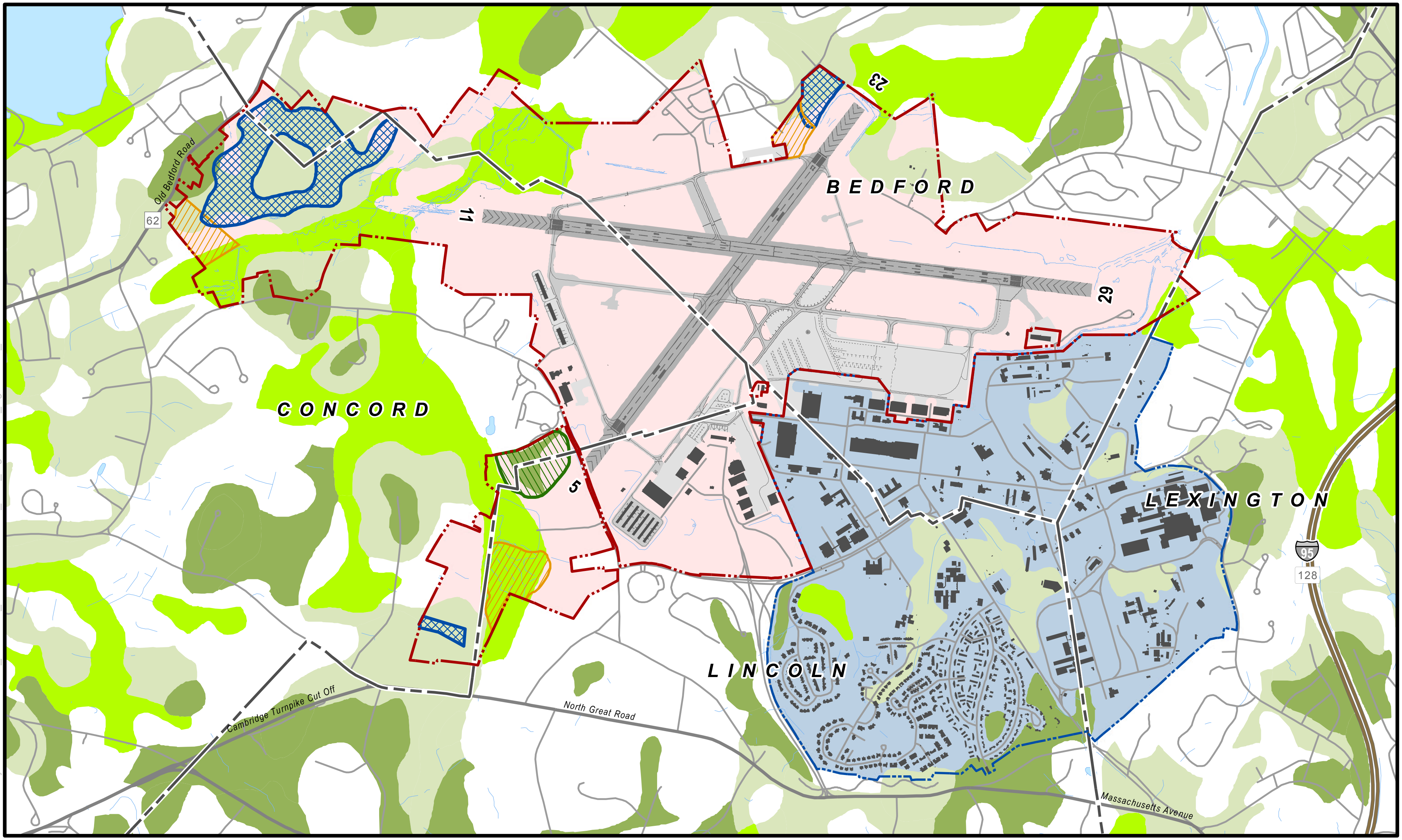
10.14.9 Agricultural Resources

The location of agricultural resources is shown in Figure 10-10. Hanscom Field contains soils identified on mapping prepared by the U.S. Natural Resources Conservation Service as having varying levels of agricultural potential.[82] Such soils are described as either Prime Farmland soils or Farmland Soils of Local/State Importance, defined as follows:

1. Prime Farmland – land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, and is also available for these uses.
2. Locally Important Farmland – farmland that fails to meet the requirements of prime farmland, but is of statewide importance for the production of food, feed, fiber or forage crops.

Figure 10-10 shows Areas of Prime Farmland and Farmland Soils of Local Importance at Hanscom Field. Limited agricultural activity currently occurs at Hanscom Field. Mowing of runway infield areas is performed to maintain low grassland vegetation for safe sight distances for aircraft operation and to provide grassland habitat for protected avian species. Agricultural operations within an airport setting must be restricted for reasons of safety for both aircraft operations and for farm workers located in proximity to operating aircraft. There is agricultural activity in outlying areas.

[82]Middlesex County, Massachusetts Interim Soil Survey Report - July 1995, and draft maps



Path: G:\Projects\305XXX\305540_Hanscom_ESPR\GIS\305540_BED_Figure10-10_Agricultural_Resources.mxd

North

0 1,000 2,000 Feet

Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Interstate
Highway
Road

Open Water
Stream

Agricultural Resources (Massport)

Locally Important Farm Soils
Open and Mowed Areas
Prime Farmland Soils

NRCS SSURGO Soils Data

Prime Farmland Areas
Farmland of Statewide Importance
Farmland of Unique Importance

Data Sources: MassGIS (Roads, Rail), March 5, 2013; MassGIS (Bike Trails, Tracks and Trails), March 7, 2013; MassGIS (Community Boundaries), March 5, 2013; MassGIS (Soils), Oct 22, 2013;

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Agricultural Resources

Figure **10-10**

Prior to the *2005 ESPR*, Massport met with Massachusetts Department of Agricultural Resources (MADAR) representatives to discuss envisioned uses of known agricultural soils at Hanscom Field. There have been no changes to use and management of agricultural lands at Hanscom since the filing of the *2005 ESPR* with one exception. In 2009, Massport has made available 1.8 acres of land in Concord to Gaining Ground, a non-profit organic farming organization, for agricultural use. Massport continues to work with MADAR to determine appropriate measures to protect Massport-owned agricultural lands from conversion to non-agricultural uses. Massport will inform the towns about actions related to agricultural lands as part of its briefings at HFAC meetings.

10.15 Analysis of Future Scenarios

This section analyzes the potential effects of the 2020 and 2030 scenarios on historical, cultural, recreational, and conservation resources within and in the vicinity of Hanscom Field. The environmental analysis focuses on traffic and noise effects of the 2020 and 2030 scenarios. The air quality assessment, discussed in Chapter 8, Air Quality concludes that even maximum air concentrations for the 2020 and 2030 scenarios comply with all health-based air quality standards and therefore will result in no adverse air quality effects to historic resources including MMNHP.

The analyses of historical and cultural resources use information on future aviation operations activity levels presented in Chapter 3, Airport Activity Levels, and potential new facilities described in Chapter 4, Airport Planning. Data is also derived from the evaluation of traffic volumes and intersection operations that are described in Chapter 6, Ground Transportation; and noise analyses for DNL and TA measurements that are presented in Chapter 7, Noise.

Any future project at Hanscom Field will undergo a project-specific environmental review process in the event that MEPA or other applicable environmental review thresholds are met. The historic resources and archaeological reconnaissance surveys, which are included in Appendix G, will provide baseline data for these assessments. Additional cultural and historical properties may be identified through more detailed intensive-level surveys in that process and will be addressed at that time. The potential effects on specific recreational and conservation resources would also be evaluated at that time.

As described in Chapter 6, Ground Transportation, the *2012 ESPR* reflects Massport's commitment to TDM and traffic management approaches to address future Hanscom Field-related traffic volumes, rather than physical modifications to intersections to add capacity. The traffic analysis focuses on predicted traffic volume changes on Route 2A in the MMNHP.

As stated in Chapter 7, Noise, any significant changes in noise exposure are assessed based on both the absolute value of the projected DNL, as well as the magnitude of the change. Noise analysis considers as significant changes in DNL on the order of 1.5 dB or more for areas within the 65 dB DNL noise contour and changes of 3.0 or more decibels between 60 and 65 dB DNL[83] Noise impact criteria are used to determine areas for further analysis and possible mitigation when completing environmental documentation for a specific project at an airport. Though the *2012 ESPR* is not an environmental permitting document for a project, the use of these criteria help to highlight notable changes in the noise environment at Hanscom Field.

[83]U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Environmental Impacts: Policies and Procedures, FAA Order 1050.1E CHG1, Washington, DC.

Chapter 7, Noise, presents 2020 and 2030 noise exposure levels at noise analysis locations including those that are cultural and historic resources. The 65 dB DNL noise contour was used as a guideline for determining potential land use incompatibilities, in accordance with FAA guidelines. The Secretary directed Massport to evaluate the extent of the 55 dB DNL noise contour in the *2012 ESPR*.

10.15.1 Historical Resources

This section assesses potential effects to historical resources that could result from the 2020 and 2030 scenarios. Assessment of future noise effects to historical resources primarily focuses on the National and State Registers-listed, MHC Inventory and MACRIS-listed resources. Information about the environmental effects to MMNHP is contained in a separate section below.

10.15.2 State Register Resources

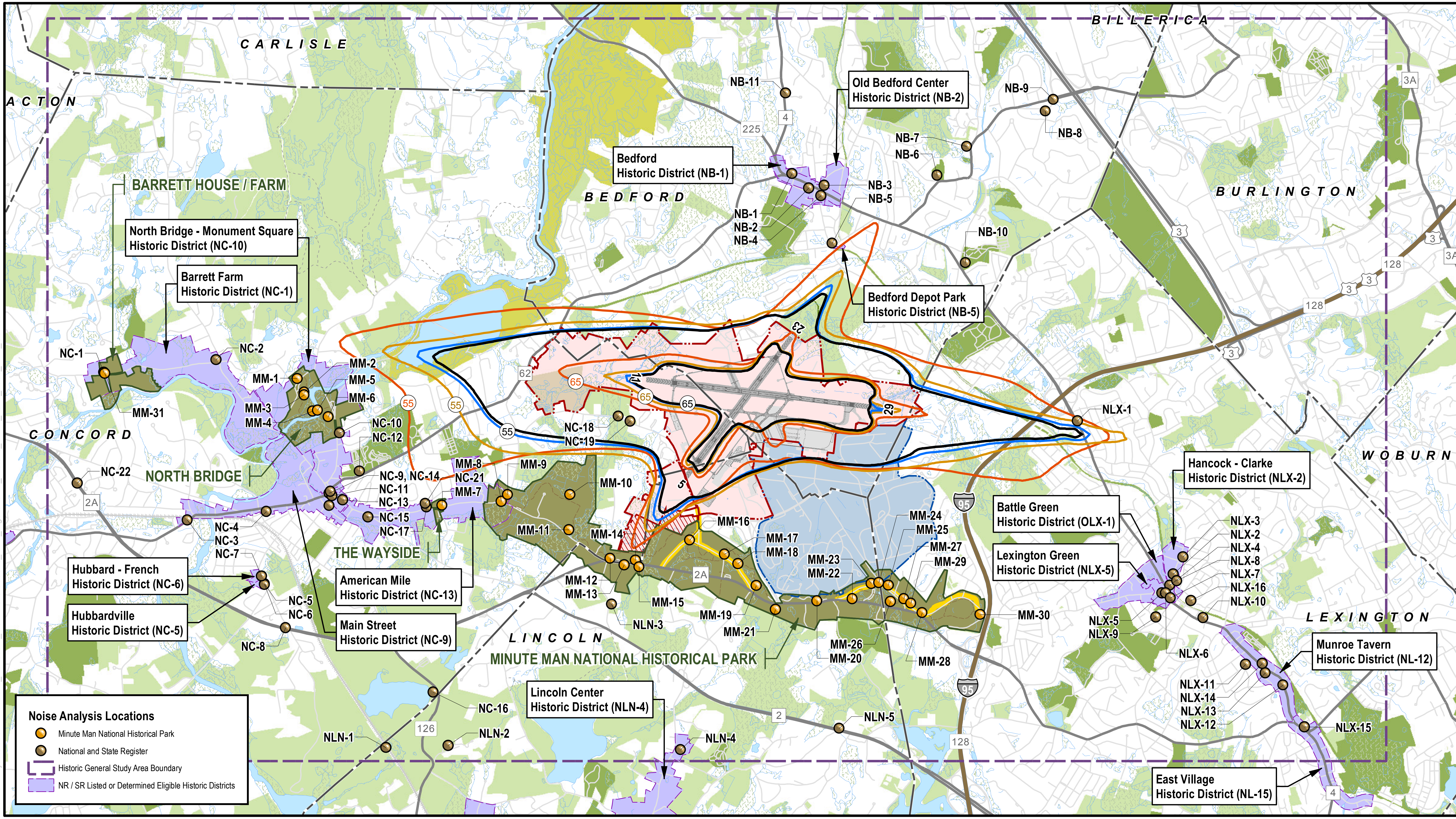
Figure 10-11 illustrates the location of historic resources relative to the noise contours for the 2020 and 2030 growth scenarios. The figure includes the contours for 2005 and 2012 as well for comparing future noise with that experienced in recent years. Table 10-14 presents DNL values for the 2020 and 2030 scenarios at the ten locations with the highest DNL values in 2012. No historical resources fall within the 65 dB DNL noise contour or experience increased exposure of 3.0 dB or more at DNL levels between 60 and 65 dB. As compared to the 2005 DNL values, the increases in DNL values for most sites are less than one decibel and have DNL values below 55 dB in the 2020 and 2030 scenarios.

Table 10-14 DNL Values for Historic Architectural Resources Listed in the National and State Registers of Historic Places

MHC Number	Name[1]	Street Address	Town	Noise Label	2005	2012	2020	2030
CON.177	Deacon John Wheeler- Captain Jonas Minot Farmhouse (aka Thoreau Birthplace)	341 Virginia Rd.	Concord	NC-18	60.4	58.4	58.7	59.8
CON.178	Wheeler-Meriam House	477 Virginia Rd.	Concord	NC-19	59.9	58.1	58.4	59.4
LEX.413	Simonds Tavern	331 Bedford Street	Lexington	NLX-1	55.5	53	53.6	54.7
CON.170	Orchard House	399 Lexington Rd.	Concord	NC-17	53.8	50.2	50.4	51.6
BED.V	Bedford Depot Park Historic District	80 Loomis St. and 120 South Rd.	Bedford	NB-5	53.7	49.8	50.3	51.3
CON.317	Ralph Waldo Emerson House	28 Cambridge Turnpike	Concord	NC-15	52.9	49.1	49.3	50.5
CON.802 (CON.DY)	Sleepy Hollow Cemetery	24 Court Ln.	Concord	NC-12	52.2	49	49.2	50.4
CON.DS	American Mile Historic District	Lexington Road	Concord	NC-13	51.7	48.5	48.7	49.9
CON.329	Wright Tavern	Lexington Rd. & Main St.	Concord	NC-11	51.0	48.2	48.3	49.5
CON.A	Concord Monument Square-Lexington Road Historic District	Monument Sq. and Lexington Rd.	Concord	NC-14	50.9	48.1	48.2	49.4

Note:
1. The historic districts and properties with the ten highest DNL values in 200512 are listed in order of their 2012 DNL value. MMNHP sites are included in Table 10-17.

(This page intentionally left blank)



North

0 3,500 7,000 Feet

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Community Boundaries), March 5, 2013; PAL, Inc. (Noise Sensitive Receptors), August 28, 2013

- 2005 DNL Noise Contour
- 2012 DNL Noise Contour
- 2020 DNL Noise Contour
- 2030 DNL Noise Contour
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service
- Open Water
- Wetland/Marsh
- Stream
- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity

massport

Hanscom Field 2012 ESPR

Bedford, Concord, Lexington, Lincoln, Massachusetts

Historic Resources within the 2005, 2012, 2020 and 2030 DNL Noise Contours

Figure **10-11**

(This page intentionally left blank)

10.15.3 2020 Scenario

Two historic properties in Concord that are located on Virginia Road next to Hanscom Field would have DNL values between 55 and 60 dB DNL in the 2020 scenarios:

1. The Deacon John Wheeler/Capt. Joseph Minot Farmhouse is forecast at 58.7 dBA in the 2020 scenario (compared to 58.4 dBA in 2012)
2. The Wheeler-Meriam House is forecast at 58.4 dBA in the 2020 scenario (compared to 58.1 dBA in 2012)

The next highest predicted level for a historical resource, Simonds Tavern in Lexington, would have a DNL value under 55 dB DNL, with a DNL value of 53.6 dBA in the 2020 scenario (compared to 53 dBA in 2012). All other sites would have a DNL value below 55 dBA in both the 2020 scenario.

The highest predicted TA65 level occurs at the Deacon John Wheeler/Capt. Joseph Minot Farmhouse for the 2020 scenario, which increases from 34.5 minutes a day in 2012 to 42.0 minutes a day minutes a day in the 2020 scenario. The highest 2020 TA55 level occurs at Wheeler-Meriam House, which increases from 141.7 minutes a day in 2012 to 166.2 minutes a day in the 2020 scenario.

Each of the 17 historic districts listed in Table 10-15 is outside the 65 dBA DNL contour for the 2012, 2020, and 2030 scenarios.

Table 10-15 Area of National and State Registers Historic Districts within the 55 dBA DNL Contour

MHC Number	Name[1]	Acreage	2012	2020	2030
BEDFORD					
BED.V	Bedford Depot Park Historic District	6.8 acres	-	0 acres	0 acres
BED.A	Bedford Historic District	42 acres	0 acres	0 acres	0 acres
BED.C	Old Bedford Center Historic District	79 acres	0 acres	0 acres	0 acres
BED.K	Old Burlington Road- Wilson Mill Area	2.7 acres	0 acres	0 acres	0 acres
CONCORD					
CON.DS	American Mile Historic District	133 acres	0 acres	0 acres	0 acres
CON.DT	Barrett Farm Historic District	221 acres	0 acres	0 acres	0 acres
CON.A	Concord Monument Sq.- Lexington Rd Historic District	42 acres	0 acres	0 acres	0 acres
CON.EA	Hubbard-French Historic District	2.6 acres	0 acres	0 acres	0 acres
CON.DZ	Hubbardville Historic District	6.6 acres	0 acres	0 acres	0 acres
CON.DU	Main Street Historic District	74 acres	0 acres	0 acres	0 acres
CON.DV	North Bridge- Monument Square Historic District	89 acres	0 acres	0 acres	0 acres
LEXINGTON					
LEX.B	Battle Green Historic District	110 acres	0 acres	0 acres	0 acres
LEX.E	East Village Historic District	56 acres	0 acres	0 acres	0 acres
LEX.C	Hancock-Clarke Historic District	34 acres	0 acres	0 acres	0 acres
LEX.AC	Lexington Green Historic District	17 acres	0 acres	0 acres	0 acres
LEX.D	Munroe Tavern Historic District	70 acres	0 acres	0 acres	0 acres
LINCOLN					
LIN.A LIN.D	Lincoln Center Historic District	187 acres	0 acres	0 acres	0 acres

Note:
1. All districts are outside the 65 dBA DNL contours for 2012 and the 2020 and 2030 scenarios. MMNHP is discussed separately.

10.15.4 2020 Scenarios

No historic sites would be exposed to DNL values greater than 65 dB in the 2030 scenario. Increases are projected to be between 0.5 dB and 1.5 dB. Two properties are expected to have noise levels between 55 and 65 dB; which represent a reduction in levels from 2005 conditions:

- Deacon John Wheeler/Capt. Jonas Minot Farmhouse (NC-18) in Concord forecast at 59.8 dBA in the 2030 scenario (compared to 58.4 dBA in 2012)
- Wheeler-Meriam House (NC-19) in Concord forecast at 59.4 dBA in the 2030 scenario (compared to 58.1 in 2012)

None of the other resources would experience noise levels that exceed 55 dBA.

The highest predicted TA65 level would occur at the Deacon John Wheeler/Capt. Joseph Minot Farmhouse in the 2030 scenario; the TA65 would increase from 34.5 minutes a day in 2012 to 60.1 minutes a day in 2030. The highest predicted TA55 level would occur at Wheeler-Meriam House in the 2030 scenario; the TA65 would increase from 141.7 minutes a day in 2012 to 223.8 minutes a day.

Table 10-16 Historic Resources in the MHC Inventory and MACRIS within the 65 dBA and 55 dBA DNL Contours for the 2020 and 2030 Scenarios

Location[1]	2012 MHC Inventory[2]	2012[3]		2020[3]		2030[3]	
		65 dBA	55 dBA	65 dBA	55 dBA	65 dBA	55 dBA
AREAS							
Bedford	6	-	5	-	6	-	6
Concord	38	-	7	-	15	-	24
Lexington	1	-	1	-	1	-	1
Lincoln	-	-	0	-	0	-	0
Total	45	0	13	0	22	0	31
INDIVIDUAL PROPERTIES							
Bedford	59	-	19	-	29	-	44
Concord	218	-	47	-	58	-	106
Lexington	63	-	33	-	39	-	47
Lincoln	-	-	0	-	0	-	0
Total	340	0	99	0	126	0	197

Notes:
1. Based on research for *2012 ESPR*.
2. Appendix G lists these historic resources.
3. The number of areas listed is fully or partially within the 55 dBA DNL contour.

10.16 MHC Inventory and Information from Historic Commissions

None of the historic resources in the MHC Inventory and MACRIS would be within the 65 dB DNL contour for the 2020 or 2030 scenarios. Table 10-16 summarizes by town the number of historic resources in the MHC Inventory and MACRIS that would be within the 55 dB DNL contour for the 2020 and 2030 scenarios.

10.16.1 2020 Scenario

In the 2020 growth scenario, 13 individual and 99 survey areas listed in the MHC Inventory and MACRIS would be within the 55 dB DNL contour.

10.16.2 2030 Scenario

In the 2030 growth scenario, 226 individual and 36 area historic resources listed in the MHC Inventory and MACRIS would be within the 55 dB DNL contour.

10.17 Archaeological Resources

Massport encourages new development in areas with existing impervious surfaces that take advantage of existing infrastructure. Any physical changes proposed near the archaeological sites, which are located in undisturbed portions of the airport, have the potential to affect archaeological resources. These areas would be studied, as appropriate, if a project were proposed that affected a relevant area. Ground disturbance is not contemplated near traffic study intersections, since no physical modifications are proposed for these locations. The following is an assessment of the potential impacts to archaeological resources from the Master Planning areas reviewed for development in 2020 and 2030 and described in Chapter 4, Airport Planning. The four planning areas are Terminal, ATCT Apron, East Ramp, and North Airfield.

10.17.1 2020 Scenario

Development in the 2020 scenario is evaluated for each of the four planning areas described in Chapter 4, Airport Planning. All development evaluated for the East Ramp and ATCT Apron areas will occur on existing impervious ramp and apron and are entirely within areas assessed as having a low archaeological sensitivity. These potential development sites are unlikely to affect potentially significant archaeological resources.

Of the new development concepts being evaluated for the 2020 scenario in the Terminal area, some would be sited on existing impervious and previously disturbed areas while other could be in areas that are presently vegetated and pervious. One new parking area was considered adjacent to the existing surface parking lot and Hanscom Drive. Also, the initial phase of the new Air and Space Museum is contemplated to be completed in the 2020 scenario in a wooded area at the intersection of Hanscom Drive and Old Bedford Road. These projects could affect areas assessed as having a high archaeological sensitivity. Additional archaeological investigation within these areas would be appropriate if these concepts moved forward to planning and design and belowground impacts were proposed.

New development is also evaluated for some areas of the North Airfield planning area, some of which would be in presently pervious land. This work would primarily be located on Massport property previously leased to the Air Force for the trailer park which includes pockets of impervious area where the trailer pads were constructed. The development concepts in the 2020 scenario considered a new apron with access to Taxiways N and R and associated hangars. The sites in the North Airfield area are entirely within areas assessed as having a low archaeological sensitivity, and they are unlikely to affect potentially significant archaeological resources.

10.17.2 2030 Scenario

The development concepts considered for the 2030 scenario augment those discussed above in the 2020 scenario and the potential effects on archaeological sensitive areas would be similar. Construction activity in the East Ramp and ATCT Apron areas would continue to be confined to existing impervious areas previously disturbed with low archaeological sensitivity.

Additional development concepts in the Terminal area could include an additional surface parking area, a second phase for the Air and Space Museum, and a placeholder for a hotel along a new road connecting Hanscom Drive with the West Ramp. These projects areas are presently vegetated and considered to have high archaeological sensitivity due to their undisturbed state. Additional archaeological investigation would be recommended if these concepts moved forward to planning and design and belowground impacts were proposed.

In the North Airfield area, most of the augmented development is contemplated for the area around the existing Navy hangar which is presently impervious buildings and apron. There could be some minor increases in impervious area but much would be adjacent to the existing development in areas considered to be of low archaeological sensitivity.

10.18 Minute Man National Historical Park

This section assesses potential noise and traffic effects of the 2020 and 2030 scenarios on the MMNHP. Specific areas of focus include the NPS's goals of physical protection and restoration of Battle Road; road traffic, public safety, and access to park facilities, particularly regarding speed and traffic congestion; management of air traffic to protect the visitor's experience in the park; and the future of Hanscom AFB. Noise level analyses identified DNL and TA values at contributing resources within the park and estimates of acreage of park within the 55 dB DNL contour for the 2020 and 2030 scenarios. Table 10-18 presents the sites with the ten highest DNL values in the Park.

The evaluation of traffic identifies potential changes in Route 2A traffic volumes that are attributable to Hanscom Field. Chapter 6, Ground Transportation describes Massport's support for Transportation Demand Management strategies to reduce its contribution to traffic on area roadways and potential traffic management strategies that do not require physical modification to intersections. As described in Chapter 8, Air Quality, there are no adverse effects attributable to air quality in 2012 or the 2020 and 2030 scenarios.

10.18.1 2020 Scenario

The environmental effects of traffic and noise on MMNHP from Hanscom planning concepts in the 2020 scenario are presented below.

10.18.1.1 Noise

In the 2020 scenario, none of the MMNHP would be within the 65 dB or the 55 dB DNL contour. The DNL values at MMNHP sites would range from 43.9 dB to 54.5 dB. The highest level (54.5 dB) would occur at The Wayside-Samuel Whitney House (MM-7).

None of the 4.9 mile Battle Road Trail would be within the 65 dB DNL or 55 DNL contour in the 2020 scenario. It should be noted that a visitor to the Battle Road portion of the park is affected by the background noise of road traffic from Route 128/I-95 and Route 2A throughout most of the day.

Table 10-17 DNL Values of Sites in the Minute Man National Historical Park (in dB)

Label[1]	Name[2]	Unit/Town[3]	2005	2012	2020	2030
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	53.6	50.3	54.5	55.3
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	53.4	51.4	54.1	54.6
MM-14	Job Brooks House	Battle Road Unit / Lincoln	53.0	51.5	53.6	54.1
MM-12	Samuel Brooks House	Battle Road Unit / Concord	52.5	50.8	53.1	53.7
MM-9	Meriam House	Battle Road Unit / Concord	52.1	50.6	52.9	53.9
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	51.9	50.3	52.6	53.6
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	51.7	50.7	52.2	52.8
MM-10	Historic Farming Fields	Battle Road Unit / Concord	51.4	50.7	52.1	53.0
MM-1	Major John Buttrick House	North Bridge Unit / Concord	51.2	48.7	52.1	53.2
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	50.5	48.3	51.4	52.5
MM-11	Olive Stow House/Farwell Jones House/ Carty Barn	Battle Road Unit / Concord	50.5	49.2	51.3	52.0
MM-31	Col. James Barrett Farm *	Barrett Farm Unit/Concord	n/a	43.5	43.9	44.9

Notes:
1. The MMNHP is a national historic landmark district. All sites are in the National Register of Historic Places. The sites with the ten highest DNL values in 2012 are listed in order of their 2012 DNL value.
2. Sites within MMNHP are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places. Co. James Barrett Farm has been added to the MMNHP since the *2005 ESPR*.
3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail.

The DNL, TA65 and TA55 values at noise analysis locations along the Battle Road Trail were plotted in Figures 10-12 through 10-14 from the Fiske House Foundation (Mile 0) to Meriam's Corner Monument (Mile 5.5). Figures 10-12 through 10-14 indicate that predicted DNL and Time Above values along the trail are highest west of the Hartwell Tavern, reflecting the proximity of these sites to runways at Hanscom Field.

TA65 values ranged from one to thirteen minutes at the thirty noise analysis locations with the highest levels occurring at The Wayside-Samuel Whitney House (MM-7) in the 2030 scenario. TA55 values ranged from 19 to 90 minutes with the highest levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels in the 2030 Scenario.

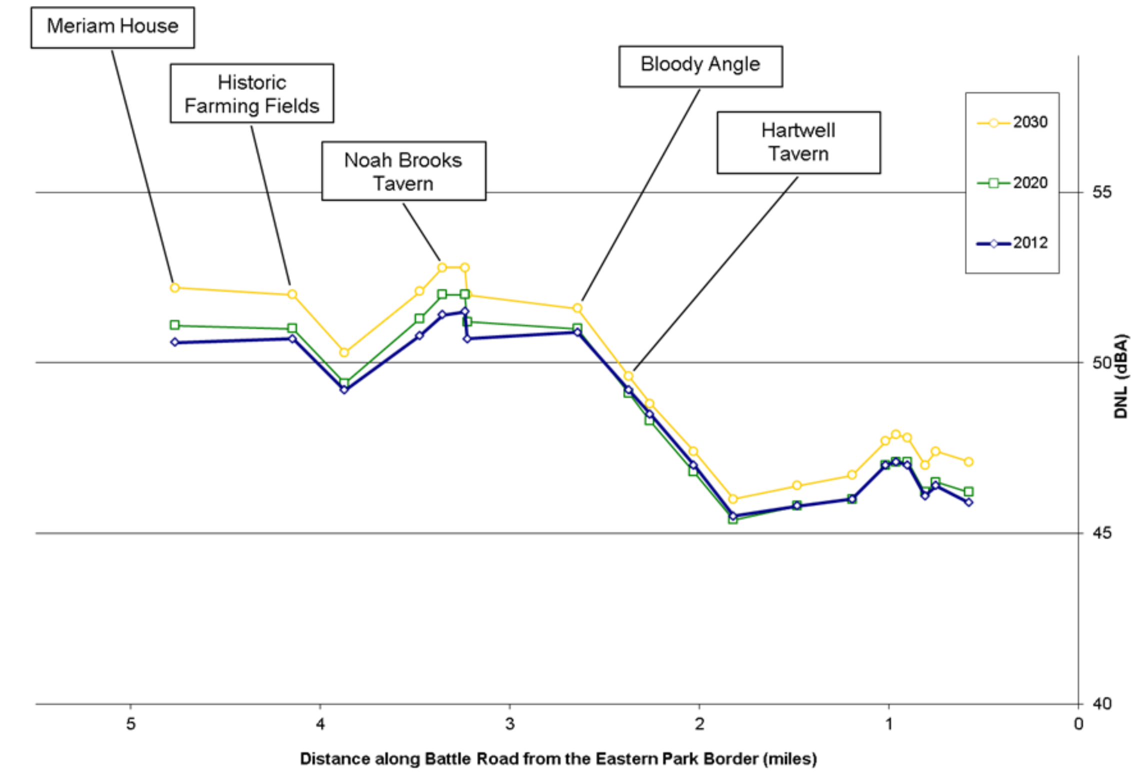


Figure 10-12 DNL at Minute Man National Historic Park Battle Road Unit Locations

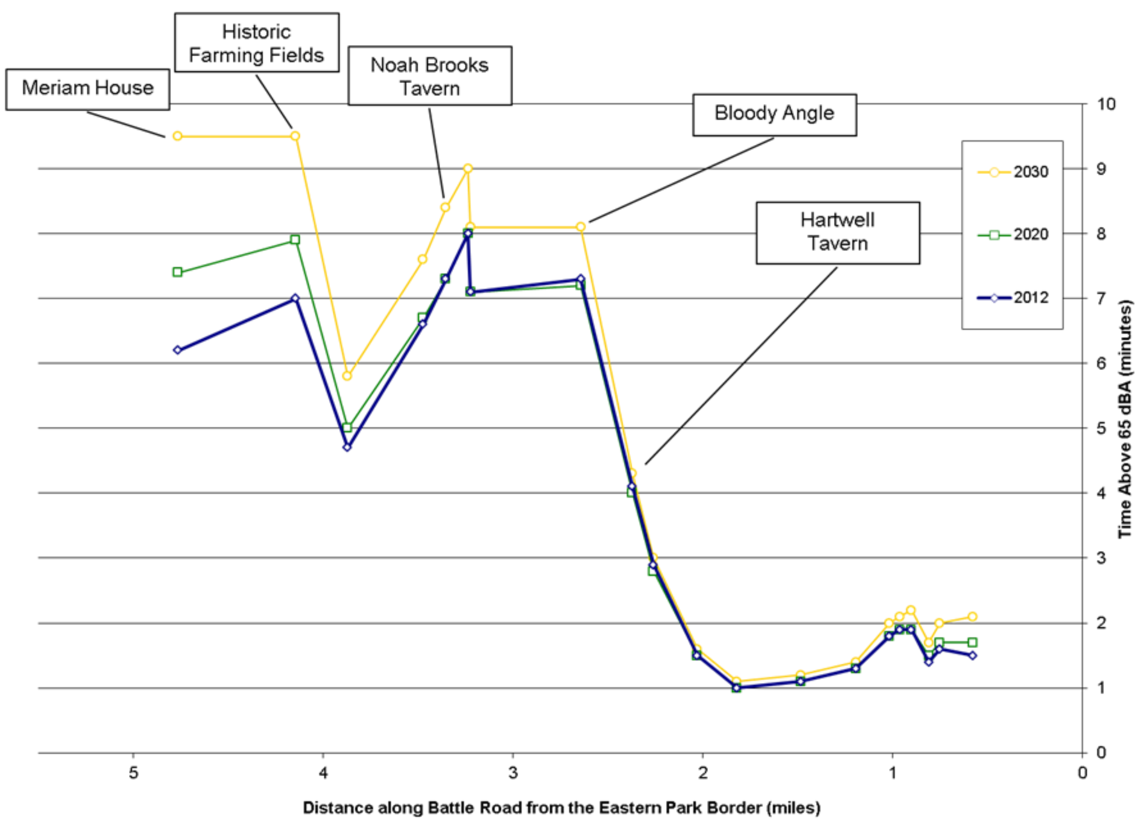


Figure 10-13 Time Above 65 dBA at Minute Man National Historic Park Battle Road Unit Location

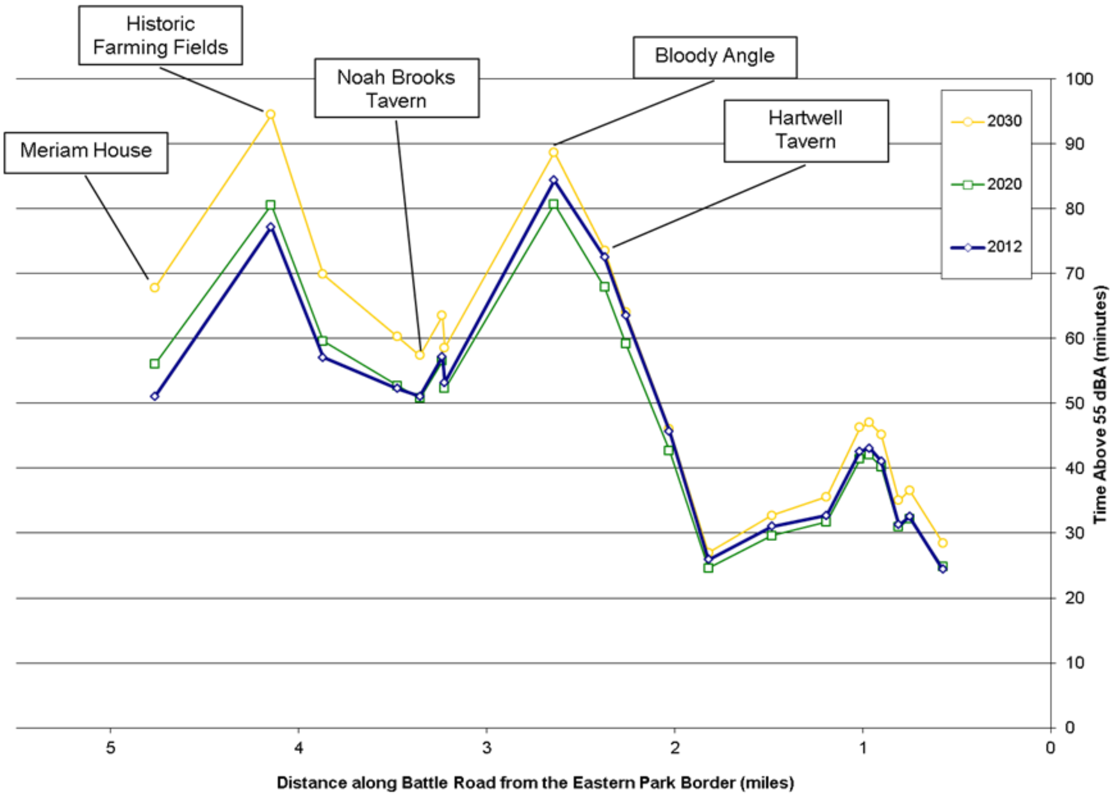


Figure 10-14 Time Above 55 dBA at Minute Man National Historic Park Battle Road Unit Locations

10.18.1.2 Traffic

Hanscom Field traffic remains a very small percentage of the overall volumes on the roadway in the 2020 scenarios. In 2012, Hanscom Field represented four percent of peak hour traffic on Route 2A. Hanscom Field traffic would represent five percent of peak hour volumes in the 2020 scenario and seven percent of peak hour volumes in the 2030 scenario. Hanscom AFB and other local and regional traffic sources account for the rest of the traffic volumes.

In the 2020 scenarios, Hanscom Field traffic would exceed ten percent of a single traffic movement at only one intersection on Route 2A in the MMNHP #6) Hanscom Drive/Route 2A in Lincoln.

10.18.2 2030 Scenario

The environmental effects of traffic and noise on MMNHP from Hanscom planning concepts in the 2030 scenario are presented below.

10.18.2.1 Noise

In the 2030 scenario, none of the MMNHP would be within the 65 dB DNL contour. The predicted DNL values at MMNHP sites would range from 44.9 dB to 55.3dB. The highest predicted level (55.3 dB) would occur at The Wayside-Samuel Whitney House (MM-7). In the 2030 scenario, 0.4 acres of the MMNHP would be within the 55 dB DNL contour up from 0 acres in the 2020 scenario.

None of the 4.9 mile Battle Road Trail would lie within the 55 or 65 dB DNL contour in the 2030 scenario.

TA65 values would range from one to 20 minutes at the thirty noise analysis locations, with the highest levels occurring at The Wayside-Samuel Whitney House (MM-7) in the 2030 scenario. TA55 values would range from 21 to 127 minutes, with the highest predicted levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels. Similar to the 2020 scenario, DNL and Time Above values, along the trail would be highest west of the Hartwell Tavern.

10.18.2.2 Traffic

Even in the 2030 planning scenarios, Hanscom Field traffic remains a relatively small percentage of the overall roadway volumes. In 2012, Hanscom Field represented four percent of peak hour traffic on Route 2A. Hanscom Field traffic would represent seven percent of peak hour volumes in the 2030 scenario Hanscom AFB and other local and regional traffic sources account for the rest of the traffic volumes.

In the 2030 scenarios, Hanscom Field traffic would exceed ten percent of a single traffic movement at four intersections on Route 2A in the MMNHP: #2) Route 2A/ Massachusetts Avenue; #3) Route 2A/Old Massachusetts Avenue; #4) Route 2A/Airport Road; and #6) Hanscom Drive/Route 2A;. Delays would increase on the Hanscom Drive approach to the Hanscom Drive/Route 2A intersection and a traffic control officer could be considered for morning peak hour in the 2030 scenario. Average delay on the northbound Bedford Road left-turn at Route 2A would also increase by ten to 20 seconds due to Hanscom Field traffic volumes.

10.18.3 Recreational and Conservation Lands

The 2020 and 2030 scenarios would not result in alterations to recreational and conservation lands. However, there would be incremental noise increases from operating aircraft. Table 10-19 summarizes the predicted changes in noise exposure for the Minuteman Commuter Bikeway, Narrow Gauge Rail-Trail, Hartwell Town Forest/ Jordan Conservation Area, Great Meadows National Wildlife Refuge, and the Concord River.

Impacts within the 65 dB threshold which the FAA uses as a standard to assess significance are limited to a small area of less than an acre of the Hartwell Forest. None of the other noted areas would be with the 65 dB contour.

Impacts within the 55 dB threshold are identifiable for most of the noted areas with the exception being the narrow gauge trail which has no impact. The largest predicted increases are at the Hartwell Forest given its close proximity to Runway 23 end. Impacts within the 55 dB contour also occur in the Great Meadows National Wildlife Refuge. Aircraft fly directly over the Concord Impoundments on a regular basis. The Concord Impoundments are a popular location for bird watching and visits by school groups. To the extent that noise levels can be reduced in the Refuge, it will also benefit nearby residents of Concord along Bedford Street. However, except for implementation of noise abatement takeoff procedures (which many pilots already use), mitigation strategies aimed at protecting open space areas would necessarily redirect aircraft over other populated areas around Hanscom and are not likely to be desirable solutions for most residents.

Table 10-18 Noise Effects on Recreational and Conservation Resources

	Total Distance or Acreage	2005	2012	2020	2030
Within 65 DNL Contour[1]					
Minuteman Commuter Bikeway	10.1 miles	0 miles	0 miles	0 miles	0 miles
Narrow Gauge Rail-Trail	3.0 miles	0 miles	0 miles	0 miles	0 miles
Hartwell Town Forest/ Jordan Conservation Area	165.9 acres	1.4 acres	0.1 acres	0.1 acres	0.9 acres
Great Meadows National Wildlife Refuge	3,409 acres	0 acres	0 acres	0 acres	0 acres
Concord River[2]	6.5 miles	0 miles	0 miles	0 miles	0 miles
Within 55 DNL Contour					
Minuteman Commuter Bikeway	10.1 miles	1.3 miles	0.3 miles	0.4 miles	0.5 miles
Narrow Gauge Rail-Trail	3.0 miles	0 miles	0 miles	0 miles	0 miles
Hartwell Town Forest/ Jordan Conservation Area	165.9 acres	118 acres	66.4 acres	72.1 acres	95.8 acres
Great Meadows National Wildlife Refuge	3,409 acres	210 acres	26.4 acres	43.1 acres	94.4 acres
Concord River[2]	6.5 miles	0.5 miles	0 miles	0 miles	0.1 miles

Notes:
1. This is the exposure level that the Federal Aviation Administration identifies as a guideline for determining potential land use incompatibilities.
2. Concord River is approximately 6.5 miles in length from State Route 2 (South of Airport) to State Route 225 (North of Airport).

10.19 Environmentally Beneficial Measures

This section presents a summary of possible environmentally beneficial measures that have been identified to address the predicted effects of Hanscom Field on historical and cultural resources in the 2020 and 2030 scenarios. The development and implementation of these improvements would occur in the future in response to actual conditions and anticipated environmental effects. More discussion of potential strategies is presented in Chapter 12, Environmentally Beneficial Measures.

10.19.1 Historical Resources

The inclusion of several tiered categories of information about historic resources in the *2012 ESPR* provides a comprehensive basis for future analyses in the event that a specific project is developed for implementation. These include the up-to-date compilation of National and State Registers-listed historic resources, the data on current MHC Inventory and MACRIS resources; and the results of the 2006 historic resources reconnaissance survey and 2012 update to capture other historic resources that are 50 years old or older. Traffic measures in Chapter 12, Environmentally Beneficial Measures focus on TDM and operational improvements that do not require physical changes to the roadways. Possible noise mitigation measures could include operational measures of a voluntary nature such as those reported in Chapter 12, Environmentally Beneficial Measures.

10.19.2 Archaeological Resources

Any proposed future activities under the 2020 and 2030 scenarios that involve ground disturbance in areas of archaeological sensitivity or near known archaeological sites have the potential to impact known archaeological resources. The 2006 reconnaissance survey and 2012 update will guide future studies to identify and evaluate these areas in the event that a specific project is contemplated. Possible measures, if they are needed, may include project design approaches to avoid an archaeological site or sensitive area, site protection during construction, or data recovery excavations if a site cannot be avoided.

10.19.2.1 Minute Man National Historical Park

TDM approaches can reduce traffic volumes at a regional level and at Hanscom Field. A traffic control officer could be used during morning peak hours at the Hanscom Drive/Route 2A intersection if volumes reach 2020 and 2030 forecast levels. Possible noise mitigation strategies to reduce effects on historical sites could include continued operational measures of a voluntary nature such as those reported in Chapter 12, Environmentally Beneficial Measures. The federal interagency working group that was formed to review impacts on MMNHP may provide specific recommendations in the future that should be considered. Future noise recommendations may also be derived from the NPS soundscape plan for MMNHP.

11 Sustainable Development and Environmental Management System (EMS)

Sustainability is good for the environment and also makes good business sense. Massport recognizes the importance of sustainability and seeks to incorporate and encourage sustainable practices as an integral part of the agency's general operating and development philosophy.

Massport's mission is "to promote economic growth and vitality throughout Massachusetts and New England by operating many of the region's largest transportation facilities safely, securely, and efficiently while being mindful of the environment and our neighboring communities." In addition, Massport is committed to its pursuit of improving overall sustainability performance of the agency's operations and projects. In keeping with this mission, Massport manages Hanscom Field and its operations in a responsible fashion that considers the operational needs of the airport within the broader context of its environment.

11.1 Key Findings Since 2005

Massport is a leader among Massachusetts agencies in the promotion and implementation of sustainable design and operations. This is reflected in two relevant examples: Logan Terminal A, the first terminal in the world to achieve Leadership in Energy and Environmental Design (LEED) certification[84]; and Hanscom Field being the first airport in the U.S. to achieve ISO 14001 certification. The new Rental Car Facility and the recently completed Green Bus Depot at Logan are also anticipated to achieve LEED Silver certification.

Massport requires that all new development, including that conducted at Hanscom, meet performance standards established by LEED for Silver certification. LEED certification is achieved through the incorporation of sustainability commitments in building design and operation including energy efficiency, use of environmentally-friendly products, reuse and recycling, and renewable energy. At Hanscom, as an example, the new Liberty Mutual Hangar, while not a LEED certified facility includes a range of environmentally friendly elements to reduce energy utilization and environmental management. Rectrix Aviation is constructing a new state-of-the-art fixed-base operator (FBO) facility to replace Hangar 24 and is expected to achieve LEED Silver certification. Massport has constructed solar photovoltaic (PV) panels on the Hanscom Civil Air Terminal Building to provide onsite renewable energy and reduce its demand for power from offsite electricity sources. Massport will continue to encourage future operation and development of Hanscom Field facilities to be performed in a sustainable manner.

[84] The U.S. Green Building Council developed the LEED Green Building Rating System® to rate the sustainability of different building types.

11.2 Concept of Sustainability

Sustainability is a perspective that integrates economic development and environmental stewardship while meeting societal needs. In planning, design, construction, and operations, the conventional method of problem-solving typically considers short-term economic parameters, such as capital costs. While this consideration remains central to a benefit-cost analysis, the inclusion of operations and maintenance issues are critical for meeting long-term economic and societal goals. In particular, a sustainable approach to planning, design, construction, and operations considers all three elements: economy, environment, and society. Also called the “triple bottom line” (TBL), this approach to sustainable solutions is characterized by an appropriate and optimal balance among the three TBL elements, in addition to considering long-term implications. The long-term perspective is often carried out through life-cycle accounting or scenario planning and can uncover hidden TBL costs, such as potential regulatory changes, increases in the cost of fuel, impacts of climate change on airport operations, and future public demands. In general, sustainable solutions derived from TBL approaches can be expected to be more durable, effective, and economically viable.

The broad definition of sustainability, which acknowledges the inter-relationships among economic, environmental, and societal needs, is presented and discussed below.

11.2.1 Defining Sustainability

In keeping with the sustainability concepts described above, sustainability is a practice in which the use of renewable resources is balanced against their current and future availability, as well as the individual and commercial needs for those resources. It is based on the principle that consumption of resources should not lead to their exhaustion or to permanent damage.

Sustainable development was defined by the World Commission on Environment and Development in 1987 as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[85] This definition is widely accepted because the use of natural resources includes not only their direct consumption in processes but also encroachment upon nature through development and land use. It is common to use the terms “sustainability” and “sustainable development” interchangeably.

To be successful, sustainability must be initiated at all levels of a community—from the individual citizens to large public and private organizations. To date, sustainability has achieved its greatest success through voluntary programs, wherein citizens, organizations, and businesses formulate plans that balance the needs of economic prosperity with environmental health. For example, the sustainability reporting movement began around 2000 and is now considered standard practice among private and public corporations. In the last decade, many municipal organizations such as utilities, cities, and airports have begun this practice as well. While guidance for sustainability reporting is well codified by the Global Reporting Initiative, it is still a voluntary undertaking by public and private organizations in the United States.

In the green building arena, the LEED green building rating system has been adopted as part of many local and state building codes. For example, many cities now require new development projects above a specified footprint area to achieve LEED Silver certification. Looking ahead, greenhouse gas (GHG)

[85] World Commission on Environment and Development (WCED). 1987. ***Our Common Future,*** the Report of the Brundtland Commission, published by Oxford University Press.

inventorying and reporting—already required for specific industry sectors—is an area in which future regulations can be expected. Already, voluntary GHG mitigation programs have been established by many states and local jurisdictions.

In the Commonwealth of Massachusetts, sustainability has been codified in several ways since the 2005 Environmental Status and Planning Report (ESPR), including Executive Order 484 (Leading by Example: Clean Energy and Efficient Buildings) and the Global Warming Solutions Act (to reduce GHG emissions and adapt to climate change).

11.2.2 State of Practice in Airport Sustainability

Since 2005, numerous advances in aviation sustainability have taken place and many airports have developed sustainability management plans, instituted practices, educated staff, communicated with stakeholders, and begun to track sustainability performance. Massport continues to stay abreast of these advancements and is participating in some of them, such as the Federal Aviation Administration (FAA) Sustainable Master Plan Pilot Program.[86]

For agencies managing airports, some of the recent sustainability advances and resources now available include the following:

- Global Reporting Initiative's (GRI) Airport Operators Sector Supplement, providing guidance for sustainability reporting.
- Sustainable Aviation Guidance Alliance (SAGA) Database, providing a comprehensive list of sustainability strategies, practices, and technologies at airports.
- Airport initiatives: Sustainable airport manuals, master plans, and projects at multiple airports, such as Portland International (PDX), Sky Harbor (PHX), and Denver International (DIA).
- The Airports Council International North America (ACI-NA) environmental steering committee, of which Massport is a member, published environmental goals for North American airports in 2009. The goals covered environmental policies and management systems, air quality, climate, energy, noise, waste management, and water quality.[87]
- Multiple research efforts conducted under the Airport Cooperative Research Program (ACRP), including:
  - ACRP Synthesis 10: Airport Sustainability Practices
  - ACRP Project 02-28: Sustainability for Airports: Best Practices, Success Metrics, and Beyond
  - ACRP Project 02-30: Enhancing the Airport-Industry Database of Sustainable Practices
  - ACRP Report 42: Sustainable Airport Construction Practices
  - ACRP Project 02-40: Climate Change Adaptation Planning: Risk Assessment for Airports
  - ACRP Project 09-06: Sustainable Practices for Airport Maintenance and Operations

In addition, the FAA has been active in sustainable aviation through the following efforts:

- Existing and new noise compatibility programs (see Federal Aviation Regulations Part 150)
- Voluntary Airport Low Emissions (VALE) Program
- *Technical Guidance for Evaluating Selected Solar Technologies at Airports* (The Solar Guide)

---

[86] FAA website, Sustainability page, accessible at http://www.faa.gov/airports/environmental/sustainability/.
[87] ACI (February 2009), ACI-NA Environmental Goals. Accessible at http://www.airportsgoinggreen.org/Content/Documents/ACI_NA_board_enviro_goals_feb6.pdf

- Provisions in the FAA Reauthorization Act of 2012 for recycling and energy management

Most notably, the FAA initiated a Sustainable Master Plan Pilot Program in May 2010, to promote industry-wide learning about effective sustainability practices in master planning and operational management. Logan Airport, owned and operated by Massport, is one of the pilot locations for this program. Under a federal grant, Logan Airport is developing a Sustainability Management Plan. Massport is also undertaking a long-term strategic plan and a climate adaptation plan. Massport expects that practices and lessons learned at Logan will be applied as practicable to Hanscom Field and other Massport facilities.

11.2.3 Guiding Principles

As described above, the state of aviation practice has evolved considerably in the last several years; however, the fundamental guiding principles for airport sustainability have remained unchanged. At the highest level, as articulated by The Natural Step,[88] a global non-profit sustainability education and training organization, these guiding principles include the following:

- Reduce reliance upon non-renewable resources such as fossil fuels, metals, and minerals.
- Reduce consumption of chemicals and other synthetic compounds that are not easily assimilated by biological systems.
- Reduce or reverse the progressive degradation of natural systems resulting from development and other human activities.
- Help people meet their hierarchy of economic and social needs in fair and efficient ways.

Translated into terms applicable to airports, these general sustainability guiding principles address the following airport action areas as reported in ACRP Synthesis 10, Airport Sustainability Practices:

- Promote environmental sustainability through protecting water and air quality, adapting to climate change, reducing GHG emissions, stewarding land resources, preserving biodiversity, selecting environmentally preferable materials, minimizing and eliminating waste, recycling, abating noise, reducing energy consumption and efficiency, building green buildings, and implementing efficient transportation systems.
- Promote social sustainability by promoting aesthetics, communicating via public relations and stakeholder engagement, following fair and beneficial employee practices and procedures, promoting transportation mobility and accessibility solutions, celebrating local culture and heritage, safeguarding health/safety/indoor environmental quality, and promoting employee and passenger well-being.
- Promote economic sustainability through local hiring and purchasing, making contributions to the community, quantifying the economic metrics of sustainable solutions, contributing to research and development, participating in local economic development, and monetarily incentivizing sustainable behavior (for example, though lease terms with tenants).

11.2.4 State-Level Guidelines, Initiatives, and Programs

Massport voluntarily ascribes to and supports various sustainability guidelines, initiatives, and programs that are promulgated and promoted by the Commonwealth of Massachusetts. These are described in the following subsections.

[88] The Natural Step, Four System Conditions and Principles of Sustainability, accessible at http://www.naturalstep.org/the-system-conditions.

11.2.4.1 Executive Order 385 Planning for Growth (1996)

Massport voluntarily follows to the guidelines of Executive Order 385 Planning for Growth.[89] Key features of Executive Order 385 include the following:

- Massachusetts supports economic development that does not result in preventable adverse environmental effects.
- Massachusetts promotes development that is designed to minimize environmental impacts.
- The preferred method of achieving sustainability is through voluntary actions of involved parties.
- All Commonwealth agencies are to analyze the effect of their operations on their ability, and the ability of others, to implement sustainability and, when necessary, practical, and feasible, make changes to prevent any hindrances to achieving sustainability.
- All agencies shall try to work within the local or regional growth management plans.
- Reuse and rehabilitation of existing facilities and infrastructure are preferred over new facilities and infrastructure, where practicable and consistent with other plans.
- Regional transportation planning shall be coordinated among all involved agencies.

11.2.4.2 Executive Order 438 State Sustainability Program (2002)

In 2002, Massport began participating in the new State Sustainability Program (Executive Order 438)[90] developed by the Executive Office of Environmental Affairs. This program was an expansion of the Clean State Program, in which Massport had actively participated for many years.

The State Sustainability Program was designed to encourage state agencies to promote environmentally sustainable practices—including green buildings—to reduce environmental impacts from operations and to increase energy efficiency. Green building is the design, construction, and/or renovation of buildings that achieve energy efficiency and environmental sustainability. Massport has taken a leadership role in ensuring that its facilities meet LEED Silver criteria, including requiring third-party developers to meet the same standard.

11.2.4.3 Executive Order 484 Leading by Example—Clean Energy and Efficient Buildings (2007)

Executive Order 484[91] was signed by Governor Deval Patrick in 2007. It requires that state agencies lead by example to promote clean energy and efficient buildings. The Executive Order states that because buildings are significant users of energy, water, and natural resources, and because the Commonwealth manages millions of square feet of buildings, state agencies must prioritize energy conservation practices and programs that will reduce consumption of fossil fuels and measure progress towards clean energy and environmental goals. The Executive Order also requires that long-term programs, such as the Lead by Example Program, be established to identify and implement cost-effective initiatives that will result in environmental improvement and offer educational and training efforts in order to carry out the mandate of Executive Order 484.

---

[89] Governor William F. Weld, Executive Order No. 385 Planning for Growth, April 23, 1996. Accessible at http://www.lawlib.state.ma.us/source/mass/eo/eotext/EO385.txt

[90] Governor Jane M. Swift, Executive Order No. 438 State Sustainability Program. Accessible at http://www.lawlib.state.ma.us/source/mass/eo/eotext/EO438.txt

[91] Governor Deval L. Patrick, Executive Order 484, Leading by Example: Clean Energy and Efficient Buildings. Accessible at http://www.mass.gov/governor/docs/executive-orders/leading-by-example-eo.pdf .

11.2.4.4 Global Warming Solutions Act (2008)

The Global Warming Solutions Act (GWSA) was signed into law in August 2008, thereby establishing a comprehensive regulatory program for the Commonwealth to address climate change. The GWSA required the setting of economy-wide GHG emission reductions to reduce emissions between 10 percent and 25 percent below statewide 1990 levels by 2020, and 80 percent below 1990 levels by 2050. Massport's Energy Efficiency Initiative implements the goals of this act through energy efficiency and renewable energy installations.

11.2.4.5 MassDOT's GreenDOT Program (2010)

In June 2010, the Massachusetts Department of Transportation (MassDOT) launched the GreenDOT program to work toward three primary goals: reduce GHG emissions; promote the healthy transportation options of walking, bicycling, and public transit; and support smart growth development. GreenDOT calls for MassDOT to incorporate sustainability into all of its activities from strategic planning to project design and construction to system operation. The initiative includes GHG reduction targets mandated under the GWSA. The implementation plan centers around 16 sustainability goals under Air, Energy, Land, Materials, Policy/Planning, Waste, and Water. Massport was already aligning with these sustainability goals even before the formal implementation plan, and many of these activities are described below.

11.2.5 Massport's Environmental Management Policy

In November 2000, the Massport Board approved the Environmental Management Policy that states:

> Massachusetts Port Authority (Massport) is committed to operate all its facilities in an environmentally sound and responsible manner. Massport will strive to minimize the impact of its operations on the environment through the continuous improvement of its environmental performance and the implementation of pollution prevention measures, both to the extent feasible and practicable in a manner that is consistent with Massport's mission and goals. To successfully implement this policy, Massport will develop and maintain management systems that will:
>
> - Ensure that the environmental management policy is available to staff, tenants, customers and the general public.
> - Ensure compliance with all applicable laws and regulations.
> - Ensure that environmental considerations are included in the business, financial, operational, and programmatic decisions, including feasible and practicable options for potentially exceeding compliance with applicable regulatory requirements.
> - Define and apply sustainable design principles in the planning, design, operation and decommissioning of its facilities.
> - Define and establish environmental objectives, targets, and best management practices and monitor performance.
> - Provide training to and communication with staff and affected tenants regarding environmental goals, objectives, and targets and their respective roles and responsibilities in fulfilling them.
> - Incorporate monitoring of Massport and Massport tenants' environmental activities.
> - Include the preparation of an annual environmental performance report, which will be made available to staff, tenants, customers and the general public.

11.2.6 Environmental Management Systems

The ISO 14000 series of international standards addresses environmental issues associated with the activities, products, or services provided by an organization. The standards are designed to be incorporated into organizations of any type and size. The voluntary program involves creating an Environmental Management System (EMS), a proactive environmental program promoting pollution prevention, sustainable development, and continuous improvement. An International Standards Organization (ISO)-certified EMS must include a corporate environmental policy, environmental performance evaluation, and comprehensive system auditing. This process allows for continual evaluation and improvement in environmental performance.

ISO 14001 environmental management systems are being adopted around the world under the Aviation Environmental Management System (AEMS). Hanscom was the first U.S. airport to obtain ISO 14001 certification in 2001. Since then, other airports have followed suit, including Logan, Dallas/Ft. Worth, Denver, and Westchester County. A number of European airports, including Dublin, Cannes Mandelieu, Torp Sandefjord (Norway), Brussels, Hamburg, and Heathrow, as well as Toronto Pearson Airport, Vancouver International, and Aeroports de Montreal in Canada, are ISO 14001 certified or compliant.

11.2.7 LEED Certification

The U.S. Green Building Council (USGBC) established the LEED Green Building Rating System in 2000. "LEED is a third-party certification program and nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED certification is available for various building types including new construction and major renovation; existing buildings; commercial interiors; core and shell; schools and homes. LEED systems for neighborhood development, retail and healthcare are currently pilot testing. To date, there are over 4.5 billion square feet of construction space involved with the LEED system." According to the USGBC and substantiated by many case studies, buildings benefit from LEED certification by:

- Costing less to operate and maintain.
- Generating higher energy- and water-efficiencies.
- Demonstrating higher lease-up rates than conventional buildings in their markets.
- Providing a healthier and safer indoor environment for occupants.
- Embodying the environmental or sustainability values of the organizations that build, own, and occupy them.

The USGBC has a defined process to grant LEED certification. Building designs are registered with USGBC for review, which includes third-party validation. Buildings are certified based on whether they achieve a minimum number of points that are based on the number of "green" design elements that are in the design. One innovation in the LEED system since 2005 is that the rating system now includes regional credits. Projects can earn up to four "bonus" credits for implementing green building strategies that address the important environmental issues facing their region.[92] A rating system is used to determine four levels of LEED certification (Certified, Silver, Gold, and Platinum). The USGBC also provides training and accreditation for design professionals.

[92] U.S. Green Building Council. Fact Sheet. Available at http://new.usgbc.org/sites/default/files/Docs3330.pdf.

11.3 Sustainable Development at Hanscom Field

There are many strategies and practices available that support sustainable development. Since the *2005 ESPR*, Massport has developed and implemented sustainability initiatives appropriate to an airport environment, as well as to the particular location and role of Hanscom Field. A keystone of its overall program, Massport requires LEED Silver certification for all new development. This section provides details of Massport's current and planned sustainability practices at Hanscom Field.

11.3.1 Environmental Management System

In May 2001, Hanscom Field became the first airport in the U.S. to receive ISO 14001 certification through the development and implementation of an Environmental Management System (EMS). This achievement is a cornerstone for Massport in defining and achieving its sustainability goals and set a course for other Massport facilities.

A key feature of the EMS is a focus on continuous improvement by setting objectives and targets that are achieved and updated at regular intervals. Hanscom's focus areas for the EMS are related to vehicle emissions, energy use, solid waste recycling, stormwater management, hazardous materials, and tenant training.

In addition, employees are regularly trained to ensure awareness of risks to the environment associated with their jobs, to support continued ISO 14001 certification, and to maintain continuous improvement. Training topics include compliance requirements such as the management of hazardous materials and waste, stormwater pollution prevention, and spill prevention and response.

Massport's ISO 14001 certification requires having a third-party audit the system to ensure that it demonstrates continued improvement. These audits are performed by an internal auditor and then by a third-party auditor, typically every three years.

Hanscom Field is continuously improving the EMS itself by working toward greater staff engagement, improving information flows, and maintaining better documentation. In this regard, management review is a key element to the EMS at Hanscom Field. Senior managers regularly review the EMS, ensure adequate resources are available, and determine next steps. A management review meeting is held regularly to review the results of periodic audits and to determine if changes to the system are required.

11.3.2 Environmental Sustainability Initiatives

Massport is committed to minimizing the impact of its operations on both the natural and human environments through a wide array of initiatives and programs, in addition to those included in the EMS. Initiatives to promote sustainability include:

- Sustainable Planning and Design
- Sustainable Construction
- Sustainable Operations and Maintenance
- Monitoring of Environmental Performance

The beneficial effects to the environment of these initiatives extend across a variety of media, including air, water, noise, waste, and energy. The following sections, organized by the four initiatives listed above, highlight activities since 2005 and describe current program elements.

11.3.3 Sustainable Planning, Design, and Construction

Massport follows a formal sustainable planning, design, and construction program, which is applied at Hanscom Field. In addition to requiring LEED Silver certification, the program established specific criteria for designer selection and design review, design guidelines, and requirements for use of green technologies that foster the efficient use of resources such as energy, water, and air. These technologies include natural day-lighting, passive solar gain, natural cooling, energy-efficient HVAC equipment, environmentally beneficial building materials, and renewable energy and energy use monitoring.

To support this program, Massport adopted a comprehensive set of standards and guidelines for sustainable design in 2009, followed by Version 2 in 2011. The Sustainable Design Standards and Guidelines (SDSG) document currently applies to Massport projects in the capital program. Tenants and third-party developers are encouraged to follow the SDSG, which covers the following areas:

- General standards relating to project management, documentation, public involvement, commissioning, operational programs and infrastructure, and other topics
- Project site design
- Project materials
- Energy management and efficiency
- Air emissions
- Water management quality and efficiency
- Indoor air quality and occupant comfort

11.3.3.1 LEED Certification

Under the LEED certification program, Massport requires building projects (new or rehab projects) greater than 20,000 square feet in size to meet sustainable design elements and achieve a minimum LEED Silver certification. Designers are encouraged to achieve higher levels of LEED certification through the incorporation of appropriate sustainable design and operational elements. The Rectrix Hangar, to be completed in 2013, is anticipated to be LEED Silver certified upon completion. The key green features for these facilities include day-lighting, energy-efficient systems, and environmentally sustainable materials.

11.3.3.2 Energy Efficiency and Renewable Energy

Energy efficiency and renewable energy requirements are often stipulated in the environmental permitting documents and commitments as well as lease agreements. In addition to following the SDSG and supporting the LEED credits for energy in new or rehabilitated buildings, Hanscom Field has invested a significant effort into post-construction energy-efficiency projects.

The new roofing system for the Civil Air Terminal includes a 51 kilowatt solar PV facility comprised of 222 solar panels. Testing and commissioning of the system was completed in 2011. The total system was modeled to produce over 57,233 kilowatt-hours (kWh) of electricity per year, or 10 percent of the total building electricity requirement. To date, this installation has produced more than 156,000 kWh of electricity.

As part of the roof replacement project, Massport included increased insulation that is anticipated to decrease heating and cooling demands for the building by an estimated 20 percent as a result of lower heating and cooling demands. It installed new energy-efficient HVAC units in the Civil Air Terminal in August 2012. A dedicated building electricity meter was also installed to provide detailed monitoring of total building electricity demands and is used to track and verify whole building energy efficiency improvements.

11.3.3.3 Water Efficiency and Wastewater Reduction

In addition to using the sustainable design guidelines in the SDSG and supporting the LEED credits for water efficiency and wastewater reduction in new or rehabilitated buildings, Hanscom Field seeks opportunities to manage water resources more sustainably.

11.3.4 Sustainable Construction

Massport has established requirements for construction contractors that are aimed at minimizing environmental impacts. As part of its project approval process, Massport requires contractors to adhere to construction guidelines relating to:

- Construction debris and demolition waste recycling
- Selection of high-efficiency space heating/cooling systems
- Soil treatment and reuse on site (Soil Management Plan)
- Construction worker vehicle trip limitation
- Clean Construction Initiative, which requires contractors to retrofit their heavy equipment with advanced pollution control devices during construction of all Massport projects

In addition to enforcing the use of the construction guidelines, Massport seeks opportunities to employ more environmentally-friendly technologies. For example, warm-mix asphalt was pioneered at Logan Airport to take advantage of the benefits it offers: less energy required for heating, reducing air emissions, and healthier conditions for workers. At Hanscom Field, warm-mix asphalt was used in the rehabilitation of Taxiway ES-EW and in the resurfacing of the general aircraft parking lot.

11.3.5 Sustainable Operations and Maintenance

Massport has several programs in place that contribute to the sustainable operation and maintenance of the airport and its facilities. These programs are described below.

11.3.5.1 Energy Efficiency

In addition to promoting energy efficiency in planning, design, and construction, Massport strives for continuous improvement in operational energy efficiency. At Hanscom Field, digital energy meters were installed to obtain more accurate energy consumption data.

11.3.5.2 Clean Fuel Vehicle Program

As part of the Clean Fuel Vehicle Program, Massport has made progress in bringing alternative fuel vehicles (AFVs) into its fleet at Hanscom Field. At present, Massport owns fifteen fleet vehicles at Hanscom Field, four of which are electric. In addition, several tenants have switched to electric tugs for moving aircraft, resulting in reduced emissions at the airport. Jet Aviation uses six electric tugs and Signature uses electric two tugs and two electric golf carts.

The primary alternative fuel is ultra-low-sulfur diesel fuel. Massport will continue to consider AFVs for any new vehicle purchase in the future. Any new conventional-fueled vehicle added to the Hanscom fleet in the future will have very low emissions and will automatically comply with the low emission goals of the federal Clean Fuel Fleet Program (40 Code of Federal Regulations Part 88). As part of these regulations, ultra-low-sulfur diesel fuel for on-road diesel vehicles was phased in starting in 2005.

11.3.5.3 Toxic Reductions

Hanscom Field is a Very Small Quantity generator (< 220 lb/month) of Resource Conservation and Recovery Act (RCRA) regulated hazardous waste and a Small Quantity generator (< 2,200 lb/month) of Massachusetts regulated hazardous waste. Massport is committed to reducing the potential for the discharge and release of toxic materials, and pollution prevention is part of Massport's Storm Water Pollution Prevention Plan (SWPPP). Less toxic and non-toxic alternatives are evaluated and implemented where applicable.

Through Hanscom's EMS, Massport periodically looks for ways to reduce the use of toxic materials including evaluation of products for replacements with non-toxic alternatives. For example, solid-form sodium formate was selected for deicing at Hanscom after a careful evaluation of other options that were both FAA-approved and that met Clean Water Act receiving water standards. An inventory of chemicals being used at Hanscom Field is underway to identify other opportunities to reduce toxic compounds. Reduction of toxic materials means that less hazardous waste is produced, thereby minimizing impacts to the environment and saving dollars on waste disposal. In keeping with this goal, potential sources of spills or contamination are also carefully managed. For instance, the aboveground storage tanks at Hangar 10 were removed in August 2011.

Massport also works with its tenants to identify ways to reduce the amount and toxicity of certain products used at Hanscom Field. Massport involves the tenants in achieving environmental compliance and pollution prevention. Massport provides ongoing technical assistance to tenants regarding new regulations and means for compliance through an inspection program conducted by the Environmental Management Unit. In addition, educational materials are distributed on pollution prevention, stormwater best management practices, spill prevention and response procedures, and other topics.

Massport periodically sends tenants reminder notices of upcoming regulatory requirements. Since 2005, these notices covered topics such as recycling, tank management, spill prevention and reporting, stormwater, and universal waste management.

11.3.5.4 Recycling

Since the *2005 ESPR*, Massport has converted to single-stream recycling, which recycles a wider range of materials than the previous system. Hanscom and tenant facilities are provided with recycling dumpsters. Overall, Massport's recycling rates have steadily risen to approximately 11 to 12 percent for the entire Authority.

Under a new Massport recycling contract, the containers will be changed to a style that can be weighed at the time of service. Hanscom will be outfitted with larger-capacity containers, which will be wirelessly monitored, reducing unnecessary services. These units are available with solar panels as the primary power source, with traditional electrical backup.

Massport's goal is to reduce the cost of waste and recycling at Hanscom by 40 percent, while increasing the recycling rate to 30 to 40 percent during the 2014-2017 timeframe, and eventually to zero waste by 2020. Lastly, the trucks used to collect trash and recycling will be converted to compressed natural gas (CNG) during 2014.

11.3.5.5 Stormwater Management

Massport and its tenants have implemented a number of programs and management practices to reduce the potential for pollutants to be released into the storm drainage system. Many of the ongoing practices are focused on control of pollutants at their source through education and implementation of source reduction techniques and better administration and handling practices. Examples of ongoing practices include:

- Annual spill, stormwater, and hazardous waste management training for Massport employees
- Spill prevention, control, and countermeasure plan implementation by Massport and its tenants
- Inspection of stormwater discharges
- Placement of floating booms at outfalls
- Monitoring outfall conditions
- Implementation of a tank management program

Massport has also conducted design reviews to ensure that new facilities improve the quality and character of the airport while minimizing environmental impacts. Improved stormwater runoff control has been achieved through the requirement that compensatory storage for stormwater be provided for any projects resulting in increases in impervious surfaces, in order to not increase peak runoff rates.

In addition, Massport strives to take advantage of existing stormwater infrastructure and directs new development to areas with existing impervious surfaces. Massport also identifies and removes existing impervious surfaces where feasible. Since the *2005 ESPR*, Massport has eliminated approximately 4.4 acres of impervious surfaces at Hanscom Field by removing unused airside pavement.

11.3.5.6 Climate Adaptation

Adaptation to the anticipated impacts of climate change, such as increased frequency and intensity of storms, flooding, and sea level rise, may require adaptive actions at Hanscom Field and potential investments in infrastructure improvements. Hanscom has undertaken several initiatives in this area to become informed and begin securing the assets of the airport. For example:

- Massport managers participated in a statewide climate adaptation dialogue, which resulted in the development of short-, mid-, and long-range goals for addressing climate change within each state agency.
- Massport is evaluating disaster vulnerability, and the resulting report will become the basis for disaster planning.
- Massport has also initiated a long-range strategic planning effort Massport-wide, which includes an element addressing climate adaptation.
- In addition, the results of Logan Airport’s climate adaptation work, in association with the development of its Sustainable Management Plan (currently underway), will be translated to Hanscom Field and other Massport facilities through the EMS framework.

11.3.6 Monitoring of Environmental Performance

Massport has in place a number of environmental monitoring and audit programs at Hanscom Field that are required under regulatory programs such as the National Pollutant Discharge Elimination System, Oil Pollution Prevention regulations, and the Clean Air Act. In addition, Massport has in place several proactive policies, procedures, and programs that it has voluntarily adopted to assist in monitoring environmental performance and to identify opportunities to improve Massport’s environmental programs.

11.3.6.1 Annual Reporting

As part of the EMS, an annual performance report is compiled, which becomes the basis for selecting new objectives and targets for continuous improvement. This report evaluates environmental performance on a number of parameters, including energy efficiency and watershed protection.

At the beginning of each year, Massport prepares *The State of Hanscom*, which is presented to the Hanscom Field Advisory Commission (HFAC), a legislatively created body comprised of representatives from the surrounding residential areas, area-wide organizations, and members of the aviation community. The presentation to the HFAC provides a wide range of interested parties with an opportunity to openly discuss the role of Hanscom Field in the regional transportation system and Massport's objectives for the airport, including environmental and sustainability activities. In this report, it is noted that Massport meets its environmental commitments using a series of programs that include monitoring and auditing activities at Hanscom to ensure compliance with environmental regulations and the use of pollution prevention practices. Ongoing practices include:

- Using the EMS to track, manage, and improve environmental compliance and performance; updating targets as target dates are reached or when opportunities arise for improving the EMS framework.
- Participating in the Massachusetts State Sustainability Program (Executive Order 438) to promote environmentally sustainable practices and in the Massachusetts Leading By Example—Clean Energy and Efficient Buildings program (Executive Order 484).
- Inspecting Massport and tenant facilities to ensure environmental compliance.
- Reviewing and updating the Spill Prevention Control and Countermeasure (SPCC) Plan, which outlines steps to be taken by Massport employees in the event of a spill of fuel or other hazardous materials.
- Conducting monthly inspections of materials in the Field Maintenance garage that are used to control spills of fuel or other hazardous materials.
- Implementing and encouraging tenants to utilize best management practices (BMPs).
- Conducting periodic water quality inspections at Massport’s stormwater outfall locations.
- Participating in an aggressive mixed paper and cardboard recycling program for tenant and Massport offices, which expanded to single-stream recycling in 2009.
- Identifying opportunities during Massport capital program project design development to reduce stormwater runoff and peak flows.
- Identifying opportunities for development projects to control stormwater runoff.

11.4 Social Sustainability Initiatives

In recognition of the triple bottom line, Massport undertakes a number of partnerships and joint efforts with and for external stakeholders. For Hanscom Field, social sustainability emphasizes good community relations, productive stakeholder engagement, charitable contributions, support for education and youth programs, and environmental efforts that create community benefits. Since the *2005 ESPR* was prepared, Hanscom Field’s social sustainability initiatives have included the following:

- For 2011, in celebration of Earth Day, Hanscom conducted a hazardous waste collection event for tenants. The event was a success with over 8,000 pounds of hazardous materials collected.
- Massport has made contributions to various charities and scholarships. Massport’s Charitable Contribution, Scholarship, and Community Summer Jobs programs benefit organizations located

in communities that host its facilities. The organizations serve a diverse constituency and a variety of worthwhile purposes.

- In 2012, Massport contributed $7,000 to educational, scholarship, and youth programs in the Hanscom area. Additionally, Massport provided approximately $12,000 to sponsor summer internship positions at various municipal departments in the four Hanscom towns and $24,000 for the salaries of local college students that worked directly for Massport.
- Completing a noise outreach program in conjunction with the National Parks Service.
- Implementing a vegetative management plan with the conservation commissions of the four towns of Bedford, Concord, Lexington, and Lincoln so that the vegetation that grows into Hanscom airspace is managed in an environmentally sensitive manner.
- Opening a 40-acre conservation area with a trail network to the public, which allows users to enjoy the natural surroundings and understand the importance of conservation efforts by Massport.

11.5 Future Sustainability Efforts

Massport's future environmental sustainability efforts at Hanscom Field are expected to include the following:

- Integration with Logan Airport Sustainable Management Plan – Results, findings, and lessons learned from Logan's Sustainable Management Plan can be scaled up and across other Massport facilities, including Hanscom. Any resulting new efforts will be integrated with Hanscom's ongoing environmental management under the EMS and other existing sustainability initiatives.
- Environmental Management System – Hanscom's EMS recertification audit was conducted successfully in March 2013 and resulted in recertification through May 2016.
- Sustainable Design and Construction – Future design and construction efforts will maintain the sustainable design and construction initiatives and identify opportunities to expand the scope to achieve additional benefits. This includes a continued commitment to the initiatives described above.
- LEED Certification – Massport will continue to utilize and require that sustainable design guidelines and LEED certification be met by Massport, tenants, and third-party developers. This effort includes asking third-party developers to adopt good commissioning practices to ensure that facilities operate as designed.
- Energy Efficiency – Hanscom operations staff will investigate opportunities to re-lamp facilities, airfields, and street lights with LED systems. In addition, automatic, power-saver light switches will also be evaluated for installation.
- Renewable Energy – All future development projects will be evaluated for opportunities to incorporate renewable energy installations, such as solar power, wind, passive solar, biomass, or other viable technologies that may become available.
- Water Efficiency and Wastewater Reduction – All future development projects will be evaluated for opportunities to improve water efficiency and wastewater reduction, such as rainwater harvesting; gray water reuse for flushing, irrigation, or vehicle washing; and other technologies that may become available.
- Sustainable Construction – Individual projects will be required to implement BMPs to address Massport's policy regarding stormwater runoff, which requires that projects resulting in increases in impervious surfaces do not increase peak runoff rates.

- Clean Fuel – The existing programs for fuel efficiency and alternative fuel vehicles will be continued under the EMS program.
- Toxic Reductions – The existing program for toxic materials reduction and pollution prevention will be continued under the EMS program.
- Recycling – Massport's innovative waste management approach, which seeks to create revenue from this former cost center, will begin implementation in late fall 2013. Initial implementation will focus on waste streams controlled by Massport; over time, tenants' waste streams will be incorporated. Massport will also investigate the practicality of composting.
- Stormwater Management – Massport will continue to improve the management of stormwater runoff at Hanscom Field. This will include the potential elimination of unused paved surfaces (without affecting airport operations) and avoiding any increases in areas of impervious surfaces.
- Climate Adaptation – Massport is reviewing this issue authority-wide through studies that will develop recommendations for its facilities.
- Monitoring of Environmental Performance – The existing EMS program will continue to monitor environmental performance in its focus areas of vehicle emissions, energy efficiency, stormwater management, hazardous materials management, and employee/tenant training.

(This page intentionally left blank)

12 Environmentally Beneficial Measures

The previous sections assessed the environmental effects of Hanscom Field associated with year 2012 as a baseline, analyzed historic environmental trends using information from past reports, and considered the potential future effects of operations and development scenarios in the planning years 2020 and 2030. The *2012 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that that are described in Chapter 3, Airport Activity Levels. The aviation activity forecasts that are described in Chapter 3 provide for a realistic and practical level of growth based on local and national aviation trends including forecasts from the New England Regional Aviation System Plan. The 2020 and 2030 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes. This chapter summarizes the environmentally beneficial actions described in previous chapters that are in place at Hanscom Field as well as those additional measures that could be implemented to avoid or minimize potential environmental effects associated with the future scenarios.

Massport’s existing programmed activities encompass stewardship of environmental resources at and near Hanscom Field. Hanscom was the first airport in the nation to be ISO-certified and Massport implements an Environmental Management System (EMS) which includes continually reviewing and expanding the program to meet future environmental effects. Massport is also a leader among Massachusetts agencies in the promotion and implementation of sustainable designs through its Sustainable Design Standards and Guidelines and requirement that all new building development meet LEED Silver Certification. New hangars at Hanscom being developed by Rectrix Aviation and proposed by Jet Aviation are planned to meet this design requirement.

Massport has a long history of noise abatement commitments at Hanscom Field which are based on the 1978 Master Plan and 1980 regulations. These regulations prohibit 11:00 p.m. to 7:00 a.m. touch-and-go activity; prohibit touch-and-go activity by aircraft weighing over 12,500 pounds; and prohibit activity by Stage I Aircraft over 12,500 pounds. Massport's 1980 Regulations also prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

Massport has also worked cooperatively with the local community, aviation groups and the Minute Man National Historical Park (MMNHP) to implement a comprehensive noise abatement program known as "Fly Friendly" guided by the National Business Aircraft Association's (NBAA) published noise abatement guidelines and the Aircraft Owners and Pilots Association (AOPA) noise reduction recommendations. Pilots are encouraged to adhere to safe and quiet flying techniques and to remain aware of noise issues at the airfield. Additionally, Massport developed recommended helicopter procedures and voluntary touch-and-go procedures that help reduce noise over the MMNHP.

Within this context, the ESPR process provides a comprehensive evaluation of existing conditions, recent trends and the environmental effects of 2020 and 2030 scenarios. The *2012 ESPR* provides baseline information for the planning and design of new facilities and serves as a useful resource for the towns of Bedford, Concord, Lexington and Lincoln, Metropolitan Area Planning Council (MAPC), National Park

Service (NPS), Hanscom Air Force Base (AFB), and other interested parties. The existing programs and ongoing efforts to enhance these programs provide the foundation to address the types of conditions that could occur if activity levels are comparable to the 2020 and 2030 scenarios.

In accordance with the EEA Scope Certificate, Table 12-1 presents the responsible parties, implementation schedule, and the estimated cost of environmentally beneficial measures that are presented in the previous chapters. The identified ground transportation measures and others will be assessed through Massport's participation in the MassRIDES Transportation Management Initiative (TMI) program and discussed in Chapter 6, Ground Transportation. Site-specific noise abatement is not proposed since no noise analysis location experiences a DNL value greater than 60 dB in 2012 nor would any site be expected to experience a DNL value greater than 60 dB under the 2020 and 2030 scenarios.

Table 12-1 Summary of Existing and Possible Future Environmentally Beneficial Measures

Measure	Responsible Party	Timetable
GROUND TRANSPORTATION		
Transportation information on Massport website	Massport	Ongoing
Transit information in Civil Air Terminal	Massport	Ongoing
Participation as a partner in MassRIDES Transportation Management Initiative program	Massport	Ongoing
Information about transit and non-auto travel options in prominent locations throughout Hanscom Field	Massport	2014
Bus shelter with transit information	Massport	2014
Exploration of working with local communities and stakeholders on a bikeshare network	Multiple parties including Massport	Ongoing
NOISE		
Modifications to the Fly Friendly Program using the flight tracking software to direct pilots conducting touch-and-go procedures to fly more over the airport than neighboring lands	Massport	Ongoing
Continued implementation of the Fly Friendly program	Massport	Ongoing
Run-up procedures for use of the East Ramp	Massport	Ongoing
Relocation of noise monitors based on input from ongoing community coordination process and implementation of updates to the Noise and Operations Monitoring System	Massport	2014
Creation of the "Airport Activity Monitor" which allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance.	Massport	Ongoing
AIR QUALITY		
Continued encouragement of tenants to consider the purchase of alternatively fueled ground service equipment, where appropriate	Massport	Ongoing
Encouragement of Fixed Base Operators to minimize Auxiliary Power Unit/Ground Power Unit use	Massport	Ongoing
Use of Ultra Low Sulfur Fuel in Massport fleet vehicles	Massport	Ongoing
Evaluation of the installation of a paved aircraft holding area at the head of Runway 23 to reduce minor aircraft delays	Massport	2014-2016
Continued consideration of Alternative Fuel Vehicles for any new Massport vehicle purchase	Massport	Ongoing
WATER QUALITY		
Support for Shawsheen Watershed Initiative to improve water quality and quantity flow in the Shawsheen River and its tributaries	Massport working with the MassDEP, USEPA, and Hanscom AFB	Ongoing
Stormwater improvements to construct detention areas around Hanscom in conjunction with the USAF	Massport through MassDEP grant	2014-2016
Continuation of MassDEP Best Management Practices	Massport	Ongoing
WILDLIFE		
Manage airfield in a manner that does not disrupt breeding season for grassland birds of which two species are listed under the Massachusetts Endangered	Massport	Ongoing

Species Act		
SUSTAINABLE DEVELOPMENT		
Implementation and maintenance of EMS procedures to control environmental effects	Massport	Ongoing

12.1 Current Massport Programs and Procedures

The *2012 ESPR* describes the ongoing Massport programs and provides a comprehensive evaluation of the cumulative environmental effects of Hanscom Field. Massport has a number of programs in place to manage environmental issues at Hanscom Field. The environmentally beneficial measures for the 2020 and 2030 scenarios were identified within the context of these ongoing Massport programs and policies and are appropriate for the level of environmental effect that was identified in the technical analysis.

12.1.1 Environmental Programs

Massport has addressed many of the environmental issues that were identified in the *2005 ESPR*, including working with the U.S. Environmental Protection Agency (EPA), Massachusetts Department of Environmental Protection (MassDEP), and the U.S. Air Force (USAF) to take actions to reduce impacts of Hanscom area activities on the Shawsheen River Watershed. Cooperatively, the agencies have assessed current impacts of stormwater through modeling of discharges in the drainage area, installing weirs to reduce peak flows, and removing impervious area and increasing infiltration. Massport has also implemented the following measures and monitoring programs to reduce or eliminate potential impacts to the environment at Hanscom Field:

- Tracking the progress of the Installation Restoration Program (for environmental cleanup) and the USAF's progress toward site closure as described in Chapter 9, Wetlands, Wildlife and Water Resources.
- Employing Best Management Practices through its EMS to reduce potential impacts on the environment.
- Performing regular visual inspections of water quality at Hanscom Field stormwater outfalls in accordance with its Stormwater Pollution Prevention Plan and the National Pollutant Discharge Elimination System (NPDES) permit.
- Enforcing Massport's policy that stormwater runoff for new projects does not increase peak runoff rates.
- Ongoing implementation of Hanscom Field's Spill Prevention Control and Countermeasure (SPCC) Plan to ensure that all of Massport's hazardous material storage tanks are in compliance with current regulations and to monitor the age, condition, and regulatory compliance status of these tanks on an ongoing basis through the Tank Management Program
- Employing pollution prevention measures as they apply to site drainage, material storage, material transfer, truck unloading operations, and site security as part of the SPCC Plan.
- Continuing efforts to minimize and prevent the future releases of hazardous materials through careful operation and maintenance of equipment and site activities; the availability of spill response equipment; periodic employee training, and monitoring and review of ongoing environmental/spill prevention programs; and an compliance with the regulatory requirements governing spill reporting and response actions.
- Ensuring that new development is designed to meet LEED Silver certification and Massport’s Sustainable Design Standards and Guidelines.

12.1.2 Ground Transportation

Hanscom Field contributes a small percentage of traffic (four percent) to Route 2A traffic volumes. The 2012 peak hour volumes represent a slight decrease compared to the 2005 volumes reported in the *2005 ESPR*.

Massport is a MassRIDES partner. Massport is working with MassRIDES to develop an outreach program to make its employees and tenants aware of various MassRIDES programs such as the Emergency (Guaranteed) Ride Home Program for carpool and transit users. MassRIDES provided input to the employee and student survey that was discussed in Chapter 6, Ground Transportation.

Massport will continue to work with MassRIDES to review other potential TDM measures that would be appropriate for Hanscom Field. These would include measures (previously discussed in the *2005 ESPR)* such as updates to Massport's website and other mechanisms to distribute information.

12.1.3 Noise Abatement

Massport implements an aggressive noise abatement program at Hanscom Field. Massport restricts touch-and-go operations between 11:00 p.m. and 7:00 a.m., the most noise-sensitive time of day, and imposes a fee on other operations to discourage nighttime operations. The fee doubles for aircraft that conduct more than five night operations in a calendar year. This nighttime field use charge applies to all aircraft including commercial flights. Massport added enhancements to implement the Fly Friendly Program, which includes encouraging operators to use noise abatement procedures.

Tables 12-2 and 12-3 present metric and recommendations respectively prepared by the Hanscom Field Noise Workgroup report (using the same numbering methodology) which has guided the Noise Abatement. Nearly ninety percent of the recommendations have been implemented or are in the process of implementation. Eight of the fourteen measures were included in the *2005 ESPR* and updated in the *2012 ESPR*. Four other recommendations related to noise monitoring and the correlation of complaints with noise events are being addressed through updates to the Noise and Operations Monitoring System.

Massport continues to enhance its nighttime run-up noise abatement procedures. Massport directs operators to the run-up pad located due south of Runway 11-29 and west of the intersection with Runway 05-23 during the day. There is a short "blast fence" on the east side of the pad which deflects jet exhaust, prop wash, and debris. During nighttime hours, Massport directs operators to the east end of the East Ramp away from residential areas. Massport has as no plans to provide additional attenuation at these run-up areas. Massport also encourages Fixed Base Operators (FBOs) to minimize the use of auxiliary power units (APUs) and ground power units (GPUs) to minimize noise.

Table 12-2 Hanscom Noise Workgroup Metrics Recommendations

Number	Description	Status
M1	The workgroup should continue in existence and make additional suggestions for changes to the ESPR.	The Noise Workgroup contributed substantially to the formulation of the scope of work that formed the basis for the ongoing Hanscom Field ESPR analyses.
M2	The ESPR should include Time-Above (TA) contours and their areas.	Included. Figure 7-12, Figure 7-13 and Figure 7-19 to Figure 7-22 illustrate the contours and Table 7-16 and Table 7-30 present the estimated areas within the contours.
M3	The ESPR should show Single Event Level Distributions.	Included as Figure 7-16 and Figure 7-23.
M4	The next GEIR [ESPR] should include a linear dimensionless metric to show exposure to noise energy.	Not included. No such metric is used regularly in the evaluation of aircraft or other environmental noise.
M5	Future GEIRs (ESPRs) should include discussion of impacts with reference to the EPA level of 55 dB DNL and avoid the implication that DNL less than 65 (the Federal Aviation Administration mitigation threshold) has no impact.	Included in Chapter 7, Noise.
M6	Future GEIRs (ESPRs) should include three Community Summary Metrics - Loud Event Count, Area of 55 dB DNL contour, and Area of the 30-minute TA 55 dBA contour.	Included. Figure 7-16 and Figure 7-23 present SEL distributions; Table 7-9and Table 7-24present the estimated areas within the DNL contours; Table 7-11 and Table 7-25 present the population estimates within the current and forecasted 55 dB DNL contour; Figure 7-13,Figure 7-21 and Figure 7-22 present the area of the 30-minute TA 55 dBA contour
M7	Documentation should include a detailed list of assumptions and model parameters used in the noise modeling.	Included in Chapter 7, Noise.
M8	The ESPR should include a section discussing the estimated variation in Integrated Noise Model (INM) results due to different modeling assumptions, and Massport should adopt the standard practice of reporting "error bands." The ESPR should also include a comparison of measured and modeled results and an explanation of the differences.	Not included. There is no current FAA guidance or industry best practices guidelines for such an analysis. However, the noise analyses in the ESPR are intended to evaluate the range of noise exposure due to existing and forecast fleet and airport development assumptions. Measured noise values are compared to modeled noise values for the six permanent noise monitors.
M9	Future ESPRs should explain expected short-term variations in noise from long-term averages.	Included in Chapter 7, Noise.
M10	The ESPR should document how changes in the INM data [base] affect predicted noise exposure.	Included in Chapter 7, Noise.
M11 and M12	Three of the six permanent noise monitoring sites should be relocated and more sites should be added to the system.	In process. Massport is working with the communities to relocate two of the six permanent noise monitoring sites.
M13 and M14	A procedure or system should be developed to correlate noise events with flight data and complaints, and the noise data should be stored in a publicly accessed location such as a web site.	Recent updates to the Noise and Operations Monitoring System are described in Section 7.8.4.

Table 12-3 Status of the Hanscom Noise Workgroup Noise Abatement Recommendations

Number	Measure	Detail	Massport Actions to Date
A1	Voluntary Noise Abatement Procedures	Massport will formalize, publish, distribute and post existing noise abatement procedures drafted by Massport, HART, and HPA.	Massport distributes handouts and posters describing noise abatement procedures to all tenants, fixed base operators, and flight training schools. Massport mailed AOPA Fly Friendly videos to all hangar and tie-down tenants. Additionally, Massport installed AOPA and NBAA noise abatement procedures in its badge training program. All based pilots are asked to watch the AOPA or NBAA video when getting or renewing a security badge.
A2	Distribution to	Massport will duplicate and deliver to flights	Massport distributes handouts and posters

Number	Measure	Detail	Massport Actions to Date
	Renters	schools voluntary noise abatement procedures in sufficient quantity for schools to distribute to all aircraft renters.	describing noise abatement procedures to all tenants, fixed based operators, and flight training schools.
A3	Informative Page Markers	Massport will print and distribute informative page markers for noise abatement information in Jeppesen and Flight guide handbooks to local and transient pilots.	Massport distributes flight manual inserts describing noise abatement procedures to all tenants, fixed base operators, and flight training schools.
A4	Flight School Briefings	Hanscom flight schools will display and distribute local noise abatement procedures to their pilots, brief all flight instructors at least annually on local noise abatement procedures and AOPA Fly Friendly program, and require all students to view the AOPA Fly Friendly video.	Massport discusses noise abatement with the flight schools and makes the AOPA Fly Friendly video available. Handouts are replenished. Flight school pilots and student pilots watch the AOPA video when getting or renewing a security badge.
A5	Flight Training Center Briefings	The Hanscom AFB Flight Training Center will display in its flight planning room, and distribute to its members local noise abatement procedures brief the AOPA Fly Friendly program and local noise abatement procedures at its safety meetings at least annually, and require new club members to view the AOPA Fly Friendly video.	Massport provided the Hanscom AFB Flight Training Center with posters, flight manual inserts, and AOPA Fly Friendly videos. Flight manual inserts continue to be made available.
A6	FBO Guest Follow-up	Each FBO at Hanscom will institute a guest sign-in sheet and send each transient pilot a follow-up letter describing the voluntary noise abatement procedures at Hanscom.	Massport works with FBOs to implement this measure. Massport makes inserts available which the FBOs display in their flight preparation rooms.
A7	Massport Website	Massport will include the voluntary noise abatement procedures for Hanscom on its public access website with mutual links to the USAF and other web-based pre- flight planning resources.	Massport's website includes the voluntary noise abatement procedures for Hanscom Field.
A8	ATIS Broadcast	The ATIS broadcast will include a reminder that voluntary noise abatement procedures are in effect and whenever workload permits the Tower, Ground, and Clearance Delivery will follow with reminders.	FAA is the primary entity responsible for implementing this measure.
A9	Hanscom AFB Leader Briefings	Hanscom AFB representatives to the Hanscom Noise Workgroup will brief Electronic Systems Center and 66th Air Base Wing leaders on local noise abatement procedures, sensitivities, and issues.	Massport is not the primary entity responsible for implementing this measure.
A10	Military Flight Crews	Hanscom AFB Transient Alert will display and distribute local noise abatement procedures and information to military flight crews utilizing their facility.	Massport is not the primary entity responsible for implementing this measure. Massport distributed handouts and posters describing noise abatement procedures and continues to make handouts available.
A11	ESC Web page	The Hanscom AFB Electronic Systems Center will create a web page dealing with noise abatement issues at Massport for both military and civilian pilots.	Massport is not the primary entity responsible for implementing this measure.
A12	ESC Press Releases	The Hanscom AFB Electronic Systems Center Office of Public Affairs will send area newspapers regular (biweekly or monthly) news releases updating area residents on Air Force flight operations, subject to security considerations.	Massport is not the primary entity responsible for implementing this measure.
A13	ESC Website News Releases	The Hanscom AFB Electronic Systems Center Office of Public Affairs will add information about Air Force flight operations to the public access section of the Hanscom AFB web site, subject to security considerations.	Massport is not the primary entity responsible for implementing this measure.
A14	AOPA Video Distribution	Massport will purchase and distribute the AOPA Fly Friendly video to all Hanscom pilots.	Massport distributed the video to all tenants, fixed based operators, and flight training schools. Pilots are encouraged to watch the AOPA or NBAA video when getting or renewing a security badge.

Number	Measure	Detail	Massport Actions to Date
A15	Hanscom User Group	Massport will provide support to ensure that a representative user group be available to all users, pilots, and businesses.	Massport is supportive of aviation user groups and encourages aviation participation at HFAC.
A16	Selectmen and Town Briefings	HNWG will brief Town Selectmen on the group's findings.	Massport is not the primary entity responsible for implementing this measure.
A17	Part 150 Study	A group representing local pilots, business interests, surrounding communities and Massport will be formed to investigate the possibility and implications of re-opening the Part 150 Study at Hanscom Field.	Massport is not the primary entity responsible for implementing this measure.
A18	Model Quiet Airport Study	A group representing local pilots, business interests, surrounding communities and Massport will be formed to define the scope and purpose of a Model Quiet Airport Study at Hanscom Field.	Massport is not the primary entity responsible for implementing this measure.
A19	Non-Profit Organization	A group representing local pilots, business interests, surrounding communities and Massport will be formed to explore the idea of establishing a non-profit organization to raise funds to support various noise reduction awareness programs.	Massport is not the primary entity responsible for implementing this measure.
A20	Noise Abatement Officer	A group representing local pilots, business interests, surrounding communities and Massport will be formed to explore the idea of establishing a Noise Abatement Officer position at Hanscom Field.	Massport has a Noise Abatement Coordinator who ensures continued distribution of noise abatement materials, talks to pilots, and responds to comments concerning noise. In addition, Massport's Office of Noise Abatement (at Logan) supports Hanscom's noise monitoring system.
A21	Noise Overlay Zones	A group including representatives of the Planning Boards of the towns of Lincoln, Lexington, Bedford, and Concord will be formed to study the issues associated with the creation of Noise Overlay Zoning Districts.	Massport is not the primary entity responsible for implementing this measure.
There are a number of recommendations for which Massport is not the primary entity responsible.			

Massport distributes handouts and posters describing noise abatement procedures to all tenants, FBOs, and flight training schools. Massport mailed AOPA Fly Friendly videos to all hangar and tie-down tenants. Additionally, Massport installs AOPA and NBAA noise abatement procedures in its badge training program. All based pilots are asked to watch the AOPA or NBAA video when getting or renewing a security badge.

Massport was an active participant in Sound Initiative, a coalition that successfully supported the federal phase out of Stage 2 aircraft weighing less than 75,000 pounds. Stage 2 aircraft were manufactured before today’s stringent noise standards were adopted for new airplanes. The use of Stage 2 aircraft weighing over 75,000 pounds was phased out nationally by 2000, but most of Hanscom’s jets weigh less than 75,000 pounds. In 2012, Congress passed the FAA Modernization and Reform Act, which included the phase out of all non-stage 3 aircraft by December 31, 2015. Section 506 of the Act prohibits the operation, within the 48 contiguous states, of jets weighing 75,000 pounds or less that do not comply with Stage 3 noise levels. Military aircraft are exempt from the Stage 3 Rule.

Massport has also launched the “Airport Activity Monitor” which allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance.

12.1.4 Air Quality

Massport has also made progress in bringing alternative fuel vehicles (AFVs) into the fleet at Hanscom Field. Massport will continue to consider AFVs for any new vehicle purchase in the future. Also, since

Massachusetts has adopted the California LEV program, which requires that any new conventionally-fueled vehicle added to the Hanscom fleet in the future will have very low emissions and will automatically comply with the low emission goals of the federal Clean Fuel Fleet Program (40 CFR Part 88). As part of these regulations, ultra-low sulfur diesel fuel for on-road diesel vehicles was phased in starting in 2005. Massport also encourages FBOs to minimize the use of APUs and GPUs to address air quality considerations.

12.1.5 Project Development and Review

Massport will continue to provide regular updates on its activities at Hanscom Field through monthly HFAC meetings and the annual State of Hanscom reports. These public outreach and information mechanisms provide information to Bedford, Concord, Lexington, Lincoln, Hanscom AFB and the National Park Service on airport and project status. The *2012 ESPR* provides a comprehensive review of the cumulative environmental effects of Hanscom Field, but does not replace the requirement for an environmental filing for a specific project if that project meets or exceeds a MEPA regulatory threshold.

12.1.5.1 State and Local Review

Where state environmental review thresholds are exceeded, proposed projects are subject to a project-specific environmental review process with opportunities for public comment. In cases where the state environmental thresholds are triggered, Massport or the project proponent must prepare the appropriate environmental filing.

Massport is not subject to local zoning; however projects involving work within wetland resource areas or their buffer zones will involve applications to the appropriate conservation commissions for permitting as required under the Massachusetts Wetlands Protection Act. Massport will make every effort to avoid, minimize, and mitigate potential wetland impacts for future Massport or tenant projects.

12.1.5.2 Use of ESPR Baseline Data

Within this context, the *2012 ESPR* provides baseline conditions to inform the planning and review of future activities and projects at Hanscom Field including:

- A comprehensive database of historic and cultural resources including archeological sensitive locations located on Massport property
- Summary information and illustrations of the location of public water supplies and Zone II Wellhead Protection Areas
- Summary information and illustrations of wetlands resources, rare and endangered species, and agricultural resources at Hanscom Field
- Traffic volume data on area roadways and intersections

12.1.5.3 Massport Guidance

Massport guides the location of new facilities at Hanscom Field to developed areas where feasible to minimize impacts to undeveloped, natural areas. The continued implementation of the EMS at Hanscom Field also encourages the use of sustainable principles in future projects. Massport encourages the following specific measures for the development of new facilities:

- Achieving LEED Silver certification
- Use of Massport's Sustainable Design Guidelines

- If feasible, locating new water, sewer and stormwater drainage systems within already developed areas
- Implementing soil erosion and sediment control measures during construction
- Designing facilities that require septic systems in accordance with Title 5 regulations
- Using BMPs to ensure that relevant stormwater runoff rates are not increased both during construction and in future operating conditions

The construction of a new FBO facility by Rectrix Aviation is an example of a project designed and implemented using Massport's environmental and sustainable guidance. Since the facility is located in a Zone II Wellhead Protection Area that protects the recharge area around three public wells in Bedford, the new fueling facility is an above-ground fuel storage facility designed in accordance with the regulatory requirements of 527 CMR 9.00, "Board of Fire Prevention Regulations: Tanks and Containers" overseen by Massport's Fire Chief. The new facility was moved outside of the Zone II Wellhead Protection Area and adjacent to the existing fuel farm.

The *2012 ESPR* identifies the potential environmental effects of the 2020 and 2030 scenarios. The continued implementation and planned enhancement of the existing programs and measures, such as continually expanding the EMS program, is expected to address many of the potential environmental effects of the 2020 and 2030 scenarios. Other environmentally beneficial measures would likely be developed if and as concepts move forward to become specific projects.

12.2 Additional Environmentally Beneficial Measures

12.2.1 Ground Transportation

Measures to address ground transportation considerations in the 2020 and 2030 scenarios focus on traffic management and TDM approaches, as well as planning efforts to facilitate the development of non-auto modes in the area.

12.2.1.1 Transportation Demand Management

TDM measures will provide appropriate environmentally beneficial measures if airport activity levels approach the 2020 and 2030 scenarios. Massport is a MassRIDES partner and has already begun efforts to develop TDM measures through the TMI program that MassRIDES administers for the Massachusetts Department of Transportation (MassDOT). Massport is also coordinating with the Hanscom AFB on TDM Programs and will be conducting a joint transportation fair at Hanscom to provide information and encourage registration with MassRIDES.

Massport interviewed its tenants in December 2012 and conducted a travel survey of airport employees and the National Aviation Academy (NAA) in August 2013. Based on discussions with MassRIDES and the information from the interviews, surveys and future outreach meetings with tenants, Massport will enhance its TDM program at Hanscom Field. This could include the distribution of travel information and evaluation of alternative modes.

12.2.1.2 Bicycle Facilities

As indicated in Chapter 6, Ground Transportation, Hanscom Field and its environs benefit from a network of regional bicycle facilities. However, some of the trails are not directly linked to the other regional trails. The Town of Concord has expressed interest in providing links between a rail-to-trail that the Town of Bedford is considering and the existing network of paths in the MMNHP. Massport will work with the towns and the National Park Service to explore this option.

Massport is also evaluating the development of a bikeshare network that would provide bike facilities and rental bikes for use between Hanscom Field, the AFB, the town centers, and the MBTA commuter rail.

12.2.2 Noise

Massport will continue to support its Fly Friendly program and coordination with aircraft pilots and local stakeholders. Massport has been actively discussing changes to the noise monitoring system including possible relocation of noise monitors and upgrades to the operating system that will facilitate addressing additional recommendations identified by the Hanscom Noise Workgroup.

In all future scenarios, the total population exposed to high noise levels at Hanscom Field remains low and well below historic levels. In the 2020 and 2030 scenarios, none of the locations evaluated, including historical resources, are exposed to a DNL value over 60 dBA, 5 dBA below the federal standard for noise compatibility. Aircraft noise mitigation is being addressed by FAA's ongoing efforts to make aircraft quieter. Therefore, Massport does not propose site specific noise abatement to address conditions that are projected in the 2020 and 2030 scenarios, but instead plans to focus on implementation of its noise abatement regulations, procedures, and programs.

12.2.3 Air Quality

The air quality analysis in Chapter 8 indicates that the emission levels forecasted for the 2020 and 2030 scenarios will not result in any significant adverse air quality effects and will be below historic levels. However, Massport will continue its efforts to help to reduce emissions including TDM measures, encouraging FBOs to minimize the operation of APUs and GPUs, and efforts to bring AFVs into the fleet at Hanscom Field. Massport will also investigate the creation of an aircraft holding area at the head of Runway 23 that would allow piston aircraft to pull off Taxiway G and complete their pre-flight checkout, freeing other aircraft that are behind to takeoff.

12.2.4 Water Quality and Stormwater

Massport will encourage new facilities at Hanscom to be located in developed areas where feasible. The continued implementation of the EMS at Hanscom Field will also encourage the use of sustainable principles in future projects. All potential components of the 2020 and 2030 scenarios would be required to meet requirements of the NPDES Permit and applicable standards for stormwater management required by the MassDEP.

The *2012 ESPR* identifies other potential development sites in the North Airfield area that fall within the Zone II Wellhead Protection Areas for the Bedford Town Wells. As specific projects are developed, including corporate GA hangars in the North Airfield, Massport will review the designs to ensure that appropriate measures are taken to protect the recharge area of the Bedford public wells.

Acronyms and Glossary of Terms

Acronyms and Abbreviations

This section provides a list of acronyms and abbreviations that are found in the *2012 ESPR*. The Glossary of Terms provides definitions for acronyms and abbreviations that have an asterisk (*).

µg/m3 micrograms of pollutant per cubic meter

A

ABW Air Base Wing

ADD* Average Daily Demand

ADF* Average Daily Flow

AFB* (Hanscom) Air Force Base

AFDSI Air Force Director of Staff Information

AFV* Alternative Fuel Vehicle

ALP* Airport Layout Plan

ALS* Approach Lighting System

AMSL Above mean sea level

ANRAD* Abbreviated Notice of Resource Area Delineation

APA American Planning Association

APU* Auxiliary Power Unit

ARFF Aircraft Rescue and Fire Fighting

ARP* Airport Reference Point

ARTC Anderson Regional Transportation Center

ARTS* Automated Radar Terminal System

ASR* Airport Surveillance Radar

ATC* Air route traffic control center

ATCT* Airport traffic control tower

ATR Automatic Traffic Recorder

B

BDL Bradley International, CT airport code

BED Hanscom Field, MA airport code

BGR Bangor, ME airport code

BLSF* Bordering Land Subject to Flooding

BMP* Best Management Practice

BOS (Logan) Boston, MA airport code

BRAC* Base Realignment and Closure

BVT Burlington, VT airport code

BVW* Bordering Vegetated Wetlands

BX Base Exchange

C

CEQ Council on Environmental Quality

CERCLA* Comprehensive Environmental Response, Compensation, and Liability Act

CMPL Concord Municipal Power and Light

CMR Commonwealth of Massachusetts Regulation

CMS* Congestion Management System

CO* Carbon monoxide

CPI Consumer Price Index

CTPS Central Transportation Planning Staff

CXC Chandra X-ray Center

D

dB* Decibel

dBA* A-weighted decibel

DCE* dichloroethylene

DEP Department of Environmental Protection

DERP* Defense Environmental Restoration Program

DNL* Day-Night Sound Level

DoD Department of Defense

DOT (U.S.) Department of Transportation

E

EA* Environmental Assessment

EB Eastbound

EDMS* Emissions and Dispersion Modeling System

EIR* Environmental Impact Report

EIS* Environmental Impact Study

EMS* Environmental Management System

ENF* Environmental Notification Form

EOEA Executive Office of Environmental Affairs

EOT Executive Office of Transportation

EPA (U.S.) Environmental Protection Agency

ESC Electronic Systems Center

ESPR* Environmental Status and Planning Report

EXP* Total Noise Exposure

F

FAA Federal Aviation Administration

FAEED* FAA Aircraft Engine Emissions Database

FAF* Final Approach Fix

FAP* Final Approach Point

FAR Federal Aviation Regulation

FBO* Fixed Base Operator

FEMA Federal Emergency Management Agency

FHWA Federal Highway Administration Program

FICAN Federal Interagency Committee on Aviation Noise

FICON Federal Interagency Committee on Noise

FIR Field Investigations Region

FIRM* Flood Insurance Rate Map

FMVCP* Federal Motor Vehicle Control

FONSI* Finding of No Significant Impact

FY Fiscal Year

G

GA General Aviation

GARA* General Aviation Revitalization Act

GEIR* Generic Environmental Impact Report

GIS Geographic Information Systems

GMP* General Management Plan

gpd gallons per day

gpm gallons per minute

GPU* Ground Power Unit

GS* Glide Slope

GSE* Ground Service Equipment

H

HANAM Hanscom Aboveground Tank – Massport

HANAT Hanscom Aboveground Tank – Tenant

HANBM Hanscom Underground Tank – Massport

HANBT Hanscom Underground Tank – Tenant

HATS* Hanscom Area Towns

HCM* Highway Capacity Manual

HCS* Highway Capacity Software

HFAC* Hanscom Field Advisory Commission

HIRLS* High Intensity Runway Lighting System

HNM* Heliport Noise Model

HNWG* Hanscom Noise Workgroup

HOV* High Occupancy Vehicle

HP* Horsepower

HUD Department of Housing and Urban Development

HVN Tweed New Haven, CT airport code

Hz* Hertz

I-J

I/M Inspection & Maintenance

IFR* Instrument Flight Rule

ILS* Instrument Landing System

ILSF* Isolated Land Subject to Flooding

INM* Integrated Noise Model

IROD* Interim Record of Decision

IRP* Installation Restoration Program

ITE Institute of Transportation Engineers

K

kV* Kilovolt

kVA* Kilovolt ampere

L

LDA* Localizer Directional Aid; Landing Directional Aid

LEED* Leadership in Energy and Environmental Design

Leq* Equivalent Sound Level

LEV* Low Emissions Vehicle

LOC* Localizer antenna

LOS* Level of service

LSP* Licensed Site Professional

LTO* Landing and takeoff

LUWB* Land under Water Bodies/Waterways

M

M.G.L. Massachusetts General Law

MAC Massachusetts Aeronautics Commission

MACRIS* Massachusetts Cultural Resources Information System

MAGIC Minuteman Advisory Group on Interlocal Coordination

MALSR* Medium Intensity Approach Lighting System and Runway Alignment Indicator Lights

MAPC Metropolitan Area Planning Council

MassHighway Massachusetts Highway Department

MassPike Massachusetts Turnpike Authority

Massport Massachusetts Port Authority

MBTA Massachusetts Bay Transportation Authority

MCP* Massachusetts Contingency Plan

MDAR Massachusetts Department Agricultural Resources

MEPA* Massachusetts Environmental Policy Act

MESA* Massachusetts Endangered Species Act

MHC* Massachusetts Historic Commission

MHT Manchester-Boston, NH airport code

MIRLS* Medium Intensity Runway Lighting System

MIT Massachusetts Institute of Technology

MLS* Microwave Landing System

MMNHP* Minute Man National Historical Park

mph miles per hour

MPO Metropolitan Planning Organization

MWRA Massachusetts Water Resources Authority

MWRC Merrimack River Watershed Council

N

NAAQS* National Ambient Air Quality Standards

NASA National Aeronautics and Space Administration

NAVAID* Navigational Aid

NB Northbound

NCP* National Oil and Hazardous Substances Pollution Contingency Plan

NDB* Non-Directional Beacon

NEPA* National Environmental Policy Act of 1969

NERASP* New England Regional Aviation System Plan

NET National Emission Trends

NHESP* Natural Heritage and Endangered Species Program

NO2* Nitrogen dioxide

NOI* Notices of Intent

NOMS* Noise and Operations Monitoring System

NOx* Nitrogen oxides

NPC* Notice of Project Change

NPDES* National Pollutant Discharge Elimination System

NPL* National Priority List

NPS National Park Service

NR* National Register (of Historic Places)

O

O3* Ozone

OFA* Object Free Area

OFZ* Object Free Zone

Opspecs Operations specifications

ORH Worcester, MA airport code

ORW* Outstanding Resource Water

OU* Operable Unit

P-Q

PAPI* Precision Approach Path Indicators

PAR* Precision Approach Radar

PCB* Polychlorinated biphenyl

PM* Particulate matter (e.g., PM10, PM2.5)

PMT* Program for Mass Transit

ppm parts per million

psi pounds per square inch

PSM Portsmouth International, NH airport code

PVD T.F. Green, RI airport code

PWM Portland, ME airport code

R

RACT* Reasonably Available Control Technology

RAIL* Runway Alignment Indicator Lights

RAO* Response Action Outcome

RDA* Request for Determination of Applicability

REIL* Runway end identifier light

RIAC Rhode Island Airport Corporation

ROD* Record of Decision

RPZ* Runway Protection Zone

RSA* Runway Safety Area

RTAC Regional Transportation Advisory Council

RTCC Regional Transportation Coordinating Council

RTN Release Tracking Number

RVR* Runway visual range

S

SB Southbound

SDF* Simplified Direction Finding

SE* Single engine

SEL* Single Event Level

SIP* State Implementation Plan

SO2* Sulfur dioxide

SPCCP* Spill Prevention Control and Countermeasure Plan

SR* State Register (of Historic Places)

SRS Strategic Reconnaissance Squadron

SSALR* Simplified Short Approach Light System (SSALR)

SuAsCo Sudbury-Assabet-Concord (Wild and Scenic River System)

SWPPP* Stormwater Pollution Prevention Plan

SX Assistant Secretary

T

TA* Time Above (a decibel threshold)

TACAN* Tactical Air Navigation

TCE* Trichloroethylene

TDM* Transportation Demand Management

TERPS* Terminal Instrument Procedures

TIM* Time-in-mode

TIP* Transportation Improvements Plan

TL* Taxilane

TMA* Transportation Management Association

TMI* Transportation Management Initiative

TPH* Total petroleum hydrocarbon

TRACON* Terminal Radar Approach Control

TRB Transportation Research Board

TSA* Transportation Security Administration: Taxiway Safety Area

TSS* Total suspended solids

TW* Taxiway

U

USACE U.S. Army Corps of Engineers

USC United States Code

USFWS U.S. Fish and Wildlife Service

USGS United States Geological Survey

V

VASI* Visual Approach Slope Indicators

VER* Vacuum-enhanced recovery

VFR* Visual Flight Rules

VMP* Vegetation Management Plan

VMT* Vehicle miles traveled

VOC* Volatile organic compounds

VOR* Very-High-Frequency Omnidirectional Range (aviation); Vehicle Occupancy Rate (ground transportation)

W-Y

WB Westbound

WPA* Wetlands Protection Act

Z

ZEV* Zero emissions vehicle

Glossary of Terms

A

A-Weighted Sound Level (dBA) – An adjustment to the very high and very low frequencies to approximate the human ear's reduced sensitivity to those frequencies. This adjustment is used to account for frequency dependence in measuring community noise. Customarily referred to simply as "sound levels," where the adjective "A-weighted" has been omitted. With A-weighting, a noise source having a higher sound level than another is generally perceived as louder. Also, the minimum change in sound level that people can detect outside of a laboratory environment is on the order of three decibels (dB). A change in sound level of ten dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relationship holds true for loud sounds as well as for quieter sounds.

Average Daily Demand (ADD) – The calculated average of the sum of water meter readings for a facility or facilities.

Average Daily Flow (ADF) – A measure of wastewater flows that is typically described in gallons per day. Wastewater average daily flow is a calculation of the average wastewater flow generated from a facility based on 80 percent of the average daily potable water demand.

Abbreviated Notice of Resource Area Delineation (ANRAD) – The Abbreviated Notice of Resource Area Delineation, WPA Form 4A, is a filing to Conservation Commission of a local jurisdiction or the Massachusetts Department of Environmental Protection (DEP) that serves two purposes under the Massachusetts Wetlands Protection Act:

1. A procedure for an applicant to confirm the delineation of a Bordering Vegetated Wetland (BVW).
2. The application for Simplified Review for projects in the Buffer Zone, which must certify that the project design meets all of the eligibility criteria in Section D of the ANRAD

If an ANRAD is filed for a BVW delineation, confirmation of other resource areas may also be requested provided the other resource area boundaries are identified on the plans which accompany the BVW boundary delineation. To determine the applicability of the Wetlands Protection Act, an applicants may file a Request for Determination of Applicability (RDA), a Notice of Intent (NOI) or an Abbreviated Notice of Intent. Any work within an area subject to the jurisdiction of the Wetlands Protection Act may not proceed until either a Negative Determination of Applicability or a final Order of Conditions has been issued by the Conservation Commission or DEP.

Air Route Traffic Control Center (ATC) – A facility established to provide air traffic control service to aircraft operating on Instrument Flight Rules (IFR) flight plans within controlled airspace and principally during the enroute phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to Visual Flight Rules (VFR) aircraft.

Air Taxi – An aircraft operator who conducts operations for hire or compensation in accordance with Federal Aviation Regulations (FAR) Part 135 in an aircraft with 30 or fewer passenger seats and a payload capacity of 7,500 lbs. or less. An air taxi operates on an on-demand or charter basis and cannot operate “scheduled” services with the same frequency as regional or commuter airlines. Air taxi operators are limited to no more than four scheduled roundtrip flights per route per week using turboprop aircraft.

Airport Traffic Control Tower (ATCT) – The air traffic control unit responsible for controlling movements around an airport as well as the name of the building in which the unit operates. The height of permanent ATCT structures gives air traffic controllers visual contact with aircraft on the ground and in the air around an airport. The ATCT facility, operated by appropriate authority at an airport, promotes the safe, orderly and expeditious flow of air traffic within the airport traffic area.

Airport Elevation – The highest point of an airport's usable runway expressed in feet above mean sea level (AMSL).

Airport Layout Plan (ALP) – A scaled drawing of existing and proposed land and facilities necessary for the operation and development of the airport.

Airport Lighting – Various lighting aids that may be installed on an airport. Types of airport lighting include:

1. **Approach Light System (ALS)** – An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach for landing. Condenser-Discharge Sequential Flashing Lights/Sequenced Flashing Lights may be installed in conjunction with the ALS at some airports. Types of ALS at the Airport are Simplified Short Approach Light System (SSALR) with Runway Alignment Indicator Lights (RAIL).
2. **Runway Lights/Runway Edge Lights** – Lights having a prescribed angle of emission used to define the lateral limits of a runway. Runway lights are uniformly spaced at intervals of approximately 200 feet, and the intensity may be controlled or preset.
3. **Runway Centerline Lighting** – Flush centerline lights spaced at 50-foot intervals beginning 75 feet of the opposite end of the runway.
4. **Runway End Identifier Lights (REIL)** – Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.
5. **Visual Approach Slope Indicator (VASI)** – An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is "on path" if he sees red/white, "above path" if white/white, and "below path" if red/red. Some airports serving large aircraft have three-bar VASIs which provide two visual glide paths to the same runway.

Airport Marking Aids – Markings used on runway and taxiway surfaces to identify a specific runway, a runway threshold, a centerline, a hold line, etc. A runway should be marked in accordance with its present usage such as:

- Visual
- Nonprecision instrument
- Precision instrument

Airport Reference Point (ARP) – The latitude and longitude of the approximate center of the airport.

Airport Rotating Beacon – A visual NAVAID operated at many airports. At civil airports, alternating white and green flashed indicate the location of the airport. At military airports, the beacons flash alternatively white and green, but are differentiated from civil beacons by dualpeaked (two quick) white flashes between the green flashes.

Airport Surveillance Radar (ASR) – Approach control radar used to detect and display an aircraft's position in the terminal area. ASR provides range and azimuth information but does not provide elevation data. Coverage of the

ASR can extend up to 60 miles, presenting air traffic controllers with the location of all aircraft within the range of the antenna.

Alternative Fuel Vehicle (AFV) – Vehicles that are powered by fuels that reduce the air pollution, solid waste, and hazardous waste that result from their use, service, and maintenance. Alternative fuels may include compressed natural gas, biodiesel, ethanol, electric and hybrid electric, propane, liquefied natural gas, and hydrogen fuel cells.

Approach Control Facility – A terminal Air Route Traffic Control Center facility that provides approach control service in a terminal area.

Approach Light System (ALS) – See Airport Lighting.

Apron – A defined area on an airport or heliport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance. With regard to seaplanes, a ramp is used for access to the apron from the water.

Automated Radar Terminal System (ARTS) – A range of systems that display for the terminal controller aircraft identification, flight plan data, other flight associated information such as altitude, speed, and aircraft position.

Auxiliary Power Unit (APU) – Self-contained generator on an aircraft that provides electricity, heat and air conditioning to an aircraft when its engines are off.

B

Banks – Land areas that normally abut and confine a water body. Banks occur between a waterbody and a vegetated wetland or adjacent floodplain, or between a waterbody and an upland.

Base Realignment and Closure (BRAC) – A process used by the U.S. Department of Defense to close military bases and realign assets to improve efficiency and reduce cost. BRAC processes have occurred in 1989, 1991, 1993, 1995 and 2005.

Below Minimums – Weather conditions below the minimums prescribed by regulation for the particular action involved; e.g., landing minimums, takeoff minimums.

Best Management Practice (BMP) – Approaches to address the management of environmental resources in a proactive and practical fashion. Examples of BMPs include preventative maintenance, elimination of non-stormwater discharges to storm drains, spill response and the use of oil/water separators.

Bordering Land Subject to Flooding (BLSF) – The maximum lateral extent of floodwater, which will theoretically result from the statistical 100-year storm. The extent of Bordering Land Subject to Flooding is typically derived from examining FEMA Flood Insurance Rate Maps.

Bordering Vegetated Wetlands (BVW) – Vegetated areas that border on water bodies and waterways including vegetated freshwater wetlands. The technical criteria and methodology utilized to identify and delineate BVW is set forth in Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act (DEP, 1995). Criteria for identifying and delineating this resource area include the presence of a plant community dominated by wetland indicator species, and signs of hydrology. The presence of hydric soils within the wetland is considered an indicator of hydrology.

C

Congestion Management System (CMS) – A federally mandated multimodal transportation plan for metropolitan areas. The findings of the CMS must be considered in the development of the Regional Transportation Plan and the Transportation Improvement Plan. Any expansion of roadway capacity must be developed in the context of the CMS in transportation management areas that have not attained federal air quality standards. The Central Transportation Planning Staff prepares and updates the CMS for the Boston metropolitan area.

Carbon Monoxide (CO) – A regulated air pollutant created from the combustion of fossil fuel.

Ceiling – The heights above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obscuration," and not classified as "thin" or "partial."

Comprehensive Environmental Liability Act (CERCLA) – A federal law enacted by Congress on December 11, 1980 vehicle that provides federal authority to respond to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and, established a trust fund to provide for cleanup when no responsible party could be identified. The trust fund is funded by taxes on the chemical and petroleum industries.

Controlled Airspace – Airspace designated as a control zone, airport radar service area, terminal control area, transition area, control area, continental control area, and positive control area within which some or all aircraft may be subject to air traffic control.

D

Decibel (dB) – A logarithmic unit that is used to represent the intensity of sound. This representation is called a sound pressure level. A sound pressure level of less than 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet conditions. Normal conversational speech has a sound pressure level of approximately 60 to 65 dB. Sound pressure levels above 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Decision Height – With respect to the operation of aircraft, means the height at which a decision must be made during an Instrument Landing System or instrument approach to either continue the approach or to execute a missed approach.

Departure Control – A function of an approach control facility providing air traffic control service for departing IFR and, under certain conditions, Visual Flight Rules aircraft.

Defense Environmental Restoration Program (DERP) – A program established by the Department of Defense to address hazardous substances, pollutants, contaminants, and military munitions remaining from past activities at military installations and formerly used defense sites.

E

Emissions and Dispersion Modeling System (EDMS) – Computer program established by the Federal Aviation Administration (FAA) to calculate emissions and dispersion of aircraft operations at an airport. The latest version is 4.3.

Enroute Air Traffic Control Services – Air traffic control service provided aircraft on Instrument Flight Rules flight plans, generally by centers, when these aircraft are operating between departure and destination terminal areas. When equipment, capabilities, and controller work load permit, certain advisory/assistance services may be provided to VFR aircraft.

Environmental Assessment (EA) – An environmental document filed in accordance with the National Environmental Policy Act of 1969 that documents the environmental impacts of a proposed action in support of a Finding of No Significant Impact (FONSI) or the facilitation of the preparation of an Environmental Impact Statement (EIS). An EA and its FONSI document NEPA compliance. The EA process includes public review and comment on its scope and filing.

Environmental Impact Report (EIR) – An environmental document filed in accordance with the Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive, to study the environmental consequences of a project. Typically, the proponent files a draft and final EIR, but the Secretary of Environmental Affairs may allow a single EIR. The EIR process includes public review and comment on its scope and filings, which are noticed in the Environmental Monitor. At the close of the EIR review period, the Secretary decides whether the EIR is adequate and issues an Adequacy determination that includes enforceable mitigation commitments.

Environmental Impact Study (EIS) – An environmental document filed in accordance with the National Environmental Policy Act of 1969 that documents the environmental impacts of a proposed action that has significant environmental impacts. An EIS describes a proposed action, its purpose and need, alternatives to the proposed action, the affected environment, and an environmental analysis of each alternative. The EIS process includes public review and comment on its scope and filing.

Environmental Management System (EMS) – A system instituted by Massport to help evaluate and mitigate the environmental impacts from airport operations and planning.

Environmental Notification Form (ENF) – An environmental document filed in accordance with the Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive, to begin the MEPA review process. A proponent begins the ENF process if a project is subject to MEPA jurisdiction and either it meets or exceeds one or more review thresholds or the Secretary of Environmental Affairs requires fail-safe review. The ENF process includes public review and comment on its scope and filing, which are noticed in the Environmental Monitor, and a MEPA Consultation session. At the close of the review period for an ENF, the Secretary issues an Adequacy Determination that may require an EIR or allow the proponent to take action on the project.

Environmental Status and Planning Report (ESPR) – An environmental filing made by Massport to the Executive Office of Environmental Affairs. An ESPR provides a retrospective analysis of past trends in the environmental effects of the airport while including analyses for future conditions under various scenarios. Massport prepares ESPRs for Hanscom Field and Logan Airport. The Hanscom Field ESPR is filed every five years.

Equivalent Sound Level (Leq) – A measure of exposure resulting from the accumulation of A-weighted sound levels over a particular period (as opposed to an event) of interest such as an hour, an eight-hour school day, nighttime, a single 24-hour period, or an average 24-hour period. Because the length of the period can differ, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example Leq (8) or Leq (24). Conceptually, the Leq may be thought of as the constant sound level occurring over the designated period of interest and having as much sound energy as that created by the actual rising and falling sound pressures from multiple noise sources as they become more or less pronounced.

F

FAA Aircraft Engine Emissions Database (FAEED) – A computerized emissions inventory calculation procedure that contains air pollution emissions information for various aircraft engines and data correlating engines to specific aircraft. The emissions data from FAEED have been incorporated into the EDMS.

Federal Motor Vehicle Control Program (FMVCP) – Air pollution emission standards for new motor vehicles that have been established by the U. S. EPA. These standards have mandated increasing strict air pollution emission factors for motor vehicles.

Final Approach – That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified,

1. at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or
2. at the point of interception of the last track specified in the approach procedure; and ends at a point in the vicinity of an aerodrome form which: a) a landing can be made; or b) a missed approach procedure is initiated.

Final Approach Fix (FAF) – The fix from which the final approach (IFR) to an airport is executed and which identifies the beginning of the final approach segment. When ATC directs a lower-than-published Glide Slope/path Intercept Altitude, it is the resultant actual point of the glide slope/path intercept.

Final Approach Point (FAP) – The point, applicable only to a nonprecision approach with on depicted Final Approach Fix such as on-airport Very-High-Frequency OmniRange (VOR), where the aircraft is established inbound on the final approach course from the procedure turn and where the final approach descent may be commenced. The FAP serves as the FAF and identifies the beginning of the final approach segment.

Fixed Base Operator (FBO) – A full-service FBO is a company that handles a range of needs for based and transient aircraft, their operators, and their passengers. These include cleaning, maintaining, fueling and parking/hangaring aircraft, providing flight planning services for the pilots, and arranging for the specific needs of those flying such as ground transportation or overnight accommodations. Although the majority of FBO activity involves servicing corporate general aviation activity, the FBOs also provide some charter activity.

Flood Insurance Rate Map (FIRM) – A map that are published by the Federal Emergency Management Agency to determine flood insurance requirements and to assist communities in regulating new development. Flood Insurance Rate Maps show areas that have a one percent chance of flooding (the 100-year floodplain) and a 0.2 percent chance of flooding in any given year (the 500-year floodplain). These areas are determined to be the areas of highest risk when a stream overflows its banks or when coastal waters experience tidal surges from tropical storms or hurricanes.

G

General Aviation (GA) – That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of public convenience and necessity from the Civil Aeronautics Board and large aircraft commercial operators.

General Aviation Revitalization Act (GARA) – Legislation that amends the Federal Aviation Act of 1958 to establish time limitations on certain civil actions against aircraft manufacturers.

General Management Plan (GMP) – Broad and comprehensive, long-term planning documents prepared by National Park Service for each National Park, which typically encompasses preservation of natural and cultural resources, visitor use and interpretation, roads, and facilities.

Generic Environmental Impact Report (GEIR) – An environmental filing to the Executive Office of Environmental Affairs that assesses the environmental effects of policies or plans as opposed to site-specific projects.

Glide Slope (GS) – Provides vertical guidance for aircraft during approach and landing. The glidescope/glidepath is based on the following:

- Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as Instrument Landing System/, or
- Visual ground aids which provide vertical guidance for Visual Flight Rules approach or for the visual portion of an instrument approach and landing.

Ground Power Unit (APU) – Generator on the ground that provides electricity, heat and air conditioning to an aircraft when its engines are off.

H

Hanscom Air Force Base (AFB) – 396-acre United States Air Force Base in Bedford, Concord, Lexington, and Lincoln that supports the Electronic Systems Center of the Air Force Material Command.

Hanscom Area Towns (HATS) – The Growth and Development Policy Committee established under M.G.L. Chapter 40 Section 4I to address intergovernmental and planning issues in Bedford, Concord, Lexington and Lincoln.

Hanscom Field Advisory Commission (HFAC) – An advisory commission that was established by act of the State legislature in 1980. HFAC includes 16 members appointed by the selectmen of Bedford, Concord, Lexington and Lincoln. HFAC includes representatives from the Town of Bedford, Concord, Lexington and Lincoln; local citizens groups; other area towns affected by Hanscom Field; businesses basing aircraft at Hanscom Field; aviation or aviation-related businesses at Hanscom Field; and business-aviation general aviation organizations. HFAC and Massport meet monthly to provide continued communication.

Hanscom Noise Workgroup (HNWG) – A group of community- and aviation-based members that was organized by Massport at the request of the Secretary of Environmental Affairs after the filing of the 1995 GEIR in 1997. The HNWG met for a period of two years and published its findings in a report entitled "Report of the Hanscom Field Noise Workgroup," dated September 22, 1999. Their report summarizes the series of meetings by the committee and its two task groups, one devoted to abatement and mitigation, the other to metrics and modeling.

Hertz (Hz) – International System of Units measure for the number of times that a repeated event occurs during a specified unit of time

Heliport Noise Model (HNM) – A computer program that is intended to serve as an aid in assessing the impact of helicopter noise in the vicinity of terminal operations. HNM Version 2.2 is based upon Version 4 of the Federal Aviation Administration's Integrated Noise Model (INM). Utilized in the 2005 ESPR as a data source for helicopter flight profiles

High Occupancy Vehicle (HOV) – A vehicle carrying two or more passengers.

High Intensity Runway Lighting System (HIRLS) – A system of high intensity lights that outline edges of runways during periods of darkness or restricted visibility conditions.

Horsepower (HP) – A measure of power. The electrical industry defines the horsepower of electric motors to be 746 watts at 100-percent efficiency.

I

Initial Approach Fix – The fixes depicted on instrument approach procedure charts that identify the beginning of the initial approach segments.

Installation Restoration Program (IRP) –A program within the DERP that focuses on releases of hazardous substances, pollutants, or contaminants that pose environmental health and safety risks.

Instrument Approach Procedure – A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority.

Instrument Flight Rules (IFR) – Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

Instrument Landing System (ILS) – A precision instrument approach system which normally consists of the following electronic components and visual aids:

- Localizer
- Glide slope
- Outer Marker
- Middle Marker
- Approach Lights

Instrument Landing System (ILS) Category – An Instrument Landing System approach procedure which provides for approach to a height above touchdown of not less than 200 feet and with runway visual range of not less than 1,800 feet.

Instrument Meteorological Conditions – Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

Instrument Runway – A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach having straight-in landing minimums has been approved.

Integrated Noise Model (INM) – A complex computer program that calculates aircraft noise levels around an airport from user input data and an extensive internal database of aircraft noise and performance statistics. Outputs can include DNL contours and other metrics such as Time Above and DNL values at specific points. The FAA developed the INM as the primary tool for analyzing and evaluating noise impacts from aircraft operations. Its use is prescribed for all FAA-sponsored projects requiring environmental evaluation.

Interim Record of Decision (IROD) – An interim document in the progression of assessment and cleanup of a site, and is intended to provide the public with a consolidated source of information about the site history, characteristics, risks posed, and a rationale behind the selected remedy.

Inventory of the Historic and Archaeological Assets of the Commonwealth – Inventory of historic properties and archaeological sites maintained by the Massachusetts Historical Commission.

Isolated Land Subject to Flooding (ILSF) – Isolated depressions or closed basins without an inlet or outlet. It is an area which, at least once per year, confines standing water to a volume of at least one-quarter acre-feet and an average depth of at least six inches.

K

Kilovolt (kV) – A unit of measure equal to 1,000 volts that is commonly used to describe the potential power of an electrical distribution system.

Kilovolt ampere (kVA) – A unit of measure equal to 1,000 volt amperes that is commonly used to describe the capacity of an electrical transformer.

L

L.G. Hanscom Field (Hanscom Field) – Approximately 1,300-acre civilian airport in Bedford, Concord, Lexington, and Lincoln and operated by the Massachusetts Port Authority.

Landing Minimums – The minimum visibility prescribed for landing a civil aircraft while using an instrument approach procedure. Descent below the established or Decision Height is not authorized during an approach unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and adequate visual reference to required visual cues is maintained.

Land Under Water Bodies/Waterways (LUWB) – The land area under any creek, river, stream, pond or lake is a resource area subject to protection under the Massachusetts Wetlands Protection Act.

Landing-Takeoff Cycle (LTO) – Aircraft operations performed at airports. The Landing-Takeoff Cycle includes: approach from a level of 3,000 feet above ground level, landing, taxi-in, taxi-out, takeoff, and climbout to a height of 3,000 feet above ground level.

Large Airplane – An airplane of more than 12,500 pounds (5,700 kg) maximum certificated takeoff weight.

Leadership in Energy and Environmental Design (LEED) – The U.S. Green Building Council established the LEED Green Building Rating System® as a "voluntary, consensus-based national standard for developing high-performance, sustainable buildings." A rating system is used to determine four levels of LEED certification with Platinum being the highest level.

Level of Service (LOS) – Level of service is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. It is an aggregate measure of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway system capacity to roadway system travel demand. Operating level of service is reported on a scale of A to F, with A representing the best operating conditions and F representing the worst operating conditions. LOS A represents uncongested conditions with little or no delay to motorists, while LOS F represents a forced-flow condition with delays and traffic demands that have been identified as exceeding roadway capacity. Roadway operating levels of service are calculated following procedures defined in the *2000 Highway Capacity Manual (HCM)*, published by the Transportation Research Board (TRB) for signalized and unsignalized intersections

Licensed Site Professional (LSP) – The Massachusetts (DEP has developed a licensing procedure for consultants working in the context of the MCP, consisting of testing and training requirements to assure a base level of competency. Those consultants meeting DEP requirements become LSPs and provide assistance to disposal site owners to assure the site is cleaned up following the MCP process. The LSP minimizes DEP involvement in site activities by overseeing actions conducted at the site.

Localizer (LOC) – The component of an ILS that provides course guidance to the runway, emitting a signal used to establish and maintain an aircraft's horizontal position until visual contact confirms the runway alignment and location.

Localizer Type Directional Aid (LDA) – A navigational aid used for nonprecision instrument approaches with utility and accuracy comparable to a localizer but which is not a part of a complete ILS and is not aligned with the runway.)

Low Emissions Vehicle (LEV) – Motor vehicles that meet air pollution emission standards that are more-strict (lower) than those that are required for vehicles under the FMVCP.

M

Massachusetts and National Ambient Air Quality Standards (NAAQS) – Air pollutant concentrations for defined periods of time (1-hour, 24-hours, annual, etc.) established to protect the public's health and welfare in ambient (outdoor) air.

Massachusetts Contingency Plan (MCP) – A regulatory framework for cleaning up hazardous waste sites in Massachusetts. The MCP outlines the schedule and procedures to be followed at disposal sites to undertake necessary and appropriate response actions to provide protection of health, safety, public welfare and the environment. The MCP regulatory citation is 310 CMR 40.0000.

Massachusetts Cultural Resources Information System (MACRIS) – A computerized database listing of the Inventory of the Historic and Archaeological Assets of the Commonwealth that can be linked to MassGIS. MACRIS is maintained by the Massachusetts Historical Commission (MHC).

The Massachusetts Endangered Species Act (MESA) – The Massachusetts Endangered Species Act that was enacted in December 1990 to protect plant and animal species in danger of extinction. Implementing regulations were promulgated in 1992 and recently revised and implemented as of July 1, 2005. The regulation requires habitat alteration permits for projects that may alter a significant portion of habitat. The recent revisions clarify filing requirements, implement fees, and specify time lines for the regulatory review process.

Massachusetts Environmental Policy Act (MEPA) – The Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive. The Massachusetts Environmental Policy Act requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. It also requires them to take all feasible measures to avoid, minimize, and mitigate damage to the environment. MEPA further requires that state agencies "use all practicable means and measures to minimize damage to the environment," by studying alternatives to the proposed project, and developing enforceable mitigation commitments, which will become permit conditions for the project if and when it is permitted.

Massachusetts Environmental Policy Act (MEPA) Office – The MEPA Office is the staff of the Secretary of Environmental Affairs responsible for daily implementation and administration of the MEPA review process. The staff, headed by the Assistant Secretary for Environmental Impact Review (also known as the MEPA Director), consists of environmental analysts and administrative support persons. The MEPA Office reviews ENF, EIR, Notice of Project Change (NPC), and ESPR filings; makes recommendations to the Secretary regarding the adequacy of these filings and the need for additional filings; assists project proponents, agencies, and the public with questions; interprets the MEPA regulations; publishes the Environmental Monitor and review schedule.

Massachusetts Historical Commission (MHC) – Established in 1983 to encourage preservation of the rich cultural heritage of the Commonwealth's cities and towns. The MHC is the State Historic Preservation Office.

Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) – A configuration of medium-intensity lights with Runway Alignment Indicator Lights positioned symmetrically along the extended runway centerline to provide visual lighting guidance for landing aircraft. A MALSR supports Category I precision approaches.

Medium Intensity Runway Lighting System (MIRLS) – A system of medium intensity lights that define the lateral limits of runways during periods of darkness or restricted visibility conditions.

Microwave Landing System (MLS) – A precision instrument approach system operating in the microwave spectrum that provides the pilot of a properly equipped aircraft with electronic guidance to control the aircraft's alignment and descent until visual contact is made with the runway environment.

Middle Marker – A marker beacon that defines a point along the glide slope of an Instrument Landing System normally space located at or near the point of decision height (Instrument Landing System Category I). It is keyed to transmit alternate dots and dashes, with the alternate dots and dashes keyed at the rate of 95 dot/dash combinations per minute on a 1300 Hz tone, which is received aurally and visually by compatible airbourne equipment.

Minimums – Weather condition requirements established for a particular operation or type of operation; e.g., IFR takeoff or landing, alternate airport for Instrument Flight Rules flight plans, Visual Flight Rules flight, etc.

Minute Man National Historical Park (MMNHP) – The National Park Service operates the Minute Man National Historical Park, which was created in 1959. The park consists of three discontinuous sections referred to as the Battle Road, Wayside, and North Bridge Units and covers approximately 967 acres along Route 2A in Concord, Lexington, and Lincoln and off Monument Street in Concord. Minute Man National Historical Park itself and a number of individual historic properties within the park are historic resources of national significance that are designated National Historic Landmarks. The park is nationally significant as the site of the Battle of Concord, one of the two battles that marked the beginning of the Revolutionary War; for its association with prominent literary figures of the nineteenth and twentieth centuries; and as one of the earliest places in the nation to be commemorated. The park was created to " . . . provide . . . for the preservation and interpretation of historic sites, structures, and properties lying along the entire route of battle" in April 1775.

MOBILE6.2 – U. S. Environmental Protection Agency model to predict fleet-average emissions of carbon monoxide, oxides of nitrogen, and volatile organic compounds from motor vehicles.

Movement Area – The runways, taxiways, and other areas of an airport/heliport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with a tower, specific approval for entry onto the movement area must be obtained from Air Route Traffic Control Center.

N

National Ambient Air Quality Standards (NAAQS) – Air pollution concentrations in outdoor air that have been established by the EPA to protect the public's health and welfare. NAAQS are air pollution concentrations that may not be exceeded.

National Environmental Policy Act (NEPA) of 1969 –An Act that established the national policy for the environment and created the Council on Environmental Quality. NEPA requires that an environmental impact statement or EIS be prepared on every "major federal action" undertaken or permitted. A Finding of No Significant Impact (FONSI) is issued if it is determined that the project will not have a significant effect on the environment. An EIS must consider alternatives and mitigation measures that would lessen the project's impacts. The EIS must be made available in draft form for public comment and the agency must respond to those comments received in the Final EIS.

Natural Heritage and Endangered Species Program (NHESP) – Part of the Massachusetts Division of Fisheries and Wildlife that is responsible for the conservation and protection of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the state. The highest priority of NHESP is protecting the approximately 190 species of vertebrate and invertebrate animals and 258 species of native plants that are officially listed as Endangered, Threatened or of Special Concern in Massachusetts. A primary responsibility of the NHESP is the regulatory protection of rare species and their habitats as codified under the MESA (M.G.L. c.131A) and Wetlands Protection Act (M.G.L c.131s.40).

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) – The NCP establishes an organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants. Development of the NCP was required under the Comprehensive Environmental Liability Act (CERCLA), also known as the Superfund Act, and by the U.S. Clean Water Act.

National Pollutant Discharge Elimination System (NPDES) – A program authorized under the U.S. Clean Water Act to control water pollution by regulating point sources (e.g., pipes, ditches, conduits) that discharge pollutants into waters of the United States. NPDES permits are administered by U.S. EPA or delegated to individual states to administer. General and Individual NPDES permits are typically five years in length and have provisions for automatic extensions if the permit is not reissued prior to expiration.

National Priority List (NPL) – List of hazardous waste sites eligible for long-term remedial action financed under the federal Superfund program.

National Register of Historic Places (NR) – Includes properties of local, state, and national significance designated by the Department of the Interior through the State Historic Preservation Officer.

Navigational Aid (NAVAID) – Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight.

New England Regional Aviation System Plan (NERASP) – A joint effort by the FAA, Massport and the Massachusetts Aeronautics Commission with the involvement of major commercial service airports throughout the six-state region. The NERASP developed forecasts from a regional perspective rather than from the perspective of an individual airport or a state system of airports. Each airport’s potential to accommodate scheduled commercial passenger was based not only on the demand generated by the airport’s catchment area, but also considered the attractiveness of nearby airports that passengers may also utilize

Nitrogen dioxide (NO2) – One of the Oxides of Nitrogen (NOx) compounds. The U. S. EPA has established regulations, including a NAAQS, for nitrogen dioxide (NO2).

Noise and Operations Monitoring System (NOMS) – A system of six permanent noise monitors near Hanscom Field and the software that is used to monitor their operation. The system was installed in 1989 and is in the process of being upgraded by Massport.

Noise Sensitive Receptor – Site-specific location where noise exposure may be a concern. The ESPR calculates DNL and Time Above values at the following types of noise sensitive receptors: hospitals, sites on the National Register of Historic Places, public facilities, religious sites, and schools.

Nondirectional Beacon (NDB) – A Low/Medium Frequency or Ultra High Frequency radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his bearing to or from the radio beacon and "home" on or track to or from the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

Nonmovement Area – Taxiways and apron (ramp) areas not under the control of air traffic.

Nonprecision Approach Procedure – A standard instrument approach procedure in which no electronic glidescope is provided; e.g., VHF Omnidirectional Range (VOR), Tactical Aircraft Control and Navigation (TACAN), NDB, LOC, ASR, LDA, or Simplified Direction Finding (SDF) approaches.

Notice of Intent (NOI) – A filing with the Conservation Commission of a local jurisdiction that uses WPA Form 3 or, in limited circumstances WPA Form 4 (Abbreviated Notice of Intent), to seek confirmation of delineated wetland resource area boundaries

Notice of Project Change (NPC) – An environmental document filed in accordance with the Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive, if there is any material change in a project prior to the taking of all Agency Actions for the project. The continuation of the project by a new proponent shall not by itself constitute a change in the Project, provided that the new proponent adopts all mitigation measures to which the previous Proponent committed. The NPC shall specify in detail any change in the information provided in any previous review document. In determining whether a change in a project or the lapse of time might significantly increase environmental consequences, the Secretary shall consider the following factors:

a) Expansion of the Project. A change in a project is ordinarily insignificant if it results solely in an increase in square footage, linear footage, height, depth or other relevant measures of the physical dimensions of the project of less than ten percent over estimates previously reviewed, provided the increase does not meet or exceed any review thresholds.

b) Generation of further impacts, including an increase in release or emission of pollutants or contaminants during or after completion of the project. A change in a project is ordinarily insignificant if it results solely in an increase in impacts of less than twenty-five percent of the level specified in any review threshold, provided that cumulative impacts of the project do not meet or exceed any review thresholds that were not previously met or exceeded.

c) Change in expected date for commencement of the project, commencement of construction, completion date for the project, or schedule of work on the project.

d) Change of the project site.

e) New application for a permit or new request for financial assistance or a land transfer.

f) For a project with net benefits to environmental quality and resources or public health, any change that prevents or materially delays realization of such benefits.

g) For a project involving a lapse of time, changes in the ambient environment or information concerning the ambient environment.

O

Object – Includes, but is not limited to, above ground structures, NAVAIDs, people, equipment vehicles, natural growth, terrain, and parked aircraft.

Object Free Area (OFA) – An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Obstacle – An existing object, object of natural growth, or terrain at a fixed geographical location or which may be expected at a fixed location within a prescribed area with reference to which vertical clearance is or must be provided during flight operations.

Obstacle Free Zone (OFZ) – The OFZ is the airspace below 150 feet (45 m) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches. The OFZ is subdivided as follows:

- **Runway OFZ** – The airspace above a surface centered on the runway centerline;
- **Precision Approach Category I (CAT I) Runway** – A runway with an instrument approach procedure which provides for approaches to a decision height (DH) of not less than 200 feet (60m);
- **Runway Protection Zone (RPZ)** – An area off the runway end to enhance the protection of people and property on the ground;
- **Runway Safety Area (RSA)** – A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway;
- **Shoulder** – An area adjacent to the edge of paved runways, taxiways or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection;
- **Taxilane (TL)** – The portion of the aircraft parking area used for access between taxiways and aircraft parking positions;
- **Taxiway (TW)** – A defined path established for the taxiing of aircraft from one part of an airport to another;
- **Taxiway Safety Area (TSA)** – A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway;
- **Visual Runway** – A runway without an existing or planned straight-in instrument approach procedure.

The OFZ is a three dimensional volume of airspace which protects for the transition of aircraft to and from the runway. The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, expect for frangible NAVAID locations that are fixed by function. Additionally, vehicles, equipment, and personnel may be authorized by air traffic control to enter the area using the provisions of Order 7110.656, Air Traffic Control, paragraph 3-5. The runway OFZ and, when applicable, the inner-approach OFZ and the inner-transitional OFZ, comprise the OFZ.

Operable Unit (OU) – A discreet portion of a site that is investigated and cleaned up separately from other portions of the site. Dividing a site into two or more operable units allows separate investigations and cleanups to proceed at their own pace. Common examples are investigating soil and groundwater contamination separately, and cleaning up and redeveloping small portions of a larger site.

Outer Marker – A marker beacon at or near the glide slope intercept altitude of an ILS approach. It is keyed to transmit two dashes per second on a 400 Hz tone, which is received aurally and visually by compatible airborne equipment. The OM is normally located four to seven miles from the runway threshold on the extended centerline of the runway.

Outstanding Resource Water (ORW) – A water or a wetland bordering a water that has been designated by the Massachusetts Department of Environmental Protection as an Outstanding Resource Water (ORW). ORWs include public water supplies, certified vernal pools, and other waters that constitute an outstanding resource as determined by their outstanding socio-economic, recreational, ecological and/or aesthetic values.

Overhead Maneuver – A series of predetermined maneuvers prescribed for aircraft (often information) for entry into the VFR traffic pattern and to proceed to a landing. An overhead maneuver is not an IFR approach procedure. These aircraft shall be considered VFR and the IFR flight plan is canceled when the aircraft crosses the landing threshold on the initial approach portion of the maneuver.

Oxides of Nitrogen (NOX) – Regulated air pollutants representing different combinations of oxygen and nitrogen. The U. S. EPA has established regulations, including a NAAQS, for nitrogen dioxide (NO2).

Ozone (O3) – A regulated air pollutant formed from reactions between Volatile Organic Compounds (VOC) and oxides of nitrogen in the presence of sunlight, primarily during summer months. Also generally known as smog.

P-Q

Particulate Matter (PM2.5) – Regulated fine particle matter in the air with a diameter of 2.5 micron or less. One micron is one-millionth of a meter.

Particulate Matter (PM10) – Regulated coarse particle matter in the air with a diameter of 10 micron or less. One micron is one-millionth of a meter.

PART5 – U. S. EPA model to predict fleet-average emissions of particulate matter from motor vehicles. This function of the PART5 model has been replaced with the MOBILE6 model.

Polychlorinated biphenyl (PCB) – Mixtures of up to 209 individual synthetic chlorinated compounds. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence that they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and hydraulic oils. There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow, and have no known smell or taste.

Precision Approach Path Indicators (PAPI) – A visual aid consisting of a system of lights installed on the side of the runway that provide visual descent guidance information during approach to a runway to provide for the aircraft crossing the runway threshold at an appropriate height. A PAPI is intended primarily for use during VFR weather conditions.

Precision Approach Procedure – A standard instrument approach procedure in which an electronic glide slope/glidepath is provided; e.g., ILS/MLS and Precision Approach Radar (PAR).

Precision Approach Radar (PAR) – Radar equipment in some Air Traffic Control facilities operated by the FAA and/or the military services at joint-use civil/military locations and separate military installations to detect and display azimuth, elevations, and range of aircraft on the final approach course to a runway. PAR provides both horizontal and vertical guidance to approaching pilots.

Program for Mass Transit (PMT) – A long-range transit plan that evaluates and recommends transit projects to preserve, enhance and expand the MBTA system. The PMT describes the MBTA's fiscally-unconstrained capital investment plan. Any transit project eligible for federal funds must be included in the PMT. The PMT was last revised in January 2004.

Propylene glycol – An organic compound that is used as ingredient in aircraft deicing solutions.

R

Reasonably Available Control Technology (RACT) – Requires the use of reasonably available control requirements to reduce or limit air emissions from sources in areas that do no meet national ambient air quality standards (i.e., non-attainment areas).

Request for Determination of Applicability (RDA) – A filing with the Conservation Commission of a local jurisdiction or the Massachusetts DEP that uses WPA Form 1 to determine whether the Wetlands Protection Act applies to a particular area of land or to specific work planned on a particular area of land.

Response Action Outcome (RAO) – A designation applied to a disposal site, as defined under the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000), at which there is No Significant Risk, also as defined by the MCP. The goal of assessment and mitigation activities under the MCP is to achieve conditions of No Significant Risk, so attainment of a Response Action Outcome (RAO) is considered a significant milestone in the progression through MCP activities, and in many (but not all) cases serves as an endpoint to those activities.

Record of Decision (ROD) – In the Commonwealth of Massachusetts, a document issued by the Secretary of Environmental Affairs on a project where a waiver of a MEPA threshold or other MEPA requirement has been requested. At the federal level, a decision on an EIS filing.

Runway – A defined rectangular area on land airport prepared for the landing and takeoff run of the aircraft along its length. Runways are normally numbered in relation to their magnetic direction rounded off to the nearest 10 degrees; e.g., Runway 01, Runway 25.

Runway Alignment Indicator Lights (RAIL) – A visual lighting system that provides information on the approach end of the runway

Runway End Identifier Lights (REIL) – See Airport Lighting.

Runway Protection Zone (RPZ) – See Obstacle Free Zone.

Runway Safety Area (RSA) – See Obstacle Free Zone.

Runway Visual Range (RVR) – See Visibility.

S

Simplified Directional Facility (SDF) – A navigational aid used for nonprecision instrument approaches that provides lateral guidance from a final approach fix when the lateral course alignment is offset from the extended runway centerline by more than 3 degrees but less than 30 degrees.

Simplified Short Approach Light System with Runway Alignment Indicator Lights (SSALR) – A high intensity approach lighting system that provides a visual lighting path for landing aircraft. The SSALR has up to eight sequenced flashing lights and is used as part of a dual-mode ALS (ALSF-2/SSALR) when Category I conditions exist on Category II runways.

Single Event Level (SEL) – The total noise dose, or exposure, resulting from a time-varying sound that is normalized to a one second duration so that exposures of different durations can be compared on an equal basis. Because aircraft noise events last longer than one second, the time-integrated SEL always has a value greater in magnitude than the maximum sound level of the event – usually about seven to ten dB higher for most airport environments.

Small Airplane – An airplane of 12,500 pounds (5,700 kg) or less maximum certificated takeoff weight;

Spill Prevention Control and Countermeasure Plan (SPCCP) – The cornerstone of the EPA's strategy to prevent oil spills from reaching the nation's waters. Requirements for maintaining SPCC Plans are dependent on facility operations and on site storage practices, as regulated under 40 CFR 112. SPCC Plans have prescribed elements for management and inspection of facilities' storage and handling operations, and are designed to ensure that such facilities put into place containment and other countermeasures that would prevent oil spills from reaching navigable waters.

State Implementation Plan (SIP) – A detailed plan prepared by the states to show how they will comply and maintain compliance with national air quality rules. States prepare SIPs and submit them to the U.S. EPA for approval to meet specific requirements of the Clean Air Act, including the requirement to attain and maintain the National Ambient Air Quality Standards (NAAQS).

State Register of Historic Places (SR) – Established by MGL Ch. 9, ss. 26-27C, as amended by Chapter 152 of the Acts of 1982 and Chapter 254 of the Acts of 1988. Regulations promulgated on August 4, 1989 (950 CMR 71.00). The State Register includes properties that meet one of the following criteria: National Historic Landmark; listed or formally determined eligible for inclusion in the National Register of Historic Places; Massachusetts Archaeological/Historic Landmark; Local Landmark; Local Historic District; Regional Historic District; and subject to a Preservation Restriction managed by the Massachusetts Historical Commission. The State Register is updated weekly.

Stormwater Pollution Prevention Plan (SWPPP) – A plan developed in accordance with the requirements of a General or Individual NPDES permit issued pursuant to the U.S. Clean Water Act. The SWPPP sets forth the activities to be initiated at a site to minimize or prevent pollution of waters of the U.S. A SWPPP may be necessary for existing industries or planned construction projects. The development of the SWPPP includes site characterization and the implementation of specific BMPs to address activities at the site. The U.S. EPA is the permitting authority in Massachusetts. The Massachusetts DEP has review and approval of the SWPPP if the site discharges to an ORW.

Sulfur dioxide (SO_2) – A regulated air pollutant created by the combustion of materials containing sulfur. The U. S. EPA has established regulations, including a NAAQS, for SO_2.

T-U

Tactical Air Navigation (TACAN) – A navigational aid that provides suitably equipped aircraft a continuous indication of bearing and distance to the TACAN station.

Taxi – The movement of an airplane under its own power on the surface of an airport (Part 135.100 – Note). Also, it describes the surface movement of helicopters equipped with wheels.

Taxilane (TL) – See Obstacle Free Zone.
Taxiway (TW) – See Obstacle Free Zone.

Taxiway Safety Area (TSA) – See Obstacle Free Zone.

Terminal Instrument Procedures – TERPS establishes criteria that are used to formulate and publish procedures for instrument approach and departure of aircraft to and from civil and military airports.

Terminal Radar Approach Control (TRACON) – Controls aircraft in the vicinity of a large airport, between the departure or arrival airport and the Air Route Traffic Control Center.

Terminal-Very High Frequency Omnidirectional Range Station – A very high frequency terminal omnidirectional range station located on or near an airport and used as an approach aid.

Threshold – The beginning of that portion of the runway usable for landing.

Time Above a decibel threshold (TA) – Because analyses of decibels are complex and often unfamiliar to the public, the FAA has developed a supplemental noise metric that is non-logarithmic: the amount of time (in minutes or seconds) that the noise source of interest exceeds a given A-weighted sound level threshold. Every time a noise event goes above a given threshold, the number of seconds is accumulated and added to any previous periods that the noise exceeded the threshold. These time-above-thresholds, or Time Above, are usually reported for a 24-hour period. Note that TA does not tell the loudness of the various noise events. Just as a single value of the A-weighted sound level ignores the dimension of time, so the TA ignores the dimension of loudness.

Time-In-Mode (TIM) – The time an aircraft spend in each mode of the LTO cycle.

Total Noise Exposure (EXP) – The EXP metric was developed in 1982 as a screening tool for Massport to assess changes in the fleet mix of aircraft operating at Hanscom Field overtime. EXP indicates changes in total noise exposure and expected resultant changes in DNL, without the need to prepare noise contours. The metric is calculated by logarithmically summing the representative SELs for each departure of an airplane assuming it flies over a single point on the ground. Similar aircraft types are grouped together in the calculations at creating a "partial EXP" for the group. Partial EXP values for each group are then summed to obtain a single number estimate of departure noise exposure at that reference location. Similar calculations are performed for arrival operations. Separate computations are performed for civil and military operations. Massport maintains a comprehensive database of operations conducted by aircraft heavier than single engine piston aircraft. EXP uses the same summation formula as DNL: logarithmic summation of all noise events over a 24-hour day, with a 10 dB penalty applied to events occurring between 10:00 p.m. and 7:00 a.m.

Total petroleum hydrocarbon (TPH) – A term used to describe a large family of several hundred chemical compounds that originally come from crude oil, which is refined to common petroleum products such as gasoline, motor oil, and jet fuel. Because there are so many different chemicals in petroleum products, it is not practical to measure each of them individually, so TPH testing in the environment is often used as a measure of evidence of release of such products to soils, groundwater, or surface water.

Total suspended solids (TSS) – Solids in water that can be trapped by a filter (the combination of TSS and total dissolved solids together comprise Total Solids). TSS can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. High levels of TSS can pose risk to the aquatic life and natural stream processes.

Touch-And-Go – An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway.

Tower – A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity or an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the airport traffic area regardless of flight plan or weather conditions (IFR or VFR). A tower may also provide approach control services (radar or nonradar).

Traffic Pattern – The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg and final approach.

- **Upwind Leg** – A Flight path parallel to the landing runway in the direction of landing.
- **Crosswind Leg** – A flight path at right angles to the landing runway off its upwind end.
- **Downwind Leg** – A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg.
- **Base Leg** – A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline.
- **Final Approach** – A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. An aircraft making a straight-in approach VFR is also considered to be on final approach.

Transmissometer – An apparatus used to determine visibility by measuring the transmission of light through the atmosphere. It is the measurement source for determining runway visual range (RVR) and runway visibility value (RVV).

Transportation Demand Management (TDM) – Measures that make better use of existing transportation facilities by reducing the peak hour demand for automobile trips, as opposed to increasing roadway capacity. Examples of TDM measures include increased or expanded transit service, carpool/vanpool programs, employee rideshare programs, and staggered work hours.

Transportation Improvements Plan (TIP) – A five-year plan that programs federally fund roadway and transit projects. Metropolitan Planning Organization updates the TIP on an annual basis.

Transportation Management Association (TMA) – A structured organization typically comprised of employers interested in collectively improving transportation access to an area through the implementation of cost-sharing approaches such as Transportation Demand Management (TDM) measures, public advocacy and marketing and information campaigns. The transportation access measures, as well as the dues and organizational structure, are tailored to the specific needs of the TMA membership.

Transportation Management Initiative (TMI) – A program that is administered by MassRIDES on behalf of the Executive Office of Transportation. The program funds a MassRIDES staff coordinator to plan and administer TDM actions with members. Membership in the program is free. Benefits are provided based on the level of participation in TDM, with employees of partner companies eligible to use MassRIDES's guaranteed ride home program.

Transportation Security Administration (TSA) – Federal agency created as part of the Aviation and Transportation Security Act passed by the U.S. Congress and signed into law on November 19, 2001 and in response to the September 11, 2001 attacks on the World Trade Center and The Pentagon. The agency is charged with developing policies to ensure the safety of U.S. air traffic and other forms of transportation.

Trichloroethylene (TCE) – A synthetic volatile organic compound that is often used as a solvent for resins, oils, and paints, and also as a degreaser, particularly for mechanical parts. It is a colorless liquid with a chloroform like odor, and is considered carcinogenic.

Trip (vehicle) – A trip represents one vehicle entering or leaving a facility. A vehicle entering and leaving a facility represents two vehicular trips.

V

Vacuum-enhanced recovery (VER) – A system of recovery of groundwater or total fluids from a groundwater well, in which the radius of the capture zone of a groundwater pumping system is increased through the application of a high negative pressure differential to the recovery well. VER is typically used when low transmissivity conditions are encountered in a contaminated subsurface formation, and in which capture zones and fluid recoveries are very low under normal pumping conditions.

Vehicle Miles Traveled (VMT) – The product of the number of vehicles on a given roadway by the length of the roadway. The units are vehicle miles per year.

Vehicle Occupancy Rate (VOR) – Number of persons per vehicle.

Vegetation Management Plan (VMP) – A program of actions by Massport at Hanscom Field to comply with FAA regulations and Massachusetts General Laws regarding protected airspace. The VMP includes vegetation removal project addresses obstructions. Massport implemented the VMP in 2004. Since then, the VMP has moved into a maintenance phase.

Very-High-Frequency Omnidirection Range (VOR) – A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the National Airspace System. The VOR periodically identifies itself by Morse Code and many have an additional voice identification feature. Voice features may be used by Air Route Traffic Control Center or for transmitting instructions/information to pilots.

Visibility – The ability, as determined by atmospheric conditions and expressed in units of distance, to see and identify prominent unlighted objects by day and prominent lighted objects by night. Visibility is reported as statute miles, hundreds of feet or meters.

- **Flight Visibility** – The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.
- **Ground Visibility** – Prevailing horizontal visibility near the earth's surface as reported by the United States National Weather Service or an accredited observer.
- **Runway Visual Range (RVR)** – An instrumentally derived value, based on standard calibrations, that represents the horizontal distance a pilot will see down the runway from the approach end. It is based on the sighting of either high intensity runway lights or on the visual contrast of other

targets, whichever yields the greater visual range. RVR, in contrast to prevailing or runway visibility, is based on what a pilot in a moving aircraft should see looking down the runway. RVR is horizontal visual range, not slant visual range. It is based on the measurement of a transmissometer made near the touchdown point of the instrument runway and is reported in hundreds of feet. RVR is used in lieu of RVV and/or prevailing visibility in determining minimums for a particular runway.

- **Touchdown RVR** – The RVR visibility readout values obtained from RVR equipment serving the runway touchdown zone.
- **Mid-RVR** – The RVR readout values obtained from RVR equipment located midfield of the runway.
- **Rollout RVR** – The RVR readout values obtained from RVR equipment located nearest the rollout end of the runway.

Visual Approach – An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

Visual Approach Slope Indicators (VASI) – See Airport Lighting

Visual Flight Rules (VFR) – Rules that govern the procedures for conducting flight under visual conditions. The "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

Visual Flight Rules (VFR) Conditions – Weather conditions equal to or better than the minimum for flight under visual flight rules.

Visual Meteorological Conditions – Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specified minima.

Volatile Organic Compounds (VOC) – Hydrocarbons associated with motor fuels that are highly reactive and may help form ozone.

VORTAC - A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site.

W-Y

Wetlands Protection Act (WPA) – An Act (MGL Chapter 131 Section 40) that protects Massachusetts wetlands resources and ensures that the beneficial functions of these resources are maintained. Projects that affect wetlands are required to avoid impacts where possible, minimize unavoidable impacts, and mitigate for unavoidable impacts. Proponents of projects in wetlands or in the buffer zone around them must apply for an Order of Conditions from the municipal Conservation Commission.

Z

Zero emissions vehicle (ZEV) – A vehicle that has no air pollution emissions directly associated with it (e.g. vehicles powered with electricity or hydrogen fuel cells).

Distribution List

List of Reviewers

Massport Board of Directors

Secretary Richard Davey, Chairman
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

Michael Angelini, Board Member
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

Douglas Husid, Board Member
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

Kathryn West, Board Member
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

L. Duane Jackson, Board Member
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

Sean M. O'Brien, Board Member
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

Kurt N. Schwartz, Board Member
Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02128-2909

Federal

Senator Elizabeth Warren
2400 JFK Federal Building
15 New Sudbury Street
Boston, MA 02203

Senator Edward Markey
10 Causeway Street, Suite 559
Boston, MA 02222

Representative Niki Tsongas
11 Kearney Square, 4th floor
Lowell, MA 01852-1940

Representative John Tierney
17 Peabody Square
Peabody, MA 01960

Representative Katherine Clarke
2108 Rayburn House Office Bldg
Washington, DC 20515

Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue NW, Suite 803
Washington, DC 20004

Amy Corbett, New England Regional Administrator
FAA New England Region
12 New England Executive Park, Box 510
Burlington, MA 01803

Ralph Nicosia-Rusin
Airport Capacity Program Manager
FAA New England Region
12 New England Executive Park
Burlington, MA 0180

Richard Doucette
Manager Environmental Program
FAA New England Region
12 New England Executive Park, Box 510
Burlington, MA 01803

Dimitros Merageas
FAA Control Tower
4th Fl Tower Building/Hanscom Field
Bedford, MA 01730

EPA/Council on Environmental Quality
722 Jackson Place NW
Washington, DC 20503

Nancy Nelson, Superintendent
National Park Service
Minute Man National Historical Park
174 Liberty Street
Concord, MA 01742-1705

Dennis Reidenbach, Regional Director
National Park Service
U.S. Custom House, 200 Chestnut Street
Philadelphia, PA 19106

Chris Perkins, Base Civil Engineer
Hanscom Air Force Base
120 Grenier Street
Hanscom Air Force Base, MA 01730

Colonel Charles P. Samaris, Division Engineer
U.S. Army Corps of Engineers
New England District, 696 Virginia Road
Concord, MA 01742-2751

H. Curtis Spalding, Regional Administration
U.S. EPA New England Region
One Congress Street
Boston, MA 02114

New England Field Office
U.S. Fish & Wildlife Service
Department of the Interior
70 Commercial Street, Suite 300
Concord, NH 03301-5087

Libby Herland, Refuge Complex Manager
Eastern Massachusetts NWR Complex
73 Weir Hill Road
Sudbury, MA 01776

State

The Honorable Kathleen O'Connor Ives
State Senate
State House, Room 519
Boston, MA 02133

The Honorable Michael Barrett
MA State Senate
State House, Room 313A
Boston, MA 02133

The Honorable Kenneth J. Donnelly
MA State Senate
State House, Room 413-D
Boston, MA 02133

The Honorable Cory Atkins
MA House of Representatives
State House, Room 195
Boston, MA 02133

The Honorable Jay R. Kaufman
MA House of Representatives
State House, Room 34
Boston, MA 02133

The Honorable Ken Gordon
MA House of Representatives
State House, Room 39
Boston, MA 02133

Senator Thomas McGee
MA State House
State House, Room 109C
Boston, MA 02133

The Honorable Thomas P. Conroy
MA House of Representatives
State House, Room 236
Boston, MA 02133

The Honorable Thomas M. Stanley
MA House of Representatives
State House, Room 167
Boston, MA 02133

Representative William Strauss
MA House of Representatives
State House, Room 134
Boston, MA 02133

Executive Office of Energy and Environmental Affairs
Barbara Kates-Garnick, Undersecretary for Policy
100 Cambridge Street, Suite 900
Boston, MA 02114

Kenneth L. Kimmell, Commissioner
Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108-4746

Deirdre Buckley, Director
MEPA Office
Executive Office of Energy Environmental Affairs
100 Cambridge St, 9th Floor
Boston, MA 02114

William Gage, Environmental Analyst
MEPA Office
Executive Office of Energy Environmental Affairs
100 Cambridge St, 9th Floor
Boston, MA 02114

John D. Viola, Assistant Regional Director
Massachusetts Department of Environmental Protection/Northeast Regional Office
205-B Lowell Street
Wilmington, MA 01887

David Shakespeare, MEPA Coordinator
Massachusetts Department of Environmental Protection/Northeast Regional Office
205-B Lowell Street
Wilmington, MA 01887

DCR Division of Water Supply Protection
Attn: Environmental Reviewer
251 Causeway Street
Boston, MA 02114

Clinton Bench, Deputy Secretary for Transportation Planning
Massachusetts Department of Transportation
10 Park Plaza, Room 4150
Boston, MA 02116

Attn: Environmental Reviewer
Massachusetts Department of Transportation
10 Park Plaza, Room 3510
Boston, MA 02116

Leeroy Wagner
MassRIDES
10 Park Plaza, Suite 2180
Boston, MA 02116

Massachusetts Department of Transportation
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116

Massachusetts Department of Transportation
Highway Division - MHD – District #4
Attn: MEPA Coordinator
519 Appleton Street
Arlington, MA 02174

Christopher Willenborg, Administrator Division
Massachusetts Department of Transportation
Aeronautics Division
10 Park Plaza, Room 6620
Boston, MA 02116

Katie Servis
Massachusetts Department of Transportation
Aeronautics Division
Attn: MEPA Coordinator
10 Park Plaza, Room 3510
Boston, MA 02116-3966

Massachusetts Historical Commission
The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, MA 02125

Massachusetts Department Agricultural Resources
Attn: MEPA Coordinator
16 West Experiment Station
University of Massachusetts
Amherst MA 01003

Thomas W. French, Ph.D., Assistant Director
Natural Heritage and Endangered Species Program
Massachusetts Division of Fish & Wildlife
One Rabbit Hill Road
Westborough, MA 01581

Massachusetts Department of Public Health
Director of Environmental Health
250 Washington Street
Boston, MA 02108-4619

Massachusetts Water Resource Authority
Attn: MEPA Coordinator
Charlestown Navy Yard, 100 First Avenue
Boston, MA 02129

Massachusetts Bay Transportation Authority
Attn: MEPA Coordinator
10 Park Plaza, 6th Floor
Boston, MA 02216-3966

Regional

Joel Barrera, Deputy Director
Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111

Marc Draisen
Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111

Martin Pillsbury, Environmental Division Manager Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111

Amy A. Cotter, Regional Transportation Planning Staff
Metropolitan Area Planning Council
10 Park Plaza, Room 2150
Boston, MA 02116

Julie Conroy
Minuteman Advisory Group on Interlocal Coordination
c/o MAPC
60 Temple Place
Boston, MA 02111

Bedford

Bedford Public Library
7 Mudge Way
Bedford, MA 01730-2168

Richard T. Reed Town Manager
Town of Bedford
10 Mudge Way
Bedford, MA 01730

Bedford Board of Health
10 Mudge Way
Bedford, MA 01730

Doreen Trembaly, Town Clerk
10 Mudge Way
Bedford, MA 01730

Elizabeth Bagdonas, Administrator Bedford Conservation Commission
10 Mudge Way
Bedford, MA 01730

Alethea Yates, Chair
Bedford Historic Preservation Commission
10 Mudge Way
Bedford, MA 01730

Lisa Mustapich, Chair

Bedford Planning Board
10 Mudge Way
Bedford, MA 01730

Glenn Garber, Planning Director
Town of Bedford
10 Mudge Way
Bedford, MA 01730

William Moonan, Chair
Board of Selectmen
Town of Bedford
10 Mudge Way
Bedford, MA 01730

Michael A. Rosenberg, Board of Selectmen
Town of Bedford
10 Mudge Way
Bedford, MA 01730

Mark Siegenthaler, Board of Selectmen
Town of Bedford
10 Mudge Way
Bedford, MA 01730

Caroline Fedele, Board of Selectmen
Town of Bedford
10 Mudge Way
Bedford, MA 01730

Margot R. Fleischman, Clerk
Board of Selectmen
Town of Bedford
10 Mudge Way
Bedford, MA 01730

Boston

Nancy Girard, Director
Boston Environment Department
One City Hall Plaza, Room 803
Boston, MA 02201

Maura Zlody
Boston Environment Department
One City Hall Plaza, Room 803
Boston, MA 02201

Thomas Tinlin, Commissioner
Boston Transportation Department
One City Hall Plaza, Room 721
Boston, MA 02201

Carlisle

George Mansfield, Planning Administrator
Town of Carlisle
108 Main Street, P.O. Box 67
Carlisle, MA 01741

Concord

Concord Public Library
129 Main Street
Concord, MA 01742

Chris Whalen, Town Manager
Town of Concord
22 Monument Square, P.O. Box 535
Concord, MA 01742

Anita S. Tekle, Town Clerk
22 Monument Square, P.O. Box 535
Concord, MA 01742

Delia Kaye, Administrator
Concord Natural Resources Commission
141 Keyes Road
Concord, MA 01742

Elissa J. Brown, Chair
Concord Historical Commission
141 Keyes Road, P.O. Box 535
Concord, MA 01742

Marcia Rasmussen, Director
Concord Department of Planning & Land
Management
141 Keyes Road
Concord, MA 01742

Elise Woodward
Board of Selectmen
22 Monument Square, P.O. Box 535
Concord, MA 01742

Carmin C. Reiss
Board of Selectmen
22 Monument Square P.O. Box 535
Concord, MA 01742

Jeffrey S. Wieland, Chair
Board of Selectmen
22 Monument Square P.O. Box 535
Concord, MA 01742

Steven Ng, Clerk
Board of Selectmen
22 Monument Square P.O. Box 535
Concord, MA 01742

Lexington

Carey Memorial Library
1874 Mass Ave. at Carey Hall
Lexington, MA 02420-5385

Carl F. Valente, Town Manager
Town of Lexington
1625 Mass. Avenue
Lexington, MA 02420

Donna Hooper, Town Clerk
Town of Lexington
Town Offices, 1625 Mass Avenue
Lexington, MA 02420

Karen Mullins, Administrator
Conservation Commission
Town Offices, 1625 Mass Avenue
Lexington, MA 02420

Gerard Cody, Health Division
Town of Lexington
Town Offices, 1625 Mass Avenue
Lexington, MA 02420

David Kelland, Chair
Historical Commission
Town Offices, 1625 Mass Avenue
Lexington, MA 02420

Charles Hornig, Chair
Lexington Planning Board
1625 Mass Avenue
Lexington, MA 02420

Maryann McCall-Taylor, Director
Lexington Planning Department
1625 Mass Avenue
Lexington, MA 02420

Paul B. Ash, Ph.D., Superintendent
Lexington Public Schools
1557 Mass Avenue
Lexington, MA 02420

Lincoln

Chris Reilly, Director of Planning and Land Use
Town Office Building
16 Lincoln Road, 2nd Floor
Lincoln, MA 01773

Noah Eckhouse, Hanscom Area Town Selectmen
Town of Lincoln
7 Conant Road
Lincoln, MA 02173

Peter Braun, Chair
Town of Lincoln
Hanscom Area Town Selectmen, 7 Conant Road
Lincoln, MA 02173

Gregory A. Woods
Lincoln Water Department
16 LincolnRoad
Lincoln, MA 01773

Renel Fredriksen, Hanscom Area Town Selectmen
Town of Lincoln
7 Conant Road
Lincoln, MA 02173

Organizations

Mark Baker, President
Aircraft Owners and Pilot Association
421 Aviation Way
Frederick, MD 21701-4798

Pam Howell, Vice President
Annursnac Hill Association
29 Isaac Davis Road
Concord, MA 01742

Sheila Spellman
Battle Road Farm
5D South Commons
Lincoln, MA 01773

Eileen Entin, President
Citizen's for Lexington Conservation
P.O. Box 292
Lexington, MA 02420-0003

Lisa Litchfield, Administrator
Concord Field Station
100 Old Causeway Road
Bedford, MA 01730

Mary Jo Bohart, Executive Director
Lexington Chamber of Commerce
1875 Massachusetts Avenue
Lexington, MA 02420

John M. Steven, Chair
Concord Land Conservation Trust
P.O. Box 141
Concord, MA 01742-0141

Margaret Burke, Executive Director
Concord Museum
200 Lexington Road, P.O. Box 146
Concord, MA 01742-0146

Stephanie Spillman, Executive Director
Concord Chamber of Commerce
15 Walden Street, Suite 7
Concord, MA 01742

John Kassel, President
Conservation Law Foundation
62 Summer Street
Boston, MA 02116

Gerard J. G. Ward, Headmaster
Fenn School
516 Monument Street
Concord, MA 01742

Mary Wren-vanderWilden, Chair
Fenn School Board of Trustees
516 Monument Street
Concord, MA 01742

Robert K. Lemons, Managing Partner
Finard & Company, LLC
One Burlington Woods Drive
Burlington, MA 01803

Paul Guzzi, President and CEO
Greater Boston Chamber of Commerce
One Beacon Street
Boston, MA 02108-3114

Jim Phelps
Signature Flight Support
180 Hanscom Drive
Bedford, MA 01730

Jeanne Krieger, Chair HFAC
Lexington Town Hall
1625 Massachusetts Avenue
Lexington, MA 02173

Frank Diglio
Jet Aviation of America, Inc.
380 Hanscom Drive, Hanscom Field
Bedford, MA 01730-2630

Dee Ortner, HFAC Member
The League of Women Voters of
Concord/Carlisle
P.O. Box 34
Concord, MA 01742

John J. Clarke, Director of Public Policy &
Government Relations
Mass Audubon
208 South Great Road
Lincoln, MA 01773

Ford Van Weise
Hanscom Aircraft Owners and Pilots
Association
380 Hanscom Drive
Bedford, MA 01730

E. Heidi Roddis, Environmental Policy
Specialist
Massachusetts Audubon Society
208 South Great Road
Lincoln, MA 01773

Dave Richter, President
Massachusetts Business Aviation Association
60 Thoreau Street, Suite 208
Concord, MA 01742

Gregory P. Bialecki, Chair
MassDevelopment
160 Federal Street
Boston, MA 02110

Christopher R. Anderson, President
Massachusetts High Technology Council
Reservoir Place
1601 Trapelo Road, Suite 336
Waltham MA 02451-7333

Charles C. Ames, Chair
Massachusetts Historical Society
1154 Boylston Street
Boston, MA 02215-3695

Kathleen C. Giles, Head of School
Middlesex School
1400 Lowell Road
Concord, MA 01742-9122

Danielle Heard, Head of School
Nashoba Brooks School
200 Strawberry Hill Road
Concord, MA 01742-5404

James T. Brett, Secretary
New England Council
98 North Washington Street, Suite 201
Boston, MA 02199

Maureen A. Rogers, President
North Suburban Chamber of Commerce
76R Winn Street, Suite 3D
Woburn, MA 01801

Jan Turnquist, Executive Director
(Alcott) Orchard House
399 Lexington Road, P.O. Box 343
Concord, MA 01742

John Coleman
Thomas H. Lee Company
Hanscom Drive
Bedford, MA 01730

Deborah Kreiser-Francis, Historic Site Manager
The Old Manse
The Trustees of Reservations
P.O. Box 572, 269 Monument Street
Concord, MA 01742-1837

John H. Adams, Executive Director
The Walden Woods Project
44 Baker Farm
Lincoln, MA 01773-3004

Individuals

The 2012 Hanscom Environmental Status and Planning Report is available on the Massport website at www.massport.com.