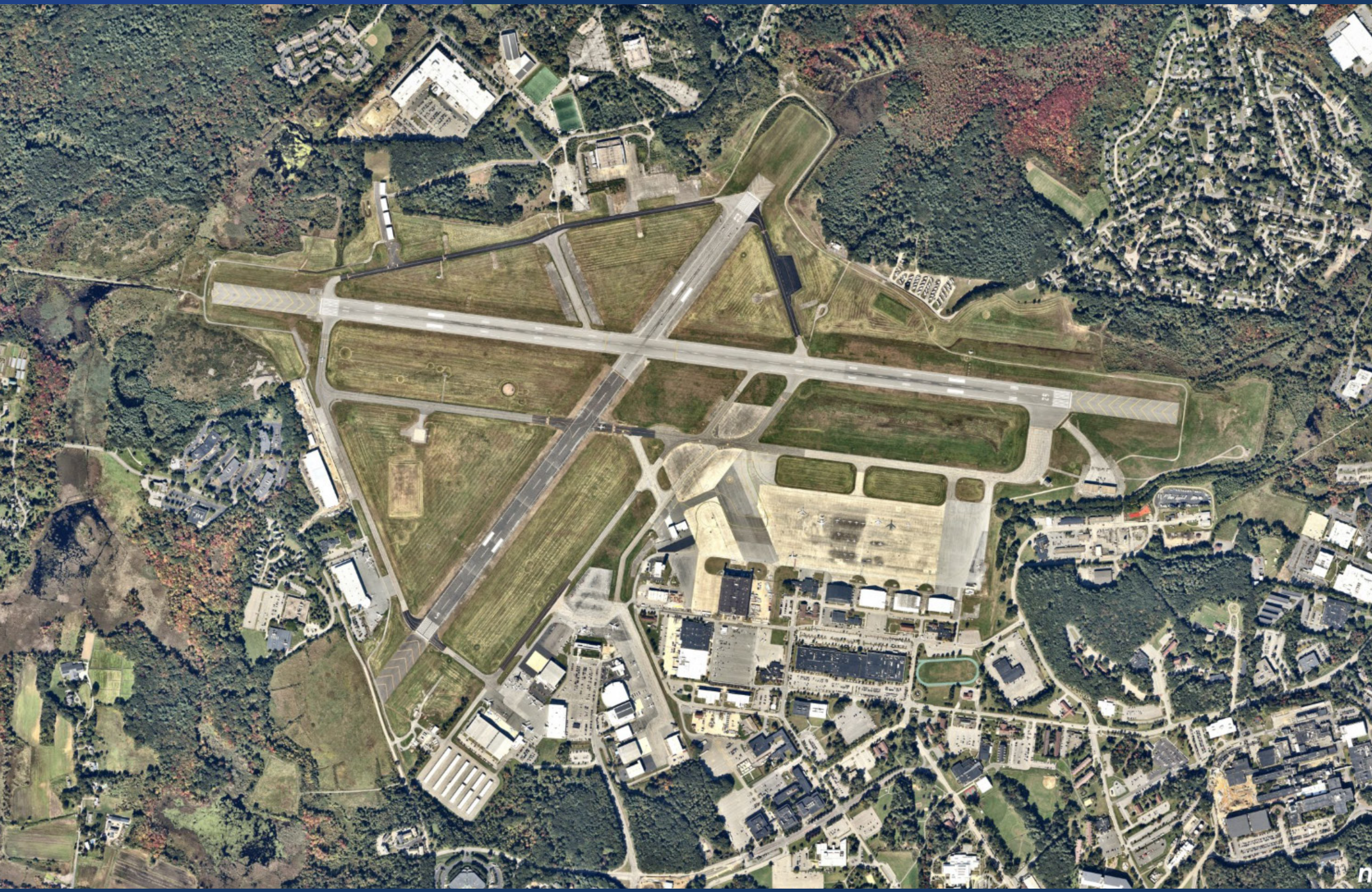

2022 L.G. Hanscom Field

Environmental Status & Planning Report

Bedford, Massachusetts • EEA Number: 5484/8696 • May 2024

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

May 15, 2024

Secretary Rebecca Tepper
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Alex Strysky, EEA No. 5484/8696
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: 2022 L.G. Hanscom Field Environmental Status & Planning Report (EEA #5484/8696)

Dear Secretary Tepper and Director Kim:

The Massachusetts Port Authority (Massport) is pleased to submit for your review this 2022 L.G. Hanscom Field Environmental Status and Planning Report (2022 ESPR) (EEA #5484/8696). The 2022 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 2022 ESPR responds to the December 16, 2022 Certificate on the Proposed Scope for the 2022 ESPR.

This ESPR provides updated forecasts looking at potential future scenarios for 2030 and 2040. The document contains analyses on all topics covered in prior ESPRs, following the structure introduced in the 2017 ESPR, and includes a new section on Environmental Justice.

As we have done in the past, Massport is requesting an extension of the public comment period to approximately 60 days with the close of public comments on July 19, 2024. Two virtual public technical meetings are scheduled for 6:00PM on June 10 and June 11 via Zoom; each will cover half of the analysis topics. Information on the public meetings will be posted on the Massport website and is being sent to the reviewers list, commentors list, and the EJ reference list.

Members of Massport staff and the consultant team are available to discuss the attached document with you at your earliest convenience. Please contact me at (617) 568-3546 or bwashburn@massport.com with any questions or comments.

Sincerely,
Massachusetts Port Authority

Brad Washburn, Deputy Director
Environmental Planning and Permitting

Cc: S. Williams, A. Goodspeed, J. Barrera, F. Leo/Massport
K. Larson/HMMH

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2022 L.G. Hanscom Field

Environmental Status and Planning Report

Bedford, Massachusetts

EEA Number: 5484/8696

May 15, 2024

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Table of Contents

List of Figures

List of Tables

List of Appendices

1 Executive Summary

Laurence G. Hanscom Field (Hanscom Field) is a full-service general aviation airport and serves as a reliever airport to Boston Logan International Airport. Approximately 20 miles northwest of Boston, Massachusetts, Hanscom field is located within the municipalities of Lincoln, Concord, Lexington, and Bedford.

The Massachusetts Port Authority (Massport) regularly reviews, analyzes, and reports on the environmental impacts associated with Hanscom Field's operation, potential future development based on demand, and the anticipated cumulative effects of operations at Hanscom Field. Massport prepared Generic Environmental Impact Reports (GEIRs) from 1985 to 1995. Massport prepares Environmental Status and Planning Reports (ESPRs) approximately every five years.

This first chapter of the 2022 ESPR provides an introduction and includes background information on Hanscom Field, describes the environmental review process, identifies the analytical framework for the 2022 ESPR, summarizes the primary changes since the 2017 ESPR, and explains the organization of the report. It also provides an executive summary of the findings.

1.1 Environmental Status and Planning Report

The Massachusetts Port Authority (Massport) has filed this Environmental Status and Planning Report (ESPR) for calendar year 2022, in compliance with the Massachusetts Environmental Policy Act (MEPA), to provide a status report on activity levels and environmental conditions at Laurence G. Hanscom Field (Hanscom Field). The Secretary of the Executive Office of Energy and Environmental Affairs (EEA) defined the scope for the *2022 ESPR* in a Certificate issued December 16, 2022.

This *2022 ESPR* reports on current conditions at Hanscom Field and compares them to historical data from the 2000, 2005, 2012, and 2017 ESPRs and other available sources as described in each chapter of this report. This *2022 ESPR* informs future planning by presenting and evaluating the potential cumulative environmental effects of future scenarios for the planning years 2030 and 2040 based on forecasts of airport activity levels. The 2030 and 2040 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions. The future scenarios are consistent with Massport's 1978 Master Plan and 1980 Noise Rules for Hanscom Field.

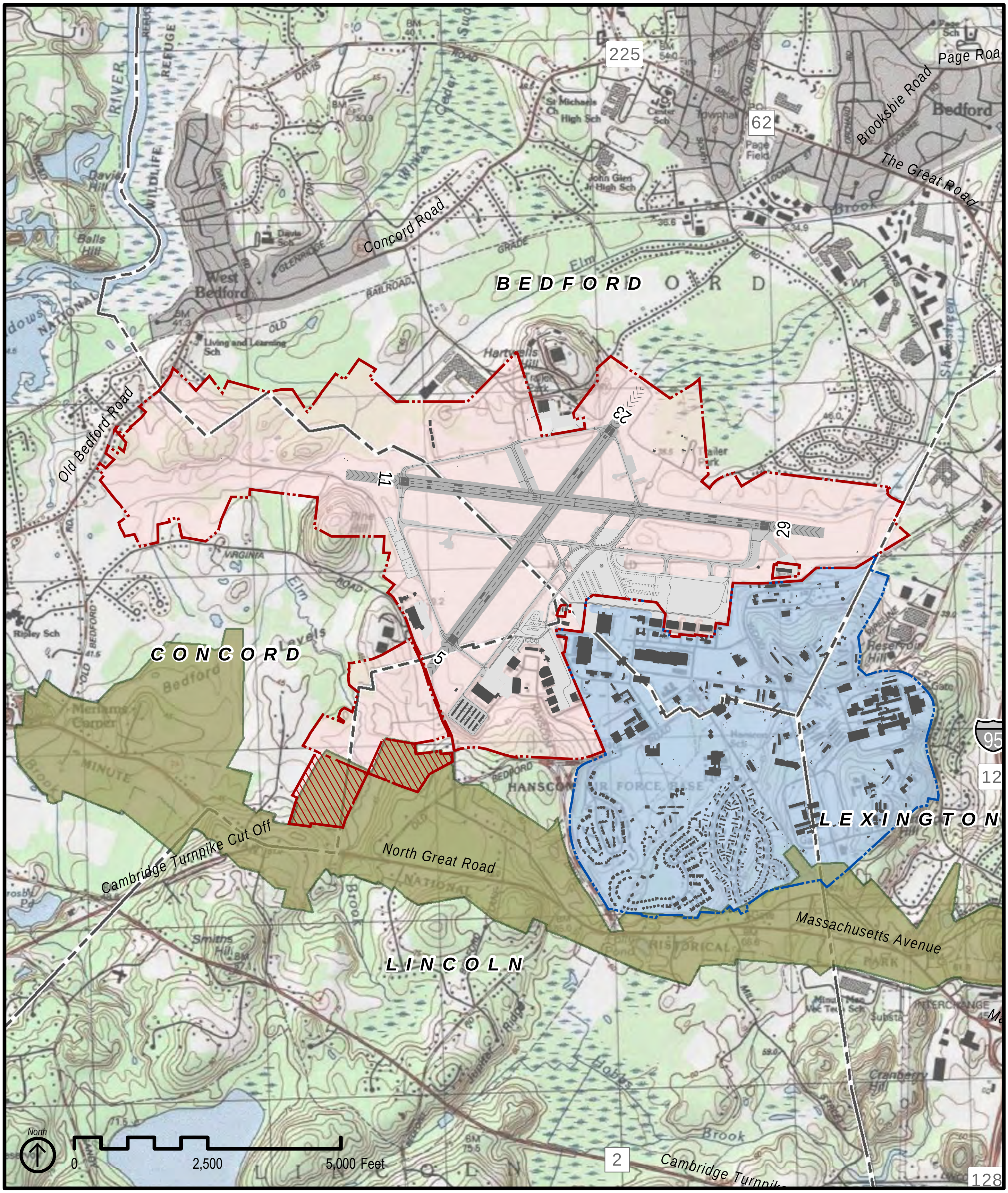
The retrospective and prospective information presented in this *2022 ESPR* provide a planning tool for assessing and reviewing changes at Hanscom Field and its environs over time. The aviation activity forecasts in this *2022 ESPR* account for a realistic level of aviation growth based on local and national aviation trends and forecasts. Additionally, this *2022 ESPR* references regional planning activities for the Towns of Bedford, Concord, Lexington, and Lincoln, as well as state agencies and other interested parties. For reference, **Figure 1-1** shows the location of Hanscom Field on the U.S. Geological Survey (USGS) map.

1.2 Hanscom Field Overview

Hanscom Field is New England's premier full-service general aviation (GA) airport and serves as a GA reliever for Boston Logan International Airport. Comprised of approximately 1,300 acres of land, Hanscom Field is located 20 miles northwest of Boston, Massachusetts and is located within parts of four different municipalities: Bedford, Concord, Lexington, and Lincoln. To the south, the Airport abuts the 900-acre Minute Man National Historical Park (MMNHP) and the 800-acre Hanscom Air Force Base (AFB). The Great Meadows National Wildlife Refuge (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.

Hanscom Field Fast Facts

- Hanscom Field was constructed in 1941 by the Federal Government and has been owned and operated by Massport since 1974.
- After providing primarily military service from 1941 to 1954, Hanscom Field became a GA airport and now serves as a GA reliever airport for Boston Logan International Airport.
- Hanscom Field is located in parts of four municipalities: Bedford, Concord, Lexington, and Lincoln.
- Two national parks are in the vicinity: Minute Man National Historical Park and Great Meadows National Wildlife Refuge.



Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary
Massport Property within MMNHP Congressional Boundary
MMNHP Boundary

massport

L. G. Hanscom Field
2022 Environmental Status & Planning Report

Location of Hanscom Field

Data Sources: ESRI (USGS Topographic Maps), March 4, 2013; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure 1-1

Hanscom Field lies just outside Route 128/I-95 and is easily accessed by most of the Greater Boston population. Route 2A serves as the primary access route to the Airport, MMNHP, and Hanscom AFB. Figure 1-1 on page 1-3 provides the site location of Hanscom Field in relation to the nearby roads and its boundaries with MMNHP, GMNWR, and Hanscom AFB. Despite its proximity to public recreational areas and adjacent communities, the airport is visible from few locations due to its location within a low-lying, flat geographical area.

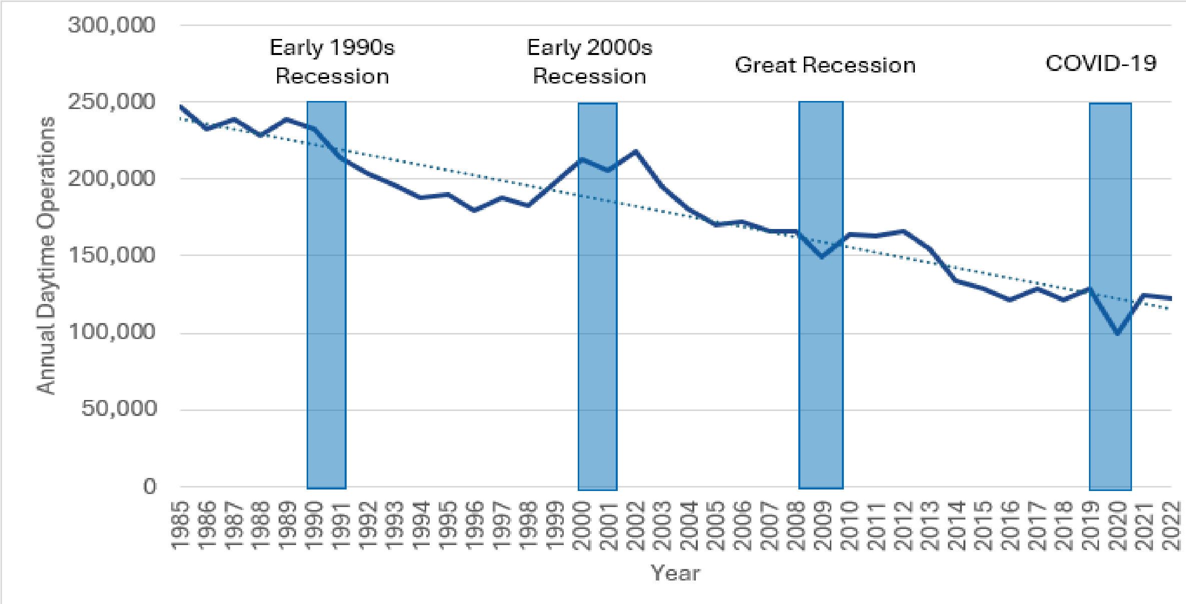
Massport assumed ownership of Hanscom Field in 1974 and prepared a Master Plan for the Airport in 1978, which included a comprehensive public outreach process. In 1980, after additional stakeholder engagement, Massport adopted the Hanscom Field Noise Rules, which were an important outgrowth of the Master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

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 variety of aviation activities at Hanscom Field include private and corporate aviation, recreational flights, pilot training, air charter, cargo, and limited military use. The Master Plan and 1980 Noise Rules provided for scheduled commercial airline service specifically allowing for scheduled commercial passenger aircraft with 60 seats or fewer. Commercial airlines have operated periodically at Hanscom Field since the mid-1970s. There are currently no scheduled commercial Passenger operations.

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 3 percent, and military at less than 1 percent.

Hanscom Field's total aircraft operations have decreased an average of 3 percent per year since 2017, down from approximately 129,000 daytime operations in 2017 to approximately 122,000 daytime operations in 2022. As shown in **Figure 1-2**, this is well below the operations in 1985, which were close to 250,000 when Massport developed the first Generic Environmental Impact Report (GEIR) for Hanscom Field. In 2022, GA (which includes business aviation) accounted for 99 percent of all operations, and military operations accounted for approximately 1 percent.

Figure 1-2. History of Daytime Operations at Hanscom Field



Note: Operations are between 7:00 a.m. and 11:00 p.m., the hours that the air traffic control tower is open.
Sources: Massport Annual Noise Report 2021, Massport Noise and Operations Monitoring System (NOMS) data

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. Business aviation accounted for 40 percent of Hanscom Field's activity in 2022 and has increased at an annual rate of 4.3 percent from 2017 to 2022.

1.2.1 Economic Impact of Massachusetts Airports

The aviation industry, including activity at Hanscom Field, has a significant impact on the Massachusetts economy. The Federal Aviation Administration (FAA) and the Massachusetts Department of Transportation (MassDOT) continue to invest in airport infrastructure to improve and enhance economic development opportunities. MassDOT published the *Massachusetts Statewide Airport Economic Impact Study* in 2011, which was updated in 2019, summarizing the economic benefits that Massachusetts derives from its public-use airports.[1] The study describes how the local economy builds on aviation and enumerates the other benefits that air transportation provides to its host communities.

The 2019 study found that Massachusetts public use airports generate $24.7 billion in total economic activity, including $7.2 billion in total annual payroll resulting from 199,237 jobs that can be traced to the aviation industry. Specifically, Massport's three airports (Boston Logan International Airport, Hanscom Field, and Worcester Regional Airport) have made significant contributions to the regional economy, generating approximately $23.1 billion (94

Economic Benefits of Hanscom Field

- 2,243 jobs supported by Hanscom Field
- $680 million in economic activity
- Offers GA access and provides an ideal location with facilities for business, research, and military

[1] *Massachusetts Statewide Airport Economic Impact Study Update*, January 2019, Massachusetts Department of Transportation. Available at https://www.mass.gov/files/documents/2019/03/25/AeroEcon_ImpactStudy_January2019.pdf

percent) of the overall annual economic benefits generated by the Massachusetts airport system. Hanscom Field is particularly important for its function as the airfield for Hanscom AFB, an active military facility that is aided by its proximity to the Boston-area technology and research industries. Hanscom Field alone supports 2,243 jobs and generates $680 million in economic activity, but combined with Hanscom AFB, the two entities together support 19,587 jobs and have a total economic impact of $6.7 billion. According to the study, for every $100 spent by aviation-related businesses, an additional multiplier impact of $56 is created within Massachusetts.[2]

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. The Airport's tenants support various nonprofit organizations such as Angel Flight Northeast and Pilots N Paws, and with the Boston MedFlight's ambulance headquarters based at Hanscom Field, the Airport also facilitates emergency medical transport. Additionally, other public-use Massachusetts airports provide a fertile environment for business development through investments, youth outreach activities, partnerships with first responders, aerial survey support, and U.S. military support.

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 a report 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*, followed by the *1995 GEIR Update*, *2000 ESPR*, *2005 ESPR*, *2012 ESPR*, *2017 ESPR,* and now the *2022 ESPR* provide an analysis of the environmental effects of Hanscom Field including analyses for potential future conditions. 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

The *2022 ESPR* continues Massport's established state-level environmental review process, which assesses the cumulative environmental impacts of activities associated with Hanscom Field. This *2022 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.

Massport has developed this *2022 ESPR* to serve as an important planning tool for the airport as well as being a review vehicle for MEPA. For example, potential future development documented within the *2022 ESPR* (see Chapter 4) may be subject to further environmental review under the National Environmental Policy Act (NEPA) prior to a project being implemented.

Massport collaborated with the FAA during the preparation of this ESPR regarding future plans for the Airport and the forecast of aviation demand. Massport is committed to working with the FAA on an ongoing basis to conduct the necessary environmental reviews under NEPA and other applicable special purpose laws such as the Endangered Species Act. As the FAA reviews future development, it will

[2] *Massachusetts Statewide Airport Economic Impact Study Update*, January 2019, Massachusetts Department of Transportation. Available at https://www.mass.gov/files/documents/2019/03/25/AeroEcon_ImpactStudy_January2019.pdf

determine what specific analysis is required depending on the nature and anticipated impacts of the potential future projects.

The *2022 ESPR* is also 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 2030 and 2040 scenarios. Additionally, the *2022 ESPR* is 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. However, this ESPR does not replace the requirement for filing an Environmental Notification Form (ENF) for a specific project that meets or exceeds a MEPA review 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. 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 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.

1.3.3 Hanscom Field Advisory Commission Review

The Hanscom Field Advisory Commission (HFAC) process provides an opportunity to review projects that are not subject to formal MEPA or NEPA review. The HFAC was established by an act of the state legislature in 1980 and includes members appointed by constituent groups and approved by the selectmen from the four host municipalities. The 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. Massport meets monthly with the HFAC to review activities at Hanscom Field.

1.4 Development of the 2022 ESPR

Massport filed the *2017 ESPR* in May 2019 and the Secretary issued the MEPA Certificate on July 18, 2019, which determined that the *2017 ESPR* “adequately and properly complies with the Massachusetts Environmental Policy Act.”

Massport filed a proposed scope for the *2022 ESPR* with MEPA on October 31, 2022, and MEPA published notice of the proposed scope in the November 9, 2022 edition of the *Environmental Monitor*. After a public comment period which included a scoping meeting at Hanscom Field on November 28, 2022, the Secretary issued the scope for the *2022 ESPR* in its Certificate on December 16, 2022.

Detailed ESPR technical studies are summarized in a readable format to clearly illustrate the implications of recent trends, existing conditions, and potential future scenarios. The *2022 ESPR* presents 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.

This section outlines the enhancements to the technical analysis since the *2017 ESPR*, describes the outreach program for the development of the *2022 ESPR*, and provides a schedule for the *2022 ESPR* public review and comment period.

1.4.1 Technical Analysis and Data Gathering for the 2022 ESPR

Massport has responded to the Secretary's Certificate and prepared a detailed study of existing and projected future conditions at Hanscom. The *2022 ESPR* includes a comprehensive analysis of information collected over the past four ESPRs to show important trends in Hanscom and regional activities and the associated trends in environmental conditions over time. The preparation of forecast scenarios for the two planning years (2030 and 2040), based on realistic development assumptions, provides a practical and effective way to evaluate potential future environmental effects.

Issues that are addressed in the *2022 ESPR* include airport facilities and infrastructure; airport activity levels; airport planning; regional transportation context; ground transportation; noise; air quality; wetlands, wildlife, and water resources; historic and cultural resources; sustainability, environmental management, and environmental justice; and a summary of potential beneficial measures. Technical appendices are provided, along with responses to comments on the proposed *2022 ESPR* Scope and supportive material for the technical studies.

1.4.2 Outreach for Preparation of the *2022 ESPR*

In addition to the MEPA scoping process, Massport engaged with state, regional, and local agencies and commissions in the preparation of the *2022 ESPR* and gave regular updates on the document progress at monthly HFAC meetings. Massport sent letters to each of the local Historic Commissions and participated at one of their regularly scheduled public meetings where the *2022 ESPR* planning effort was described and input solicited. Specifically, each commission was asked to discuss any updates to cultural and historic resources since 2017 that should be included in the *2022 ESPR*. This information has been incorporated into Chapter 10.

MMNHP staff reviewed existing material and provided updates. Staff from the Hanscom AFB provided information about their recent and upcoming development projects and sustainability efforts as part of the data collection process for the *2022 ESPR*. MassDOT staff provided information on local transportation initiatives. Additionally, Hanscom Field tenants were contacted to provide information, including their environmental management activities, sustainable development, vehicle and fuel use, spill information, and planned developments. This information is contained in Chapters 2, 4, 6, 8, and 11.

Finally, Massport coordinated with the FAA for the preparation of the *2022 ESPR*. Hanscom Field is under the purview of the FAA’s New England Region, whose regional office is in Burlington, Massachusetts. The FAA administers the Airport Improvement Program (AIP), which provides grants for planning and development projects. The FAA also provides air traffic control and navigation services and is the regulator of the airport and airspace system to ensure safe and efficient operations at public-use airports, including Hanscom Field. As a federal agency, the FAA is responsible for implementing NEPA. The FAA is therefore an important stakeholder in the ESPR development process, and a central partner to Massport in the operation of Massport facilities.

1.5 Primary Findings of the 2022 ESPR

This section provides a summary of the *2022 ESPR* key findings, corresponding with the subject matter of each chapter, in the order in which they appear in this document.

1.5.1 Airport Facilities and Infrastructure

Since the *2017 ESPR*, Massport has made key improvements to fundamental airport infrastructure at Hanscom Field. **Chapter 2** contains a listing of significant projects by year, which is also provided in **Table 1-1** below. Key projects since 2017 include hangar improvements, pavement maintenance, replacement of the U.S. Customs and Border Protection (CBP) facility, rehabilitation of the East Ramp and Taxiway N, and implementation of a Vegetation Management Plan (VMP) update.

Table 1-1. Key Projects Since 2017

Year	Projects
2017	• Jet Aviation completed fixed base operator (FBO) facilities, ramp, and Hangar 17 replacement construction. This project reduced the number of parking spaces available at the Hanscom Field Terminal. • The first floor of the Hanscom Field Terminal flooded and was rehabilitated. Engineering studies have been completed to improve drainage. • In August, Runway 11/29 was repaved, repainted, and excess shoulder pavement was removed. The runway was last paved in 1994. • Boston MedFlight began construction activities to redevelop Hangar 12A.
2018	• New aerial photogrammetric mapping of the airport was performed in 2018 as part of the fourth Vegetation Management Plan (VMP) update for 2019–2023. • A Request for Proposals to provide Noise and Operations Management System coverage for Massport was released in 2018. • Completion of Boston MedFlight's new Leadership in Energy and Environmental Design (LEED) building/terminal facility occurred in late 2018.
2019	• Massport finalized development of the 2019–2023 VMP and initiated local permitting. • A Request for Proposals to provide Noise and Operations Management System coverage for Massport was released in 2018, and a new contract with L3Harris was finalized in 2019. • The former U.S. Customs and Border Protection (CBP) facility (an aging trailer on the east side of the airfield) was replaced to meet updated CBP facility guidelines. • The Massachusetts Environmental Policy Act (MEPA) Office approved the *2017 ESPR*. • Massport rehabilitated portions of the East Ramp utilizing a combination of crack sealing, asphalt repair, and asphalt replacement. • The new Airport Rescue and Fire Fighting (ARFF) facility (for which design began in 2016) was completed, and staff moved in. Massport added an enhanced structural fire response in addition to aircraft responses. • Replacement of the three South T-Hangar rows (A–C) that had reached the end of useful life was completed. • The CBP facility construction was completed in 2019.
2020	• CBP staff moved into the newly constructed facility in 2020.

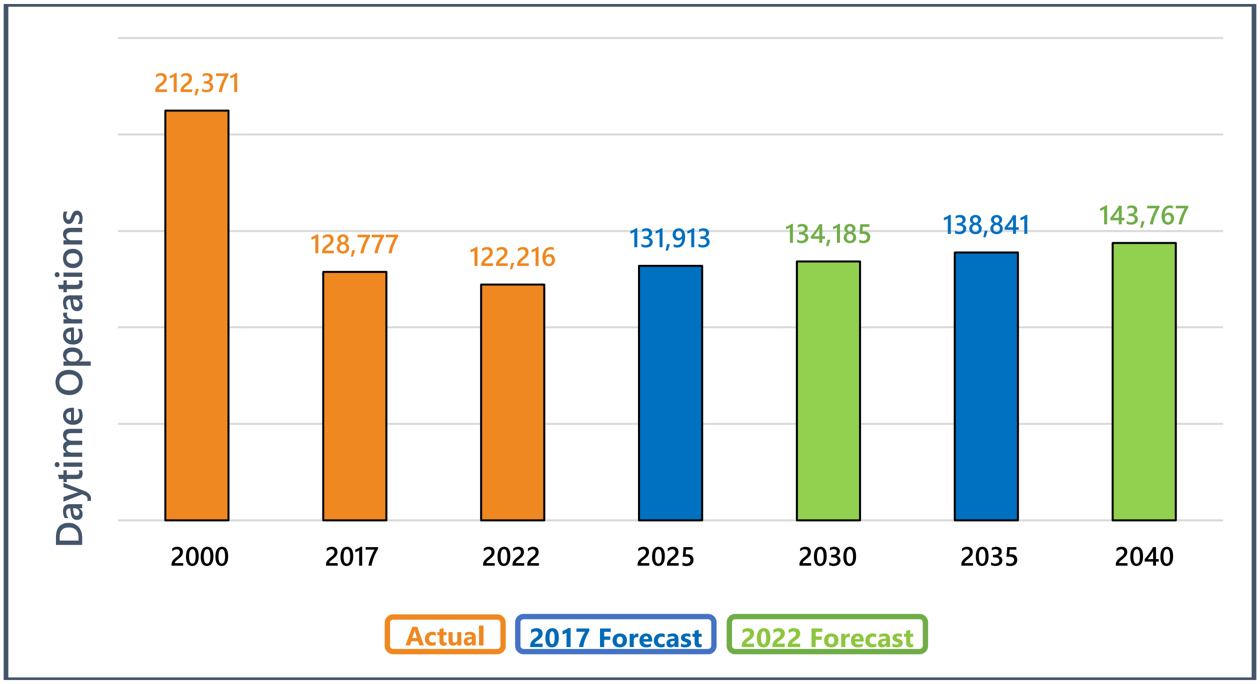
Year	Projects
	• L3Harris continued to make improvements to the Operations Management system. • Massport continued to rehabilitate the East Ramp utilizing a combination of crack sealing, asphalt repair and asphalt replacement, and replaced outdated taxiway light fixtures with LED fixtures on Taxiway J (in 2020/2021). • Vegetation management work began as prescribed in 2019–2023 VMP Update. • Signature Flight Support began a Campus Redevelopment plan. The project includes a replacement FBO facility and demolition of the existing facility upon completion. In addition, Signature Flight Support will renovate five other leased hangars located on the West Ramp and the East Ramp.
2021	• A full Geometry Study of Hanscom Field's airfield geometry was completed in 2021. • L3Harris upgraded all Massport permanent noise monitoring equipment as well as replaced an aircraft radar sensor at Hanscom Field. • Massport rehabilitated Taxiway N and installed LED Taxiway Lights. • Massport continued vegetation management as prescribed in the 2019–2023 VMP. • Massport signed a new agreement with CBP for Customs Services. • Plans began to relocate the Pine Hill T-Hangars to the North Airfield area. • Signature Flight Support began construction of an LEED-certified replacement FBO facility and made repairs and renovations to existing hangars. • Massport approved the design for the Atlantic Aviation corporate hangar facility.
2022	• The North Airfield box hangars were completed, and Pine Hill T-Hangars were demolished in late 2022. • Massport performed pavement maintenance and crack seal of Taxiway R. • Atlantic Aviation began construction of the hangar facility at Pine Hill. • New aerial photogrammetric mapping was flown as part of the VMP in fall 2022.
Sources: Massport; The State of Hanscom, March 2019; The State of Hanscom, March 2020; The State of Hanscom, July 2022; and 2017 L.G. Hanscom Field Environmental Status & Planning Report (ESPR), May 2019	

1.5.2 Airport Activity Levels

In 2022, GA accounted for 99 percent of total operations, and military operations accounted for approximately 1 percent. As shown in **Chapter 3**, Hanscom Field's total aircraft operations have declined by an annual rate of 1 percent from approximately 129,000 operations in 2017 to 122,000 operations in 2022. Business aviation increased at a rate of 4.3 percent from 2017 to 2022.

Figure 1-3 below (also appearing as Figure 3-1 in Chapter 3) presents a summary of actual conditions for daytime aircraft operations in 2017 and 2022 in relation to forecast operations. Total daytime operations are forecast to increase at an annual rate of 0.9 percent, with approximately 134,200 operations in 2030 and 144,000 in 2040. This increase is consistent with the FAA's national forecasts.

Figure 1-3. Summary of Actual and Forecast Daytime Activity at Hanscom Field



Note: Operations are between 7:00 a.m. and 11:00 p.m., the hours that the air traffic control tower is open.
Sources: *2017 ESPR* for Hanscom Field, Massport NOMS data, FAA Aerospace Forecast FY22–FY42, Woods & Poole Massachusetts Gross Regional Product forecast, McFarland Johnson analysis

1.5.3 Airport Planning

Chapter 4 describes the development and planning framework for Hanscom Field and considers how the Airport's planning aligns with FAA guidance and local and regional planning activities. The planning concepts take into account the 1978 *Hanscom Field Master Plan and Environmental Impact Statement* and the 740 Code of Massachusetts Regulations (CMR) Part 25. The conceptual plans for the Airport were developed as options to meet potential future demand associated with the forecast of activity that is described in Chapter 3; they follow a similar planning method to those outlined in earlier ESPRs.

After explaining the context for the Airport's planning framework, Chapter 4 divides Hanscom Field into planning areas based on geographic considerations, to facilitate the discussion of planning for future aviation-related facilities and the evaluation of the 2030 and 2040 development concepts. The five planning areas include the following: North Airfield, Northeast Airfield, East Ramp, West Ramp, and Pine Hill. **Table 1-2** below (also provided as Table 4-8 in Chapter 4) summarizes potential planning concepts for the 2030 and 2040 concepts for each planning area.

Table 1-2. Hanscom Field Planning Concepts for 2030 and 2040

Planning Area	2022 Existing Uses	2030 Concepts (2022–2030 development)	2040 Concepts (2031–2040 development)
North Airfield	Box hangar buildings	• GA and corporate hangars with aircraft parking • Taxiway R pavement maintenance and geometry improvements	None
Northeast Airfield	Currently vacant	Potential aeronautical development	Potential aeronautical development
East Ramp	General aviation, including FBO and fueling facilities	• Expansion of the fuel farm • Taxiway E rehabilitation • Sand storage facility relocation • Expansion of the airport maintenance facility • Hangar improvements • Corporate hangar facilities	Potential aeronautical development
West Ramp	GA, including FBO and T-Hangars, Hanscom Field Terminal	• Salt storage facility relocation • Hanscom Field Terminal enhancements • West Ramp rehabilitation • Taxiway M (South) rehabilitation and geometry improvement • Potential aviation compatible development	• Hanscom Field Terminal enhancements • New and replacement structured public parking spaces as needed • Fuel farm expansion • Hangar upgrades • Potential aviation compatible development
Pine Hill	General aviation including T-Hangar FBO	• Corporate facilities with new aircraft parking spaces • Taxiway E rehabilitation • Runway 23 departure engineering materials arresting system (EMAS) • Taxiway M (North) rehabilitation and geometry improvements	Potential aeronautical development
Sources: Hanscom Field Capital Improvement Plan (ACIP) FY 22 – FY29, September 2022 Update and Hanscom Field Final Board Capital Improvement Plan (CIP) FY23–FY27			

1.5.4 Regional Transportation Context

Hanscom Field is part of the Boston area network which includes the airports that are closest to Logan Airport and have the greatest influence on its passenger traffic and aircraft activity (Worcester Regional Airport, T. F. Green International Airport, Manchester-Boston Regional Airport, and Hanscom Field). **Chapter 5** provides data showing that Hanscom Field is the busiest GA airport in New England and is in the top 4 percent of busiest GA airports in the country. Hanscom Field's activity levels are due in part to its proximity to Boston and the Route 128/I-95 and Route 495 corridors. Hanscom Field handles over seven times as many GA operations per year as Logan Airport and serves an important role as a GA reliever to Logan Airport. Hanscom Field will continue to function within the Boston area primarily as the premier full-service GA facility for Massachusetts and New England and as GA reliever to Logan Airport with the possibility of limited scheduled commercial passenger service.

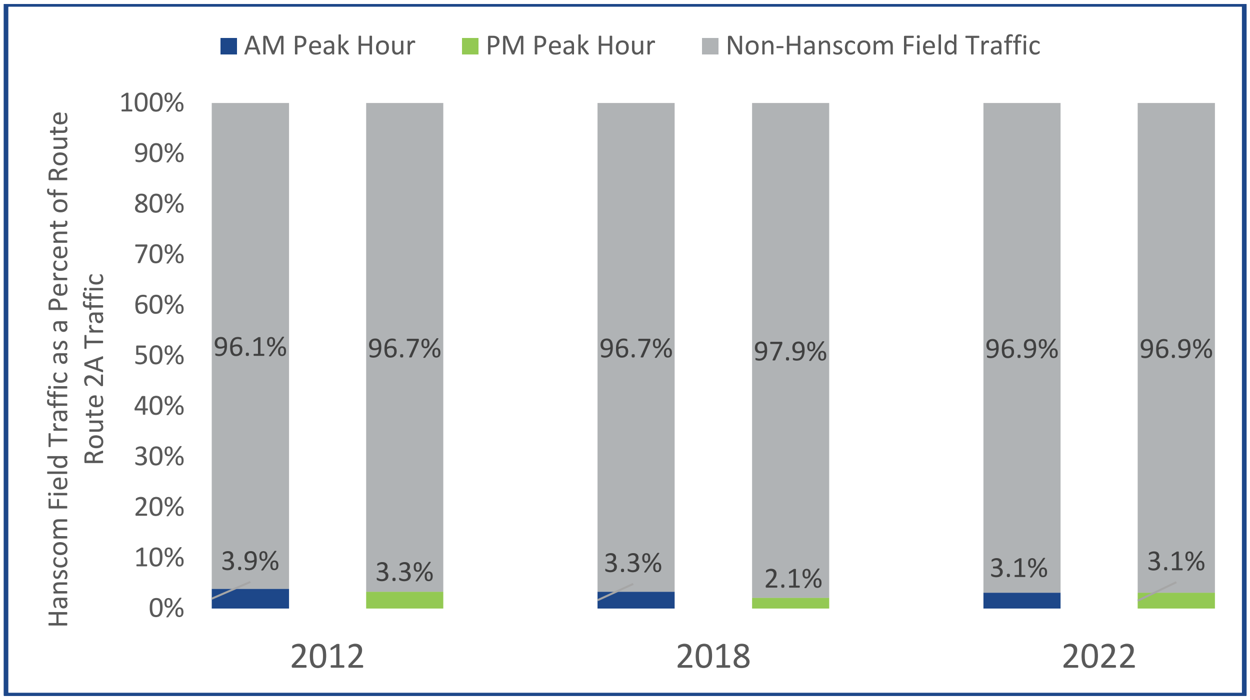
Ongoing trends for the regional aviation system that had developed prior to the *2017 ESPR* were affected by the COVID-19 pandemic: scheduled commercial passenger traffic at regional airports collectively declined from 2019 to 2020. Since the low point in activity levels in 2020, airlines and airports have been reestablishing themselves. Suspended routes have been resumed, as many people who had not traveled for at least a year were eager to do so. However, passenger numbers in the region have not yet recovered to 2019 pre-COVID-19 numbers. For example, Logan Airport handled just over 36 million passengers in 2022, which is over 70 percent of the regional share. In 2019, before the COVID-19 pandemic, Logan Airport handled over 42 million annual passengers. After Logan Airport, the top three regional airports for annual passengers in 2022 were Bradley, T. F. Green, and Portland Jetport. The combined passenger market share for those airports declined from 22.6 percent in 2017 to 21.3 percent in 2022.

1.5.5 Ground Transportation

Chapter 6 includes a traffic study conducted for this *2022 ESPR.* It found similar results to those depicted in the 2*017 ESPR,* in that traffic activity by Hanscom Field employees and passengers occurs outside the typical peak period commuting patterns (very early or late in the day) due to the nature of operations at the Airport.

Based on turning movement counts at the intersection of Route 2A and Airport Road, as shown in **Figure 1-4** below (also provided as Figure 6-1 in Chapter 6), Hanscom Field-related traffic has increased since 2017, while overall Route 2A peak hour traffic volumes have decreased. Hanscom Field-related traffic only contributes to approximately 3 percent of peak hour traffic volumes along Route 2A, east of Hanscom Drive.

Figure 1-4. Percent of Hanscom Field Traffic on Route 2A, East of Hanscom Drive



Note: Traffic data for the *2022 ESPR* was collected in November and December of 2022 and March of 2023. Traffic volume, vehicle occupancy, and parking demand in 2023 are likely comparable to what occurred in 2022.
Source: McFarland Johnson, 2023

1.5.6 Noise

As shown in **Chapter 7**, overall operations and noise levels remain well below historical peaks at Hanscom Field. Although total operations at Hanscom Field decreased since the *2017 ESPR*, jet aircraft operations and the number of nighttime flights increased, contributing to the small increase in the number of people within the 55 day-night average sound level (DNL) contour. However, the 65 DNL contour remains entirely within the Hanscom Field and Hanscom AFB properties. **Table 1-3** below (also provided as Table 7-1 in Chapter 7) presents population estimates within the 65 and 55 DNL contours for 2005, 2012, 2017, 2022, and the 2030 and 2040 forecast scenarios. FAA land use compatibility guidelines generally consider aircraft noise greater than DNL 65 dB to be non-compatible with residential land uses.

Table 1-3. Summary of U.S. Census Population Counts within DNL Contours for Hanscom Field

Year/Scenario	Population[1]	
	65 dB or Greater[2]	55 dB or Greater[3]
2005	17	2,953
2012	0	1,041
2017	0	1,271
2022	0	1,324
2030	0	1,521
2040	0	1,757

Notes:
1. 2022, 2030, and 2040 data based on the 2020 U.S. Census; 2012 and 2017 data based on the 2010 U.S. Census; 2005 data based on the *2005 ESPR* using the 2000 U.S. Census.
2. These population estimates fall between the 65 and 70 DNL contours.
3. These population estimates include population within the 55, 60, 65, and 70 DNL contours
Source: HMMH 2023

Massport has continued to pursue measures to reduce noise impacts, including an initiative that began in 2009, intended to reduce noise over MMNHP by increasing the use of a tight touch-and-go pattern that keeps aircraft over the airfield. Furthermore, Massport's Fly Friendly program at Hanscom Field continues to support quieter arrival and departure procedures. Part of this effort included the development of a multi-faceted publicity program that results in pilots being exposed and re-exposed to the importance and understanding of the quiet-flying techniques.

1.5.7 Air Quality

Chapter 8 defines and reports emissions at Hanscom Field for criteria pollutants and Greenhouse Gases (GHGs) in a manner consistent with previous ESPRs. The primary sources of air pollution from Hanscom Field are airfield operations and roadway traffic. Since the 2017 ESPR, estimated total emissions of CO, PM, and CO2 have decreased, primarily due to a reduction in operations at Hanscom Field. At the same time, aircraft emission levels of NOx and VOCs (precursors to ozone) have increased, which is largely attributable to changes in the fleet mix, including a 23 percent increase in jet operations. Additionally, emissions from Hanscom Field vehicular traffic declined for all pollutants since the 2017 EPSR, which is attributable to both a decrease in traffic generated by Hanscom Field and the natural phasing out of less-efficient vehicles over time. Since 2017, total GHG emissions at Hanscom Field have decreased for all pollutants from the 2017 baseline year to the 2022 analysis year.

2022 Hanscom Field aircraft emissions continue to comprise a very small portion (less than 1 percent) of the total air emissions in Middlesex County for any of the criteria pollutants. **Table 1-4** (also provided as Table 8-4 in Chapter 8) shows these proportions. GHG emissions also continue to represent a small fraction of statewide GHG totals. Forecasted emissions for Hanscom Field's 2030 and 2040 scenarios indicate no adverse air quality effects. For the 2030 scenario, as compared to 2022, estimated total emissions of CO and PM are expected to decrease, and emissions of NOx, VOCs, and CO_2 are expected to increase a small amount. Between 2030 and 2040, estimated total emissions for all criteria pollutants increase correspondingly with forecasted increases in operations; the modeling does not adjust for future technology improvements. Aircraft and vehicle GHG emissions for the 2030 and 2040 future year scenarios are estimated to be higher than for 2022 but would continue to be a small fraction of Massachusetts statewide totals.

Table 1-4. Total Criteria Pollutant Emissions from All Sources in Middlesex County

Source Type		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	CO_2
		Emissions in thousands of kilograms per year					
2020 Middlesex County emissions[1]	Point Source	15,450	4,905	22,081	10,016	3,818	975,213
	Mobile Source	77,833	6,364	4,920	957	470	5,963,725
	Total	93,283	11,269	27,001	10,973	4,288	6,938,938
2022 Hanscom Field Aircraft Emissions		502.5	45.8	55.3	1.9	1.9	16,971
Hanscom Field Aircraft Emissions percentage of Middlesex County total[2]		*0.54%*	*0.41%*	*0.20%*	*0.02%*	*0.04%*	*0.24%*

Notes:
1. Middlesex County Emissions obtained from National Emissions Inventory (2020). https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data
2. The 2022 aircraft emissions totals as a percentage of the total 2020 Middlesex County emissions.

Chapter 8 also presents estimates of potential emission reductions as a result of Sustainable Aviation Fuel (SAF) use and Unleaded Avgas adoption at Hanscom Field, using current Federal Aviation Administration (FAA) guidance in the estimation methodology.

1.5.8 Wetlands, Wildlife and Water Resources

With a few minor exceptions, wetlands, wildlife, and water resources at Hanscom Field have not changed since the *2017 ESPR*, as documented in **Chapter 9**. In the Hanscom Field area, three bird species and two turtle species have been identified as Endangered, Threatened, or Special Concern species in Massachusetts; however, Massport does not expect any potential habitat or water supply impacts to the identified species. Furthermore, the status of wetland resource areas, vernal pools, and perennial waterways at Hanscom Field have not changed since the *2017 ESPR.*

Several of the potential future development areas of Hanscom Field in the 2030 and 2040 scenarios are in proximity to protected resource areas. However, Massport's planning for development is designed to avoid impacts on vernal pools, rare and endangered species habitats, and water quality, and it seeks to avoid or minimize both direct and indirect adverse impacts through the design process. An analysis of potential impacts of future scenarios for six planning areas in the Hanscom Field vicinity is discussed in detail in Chapter 9.

1.5.9 Cultural and Historic Resources

Since the *2017 ESPR*, limited changes have occurred to cultural and historic resources (those listed in the State and National Registers of Historic Places) within, and in areas adjacent to, Hanscom Field. **Chapter 10** describes the comprehensive reconnaissance surveys of historic and archaeological resources that were conducted for the *2022 ESPR*. In the General Study Area, the reconnaissance survey identified 72 historic resources across the four towns that are listed in or determined eligible for the National and State Registers. None of those 72 historic resources are within the 65 DNL contour in 2022 (the FAA-defined threshold for significant noise exposure).

Since the *2017 ESPR*, there have been few changes to the Massachusetts Historical Commission (MHC) Inventory within the Reconnaissance Survey Area (an area within the General Study Area that has a boundary based on maximum forecasted 55 DNL and traffic study intersections). The MHC Inventory includes historic resources that have not yet been formally evaluated for their historical significance. Chapter 10 identifies 156 individual resources and nine survey areas in the MHC Inventory for the Reconnaissance Survey Area. Also, with a few exceptions, the existing archaeological conditions within the Hanscom Field area remain unchanged since the *2017 ESPR*.

1.5.10 Sustainability, Resiliency, and Environmental Justice

As reported in **Chapter 11**, Massport's primary responsibility at Hansom Field is to maintain a safe, secure, and efficient regional airport while minimizing the environmental impact of its operations. Massport first identified sustainability goals in the 2015 *Boston Logan International Airport Sustainability Management Plan* and has since published regular sustainability and resiliency reports that provide progress on goals. Some of Massport's sustainability goals include waste reduction, water conservation, noise abatement, and air pollutant reduction.

Since the *2017 ESPR*, Massport has implemented several sustainability initiatives including recycling collection, development strategies to decrease the impacts of flooding, and installation of LED runway lighting. Additionally, in early 2022, Massport committed to achieving net-zero carbon emissions across all of its properties, including Hanscom Field, through its *Roadmap to Net Zero* program by 2031. Massport will achieve net-zero emissions through five primary pathways:

- Energy conservation and efficiency measures
- Clean and renewable energy sources
- Sustainable ground transportation
- Partnerships
- Culture of sustainability and innovation

EEA updated its Environmental Justice (EJ) Policy in June 2021, implementing new requirements for project filings to address EJ as set forth in Massachusetts state legislation. Massport will comply with the amended regulations and protocols for individual projects at Hanscom Field filed with MEPA. While Hanscom's ESPR is not subject to these new regulations and protocols, as it does not address any specific development project(s), the ESPR meets the spirit of the 2021 EJ Policy and 2022 EJ Protocols, and as such, this 2022 ESPR includes definition of an EJ study area and identification of EJ census blocks contained in that area. As reported in Chapter 11, the Massachusetts Department of Public Health (DPH) EJ Tool was used to determine if any of the identified EJ block groups exhibit vulnerable health criteria and to identify other potential sources of pollution within the EJ study area that may pose a health risk to the public.

1.6 MEPA Documentation

Appendix A of the *2022 ESPR* contains the Proposed Scope submitted to the Massachusetts Executive Office of Energy and Environmental Affairs, the MEPA certificate on the *2017 ESPR* and copies of all comments received on the Proposed Scope and the 2017 ESPR. The *2022 ESPR* is posted on Massport's website and is publicly available.[3] Paper copies of the report are available for review in all four town libraries and in Massport offices at Hanscom Field. Other entities listed in the Distribution List in Appendix A were provided with a notice of availability letter, which shares the link to the electronic version of the document on Massport's website. Consistent with EEA's EJ requirements, the ESPR notice of availability letter was also circulated to the EJ Reference list provided by the MEPA Office. Additional public outreach for this *2022 ESPR* includes two public technical workshops to provide analysis results and an opportunity for questions and answers during the public review period.

In addition to the ESPR process, Massport publishes two annual reports for Hansom Field for public review: T*he State of Hanscom* and the *Annual Noise Report*. Both documents 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) and have continued annually.

All projects that meet the threshold for NEPA or MEPA review undergo project-specific environmental analysis. These documents are also available on Massport's Project Environmental Filings website.

1.7 Organization of the 2022 ESPR

The *2022 ESPR* contains planning information, technical analyses, and supportive data, including the Secretary's December 16, 2022 Scope Certificate, comment letters on the Draft Scope for the *2022 ESPR*, responses to the Certificate and the comment letters, a list of reviewers, and technical appendices. The technical appendices provide additional analytical data and methodological documentation for the various environmental analyses conducted for this *2022 ESPR*. A brief description of the following chapters in the *2022 ESPR* is provided below.

Chapter 2: Airport Facilities and Infrastructure

- Provides updated information about Hanscom Field's facilities and infrastructure
- Discusses the status of programs designed to prevent, reduce, and mitigate the occurrence of environmental impacts related to the use and storage of fuel

Chapter 3: Airport Activity Levels

- Summarizes aviation activity at Hanscom Field
- Provides an overview of national general aviation trends
- Quantifies the aircraft operations at Hanscom Field in 2022 in comparison to previous years, and in the context of operations at other regional airports
- Presents 2030 and 2040 aircraft operation and air passenger forecasts for the future planning scenarios

[3] Massport Project Environmental Filings website for Hanscom Field can be accessed at: http://www.massport.com/massport/about-massport/project-environmental-filings/hanscom-field/

Chapter 4: Airport Planning

- Describes the status of planning initiatives and projects for five planning areas
- Evaluates the potential effects of the 2030 and 2040 scenarios on the airport infrastructure
- Presents the relationship between the *2022 ESPR* and FAA regulations and guidance related to airport planning
- Describes projects in the five-year capital improvement program and identifies which projects may require individual MEPA or NEPA review

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 New England region general aviation and commercial service trends
- Describes aircraft activities and planned improvement projects at regional airports
- Discusses rail and ground access improvements in the region

Chapter 6: Ground Transportation

- Reports on current conditions and future conditions in the 2030 and 2040 analysis years for ground transportation in the vicinity of Hanscom Field
- Compares the current traffic data with the data from the *2017 ESPR*
- Discusses the status of existing and future parking needs at Hanscom Field
- Discusses improvements to intersections and the pedestrian environment in the vicinity of Hanscom Field

Chapter 7: Noise

- Provides an explanation of noise terminology
- Describes the methodology for preparing the noise contours for the *2022 ESPR*
- Presents the noise conditions at Hanscom Field for the 2022 current conditions and the 2030 and 2040 forecast conditions
- Describes the noise analysis locations and reviews changes to the sites since the *2017 ESPR*
- Describes Massport's noise abatement program and stakeholder engagement

Chapter 8: Air Quality

- Provides a regulatory context for air quality by discussing requirements of the Clean Air Act
- Compares current (2022) annual operational air emissions at Hanscom Field to operational emissions presented in the *2017 ESPR*
- Provides an analysis of future (2030 and 2040) conditions of air quality effects from Hanscom Field
- Provides a greenhouse gas emissions inventory for Hanscom Field

Chapter 9: Wetlands, Wildlife and Water Resources

- Describes the natural environment of Hanscom Field, including geographical conditions, wetlands, vernal pools, perennial streams, water resources, and wildlife habitats
- Provides an update on the Vegetation Management Plan
- Provides figures that illustrate the current wetlands resources and location of water supplies at Hanscom Field
- Describes the active Massachusetts Department of Environmental Protection (MassDEP)-listed disposal site that Massport is responsible for bringing to regulatory closure
- Presents information about Massport's National Pollution Discharge Elimination System (NPDES) permit
- Describes aircraft deicing and anti-icing activities at Hanscom Field

Chapter 10: Cultural and Historic Resources

- Reviews the historic and archeological resources located the Hanscom Field area that were identified by the reconnaissance survey
- Describes the background and methodologies used for the reconnaissance survey
- Presents information about MMNHP (the largest National and State Registers resource in the vicinity of Hanscom Field)
- Evaluates the potential effects of traffic, air quality, and noise on historic and cultural resources in the current and future planning scenarios
- Presents a summary of the possible environmentally beneficial measures identified to address effects of Hanscom Field on historic and cultural resources in the future scenarios

Chapter 11: Sustainability, Resiliency, and Environmental Justice

- Provides an overview of airport sustainability
- Describes Massport's sustainability management plan and vision
- Presents Massport's roadmap for achieving net-zero emissions by 2031
- Describes Massport's approach to climate adaptation
- Provides information on the sustainable design approaches for new and existing facilities
- Describes Massport's initiatives to comply with federal and state environmental regulations
- Summarizes environmentally beneficial measures that are identified in previous chapters
- Defines the environmental justice study area for Hanscom Field and identifies environmental indicators for neighborhoods within the study area

Appendices

- Provides a list of reviewers
- Includes the following appendices:
    - Appendix A: Executive Office of Energy and Environmental Affairs Secretary's Certificate on the *2022 ESPR* Scope and a Response to Comments section
    - Appendix B: Airport Layout Plan

- Appendix C through Appendix G: Technical appendices that provide detailed analytical data and methodological documentation for the various environmental analyses conducted for the *2022 ESPR*
    - Appendix C: Ground Transportation data
    - Appendix D: Noise supplemental and background information
    - Appendix E: Air Quality supplemental and background information
    - Appendix F: Wildlife Species of Concern
    - Appendix G: Cultural and Historic Resources data

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2 Facilities and Infrastructure

Hanscom Field is a Federal Aviation Administration (FAA) certified airport (per 14 Code of Federal Regulations (CFR) Part 139). It is one of three airports owned and operated by the Massachusetts Port Authority (Massport). (The other two are Boston Logan International Airport and Worcester Regional Airport.) 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. Hanscom Field's users are a mix of corporate aviation, private pilot operations, flight schools, commuter services, as well as some charter and light cargo operations.

This chapter provides updated information about Hanscom Field's aviation facilities and infrastructure since the publication of the previous Environmental Status & Planning Report (ESPR) for 2017. The description of existing airside and landside facilities includes runways, taxiways, taxilanes, 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 2017

Efforts undertaken toward improving and updating airport facilities and infrastructure at Hanscom Field since the *2017 ESPR* are documented in **Table 2-1**.

Table 2-1. Key Projects Since 2017

Year	Projects
2017	• Jet Aviation completed fixed base operator (FBO) facilities, ramp, and Hangar 17 replacement construction. This project reduced the number of parking spaces available at the Hanscom Field Terminal. • The first floor of the Hanscom Field Terminal flooded and was rehabilitated. Engineering studies have been completed to improve drainage. • In August, Runway 11/29 was repaved, repainted, and excess shoulder pavement was removed. The runway was last paved in 1994. • Boston MedFlight began construction activities to redevelop Hangar 12A.
2018	• New aerial photogrammetric mapping of the airport was performed in 2018 as part of the fourth Vegetation Management Plan (VMP) update for 2019–2023. • A Request for Proposals to provide Noise and Operations Management System coverage for Massport was released in 2018. • Completion of Boston MedFlight's new Leadership in Energy and Environmental Design (LEED) building/terminal facility occurred in late 2018.
2019	• Massport finalized development of the 2019–2023 VMP and initiated local permitting. • A Request for Proposals to provide Noise and Operations Management System coverage for Massport was released in 2018, and a new contract with L3Harris was finalized in 2019. • The former U.S. Customs and Border Protection (CBP) facility (an aging trailer on the east side of the airfield) was replaced to meet updated CBP facility guidelines. • The Massachusetts Environmental Policy Act (MEPA) Office approved the *2017 ESPR*. • Massport rehabilitated portions of the East Ramp utilizing a combination of crack sealing, asphalt repair, and asphalt replacement. • The new Airport Rescue and Fire Fighting (ARFF) facility (for which design began in 2016) was completed, and staff moved in. Massport added an enhanced structural fire response in addition to aircraft responses. • Replacement of the three South T-Hangar rows (A–C) that had reached the end of useful life was completed. • The CBP facility construction was completed in 2019.
2020	• CBP staff moved into the newly constructed facility in 2020. • L3Harris continued to make improvements to the Operations Management system. • Massport continued to rehabilitate the East Ramp utilizing a combination of crack sealing, asphalt repair and asphalt replacement, and replaced outdated taxiway light fixtures with LED fixtures on Taxiway J (in 2020/2021). • Vegetation management work began as prescribed in 2019–2023 VMP Update.

Year	Projects
	• Signature Flight Support began a Campus Redevelopment plan. The project includes a replacement FBO facility and demolition of the existing facility upon completion. In addition, Signature Flight Support will renovate five other leased hangars located on the West Ramp and the East Ramp.
2021	• A full Geometry Study of Hanscom Field's airfield geometry was completed in 2021. • L3Harris upgraded all Massport permanent noise monitoring equipment as well as replaced an aircraft radar sensor at Hanscom Field. • Massport rehabilitated Taxiway N and installed LED Taxiway Lights. • Massport continued vegetation management as prescribed in the 2019–2023 VMP. • Massport signed a new agreement with CBP for Customs Services. • Plans began to relocate the Pine Hill T-Hangars to the North Airfield area. • Signature Flight Support began construction of an LEED-certified replacement FBO facility and made repairs and renovations to existing hangars. • Massport approved the design for the Atlantic Aviation corporate hangar facility.
2022	• The North Airfield box hangars were completed, and Pine Hill T-Hangars were demolished in late 2022. • Massport performed pavement maintenance and crack seal of Taxiway R. • Atlantic Aviation began construction of the hangar facility at Pine Hill. • New aerial photogrammetric mapping was flown as part of the VMP in fall 2022.
Sources: Massport; The State of Hanscom, March 2019; The State of Hanscom, March 2020; The State of Hanscom, July 2022; and 2017 L.G. Hanscom Field Environmental Status & Planning Report (ESPR), May 2019	

2.2 Airport Facilities Inventory and Assessment

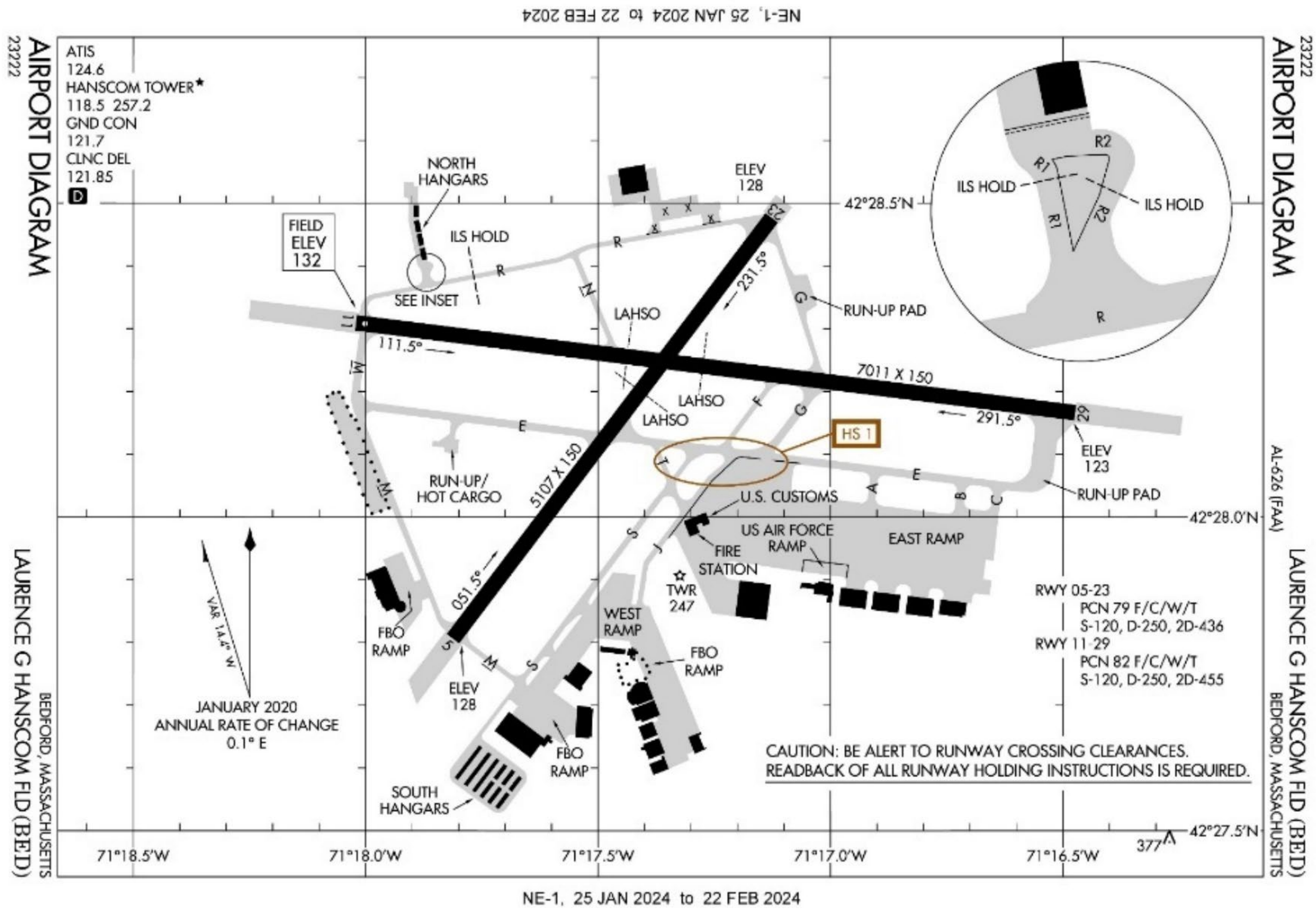
Hanscom Field has two intersecting grooved asphalt-paved runways and additional supporting infrastructure. Runway 11/29 is oriented in an east/west configuration and Runway 5/23 is oriented in a northeast/southwest configuration. Supporting infrastructure includes taxiways, an FAA-owned and operated Air Traffic Control Tower (ATCT), FAA-owned navigational aids (NAVAIDs), aircraft aprons, hangars, passenger terminal buildings, CBP, and other aviation support facilities. These facilities are shown in **Figure 2-1**.

2.2.1 Runways

Runway 11/29, the primary runway, is 150 feet wide and 7,011 feet long and is equipped with a High Intensity Runway Lighting (HIRL) system. Both runway ends are equipped with an Instrument Landing System (ILS), Distance Measuring Equipment (DME), and Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). Both runway ends also have paved blast pads, located within the Runway Safety Areas (RSAs), that are 200 feet wide and 1,000 feet long and are equipped with a four-light Precision Approach Path Indicator (PAPI).[4]

[4] FAA Airports Data and Information Portal: https://adip.faa.gov/agis/public/#/airportData/BED, accessed Jan. 3, 2022.

Figure 2-1. Airport Diagram

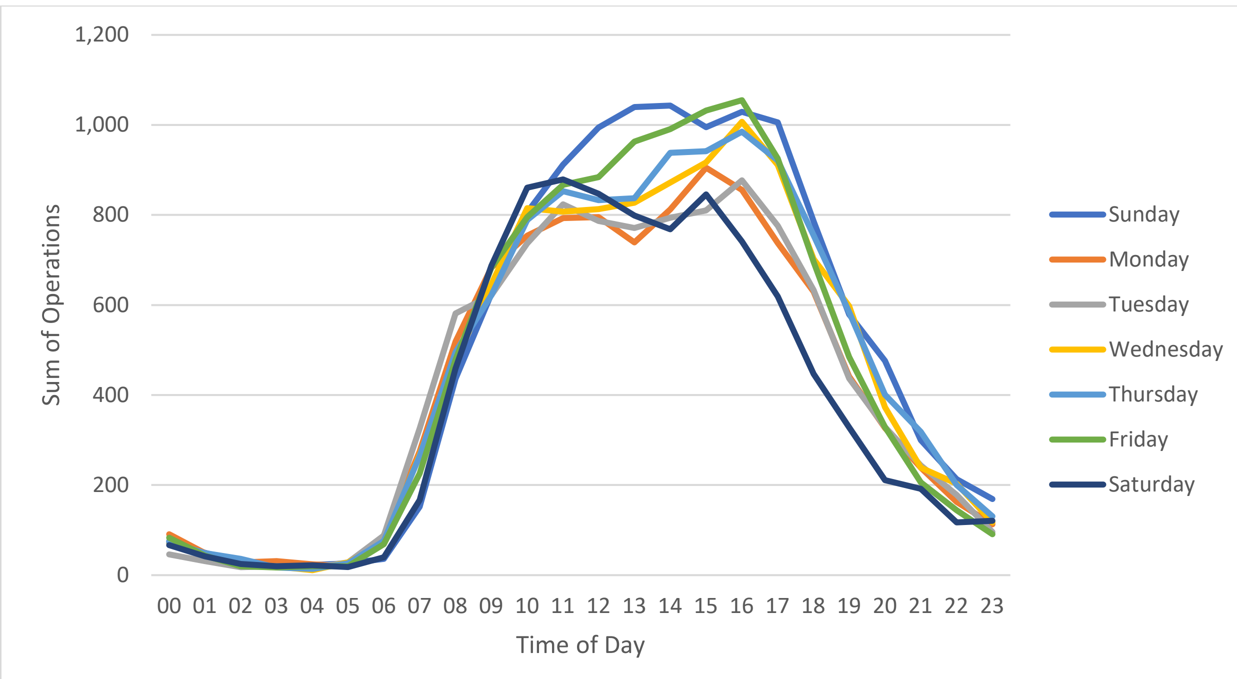


Source: FAA Terminal Procedures, 2024

Runway 5/23, the secondary crosswind runway, is 150 feet wide and 5,107 feet long. This non-precision instrument runway is equipped with a Medium Intensity Runway Lighting (MIRL) system and runway end identifier lights (REILs). At the approach end of Runway 23, the paved blast pad within the RSA is 200 feet wide and 200 feet long. At the approach end of Runway 5, the paved blast pad within the RSA is 200 feet wide and 645 feet long at the centerline. Both runway ends are equipped with a 4-light PAPI.

Most flights at Hanscom Field occur during the daytime and, based on calendar year 2022 data, Hanscom Field's most active month was June. The majority of arrival flights occur on Sundays between 2:00 and 6:00 p.m. and Wednesdays, Thursdays, and Fridays between 3:00 and 6:00 p.m. The majority of flights depart on Saturday between 9:00 a.m. and 1:00 p.m., Sunday between 10:00 a.m. and 3:00 p.m., and late mornings/early afternoons on Wednesdays through Fridays. Sunday and Friday are typically the most active days of the week as shown in **Figure 2-2**.

Figure 2-2. Hanscom Field 2022 Time of Day Summary of Operations (Arrivals and Departures) by Weekday



Source: 2022 Hanscom Field Radar Flight Records

2.2.2 Taxiways

A system of taxiways provides access between the two runways and aircraft parking aprons at Hanscom Field. Taxiway widths range from 50 to 75 feet. In 2021, Massport completed a geometry study of the airfield which addressed airfield standards for design, airfield geometry, and runway incursion mitigation in accordance with FAA AC 150/5300-13B*, Airport Design.*[5] Massport developed a Future

[5] In coordination with the FAA, Massport has planned a near-term study of airfield geometry with the goal of mitigating the risk of runway incursions.

Airport Layout Plan in January 2022 that identified existing buildings/facilities as well as proposed buildings/facilities.

Runway ends 11, 5, and 23 are connected by taxiways that allow aircraft to utilize the full runway length without the need to backtaxi. Runway 29 end requires short backtaxi operation from Taxiway E to utilitize the full runway length. Taxiways F, G, and N provide mid-point access to and from Runway 11/29. Taxiway G crosses Runway 11/29 and provides access to Runway 23. There is a paved run-up area on the northeast most portion of Taxiway G. Taxiway R connects the ends of Runway 11 and 23 with the north side of the airfield. Taxiway M connects Runway 5 and 11 to the Pine Hill area and FBO. Finally, Taxiway S is a partial parallel to Runway 5/23.

In addition to the taxiways that provide access to the runways, Hanscom Field has a series of taxiways that provide connectivity between the main taxiways and the aircraft parking aprons. Taxiways A, B, and C provide connection to the East Ramp that is north of tenant and U.S. Air Force (USAF) hangars, and the CBP building. Taxiway T connects Taxiway E, Taxiway J, and Taxiway S. Taxiway J provides access from Taxiway E to the West Ramp.

2.2.3 Airport Traffic Control Facilities and Navigational Aids

The ATCT is located on the south side of the airfield east of 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 5-mile radius of the airport. Air traffic controllers are responsible for controlling Hanscom Field's airspace. Close coordination is maintained between the ATCT and the FAA's Boston Consolidated Terminal Radar Approach Control (TRACON).

FAA-owned and maintained electronic NAVAIDs serving Hanscom Field 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. Runways 11 and 29 are also supported with a required navigation performance (RNP) system consisting of an on-board navigation performance monitoring system coupled with global positioning system (GPS) satelite navigation.[6]

The FAA manages Hanscom's airspace and provides air traffic control at Hanscom Field.[7] FAA rules and regulations govern the movement of air traffic. The FAA's TRACON, located in Southern 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 Field. By means of remote communication between 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.

[6] FAA Terminal Procedures: https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/search/results/?cycle=2301&ident=BED, accessed Feb. 1, 2023.

[7] Massport. *Hanscom Field Flight Operations, FAA, and Massport Responsibilities*. http://www.massport.com/hanscom-field/about-hanscom/airport-activity-monitor/flight-operations/.

2.2.4 Buildings and Hangars

Most of the existing facilities at Hanscom Field are in good condition. Some of the older buildings lack amenities. **Table 2-2** provides a summary of existing building size and condition (i.e., excellent, good, fair, or poor). **Figure 2-3** serves as a reference guide to the facilities listed in Table 2-2 and illustrates the location of leased and Massport-owned properties.

Table 2-2. Hanscom Field Facilities and Infrastructure Inventory and Assessment

No.	Facility	Primary User	Footprint Area (in SF)	Year Built	Condition (as of 2023) [1]	Facility Type/ Comments
1	Hangar 1	Signature Flight Support	28,400	1955	Fair	Fixed Base Operator
2	Hangar 2	Signature Flight Support	36,000	1955	Average	Fixed Base Operator
3	Hangar 3	Signature Flight Support	36,000	1955	Average	Fixed Base Operator New/renovated
4	Hanscom Air Force Base (AFB) Aero Club	U.S. Air Force	n/a	n/a	n/a	Corporate/ conventional GA hangar
5	Hanscom AFB Fire Department	U.S. Air Force	n/a	n/a	n/a	
6	MIT/LL Flight Facility	Lincoln Laboratory	n/a	n/a	n/a	Corporate/ conventional GA hangar
7	Field Maintenance Garage	Massport	11,300	1984	n/a	Airfield maintenance
7A	Electric Vault	Massport	1,000	n/a	n/a	-
7B	Airport Maintenance	Massport	900	2016	Good	-
8	FAA ATCT	FAA-owned property	5,200	2002	n/a	FAA Control Tower
8A	FAA SSC/Tech Ops	FAA-owned property	1,800	n/a	n/a	-
9	FAA FMP Hangar	FAA-owned property	21,000	n/a	n/a	FAA
9A	Sand Storage	Massport	2,400	n/a	Average	Airfield sand storage
10	Hangar 10	Signature Flight Support	20,600	1950s	Average	Fixed Base Operator
11	Hangar 11	NorthStar	15,600	2001	Average	Corporate/ conventional GA hangar
11A	Hangar 11A	Steam Enterprises	26,700	2001	Average	Corporate/ conventional GA hangar
12	Hangar 12	Signature Flight Support	14,500	2002	Average	Corporate/ conventional GA hangar

No.	Facility	Primary User	Footprint Area (in SF)	Year Built	Condition (as of 2023) [1]	Facility Type/ Comments
12A	Hangar 12A	Boston MedFlight	30,000	2017/2018	n/a	Medical flights & training
13	Hangar 13	Signature Flight Support	40,000	2001	Average	Fixed Base Operator
14	FBO Facility	Signature Flight Support	6,500	1988	n/a	Fixed Base Operator
15	Hanscom Field Terminal (formerly Civil Air Terminal)	Massport	12,700	n/a	Average	First floor improvements completed in 2017.
16	Hangar 16	Liberty Mutual	37,300	2005	Good	Corporate/ conventional GA hangar
17	Hangar 17	Jet Aviation	45,900	2017	n/a	Fixed Base Operator
18	Unassigned	n/a	n/a	n/a	n/a	-
19	Unassigned	n/a	n/a	n/a	n/a	-
20	Building Maintenance	Massport	2,100	n/a	n/a	Building maintenance & salt storage; to be removed
21	Hangar 21	Jet Aviation	84,700	2001, 2017	n/a	Fixed Base Operator
22	Jet Aviation GSE Garage	Jet Aviation	2,800	1985	n/a	Fixed Base Operator
23	Draper Laboratory	Draper Laboratory	13,100	1948	n/a	-
24	Hangar 24	Atlantic Aviation	89,714	2014	n/a	-Corporate/ conventional GA hangar
25	MIT/LL Laboratory	Lincoln Laboratory	4,500	n/a	n/a	Leased from Massport
26	FAA Localizer	FAA	n/a	n/a	n/a	NAVAID
27	FAA Glide Slope	FAA	n/a	n/a	n/a	NAVAID
28	FAA Glide Slope	FAA	n/a	n/a	n/a	NAVAID
29	FAA Localizer	FAA	n/a	n/a	n/a	NAVAID
30	CBP / ARFF	U.S. Customs & Border Patrol / ARFF	11,500	2019	n/a	Constructed in 2019. Staff moved in 2020.
31	T-Hangar Row A	Massport	13,700	1972	Good	Replacement completed in 2019.
32	T-Hangar Row B	Massport	14,200	1973	Good	Replacement completed in 2019.
33	T-Hangar Row C	Massport	14,300	1973	Good	Replacement completed in 2019.

No.	Facility	Primary User	Footprint Area (in SF)	Year Built	Condition (as of 2023)[1]	Facility Type/ Comments
34	T-Hangar Row D	Massport	13,900	1982	Average	GA hangar
35	T-Hangar Row E	Massport	13,900	1982	Average	GA hangar
36	T-Hangar Row F	Massport	13,900	1982	Average	GA hangar
37	Unassigned	n/a	n/a	n/a	n/a	T-Hangar Row G was demolished in 2022.
38	Unassigned	n/a	n/a	n/a	n/a	T-Hangar Row H was demolished in 2022.
39	Unassigned	n/a	n/a	n/a	n/a	T-Hangar Row J was demolished in 2022.
40	Athletic Complex	Edge Sports	n/a	n/a	n/a	-
41	Unassigned	n/a	n/a	n/a	n/a	-
42	Unassigned	n/a	n/a	n/a	n/a	-
43	FBO Fuel Farm	Jet Aviation	2,400	2008	n/a	Fixed-Base Operator
44	FBO Fuel Farm	Atlantic Aviation	2,300	2014	n/a	Fixed-Base Operator
45	FBO Fuel Farm	Signature Flight Support	3,300	1976	n/a	Fixed-Base Operator
46	Unassigned	n/a	n/a	n/a	n/a	
47	Box Hangars	Massport	5,750	2022	Excellent	Replacement GA hangar
48	Box Hangars	Massport	5,750	2022	Excellent	Replacement GA hangar
49	Box Hangars	Massport	5,750	2022	Excellent	Replacement GA hangar
50	Box Hangars	Massport	5,750	2022	Excellent	Replacement GA hangar
B	USAF Parcel B	U.S. Air Force	n/a	n/a	n/a	Leased from Massport by the U.S. Air Force.

Notes:
1. Property condition determined from Massport Infrastructure Conditions Assessment (MICA) 2023
2. Building footprints determined from airport drawing provided by Massport.
3. Not applicable (n/a) applies to unused Building ID or facilities where information was not available.

Sources: 2023 – Massport Infrastructure Conditions Assessment; Hanscom Field drawings provided by Massport; State of Hanscom Reports 2018–2022.

2.2.5 Full-Service Fixed Base Operator Facilities

A full-service 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, flight planning for 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 charter activity.

Hanscom Field currently has three full-service FBOs: Jet Aviation, Signature Flight Support, and Atlantic Aviation. Jet Aviation typically operates 24/7. Atlantic Aviation and Signature Flight Support operate from 6:00 a.m. to 10:00 p.m. and 11:00 p.m., respectively, and offer on-call services with prior arrangements 24/7.

Jet Aviation operates approximately 130,600 square feet (SF) of hangar space and a 6,200 SF FBO office area building on the West Ramp. Its replacement hangar opened in June 2017 and can accommodate aircraft up to the size of a Global 7000 or G650. The adjacent 92,000 SF ramp was upgraded in 2017 as well. Jet Aviation also operates a fuel farm nearby.

Signature Flight Support operates an FBO building on the West Ramp, directly east of the Hanscom Field Terminal. In June 2023, Signature Flight Support constructed a replacement building south of the existing Building 14, which will be torn down and turned into an aircraft parking ramp. The replacement building is south of Building 14 shown in **Figure 2-3**. South of their FBO facility, Signature leases a primary 38,000 SF hangar (Hangar 13). The hangar was constructed by the Mercury Air Group in 2001. In addition to its primary hangar, Signature leases Hangar 10 (20,000 SF), Hangar 1 (28,000 SF), and Hangars 2 and 3 (36,000 SF each). The buildings are primarily used for aircraft maintenance and storage, with some area available for general office activities. Signature also operates a fuel farm on the East Ramp.

Facilities	
NO.	Description
1	Hangar 1
2	Hangar 2
3	Hangar 3
4	Hanscom Air Force Base (AFB) Aero Club
5	Hanscom AFB Fire Department
6	MIT/LL Flight Facility
7	Field Maintenance Garage
7A	Electrical Vault
7B	Airport Maintenance
8	FAA ATCT
8A	FAA SSC/Tech Ops
9	FAA FMP Hangar
9A	Sand Storage
10	Hangar 10
11	Hangar 11
11A	Hangar 11A
12	Hangar 12
12A	Hangar 12A
13	Hangar 13
14	FBO Facility
15	Hanscom Field Terminal
16	Hangar 16
17	Hangar 17
18	Unassigned
19	Unassigned
20	Building Maintenance
21	Hangar 21
22	Jet Aviation GSE Garage

Facilities	
NO.	Description
23	Draper Laboratory
24	Hangar 24
25	MIT/LL Laboratory
26	FAA Localizer
27	FAA Glide Slope
28	FAA Glide Slope
29	FAA Localizer
30	USCBP / ARFF
31	T-Hangar Row A
32	T-Hangar Row B
33	T-Hangar Row C
34	T-Hangar Row D
35	T-Hangar Row E
36	T-Hangar Row F
37	Unassigned
38	Unassigned
39	Unassigned
40	Athletic Complex
41	Unassigned
42	Unassigned
43	FBO Fuel Farm
44	FBO Fuel Farm
45	FBO Fuel Farm
46	Unassigned
47	Box Hangars
48	Box Hangars
49	Box Hangars
50	Box Hangars

Note: On-airport buildings without a number have been removed since the November 2022 aerial.

North

0 1,000 2,000 Feet

- Airport Property Boundary
- Military Lease
- FAA Boundary
- Hanscom AFB Property Boundary
- Town Boundary

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Hanscom Field Facilities

Figure **2-3**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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Atlantic Aviation (formerly Ross/Rectrix Aviation) is the newest FBO at Hanscom Field. It opened in 2014 as Rectrix, which was taken over by Ross Aviation in 2019[8] and merged with Atlantic Aviation in 2021.[9] Atlantic is located on the southwest side of the airfield, west of Taxiway M. Facilities include a 60,000 SF hangar and a 20,000 SF FBO building, guest, and office space. Atlantic operates a fuel farm located west of the Jet Aviation Fuel Farm.

Hangar space at all three FBOs are reported to be sold out/oversold, with waiting lists for corporate jet customers at each.

2.2.6 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. The following companies provide maintenance services at Hanscom Field:

- Signature Flight Support (an FBO) provides maintenance services through Jet East at Hanscom Field, which provides aircraft on ground (AOG) aircraft maintenance at Hanscom Field.
- Duncan Aviation has a satellite repair station at Hanscom Field.

2.2.7 Corporate/Conventional Hangars

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

Active corporate and conventional hangars at Hanscom Field are:

- Hangar 11 (Northstar LLC, 15,600 SF) located on the east side of the West Ramp.
- Hangar 11A (Stream Enterprises, 26,700 SF) located on the east side of the West Ramp.
- Hangar 16 (Liberty Mutual, 37,300 SF) located on the west side of the West Ramp.

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.

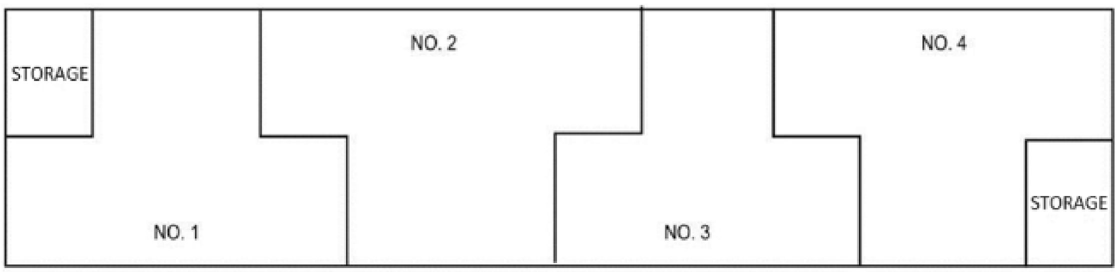
2.2.8 T-Hangars

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 space-efficient storage

[8] Ross Aviation completes takeover of Rectrix Aviation. https://www.ch-aviation.com/portal/news/76065-ross-aviation-completes-takeover-of-rectrix-aviation, March 8, 2019, accessed February 27, 2023.
[9] Atlantic Aviation and Ross Aviation Announce Agreement to Combine FBO Networks. https://www.atlanticaviation.com/news/atlantic-aviation-and-ross-aviation-announce-agreement-to-combine-fbo-networks, Nov. 16, 2021, accessed February 27, 2023.

for small, individual aircraft. **Figure 2-4** displays a typical T-Hangar layout (areas labeled storage space can also be office space).

Figure 2-4. Standard T-Hangar Layout



Source: *2017 ESPR*, 2023.

Six T-Hangar buildings with 12 individual T-Hangar units each are located in the southwest portion of the West Ramp. These are commonly referred to as the "South T-Hangars." Each individual hangar unit contains approximately 1,344 SF of space and can accommodate a small aircraft. T-Hangar Rows A–C were replaced in 2019.

On the southwest side of the airfield in the Pine Hill Area. Three T-Hangar buildings (former Hangars 37-39) were demolished as part of the 2021-2023 airfield improvements. These three T-Hangar buildings were constructed in 1987 and were commonly referred to as the "Pine Hill Ts." In replacement of Buildings 37-39, four 2-unit box hangar buildings (Buildings 46–49) were constructed north of Taxiway R.

2.2.9 Flight Schools

Flight schools, as the name implies, provide flight training to individuals who are learning to fly aircraft. Training is provided in classroom facilities as well as in an aircraft with a certified instructor. Currently, three flight schools operate at Hanscom Field: East Coast Aero Club,[10] Mike Goulian Aviation,[11] and Hanscom AFB Aero Club.[12] The East Coast Aero Club operates out of the Hanscom Field Terminal. Mike Goulian Aviation subleases space in Signature's Hangar 12. The Hanscom AFB Aero Club operates out of Building 4 on the East Ramp. The flight schools use the tie-down facilities[13] on the East and West Ramps for aircraft parking and storage.

2.3 Other Aviation-Related and Ancillary Business Inventory

In addition to the services referenced above, there are varieties of mostly aviation-related businesses that operate out of offices located in the Hanscom Field Terminal or in the FBOs, such as car rental agencies and food services. Hangar 12A was occupied and used by the National Aviation Academy as an aircraft mechanic training school until the lease expired in 2015. In 2016, Massport accepted a proposal from Boston MedFlight to redevelop the site. The new facility is a multi-

[10] East Coast Aero Club, https://eastcoastaeroclub.com, accessed on March 9, 2023.
[11] Mike Goulian Aviation, http://www.mikegoulianaviation.com, accessed on March 9, 2023.
[12] Hanscom Air Force Base (AFB) Aero Club, https://www.hanscomfss.com/aero-club, accessed on March 9, 2023.
[13] Tie-down facilities are areas on an airport specifically designed for the outdoor storage of aircraft.

purpose facility incorporating hangar space, office space, and training space. Boston MedFlight completed its new Leadership in Energy and Environment Design (LEED) facility in 2018.[14] As of 2022, Boston MedFlight announced that they had provided critical care medical transport for over 90,000 patients, with 2021 being the busiest year in Boston MedFlight's history.[15]

2.3.1 Hanscom Field Terminal

The three-story Hanscom Field Terminal building has a total gross floor area of approximately 36,000 SF, consisting of space for passenger holding areas, public seating, general office space, flight schools, car rental agencies, and Massport administrative offices.

Massport continually maintains and upgrades the Hanscom Field Terminal. In 2017, Massport moved all administrative offices to the vacant office space on the second floor of the Hanscom Field Terminal, consolidating resources and utilizing a smaller footprint. A variety of security upgrades have been adopted, and budget has been allocated to specifically increase security of the Hanscom Field Terminal between 2022 and 2025. Along with security upgrades, the Hanscom Field Terminal has budgeted for restroom renovations for FY 2023.[16]

2.3.2 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 and secured with anchors.

Spaces for aircraft parking are located at the East Ramp (with approximately 36 tie-downs) and the West Ramp (with approximately 37 tie-downs). As shown on Figure 2-3, the West Ramp includes areas to the east, west, and north of the Hanscom Field Terminal. The East Ramp abuts the Hanscom Air Force Base and is comprised of approximately 2 million SF of gross apron space. Approximately 220,000 SF are used for aircraft tie-downs. The remainder is currently used for taxiway access and other transient aircraft parking for both civilian and military aircraft.

2.3.3 Fire Fighting and Police

Massport has been standardizing ARFF procedures across all three Massport-owned airports in order to enhance safety and coordination efforts. This allows Massport Fire-Rescue to leverage additional resources from other Massport facilities (airports) for use at Hanscom Field as needed. Massport Fire-Rescue at Hanscom Field began operations in 2015 with a temporary ARFF vehicle bay added to the maintenance garage. Construction on a permanent 11,500 SF facility with two bays began in 2018 and was completed in 2019, with staff fully moved in by 2020. Construction of the ARFF building required removal of approximately 17 aircraft tie-downs. The aircraft utilizing the tie-downs were absorbed by FBOs at Hanscom Field. Massport included an enhanced structural fire response capability in addition to the aircraft rescue response readiness. Additionally, the local Fire

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[14] The State of Hanscom March 2019 Report, https://www.massport.com/media/3115/state-of-hanscom-2018.pdf, accessed on March 9, 2023.
[15] Boston MedFlight Reaches 90,000 Patient Transport Milestone, https://verticalmag.com/press-releases/boston-medflight-reaches-90000-patient-transport-milestone/, accessed on March 9, 2023.
[16] *The State of Hanscom July 2022 Report*, https://www.massport.com/media/khjo0oua/2021-state-of-hanscom.pdf, accessed on March 9, 2023.

Departments offer supplemental firefighting capabilities at Hanscom Field as part of the MetroFire agreement mutual aid system.[17]

A Massachusetts State Police office is located inside the Hanscom Field Terminal; it provides 24/7 policing and law enforcement services to Hanscom Field.

2.3.4 Miscellaneous Support Facilities

Massport is responsible for upkeep of Massport-owned airport facilities and infrastructure maintenance. Additional terminal and general airport support facilities exist at Hanscom Field, including fuel storage and airfield maintenance facilities. The three FBOs store and dispense fuel for civil and military aircraft. The Jet Aviation and Atlantic Aviation[18] fuel farm facilities are located on the southwest side of the airfield, near the South T-Hangars. The Signature Flight Support fuel farm facility is located on the east side, adjacent to Hangar 1. Massport maintenance vehicles, including trucks, snowplows, construction equipment, and other general maintenance equipment are stored adjacent to or inside an 11,300 SF building located adjacent to the FAA ATCT (building 7B on Figure 2-3).

2.3.5 Commuter/On-Demand Charter Services

Commuter service is not currently offered from Hanscom Field. The previous on-demand aircraft operator, Southern Airways Express, commenced seasonal operations on May 27, 2021 which were no longer offered in 2022.[19] Various companies operate on-demand air taxi and charter service at Hanscom Field.

2.4 Infrastructure Inventory and Assessment

Hanscom Field is served by an infrastructure system of transportation and utility facilities. Roadway conditions are described generally below, with more detail provided in Chapter 6. In the *2017 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 *2022 ESPR*. Information regarding the water distribution system's supply and demand and the wastewater system serving Hanscom Field is based on information published in in the *1995 GEIR* through the *2017 ESPR* documents, with updates provided by Massport. The stormwater management and drainage system information comes from the same published sources, updated by the 2023 Stormwater Pollution Prevention Plan (SWPPP) and data supplied by Massport.

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[17] *MetroFire Mutual Aid System*, Revision 1016.1, June 2016, accessed on March 8, 2023: https://www.massmetrofire.org/sites/default/files/Metrofire%20Mutual%20Aid%20System%20for%20COMPUTER%20VIEWING.pdf.

[18] "Atlantic Aviation and Ross Aviation Announce Agreement to Combine FBO Networks", https://www.atlanticaviation.com/news/atlantic-aviation-and-ross-aviation-announce-agreement-to-combine-fbo-networks, accessed on March 9, 2023.

[19] Aviation Pros, "Southern Airways Re-Launches Nantucket Service," https://www.aviationpros.com/airlines/press-release/21224660/southern-airways-southern-airways-relaunches-nantucket-service, accessed on January 3, 2022.

2.4.1 Surface Access Roadways and Ground Transportation

Hanscom Drive is the main entrance to the Airport. Additional access is provided on Virginia Road in the Pine Hill area for the Atlantic Aviation facility. Hanscom Drive intersects with Route 2A, which provides connections to Route 128/Interstate 95 (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. Old Bedford Road (which intersects with Hanscom Drive at the entrance to Hanscom Field) and Virginia Road provide connections to Routes 62, 4, and 225.

Hanscom Drive is a paved, four-lane divided roadway from Route 2A that provides access to Hanscom Field and Hanscom AFB. The intersection of Old Bedford Road, Vandenberg Drive, and Hanscom Drive is being reconfigured into a roundabout. After the roundabout at Old Bedford Road, Hanscom Drive becomes an undivided two-lane roadway until its northernmost point where it splits off to the east (turning right) and west (turning left) at the Hanscom Field Terminal and northern end of the Hanscom Field Public Parking lots. Hanscom Drive continues one-way westbound (turning left) in three lanes providing access to the Hanscom Field Terminal, the main parking lot circulation, and West Ramp facilities to the north and west. Hanscom Drive continues eastbound (turning right) as a two-lane roadway providing access to Signature Flight Support and eastern West Ramp facilities. The roadway in front of the Hanscom Field Terminal has designated areas for passenger drop-off and pick-up, taxis, and bus stops. Hanscom Drive is in good condition, and the capacity of the roadway is adequate to meet its internal circulation needs.

Public ground transportation to Hanscom Field is provided by the Massachusetts Bay Transportation Authority (MBTA). The Routes 62 and 76 buses stop in front of the Hanscom Field Terminal and provide connections to Lexington, Arlington, Bedford, and the MBTA Red Line train at Cambridge's Alewife Station, from which commuters can continue anywhere within the MBTA transit system. As of spring 2023, the Route 62 buses stop at Hanscom Field on Saturdays only and the Route 76 buses stop at Hanscom Field daily (including Sundays/holidays).

The Airport is accessible by bike and has convenient cycling access via the Minuteman Bikeway and other bike paths. Bike racks are available at multiple locations throughout the Airport, including the Hanscom Field Terminal.

2.4.2 Automobile Parking

There are approximately 1,239 automobile parking spaces at Hanscom Field (excluding USAF Parcel B). This includes both marked and unmarked spaces around the Hanscom Field Terminal, aircraft hangars, and other facilities on airport property. Parking spaces were counted through visual inspection and recent satellite imagery.

Table 2-3 summarizes available parking by facility (excluding USAF Parcel B). The *2022 ESPR* re-evaluated some parking lot uses; major changes from the *2017 ESPR* are noted in the comments. Additional automobile parking may be available in the future as part of proposed development areas.

Table 2-3. Summary of Vehicle Parking Spaces

Building No.	Facility	Primary User	Parking Spaces 2012	Parking Spaces 2017	Parking Spaces 2022	Comments
1	Hangar 1	Signature Flight Support	37	37*	28	-
2	Hangar 2	Signature Flight Support	20	22*	18	-
3	Hangar 3	Signature Flight Support	20	20*	18	-
4	Hanscom AFB Aero Club	U.S. Air Force	n/a	n/a	18	-
5	Hanscom AFB Fire Department	U.S. Air Force	n/a	n/a	n/a	-
6	MIT/LL Flight Facility	Lincoln Laboratory	n/a	n/a	n/a	-
7	Field Maintenance Garage	Massport	18	18*	17	-
7A	Electric Vault	Massport	n/a	n/a	n/a	-
7B	Airport Maintenance	Massport	n/a	4	n/a	-
8	FAA ATCT	FAA-owned property	107	105*	18	62 marked and ~11 unmarked parking spaces in a lot across the street that is no longer being used.
8A	FAA SSC/Tech Ops	FAA-owned property	n/a	n/a	12	These parking spaces exist for FAA use.
9	FAA FMP Hangar	FAA-owned property	18	18	n/a	This *2022 ESPR* recategorized this area as n/a.
9A	Sand Storage	Massport	0	0*	0	-
10	Hangar 10	Signature Flight Support	64	37	37	-
11	Hangar 11	NorthStar	34	11	14	-
11A	Hangar 11A	Steam Enterprises	25	18	28	-
12	Hangar 12	Signature Flight Support	12	12	12	-
12A	Hangar 12A	Boston MedFlight	57	34	40	-

Building No.	Facility	Primary User	Parking Spaces 2012	Parking Spaces 2017	Parking Spaces 2022	Comments
13	Hangar 13	Signature Flight Support	15	14	0	Parking spaces removed during construction.
14	FBO Facility	Signature Flight Support	10	10	20	Replacement FBO facility completed in 2023.
15	Hanscom Field Terminal (formerly Civil Air Terminal)	Massport	667	444	451	-
16	Hangar 16	Liberty Mutual	45	46	46	-
17	Hangar 17	Jet Aviation	25	31	31	Row of parking in front of the building.
18	Unassigned	n/a	n/a	n/a	n/a	-
19	Unassigned	n/a	n/a	n/a	n/a	-
20	Building Maintenance (abandoned)	Massport	23	0	0	This building has been abandoned and parking spaces have been included in the terminal lot.
21	Hangar 21	Jet Aviation	142	178	160	-
22	Jet Aviation GSE Garage	Jet Aviation	0	0	5	-
23	Draper Laboratory	Draper Laboratory	17	17*	0	-
24	Hangar 24	Atlantic Aviation	70	97	98	-
25	MIT/LL Laboratory	Lincoln Laboratory	26	26*	9	-
26	FAA Localizer	FAA	n/a	n/a	n/a	-
27	FAA Glide Slope	FAA	n/a	n/a	n/a	-
28	FAA Glide Slope	FAA	n/a	n/a	n/a	-
29	FAA Localizer	FAA	n/a	n/a	n/a	-
30	ARFF/CBP	U.S. Customs & Border Patrol	5	5*	8	-
31	T-Hangar Row A	Massport	12	12	12	Based on aircraft occupancy
32	T-Hangar Row B	Massport	12	12	12	Based on aircraft occupancy
33	T-Hangar Row C	Massport	12	12	12	Based on aircraft occupancy
34	T-Hangar Row D	Massport	12	12	12	Based on aircraft occupancy
35	T-Hangar Row E	Massport	12	12	12	Based on aircraft occupancy

Building No.	Facility	Primary User	Parking Spaces			Comments
			2012	2017	2022	
36	T-Hangar Row F	Massport	12	12	12	Based on aircraft occupancy
37	Unassigned	n/a	8	8	n/a	T-Hangar Row G was removed.
38	Unassigned	n/a	12	12	n/a	T-Hangar Row H was removed.
39	Unassigned	n/a	18	18	n/a	T-Hangar Row J was removed
40	Athletic Complex	Town of Bedford	n/a	n/a	n/a	-
41	Unassigned	n/a	n/a	n/a	n/a	-
42	Unassigned	n/a	n/a	n/a	n/a	-
43	FBO Fuel Farm	Jet Aviation	n/a	n/a	n/a	-
44	FBO Fuel Farm	Atlantic Aviation	n/a	n/a	n/a	-
45	FBO Fuel Farm	Signature Flight Support	n/a	n/a	n/a	-
46	Unassigned	n/a	n/a	n/a	n/a	-
47	Box Hangars	Massport	n/a	n/a	2	Based on aircraft occupancy
48	Box Hangars	Massport	n/a	n/a	2	Based on aircraft occupancy
49	Box Hangars	Massport	n/a	n/a	2	Based on aircraft occupancy
50	Box Hangars	Massport	n/a	n/a	2	Based on aircraft occupancy
-	Jet Aviation Lot	n/a	n/a	71*	71	Located off Hanscom Drive, near entrance
Total[3]			1,567	1,385	1,239	

Notes:
1. **FY 2022 – Massport Facilities Annual Report of Conditions 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. **2017 totals did not add up to the sum of individual parking numbers and was corrected.**

Sources: FY 2022 – Massport Facilities Annual Report of Conditions, *2017 ESPR* (*based on Google Earth, April 2017), Google Earth April 2023, and drawings/information provided by Massport.

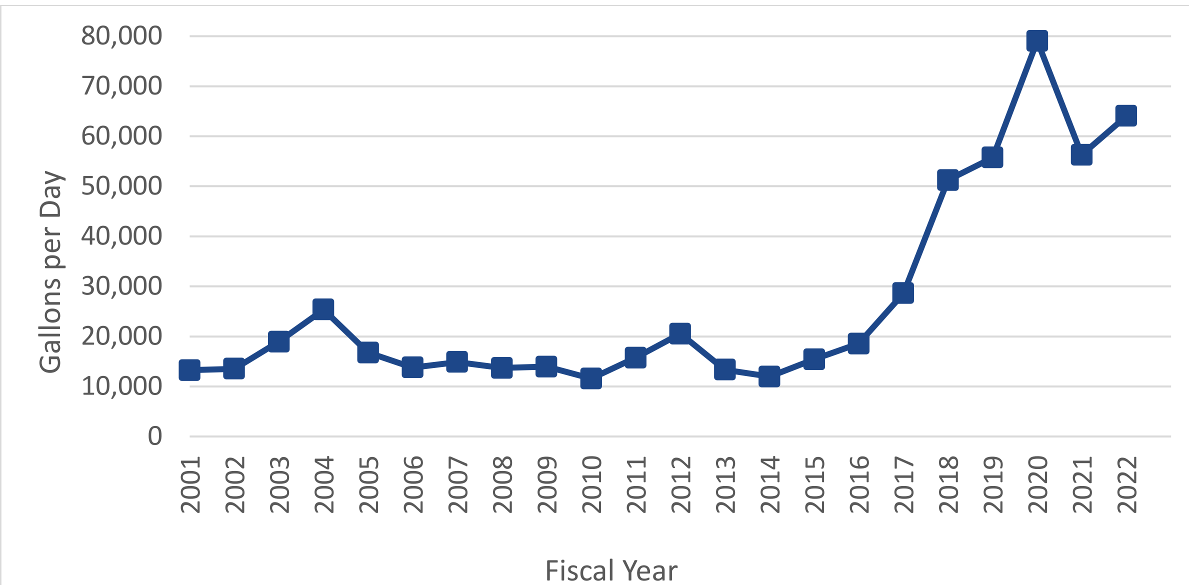
2.4.3 Water Supply and Demand

A 22-year history of water usage from 2001 to 2022 is provided in **Figure 2-5**. **Figure 2-6** shows the Massport existing water distribution system. The increase in daily water usage from fiscal year (FY) 2017 to FY 2018 can be attributed to regular monthly readings being reported for five individual potable water meters that previously reported either zero, or very sporadic readings. The large average daily water usage for FY 2020 is due to an anomaly reported in July 2019, the first month of FY 2020. In July 2019, the reported monthly water usage was more than double any previous or future high monthly reading reported. If the July 2019 reading is excluded as an anomaly, the FY 2020 average daily water usage would be 68,044 gallons. Additionally, in 2020 the new ARFF and

CBP facility was connected to the water line. The decrease from FY 2020 to FY 2021 can be attributed to the fact that for nine months only one of the 10 potable water meters recorded readings, and the first three months of FY 2021 were recorded following the COVID-19 pandemic lockdown.

Massport's water supply is provided primarily by the adjacent Hanscom AFB water distribution system. Hanscom AFB purchases its water from the towns of Lexington and Bedford. Lexington is supplied by the Massachusetts Water Resources Authority (MWRA). As of 2020, Bedford receives its water from the MWRA. Prior to 2020, a small amount of Bedford's water was from the Shawsheen Groundwater Treatment Facility, but those wells were shut down indefinitely on October 24, 2019.[20] The MWRA water comes from the Quabbin Reservoir, 65 miles west of Boston, and the Wachusett Reservoir, 35 miles west of Boston. Both reservoirs are protected by both the MWRA and the Massachusetts Department of Conservation and Recreation (DCR). MWRA's licensed treatment operators provide state-of-the-art treatment to the drinking water.

Figure 2-5. History of Water Usage from 2001 to 2022



Notes:
1. FYs 2010 and 2011 do not include March. FY 2013 does not include May. FYs 2015-2017 do not include August. Data presented herein is representative of usage history requested of and obtained from Massport. Data presented may differ from the *2017 ESPR* as the source(s) for the *2017 ESPR* data could not be verified.
2. *2017 ESPR* data was aggregated in calendar year, whereas *2022 ESPR* data is aggregated during the fiscal year. Therefore, annual numbers show a difference even though the same data source was used.

Sources: Massport data, 2023

[20] *2021 Annual Drinking Water Quality Report For MWRA Lexington – Hanscom AFB (Public Water System Identification (PWSID) Number 3023002)*, https://www.hanscom.af.mil/Portals/57/documents/20220606%20-%20Consumer%20Confidence%20Report%20for%20Hanscom%20AFB%20MA.pdf?ver=dst9d0-1gnzQu_DAbpHk8w%3D%3D, accessed on May 18, 2023.

In 2021, the entirety of the MWRA source water to Hanscom AFB was treated at the John J. Carroll Treatment Plant in Marlborough, Massachusetts. The plant averages treatment of up to 275 million gallons of water per day and up to 405 million gallons on peak days. The water mains within the Hanscom AFB water distribution system vary in size (6, 8, or 12 inches in diameter) and composition (cast iron, ductile iron, asbestos cement, and polyvinyl chloride).

The Hanscom AFB water distribution system primarily serves the West Ramp and the East Ramp Areas. 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 West Ramp. Each of the hangars on the East Ramp has their own separate connection to the Hanscom AFB system.

In total, there are 90 hydrants for firefighting purposes.[21] There are 45 hydrants located on Massport property, 25 hydrants are located on USAF property, 13 hydrants are located on public right-of-way, and 7 are located on private property. These hydrants are all located strategically near major buildings and hangars. The fire flow assessment for each area is described in **Table 2-4**.

[21] L.G. Hanscom Field, Fire Hydrants Location & Number, Bedford, Concord & Lincoln, MA – Massport Survey Unit Drawing No. 2130-01, dated June 12, 2015, Revision #2 dated September 9, 2020.

Note: On-airport buildings without a number have been removed since the November 2022 aerial.

North

0 1,000 2,000 Feet

- Airport Property Boundary
- Proposed Property Line
- Military Lease
- FAA Boundary
- Town Boundary
- Existing Water Line
- Hydrology

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Existing Water System

Figure **2-6**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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Table 2-4. Existing System Fire Flow Modeling

Area/Facility	Available Fire Flow at 20 psi (gpm)
Pine Hill Area	1,500
East Ramp Area	2,000
West Ramp Area	
Hanscom Field Terminal	1,410
Hangar 11	1,160
Signature FBO	1,980[1]
Hangar 10	1,020
Hangar 12A	1,138[4]
Signature Fuel Farm	1,909[2]
South T-Hangars	990
Massport Maintenance Buildings	1,460
Hangars 1, 2, and 3	1,665[3]
FAA Storage Facility	n/a
Sources: *2017 ESPR*, (1) Signature Flight Support Flow Test (January 15, 2020), (2) S-192-21 BED-SFS Hangar Flow Test (April 6, 2021), (3) BED h123 flow test (June 26, 2018), and (4) Boston MedFlight Hangar 12A Flow Text (December 13, 2016).	

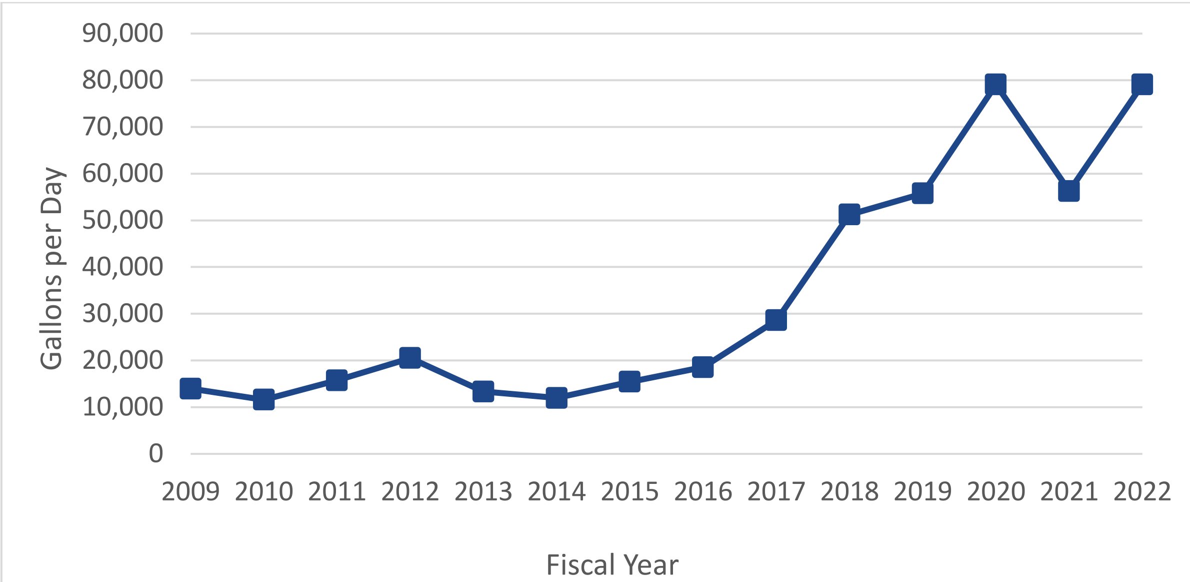
2.4.4 Sanitary Sewer System

Figure 2-7 provides average daily wastewater flows at Hanscom Field. **Figure 2-8** shows Massport's existing sewer system, the location of the septic system serving the Lincoln North facility, which is sited on Massport land south of the West Ramp on Old Bedford Road, and the septic system used in the Pine Hill area. The Atlantic Aviation sewer system is connected to the West Ramp.

Massport's wastewater is pumped to the Town of Bedford's force main and then into the Town of Lexington's force main. The USAF has two pump stations on base (also known as lift stations): the lower lift station at Hanscom AFB Building 1539 and the upper lift station at Hanscom AFB Building 1306. The lower lift station was last upgraded in 2011 and has three 40-horsepower (HP) pumps. That station has a total capacity of 900 gpm and serves Massport's Hanscom Field facilities and Hanscom AFB housing. The upper station receives flow from the lower pump station as well as the Minuteman Commons and MIT-Lincoln Laboratory. The upper station was upgraded in 2005-2006. It is equipped with two 50 HP pumps, one 125 HP pump, and two wet wells with a combined storage capacity of 240,000 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.

Figure 2-7. Daily Average Wastewater Flows



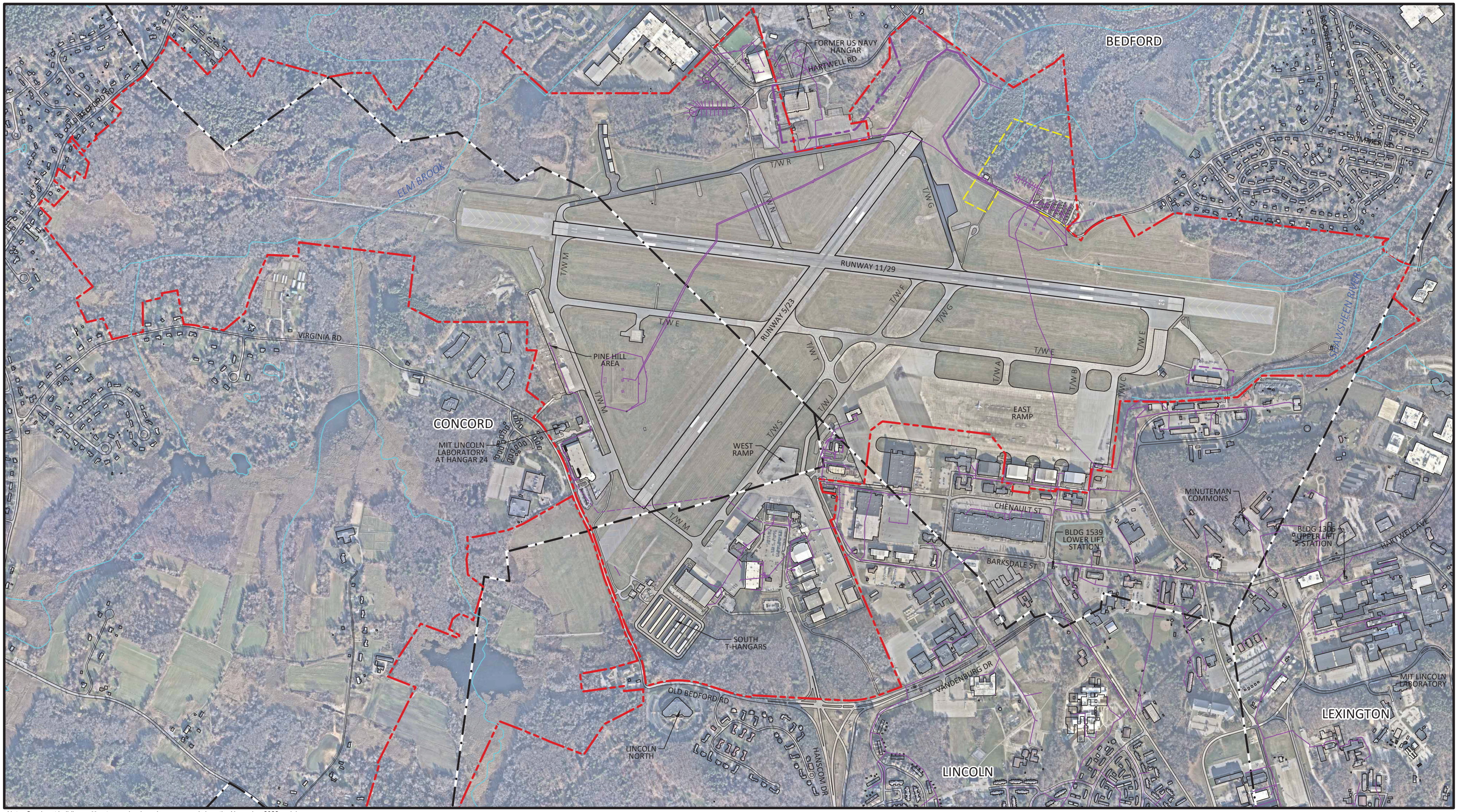
Notes:

1. FY 2021 includes data for three months only (July, August, and September), and FY 2022 does not include data for May.
2. *2017 ESPR* data was aggregated in calendar year, whereas *2022 ESPR* data is aggregated during the fiscal year. Therefore, annual numbers show a difference even though the same data source was used.

Source: Massport, 2023

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 on the West Ramp. 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 gallons per day (gpd) and 500,000 gpd, respectively.[22] 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.

[22] Metcalf & Eddy, *Water System Improvements Study*, 1992.



Note: On-airport buildings without a number have been removed since the November 2022 aerial.

North

0 1,000 2,000 Feet

Airport Property Boundary
Proposed Property Line
Military Lease
FAA Boundary
Town Boundary
Existing Sanitary Sewer Line
Hydrology

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Existing Sanitary Sewer System

Figure **2-8**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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2.4.5 Stormwater Management and Drainage System

Hanscom Field is 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 soil becomes 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 works cooperatively with the Massachusetts Department of Environmental Protection (MassDEP) and the USAF to improve the flow characteristics and profile of stormwater discharges into the Shawsheen River. Massport continues to remove pavement, where possible, 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. **Table 2-5** provides a drainage area summary of the 10 drainage areas shown in **Figure 2-9**.

Flooding of the Hanscom Field Terminal building was identified as a concern in the *2017 ESPR* and a 2-phase plan was developed to address the problem. Phase 1, to reduce flood hazards, was completed in 2018 to provide emergency protection of the Hanscom Field Terminal. Phase 1 included passive flood barriers to prevent sheet flow into the Hanscom Field Terminal during a flood event. Additionally, flood doors were installed at a side entrance, drainage pipes in the adjacent parking lot were cleaned, conduit penetrations to the building’s mechanical room were sealed, and sanitary sewer manhole covers were replaced with bolted and gasketed covers. Phase 2 is on-going and requires coordination with the USAF as the proposed drainage pipes would either discharge onto or cross their leased lands.

Drainage Area 1: DA-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. The five pipes collect runoff areas occupied by Massport, Signature Flight Support, Jet Aviation, Liberty Mutual, and a portion of USAF property. Jet Aviation's fuel farm is also included in the drainage area for Outfalls 1A-1E.

Drainage Area 2: DA-2 drains to three 72-inch circular storm drains that discharge to the Shawsheen River at Outfalls 2A-2C. 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 some of Signature Flight Support hangars and its fuel farm.

Table 2-5. Drainage Area Summary

Basin/Discharge Location	Drainage Area (acres)	Impervious Area (acres)	Percent Impervious
Shawsheen River			
1	315.0	151.8	48
2	37.5	20.4	54
3	2.2	0.9	41
4	53.7	16.8	31
5	33.3	7.1	21
6	76.0	3.1	4
Elm Brook			
7	274.5	2.9	1
8	49.4	14.7	30
9	238.8	63.3	27
Wetlands			
10	171.9	36.9	22
Sources: 2022 Hanscom Field ALP and Massport drawing files			

Drainage Area 3: DA-3 collects runoff from a small mostly vegetated area and discharges it to the Shawsheen River through an 18-inch pipe at Outfall 3.

Drainage Area 4: DA-4 includes a portion of Runway 11/29 and infield areas that drain to two 24-inch pipes before discharging to the Shawsheen River at Outfalls 4A and 4B.

Drainage Area 5: DA-5 includes a portion of Runway 11/29 and infield areas that drain via an overland flow to the Shawsheen River. Drainage Areas 5-7 do not have a specific outfall point (pipe) and are therefore not shown in Figure 2-9.

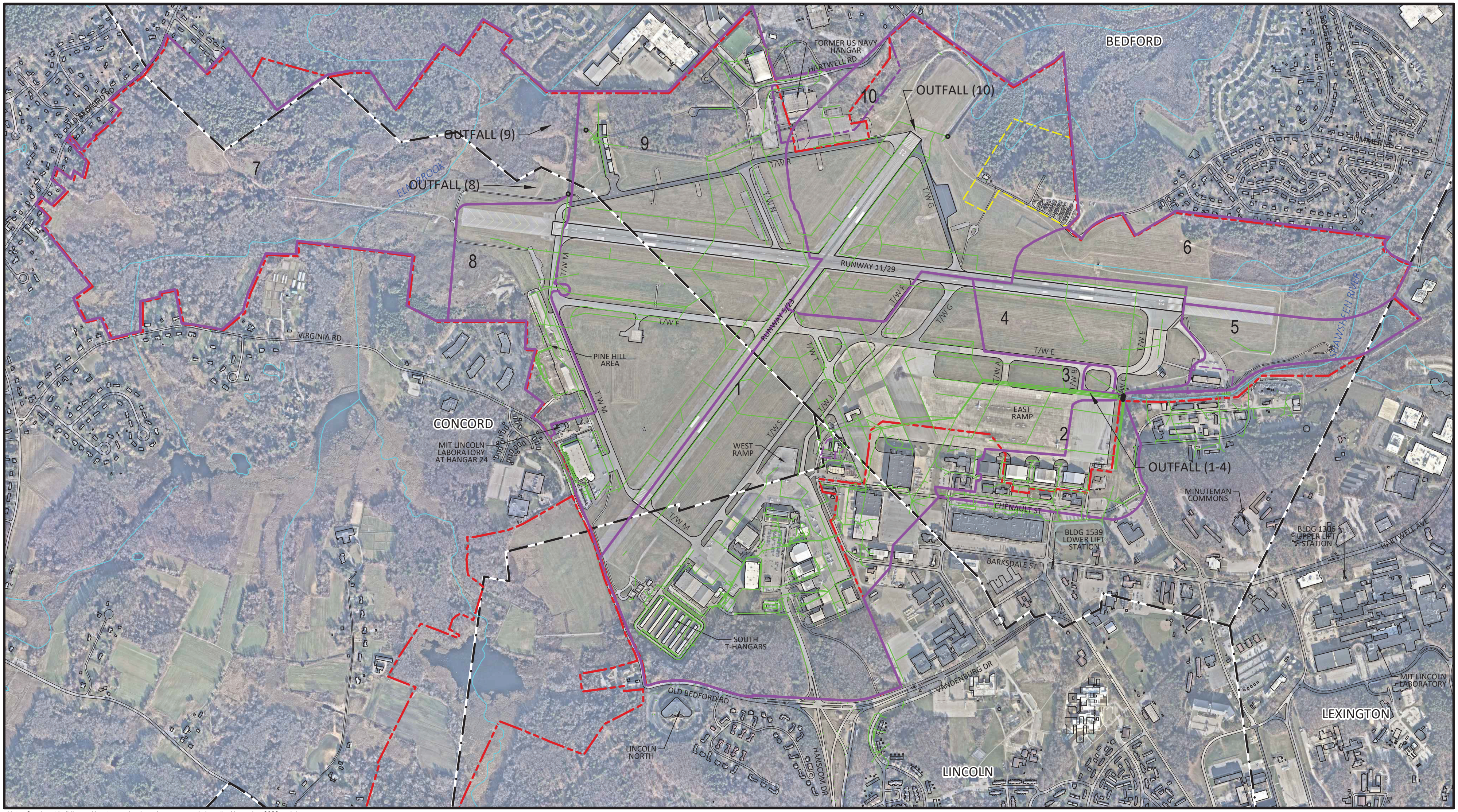
Drainage Area 6: DA-6 includes a portion of Runway 11/29 and infield areas that drain via drainage swales to the Shawsheen River.

Drainage Area 7: DA-7 includes undeveloped area west of Runway 11/29 and Elm Brook. Several maintenance roads contribute runoff to Elm Brook via overland flow.

Drainage Area 8: DA-8 collects runoff from Runway 11/29 and infield area and drains via one 36-inch pipe to Outfall 8. The discharge flows via drainage swale (approximately 900 feet) to Elm Brook.

Drainage Area 9: DA-9 includes portions of Runways 11/29 and 5/23 with associated grassed infield. DA-9 includes portions of former U.S. Navy property, Atlantic Aviation (in the Pine Hill Area), and the Lincoln Laboratory at Hangar 24. DA-9 also includes T-Hanger buildings 46-49 in the North Airfield area. Runoff discharges through a 54-inch reinforced concrete pipe at Outfall 9, approximately 500 feet from Elm Brook.

Drainage Area 10: DA-10 includes portions of Runways 11/29 and 5/23 and infield areas to the north. This area drains via a 48-inch reinforced concrete pipe to Outfall 10, discharging to the wetland area (shown as hydrology) north of the Airport.



Note: On-airport buildings without a number have been removed since the November 2022 aerial.

North

0 1,000 2,000 Feet

Airport Property Boundary

Proposed Property Line

Military Lease

FAA Boundary

Town Boundary

Existing Sewer Line

Hydrology

Drainage Area Boundary

1 Drainage Area Designation

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Drainage Area and Outfall Locations

Figure **2-9**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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2.4.6 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) or more than 1,320 gallons of oil in above-ground storage tanks (ASTs) or containers are required to have an SPCC Plan as required under 40 CFR 112 (Oil Pollution Prevention). **Table 2-6** lists the hazardous materials that are likely to be present at Hanscom.

Table 2-6. Hanscom Field List of Hazardous Materials

Fuels	Miscellaneous Materials	Waste Materials	Vehicle Maintenance Materials
Jet Fuel A	Parts Cleaners	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	Magnesium Chloride		
Motor Oil	Calcium Chloride		
Turbine Oil	Sodium Formate		
	Cleaners/Detergents		
Source: Massport, 2023			

Spills of hazardous materials on site must be immediately reported to the Massport 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 Management Departments by property owners and/or other potentially responsible parties of the spill.[23]

Spills exceeding the reportable quantity limits established in Table 302.4 - List of Hazardous Substances and Reportable Quantities of 40 Code of Federal Regulations (CFR) 302 and Table 1 - Massachusetts Oil and Hazardous Materials List 310 Compliance Monitoring Report (CMR) 40.1600, Subpart P, must be reported to the National Response Center and MassDEP, respectively. The Reportable Quantities established by these regulations for the most common materials handled at Hanscom Field are provided in the SWPPP along with the spill reporting contact list.

2.4.7 Floodplain

The latest Federal Emergency Management Agency (FEMA) mapping was completed in 2010 with additional revisions in 2014 and 2016 for Middlesex County, which included the Towns of Bedford,

[23] *Massachusetts' Approach to Waste Site Cleanup: Chapter 21E and the Massachusetts Contingency Plan* fact sheet, https://www.mass.gov/doc/massachusetts-approach-to-waste-site-cleanup-chapter-21e-and-the-massachusetts-contingency-plan-0/download, accessed September 18, 2023.

Concord, Lexington, and Lincoln. Previously, separate Flood Insurance Rate Maps (FIRMs) were prepared for each identified flood prone incorporated community and the unincorporated areas of the county. The last FIRM revision for the Town of Bedford and Town of Concord took place in 1988, for the Town of Lexington in 1983, and for the Town of Lincoln in 1986.

2.4.8 Electrical Distribution System

Hanscom Field electrical power is provided primarily by Eversource Energy. Electrical services for facilities located in Concord are provided by Concord Municipal Light Plant (CMLP). For the most part, the Hanscom Field 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 800 kilovolt-amperes (kVA). The existing system has sufficient capacity to accommodate some additional power demands by existing tenants and buildings. Additional electrical capacity may be required to meet future demand.

Eversource provides a 5 kilovolts (kV) supply, which is small considering the demand placed by the airfield and buildings. Electricity generation is also conducted at one location at Hanscom Field. A solar photovoltaic array was constructed on the roof and south-facing exterior walls of the Hanscom Field Terminal in 2011 as part of a roof renovation project. The system was modeled to produce over 57,233 kilowatt-hours (kWh) of electricity per year, or up to 10 percent of the total building electricity requirement. For any periods when it is producing more electricity than the building requires, the electricity flows back to the on-site distribution system for consumption by other facilities.

Continued expansion of the electric vehicle (EV) charging infrastructure is in progress at Hanscom.[24] Jet Aviation has installed six EV chargers. All FBOs have plans for additional EV charging stations to be added over the next 10 years.

2.4.9 Natural Gas

Natural gas is supplied by National Grid through a 4-inch pressure main that comes onto Airport property from the Feed that serves Hanscom Air Force Base. Gas is used for heating purposes with demand peaking during the winter months. This gas service was increased from a 2-inch pressure main to supply the new hangars and conversion of the Hanscom Field Terminal building to gas heat, and construction by the USAF of a new Commissary facility. This 4-inch line is anticipated to accommodate future development.

2.4.10 Telephone/Communications

Hanscom Field is currently serviced by one AT&T Primary Rate Interface (PRI) which can accommodate 23 channels of voice. The PRI is serviced by Verizon for the last mile and enters along Hanscom Drive from overhead poles to the West Ramp area. The lines then run in underground conduits, which are routed to each of the facilities at Hanscom Field. Massport has plans to relocate the overhead lines underground within FY 2024. Telephone conduit capacity is adequate to meet current demand although routine service upgrades may be required to provide enough voice channels for future conditions.

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[24] Massport. 2019. *Annual Sustainability and Resiliency Report.* https://www.massport.com/media/3928/2019-sustainability-report-final_full-reduced.pdf

Comcast network services are wired to the West Ramp at Hanscom Field. Network service is provided by two 10-gigabits-per-second circuits from the Crown Castle dark fiber network. Data capacity is adequate to meet current demands although routine service upgrades from the dark fiber network may be required to provide additional data for future conditions.

2.4.11 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 -operated 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 published in the *2017 ESPR* has been updated using the most current SWPPP and tank inspection report, dated December 2022. Massport will continue to monitor the condition of all active tanks to ensure proper functioning and regulatory compliance.

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 are regulated by the Massport Fire Department, ASTs of greater than 10,000-gallon capacity are regulated by the Massachusetts Department of Fire Services, and USTs are regulated by the MassDEP. As of 2010, AST permits must be renewed annually; however, UST permits issued by Fire Rescue are now set up so they do not expire unless the tank has been moved. Active smaller ASTs, larger ASTs, and USTs at Hanscom Field are listed in **Table 2-7**, **Table 2-8**, and **Table 2-9**, respectively.

Information about Massport's Tenant Audit Program and MassDEP-listed disposal sites at Hanscom Field is provided in Chapter 9. As spills of oil and hazardous materials or wastes occur, or subsurface contamination is encountered, notification is made to the MassDEP and appropriate cleanup is conducted. The location of the spill or area of subsurface contamination is further addressed in accordance with the Massachusetts Contingency Plan (MCP), and the site achieves regulatory closure when no further response actions are needed. The site closure is documented in a Permanent Solution Statement indicating that a condition of no significant risk to human health or the environment exists at the site.

Massachusetts General Law Chapter 21E describes the legal obligations of responsible parties when assessing and cleaning up contamination. MassDEP must ensure permanent cleanup of contamination by implementing a set of regulations known as the Massachusetts Contingency Plan (MCP). A search of the MassDEP's Online 21E Site File Review database returned data indicating that there have been 10 21E cases associated with Hanscom Field since 2017. All 10 have a response action outcome (RAO) status that indicates response actions were sufficient to achieve a level of no significant risk.

Table 2-7. Active ASTs Less Than 10,000 Gallons at Hanscom Field

Tank Identifier	Owner/Operator	Location	Volume (gallons)	Content
HANAM-1802	Massport	Airfield Lighting Vault	925	D
HANAM-1900	Massport	Building #31 South T-Hangar Emergency Generator	215	D
HANAT-0050	Jet Aviation	380 Hanscom Drive	3,000	G
Unknown	Jet Aviation	Building #17 Emergency Generator	600	D
Unknown	Jet Aviation	Building #17 Fire Pump Room	350	D
Unknown	Jet Aviation	Building #17 Fire Pump Room	350	D
HANAT-0054	Stream Enterprises	140 Hanscom Drive	1,000	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	2000	D
HANAT-1901*	Signature Flight Support	Hangar 2 (in front, airside) Emergency Generator	438	D
HANAT-1004	Jet Aviation	Building #21, Jet Aviation	350	D
HANAT-1005	Jet Aviation	Building #21, Jet Aviation	150	WO
HANAT-1048	Atlantic Aviation	Building #44	5000	Avgas
HANAT-1049	Atlantic Aviation	Building #44	500	D
HANAT-1073	Atlantic Aviation	Building #24, Pump Room	360	D
HANAT-1074	Atlantic Aviation	Building #24, Pump Room	360	D
HANAT-1075	Atlantic Aviation	Building #24, Pump Room	360	D
HANAT-1900	Boston MedFlight	Building #12A	1,100	D
HANAT-2203	Massport	North Airfield Box Hangars (formerly North Airfield Hangars)	194	D

Definitions: D = diesel, G = gasoline, HO = heating oil, WO = waste oil
Note: * This tank used to be HANAT-0079 owned by Boston MedFlight. It changed ownership and therefore received a new Tank ID.
Source: Massport, 2023

Table 2-8. Active ASTs Greater Than 10,000 Gallons at Hanscom Field

Tank Identifier	Owner/ Operator	Location	Volume (gals.)	Content
HANAT-0047	Jet Aviation	380 Hanscom Drive	20,000	JA
HANAT-0048	Jet Aviation	380 Hanscom Drive	20,000	JA
HANAT-0049	Jet Aviation	380 Hanscom Drive	12,000	AG
HANAT-0059	Signature Flight Support	East Ramp	15,000	JA
HANAT-0060	Signature Flight Support	East Ramp	10,000	AG
HANAT-0063	Signature Flight Support	East Ramp	15,000	JA
HANAT-0066	Signature Flight Support	East Ramp	15,000	JA
HANAT-2001	Signature Flight Support	East Ramp	25,000	JA
HANAT-1046	Atlantic Aviation	Building 44	20,000	JA
HANAT-1047	Atlantic Aviation	Building 44	20,000	JA

Definitions: JA = Jet A, AG = AvGas
Source: Massport, 2023

Table 2-9. Active USTs at Hanscom Field

Tank Identifier	Owner/ Operator	Location	Volume (gals.)	Content
HANBM-0026[1]	Massport	Building maintenance shop	1,000	HO
HANBM-0043	Massport	Field maintenance garage	6,000	G
HANBM-0044	Massport	Field maintenance garage	6,000	D
HANBM-0045	Massport	Field maintenance garage	6,000	HO
HANBT-0065[2]	FAA	ATCT	2,500	D
HANBT-0067	Liberty Mutual	Liberty Mutual Hangar	25,000	JA

Definitions: JA = Jet A, D = diesel, G = gasoline, HO = heating oil, WO = waste oil
Notes:
1. Tank is inactive and will be removed in 2023.
2. This tank is not part of Massport's jurisdiction.
Source: Massport, 2023

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3 Airport Activity Levels

Aviation activity levels form the basis of the evaluations of ground transportation, noise, and air quality impacts associated with Hanscom Field. This ESPR provides an opportunity to update current conditions and industry trends and compare those to the forecasts presented in the 2017 ESPR. Base year (2022) traffic is compared to forecast activity from the 2017 ESPR and new forecasts for the mid-term (2030) and long-term (2040) planning horizons are presented and described. The actual operations (takeoffs and landings) for 2022 are compared with actual operations for past years to reveal activity trends.

Hanscom Field accommodates all segments of the general aviation (GA) industry including business aviation, air taxi, private charter services, personal flying, and flight training. Scheduled commercial passenger services have been available at Hanscom Field in the past as recently as 2013.

This chapter summarizes aviation activity at Hanscom Field and forecasts future levels for both aircraft operations (by type and category) and based aircraft.

3.1 Key Findings Since 2017

Updated forecasts of aviation activity at Hanscom Field were prepared for the mid-term 2030 and long-term 2040 planning periods. A key assumption underlying the forecasts is that Hanscom Field will continue to function as the region's premier full-service general aviation (GA) airport that also services a vital role in New England's regional aviation system as a GA reliever airport for Boston Logan International Airport (Logan Airport). For consistency with other Massport documents, operations are broken down by daytime and nighttime operations.[25]

> **Hanscom Field Peak Operations Compared to 2022:**
>
> ⇨ In 1970 tower counts peaked at more than 300,000 operations.
>
> ⇨ In 1985, operations peaked at 247,000.
>
> ⇨ In 2022, there were 125,000 fewer operations than in 1985.

- Hanscom Field functions as a premier full-service GA airport and corporate reliever for Logan Airport. There were approximately 122,000 daytime aircraft operations at Hanscom Field in 2022. Nighttime operations are approximately 2 percent of total operations. GA (which includes business aviation) accounted for 99 percent of the operations. Military operations in 2022 account for approximately 1 percent.
- Single-engine piston (SEP) aircraft account for more than 51 percent of the aircraft operations including approximately 36,000 local touch and go pilot training operations and 25,000 itinerant operations.
- Hanscom Field also serves the needs of business aviation users, including corporations that own aircraft and businesses that charter private flights. Business aviation operations are conducted in jets and non-jets (turbine driven propellers (turboprops) and multi-engine piston (MEP) aircraft). Business aviation accounted for 40 percent of Hanscom Field's activity which was about 49,000 operations in 2022.
- Since the last forecast, which was conducted in 2017, Hanscom Field's total aircraft operations have declined by a compound annual growth rate (CAGR)[26] of 1 percent from approximately 129,000 operations in 2017 to 122,000 in 2022. GA activity has decreased nationally since 2017, but not to the same extent that Hanscom Field has experienced.[27] For a frame of reference, Hanscom Field handled over 200,000 annual operations in the early 1990s[28] and exceeded 300,000 annual operations in the 1970s.[29]

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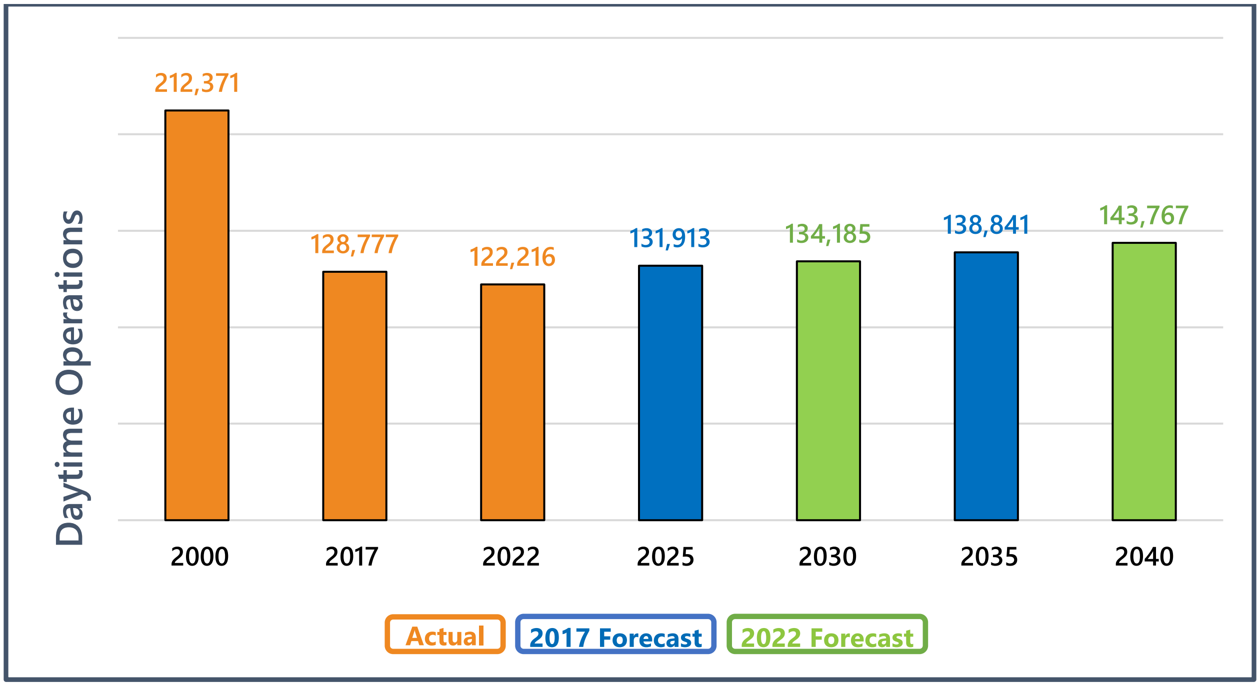
[25] The definition of "nighttime" operations under Massachusetts law, as reported in the Hanscom Field Annual Noise Report, and as used in this report is from 11:00 p.m. to 7:00 a.m. However, FAA defines "nighttime" as the period from 10:00 p.m. to 7:00 a.m. for the purposes of calculating exposure to aircraft noise with the Day-Night Sound Level (DNL) metric. Therefore, the number of operations characterized as "nighttime" for use in determining DNL (described in Chapter 7 of this document) is different from the number of nighttime operations reported in this chapter.
[26] Throughout this section, average growth rates over multi-year periods are calculated using compounded annual growth rates, or CAGR. The CAGR is the annual growth rate from the Year 1 value (e.g., aircraft operations, etc.) to the value at the end of the historic or forecast period, with the effect of compounding considered. This accurately measures the year-to-year growth.
[27] FAA. FAA Aerospace Forecast Fiscal Years 2022–2042. https://www.faa.gov/sites/faa.gov/files/2022-06/FAA_Aerospace_Forecasts_FY_2022-2042.pdf
[28] FAA Terminal Area Forecast, 2023
[29] Massachusetts Port Authority. *The State of Hanscom.* July 2022, https://www.massport.com/media/khjo0oua/2021-state-of-hanscom.pdf>, accessed April 20, 2023.

- Business aviation at Hanscom Field has grown faster than the Massachusetts economy in the last five years. It has increased at a CAGR of 4.3 percent from 2017 to 2022. Since 2017, the Massachusetts economy has grown by 2.3 percent with total personal income increasing 2.4 percent. [30]
- Total daytime aircraft operations are forecast to be approximately 134,200 in 2030 and 144,000 in 2040. This is a forecast CAGR of 0.9 percent, which is consistent with the FAA's national forecast.[31] Business aviation is the driver of forecast growth with a CAGR of 1.2 percent throughout the forecast period.
- The *2017 ESPR* forecast levels for 2025 and 2035 align with the current *2022 ESPR* forecast levels (as shown in **Figure 3-1**).
- Figure 3-1 presents the total daytime operations in 2017 and 2022 compared to the 2000 annual daytime operations and the forecast totals for the *2017 ESPR* future years (2025 and 2035) and *2022 ESPR* future years (2030 and 2040).

Figure 3-1. Summary of Actual and Forecast Daytime Activity at Hanscom Field



Note: Operations are between 7:00 a.m. and 11:00 p.m., the hours that the air traffic control tower is open.
Sources: *2017 ESPR* for Hanscom Field, Massport Noise and Operations Monitoring System (NOMS) data, FAA Aerospace Forecast FY22-42, Woods & Poole Massachusetts Gross Regional Product forecast, McFarland Johnson analysis

[30] Woods & Poole, 2022
[31] FAA Aerospace Forecast Fiscal Years 2022–2042

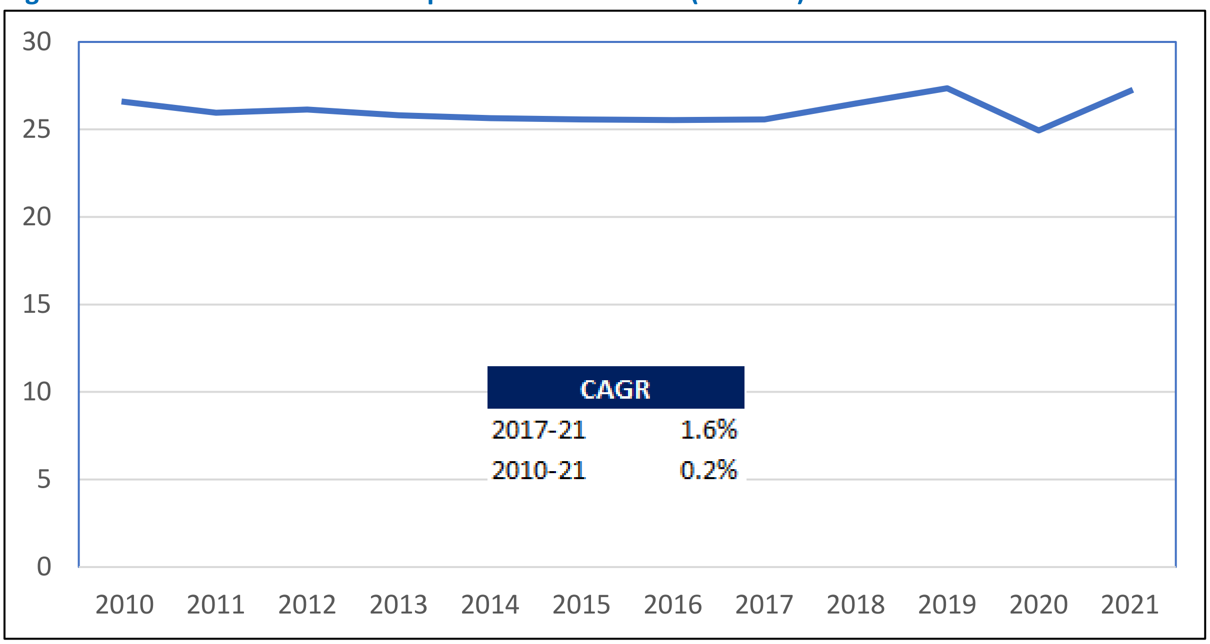
3.2 Overview of National General Aviation Trends

Airports are vital parts of the local and regional economy and Hanscom Field is an important contributor to the Massachusetts economy. In 2017, the airport contributed $679 million in total economic output that supported over 2,200 jobs and approximately $134 million in payroll.[32]

As shown in **Figure 3-2**, GA in the United States has remained relatively consistent between 2010 and 2021, with a dip in 2020 due to the worldwide COVID-19 pandemic. The outbreak of the COVID-19 pandemic in 2020 brought a temporary end to aviation growth nationwide.[33] Since 2020, conditions and the outlook have brightened considerably. In 2022, GA activity levels were higher than in 2019. The growth in the U.S. Gross Domestic Product (GDP) is a compound catalyst for the growth in the turboprop and jet fleets which resulted in jet deliveries increasing by 14.7 percent and turboprop deliveries rising 18.6 percent in 2021.

The latest Massachusetts Statewide Aviation System Plan was published in 2010; data over 10 years old has not been included in this forecast review.

Figure 3-2. U.S. General Aviation Operations 2010–2021 (Millions)



Source: FAA Aerospace Forecasts Fiscal Years 2022–2042

GA operations data show a modest 0.2 percent CAGR between 2010 and 2021 on a national level. The FAA is forecasting GA operations to continue to grow nationally at 0.9 percent per year through 2032 and 0.6 percent through 2042. The FAA develops forecasts for GA operations based on a forecast of fleet size, hours flown, and utilization rates. The 0.9 percent growth in GA operations is based on airports with FAA air traffic control and contract traffic control service. The national turboprop aircraft fleet is

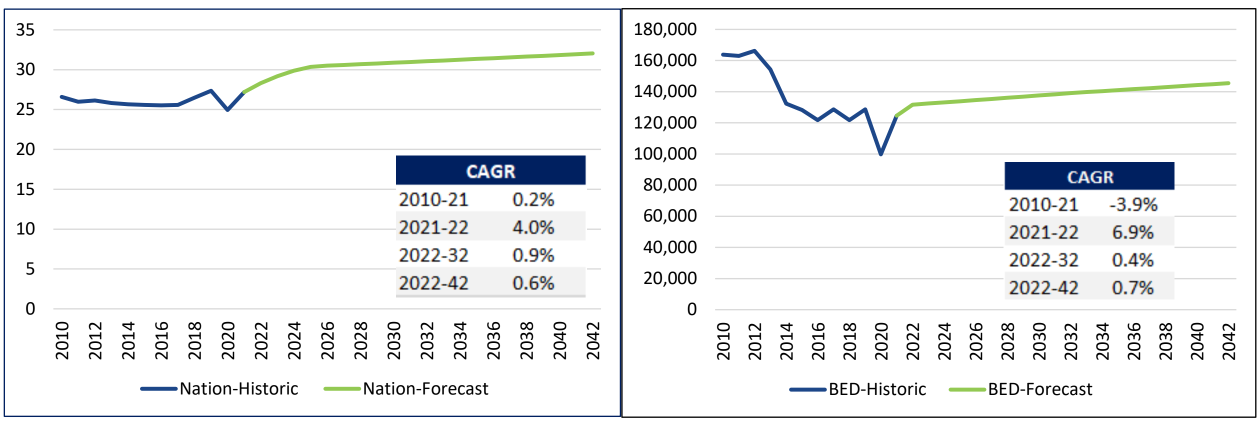
[32] MassDOT. January 2019. *Massachusetts Statewide Airport Economic Impact Study Update,* EXECUTIVE SUMMARY. https://www.mass.gov/doc/aeronautics-economic-impact-study-2019/download
[33] FAA Aerospace Forecast Fiscal Years 2023-2043

forecast to grow at 1.9 percent per year through 2042. Despite the growth in business related aviation, overall, the FAA forecasts the size of the GA fleet to remain unchanged.

The FAA forecasts GA operations to increase modestly between 2022 and 2042 in the United States, as discussed above. As illustrated in **Figure 3-3**, the FAA's forecast for Hanscom Field reflects this outlook for increases in GA activity with a CAGR of 0.7 percent per year between 2022 and 2042. Some factors contributing to the limited CAGRs nationally include the decrease in leisure GA activity with non-corporate aircraft. Driving factors in the reduction of leisure GA activity are unfavorable pilot demographics, overall increasing cost of aircraft ownership (including fuel prices), availability of lower cost alternatives for aviation recreational usage, and new aircraft delivery rates below the retirement rate of the aging fleet.[34] The dip in national operations and in Hanscom Field operations between 2019 and 2021 is due to the COVID-19 pandemic.

Figure 3-3. FAA Aerospace Forecast for GA Operations in the U.S. (Millions) and FAA's Terminal Area Forecast (TAF) for Hanscom Field

FAA Aerospace Forecasts U.S. GA Operations (mill.) **BED Historical and FAA TAF CAGR**



Notes:
1. Includes itinerant and local operations.
2. The dip in national and Hanscom Field operations between 2019 and 2021 is due to the COVID-19 pandemic.
Sources: FAA Aerospace Forecast Fiscal Years 2022–2042, Massport Annual Noise Reports Daytime Operations for Hanscom Field with FAA TAF CAGRs applied

Corporate aviation became a more attractive alternative to scheduled commercial flights during the COVID-19 pandemic as people sought to avoid crowds. Corporate aviation also added flexibility with the reduced commercial schedule during the COVID-19 shutdowns and the subsequent delay in flight recovery.

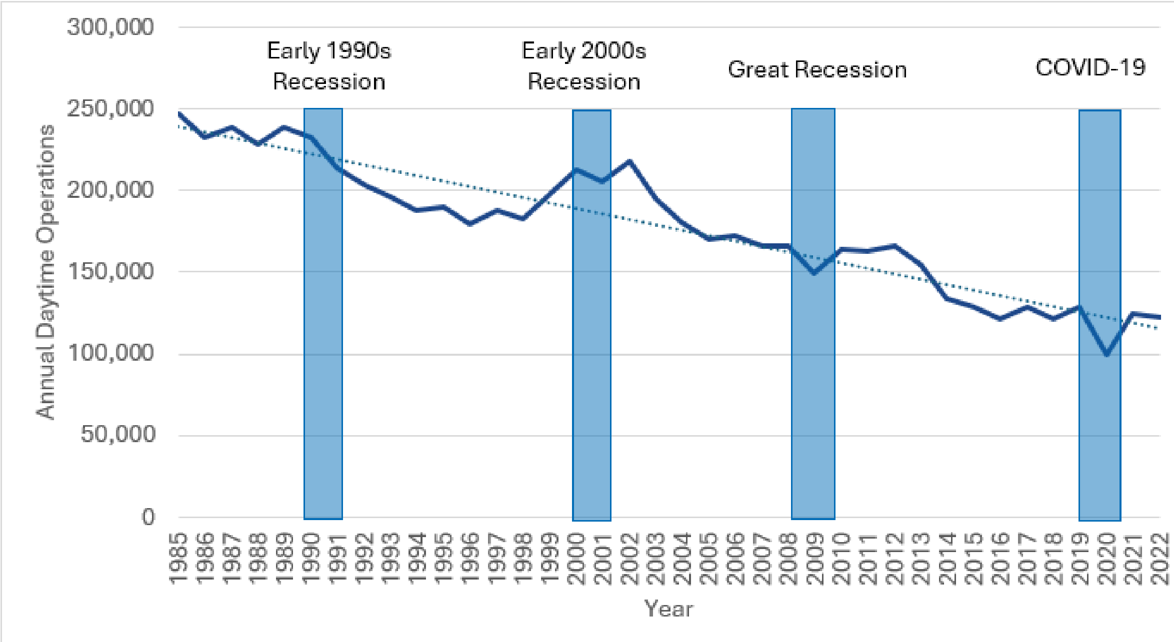
3.3 Overview of Hanscom Field Activity

In 2022, there were approximately 122,000 daytime operations at Hanscom Field. As shown in **Figure 3-4**, the 2022 total is similar to the 2018 total, but lower than the 2019 (pre-COVID-19) total. Operations slightly declined between 2021 and 2022. Hanscom Field's total operations have decreased an average 3 percent per year since 2012 and, as shown in **Table 3-1**, have decreased 1 percent per year since 2017.

[34] FAA Aerospace Forecast Fiscal Years 2022–2042.

This decline has largely been due to a decline in SEP aircraft operations, both in flight schools and in personal flying.

Figure 3-4. History of Daytime Operations at Hanscom Field



Note: Operations are between 7:00 a.m. and 11:00 p.m., the hours that the air traffic control tower is open.
Sources: Massport Annual Noise Report 2021, Massport NOMS data

Table 3-1. Summary of Aircraft Activity at Hanscom Field, 2012–2022

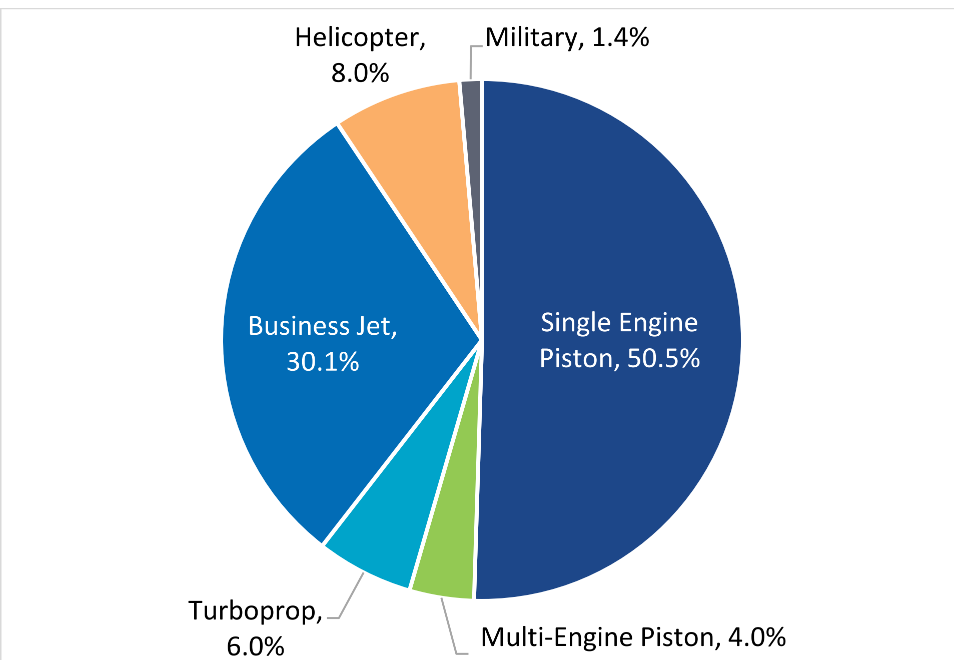
Activity	Year			CAGR	
Aircraft Operations (7:00 a.m. to 11:00 p.m.)	2012	2017	2022	2012-2017	2017-2022
General Aviation					
Training SEP	70,196	46,014	36,370	-8.1%	-4.6%
Personal SEP	51,477	33,040	25,336	-8.5%	-5.2%
Business Non-Jet (MEP + Turboprop)	10,178	10,846	12,241	1.3%	2.4%
Business Jet	25,638	29,862	36,808	3.1%	4.3%
Helicopter	7,345	8,256	9,760	2.4%	3.4%
Subtotal GA	**164,834**	**128,018**	**120,515**	**-4.9%**	**-1.2%**
Military	745	759	1,701	0.4%	17.5%
Scheduled Commercial Airline	635	0	0	-100.0%	0.0%
Total Operations	**166,214**	**128,777**	**122,216**	**-5.0%**	**-1.0%**
Based Aircraft	**340**	**350**	**284**	**0.6%**	**-4.1%**
Note: Operations are between 7:00 a.m. and 11:00 p.m., the hours that the air traffic control tower is open. Source: *2017 ESPR* for Hanscom Field, Massport NOMS data					

For 2022, GA traffic accounts for almost all the operations that occurred at Hanscom Field, with military operations accounting for the other 1.4 percent. The share of Hanscom Field's 2022 operations is shown in **Figure 3-5**, with GA operations separated by aircraft type. More than 50 percent of the operations that occurred at Hanscom Field in 2022 were from SEP aircraft utilized for training or personal flying. Hanscom Field is home to two civilian and one military flight school, and in 2022, more than 36,000 training operations occurred there. Training operations have declined on average 5 percent per year since 2017. That number does not account for the Hanscom Aero Club flight training that is counted as military because the club is owned by Hanscom AFB. Personal flying represents the remainder of the SEP aircraft operations at Hanscom Field. In 2022, approximately 25,000 personal flying operations were performed at Hanscom Field in SEP aircraft. One of the contributing factors to the decline of personal flying operations is the recent reduction of tie-down locations at Hansom Field. The reduction in the number of single engine aircraft on the airfield resulted in reduced SEP operations.

Business aviation is the second largest sector of operations at Hanscom Field. In 2022, Hanscom Field handled about 49,000 business aviation operations. These aircraft may be based at Hanscom Field or at another airport. Business aviation airport users include corporations that own aircraft, on-demand air taxi and charter operators that provide private air transportation service for hire, or fractional aircraft operators (whose customers own a share of an aircraft).

While Figure 3-4 shows a historical decline in total operations, business jet activity has been showing a growth trend for the last decade and business non-jet activity has also been on a general growth trend for almost 20 years. It is anticipated that the business aviation growth trend will continue.

Figure 3-5. Share of Hanscom Field Daytime Activity by Operation Type (2022)



Note: The operations shown occurred between 7:00 a.m. and 11:00 p.m., the hours that the air traffic control tower is open.
Source: Massport NOMS data

Helicopters at Hanscom Field provide medical and emergency services as well as charter operations. They represent approximately 8 percent of Hanscom Field's total operations with 9,800 operations in 2022. Military operations represent approximately 1.4 percent of Hanscom Field's operations, or 1,700 operations in 2022.

Hanscom Field has had cargo activity since the airport was first constructed. In general, this activity does not include scheduled cargo service, but rather cargo movement as part of the regular operations that occur at the airfield. Current cargo operations are mostly by twin engine and some business jet aircraft. Cargo is not a large enough or consistent enough source of operations at Hanscom to be tracked separately or to be included as a separate category in forecasts.

3.3.1 Nighttime Operations at Hanscom Field

Activity at Hanscom Field occurs largely during the day; however, there are limited operations that are performed during the nighttime period. Any operation that occurs between 11:00 p.m. and 7:00 a.m. must pay a nighttime field use fee.[35] Nighttime activity varies from year to year. In 2022, there were approximately 2,651 nighttime operations,[36] accounting for 2.1 percent of total operations at Hanscom Field. This activity largely consists of jet operations, with 1,617 in 2022, representing 61 percent of total nighttime operations. Since 2017, nighttime activity has a CAGR of 3.6 percent per year. As shown in **Table 3-2**, the biggest absolute increases since 2017 have occurred in the helicopter and jet categories, which increased by 213 and 158 operations, respectively. The piston and turboprop categories of operations include both single and multi-engine aircraft.

As demonstrated by **Figure 3-6**, annual nighttime activity at Hanscom Field fluctuates by year, but remains a small share of total operations at Hanscom Field. The nighttime operations have ranged from a low of 1,495 annual operations in 2020 (likely due to COVID-19) to a high of 2,651 in 2022.

[35] Military, medical, and government flights are exempt from nighttime field use fees.

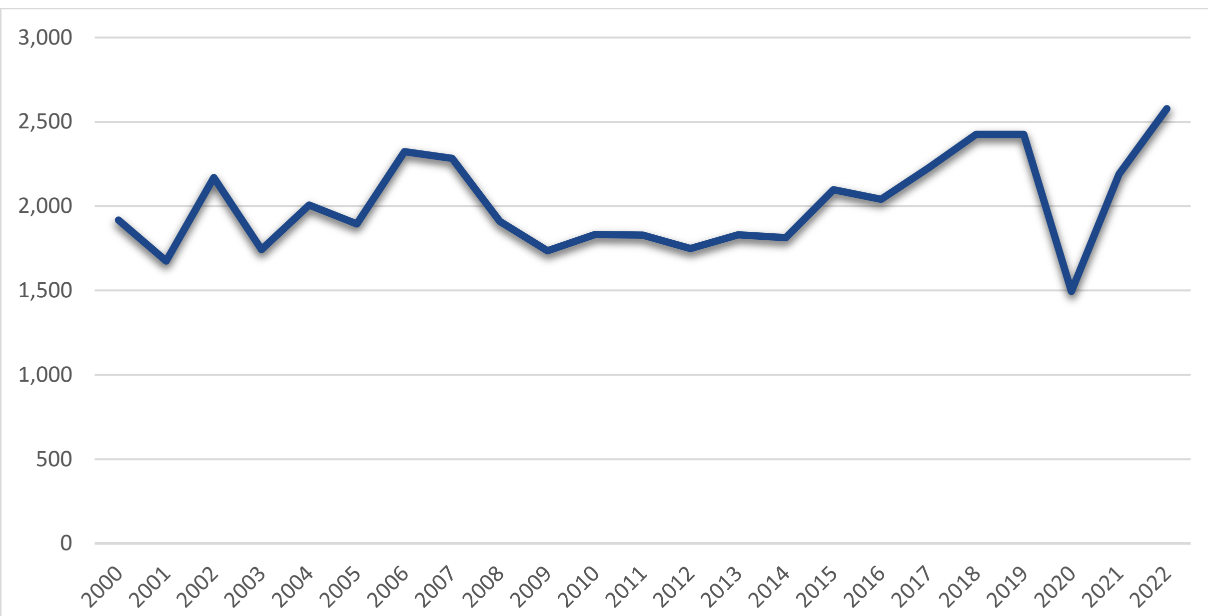
[36] Massport Hanscom Field Noise and Operations Monitoring System (NOMS) data 2022

Table 3-2. Nighttime Operations at Hanscom Field by Aircraft Category

Nighttime Operations[1]							
Year	Business Jet	Turboprop	Piston	Helicopter	Military	Scheduled Commercial Airline	Total
2017	1,459	87	220	460	0	0	2,226
2018	1,616	196	148	465	0	0	2,425
2019	1,544	210	144	528	0	0	2,426
2020	791	56	157	491	0	0	1,495
2021	1,385	162	155	489	0	0	2,191
2022	1,617	207	154	673	0	0	2,651
Difference between 2017 and 2022	**158**	**120**	**66**	**213**	**0**	**0**	**425**

Note:
1. Operations are between 11:00 p.m. and 7:00 a.m.
Source: Massport Hanscom Field Annual Noise Reports (2017 - 2022)

Figure 3-6. Historical Nighttime Annual Operations at Hanscom Field



Note: Operations are between 11:00 p.m. and 7:00 a.m.
Sources: Annual Noise Reports, Massport NOMS data

3.3.2 Aircraft Activity within the Hanscom Area

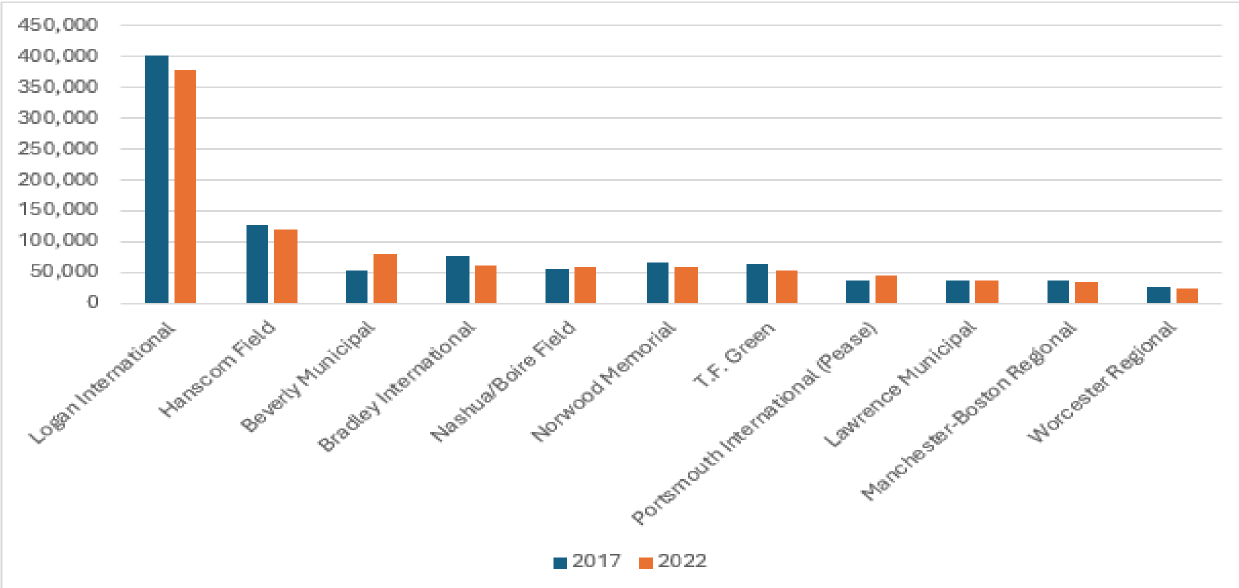
The Hanscom Area airports (airports within 70 nautical miles of Hanscom Field, excluding Cape Cod) are shown on the map in **Figure 3-7**. **Figure 3-8** depicts the total operations at these eleven airports in 2017 and in 2022. After Logan Airport, Hanscom Field handles the most operations in the area.

Figure 3-7. Select GA and Commercial Service Airports within the Hanscom Area

Note: Only airports reviewed for this *2022 ESPR* are shown; other airports are not shown.
Sources: National Plan of Integrated Airport Systems (NPIAS) 2023–2027 and McFarland Johnson

As the premier full-service GA airport and as the corporate reliever for Logan Airport, Hanscom Field has more GA operations than the other airports that serve the Hanscom Area. **Table 3-3** lists the GA operations at each of the airports. Hanscom Field's GA operations have declined an average of 1.2 percent annually since 2017. As shown by Table 3-3, four of the 10 other airports that serve the region experienced similar declines in GA while six airports had increases in GA activity since 2017. Beverly Municipal Airport's GA traffic increased over 8.5 percent per year and Manchester-Boston Regional Airport increased almost 8 percent per year over the past five years.

Figure 3-8. Total Operations at Hanscom Area Airports



Note: Norwood Memorial and Lawrence Municipal most current published data is prior to 2022; in some cases, as old as 2019.
Sources: FAA Airport Data and Information Portal (ADIP); Hanscom Field and Logan Airport counts provided by Massport

Table 3-3. GA Operations at Hanscom Area Airports, 2017–2022

Airport	General Aviation Operations[1] 2017	General Aviation Operations[1] 2022	Compound Annual Growth Rate	Percent Local 2022	Number of Based Aircraft 2022
Hanscom Field	128,018	120,515	-1.20%	30.18%	283
Norwood Memorial[2]	66,823	58,533	-2.61%	41.40%	129
Nashua/Boire Field	56,352	58,700	0.82%	51.11%	249
Beverly Municipal	53,401	80,568	8.57%	51.67%	100
Lawrence Municipal[2]	36,822	37,723	1.53%	46.25%	173
Portsmouth International (Pease)	36,717	44,711	4.02%	94.51%	138
Boston Logan International	31,120	30,504	-0.40%	0.00%	0
Worcester Regional	25,683	20,482	-4.42%	35.82%	65
T.F. Green	24,797	20,638	-3.61%	38.62%	31
Bradley International	13,233	14,343	1.62%	7.37%	70
Manchester-Boston Regional	13,169	19,310	7.96%	27.21%	72
Total	**486,135**	**508,027**	**0.88%**	**42.22%**	**1,284**

Notes:
1. Operations include itinerant air taxi, general aviation, and local civic operations. Manchester-Boston Regional, T.F. Green, and Bradley International Airport GA operations counts exclude air taxi operations as the air taxi operations counts are co-mingled with regional commuter airline operations counts at those airports.
2. Most current information published is prior to 2022; in some cases, as old as 2019.

Sources: FAA Airport Data and Information Portal (ADIP); Hanscom Field and Logan Airport counts provided by Massport

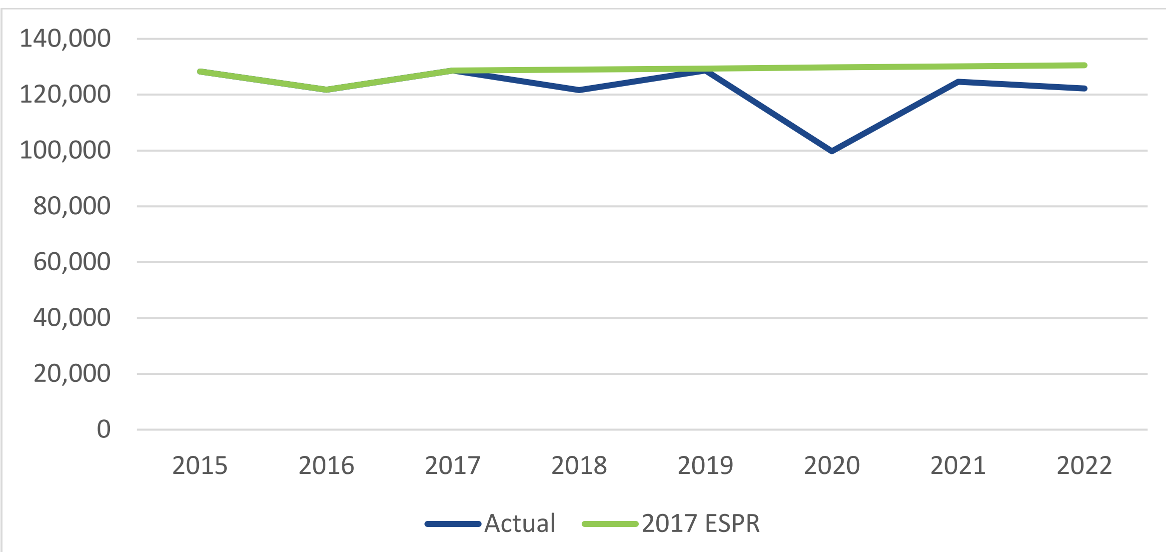
3.3.3 Review of the *2017 ESPR* Forecast

Long-term forecasts are based on the best data available at the time of the forecast and on professional judgements. Unforeseen and unpredictable factors may occur and GA trends can be particularly difficult to forecast. As noted in Section 3.2, GA activity at Hanscom Field has experienced declines due to a multitude of factors (including pilot demographics and aircraft ownership costs).[37]

The COVID-19 pandemic had a sudden and significant impact on aircraft operations throughout the world, starting in March 2020. Figure 3-3 shows the dip in operations both on a national level as well as at Hanscom Field in 2020. Additionally, the Russia-Ukraine war, which started in February 2021, drove up fuel prices from an average $3.09 gallons in 2021 to $4.06 in 2022[38] – a 31.4 percent increase year-over-year. Both events were unforeseen and have had significant effects on aviation activity.

Figure 3-9 compares actual aircraft operation levels at Hanscom Field to previously forecast levels. Forecast activity levels for 2018–2022 in the graph are interpolated from the 2025 forecast presented in the *2017 ESPR*. Hanscom Field's actual aircraft operations for 2022 were lower than the total activity levels forecasted in *2017 ESPR* by approximately 7,500 operations, or 6.1 percent. GA traffic volume at Hanscom Field has not recovered to pre-COVID levels.

Figure 3-9. *2017 ESPR* Forecast Daytime Operations Compared to Actual Daytime Operations (GA Plus Military Activity) at Hanscom Field



Sources: *2017 ESPR* for Hanscom Field, Massport NOMS data

Table 3-4 presents the comparison of actual 2022 operations to the previous forecast, broken down by aircraft category. The biggest discrepancies in percentage between the forecast and actual 2017 operations were in the military and MEP categories, which exceeded *2017 ESPR* forecasts by 55 and 40 percent, respectively. The percentage change in military operations is more sensitive to any absolute

[37] FAA Aerospace Forecast Fiscal Years 2022–2042.

[38] U.S. Energy Information Administration, "Petroleum & Other Liquids". https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_nus_dpg&f=m, accessed Jan. 31, 2023.

change in operations due to their low total number. Additionally, the Hanscom Aero Club flight school operations increased during the COVID-19 months. While Hanscom Aero Club is a flight school, the aircraft are owned by the military and therefore its operations are counted toward military operations.

Hanscom operations data from early 2023 suggest that 2022 may have been an anomalous year, possibly due to lingering effects of the COVID pandemic. Month to month comparisons show Hansom Field operations declined by 6.5 percent (according to FAA Traffic Flow Management System Counts comparison of January through April 2023), down 8.0 percent for business jets, and down a maximum 13.5 percent total operations on a month-to-month comparison between 2022 and 2023.

Turboprop operations in 2022 were 25 percent lower than in the 2017 ESPR forecast. Both categories of SEP operations were approximately 20 percent lower and combine to over approximately 12,000 fewer annual daytime operations than forecast. Business jet and helicopter operations were approximately 8 percent higher than forecast. When annualizing 2023 business jet operations based on the first four months of the year, the 2023 business jet operations are less than 2 percent different from the *2017 ESPR* forecast business jet operations.[39]

Table 3-4. 2017 ESPR Forecast and Actual 2022 GA Daytime Activity at Hanscom Field

Activity	Actual 2022	*2017 ESPR* Forecast 2022	Difference Absolute	Difference Percent
Training SEP	36,370	43,319	-6,949	-19%
Personal SEP	25,336	30,635	-5,299	-21%
Business MEP	4,890	2,940	1,950	40%
Business Turboprop	7,351	9,211	-1,860	-25%
Business Jet	36,808	33,786	3,022	8%
Helicopter	9,760	9,026	734	8%
Military	1,701	759	942	55%
Total	**122,216**	**129,677**	**-7,461**	**-6%**

Note: Operations between 7:00 a.m.-11:00 p.m., the hours that the air traffic control tower is open.
Sources: Massport NOMS data, *2017 ESPR* for Hanscom Field

3.4 Aviation Activity Forecasts

The forecasts for aviation activity at Hanscom Field include projections of aircraft operations and based aircraft for the mid-term (2030) and the long-term (2040). The forecasts assume that Hanscom Field continues to act as the region's premier full-service GA airport that also serves a vital role in New England's regional aviation system as a GA reliever airport for Logan Airport.

In addition, the forecast assumes that the airport could again offer scheduled commercial airline operations. That possibility should not be ruled out, given that the airport has had scheduled commercial service in the past and would need to accommodate new service, if proposed. The

[39] Taking the *2017 ESPR* 2022 33,786 business jet operations and applying the *2017 ESPR* business jet growth rate of 1.9 percent.

scheduled commercial service forecast is consistent with previous forecasts and is meant to be illustrative of what may occur in the future. Any scheduled commercial service at Hanscom Field must comply with 740 Code of Massachusetts Regulations (CMR) Part 25.03 (740 CMR Part 25), which states: "no person, including an air carrier or a foreign air carrier, shall conduct at Hanscom an operation in commercial air passenger service in an aircraft with a seating capacity of greater than sixty seats."[40]

The operations forecast is based on historical trends at Hanscom Field along with national trends using FAA's Aerospace Forecasts for GA. Business jet operations were forecast based on an average of FAA Aerospace Forecast GA operations growth numbers (itinerant and local) and Massachusetts Gross Regional Product (GRP) forecasts[41] given the commonly accepted relationship between the local economy and GA activity at Hanscom Field. The forecast for Hanscom Field is shown in **Table 3-5**. Details on individual category forecast methodologies are described in Section 3.4.1.

Table 3-5. Forecast of Daytime Operations at Hanscom Field

Daytime Activity	Actual		Forecast		Compound Annual Growth Rate			
	2017	2022	2030	2040	2017-22	2022-30	2030-40	2022-40
Training SEP	46,014	36,370	39,383	41,236	-4.60%	1.00%	0.46%	0.70%
Personal SEP	33,040	25,336	27,435	28,726	-5.17%	1.00%	0.46%	0.70%
Business MEP	3,015	4,890	5,212	5,446	10.16%	0.80%	0.44%	0.60%
Business Turboprop	7,831	7,351	7,835	8,187	-1.26%	0.80%	0.44%	0.60%
Business Jet	29,862	36,808*	41,030	45,624	4.27%	1.37%	1.07%	1.20%
Helicopter	8,256	9,760	10,569	11,066	3.40%	1.00%	0.46%	0.70%
Military	759	1,701	1,701	1,701	17.51%	0.00%	0.00%	0.00%
Scheduled Commercial Airline	0	0	1,019	1,783	0.00%	N/A	5.75%	N/A
Total	**128,777**	**122,216**	**134,185**	**143,767**	**-1.04%**	**1.17%**	**0.69%**	**0.91%**

* 2022 may be an anomalous year. Annualized total 2023 business jet operations (based on January through April TFMSC data) is anticipated to be 33,876. This results in a 2023-2040 CAGR of 1.77 percent.
Sources: *2017 ESPR* for Hanscom Field, Massport NOMS data, McFarland Johnson for forecast years

3.4.1 General Aviation Forecast Operations

In 2022, about 99 percent of Hanscom Field's operations were GA-related and that activity is forecasted to grow at an average rate of 1 percent per year through 2040. This growth is driven by the business aviation sector. General aviation forecasts are different at commercial service airports (such as Logan Airport), where GA is constrained by the commercial service and therefore may experience zero or very low growth rates.

[40] 740 CMR Part 25: Special Provisions – L.G. Hanscom Field, Massachusetts Port Authority, https://www.mass.gov/doc/740-cmr-25-special-provisions-lg-hanscom-field/download
[41] Woods & Poole Economics shows MA GRP growing at approximately 2.3 percent CAGR 2022-2027.

Training Operations

Training operations are expected to increase at the FAA Aerospace Forecast GA local operations growth rate of 0.7 percent CAGR through the forecast period. As an airport with mostly SEP operations, training and personal flying are commonplace and tend to follow national growth rates. Training operations at BED are forecast to increase from approximately 36,000 in 2022 to approximately 41,200 in 2040.

Personal Flying Operations

Total personal flying operations in SEP aircraft are expected to increase throughout the forecast period at the FAA Aerospace Forecast GA local operations growth rate of 0.7 percent CAGR through the forecast period. Over the past five years, personal flying has declined at Hanscom Field by an average of 5.2 percent per year. This is a decrease of approximately 8,000 operations over five years. For the forecast period of 2023– 2040, personal flying operations in SEP aircraft are projected to increase at the FAA Aerospace Forecast GA local operations CAGR. Hanscom Field has removed multiple tie-downs in the last few years, which has reduced the number of based single engine aircraft, and therefore reduced the airfield's personal flying operations. It is anticipated that Hanscom Field future operations will increase at the FAA Aerospace Forecast growth rate. By 2040, annual personal flying operations are projected to be about 28,700, increasing from 25,300 in 2022.

Business Aviation

Business aviation, like other GA operations, were disrupted by the COVID-19 pandemic and saw different trends from 2017 through 2019 than from 2020 to 2022. As shown in Table 3-5 and described in Section 3.3.3, 2022 may have been an anomalous year and may inflate business jet historical 5-year CAGR. Based on January through April 2023 operations, 2023 business jet operations may normalize to something that is more in line with the *2017 ESPR* growth rates.

The mid- and long-term outlook for business aviation (business jet, MEP, and turboprop) is strong. The FAA projects that business aviation will continue to grow nationally. Business aviation remains an attractive option for corporations, given the greater flexibility of schedules, the ability to reach destinations without stops, the ability to avoid lengthy check-in and security screening times, and a way to fly separated from the general public, all of which allow corporate passengers to use their time more effectively.

Business aviation activity at Hanscom Field has historically tracked with the state of Massachusetts' GRP. Through 2027, the GRP in Massachusetts is forecasted to increase at 2.3 percent per year.[42] Due to the impacts of COVID-19 on aviation, recent 5-year trends are not applicable to forecasts. The last three years have seen higher growth of business jet operations, which can be attributed as an outlier due to the COVID-19 pandemic. Therefore, the FAA's Aerospace Forecast growth for GA itinerant and local operations was averaged with the MA GRP forecast to get a CAGR of 1.2 percent for business jets for the current forecasting. Other business aviation was forecast using FAA's Aerospace Forecast CAGR for GA itinerant operations. Proposed development projects (including current projects) are targeting existing

[42] Woods & Poole, 2022

demand. The current and proposed hangar development, including the North Airfield Development,[43] is not anticipated to increase this forecast.

Total annual business aviation daytime operations are forecast to reach around 59,300 by 2040, an increase from the approximately 49,000 annual daytime business operations in 2022.

Helicopter Operations

Since 2017, helicopter operations have increased 3.4 percent annually, with approximately 10,000 operations in 2022. It is anticipated that this growth rate will slow to the national average (FAA Aerospace Forecast) and therefore, helicopter operations are forecast to grow throughout the specified period at 0.7 percent CAGR. Total helicopter operations are forecast to reach approximately 11,100 in 2040. It is anticipated that Hanscom Field will see electrical vertical take-off and landing (eVTOL) aircraft operations within the planning period. This forecast has been prepared in consideration of the potential arrival of eVTOL.

3.4.2 Military Forecast Operations

Since the military's function at Hanscom Field does not involve an active flying mission, annual military operations are approximately 1 percent of the total aircraft operations at the airport. The forecast assumes that the military operations continue throughout the forecast period but remain constant at the 2022 level of 1,071 operations. These military operations include many single-engine piston operations from the Hanscom Aero Club flights, which have increased during the COVID-19 pandemic.

3.4.3 Scheduled Commercial Airline Forecast Operations

Hanscom Field has most recently had scheduled commercial airline passenger service by Streamline Air, who discontinued operations at the airport in 2012. Since the *2017 ESPR*, airlines have continued the trend of withdrawing from or scaling back services at many smaller, secondary markets due to pilot shortages and, more recently, reduced demand associated with COVID-19. As the industry continues to evolve, the Hanscom Field forecast continues to include a modest level of scheduled commercial activity consistent with the previous forecast and existing restrictions.

The scheduled commercial airline forecast scenario assumes that the types of service that may be implemented at Hanscom Field would be like the service most recently provided. This includes a small regional airline operating small turboprop or regional jet aircraft to short-haul business/leisure markets.

The forecast commercial services comply with 740 CMR Part 25, which prohibits scheduled commercial passenger services in aircraft with more than 60 seats. The Hanscom Field forecast specifically assumes weekday service operated with a 50-seat turboprop type aircraft (De Haviland Dash 8-300 (Q300)) serving one or two destinations in the Northeast. This service could also be conducted by a 50-seat regional jet, but for the purposes of this analysis the Q300 is the assumed aircraft. The forecast scenario details are summarized in **Table 3-6**.

The scheduled commercial service included in this *2022 ESPR* forecast represents a potential scenario that could occur at Hanscom Field in the future. The future scenario in Table 3-6 is based on several

[43] L.G. Hanscom Field North Airfield Development Environmental Notification Form, January 2023

assumptions and are not based on specific plans proposed by any potential service providers. The forecasts represent a high-level analysis as part of the overall future activity forecast.

Table 3-6. Summary of Forecast Scheduled Commercial Passenger Service Assumptions, 2030 and 2040

Forecast Scheduled Commercial Passenger Service Assumptions	
Aircraft Type:	Small turboprop with ~50 seats, e.g., De Haviland Dash 8-300 (Q300)
Number of Nonstop Markets:	One in 2030 Two in 2040
Types of Markets:	Business/leisure destination in the northeast
Service Frequency:	Two roundtrips per market, five days a week
Average Load Factor:	70.0% in 2030 72.5% in 2040
Completion Factor:	0.98
Sources: Massport, McFarland Johnson analysis	

As shown in **Table 3-7**, Hanscom Field could potentially accommodate 35,372 scheduled commercial airline passengers by 2030 and 73,892 in 2040. With weekday-only services provided to one destination, annual scheduled commercial airline operations are forecast at 1,019, with completion rates of approximately 98 percent, since cancellations are bound to occur due to weather, staffing, or other unforeseen circumstances. In 2040, under the assumption of weekday services to two destinations, annual operations increase to 2,038, with the same completion rates. Since the scenario assumes that one service would be targeted to the business traveler, the 2040 forecast assumes that one daily departure would occur on weekdays in the early morning before 7:00 a.m. Thus, in the 2040 forecast, 1,783 scheduled commercial airline operations would occur between 7:00 a.m. and 11:00 p.m., and 255 scheduled commercial airline departures are assumed for the 11:00 p.m. to 7:00 a.m. period.

As shown in Table 3-7, the *2022 ESPR* forecast for scheduled commercial passenger service operations are the same as the *2017 ESPR* forecasts for 2025 and 2035. Passengers increase since the aircraft type in the current forecast has a higher seat number than the aircraft used in the *2017 ESPR* forecasts.

Table 3-7. Forecast Scheduled Commercial Passenger Activity at Hanscom Field, 2030 and 2040

Activity	Actual		2017 ESPR Forecast		2022 ESPR Forecast	
	2005	2012[1]	2025	2035	2030	2040
Aircraft Operations	3,627	635	1,019	2,038	1,019	2,038
Passengers	17,457	8,609	21,403	44,335	35,672	73,892
Passengers per Operation	4.8	13.6	21	21.8	35.0	36.3
Note: 1. 2012 was the last year that commercial service was available Sources: 2017 ESPR for Hanscom Field, McFarland Johnson analysis for forecast years						

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 Field 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. Depending on the aircraft to be utilized by an airline, the development of documentation under NEPA may also be required.

New scheduled commercial service at Hanscom Field proposed by new airline entrants must be consistent with the results of the Master Plan analysis that resulted in 740 CMR Part 25. 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.

3.4.4 Nighttime Operations

Total nighttime aircraft operations (11:00 p.m. to 7:00 a.m.) are forecast to increase from 2,651 in 2022 to 3,393 in 2040, as shown in **Table 3-8**. The forecast of nighttime operations for Hanscom Field are based on the forecast of annual activity by aircraft type. In 2022, approximately 4.2 percent of jet operations and 1.7 percent of turboprop operations occurred during the nighttime hours. Piston and turboprop operations include both single and multi-engine aircraft.

By 2040, business jet aircraft are forecast to fly approximately 1,900 annual nighttime operations, which accounts for 57 percent of the forecast nighttime activity. Turboprop operations during nighttime hours are forecasted to reach a collective 182 annual operations by 2040. Nighttime scheduled commercial airline operations are included in the 2040 forecast at 255 annual operations.

Table 3-8. Forecast of Nighttime Activity at Hanscom Field

Year	Nighttime Operations						
	Business Jet	Turboprop	Piston	Helicopter	Military[1]	Scheduled Commercial Airline	Total
2017	1,459	87	220	460	0	0	2,226
2022	1,617	207	154	673	0	0	2,651
2030	1,743	174	417	555	-	0	2,889
2040	1,938	182	437	581	-	255	3,393

Note: 1. The future years' forecast does not include consideration of military nighttime operations.
Sources: *2017 ESPR* for Hanscom Field, Hanscom Field 2017 and 2022 Annual Noise Reports, 2022 Massport NOMS data, McFarland Johnson analysis

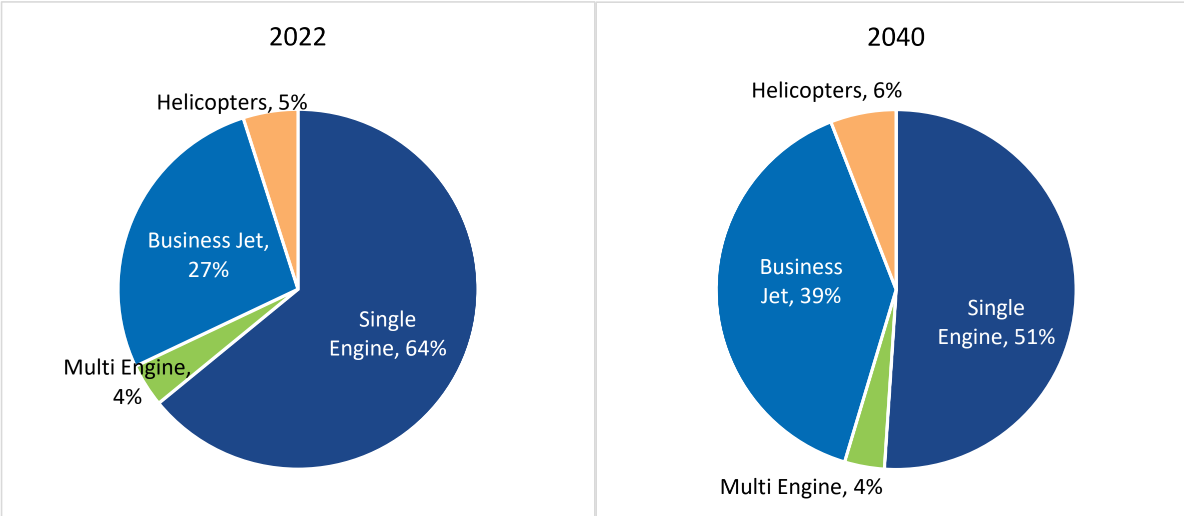
3.4.5 Based Aircraft Forecast

As of April 2023, Hanscom Field had 284 based aircraft. This figure is lower than 2017 when there were 350 aircraft based at the airport. Since 2017, based aircraft have declined an average 4.1 percent CAGR. Based aircraft, especially personal aircraft, continue to decline as the number of Hanscom Field tie-downs decrease, fuel prices increase, fewer new pilots join the market, costs of aircraft maintenance rise, and required technology changes occur. In addition, consistent with broader national trends, business jet aircraft are increasing in length and in wingspan, adding to the already constrained hangar capacity at Hanscom Field because larger aircraft require more hangar space.

Approximately 64 percent of the based aircraft are single engine aircraft. Business jets comprise the next largest share of based aircraft with an approximate 27 percent share, and these are primarily stored by the three FBOs. The number of based business jet aircraft is constrained by the lack of hangar capacity, which results in numerous aircraft utilizing Hanscom Field on itinerant basis. The distribution of aircraft by type is provided in **Figure 3-10** for 2022 and forecast year 2040.

The number of aircraft based at Hanscom Field is projected to increase over the forecast period from 284 aircraft in 2022 to 310 aircraft in 2040, as shown in **Table 3-9**. This represents a CAGR of 0.5 percent through 2040. Forecast growth for each aircraft type was calculated from the FAA Aerospace Forecast. As business jet operations shift from 30 percent in 2022 to almost 32 percent in 2040 of daytime operations, the share of based business jet aircraft increases to 39 percent of the fleet. Single-engine (piston and turboprop) aircraft decline to 51 percent of the forecast-based aircraft fleet as single-engine based aircraft continue to decline nationally and at Hanscom Field.

Figure 3-10. Hanscom Field Based Aircraft by Type, 2022 and Forecast 2040



Sources: Massport, FAA Aerospace Forecast 2022-2042, McFarland Johnson analysis

Table 3-9. Based Aircraft Forecast by Type, 2022 and Forecast 2030 and 2040

Aircraft Type	2017	2022	2030	2040
Single Engine	208	182	169	158
Multi Engine	33	11	11	11
Business Jet	93	77	97	122
Helicopter	16	14	16	18
Total	**350**	**284**	**293**	**310**

Sources: 2017 ESPR (2017), FAA ADIP (2022), McFarland Johnson for forecast years (2030 and 2040)

3.4.6 Comparison of *2017* and *2022 ESPR* Forecasts

Table 3-10 and **Figure 3-11** show the comparison of the *2017 ESPR* and *2022 ESPR* forecasts. Both forecasts of operations include all sectors of GA, scheduled commercial passenger service, and military. Total daytime airport operations forecasts appear to be aligned between the *2017* and *2022 ESPRs*.

3.5 Summary of Changes in Airport Activity Levels

In conclusion, GA operations at Hanscom and the nation decreased in recent years and are still recovering from the COVID-19 pandemic. Looking to the future, GA operations for the nation and at Hanscom Field are forecast to grow modestly. The main source of this growth will be in business operations, largely those operations occurring in turboprop and jet aircraft. Hanscom Field could also experience a return of scheduled commercial airline service. The forecast 2040 daytime operations are less than 4 percent higher than the FAA's Terminal Area Forecast 2040 total operations for Hanscom

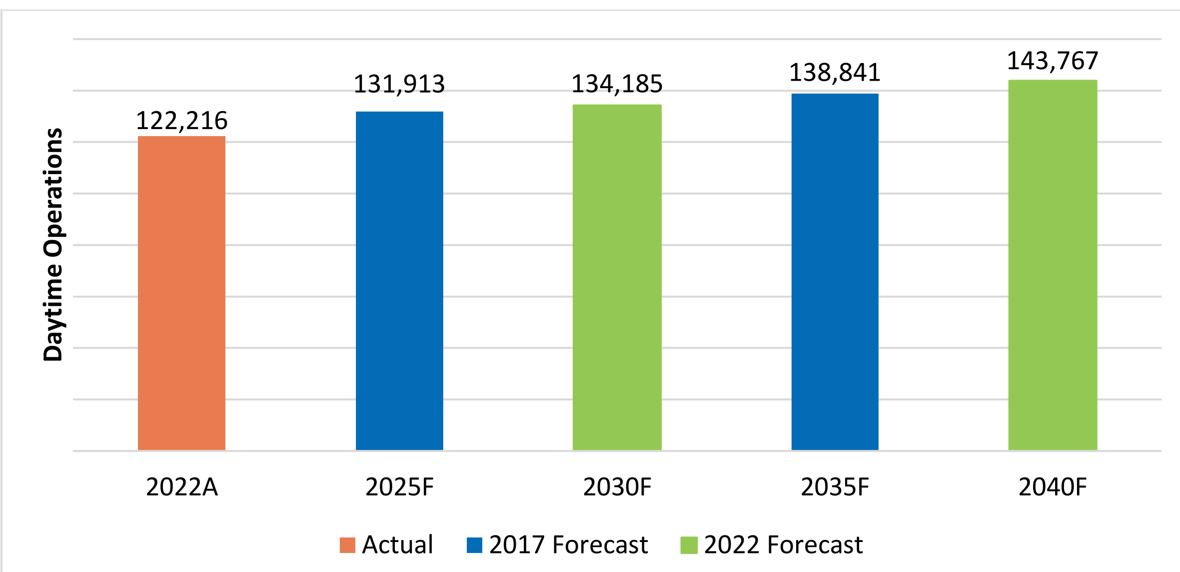
Field. Daytime plus nighttime operations at Hanscom Field in 2040 are forecast to be less than 7 percent higher than the FAA's Terminal Area Forecast 2040 total operations.

Table 3-10. *2017* vs. *2022 ESPR* Daytime Operations Forecast at Hanscom Field

Activity	Actual	*2017 ESPR* Forecast		*2022 ESPR* Forecast	
	2022	2025	2035	2030	2040
Training SEP	36,370	41,795	40,723	39,383	41,236
Personal Flying SEP	25,336	29,208	28,252	27,435	28,726
MEP	4,890	2,907	2,879	5,212	5,446
Turboprop	7,351	10,189	12,205	7,835	8,187
Business Jet	36,808	36,515	41,907	41,030	45,624
Helicopter	9,760	9,522	10,332	10,569	11,066
Military	1,701	759	759	1,701	1,701
Scheduled Commercial Airline	0	1,019	1,783	1,019	1,783
Total[1]	**122,216**	**131,913**	**138,841**	**134,185**	**143,767**

Note:
1. Operations between 7:00 a.m. and 11:00 p.m., the hours that the Air Traffic Control Tower is open.
Sources: Massport NOMS data, *2017 ESPR* for Hanscom Field, McFarland Johnson analysis

Figure 3-11. *2017 ESPR* Daytime Operations Forecast (2025F and 2035F) Compared to the *2022 ESPR* Daytime Operations Forecast (2030F and 2040F) at Hanscom Field



Sources: Massport NOMS data, 2017 ESPR for Hanscom Field, McFarland Johnson analysis

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4 Airport Planning

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. Planning is critical to ensure that an airport's facilities will continue to be safe and secure while accommodating future operating conditions. Proper planning also allows Massport to manage development in a fiscally and environmentally responsible manner. The Hanscom Field ESPRs address potential development needs based on the forecasted future activity levels.

This chapter focuses on the development and planning framework for Hanscom Field, considering the plan's alignment with FAA guidance and requirements, and with local and regional planning activities. This chapter presents potential physical and operational conditions consistent with the 2030 and 2040 activity forecast scenarios described in Chapter 3, and the baseline conditions and needs described in Chapter 2.

For context, this chapter describes the key aspects of the Master Plan and 740 CMR Part 25, as well as other planning criteria, including federal, state, and local regulations and guidance. The forecast developments are projections of what might occur with respect to future demand assumptions that may or may not come to fruition.

4.1 Airport Planning Context

Massport regularly assesses the changing dynamics of the aviation industry, including shifts in the GA demand profile, and the evolution of airport security needs due to Transportation Security Administration-issued security directives. Furthermore, legislative and regulatory mandates inform and affect airports' near- and long-term planning efforts.

Massport is committed to ensuring that planning and development at Hanscom Field is consistent with these mandates and in compliance with federal and state laws affecting the Airport. Massport acknowledges the importance of managing Hanscom Field in an environmentally sensitive and sustainable manner that recognizes the significance of the MMNHP, GMNWR, Hanscom AFB, and the towns of Bedford, Concord, Lexington, and Lincoln. Chapter 11 discusses Massport's approach to sustainable practices as part of the agency's general operating and development philosophy. 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).

Scenario-Based Planning Approach:

Massport has employed a scenario-based approach to plan for the future of the Airport. The projects presented here are based on aviation demand forecasts that are subject to changes in economic conditions. Accordingly, projects will be implemented as demand warrants.

Massport has developed the planning concepts evaluated in this *2022 ESPR* within the framework of the 1978 Master Plan and 740 CMR Part 25. Massport also considers the following when formulating the plan for the future development of the Airport:

- FAA AC 150/5070-6B, *Airport Master Plans*[44]
- FAA AC 150/5300-13B, *Airport Design*[45]
- FAA AC 150/5325-4B, R*unway Length Requirements for Airport Design*[46]
- FAA TAF for the Airport
- Federal, state, and local environmental regulatory requirements and review processes
- Massachusetts Executive Office of Energy and Environmental Affairs Smart Growth/Smart Energy Toolkit[47]
- Executive Order 438, *State Sustainability Program,*[48] which initiated the State Sustainability Program
- Regional planning framework

[44] FAA. January 27, 2015. Advisory Circular 150/5070-6b Change 2. https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_150_5070-6B_with_chg_1&2.pdf

[45] FAA. March 31, 2022. Advisory Circular 150/5300-13B. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5300-13B-Airport-Design.pdf

[46] FAA July 1, 2005. Advisory Circular 150/5325-4B. https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_150_5325-4B.pdf

[47] RE59R09: Smart Growth / Smart Energy. https://www.mass.gov/info-details/re59r09-smart-growth-smart-energy

[48] Commonwealth of Massachusetts. July 23, 2002. *Executive Order 438: State Sustainability Program.* https://www.mass.gov/executive-orders/no-438-state-sustainability-program

- Local comprehensive and growth management plans
- Long-range plans for the MMNHP and Hanscom AFB

This approach provides a planning context for potential improvements at the Airport. The future planning concepts in the *2022 ESPR* describe potential additional aviation and aviation-related uses on the Airport and retain many areas in their current, natural state.

4.1.1 Airport Plans and Regulations

In 1978, Massport issued the *Hanscom Field Master Plan and Environmental Impact Statement (Master Plan).* In response to community concerns that arose when Massport became responsible for the operation of Hanscom Field in 1974, Massport drafted several policies in the Master Plan that still guide Massport's management of and planning for Hanscom Field. The adoption of 740 CMR Part 25 was an outgrowth of the Master Plan.

In 1978, the Master Plan described aviation-related development on USAF land dedicated to aviation-related uses that later changed ownership to Massport. Other developments, according to the Master Plan, would be compatible with existing adjacent land uses and airport operations. These policies and regulations have guided Massport's development of the *2022 ESPR*, which reaffirms the role of Hanscom Field as a premier regional GA airport.

Massport Regulations and Noise Rules (740 CMR Part 25) contain the following provisions:

- ⇨ Limit scheduled commercial airline service to passenger aircraft with 60 seats or less.
- ⇨ Impose a nighttime field use fee to discourage activity between 11:00 p.m. and 7:00 a.m.
- ⇨ Prohibit touch-and-go operations between the hours of 11:00 p.m. and 7:00 a.m.
- ⇨ Prohibit touch-and-go operations at any time by aircraft exceeding 12,500 pounds.
- ⇨ Limit Auxiliary Power Unit (APU) and Ground Power Unit (GPU) usage to 30 minutes, with further limitations between the hours of 11:00 p.m. and 7:00 a.m.

4.1.2 Overview of the Aviation Forecast

The forecasts for aviation activity at Hanscom Field in this *2022 ESPR* include projections of aircraft operations and based aircraft for the mid-term (2030) and the long-term (2040) concepts. The forecasts assume that Hanscom Field continues to act as a GA reliever for Logan Airport, and as the premier business aviation airport for the Greater Boston area. The forecast also assumes that military operations will remain limited. In addition, the 2030 and 2040 forecasts assume that the Airport could again accommodate scheduled commercial airline operations. The operations forecast is based on both historical trends at Hanscom Field and national trends for GA. The forecast update for Hanscom Field is presented in **Table 4-1** (which is the same as Table 3-5).

Notably, the forecast for 2040, which projects just under 144,000 annual aircraft operations, is consistent with the *2017 ESPR* forecast for the year 2035 at nearly 139,000 operations.[49] The growth in jet operations has been a national, regional, and local trend and primarily the reason for this growth.

[49] Daytime operations between 7:00 a.m. and 11:00 p.m., the hours that the FAA Air Traffic Control Tower is open.

Historically, jet operations at Hanscom Field mirror the health of the regional economy. This forecast drives the planning for future development discussed in Section 4.2.

Table 4-1. Forecast of Operations at Hanscom Field

Activity	Actual		Forecast		Compound Annual Growth			
	2017	2022	2030	2040	2017-22	2022-30	2030-40	2022-40
Training SEP	46,014	36,370	39,383	41,236	-4.60%	1.00%	0.46%	0.70%
Personal Flying SEP	33,040	25,336	27,435	28,726	-5.17%	1.00%	0.46%	0.70%
MEP	3,015	4,890	5,212	5,446	10.16%	0.80%	0.44%	0.60%
Turboprop	7,831	7,351	7,835	8,187	-1.26%	0.80%	0.44%	0.60%
Jet	29,862	36,808	41,030	45,624	4.27%	1.37%	1.07%	1.20%
Helicopter	8,256	9,760	10,569	11,066	3.40%	1.00%	0.46%	0.70%
Military	759	1,701	1,701	1,701	17.51%	0.00%	0.00%	0.00%
Scheduled Commercial Airline	0	0	1,019	1,783	0.00%	N/A	5.75%	N/A
Total	128,777	122,216	134,185	143,767	-1.04%	1.17%	0.69%	0.91%
Sources: *2017 ESPR* for Hanscom Field, Massport NOMS data, McFarland Johnson for forecast years								

4.1.3 Investments in Safety, Equipment, and Facilities Between 2022 and 2029

Massport is allocating resources to steadily improve the safety of facilities located on Hanscom Field property as well as to rehabilitate existing runways. Massport's five-year CIP, which spans from FY 2023[50] to FY 2027, includes various projects such as Hanscom Field Terminal renovations, communications upgrades, fire protection infrastructure, taxiway and apron pavement rehabilitation, compliance with FAA mandated airfield geometry, and equipment replacement. These projects are discussed in detail in Section 4.2.5. Many of these anticipated projects have also been included in *The State of Hanscom* (July 2022) publication.[51]

4.1.4 Airport Layout Plan

The FAA defines the Airport Layout Plan (ALP) as a set of scaled drawings depicting existing and potential future airport facilities and property. The ALP enables the airport operator to seek federal funding for certain improvements, provides information for environmental review, and enables the FAA and airport management to make prudent decisions regarding near-term projects.

Appendix B provides the 2022 ALP for Hanscom Field, which includes planning improvements discussed in the *2017 ESPR* and offers a graphic representation of the existing conditions at Hanscom Field,

[50] Massport's fiscal year for accounting and budgeting purposes is from July to June, thus FY23 is July 1, 2022 to June 30, 2023.
[51] https://www.massport.com/media/khjo0oua/2021-state-of-hanscom.pdf

potential development projects, the protected airspace (as defined by CFR Part 77[52]), and the existing land use in and around Hanscom Field. The 2022 ALP was prepared in compliance with FAA standards, including those outlined in FAA AC 150/5070-6B, *Airport Master Plans, Change 2*, Chapter 10.[53] The 2022 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 North Airfield, Northeast Airfield, West Ramp (which encompasses the terminal area and Airport Traffic Control Tower), the East Ramp, and Pine Hill.

According to the MassGIS 2018 database, most of the land use at Hanscom Field is designated as transportation. Most of land within the Runway Protection Zones (RPZs) is designated as transportation with a small percentage designated as open land, wetlands, and commercial (in the Runway 29 RPZ).

4.1.5 Procedures for New Airline Tenants

Scheduled commercial passenger service continues to be only a small component of Hanscom Field's future forecasted aviation activity. An airline must follow FAA and Massport procedures to commence scheduled services at Hanscom Field, including adhering to the limitations described in Section 4.1.1. The forecast for scheduled commercial air travel at Hanscom Field is provided in Chapter 3 and is incorporated into the airport planning process. Notably, no new passenger facilities would be required to meet the forecast for potential scheduled commercial activity in the future, given the prohibition of passenger aircraft with more than 60 seats.

4.1.6 Environmental Planning

Massport has developed the *2022 ESPR* primarily for review under MEPA. However, Massport utilizes the document in a broader context. For example, potential future development documented within the ESPR may be subject to further environmental review under NEPA prior to a project being implemented, as identified in Section 4.2.5. Further, the FAA could review future development and determine that additional analysis is required beyond that indicated herein and that a Categorical Exclusion (CatEx), Environmental Assessment (EA), or Environmental Impact Statement (EIS) is warranted, depending on the nature and anticipated impacts of the proposed action(s). In addition, Massport coordinates with the FAA on ALP changes to reflect future development as mentioned in Section 4.1.4 of this chapter.

Massport collaborated with the FAA during the preparation of this *2022 ESPR* regarding plans for the Airport and the forecast of aviation demand, and Massport is committed to working with the FAA on an ongoing basis to conduct the necessary environmental reviews.

[52] Title 14 CFR. §77 - Safe, Efficient Use, and Preservation of the Navigable Airspace. July 21, 2010.
[53] FAA. January 27, 2015. Advisory Circular 150/5070-6b, Change 2. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5070-6B-Change-2-Consolidated.pdf

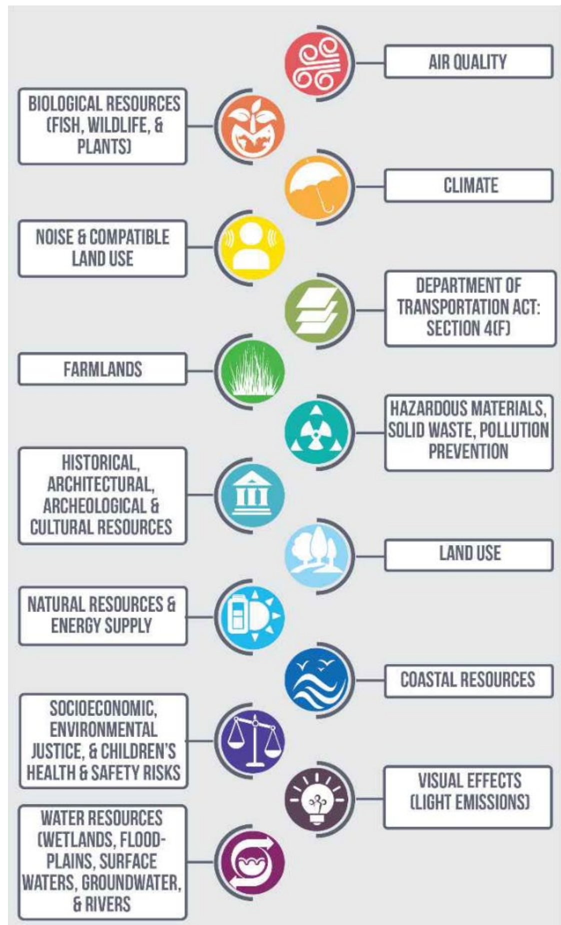
In addition to the role that the FAA plays in the environmental review process for airport projects, it also requires air service operators to meet specific safety requirements. Massport requires that air service operators obtain FAA and applicable state approvals prior to initiating scheduled commercial passenger service at the Airport. Further, Massport does not allow any new air service operator to begin service until it has secured all necessary environmental approvals. FAA Orders 1050.1F, *Environmental Impacts: Policies and Procedures,*[54] and 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions,*[55] provide instructions and guidelines for preparing and processing NEPA documents for airport development proposals and other airport actions as required by law. The specific action being requested determines the type of environmental processing required by the FAA.

In accordance with FAA regulations, some projects may be "categorically excluded" from additional environmental review due to minimal potential for adverse environmental impact[56]. Examples of projects that the FAA may categorically exclude include acquiring security equipment that the FAA requires for the safety of security personnel and property on the airport or safety equipment required by rule or regulation for the certification of an airport.

If the FAA determines a project is not categorically excluded from environmental review, the potential environmental consequences associated with a proposed action would be assessed in either an EA or an EIS, as determined by the FAA. **Figure 4-1** lists environmental impact categories which are analyzed under NEPA.

There is potential that some projects included in this *2022 ESPR* could require development within or proximate to wetland areas. Committed to minimizing environmental impacts, Massport would avoid these impacts to the maximum extent practicable and fully mitigate any unavoidable impacts. Impacts to wetland resource areas may require permits from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act, the local municipality under the Massachusetts Wetlands Protection Act, and the Massachusetts Department of Environmental Protection under Section 401 of the Clean Water Act.

Figure 4-1. Impacts Analyzed in Environmental Review for Compliance with NEPA



Source: FAA Orders 1050.1F and 5050.4B

The Vegetation Management Plan (VMP) provides Massport with a methodology to remove vegetation to maintain aviation safety while complying with local, state, and federal regulations. Vegetation removal projects take place at Hanscom Field approximately every five years. The vegetation removal

[54] FAA. July 16, 2015. Order 1050.1f. https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf
[55] FAA. April 28, 2006. Order 5050.4B. https://www.faa.gov/airports/resources/publications/orders/environmental_5050_4/
[56] These projects are documented via a process commonly referred to as a CatEx.

involves several steps. The Airport uses aerial photography and other imaging techniques to collect information identifying where trees and other structures penetrate protected airspace. The protected airspace is determined from runway approach categories defined by the FAA. Once the analysis is complete, the Airport can remove penetrating vegetation as stipulated by documents such as the Vegetation GEIR and the Massachusetts Wetlands Protection Act regulations. The VMP is developed in conjunction with Bedford, Concord, Lexington, and Lincoln. Massport continues to maintain vegetation in accordance with FAA certification and safety requirements. As part of the Order of Conditions for vegetation removal ordered in 2020, Massport has begun working as prescribed in the 2019–2023 VMP Update. Further details about the VMP are discussed in Chapter 9.

4.1.7 Local Municipality Planning Initiatives

Hanscom Field is located within the towns of Bedford, Concord, Lexington, and Lincoln (as shown in **Figure 4-2**), which are suburban communities of metropolitan Boston (Metro Boston), with strong economic ties to the high-tech and service economies that are located along Route 128/Interstate 95. The four towns have undergone significant changes since 1970 when Hanscom Field accommodated over 300,000 operations (landings and takeoffs) per year. The combined population of the four towns showed minimal growth between 1970 and 2012, and then a 0.6 percent CAGR[57] in the last ten years, as shown in **Table 4-2**. Lexington has seen the greatest annual population growth since 2012, at 0.8 percent, while all four towns have increased their populations in the past ten years.

Table 4-2. Population Trends in Bedford, Concord, Lexington, and Lincoln

Town	1970	2012	2022	CAGR 1970 – 2012	CAGR 2012-2022
Bedford	13,513	13,407	14,287	0.0%	0.6%
Concord	16,148	18,081	18,424	0.5%	0.2%
Lexington	31,886	31,527	34,235	-0.1%	0.8%
Lincoln	7,567	6,442	6,941	-0.7%	0.7%
Total	**69,114**	**69,457**	**73,887**	0.0%	**0.6%**
Source: U.S. Census Data, 1970, 2012, and 2022					

[57] The compound annual growth rate (CAGR) calculates a constant rate of growth for each year over the time period.

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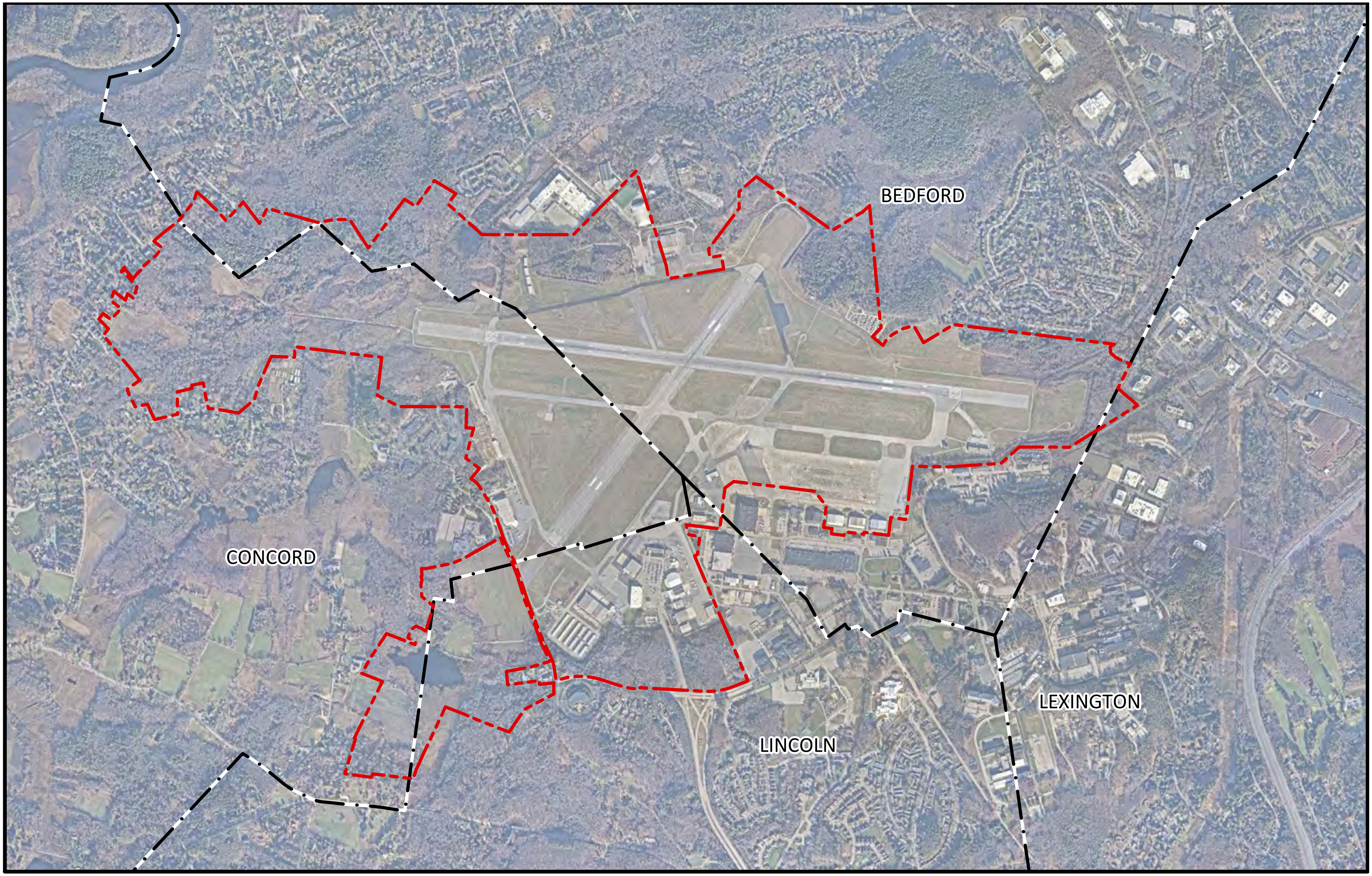

Note: On-airport buildings without a number have been removed since the November 2022 aerial.

North

0 2,000 4,000 Feet

Airport Property Boundary
Town Boundary

L. G. Hanscom Field
2022 Environmental Status & Planning Report

Hanscom Field Municipal Boundaries

Figure **4-2**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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The Metropolitan Area Planning Council (MAPC), MassDOT, and the University of Massachusetts (UMass) Donohue Institute study town population and housing, and in August 2023 published updated projections.[58] The UMass Donohue Institute continuously studies population projections in the state. The population estimates presented in **Table 4-3** for 2025 and 2035 are based on 2010 U.S. Census data reconciled to 2019 state population numbers. All four towns are projected to experience population growth.

Table 4-3. Population Projections for Bedford, Concord, Lexington, and Lincoln

Town	2020 (Actual)	UMASS Donahue Institute (2019 Projection)		
		2025	2030	2035
Bedford	14,383	15,160	16,115	17,110
Concord	18,491	18,625	18,892	19,173
Lexington	34,454	35,168	36,290	37,607
Lincoln	7,014	7,061	7,134	7,118
TOTAL	**74,342**	**76,014**	**78,431**	**81,008**

Note: Since the MAPC population numbers did not include group quarter residents, only the UMass Donohue Institute data was used for comparison.
Sources: U.S. Census 2020, UMass Donohue Institute 2019

The MAPC forecast expected the number of housing units within the four towns to increase to a combined total of 27,615 by 2030 and to 27,848 by 2040, as shown in **Table 4-4**. Compared to the actual housing data obtained from the U.S. Census (based on the 2021 American Community Survey 5-year estimates), Lexington exceeds the 2030 and 2040 projections already, whereas Concord and Lincoln have not yet met the 2020 projections.

Table 4-4. Housing Unit Projections for Bedford, Concord, Lexington, and Lincoln

Housing Units	2021 (Actual)	MAPC 2020 (2019 Projection)	MAPC 2030 (2019 Projection)	MAPC 2040 (2019 Projection)
Bedford	5,540	5,450	5,595	5,650
Concord	6,357	6,969	7,177	7,274
Lexington	12,301	11,954	12,066	12,121
Lincoln	2,566	2,643	2,777	2,803
TOTAL	**26,764**	**27,016**	**29,195**	**31,608**

Source: American Community Survey – 2021 via U.S. Census; MAPC – 2019

[58] *Massachusetts Regional Household and Labor Force Projections and Subregional Allocation Documentation*, 2023.[59] *Bedford Housing Study*, March 2019, https://www.rhsohousing.org/sites/g/files/vyhlif421/f/uploads/bedford_housing_study_2019_-_final_march_11.2019.pdf.

Bedford

The Town of Bedford completed topic-specific studies, which include the 2019 Bedford Housing Study,[59] the 2022 Great Road Optimization Study[60] (including bike lane concepts), other traffic studies, and MBTA bus stop shelter installation. Hanscom Field occupies approximately 645 acres in Bedford, including the airport areas referred to as the North Airfield and East Ramp which are shown in **Figure 4-3**. New developments, paired with growing population, are contributing to road congestion in Bedford near Hanscom Field.[61] New residential development projects have taken place on the northeast side of Hanscom Field, near Summer Street and South Road, and new residential, industrial, and retail projects have been added on the northwest side of Hanscom Field, near Hartwell Road. Additionally, the Route 3 corridor continues to feature new large-footprint developments with proximity to the Airport. Bedford's major job centers and corridors are highly automobile dependent, resulting in heavy traffic volumes during commute hours. Hanscom Field-related traffic is a minimal contributor to traffic volumes on Bedford roadways. See Chapter 6 for more information about traffic volumes.

Massport works through the Bedford Conservation Commission to address projects in or adjacent to regulated wetlands, such as the ongoing VMP. In past years, Massport implemented multiple phases of the VMP in accordance with the Order of Conditions.[62] Phase I of the VMP was prepared in 2002 to guide the maintenance of protected airspace at Hanscom Field. Massport and the Bedford Conservation Commission designed the VMP to serve as a guide for future airfield vegetation removal.

The 2008 VMP identified obstructions in Bedford's Jordan Conservation Area (JCA). In 2010, the Bedford Conservation Commission, Massport, and the Bedford Selectmen signed a Memorandum of Agreement (MOA) that allows Massport to periodically access the JCA for future vegetation management projects, subject to the Commission's review under the state's Wetlands Protection Act. As part of the MOA, Massport worked with Bedford to develop access to a trail system on Massport-owned parcels.

Concord

The Town of Concord adopted its comprehensive long-range plan, *Envision Concord*, in 2018.[63] The comprehensive plan includes analysis of historic resources, economic resources, housing, land use and zoning, mobility and transportation, open space and natural resources, public facilities and infrastructure, and fiscal planning.

Concord aims to protect its scenic quality, its historical significance, and the rural character of its roads such as Virginia Road near the Pine Hill area. To reduce automobile traffic, Concord is exploring multi-modal transportation opportunities, particularly from transit hubs to work destinations. Hanscom Field occupies 385 acres of land in Concord, about 2.3 percent of all Concord land, including the areas referred to as Pine Hill, shown in **Figure 4-3**.

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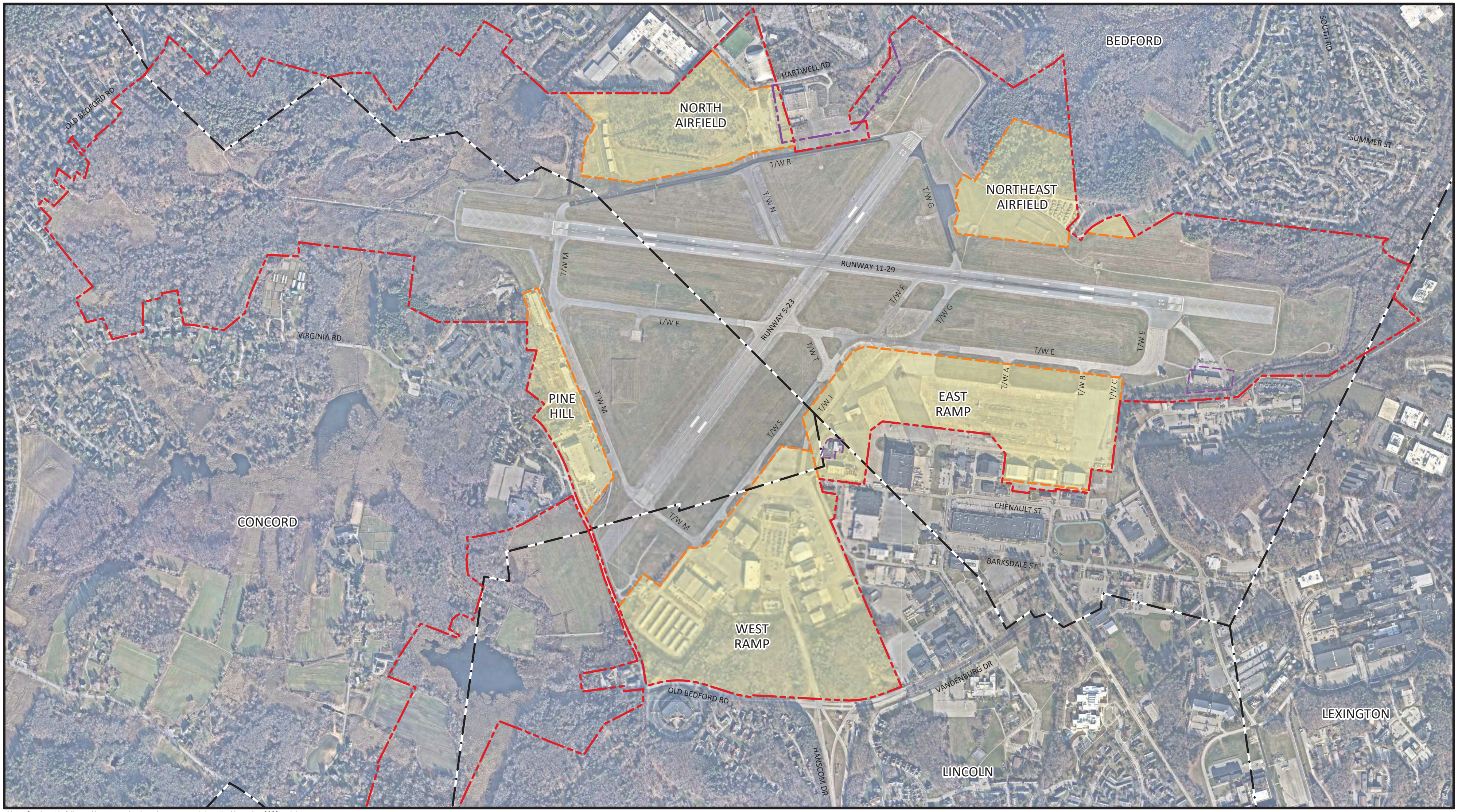
[59] *Bedford Housing Study*, March 2019, https://www.rhsohousing.org/sites/g/files/vyhlif421/f/uploads/bedford_housing_study_2019_-_final_march_11.2019.pdf.

[60] *Town of Bedford Great Road Optimization Study*, December 2022, https://www.bedfordma.gov/768/Great-Road-Traffic-Optimization-Study, accessed on March 29, 2023.

[61] Metropolitan Area Planning Council (MAPC). 2013. *Burlington/Bedford Commuter Transit Analysis*.

[62] Massport. *The State of Hanscom,* July 2022

[63] Town of Concord. July 2018. *Envision Concord – Bridge to 2030: Balancing Change with Tradition.* https://concordma.gov/DocumentCenter/View/15249/Cover---Exec-Summary---TOC---Glossary---Intro.



Note: On-airport buildings without a number have been removed since the November 2022 aerial.

North

0 1,000 2,000 Feet

Planning Area
Proposed Airport Property Boundary
Airport Property Boundary
FAA Boundary
Town Boundary

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Summary of Planning Areas

Figure **4-3**

Data Sources: 2022 Hanscom Field ALP, 2023 North Airfield Development ENF, Massport drawing files, McFarland Johnson

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Lexington

The Town of Lexington adopted *Lexington NEXT – Comprehensive Plan* in 2022.[64] Lexington appointed an advisory board to oversee the work, in consultation with Town staff and the Planning Board. As part of the plan development process, Lexington facilitated small group conversations with the public and presented updates on the comprehensive plan regarding demographics, housing trends, transportation, and economic development. The comprehensive plan seeks to include a better understanding of these topics through public and stakeholder input, consideration of the inventory and assessment of existing conditions, as well as professional best practices from other jurisdictions, planning professions, and other relevant disciplines. Lexington intends the comprehensive plan to be a living document as its stated goals entail on-going, long-term processes. To meet the stated goals, planning staff and the planning board are responsible for staying updated with other departments and committees, incorporating appropriate actions into their own work plans, keeping the comprehensive plan up-to-date, and providing an annual "State of the Comprehensive Plan" report within the planning board's annual report.[65]

Given its proximity to Hanscom Field and the AFB relative to Metro Boston, Lexington is focused on potential transportation impacts of Hanscom Field and works with Massport to attempt to mitigate impacts from proposed development and air travel, and to improve vehicle traffic safety at intersections that are high-accident locations. Lexington has recently updated its zoning bylaws in the manufacturing district at the end of Hartwell Avenue, on the east side of Hanscom Field.[66] Rezoning of this area would allow for the development for higher density small-scale residential units, which could impact road traffic in the area. Hanscom Field occupies approximately one acre of land in Lexington. Lexington participates in the Hanscom Field Advisory Commission (HFAC) which is an advisory committee that convenes to discuss items such as annual noise reports, capital programs, and third-party developments.[67]

Lincoln

The Town of Lincoln is the smallest of the four Hanscom Area towns in terms of population and economic base. The Hanscom Field Terminal is in the Town of Lincoln within the airport area referred to as the West Ramp, which, as shown in **Figure 4-3**, comprises approximately half of the airport land within Lincoln.

Lincoln last published its comprehensive plan in 2009, with a second printing in 2010.[68] 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.

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[64] Town of Lexington. September 2022, *Lexington NEXT – Comprehensive Plan,* https://www.lexingtonma.gov/816/Lexington-Next---Comprehensive-Plan

[65] *LexingtonNEXT Comprehensive Plan – Implementation*, https://www.lexingtonma.gov/DocumentCenter/View/6956/14-Implementation?bidId=

[66] Town of Lexington. 2022. *Lexington for Business – Business Toolkit 2022 Resource Guide*. https://www.lexingtonma.gov/DocumentCenter/View/2744/Business-Toolkit-2022-PDF?bidId=

[67] Town of Lexington. "Lexington, MA Public Records Portal – Hanscom Field Advisory Commission", https://records.lexingtonma.gov/WebLink/Browse.aspx?dbid=0&startid=13334&row=1&cr=1

[68] Town of Lincoln. 2009. Comprehensive Plan.

Hanscom Area Towns Coordination

Bedford, Concord, Lexington, and Lincoln established the Hanscom Area Towns Committee (HATS) to review activities that involve Hanscom AFB, Hanscom Field, and other major organizations which operate in the Hanscom Field area. These organizations include the USAF, the NPS, Massport, Lincoln Laboratories, and other private corporations. Through HATS, the four towns coordinate their planning efforts, growth projections, land use plans, and environment protection roles. The original *1985 GEIR*, the *1995 GEIR* Update, the *2000 ESPR*, the *2005 ESPR*, the *2012 ESPR*, the *2017 ESPR*, and now the *2022 ESPR* provide a retrospective analysis of the environmental effects of Hanscom Field while including analyses for future forecasts. HATS prepared a Master Plan in July 1997, soon after the completion of the *1995 GEIR*.[69] The *HATS Master Plan*, as it applies to Hanscom field, was considered during the development of the *2022 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 (a working group comprised of interested, knowledgeable members of the communities surrounding Hanscom Field), and is exploring Transportation Demand Management (TDM) strategies. Rideshare programs and other alternative transportation modes at Hanscom Field are challenging to implement due to the nature of work at the Airport and employees working non-traditional hours (more details on TDM are described in Chapter 6). Massport has also periodically met with NPS to discuss issues of concern and to identify historic resources as described in Chapter 10.

4.1.8 Stakeholder Planning Initiatives

In addition to the associated municipalities, Hanscom Field also has five key stakeholders who are central partners to Massport and the future of Hanscom Field: the FAA, Minute Man National Historical Park (MMNHP), the Hanscom Field Advisory Commission, Hanscom AFB, and the Metropolitan Area Planning Council. Both the MMNHP and Hanscom AFB are located immediately adjacent to Hanscom Field. Activities proposed on the airfield and on their properties can have a direct impact on one another. As a result, Massport engages with the NPS and the USAF periodically to discuss mutually beneficial projects to improve each organization in accordance with their mission.

Federal Aviation Administration (FAA)

Hanscom Field is under the purview of the FAA's New England Region whose regional office is in Burlington, Massachusetts. The FAA participates as a stakeholder and is a central partner to Massport.

The FAA administers the Airports Improvement Program (AIP) that provides grants for planning and development projects, and which is funded through user fees and fuel taxes. The FAA is also responsible for the ramp, ground, local, and departure/arrival air traffic through providing air traffic control and navigation services. Lastly, the FAA is the regulator of the airport and the airspace system to ensure safe and efficient operations at all public-use airports, including Hanscom Field.

Operational and infrastructure improvements require the FAA's review, as the lead agency responsible for compliance with NEPA regulations. The FAA aims to ensure timely and effective environmental reviews of proposed projects at Hanscom Field.

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[69] Hanscom Area Towns Committee. July 1997. Hanscom Area Towns (HATS) Master Plan.

Minute Man National Historical Park (MMNHP)

The MMNHP, created in 1959 and operated by the NPS, consists of the main park (Battle Road) and three additional discontinuous parcels: Barrett House Farm, Wayside, and North Bridge. The main park covers approximately 967 acres spread out along Route 2A in Concord, Lexington, and Lincoln. The congressionally approved boundaries of the MMNHP abut the southern boundary of Hanscom Field and include 48.5 acres of Massport property in the Runway 5 approach area.

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.

Based on the latest data provided by the NPS, nearly a million people visited the MMNHP in 2021.[70] 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 provides additional information about the MMNHP.

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 the NPS. Working cooperatively with the local community, aviation groups, and MMNHP, Massport has developed a noise abatement program for business, commercial, flight school, and private aircraft. The implementation of 'Fly Friendly' flight pattern 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 NPS, the FAA, the flight schools, and the pilots at Hanscom Field, it was determined that small aircraft could reduce the size of the flight pattern in touch-and-go operations that would provide a larger buffer between training operations and the park. Additionally, Massport developed recommended helicopter procedures to help reduce noise over the park. These and other noise abatement efforts are discussed in Chapter 7.

Hanscom Field Advisory Commission

Massport meets with the Hanscom Field Advisory Commission (HFAC) each month to review activities at Hanscom Field. HFAC is an advisory committee that was established by the state legislature in 1980.[71] It includes representatives from residential communities (Bedford, Concord, Lexington, Lincoln, and other towns in the area affected by Hanscom Field), business and general aviation groups, advisory members who represent MMNHP, Hanscom AFB, the FAA, and Massport. The meetings are open to the residents of surrounding towns as well. Massport provides HFAC with information regarding Massport's goals, policies, and plans for its facilities in the future. Massport also reports on monthly and annual operations and noise statistics. The HFAC process affords the community the opportunity to review and comment on projects that are not subject to formal MEPA or NEPA review. Further, it provides the

[70] National Park Service NPS Stats – Annual Park Recreation Visits (1964 – Last Current Year). https://irma.nps.gov/STATS/Reports/park/MIMA, accessed February 2, 2023.
[71] Hanscom Field Advisory Commission Meeting notes. https://www.lincolntown.org/AgendaCenter/Hanscom-Field-Airport-Commission-58

public with an opportunity to comment on proposed projects and issues related to Hanscom Field operations.

Hanscom Air Force Base

Hanscom AFB, which is directly adjacent to Hanscom Field on the southern side of the airfield, occupies 846 acres of land with approximately four million square feet of facilities.[72] Hanscom AFB and the firms that do business at the base are large employers in the region. As of April 2021, there are 10,306 employees who work at HAFB, which includes active duty, Reserve and National Guard military personnel and Department of Defense civilians, contractors who work and live at HAFB, and MIT-Lincoln Laboratory personnel. There are also 731 homes on the AFB, most occupied by Air Force personnel. Additionally, Hanscom AFB supports approximately 130,000 retired military personnel, annuitants, and spouses living in the six-state New England area and New York area. According to information published by the Hanscom AFB, as of April 2018, the total estimated economic impact is approximately $6.03 billion per year.[73] In addition to the primary jobs at Hanscom listed above, there are 10,050 secondary jobs.

The USAF is spending about $277 million to construct a modern laboratory required for development of advanced technologies on the MIT-Lincoln Laboratory campus, located on Hanscom Air Force Base.[74] The USAF expects construction to be complete in 2025 and includes resilient and sustainable infrastructure. In 2019, the USAF completed a new dormitory consisting of a new three-story 66-bedroom 25,000 SF military dormitory.[75]

The Sartain Gate (previously Vandenburg Gate) project continues. Phase I, which involves major road changes, was started in November 2022.[76] The USAF has been working with Massport, MassDOT, MMNHP, and other organizations on the design of the new gate structure and entrance facility that is planned to replace the one at the intersection of Old Bedford Road, Vandenberg Drive, and Hanscom Drive with a roundabout.[77] Along with the improvements to the roadways, a bicycle lane is also included in the design to increase safety for cyclists. As a result of traffic changes, an MBTA bus stop will also be added onto AFB property.

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[72] Hanscom Air Force Base. April 2021. *Hanscom Air Force Base Fact Sheet.* https://www.hanscom.af.mil/About-Us/Fact-Sheets/Display/Article/379461/hanscom-air-force-base/

[73] Hanscom Air Force Base. April 2021. *Hanscom Air Force Base Fact Sheet.* https://www.hanscom.af.mil/About-Us/Fact-Sheets/Display/Article/379461/hanscom-air-force-base/

[74] Mila Cisneros, AFIMSC Public Affairs. February 2022. *Air Force awards construction contract at MIT Lincoln Laboratory Hanscom campus.* https://www.wpafb.af.mil/News/Article-Display/Article/2919024/air-force-awards-construction-contract-at-mit-lincoln-laboratory-hanscom-campus, accessed on March 8, 2023

[75] Ann Marie R. Harvie, USACE. January 2019. *New England District team, partners cut ribbon on new Air Force dormitory*. https://www.nad.usace.army.mil/Media/News-Stories/Article/1756730/new-england-district-team-partners-cut-ribbon-on-new-air-force-dormitory, accessed on Mar. 8, 2023.

[76] Patty Welsh. November 2022. 66th Air Base Group Affairs. *Sartain Gate project work to involve major road shift.* https://www.hanscom.af.mil/News/Article-Display/Article/3205686/sartain-gate-project-work-to-involve-major-road-shift, accessed on Mar. 8, 2023.

[77] U.S. Army Corps of Engineers, U.S. Air Force. 2014. *Environmental Assessment, Hanscom Air Force Base Vandenberg Gate Complex Construction: https://apps.dtic.mil/sti/citations/ADA617409*

Metropolitan Area Planning Council

The MAPC is the regional planning agency for Metro Boston, representing a diverse population of 3.4 million people and 101 cities and towns. MAPC encourages sustainable development practices. The primary areas of focus are land use, transportation, housing and economic development, climate and clean energy, public safety, and municipal administration.

The most recent plan published by the MAPC is called *MetroCommon 2050: Shaping our Region Together*.[78] In 2018, MAPC launched the planning process to develop this update to Greater Boston's regional plan; the plan was published in 2021. The MetroCommon plan aims to improve the lives of people who live and work in the Metro Boston area, up through the year 2050. MetroCommon offers actionable policy recommendations and useful research and tools. MetroCommon identified 70 "Goal Statements" that apply to Metro Boston and are not specifically applicable to Hanscom Field. **Table 4-5** lists noteworthy goal statements from MetroCommon that also pertain to future planning at Hanscom. The current and future use of Hanscom Field is consistent with smart growth principles.[79] **Table 4-6** presents MAPC's 15 Smart Growth principles; the right column indicates each principle's applicability to Hanscom Field.

Table 4-5. Goals Applicable to Hanscom Field for Metro Boston's MetroFuture's Goal Statements

Goal #	Goal Statement
A1	Transit infrastructure is well-maintained and funded, and its capacity is greatly expanded through the improvement of existing service and the strategic addition of new service so that daily travel is convenient, pleasant, and reliable.
A5	Transportation options in the region are net zero for carbon emissions, contributing to improved air quality and reducing negative climate impacts.
A7	All modes of transportation, including innovative technologies, are safely integrated resulting in few transportation-related injuries and zero fatalities annually.
A8	State and local governments work together with businesses and property owners and advocates to create seamless travel throughout the region, including "first mile, last mile" connections.
C3	Critical systems, including energy supply and distribution, communications, water, and transportation are designed to continue functioning during, or quickly rebound after, severe storm events.
D4	All new construction and major renovation projects meet net zero emissions standards for heating, cooling, and electricity needs by 2030. Existing buildings meet this standard by 2050.
D5	Air, heavy-duty freight, and marine transportation have significantly reduced carbon emissions, and are providing carbon offsets.
Source: Metropolitan Area Planning Council 2021, MetroCommon 2050	

78 Metropolitan Area Planning Council. 2018. *MetroCommon 2050*. https://metrocommon.mapc.org/read-the-plan.

79 According to the MAPC, smart growth includes "sound municipal management, sustainable land use, protection of natural resources, efficient and affordable transportation, diverse housing stock, public safety, economic development, clean energy, healthy communities, an informed public, and equity and opportunity among people of all backgrounds", https://www.mapc.org/aboutus/#missionsgp.

Table 4-6. MAPC Smart Growth Principles and their Applicability to Hanscom Field

Principle	Response/Applicability
1) Encourage community and stakeholder collaboration in development decisions	Massport is engaged in ongoing meetings and discussions with the four towns through the Hanscom Field Advisory Commission (HFAC) and Hanscom Area Towns Committee (HATS).
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	Hanscom Field offers air travel service for residents and businesses in the surrounding region who would otherwise be traveling greater distances to another airport.
4) Strengthen regional cooperation	Massport is engaged in ongoing community discussions through the HFAC process.
5) Promote distinctive, attractive communities with a strong sense of place	Hanscom Field encourages community involvement and input into the airport's development plan to ensure that any negative impacts are minimized.
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. In addition, Massport maintains open space/trails at Hanscom Field.
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. Massport encourages any new development at Hanscom Field to occur in areas of previous development, if possible.
8) Mix land uses	Hanscom Field incorporates a blend of land uses that align with airport operations, promoting economic growth in the airport vicinity and encouraging efforts towards managing transportation demand.
9) Take advantage of compact development design and create walkable neighborhoods	The Town of Bedford encourages assessing the feasibility of adding sidewalks and bike lanes on Hartwell Road.
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 in the region and provides jobs for area residents. Massport is a responsible manager of the environmental resources at Hanscom Field. Massport requires third-party development as well as its own development at Hanscom Field to achieve sustainability goals.
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 another airport.
13) Develop predictable, fair, and cost-effective regulatory approvals for smart growth-oriented developments	Not Applicable.

Principle	Response/Applicability
14) Encourage fiscal policies that support smart growth.	Massport is guided by fiscal prudence with respect to plans for smart growth at Hanscom Field.
15) Enable smart growth by reforming existing zoning	Not Applicable.
Source: MAPC, Smart Growth Principles for the Metropolitan Area Planning Commission, 2023	

4.2 Airport Planning

This *2022 ESPR* includes a series of conceptual plans developed as options to meet potential future demand associated with the forecast of activity as described in Chapter 3. The planning concepts represent a vision of what could occur, not necessarily what will occur, and they provide a basis for consideration of potential future environmental and operating impacts. These concepts place a priority on sustainable development, including the reuse of existing facilities and developed land, fiscal prudence, and natural resource conservation.

4.2.1 Description of Existing Conditions and Planning Areas

For the purposes of the *2022 ESPR*, as with earlier ESPRs, this chapter divides Hanscom Field into planning areas based on geographic considerations, to facilitate the discussion of planning for future aviation-related facilities and the evaluation of the conceptual 2030 and 2040 development concepts.

Third-party developers undertake most of the development at Hanscom Field. In preparing the *2022 ESPR* and assessing locations for future development, Massport must consider a range of aviation-compatible and non-aviation-compatible development types and to identify a variety of sites capable of accommodating future development opportunities. Massport assesses development areas at Hanscom Field that can meet all safety and security requirements with the fewest environmental impacts. This includes protecting all land required by FAA safety regulations (e.g., runway safety areas, object free areas).

This *2022 ESPR* follows a similar planning method to those outlined in earlier ESPRs with a few differences. The *2012 ESPR* divided Hanscom Field into six planning areas: North Airfield, East Ramp, Terminal Area, ATCT Apron, Pine Hill, and West Airfield. The *2017 ESPR* made three key planning area changes:

- ATCT Apron, which was a new planning area identified in the *2012 ESPR,* merged into the East Ramp planning area,
- Separated the prior North Airfield area split into two planning areas North and Northeast Airfields, west and east of Runway 5/23, respectively, and
- The Terminal area merged into the West Ramp planning area.

Five planning areas in 2022 ESPR (shown in Figure 4-3):

- North Airfield
- Northeast Airfield
- East Ramp
- West Ramp
- Pine Hill

This *2022 ESPR* will describes the North Airfield, Northeast Airfield, East Ramp, West Ramp, and the Pine Hill planning areas as shown in Figure 4-3. These are the same areas outlined in the *2017 ESPR*.

North Airfield

The North Airfield encompasses property northwest of Runway 11/29, with a focus on sites accessible from Taxiway R. Raytheon operated a 16-acre section on the eastern portion of North Airfield until 2000. It includes connected aviation hangars and associated aprons. Massport had worked with the General Services Administration (GSA) regarding a transfer of ownership for this property; however, in April 2018, this effort was discontinued. As previously noted, the Navy sold its Hangar site at public auction administered by the GSA in February 2019 to Runway Realty Ventures LLC. Development of the land by third parties would be governed by federal, state, and local regulations, subject to FAA review. Edge Sports leases a portion of the North Airfield site north of Hartwell Road from Massport and two synthetic turf athletic fields were constructed in 2013 adjacent to their existing facility.

Massport issued a request for proposal for the development of the North Airfield in 2021. Massport selected North Airfield Ventures, LLC as the developer of the North Airfield in 2022. In January 2023, Runway Realty Ventures LLC and North Airfield Ventures, LLC submitted an Environmental Notification Form (ENF) for the North Airfield Development to the MEPA Office. The ENF describes development proposed for part of the North Airfield area.[80] The proponents filed a Draft Environmental Impact Report (DEIR) in March 2024.

There is a future planning initiative for Massport to rehabilitate Taxiway R pavement to include compliance with FAA mandated airfield geometry. Adjacent to Taxiway R, construction of four box hangar buildings (Buildings 46–49) was completed in 2022. Massport may build two additional hangars in the future.

Northeast Airfield

Massport leases a large portion of the Northeast Airfield to the USAF. This lease area was identified in the *2017 ESPR* as an aviation-compatible development area. The Northeast Airfield site houses the FamCamp, a Recreational Vehicle (RV) campsite open to military personnel, including employees of Hanscom AFB. FamCamp offers RV sites, most equipped with water, sewer, and electric hookups. Additionally, there is a USAF water treatment facility on this property.

The Northeast Airfield is primarily comprised of wooded open space on the airport property. Massport modifications pertaining to the Northeast Airfield area were included in the *2005, 2012,* and *2017 ESPRs*. Massport has not included any new planned facilities east of Runway 5/23 in previous ESPRs.

East Ramp

The East Ramp includes the apron and hangar facilities in the area southeast of the Runway 11/29 and Runway 5/23 intersection and properties previously identified as the ATCT apron. Grenier Street and the Shawsheen River in Lexington and Bedford bound the East Ramp on the east side. Taxiway S and the ATCT bound it on the west. A mix of Hanscom AFB and Massport property hangars occupy the southern edge of the East Ramp. Signature Flight Support, a Fixed Base Operator (FBO), occupies Hangars 1, 2, 3, and 12 on Massport property. Additionally, the Hanscom Aero Club, Hanscom AFB Fire Department, an

[80] *L.G. Hanscom Field North Airfield Development Environmental Notification Form*. January 2023, accessed on Feb. 13, 2023 at https://www.dropbox.com/s/h9q7vh5gy2bh5cd/Hanscom%20North%20Airfield_ENF-011723.pdf?dl=0

FBO fuel farm, the ARFF/CBP Facility, MIT's Lincoln Laboratory Flight Facility, and Massport's fueling facility are in the East Ramp area. Other East Ramp facilities include sand storage, FAA equipment storage, and navigational aids. The ATCT, Massport Field Maintenance, and ARFF/CBP Facility occupy the western portion of the East Ramp. The CBP relocation from the eastern edge of the East Ramp to a new location shared with the ARFF (just north of the ATCT) was completed in 2019, and staff moved into the new facility in 2020.

Massport does not have direct landside access to the East Ramp, as Hanscom AFB and other stakeholder properties surround it. Currently, the USAF controls access to the East Ramp through the AFB main gate on Vandenberg Drive (not shown on Figure 4-6). Airside access occurs at gates adjacent to Hangar 3 and the Field Maintenance facility.

West Ramp

The West Ramp is bounded on the north by the East Ramp and ATCT. Virginia Road and Old Bedford Road bound the West Ramp on the south. Hanscom AFB establishes the east boundary for the West Ramp. Primary landside access is provided from Hanscom Drive and Old Bedford Road. The West Ramp includes the Hanscom Field Terminal and supporting facilities such as public parking, FBOs, flight schools, T-Hangars, airport maintenance buildings, fuel farms, and privately-operated facilities.

The *2005 ESPR* identified the West Ramp (then called the Terminal Area) as a potential site for new GA facilities and a hotel with parking spaces. It also recommended relocating the T-Hangars to the East Ramp. The *2012 ESPR* identified this area as the potential new home of the Air and Space Museum with additional GA and corporate aviation facilities. The *2017 ESPR* identified potential changes to the West Ramp such as upgrade or replacement of corporate hangars with new aircraft parking spaces. The *2017 ESPR* also documented the plan to relocate the salt storage facility as well as enhance the Hanscom Field Terminal.

Based on current planning initiatives for the West Ramp, Massport scheduled Hanscom Field Terminal renovations to begin in 2023. The relocation of the salt storage facility is set to begin in 2024. Long-term planning initiatives include a West Ramp rehabilitation proposed for 2028 and a rehabilitation of Taxiway M proposed for 2029. In 2022, Signature Flight Support started construction of a new hangar to the east of the Hanscom Field Terminal which will replace the existing Building 14. Portions of the West Ramp are to be protected for aviation compatible land use.

Pine Hill

The Pine Hill planning area is located southwest of the Runway 11/29 and Runway 5/23 intersection and is served on the airside by Taxiway M. It is the smallest planning area, bounded on the west by the airport property line. Landside access is limited, provided from Virginia Road.

The *2005 ESPR* recommended that new GA facilities including hangars and ramps with parking spaces be built in the Pine Hill area. The *2012* and *2017 ESPRs* included the Ross Rectrix BED, LLC dba Atlantic Aviation FBO facility as part of the Pine Hill planning area. Atlantic Aviation initiated construction of its Pine Hill hangar facility in 2022 with removal of the T-Hangar buildings. Construction of the Atlantic Aviation facility is expected to be finalized in 2024.

4.2.2 Current Sustainability Initiatives

To inform the planning and site development processes, Massport reviews forecasts of future aviation activity and future operations by different types of aircraft (e.g., single engine piston, jet) to inform plans for airfield development. For example, Massport reviews airfield geometry to ensure that it meets the FAA standards for the critical aircraft operating on various portions of the Airport. In close coordination with the FAA, Massport has recently conducted a review of airfield geometry with the goal of mitigating the risk of runway incursions.

Massport promotes development of its facilities in a sustainable manner and takes steps to minimize the environmental impacts of Hanscom Field. Massport's progressive environmental program and policies are described in Chapter 11 of this *2022 ESPR.* Massport 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 design. New facilities at Hanscom Field must meet certain energy efficiency and sustainable design standards and achieve the U.S. Green Building Council's (USGBC) Leadership in Energy and Environment Design (LEED) Silver Certification.[81] In 2021, Signature Flight Support began construction of a replacement FBO facility (Phase 1 of the Signature Campus Redevelopment Plan), along with repairs and renovations to existing hangars (Phase 2 of the Signature Campus Redevelopment Plan). Additional information can be found in Section 11.3.1 Sustainable Planning, Design, and Construction.

Massport has initiated projects since the *2017 ESPR* including the rehabilitation of the East Ramp, Hanscom Field Terminal upgrades, construction of the new CBP facility, replacement of South T-Hangar rows, construction of a new hangar facility in the Pine Hill area, and various other maintenance activities at Hanscom Field. Massport will continue to describe planned and potential projects in this and forthcoming ESPRs.

4.2.3 Facility and Infrastructure Requirements

The forecasts of aviation activity levels discussed in Chapter 3 project that much of the operational growth at Hanscom Field will be related to the business aviation segment of the market.

Facility requirements are derived, in part, from the number of based aircraft expected to be located at the Airport, which are provided in Chapter 3. In 2022, 284 aircraft were based at Hanscom Field. A breakdown of the aircraft types is provided in **Table 4-7**. Using the forecast growth rates for each aircraft type, based aircraft projections for 2030 and 2040 are provided in the table.

T-Hangar occupancy was reviewed to determine the future facility needs for single engine piston aircraft. The current occupancy of the 68 stalls comprising the six rows of nine existing T-Hangar buildings is 100 percent. Massport relocated the larger single-engine aircraft that used to reside in the Pine Hill T-Hangars to the new North Airfield box hangar development, which is also at 100 percent occupancy. Over 50 people are on waitlists for both the larger and smaller aircraft hangars.

[81] LEED is an internationally recognized green building rating system that is credit-based, with different certification levels awarded depending on number of credits achieved. More information at https://new.usgbc.org/leed.

Table 4-7. Existing and Forecast Based Aircraft at Hanscom Field

Aircraft Type	Based Aircraft in 2022	Based Aircraft Forecast	
		2030	2040
Single Engine	182	169	158
Multi Engine	11	11	11
Jet	77	97	122
Helicopter	14	16	18
TOTAL	284	293	310
Sources: Massport, forecast McFarland Johnson 2023			

In addition, corporate and FBO hangar occupancy was evaluated. The three FBOs at Hanscom Field, which primarily store jets, are oversold for occupancy, and have waitlists. The three corporate hangars located on the East Ramp, West Ramp, and Pine Hill are at 100 percent occupancy with jet aircraft as well. The FBOs on the Airport have been turning away customers who are seeking aircraft storage space. These capacity constraints can result in additional aircraft operations at Hanscom Field because aircraft must be ferried from hangars at other airports to serve customers at Hanscom Field. What would be one arrival and one departure operation instead becomes two arrival and two departure operations if the aircraft cannot remain at the airfield.

Based on the occupancy and fleet mix, the facility requirements project a continued capacity shortfall for corporate and FBO hangar space. Further, T-Hangars A, B, and C reached the end of their useful life and construction of replacement hangars has been completed. No additional capacity for T-Hangars or tie-downs is expected before 2030, but existing hangars will be replaced or relocated as they reach the end of their useful life.

New corporate and FBO hangars must be capable of accommodating jets as well as turboprops. Given the proposed fleet mix, approximately 7,500 SF of hangar area is estimated per based jet aircraft and 5,500 SF per based multi-engine aircraft. The approximate hangar size was calculated based on the most common aircraft's wingspan and length in each class of aircraft, with a buffer for wingspan and tail/nose clearance included per FAA guidance.[82] With the expected growth in based aircraft of 20 business jets and two helicopters in 2030, approximately 160,000 additional SF of hangars would be required. Between 2030 and 2040, a projected increase of 25 more business jets and two more helicopters results in the need for an additional 198,000 additional SF of hangars. This calculation is based on the business jet growth rate for based aircraft published in the FAA's Aerospace Forecast[83]; it is not a specific development at Hanscom Field. Should actual growth differ from the forecast, resulting demand will dictate the need for and growth of hangar space.

Future airport planning concepts are based on:

- Forecasts of aviation activity level discussed in Chapter 3 that drive facility requirements,
- Infrastructure conditions described in Chapter 2, and
- Market and industry forces and disrupters that shape and alter demand for airport facilities and infrastructure.

[82] FAA Advisory Circular 150/5300-13B
[83] FAA Aerospace Forecast: https://www.faa.gov/data_research/aviation/aerospace_forecasts

4.2.4 Development Areas to Meet Demand

This section describes the characteristics of the potential future planning concepts for the 2030 and the 2040 scenarios. The potential development opportunity areas are shown in Figure 4-3.

The planning concepts under consideration provide flexibility to respond to the anticipated variability of future demand in a coordinated fashion. The 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 planning to the proposal stage whenever MEPA, NEPA, or other regulatory thresholds are triggered. However, because third-party developers complete most new development at Hanscom Field, Massport's planning is intended to be flexible and able to respond to changing conditions and regional demands.

General approach to identifying development sites in each of the five planning/development areas:

- Optimizing Pine Hill facilities given limited available geometry of this area.
- Accommodating aviation-related facilities on the East Ramp, which includes maximizing the use of the existing apron area.
- Development of an Airside Utility Study which includes potential improvements associated with the North Airfield.
- Upgrading the Hanscom Field Terminal to prioritize passenger safety, and overall efficiency, sustainability, and resiliency.

The following discussion of development sites presents a general context for the future planning of potential GA facility development. The array of GA hangars identified in **Table 4-8** exceeds the expressed facility requirements in Section 4.2.3 for aircraft storage for both the 2030 and 2040 scenarios, while providing a range of potential development options. This range accounts for the inherent uncertainty of future GA demand and allows Massport to facilitate GA hangars as demand materializes. The concepts for the Hanscom Field planning areas provide a basis to evaluate the range of cumulative environmental impacts of these potential development options under the 2030 and 2040 concepts. The exact locations and layouts of the proposed development are subject to change.

Table 4-8. Hanscom Field Planning Concepts for 2030 and 2040

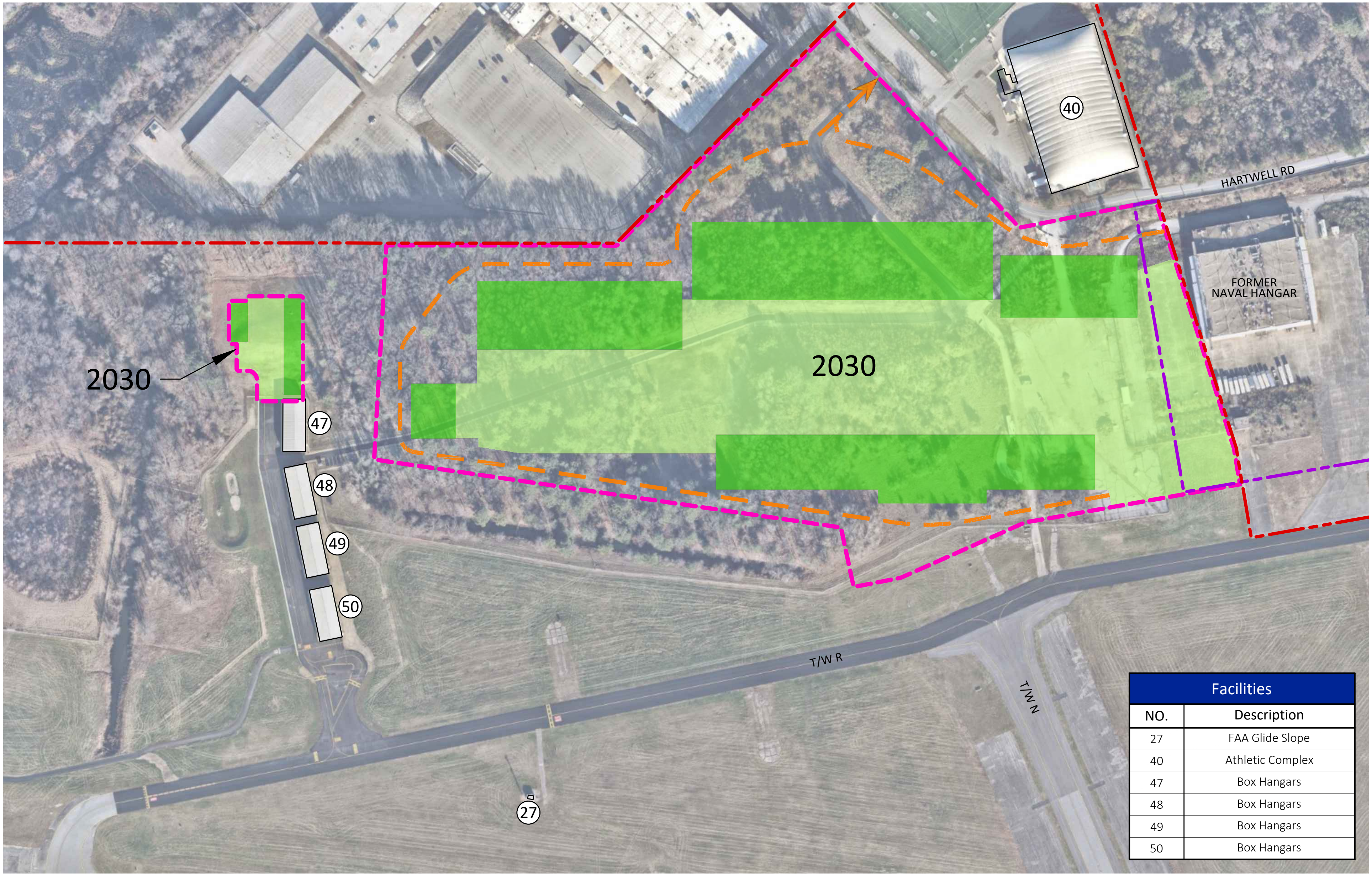
Planning Area	2022 Existing Uses	2030 Concepts (2022–2030 development)	2040 Concepts (2031–2040 development)
North Airfield	Box hangar buildings	• GA and corporate hangars with aircraft parking • Taxiway R pavement maintenance and geometry improvements	None
Northeast Airfield	Currently vacant	Potential aeronautical development	Potential aeronautical development
East Ramp	General aviation, including FBO and fueling facilities	• Expansion of the fuel farm • Taxiway E rehabilitation • Sand storage facility relocation • Expansion of the airport maintenance facility • Hangar improvements • Corporate hangar facilities	Potential aeronautical development
West Ramp	GA, including FBO and T-Hangars, Hanscom Field Terminal	• Salt storage facility relocation • Hanscom Field Terminal enhancements • West Ramp rehabilitation • Taxiway M (South) rehabilitation and geometry improvement • Potential aviation compatible development	• Hanscom Field Terminal enhancements • New and replacement structured public parking spaces as needed • Fuel farm expansion • Hangar upgrades • Potential aviation compatible development
Pine Hill	General aviation including T-Hangar FBO	• Corporate facilities with new aircraft parking spaces • Taxiway E rehabilitation • Runway 23 departure engineering materials arresting system (EMAS) • Taxiway M (North) rehabilitation and geometry improvements	Potential aeronautical development
Sources: Hanscom Field Capital Improvement Plan (ACIP) FY 22 – FY29, September 2022 Update and Hanscom Field Final Board Capital Improvement Plan (CIP) FY23–FY27			

North Airfield

Figure 4-4 illustrates the forecast planning concepts for the North Airfield, which include new GA and corporate hangar facilities, primarily along Taxiway R and Hartwell Road. The development site is approximately 15 acres and abuts the U.S. Navy Hangar to the east. In March 2019, the federal government sold their Navy Hangar site at public auction administered by the GSA; an upgrade to the former Navy Hangar and building of new hangars is included in the North Airfield Development ENF. Figure 4-4 does not portray the final site design. The development of this land by third parties would be governed by federal and state regulations.

Atlantic Aviation demolished the T-Hangars on the Pine Hill site and Massport constructed replacement box hangars (Buildings 46–49) in the North Airfield. Before 2030, additional box hangars could be constructed adjacent to the newly constructed box hangars. To prepare for future development on this site, an EA for the development of aviation facility projects on the North Airfield was completed in September 2018. This EA and the subsequent Finding of No Significant Impact (FONSI) by the FAA found that proposed developments were consistent with national policies and other applicable environmental requirements, and they will not affect the quality of the human environment.

Additionally, multiple corporate hangars are proposed in the 2030 concept in the North Airfield site as identified in the January 2023 ENF (subject to change). The DEIR was filed in March 2024.



Facilities	
NO.	Description
27	FAA Glide Slope
40	Athletic Complex
47	Box Hangars
48	Box Hangars
49	Box Hangars
50	Box Hangars

Note: Exact location and layout of proposed development is subject to change.

North

0 300 600 Feet

2030 Planning Scenario
Potential Hangar Development
Pavement Development
Proposed Ground Vehicle Pavement
Proposed Airport Property Boundary
Airport Property Boundary

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2022 Environmental Status & Planning Report

North Airfield Planning Concepts

Figure **4-4**

Data Sources: 2022 Hanscom Field ALP, 2023 North Airfield Development ENF, Massport drawing files, McFarland Johnson

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Northeast Airfield

Figure 4-5 illustrates the planning concepts for the Northeast Airfield. The area located adjacent to Taxiway G should be preserved for future aeronautical use in the 2030 planning concept. Massport owns this property and leases it to the USAF. The lease is expected to expire in 2027. Landside access would be provided from South Road, and airfield access would be provided from Taxiway G. This site is isolated from the other developments on the Airport and would also require clearing of the FamCamp RV campsite.

The parcel along south Road parallel to Runway 11/29 should be protected for future aeronautical use in the 2040 planning concept.

East Ramp

Figure 4-6 illustrates the planning concepts for the East Ramp. The concepts include proposed GA and corporate hangar facilities, reconfigured aircraft access from Taxiway E, and a landside connection that would not require controlled access through the Hanscom AFB. The East Ramp is a suitable site for hangar development because the apron, taxiway, and utility infrastructure are already available.

Recent developments have already occurred near the ATCT. Massport constructed new ARFF facilities and U.S. CBP facilities just north of the ATCT. The field maintenance facility, currently located just south of the ATCT, is proposed to be expanded based on the 2040 planning concepts. There are limited additional opportunities to expand on the western portion of the East Ramp beyond the proposed projects.

Signature Flight Support’s campus redevelopment plan includes the renovation of Hangars 1, 2, and 3 located on Massport property and expansion of the fuel facility.

Any development along the East Ramp would need to be reviewed with respect to the line-of-sight from the ATCT and 14 CFR Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace (imaginary airspace surfaces emanating from Runway 11/29). Neither the surfaces nor the line-of-sight requirements are likely to present a considerable constraint to aviation development on the site.

As discussed in the description of the planning areas, the East Ramp does not have direct landside access without passing through the AFB and its multiple layers of security vetting and credential checks. Future access to the East Ramp could include escorted travel from a point near the Hanscom Field Terminal, through the Hanscom AFB, or via a new roadway connection from Hartwell Avenue. Potential alignments for direct access between Hartwell Avenue and the East Ramp are provided in Chapter 6; these alignments have been presented in previous *ESPR*s dating back to 2000.

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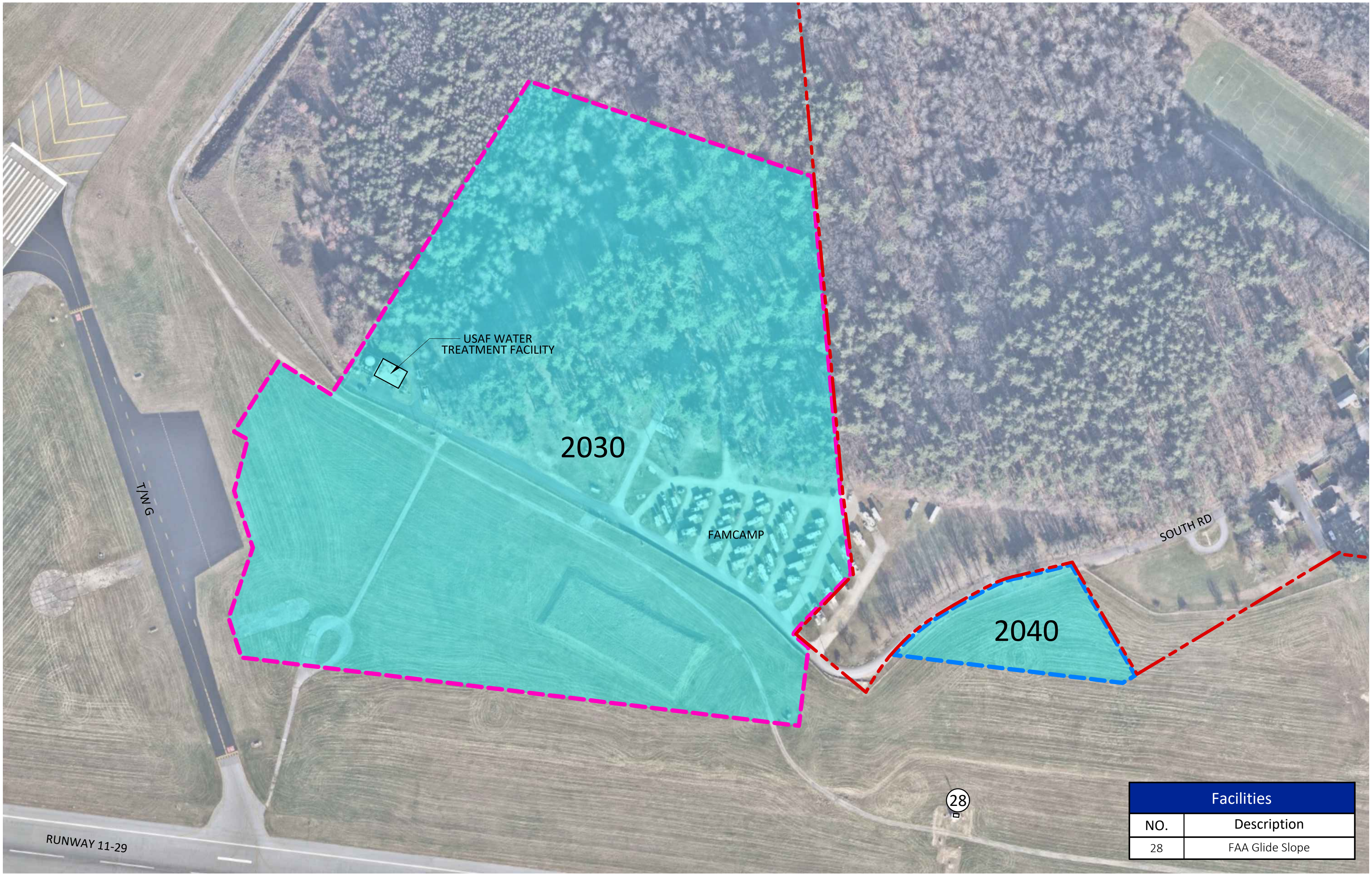

Facilities	
NO.	Description
28	FAA Glide Slope

Note: Exact location and layout of proposed development is subject to change.

North

0 300 600 Feet

2030 Planning Scenario
2040 Planning Scenario
Aeronautical Use
Airport Property Boundary

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2022 Environmental Status & Planning Report

Northeast Airfield Planning Concepts

Figure **4-5**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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Facilities	
NO.	Description
1	Hangar 1
2	Hangar 2
3	Hangar 3
7	Field Maintenance Garage
7B	Airport Maintenance
8	FAA ATCT
8A	FAA SSC/Tech Ops
30	USCBP / ARFF

Note: Exact location and layout of proposed development is subject to change.

North

0 400 800 Feet

2030 Planning Scenario
2040 Planning Scenario
Aeronautical Use
Potential Hangar Development
Airport Property Boundary
FAA Boundary

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2022 Environmental Status & Planning Report

East Ramp Planning Concepts

Figure **4-6**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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West Ramp

Figure 4-7 illustrates planning concepts for the West Ramp, which focuses on the terminal area off Hanscom Drive. West Ramp concepts include improvements in and around the Hanscom Field Terminal, an ongoing corporate hangar facility project, existing hangar renovations, and strategic reserve areas located along the main entrance roadway corridor to the terminal area. Non-aeronautical developments (which are aviation compatible) within the strategic reserve area could include offices, hotels, museums, or other commercial opportunities, as have been mentioned in the *2012* and *2017 ESPRs*.

With increased demands in the terminal area, especially if scheduled commercial service returns during the planning period, alternative parking sites should be identified. The 2022 ALP shows the planned removal of the maintenance garage, which is currently in the Hanscom Field Terminal parking lot. This will occur when the East Ramp ground service equipment (GSE) building expansion is completed. The garage removal would allow the opportunity for additional automobile parking spaces near the Hanscom Field Terminal and Building 17. Jet Aviation is planning to implement EV charging stations near their FBO main facility over the next 2–10 years. Relocating the salt storage facility from the south end of the existing parking lot to a site near the Hanscom Drive and Vandenberg Drive intersection would improve environmental controls and allow for replacement of surface parking facilities adjacent to the new Jet Aviation Hangar. The West Ramp planning concepts also show the construction of a new/relocated salt shed along Vandenburg Road. As demand warrants in the longer-term 2040 concept, structured parking may be required adjacent to the Hanscom Field Terminal. The pavement development in the West Ramp includes both additional aircraft parking spaces when the new Building 14 is completed and when the existing Building 14 is removed. Additionally, pavement rehabilitation and reconfiguration may be necessary due to Hanscom Field's changing aircraft fleet mix. It is anticipated that in the 2030 and 2040 planning concepts, a new Jet A fuel tank will be added to both the Atlantic and Jet Aviation fuel farms.

Jet Aviation's main facility, Hangar 21, includes an FBO facility and aircraft storage. As space is limited around the FBO building, Jet Aviation is focused on internal/cosmetic upgrades for the facility in 2024. Jet Aviation is currently upgrading the exterior lighting on the facility and expects to complete this project by the end of 2023. Along with the interior upgrades to their FBO, Jet Aviation plans to construct a cold equipment storage shed located in its GSE Garage within the next five years.

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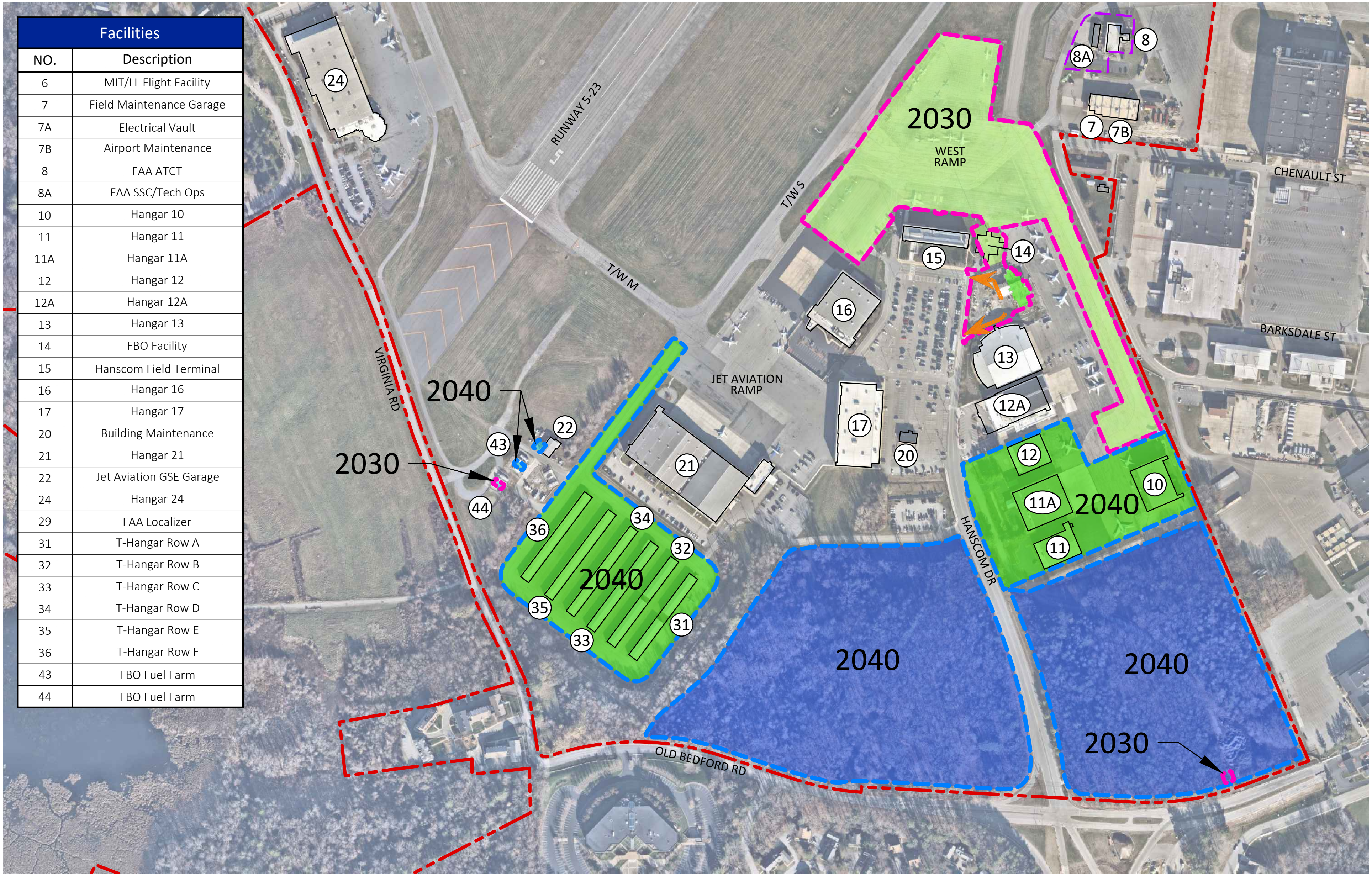

Facilities	
NO.	Description
6	MIT/LL Flight Facility
7	Field Maintenance Garage
7A	Electrical Vault
7B	Airport Maintenance
8	FAA ATCT
8A	FAA SSC/Tech Ops
10	Hangar 10
11	Hangar 11
11A	Hangar 11A
12	Hangar 12
12A	Hangar 12A
13	Hangar 13
14	FBO Facility
15	Hanscom Field Terminal
16	Hangar 16
17	Hangar 17
20	Building Maintenance
21	Hangar 21
22	Jet Aviation GSE Garage
24	Hangar 24
29	FAA Localizer
31	T-Hangar Row A
32	T-Hangar Row B
33	T-Hangar Row C
34	T-Hangar Row D
35	T-Hangar Row E
36	T-Hangar Row F
43	FBO Fuel Farm
44	FBO Fuel Farm

Note: Exact location and layout of proposed development is subject to change.

North

0 500 1,000 Feet

2030 Planning Scenario
2040 Planning Scenario
Aeronautical Use
Aviation Compatible Development Parcel
Potential Hangar Development
Pavement Development
Proposed Ground Vehicle Pavement
Airport Property Boundary
FAA Boundary

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2022 Environmental Status & Planning Report

West Ramp Planning Concepts

Figure **4-7**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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Massport should maintain property along the southern edge of Hanscom Field, along Old Bedford Road and Vandenberg Drive, as strategic reserves for future aviation compatible use. Several wetlands exist in these parcels, so the specific parameters of development would have to be further evaluated to avoid, minimize, or mitigate any potential environmental impacts. In addition, Hanscom AFB is relocating its main gate on Vandenberg Drive to the west of the current location, just before Hanscom Drive. The new gate limits landside access to the future development sites on the west side of the southern edge of Hanscom Field, but access to Hanscom Field would be maintained via Hanscom Drive.[84]

Pine Hill

Figure 4-8 illustrates the planning concepts for the Pine Hill development site. The development area on Pine Hill consists of about 14.5 acres.

As part of the recent Hanscom Aviation Facility Improvements Project, the three T-Hangars (former Buildings 37–39 not shown on Figure 4-8) north of Hangar 24 were removed. New hangars were built in the North Airfield to relocate the larger of the T-Hangar aircraft tenants. The remaining T-Hangar tenants were relocated to the West Ramp T-Hangar buildings. The removal of the T-Hangar buildings opened up over 100,000 SF of GA development space for additional aviation development.[85] The new Atlantic Aviation development in this area includes a 60,000 SF hangar and a 20,000 SF guest and office space. Vehicle access will continue to occur from Virginia Road.

[84] Depart of the Air Force. January 2023. *Draft Environmental Assessment (EA) for New Access Control Facility for Ruiz Gate at Hanscom Air Force Base*, Massachusetts https://www.hanscom.af.mil/Portals/57/documents/CE%20EAs/Draft%20EA%20Ruiz%20Gate_FINAL_20230203.pdf?ver=UsM69bL3lfEYwbR7aEmawA%3D%3D, accessed March 24, 2023.
[85] Massport. September 2018. *Environmental Assessment, L.G. Hanscom Field Aviation Facilities Improvements Project.* *https://www.massport.com/media/2970/hanscom-final-ea-facility-improvements-9-26-18.pdf*

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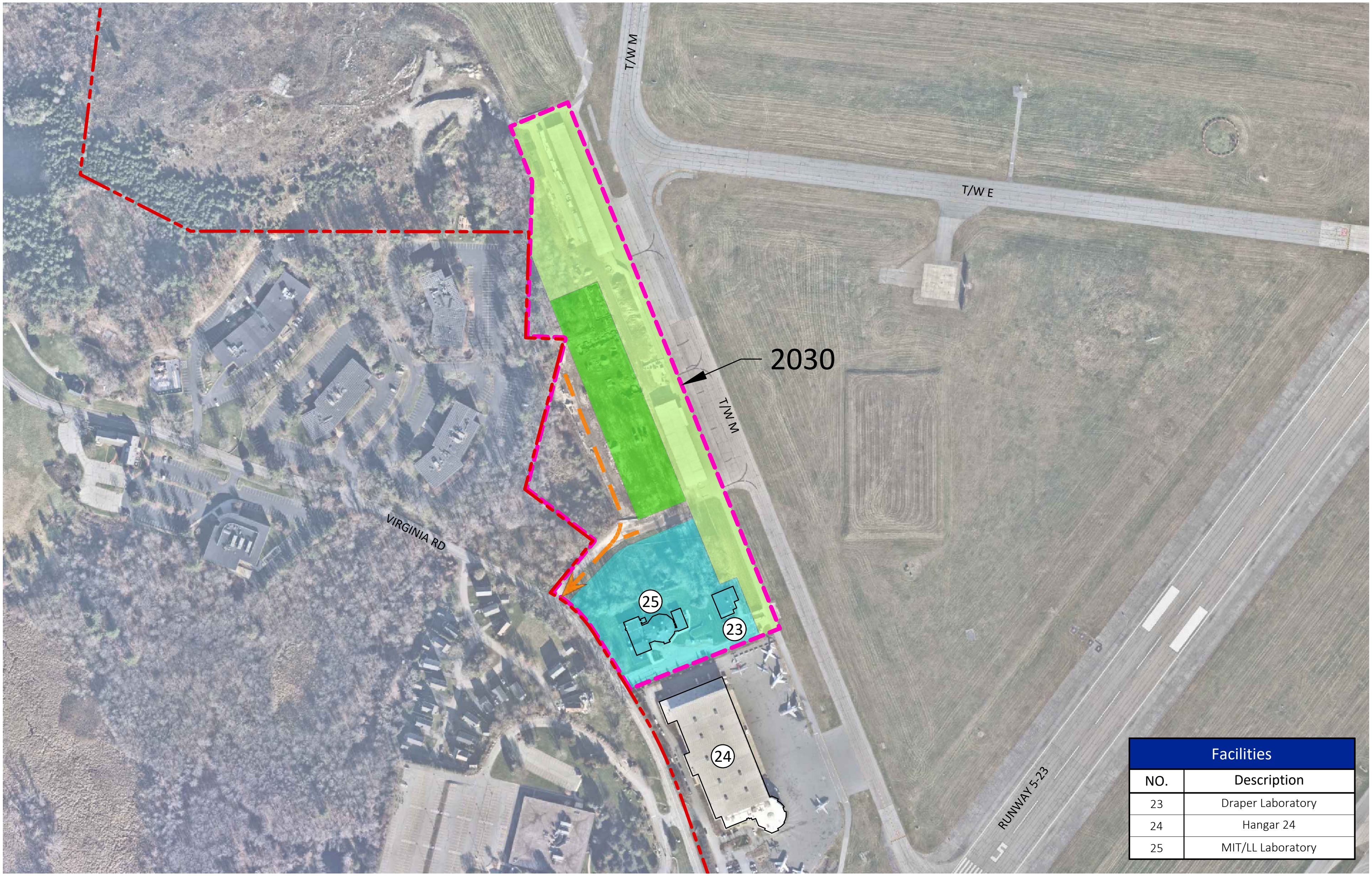

Facilities	
NO.	Description
23	Draper Laboratory
24	Hangar 24
25	MIT/LL Laboratory

Note: Exact location and layout of proposed development is subject to change.
On-airport buildings without a number have been removed since the November 2022 aerial.

North

0 400 800 Feet

- 2030 Planning Scenario
- Aeronautical Use
- Potential Hangar Development
- Pavement Development
- Proposed Ground Vehicle Pavement
- Airport Property Boundary

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L. G. Hanscom Field

2022 Environmental Status & Planning Report

Pine Hill Planning Concepts

Figure **4-8**

Data Sources: 2022 Hanscom Field ALP, Massport drawing files, McFarland Johnson

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4.2.5 Five-Year Capital Improvement Program

Massport's five-year capital improvement program spanning from FY 2023 to FY 2027 contains various projects such as T-Hangar relocations, Hanscom Field Terminal renovations, taxiway and apron pavement rehabilitation, and new equipment as identified in **Table 4-9**. Massport would file an EIR for the projects in the capital improvement program at Hanscom Field requiring MEPA review as shown in Table 4-9; Massport may bundle some of these projects.

Table 4-9. Current Hanscom Field Planning Initiative Projects

Planning Area	Current Planning Initiatives/Projects	Timing	MEPA Review[1]	NEPA Review[2]
North Airfield	Taxiway R between Runways 11 and 23 Runway Hold Position Maintenance; Taxiway G North Maintenance	FY23	ENF[4]	CatEx[5]
	North Airfield Hangars	FY23	ENF completed; EIR underway	EA
	Airside Utility Study and Improvements – North Airfield	FY24	Not required	CatEx[6]
	Taxiway R Geometry Improvements and Vehicle Service Road	FY30	ENF[3]	EA
East Ramp	Airside Utility Study and Improvements – East Ramp	FY24	Not required	CatEx[6]
	Rehabilitate Employee Areas in Maintenance Garage	FY24-25	None anticipated	CatEx issued
	Taxiway E Rehabilitation and associated Geometry Improvements, including Taxiway E5	FY24-FY27	ENF[3]	EA
West Ramp	Hanscom Field Terminal Electricity Capacity Upgrade – Phase 1	FY23-24	None anticipated	CatEx[5]
	Salt Storage Relocation and Hanscom Field Terminal Parking Expansion	FY24	Possible ENF	None
	Hanscom Field Terminal Architectural and Security Upgrades	FY23-26	None anticipated	CatEx[5]
	West Ramp Rehabilitation	FY29	None anticipated	CatEx[5]
Pine Hill	Rehabilitate Taxiway M from Runway 5 to Runway 11 with Geometry Improvements	FY30+	ENF[4]	CatEx[5]
Other	Drain Study	FY23	None anticipated	CatEx[6]
	Airfield Equipment Replacement	FY23-FY26	None anticipated	CatEx[6]
	Drainage Improvements Phase II	FY23-24	None anticipated	CatEx[5, 6]
	Rehabilitate Runway 5/23 with Lighting, EMAS, and Geometry Improvements	FY23-FY27	ENF[3]	EA

Planning Area	Current Planning Initiatives/Projects	Timing	MEPA Review[1]	NEPA Review[2]
	Water Gates and Hydrants – Selective Replacement	FY23-26	None anticipated	CatEx[6]
	Engine 53 Replacement	FY24	None anticipated	CatEx
	Small Aircraft Surveillance System	FY25	None anticipated	CatEx
	Capital Equipment Contingency	FY23-FY27	None anticipated	CatEx[6]
	Rehabilitate and Improve Geometry on Taxiway M South from Runway 5 to Taxiway S	FY30+	ENF[3]	CatEx[5]

Notes:
1. MEPA requirements are described in 310 CMR 11.00; ENF = Environmental Notification Form, EIR = Environmental Impact Report
2. NEPA requirements described in FAA Order 1050.1F and FAA Order 5050.4B; CatEx = Categorical Exclusion; EA = Environmental Assessment.
3. Determination of a potential EIR will be made as part of the permitting process.
4. Determination of a potential ENF will be made as part of the permitting process.
5. Determination of a potential EA will be made as part of the permitting process.
6. If any federal funding is used.

Sources: Massport, *The State of Hanscom*, July 2022; Hanscom Field FY23 – FY30 Airport Capital Improvement Plan (ACIP); L.G. Hanscom Field North Airfield Development Plan, Environmental Notification Form, January 2023

4.3 Analysis of Future Utility Usage

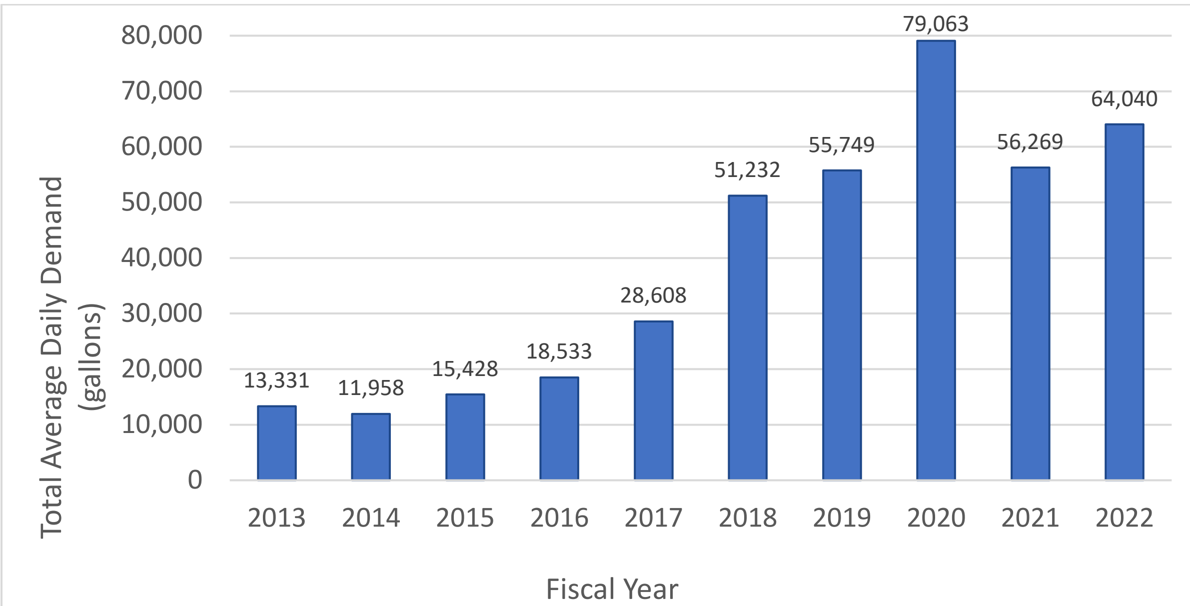
Utilities are required to support the infrastructure and local tenants of the Airport. These utilities consist of water, sanitary sewer, stormwater management and drainage, electrical distribution, natural gas, and telephone and internet communications. This section compares historic usage against available capacity to assess where changes in utility infrastructure may be needed to serve the 2030 and 2040 development scenarios. In general, any improvements and new facilities specified in the 2030 and 2040 development scenarios would require new connections and maintenance of the existing utility system to increase capacity to adequately serve the additional demand. Given the volatility and wide fluctuations of historical utility data, it is not possible to produce reasonable forecasts of future utility demands. Detailed background information is not available to establish rationalizations for the year-to-year fluctuations in water flows, sanitary sewer flows, and natural gas distributions. It can reasonably be expected that electricity usage will continue to be relatively stable in future years, as the range of daily demand has steadily declined over the last decade from 9,307 kWh in 2012 to 6,115 kWh in 2022. This trend may change when electric aircraft and airfield vehicles start operating at Hanscom Field.

4.3.1 Water Supply and Demand

The 2005 reported average daily potable water demand was 34,800 gallons, which served as a baseline for future projections in the *2005 ESPR* (subsequent ESPRs did not forecast water usage). The 2020 projection ranged from 59,200 gallons to 66,900 gallons. Since the *2017 ESPR*, the average daily water demand has ranged from 51,232 and 79,063 average daily gallons, as shown in **Figure 4-9**. Water demand between 2018 and 2022 was within or below that forecast range, except for 2020, which exceeded the forecast range. As noted in Chapter 2, Section 2.4.3, the water meters did not provide consistent readings, which resulted in irregular reporting of water demand.

Based on the existing water use and on the available system flow capacity, Massport believes the existing water systems are sized to supply the required potable water flows.

Figure 4-9. Hanscom Field Average Daily Water Usage, 2012-2022



Notes:

1. FY 2013 does not include May, and FYs 2015-2017 do not include August.
2. *2017 ESPR* data was aggregated in calendar year, whereas *2022 ESPR* data is aggregated during the fiscal year. Therefore, annual numbers show a difference even though the same data source was used.

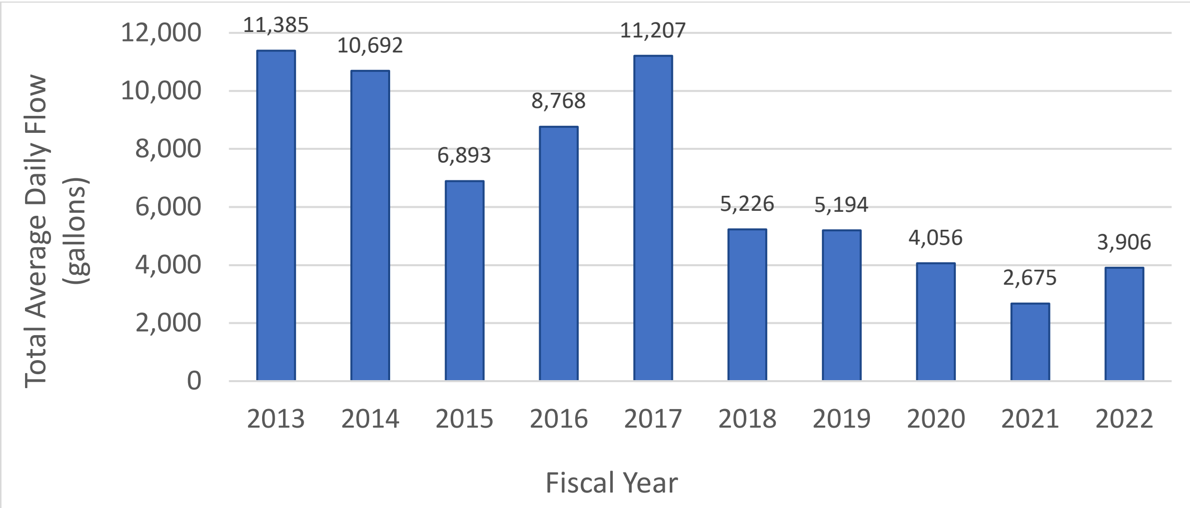
Source: Massport data, 2023

4.3.2 Sanitary Sewer System

Wastewater generation in recent years has stayed below the levels seen a decade ago, as shown in **Figure 4-10**. Per the *2017 ESPR,* the total average daily flow in 2005 was 27,800 gallons. The greatest average daily wastewater generation in the last five years was 5,226 gallons per day in 2018.

Since the existing wastewater system has dispersed average daily wastewater flow exceeding 10,000 gallons in 2012, 2013, and 2015 and flow more than doubling that in the early 2000s, the existing on-site wastewater system is expected to have the capacity to accommodate the projected scenarios. Potential new facilities would tie into the existing sewer lines.

Figure 4-10. Hanscom Field Average Daily Wastewater Generation, 2012-2022



Notes:

3. FY 2021 includes data for three months only (July, August, and September), and FY 2022 does not include data for May.
4. *2017 ESPR* data was aggregated in calendar year, whereas *2022 ESPR* data is aggregated during the fiscal year. Therefore, annual numbers show a difference even though the same data source was used.

Source: Massport, 2023

4.3.3 Stormwater Management and Drainage System

Since the *2017 ESPR*, approximately eight acres of impervious surface have been removed both along Taxiway N adjacent to the North Airfield planning area (0.9 acres) and Runway 5/23 shoulder (7.1 acres). Over the same time, approximately 0.7 acres of impervious area was added as the result of new box hangar construction in the North Airfield. These changes resulted in a net removal of approximately seven acres of impervious surfaces between 2017 and 2023, as shown in **Table 4-10**.

The 2030 scenario proposes approximately 14.5 acres of new impervious surfaces. The 2040 scenario proposes a decrease of 3.7 acres of impervious area for a total increase of approximately 3.4 acres of impervious surfaces by 2040 as compared to 2017. Massport remains committed to offsetting some or all pavement addition on the field wherever it is practical to do so. For example, in the North Airfield EA the preferred alternative was identified in part to minimize new impervious surfaces on the airport.[86]

The potential new development projects in the 2030 and 2040 scenarios would be designed to meet the MassDEP Stormwater Management Standards[87] for water quality and quantity. Stormwater at Hanscom Field outfalls to the Shawsheen River, Elm Brook, and on-site wetland areas. The stormwater runoff would be treated for water quality prior to discharging into the areas. Peak stormwater runoff rates would be mitigated such that they do not exceed existing conditions. Massport continues to monitor stormwater runoff and maintains an effective stormwater management plan.

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[86] Massport. September 2018. *L.G. Hanscom Field Aviation Facilities Improvements Project, Environmental Assessment.*

[87] Massachusetts Department of Environmental Protection. 2008. *Massachusetts Stormwater Handbook and Stormwater Standards.* https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards

Table 4-10. Potential Changes in Impervious Surface (Acres) by 2030 and 2040

Planning Area	2030 Scenario (acres) as compared to 2022	2040 Scenario (acres) as compared to 2030
North Airfield	18.9	0
Northeast Airfield	0	0
East Ramp	0	0
West Ramp	0.1	0
Pine Hill	1.9	0
Other	-6.5	-3.7
Total increase/(decrease)	**14.5**	**-3.7**
Changes since *2017 ESPR*	-7.3	0.0
Grand Total increase/(decrease)	**7.2**	**-3.7**
Sources: Massport 2023 and 2022 Hanscom Field Airport Layout Plan		

In 2017, as part of the stormwater management plan, Massport initiated a study to evaluate the existing drainage system and flooding issues associated with the Hanscom Field Terminal area, which includes the terminal building, the parking lot, and the surrounding roadways.[88] The study recommended increasing existing pipe diameter sizes and installing new pipes to increase the outflows from drainage, as well as cleaning the existing drainage system between the Hanscom Field Terminal and Shawsheen River, and increasing the detention basin storage capacity to the maximum available. Future alternatives include providing additional outlets and two new stormwater basins adjacent to Hanscom Drive outside the terminal building. Phase 1 of this effort was completed in 2018. Phase 2 is on-going and requires coordination with the USAF as the proposed drainage pipes would either discharge onto or cross their leased lands.

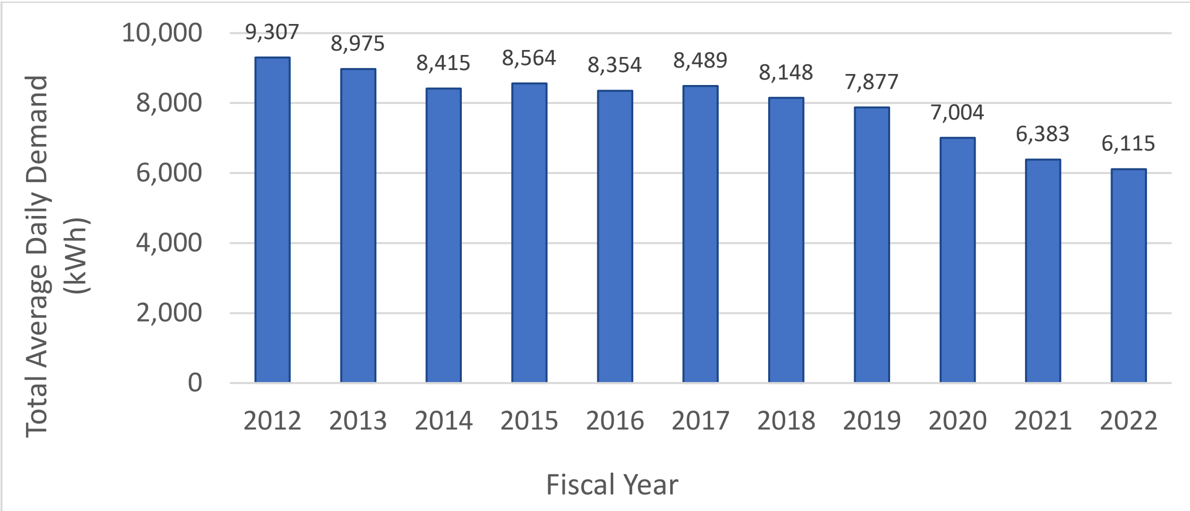
4.3.4 Electrical Distribution System

The on-site distribution system which delivers electricity to Hanscom Field is provided by Eversource Energy for most of the airport facilities and by Concord Municipal Light Plant for airport facilities located in Concord. Massport has a project in its five-year capital program to prepare a comprehensive study of the electrical and telecommunications services for the Hanscom Field Terminal and Field Lighting Vault at Hanscom Field. Massport continues to consider investments in smart energy to reduce demand for the electrical distribution system.

There are two photovoltaic arrays at Hansom Field which help offset electricity demand: one is on the roof of the Hanscom Field Terminal and the other is on the roof of Boston MedFlight's hangar (Hangar 12A). Electricity usage has steadily declined since 2012 (as shown in **Figure 4-11**).

[88] Massport. 2018. *Hanscom Terminal Building Drainage Evaluation and Recommended Improvements.*

Figure 4-11. Hanscom Field Average Daily Electricity Demand, 2012-2022



Notes:

1. FY 2022 does not include data for December.
2. *2022 ESPR* numbers were prorated and therefore differ from *2017 ESPR* numbers even though they are from the same data source.

Source: Massport, 2023

As electric vehicles (personal vehicles, public buses and shuttles, and airport operations and maintenance) become more prevalent and electric aircraft are becoming a reality, Massport continues to make smart energy investments and enhance the airport's electrical infrastructure.

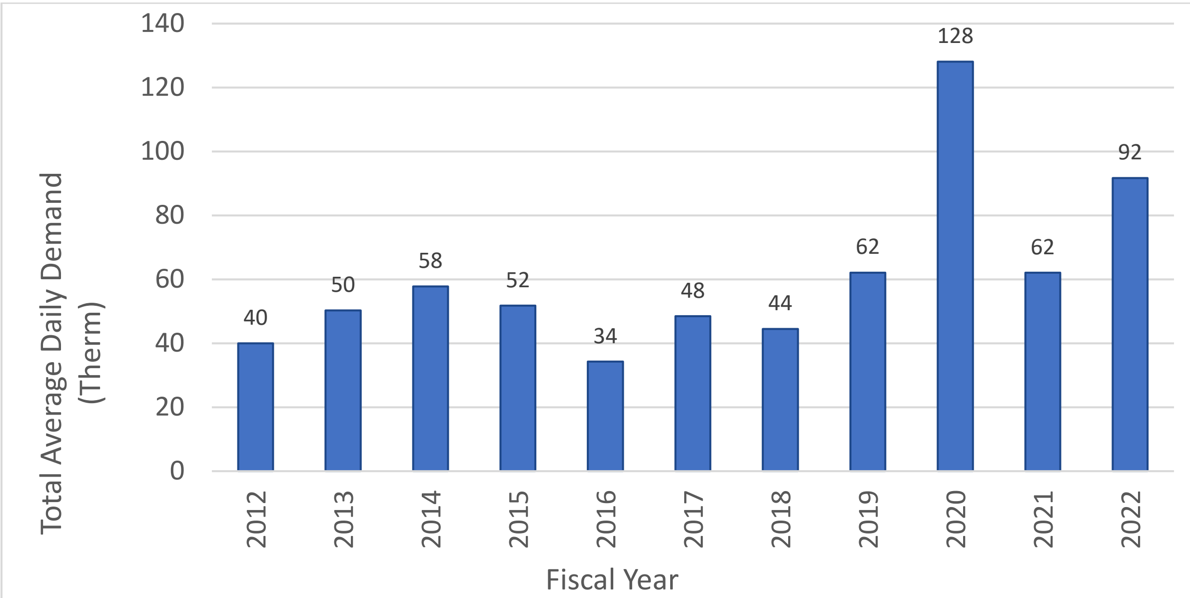
4.3.5 Natural Gas System

Enhancement of the natural gas distribution system occurred circa 2010 with the installation of a four-inch high-pressure line. This condition remains unchanged for the *2022 ESPR*. Total average daily demand has increased since the *2017 ESPR*. Over the most recent five-year period, average daily demand has been 79 therms (thm) [89] compared to 50 thm reported for 2013-2017 average.

As Massport continues to improve the energy efficiency of their facilities, it is unlikely that the natural gas distribution systems will require investment directed at the provision of additional capacity. As shown in **Figure 4-12**, natural gas usage since 2007 has ranged from a low of 35 thm in FY 2016, to a high of 130 thm in FY 2020. The highest averages can be attributed to months of extended usage that were well above typical monthly averages. In March 2007, a reading of more than triple the typical high monthly usage was recorded. If that single month anomaly was removed, the average daily demand for FY 2007 would drop from 106 thm to 69 thm. In FY 2020, there was an extended period of higher-than-normal demand from December 2019 through April 2020.

[89] Therm (thm) is a unit of heat equal to 100,000 British Thermal Units.

Figure 4-12. Hanscom Field Average Daily Natural Gas Demand, 2012-2022



Notes:

1. FYs 2022 and 2020 do not include data from July, FY 2019 does not include data from July-September, and FY 2017 does not include data from October.
2. *2017 ESPR* data was aggregated in calendar year, whereas *2022 ESPR* data is aggregated during the fiscal year. Therefore, annual numbers show a difference even though the same data source was used.

Source: Massport, 2023

4.3.6 Telephone and Internet Communications

As discussed in Chapter 2, both Comcast and Verizon provide network and phone services at Hanscom Field. The existing telephone conduit capacities are adequate for current demand, but additional capacity and routine service upgrades may be required to provide enough lines for the 2030 and 2040 future scenarios.

4.4 Consistency of 2022 ESPR with Plans and Regulations

Massport is a state authority that owns and operates public-use transportation facilities including 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 ongoing effort to update the regional plan for the Greater Boston area. Massport supports the principles described in these plans, including the creation and operation of environmentally friendly facilities, sustainability, promotion of regional equity, economic development opportunities, and the efficient use of existing resources. Massport seeks to achieve these objectives within the context of managing public-use facilities.

Massport's plans for Hanscom Field are currently limited to those investments described in Section 4.2.5. These plans support Hanscom Field's role as a premier full-service GA airport with the potential for limited scheduled commercial passenger service. The future concepts evaluated in this document present estimates of what could happen at Hanscom Field using certain assumptions, not necessarily what will happen. Should the plans associated with the future concepts come under consideration for implementation, Massport would study management approaches for continued consistency with the local and regional plans.

4.4.1 Federal and State Regulations

This *2022 ESPR* identifies potential projects that could occur based on the aviation forecasts described in Chapter 3. Massport will follow applicable local, state, and federal review for any future project that triggers such reviews. For example, both the 2030 and 2040 concepts identify additional aircraft hangar and apron facilities that would involve an update to the ALP, which in turn may require NEPA and/or MEPA review. Before proposing such changes, Massport reviews NEPA and MEPA regulations and coordinates with the FAA to determine the appropriate level of review.

4.4.2 Consistency with the 1978 Master Plan and 740 CMR Part 25

Massport's 1978 Master Plan and 740 CMR Part 25 continue to guide Massport's long-range planning. This *2022 ESPR* reaffirms the role of Hanscom Field as a premier regional GA airport with the potential for limited scheduled commercial air service. While the 1978 Master Plan anticipated cargo operations at the Airport as well as commercial air passenger services, cargo activity is anticipated to be minimal in the future. This *2022 ESPR* evaluates future concepts that include scheduled passenger service utilizing turboprop aircraft with approximately 30 seats but do not consider cargo services, given current market conditions. 2040 forecasts show approximately 144,000 annual operations, which is well below the 1978 Master Plan's estimated practical capacity of the airport at 320,000 operations per year.

4.4.3 Consistency with Local Plans

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

The use of Hanscom Field for aviation purposes takes place within a local planning and zoning context that only describes non-aviation related land 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, Massport is not subject to local regulations.

4.4.4 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 MetroCommon. In addition, through the ESPR process, Massport regularly identifies and clearly describes potential environmental effects of future concepts. Thus, a comprehensive evaluation of potential conditions that would be associated with forecasted aviation activity levels is available to regional planners.

5 Regional Transportation

Chapter 5 reviews the role of Hanscom Field in the region's broader airport and long-distance transportation system, with a brief overview of the role Logan Airport plays in the region. It provides an overview of aviation activity trends in the region for both GA and commercial air service, while also describing airport improvement plans.

This chapter also describes Massport's efforts to work with other state and regional transportation agencies within a cooperative planning context to strengthen the regional transportation network. It reports on the regional transportation planning initiatives that Massport is undertaking relative to Hanscom Field, Worcester Regional Airport, and Logan Airport. Finally, this chapter provides an overview of long-range transportation planning initiatives that are currently underway in the region, and developments in both air and rail transportation infrastructure.

5.1 Key Findings Since 2017

Hanscom Field is the busiest GA airport in New England and in the top 4-percent of busiest GA airports in the country.[90] Hanscom Field has historically accommodated a wide variety of aviation activity, including business/corporate aviation, air taxi/private charter services, recreational and personal flying, and pilot flight training. In addition to GA, Hanscom Field has accommodated limited scheduled commercial airline and light air cargo services, as well as limited military flights associated with Hanscom AFB. Hanscom Field's activity levels are due in part to its proximity to Boston and the Route 128/I-95 and Route 495 high-tech corridors. Hanscom Field handles over seven times as many GA operations per year as Logan Airport and serves an important role as a reliever to Logan Airport.

Changes to the regional aviation system since 2017 include the following:

- The COVID-19 pandemic suspended any ongoing trends, as operations and enplanements in April 2020 declined. In April 2020, Logan Airport had 95,352 passengers and 7,938 operations. That was respectively a 97.4 and a 77.9 percent decrease compared to those numbers in April 2019. The annual data for 2020 are the lowest for Logan Airport enplanements and operations since before 1998[91] and lower than the 1980 enplanements.[92]
- Since the low activity levels in 2020, airlines and airports have been reestablishing themselves. Suspended routes have been resumed, as many people who had not traveled for at least a year were eager to do so. However, passenger numbers in the region have not yet recovered to 2019 pre-COVID-19 numbers.
- Due to the COVID-19 pandemic, scheduled commercial passenger traffic at regional airports collectively declined from 2019 to 2020. The Hanscom Area airports were growing through 2019, had a sharp decline in 2020 due to the COVID-19 pandemic, and have been in collective recovery since.
- Logan Airport continues to lead the passenger counts, handling just over 36 million in 2022, which is over 70 percent of the regional share. In 2019, before the COVID-19 pandemic, Logan Airport handled over 42 million annual passengers.
- After Logan Airport, the top three regional airports for annual passengers in 2022 were Bradley, T. F. Green, and Portland Jetport.[93] The combined passenger market share for those airports declined from 22.6 percent in 2017 to 21.3 percent in 2022. The regional passenger market share of the top three airports with the greatest influence on Logan Airport (T. F. Green, Manchester-Boston, and Worcester airports) declined from 13.4 in 2017 to 11.3 percent in 2022.
- Logan Airport, Bradley, T. F. Green, Manchester-Boston, and Portsmouth at Pease all saw fewer annual passengers in 2022 than in 2017. The smaller commercial service airports in the region show increases in passengers for 2022 as compared to 2017. This is partially due to new airline service and/or new destinations at these airports (such as Avelo Airlines at Tweed-New Haven) and may be partially due to people not wanting to be around large crowds at bigger airports.

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[90] Based on 2022 FAA Terminal Area Forecast (TAF) GA itinerant plus GA local operations.
[91] Massport Boston Logan International Airport Statistics, 1998-2022.
[92] WCVB. July 13, 2015. *Historical Photos: Logan Airport in the 1920s and now.* https://www.wcvb.com/article/historical-photos-logan-airport-in-the-1920s-and-now/8122242 (slide 37 caption for 1980 passenger data)
[93] Portland Jetport surpassed Manchester-Boston, which was in fourth place for annual passengers in the Boston Metro area in the *2017 ESPR* and is now in fifth place.

- Scheduled commercial airline operations in the region were 10 percent lower in 2022 than in 2017. Commercial airline operations continue to change through airlines up-gauging to larger aircraft that can carry more people on fewer operations, in part due to the continued pilot shortage.
- GA was not as impacted by the COVID-19 pandemic as commercial aviation was, and in some cases, showed a large increase (such as Beverly Municipal and Manchester-Boston Airports). GA does not generate the crowds that commercial aviation does and, as a result of the pandemic, some people decided to take private planes instead of commercial flights. GA operations increased in the Hanscom Area, but under 1 percent CAGR (as shown in Chapter 3, Table 3-3). The declining number of private pilots has stalled, and an increase in fixed-wing turbine and business jet aircraft is offsetting a decline in fixed-wing piston aircraft.
- Hanscom Field does not currently have scheduled commercial service. 2022 GA operations were less than 2017 GA operations by 5.9 percent. Hanscom Field remains the leading GA airport in the region in terms of overall GA activity.

5.2 Role of Massport Airports in the Boston Area Network

The following subsections describe the roles of Hanscom Field, Worcester Regional Airport (Worcester), and Boston Logan International Airport (Logan Airport) and Massport's efforts to promote a successful Boston area network. The Boston area network includes the airports that are closest to Logan Airport and have the greatest influence on its passenger traffic and aircraft activity: Worcester Regional Airport in Worcester, Massachusetts; T. F. Green International Airport in Providence, Rhode Island (T.F. Green); Manchester-Boston Regional Airport in Manchester, New Hampshire (Manchester-Boston); and Hanscom Field. These airports serve as the primary alternatives to Logan Airport given their proximity to Boston, relative ease of access, and scheduled service to an array of markets. They are discussed further in Section 5.2.4.

5.2.1 Role of Hanscom Field

Hanscom Field serves as the premier full-service GA facility for Massachusetts and New England and GA reliever airport for Logan Airport. The Airport accommodates a variety of corporate and private GA activities, as well as air taxi/charter, and public service operations that might otherwise use Logan Airport. Hanscom Field's role as a GA reliever with limited scheduled commercial service was established in the Airport's 1978 Master Plan and documented in 740 CMR Part 25 for Hanscom Field. These plans restrict scheduled commercial passenger services to aircraft with 60 seats or less. To help improve capacity and ensure safety at Hanscom Field, ongoing improvement projects have been proposed by Massport in recent publications of *The State of Hanscom* and the *2017 ESPR*.

Hanscom Field has not had scheduled passenger commercial service since 2012 but has continued to have limited scheduled charter operations. The ability of Hanscom Field to provide more significant air passenger services is affected by its proximity to the region's commercial service airports including Logan Airport, Worcester, T. F. Green, and Manchester-Boston.

Expected Future Role of Hanscom Field

As part of its regional approach, Massport is committed to maintaining Hanscom Field as a vital link in the transportation infrastructure of Massachusetts and New England. Hanscom Field will continue to function within the Boston area primarily as the premier full-service GA facility for Massachusetts and New England and as GA reliever to Logan Airport with the possibility of limited scheduled commercial passenger service. Several projects have been proposed in Hanscom Field's most recent Capital Improvement Program to improve overall airport efficiencies.

5.2.2 Role of Boston Logan International Airport

By virtue of its location in New England's population and commercial center, Logan Airport is the region's dominant airport for scheduled commercial airline service. Logan Airport is New England's largest and busiest airport with flights to destinations across the United States, Canada, Central and South America, Europe, Asia, and the Middle East. Logan Airport also provides more than 50 daily departures to nearby small and/or remote communities including Cape Cod and the Massachusetts islands, as well as markets in northern New England and upstate New York, connecting these communities to the national air transportation network.

Logan Airport is the largest cargo airport in New England and the 31st largest cargo airport in the nation in terms of freight moved in the United States. The airport accommodated over one billion pounds of air freight and mail through its facilities in calendar year 2021.[94]

5.2.3 Role of Worcester Regional Airport

Worcester is an important part of the Boston area network and economic development of the central Massachusetts region, with Worcester being the second largest city in New England by population.[95] The airport is located approximately 50 miles west of Boston. It accommodates both scheduled commercial airline service and corporate GA activity.

Massport acquired the airport from the City of Worcester in 2010, and it continues to invest in modernizing facilities and working with airlines to expand scheduled commercial service from Worcester. Since Massport re-opened the airport in 2013, the airport has served more than one million passengers.[96] Massport actively markets Worcester as an additional commercial service airport in the region that can conveniently accommodate passengers in central Massachusetts and west of Boston, while simultaneously alleviating congestion at Logan Airport.

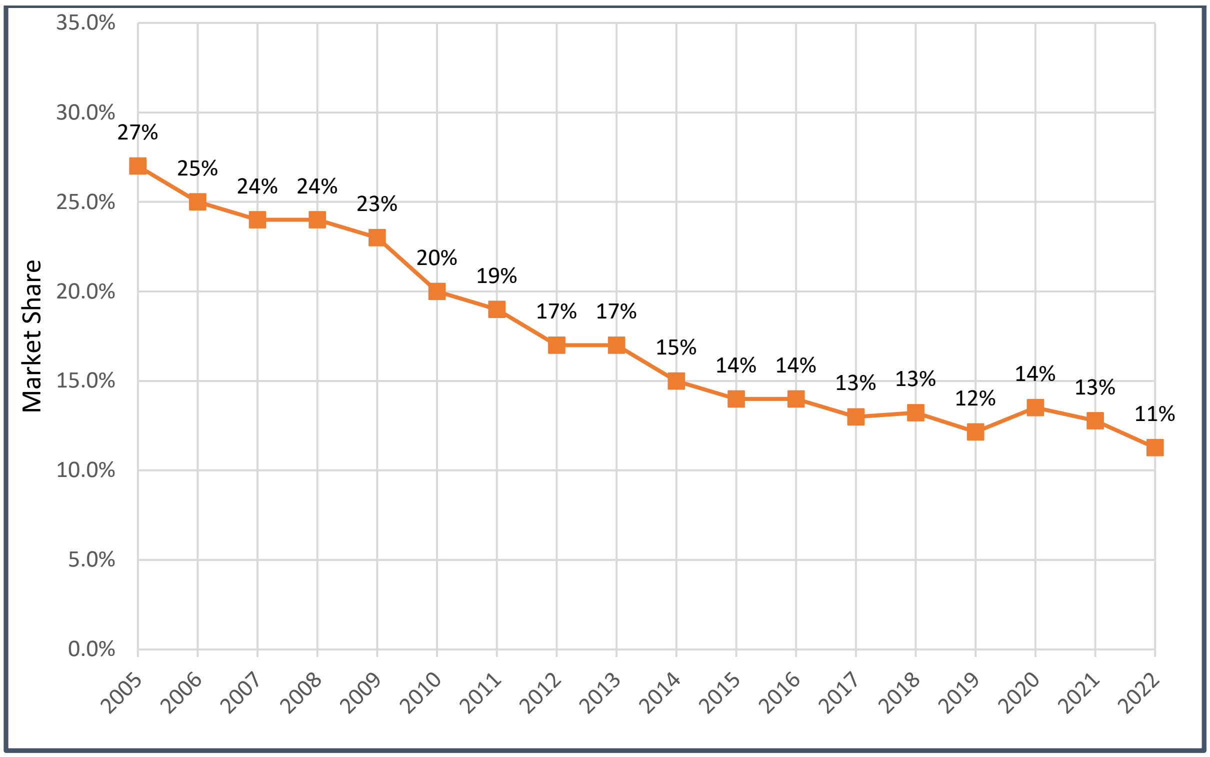
5.2.4 Massport's Efforts to Support Boston Area Airline Passengers

Figure 5-1 shows the market share of T. F. Green, Manchester-Boston, and Worcester as percentage of all the passengers that use those airports and Logan Airport. An increase in scheduled passenger service

[94] FAA. September 16, 2022. *Air Carrier Activity Information System (ACAIS) Qualifying Cargo Airports, Rank Order, and Percent Change from 2020*. https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/previous_years#2021
[95] United States Census Bureau. 2023. https://data.census.gov/
[96] Laverly, Tréa. November 1, 2022. *Worcester Regional Airport celebrates one millionth passenger*. https://www.masslive.com/worcester/2022/11/worcester-regional-airport-celebrates-one-millionth-passenger.html

and the introduction of service from low-cost carriers such as Southwest Airlines resulted in these secondary airports accommodating a higher share of the region's commercial air passengers in the early 2000s. The trend shows a gradual decrease; T. F. Green, Manchester-Boston, and Worcester airports together dropped below a 20-percent share of the market in 2011. The market share has continued to decrease, dropping to 15 percent in 2014 and then to 11 percent in 2022. The slight increase of market share in 2020 was due to the circumstances of the COVID-19 pandemic, when Logan Airport's decrease in passengers outpaced the other airports' combined decreases.

Figure 5-1. T. F. Green International, Manchester-Boston Regional, and Worcester Regional Airports Combined Share of Boston Area Airline Passengers



Note: Market share represents T. F. Green International, Manchester-Boston Regional, and Worcester Regional Airports passengers as a percentage of Boston Metropolitan Area Commercial Service Airports passengers.
Sources: Massport Airport Statistics, T. F. Green Airport Statistics, and Manchester-Boston Airport Statistics

T. F. Green and Manchester-Boston lost 3.0 million total passengers between 2003 and 2019, whereas Logan Airport gained 19.7 million total passengers in the same period. Competition in secondary markets combined with airlines' efforts to consolidate operations at large hubs has led to renewed activity in large hub airports. In 2020, the COVID-19 pandemic cut into all trends, and no airport was immune from huge passenger losses. The three airports represented in Figure 5-1 all experienced passenger declines of at least 63 percent in 2020 as compared to 2019.[97] Since then, all those airports are regaining passengers; however, the declining market share trend for the three airports is continuing.

[97] FAA. November 8, 2021. *Air Carrier Activity Information System (ACAIS) Enplanements at All Commercial Service Airports (by Rank)*. https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/previous_years#2020

The market share analysis does not reflect the growth at T. F. Green, Manchester-Boston, and Worcester. While the airports above are growing again since the COVID-19 pandemic low, Logan Airport is growing faster and is therefore absorbing more of the market.

Massport's efforts to promote commercial service at Worcester have recently succeeded, as shown by three major carriers resuming operations in 2021 after all three paused operations because of the COVID-19 pandemic. Since the pandemic, the three airlines are only serving destinations in New York (Delta and American Airlines) and Florida (JetBlue). Passenger numbers in 2022 at Worcester surpassed 2017 and 2018 numbers, though are below 2019 numbers.

5.3 Hanscom Area General Aviation Activity Trends

In 2022, Hanscom Field handled close to 121,000 daytime[98] GA operations, which represents approximately 24 percent of all Hanscom Area GA operations shown in Table 3-3 in Chapter 3, Section 3.3.2. There were approximately 128,000 daytime GA operations at Hanscom in 2017. Despite this reduction, Hanscom Field remains the busiest GA airport in the region, handling about 1.5 times as many operations as the second busiest GA airport, Beverly Municipal Airport, and four times as many GA operations as Logan Airport.

Overall, GA operations in the Hanscom Area grew at 0.9 percent CAGR between 2017 and 2022, which is a greater increase than the national trend of 0.2 percent CAGR.[99] This growth reverses the trend seen in the *2017 ESPR*, which showed an average decline of 3.0 percent CAGR between 2012 and 2017. An increase in fixed-wing turbine and business jet aircraft offset the decline in fixed-wing piston aircraft. Additionally, the drop in new private pilots has flattened while the number of airline transport pilots has increased.

GA activity declined at Hanscom Field by a 1.2 percent CAGR between 2017 and 2022. Most of this decrease is due to a decline in what the FAA defines as local operations, which are operations that remain within the local area (e.g., flight training activity, simulated instrument approaches). Among other airports in the region, GA operations at Beverly Municipal Airport grew the fastest at a CAGR of 8.6 percent between 2017 and 2022, followed closely by Manchester-Boston of approximately 8 percent CAGR between 2017 and 2022. GA operations at Worcester experienced the greatest decline of approximately 4.4 percent CAGR between 2017 and 2022. Beverly Municipal Airport's growth can be attributed to the 2021 runway extension that allows larger aircraft to operate there. The decline at Worcester, like at Hanscom Field, is due mostly to a decline in local operations.

5.4 New England Region Commercial Service Trends

A network of commercial service airports throughout the New England region, defined here as airports in the New England Regional Airport System Plan (NERASP)[100], serves the region's air passengers. **Figure 5-2** depicts the location of the airports that are included in the NERASP: Bangor International Airport,

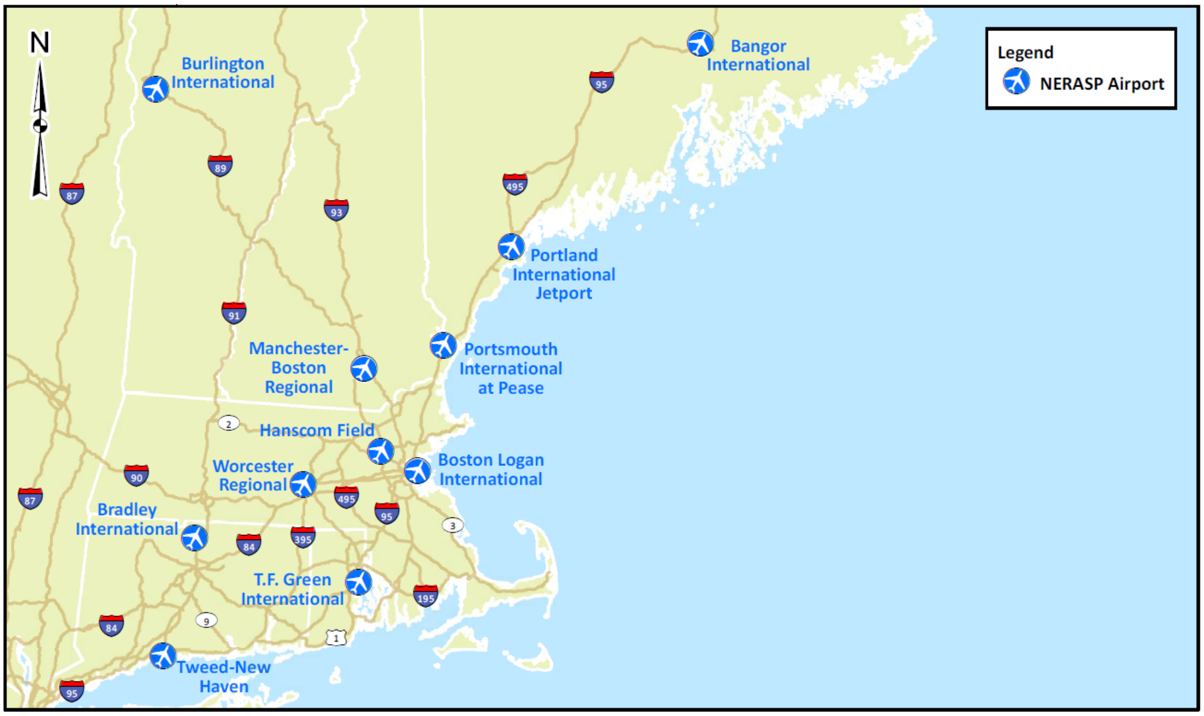
[98] As noted in chapter 3, "daytime" operations as reported in the Hanscom Field Annual Noise Report are those occurring between 7:00 AM and 11:00 PM, excluding the operations when the air traffic control tower is closed.

[99] FAA. June 28, 2022. *FAA Aerospace Forecast Fiscal Years 2022-2042*. https://www.faa.gov/dataresearch/aviation/faa-aerospace-forecast-fy-2022-2042

[100] New England Airport Coalition. 2006. *The New England Regional Airport System Plan.*

Boston Logan International Airport, Bradley International Airport, Burlington International Airport, Hanscom Field, Manchester-Boston Regional Airport, Portland International Jetport, Portsmouth International Airport at Pease, T. F. Green International Airport, Tweed-New Haven Airport, and Worcester Regional Airport.

Figure 5-2. New England Regional Airport System Plan (NERASP) Airports



Sources: NERASP and McFarland Johnson

5.4.1 Commercial Airline Trends in the New England Region

The largest commercial service airports in the New England region experienced robust growth since the late 1990s. Southwest Airlines, for example, expanded services through the region's secondary airports rather than at Logan Airport, introducing services at T. F. Green, Manchester-Boston, and Bradley airports. At the end of the 2000s, this trend began to shift as Southwest Airlines initiated service at Logan Airport in 2009 and reduced service at the other airports in the region. Allegiant Air started service at Portsmouth at Pease in 2013. Worcester has multiple airlines operating currently, including JetBlue (since 2013), American Airlines (since 2018), and Delta Airlines (since 2018), all of which took a COVID-19 hiatus. Hanscom Field most recently had scheduled passenger service in 2012.

The greatest impact on commercial airline trends in the region since 2017 has been the COVID-19 pandemic. In April 2020, over 90 percent of the commercial operations were suspended. Since then, airlines and airports have been working to bring passengers back to the skies. Yet, due to the pandemic, travel patterns have changed. For instance, fewer people are traveling for business and more people are traveling for leisure or combining business and leisure travel.

The pandemic skewed many commercial statistics, and the data presented in this section do not necessarily reflect that. This chapter discusses CAGRs and compares 2017 to 2022, following the reporting established in previous ESPRs, but the reader should bear in mind that the trends from 2017 to 2022 are not linear. The data for the commercial service airports listed in this report show that in 2022, as a group, these airports have not fully recovered from the pandemic.

Logan Airport was continuing to grow, serving over 40 million passengers in 2019, but in 2020 the airport hit a low, servicing just over 12 million passengers. Logan Airport has a diversified passenger market share. In 2022, JetBlue had approximately 30 percent share of total passengers, followed by Delta Air Lines at 19 percent, American Airlines at 18 percent, United Airlines at 10 percent, Southwest Airlines at 5 percent, and other airlines at a combined 17 percent.[101] In addition, international airlines (e.g., Air Canada, Emirates, Qatar Airways, Scandinavian Airlines, Cathay Pacific, Hainan Airlines, COPA, and TAM) have continued serving nonstop destinations to Canada, Central and South America, Europe, Asia, and the Middle East. The demand for international markets also attracted long-haul low-cost carriers (LCCs) to the region such as Play, an Icelandic airline founded in 2019.

LCCs and ultra low-cost carriers (ULCCs) have added service to secondary airports in the region, with a focus at T. F. Green, Bradley, and Tweed-New Haven. T. F. Green and Bradley have welcomed many operations from Breeze Airways, an LCC, and Tweed-New Haven is the East Coast base for the ULCC Avelo Airlines. These new carriers compensated for the loss of traffic that was a result of previous LCCs shifting focus from regional airports, leaving those airports underserved.

Post-pandemic travel appears to be different from pre-pandemic travel trends, but it is unknown if these trends will persist. 2022 showed a trend that combined business and leisure travel resulting in more midday and midweek travel rather than early morning/end of day and Friday and Monday peaks.[102] This could be a factor in fueling the leisure destination demand.

5.4.2 Commercial Airline Passengers

Table 5-1 presents the changes in commercial airline passenger levels at Logan Airport and the other New England airports in the NERASP between 2017 and 2022, listed in order of 2022 annual passengers.

[101] United States Department of Transportation. 2023. *Bureau of Transportation Statistics (Boston, MA: Logan International (BOS).*
https://www.transtats.bts.gov/airports.asp?20=E&Nv42146=Obf&Nv42146_anzr=O15610,%20ZN:%20Y1tn0%20V06r40n6v10ny&pn44vr4=SNPgf (Select a month: December 2022)
[102] Top Six Trends That Will Shape the Airline Industry In 2023, Ted Reed, Forbes. Dec. 6, 2022.
https://www.forbes.com/sites/tedreed/2022/12/06/top-six-airline-trends-for-2023-include-safety-threats-and-more-buzz-around-united/?sh=10cb1ae37e8e

Table 5-1. Passenger Activity at Airports in the NERASP

Airport	Airport Code	Annual Passengers (millions)[1] 2017	Annual Passengers (millions)[1] 2022	CAGR 2017-2022	2017 Passenger Share	2022 Passenger Share
Logan Airport, MA	BOS	38.41	36.09	-1.24%	70.1%	70.4%
Bradley International, CT	BDL	6.44	5.80	-2.08%	11.8%	11.3%
T. F. Green International, RI	PVD	3.94	3.17	-4.24%	7.2%	6.2%
Portland International Jetport, ME	PWM	1.86	1.99	1.32%	3.4%	3.9%
Manchester-Boston, NH	MHT	1.93	1.29	-7.63%	3.5%	2.5%
Burlington International, VT	BTV	1.18	1.20	0.38%	2.2%	2.3%
Tweed-New Haven, CT	HVN	0.06	0.70	63.63%	0.1%	1.4%
Bangor International, ME	BGR	0.60	0.69	2.75%	1.1%	1.3%
Worcester Regional, MA	ORH	0.11	0.16	7.87%	0.2%	0.3%
Portsmouth International, NH	PSM	0.21	0.13	-9.34%	0.4%	0.3%
Hanscom Field, MA	BED	0.02	0.03	2.68%	0.0%	0.0%
Subtotal Regional Airports[2]		16.33	15.13	-1.51%	29.9%	29.6%
Total		54.74	51.22	-1.32%	100.0%	100.0%

Notes:
1. Includes scheduled commercial, charter, and other non-scheduled passengers. Different sources have different definitions of passengers. FAA Air Carrier Activity Information System (ACAIS) counts revenue passengers (USDOT T-100 enplanements plus Part 135 on-demand annual revenue passenger enplanements upon voluntary submittal by the operator).
2. All the airports in the table are Regional Airports except Logan Airport.

Sources:
- For 2017 Data: Massport (BOS), Connecticut Airport Authority (BDL), Rhode Island Airport Commission (PVD), City of Manchester (MHT), City of Portland (PWM), City of Burlington (BTV), 2017 ACAIS (HVN, BGR, ORH, PSM, and BED).
- For 2022 Data: Massport (BOS, ORH), Connecticut Airport Authority (BDL), Rhode Island Airport Commission (PVD), City of Manchester (MHT), City of Portland (PWM), City of Burlington (BTV), 2022 ACAIS (HVN, BGR, PSM, and BED).
- Calculations done by McFarland Johnson, 2023.

Over this period, passenger traffic at Logan Airport increased to over 40 million annual passengers (MAP) in both 2018 and 2019, decreasing during COVID-19 to 12 MAP in 2020, and increasing back to 36 MAP in 2022 – a net decrease of 6 percent between 2017 and 2022. Combined passenger traffic at the other NERASP commercial airports, the regional airports (all airports in the NERASP excluding Logan Airport), decreased by a net 7 percent between 2017 and 2022.

The COVID-19 pandemic caused all passenger traffic numbers to drop in 2020. Airlines and airports have been recovering in 2021 and 2022 and some are still working to regain the passenger volume experienced pre-COVID-19, which explains the average year-over-year decline in annual passengers since 2017. In many cases, passenger numbers dropped over 90 percent in April 2020, and by the end of 2020, passenger volumes were still under 50 percent of pre-pandemic levels. Therefore, there is no trend between 2017 and 2022.

However, there are a couple other data points that stand out other than those caused by COVID-19. While most airports had growing passenger volumes through 2019 and then saw a decline in passengers due to COVID-19, Manchester-Boston's passenger peak was in 2005. Since then, it has seen a continuous decline in passengers due to airlines adjusting frequency and aircraft size to match market demand and meet profitability goals. Spirit Airlines, a ULCC, began operating at Manchester-Boston in 2021. Portsmouth at Pease lost over 12 percent CAGR in passengers mostly due to fewer charter services, not due to traditional (scheduled) commercial service changes. Portsmouth at Pease's only airline is the ULCC Allegiant, which is marketed as a leisure airline. Allegiant's enplanements increased from 46,681 in 2017 to 55,716 in 2022, whereas unscheduled enplanements declined from 58,396 in 2017 to 8,594 in 2022, driving the large net passenger decline.

In contrast, Worcester experienced growth due to airlines, especially JetBlue, resuming service. Tweed-New Haven grew the most out of any New England regional airport in terms of percentage because of its establishment as an east coast base for Avelo Airlines.

5.4.3 Commercial Airline Operations

Passenger airline operations are summarized in **Table 5-2** for airports in the NERASP (operations refer to aircraft takeoffs and landings, counted separately). Logan Airport remained the busiest in 2022. At the other regional airports (which exclude Logan Airport and Hanscom Field), collective commercial operations shrank at a CAGR of just under 4 percent between 2017 and 2022. The six busiest airports all saw decreased operations numbers while the four least busy airports saw increased operations numbers. The two airports with the largest and most substantial growth are Tweed-New Haven and Worcester.

The *2017 ESPR* observed a trend of passenger numbers increasing while operations decreased, due to airlines using larger aircraft and thus carrying more passengers with fewer operations. Although enplanement and operations counts have not yet returned to 2017 levels, passenger volumes are recovering at a faster pace than operations, indicating that airlines continue to up-gauge aircraft to carry more people with fewer operations.

Hanscom Field last had scheduled passenger commercial service in 2012 although it has continued to have limited scheduled charter operations. Accordingly, Hanscom Field has no scheduled commercial operations to report in Table 5-2.

Table 5-2. Commercial Airline Operations at Airports in the NERASP

Airport	Airport Code	Annual Commercial Airline Operations[1]		CAGR	2017 Operations Share	2022 Operations Share
		2017	2022	2017-2022		
Logan Airport, MA	BOS	370,251	348,109	-1.23%	65.8%	68.8%
Bradley International, CT	BDL	65,225	48,264	-5.85%	11.6%	9.5%
T. F. Green International, RI	PVD	39,973	33,918	-3.23%	7.1%	6.7%
Portland International Jetport, ME	PWM	27,352	22,766	-3.60%	4.9%	4.5%
Manchester-Boston, NH	MHT	24,555	14,756	-9.68%	4.4%	2.9%
Burlington International, VT	BTV	21,582	18,237	-3.31%	3.8%	3.6%
Bangor International, ME	BGR	9,882	10,516	1.25%	1.8%	2.1%
Tweed-New Haven, CT	HVN	1,929	5,699	24.19%	0.3%	1.1%
Worcester Regional, MA	ORH	1,371	3,245	18.81%	0.2%	0.6%
Portsmouth International, NH	PSM	678	729	1.46%	0.1%	0.1%
Hanscom Field, MA	BED	-	-	-	-	-
Subtotal Regional Airports[2]		192,547	158,130	-3.86%	34.2%	31.2%
Total		**562,798**	**506,239**	**-2.10%**	**-2.10%**	**100.0%**

Notes:
1. Does not include charter and other non-scheduled operations.
2. All the airports in the table are Regional Airports except Logan Airport.

Sources:
- For 2017 Data: Massport (BOS), U.S. Department of Transportation, 2023.
- For 2022 Data: Massport (BOS, ORH), U.S. Department of Transportation, 2023 (BDL uses an estimation of international flights between October and December 2022 based on 2021 figures).
- Calculations done by McFarland Johnson, 2023.

5.5 Boston Area Airport Improvement Plans and Projects

The following subsections describe airport improvement projects being planned or currently underway at the Boston area airports (Hanscom Field, Worcester, Manchester-Boston, Portsmouth at Pease, T.F. Green, and Bradley) in relation to the commercial service trends and the roles of the Massport airports as described in the previous sections. The plans described are in response to the aviation industry trends playing out at the region's airports.

5.5.1 Hanscom Field, Bedford, Massachusetts

Massport continues to invest in Hanscom Field to improve and upgrade facilities and maintain a safe, secure, and efficient airport. These investments support proposed projects such as the rehabilitation and geometry improvements for taxiways, rehabilitation of Runway 5/23, rehabilitation of the West Ramp, and Hanscom Field Terminal upgrades. Past and future capital investments ensure that Hanscom Field can continue to serve its role as a GA reliever to Logan Airport and as the premier business aviation facility for the region. Hanscom Field's five-year capital improvement program spanning from Massport's FY 2023 to FY 2028 contains a variety of maintenance and improvement projects in addition to projects recently completed or currently underway.

Ongoing or planned Massport and/or third-party projects at Hanscom Field include:

- Developing a new GA aircraft hangar area on Pine Hill.
- Developing a new GA aircraft hangar area on the North Airfield.
- Refurbishing existing hangars on the East and West Ramps.

In addition to the federal funding sources for capital improvements (e.g., FAA Airport Improvement Program funding), Massport solicits third-party development of facilities that support and enhance Hanscom Field's role in the regional transportation system. Many of the hangars at Hanscom Field are owned or leased by tenants who are responsible for maintaining them. Chapter 4 contains more information about other improvements under consideration at Hanscom Field.

Planned Massport Hanscom Field capital projects for fiscal year 2023 and beyond:

- ⇨ Rehabilitating Runway 5/23
- ⇨ Improving Taxiway R Geometry
- ⇨ Rehabilitating Taxiway E
- ⇨ Relocating the Sand Shed
- ⇨ Installing Engineered Materials Arresting System (EMAS)
- ⇨ Rehabilitating Taxiway M
- ⇨ Rehabilitating the West Ramp
- ⇨ Upgrading the Civil Air Terminal
- ⇨ Studying the utility of the North Airfield

5.5.2 Worcester Regional Airport, Worcester, Massachusetts

Worcester Regional Airport has undertaken many maintenance and improvement projects since Massport assumed operational control of the airport. Most importantly, in 2017, Massport upgraded the Runway 11 landing system from Category I to Category III, to allow for low-visibility operations in inclement weather conditions. The landing system, which became fully operational in 2018, enables landings in nearly all weather and visibility conditions, thereby enhancing the airport's ability to attract new and retain existing commercial service.

Planned/ongoing projects for Worcester Regional Airport are listed below:[103, 104]

- Rehabilitating Runway 11/29 (second half) and replacing the EMAS off each end
- Constructing the replacement of Taxiway F from Runway 11/29 to Taxiway D
- Constructing the new taxiway from Runway 15/33 to Taxiway A
- Constructing the replacement Taxiway F from Taxiway D to Taxiway B
- Extending Taxiway B to Runway 33
- Developing 40 acres of aviation-compatible land to repurpose
- Improving the security checkpoint
- Optimizing the airport roadway system
- Creating net-zero carbon emission initiatives
- Rehabilitating the terminal apron
- Rehabilitating a T-Hangar
- Installing two new passenger boarding bridges

5.5.3 Manchester-Boston Regional Airport, Manchester, New Hampshire

Since the early 1990s, Manchester-Boston has invested over $500 million to improve and develop landside and airside facilities and infrastructure. Projects included a 158,000 SF passenger terminal and two subsequent 75,000 SF terminal expansions, a 4,800 SF parking garage with an elevated pedestrian walkway connection to the terminal, roadway improvements, and extensive runway reconstruction. Recent and on-going improvements at Manchester-Boston include:

- Building a new 80,000 SF multi-tenant cargo facility (completed in 2022)
- Realigning Taxiways A1, A2, H, and K (completed in 2022)
- Rehabilitating Runway 17/35 (planned for 2023)

5.5.4 Portsmouth International Airport at Pease, New Hampshire

Portsmouth at Pease is a commercial service airport in the Seacoast region of New Hampshire and is home to several GA and flight training facilities, as well as being a base for the New Hampshire Air National Guard. A significant number of aircraft operations are generated by refueling aircraft and cargo freighters. The only commercial airline serving the airport is Allegiant Air. Frontier began servicing Pease in late 2018 but abandoned the route after six months.[105]

The KC-46A Pegasus air refueling aircraft replaced the Air National Guard's aging KC-135 fleet at Pease. The primary Runway 16/34 was rehabilitated and can serve almost any aircraft with its 11,322-foot-long

[103] Massport. 2022. *Worcester Regional Airport CIP*.
[104] Jandrow, Cam. May 5, 2022. *Worcester Regional Airport looking into rebound strategy, make enhancements.* https://spectrumnews1.com/ma/worcester/news/2022/05/02/worcester-airport-enhancements-050222
[105] McMeneny, Jeff. June 3, 2019. *Frontier to halt flights at Pease.* https://www.seacoastonline.com/story/news/2019/06/03/frontier-airlines-to-halt-flights-at-pease/4998918007/

runway. In addition, the airport is in the middle of a two-phase terminal renovation project. Phase 1 included expanding space for passenger check-in, security, a concourse, baggage handling, and more.

Additional future airport improvement projects include:[106, 107]

- Continuing Phase 2 of the terminal renovation project, which includes expanding the arrivals hall and redesigning the baggage claim area
- Constructing a new snow removal equipment building
- Constructing a new deicing pad
- Improving airport access roadways

5.5.5 T. F. Green International Airport, Warwick, Rhode Island

In 2021, T. F. Green celebrated its 40th anniversary. At that time, the airport announced its plan for the next 20 years, which includes investing $840 million into the implementation of its Master Plan projects. One of the biggest landside projects is modernizing the 25-year-old terminal and adding new concessions. The 2017 Runway 5/23 extension[108] enabled the possibility of coast-to-coast and European service. The crosswind runway, Runway 16/34, rehabilitation was completed in 2021.

Other airport improvement plans and projects at T. F. Green include:[109, 110]

- Upgrading baggage handling system
- Removing obstructions and acquiring easement
- Rehabilitating Runway 5/23 and Taxiways A, M, and N
- Rehabilitating and realigning Taxiway C
- Grading project and southside site work

5.5.6 Bradley International Airport, Windsor Locks, Connecticut

In 2011, the Connecticut Airport Authority was established, in part, to oversee the operation and development of Bradley. The goal of the Connecticut Airport Authority is to transform Bradley and the state's five GA airports (Danielson, Groton/New London, Hartford-Brainard, Waterbury-Oxford, and Windham) into economic drivers for the state.

Since 2017, many airport development projects have been completed or are underway at Bradley including:[111]

- Completing a new Master Plan in 2019
- Rehabilitating the cargo facility in 2019

[106] Pease Development Authority. 2020. *Portsmouth at Pease CIP*.
[107] Pease Development Authority. 2023. *Terminal Expansion.* https://peasedev.org/terminal-expansion/
[108] T. F. Green celebrates completion of runway extension; Extension will increase marketability and safety of the airport, Oct. 2, 2017. Accessed May 25, 2023. https://flyri.com/t-f-green-celebrates-completion-of-runway-extension-extension-will-increase-marketability-and-safety-of-the-airport/
[109] RIAC. 2021. *T. F. Green International Airport CIP*. https://flyri.com/riac/investor-relations/ (Capital Improvement Program)
[110] Garvey, Brian. February 27, 2020. *T. F. Green Airport Gets Green Light: Planned Renovations Enter Final Stages*. https://www.thecowl.com/2020/02/27/t-f-green-airport-gets-green-light-planned-renovations-enter-final-stages/
[111] Connecticut Airport Authority. 2023. *Airport Improvements.* https://bradleyairport.com/about/planning/

- Reconstructing Taxiways C and R between 2018 and 2020
- Reconstructing Taxiway E in 2022
- Redoing all airfield signs in 2022
- Constructing a new rental car center in 2022
- Improving the roadway system in 2023 and beyond

The Connecticut Airport Authority is implementing a $1.4 billion renovation at Bradley, which incorporates a new Terminal B connected to the current Terminal A (including a terminal expansion and new federal inspection services facility), a new concourse holdroom, and cargo facilities. Airside projects include extending Taxiway T to Taxiway C, extending Runway 33, and reconfiguring the apron where aircraft remain overnight.

5.6 Regional Airport Improvement Plans and Projects

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

5.6.1 Massachusetts Statewide Airport Economic Impact Study

The aviation industry and airports comprise a significant element of Massachusetts' economy. The FAA and MassDOT continue to invest in airport infrastructure to improve and enhance economic development opportunities. MassDOT published the *Massachusetts Statewide Airport Economic Impact Study* in 2011, which was updated in 2019, summarizing the economic benefits that Massachusetts derives from its public-use airports. The study describes how the local economy builds on aviation and enumerates the other benefits that air transportation provides to its host communities.

Qualitative public benefits of the state's airports include:

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

The study found that Massachusetts public use airports generated $24.7 billion in total economic activity, including $7.2 billion in total annual payroll resulting from 199,237 jobs that could be traced to the aviation industry. Massport's three airports are noted as making significant contributions to the regional economy, generating approximately $23.1 billion (94 percent) of the overall economic benefits generated by the Massachusetts airport system. Specifically, Logan Airport supported over 162,000 jobs in Massachusetts with a total economic impact estimated at $16.3 billion per year. Worcester supported 587 jobs with a total economic impact of $96.7 million. Hanscom Field is particularly important as the location for Hanscom AFB, an active military facility, which is aided by its proximity to the Boston-area technology and research industry. Hanscom Field alone supported 2,243 jobs and generates $680 million in economic activity, but combined with Hanscom AFB, the two entities together supported 19,587 jobs and had a total economic impact of $6.7 billion. For every $100 spent by aviation-related businesses, an additional multiplier impact of $56 was created within Massachusetts, according to the study.[112] 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.

5.6.2 Massachusetts Statewide Airport System Plan (MSASP)

Airports are an essential element of Massachusetts' intermodal transportation system, and the MassDOT Aeronautics Division (formerly the Massachusetts Aeronautics Commission) is responsible for being an effective steward for the state's 39 public use airports (nine commercial service airports and 30 GA airports). In 2009, MassDOT initiated development of the Massachusetts Statewide Airport System Plan to provide an assessment of current conditions and long-term development of the statewide airport system. The technical report was published in 2010 and it provides an inventory of the existing facilities, current airport roles, aviation demand forecast, adequacy of existing and future systems, as well as financial needs and recommendations.[113] A new and updated MassDOT Aeronautics Division system plan is anticipated to begin in 2024.

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 2040, which was published in 2015. In a departure from prior long-range plans, *Charting Progress to 2040* balances the need for regionally significant roadway-improvement projects with projects that will improve transit, bicycle, and pedestrian access. An update of the *Long-Range Transportation Plan* (LRTP), *Charting Progress to 2040*, occurred in 2019 and was titled *Destination 2040.*[114] The plan focuses on six goals: safety, system preservation and modernization, capacity management and mobility, clear air and sustainable communities, transportation equity, and economic vitality. The updated plan includes a major infrastructure investment program that includes funding for projects that cost more than $20 million and/or add capacity to the transportation network. The next iteration of the long-term plan, titled *Destination 2050,* is set to be released and adopted in 2023/2024.

5.6.4 Statewide Long-term Transportation Vision

MassDOT released the Commonwealth's Long-Range Transportation plan in 2014, called *weMove Massachusetts: Planning for Performance*. This report provides a summary of MassDOT's approach to multimodal capital planning and the use of scenario planning. The report analyzes several key components of the transportation system: bridges, roadways, buses, trains, and bicycle paths to provide a data-driven decision-making methodology to assist MassDOT in implementing its priorities transparently and measurably. Along with the report, a Planning for Performance tool was published that can be used to calculate the performance outcomes that would result from various levels of funding available.

Massport was an active participant in the development of MassDOT's Rail Plan and Freight Plan. The *Massachusetts State Rail Plan*, published in 2018, is the Commonwealth's 20-year plan for the state's

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[112] MassDOT. January 2019. *Massachusetts Statewide Airport Economic Impact Study Update.* https://www.mass.gov/economic-impact-study

[113] MassDOT. 2010. *Massachusetts Statewide Airport System Plan*. https://www.mass.gov/files/documents/2018/02/08/TechnicalRpt_1_Entire.pdf

[114] Boston Region Metropolitan Planning Organization. 2023. *Destination 2040.* http://www.ctps.org/lrtp

rail system. It 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.[115] MassDOT's vision for passenger and freight service is to strategically look for opportunities to better serve the Commonwealth over the next 20 years.

Published in May 2023, the 2023 *Draft Massachusetts Freight Plan*[116] outlines the significant role of Logan Airport in facilitating the transportation of freight by air, as well as its vital linkages with highway and railway systems. "Logan Airport cargo is approximately evenly split between integrated logistics shippers ('all-cargo' carriers such as FedEx and United Parcel Service) and passenger airlines that carry cargo in the luggage hold (known as 'belly' freight)." (Section 5, p. 69) In 2021, Logan Airport ranked 25th among U.S. airport in total air cargo volume. Apart from Logan Airport, Massport "continues to explore opportunities to increase Worcester Regional Airport's attractiveness as a gateway for additional freight and has invested over $100 million on upgrades and marketing […] in recent years." (Section 5, p. 73) Given the activity at Logan Airport and the commercial service already established at Worcester, significant air cargo activity at Hanscom Field is unlikely to occur. Following the earlier Freight Plan, MassDOT and its partners have undertaken enhancements to the freight rail infrastructure. MassDOT's long-term rail freight projects include plans to upgrade the weight standards of freight rail lines in Massachusetts to make freight line traffic significantly more efficient. Additionally, MassDOT completed studies that analyzed the impacts of COVID-19 on the freight system and is taking steps to address identified challenges and carry forward work that was conducted since the *2017 Freight Plan*.

The intercity rail system connects Massachusetts with other parts of the Northeast Region and relieves demand for air service and requisite terminal capacity at Logan Airport. The Northeast Regional and Acela service allow Logan Airport to optimize its limited aircraft gate capacity for long-haul and international flights rather than short trips to other northeast corridor cities. For example, ridership on the Acela trains from Boston to New York reduces the need for short-haul flights between Logan Airport and New York's system of airports.

In 2018, the MBTA unveiled a future investment plan, entitled *Focus 40*, to meet the public transportation needs of the region by 2040. The plan includes a new downtown superstation connecting multiple subway lines (e.g., Blue Line and Red Line), an extension of the existing subway lines (Blue, Green, and Orange Lines), new fleets of trains and buses, and a new fare collecting system. *Focus 40* aims to position the MBTA to make investments that will create a reliable, robust, and resilient transit system in the region. Also in 2018, the MBTA launched a two-year, three-million-dollar study, called *Rail Vision*, to identify cost-effective strategies for the commuter-rail system. The study, which was completed in 2020, focused on matching service with the growth and changing needs of the region, enhancing economic vitality, improving the passenger experience, providing an equitable and balanced suite of investments, achieving climate change and sustainability targets, and maximizing returns on investments. The study produced six different alternatives on how to improve the rail system in the region.

5.6.5 New England Regional Airport System Plan (NERASP)

The NERASP is the product of more than a decade of work by the New England Airport Coalition, a collaboration of 11 of the region's major airports, the six New England state aviation agencies, the

[115] MassDOT. 2018. *Massachusetts State Rail Plan*. https://www.mass.gov/service-details/rail-plan
[116] MassDOT. May 2023. *2023 Massachusetts Freight Plan.* https://www.mass.gov/doc/draft-2023-massachusetts-freight-plan/

Massachusetts Port Authority, the New England Council, and the FAA. The results of this 2006 study provided a foundation of a regional strategy for the airports with air service to support the needs of passengers through 2020.

The New England state aviation officials, in partnership with the FAA, also conducted a study of the GA airports in New England, titled *The Evolving Role of Our General Aviation Airports and Their Significance to New England.*[117] This report, published in 2015, provides a greater understanding of airport roles and aviation services for their communities and states, the resources required to maintain the existing runway and taxiway infrastructure, and both a short-range and long-range perspective on the future performance of the New England GA system.

5.6.6 Coalition of Northeastern Governors (CONEG)

The CONEG, a non-partisan association of the governors of the seven northeastern states, provides support to the Conference of New England Governors and Eastern Canadian Premiers, which is a formally established body which coordinates regional policy programs including the areas of economic development, transportation, environment, energy, and health. Members include the governors of the six New England states and Canadian premiers of Quebec, Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland, and Labrador.

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 system and surface transportation network. The 42nd Conference of New England Governors and Eastern Canadian Premiers was held in Vermont in August 2018. Sessions focused on energy storage, electric vehicle innovation, tourism, and trade in the region. During the conference, the region's two leading international airports, Logan Airport and Montreal Trudeau were highlighted as key gateways to Asian tourism, with services offered to China, Hong Kong, and beyond.

The 43rd Conference was held virtually in May 2021. This meeting included discussions about the COVID-19 pandemic and low carbon economies.[118]

5.7 Regional Transportation Developments

5.7.1 Rail Transportation Improvements

This subsection 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.

Amtrak Northeast Corridor High-Speed Rail

Amtrak's Northeast Corridor (NEC) is a 457-mile intercity rail line that operates between Boston's South Station and Washington, DC via New York City. Other major destinations served by the route include Providence, Rhode Island; New Haven, Connecticut; Philadelphia, Pennsylvania; and Baltimore, Maryland. With the addition of connecting corridors to Harrisburg, Pennsylvania; Springfield,

[117] New England State Airport Directors. September 2015. *New England Regional Airport System Plan – General Aviation*.
[118] New England Governors and Eastern Canadian Premiers. 2021. *NEG-ECP Resolutions.* https://cap-cpma.ca/negecp/

Massachusetts; Albany, New York; and Richmond, Virginia, the NEC spans a total of 899 miles.[119] Most of the NEC infrastructure is owned by Amtrak, with approximately 56 miles owned by the Connecticut Department of Transportation (CTDOT) and Metro-North Railroad (MNR) that is dispatched between New Rochelle, New York and New Haven, Connecticut. Thirty-eight miles of the route in Massachusetts are owned by the Commonwealth of Massachusetts and maintained and dispatched by Amtrak. While commuter services operate most trains running on the NEC, Amtrak accounts for about half of the train miles traveled on the NEC and is the only operator to provide end-to-end service between Boston and Washington, DC. Logan Airport passengers can connect to South Station in Boston via Silver Line bus rapid transit (BRT) service, Back Bay via the Logan Express, or to their destination via taxi/rideshare. 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). In April 2023, a total of approximately 14 daily departures were offered from Boston-South Station to Penn Station in New York, of which about four are Acela Express. Most trains continue south to Washington, DC and a smaller number of Northeast Regional trains continue further south to Newport News, Virginia.

Amtrak NEC ridership was 16.9 million annual passengers in FY 2019 (prior to the COVID-19 pandemic), which dropped to a low of 6.2 million passengers in FY 2021 and is up to 12.5 million passengers in f FY 2022. The NEC represented over 50 percent of total system-wide Amtrak ridership. Amtrak's Acela Express accounted for nearly 3.5 million passengers in FY 2019, dipped through COVID-19, and has increased to 2.1 million passengers in FY 2022[120] (up from less than 900,000 in FY 2021 and 1.7 million in FY 2020[121]). The Northeast Regional accounted for 8.7 million passengers in FY 2019, 4.5 million in FY 2020, 3.5 million in FY 2021, and has recovered to 7.1 million passengers in FY 2022.

Northeast Corridor Infrastructure Plan: CONNECT NEC 2035 (C35)

CONNECT NEC 2035 (C35) is a 15-year service development plan and infrastructure planning process for the Northeast Corridor. It represents the "most ambitious reinvestment program in the NEC's history and a new way of planning: a multi-agency, multi-year, shared action plan guided by the long-term vision."[122] Key elements of the plan include investments in major structures (tunnels, bridges, stations) and other structures (roadbeds, culverts, undergrade bridges) in New York, New Jersey, Maryland, Delaware, Pennsylvania, and Connecticut. C35 reviews the anticipated growth through 2035 of the Northeast Region, which supports 17 percent of the nation's population in 2 percent of its land area while generating 20 percent of its GDP. C35 is the first phase of the long-term vision established in the Federal Railroad Administration's 2017 *NEC Future* plan.[123]

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119 Amtrak. *Amtrak's Five-Year Plans, Amtrak's FY 2022-2027 Service and Asset Line Plans*. https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/businessplanning/Amtrak-Service-Asset-Line-Plans-FY22-27.pdf, accessed April 18, 2023.

120 Amtrak. "Amtrak Route Ridership FY22 vs FY21". https://media.amtrak.com/wp-content/uploads/2022/11/FY22-Year-End-Revenue-and-Ridership.pdf

121 Amtrak. "Amtrak Route Ridership FY20 vs FY19". https://media.amtrak.com/wp-content/uploads/2020/12/FY20-Year-End-Ridership.pdf

122 Northeast Corridor Commission. July 2021. *Northeast Corridor Commission Connect NEC 2035 – A 15-Year Development Plan and Infrastructure Planning Process for the Northeast Corridor*. https://nec-commission.com/app/uploads/2021/08/CONNECT-NEC-2035-Plan.pdf, accessed April 18, 2023.

123 Federal Railroad Administration. 2017 *NEC Future*, July 2021. https://www.fra.dot.gov/necfuture, accessed April 10, 2023.

NEC FUTURE is the Federal Railroad Administration's comprehensive plan for improving the Northeast Corridor. The selected alternative "prioritizes a corridor-wide commitment to the existing NEC and brings it to a state of good repair as well as provides the additional capacity and service enhancements necessary to address passenger rail needs through 2040 and beyond." NEC FUTURE is anticipated to have a capital cost of $120-150 billion over 25+ years (in 2017 dollars). The vision of the plan includes improving rail service, modernizing NEC infrastructure, expanding rail capacity, and conducting "a planning study to identify additional on- and off-corridor infrastructure […] to achieve the service and performance objectives" from New Haven, Connecticut to Providence, Rhode Island. The selected alternative included projects to relieve chokepoints and plans to grow "the NEC to a four to six track modernized, integrated rail network with sufficient capacity to accommodate a significant increase in intercity and commuter rail service, greatly improve reliability, and reduce travel time."[124]

Boston-South Station Expansion

The *Northeast Corridor Capital Investment Plan: Fiscal Years 2022 to 2026*[125] documents the investments planned over the FY 2022–2026 period. States, commuter railroads, and Amtrak will provide approximately $49 billion over the next five years to advance special projects and capital renewal. In support of the CIP, a collaboration between the Boston Planning & Development Agency (BPDA), developer Hines, and the MBTA is working on the South Station Air Rights Project for the expansion of the Boston-South Station to meet the infrastructure and capacity needs of the NEC. Construction began in January 2020 and was anticipated to take nearly five years in three stages. Stage 3 began in 2023 and was anticipated to be completed by 2025. This stage includes the completion of the South Station Transportation Center with new escalators, stairs, and elevators. The MBTA's January 2021 update indicated that the project may be delayed in its completion until 2026.[126] With thousands of daily commuters, travelers, and diners, South Station is Boston's busiest transit hub.[127]

The South Station Air Rights Project includes:[128]

- An expanded outdoor concourse area. The tracks and platforms will be completely covered.
- A new bus terminal that will increase capacity by more than 50 percent and will provide more convenient transfers to all modes of transit.
- A new indoor bike storage room.
- A weather-protected environment for all patrons of South Station.
- A mixed-use tower with 700,000 SF of office space and 166 residential units.
- Two additional phases of increased parking capacity and additional office and amenity space.

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[124] Federal Railroad Administration. July 2017. *Highlights of the FRA's Record of Decision*. https://www.fra.dot.gov/necfuture/flipbook/rod_highlights/default.html#4, accessed April 10, 2023.
[125] Northeast Corridor Commission. October 2021. *Northeast Corridor Capital Investment Plan: Fiscal Years 2022 to 2026*. https://nec-commission.com/app/uploads/2021/11/FY22-26-Capital-Investment-Plan-01-Body-Oct-21.pdf, accessed April 10, 2023.
[126] Massachusetts Bay Transportation Authority. January 2021. *Capital Program Update: FY21 Updated through November 30, 2020*. https://cdn.mbta.com/sites/default/files/2021-01/2021-01-11-fmcb-19-fy21-capital-programs-update.pdf, accessed April 10, 2023.
[127] South Station. *Welcome to South Station.* https://www.south-station.net, accessed April 10, 2023.
[128] South Station Air Rights. "Project Overview". https://southstationairrights.com/project-overview, accessed April 10, 2023 and June 14, 2023.

The COVID-19 pandemic has caused significant fluctuations in the ridership of commuter rail services from 2020 to 2022. Beginning in March 2020, ridership experienced a sharp decline due to federally mandated lockdowns and stay-at-home orders. The pandemic's impact on ridership continued until September 2021, when a slow but steady increase in ridership was observed as many people resumed in-person work and other activities. In March 2022, with the COVID-19 “Omicron wave” subsiding and gas prices soaring, commuter rail ridership saw a significant increase, reaching its highest levels since before the pandemic. Despite these gains, commuter rail ridership remains below pre-pandemic levels. The MBTA continues to provide hundreds of thousands of trips each day, and in June 2022 alone, it served approximately 18.5 million unlinked trips across all modes.[129] Weekday ridership in June 2022 ranged from approximately 47 percent (ferry/green line) to 68 percent (all bus) of what the ridership was in June 2019. Altogether, the data suggest that while the pandemic has had a significant impact on ridership, people are slowly returning to public transportation as a viable means of travel.

The Boston-South Station Expansion project will expand the station beyond its current capacity. Plans include new tracks and new passenger facilities with more amenities, as well as additional storage space for MBTA trains. As of the June 2, 2023, project update, the project is under construction.

Amtrak Downeaster Rail Service

The Amtrak Downeaster service operates between Boston and Brunswick, Maine. It is operated by Amtrak in partnership with the Northern New England Passenger Rail Authority, which is a governmental organization established to develop and manage passenger rail service in Maine. The Downeaster route covers approximately 143 miles and includes stops in 12 communities in three states. The train service operates up to five round trips per day, seven days a week with additional seasonal service during the summer and holiday periods.

The Amtrak Downeaster provides travelers with a convenient and affordable option to travel between Boston and Maine, with stops at popular destinations such as Wells, Old Orchard Beach, and Freeport. In FYs 2017–2019 it served over half a million passengers per year. This dropped to approximately 270,000 passengers in FY 2020 and 200,000 passengers in FY 2021. FY 2022 annual passengers increased to approximately 445,000. According to the website, the train features comfortable seating, free Wi-Fi, food and beverage service, and a variety of other amenities to ensure a pleasant travel experience.[130]

Pilgrim Partnership Commuter Rail Services

The Rhode Island Department of Transportation and the MBTA signed an agreement in 1988 called the Pilgrim Partnership. This partnership established a commuter rail service between Providence, Rhode Island and Boston. Initially, the commuter rail service offered five round trips per day that accommodated 200 riders. It has since increased its daily round trip services, offers weekend services, and accommodates approximately 2,000 riders per day.[131]

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[129] MassDOT. “MassDOT Tracker Data Blog – Ridership in Review: 2021 and Early 2022.” https://www.massdottracker.com/datablog/?p=1542, accessed April 28, 2023.
[130] Amtrack Downeaster. “About Us”. https://amtrakdowneaster.com/about-us, accessed June 14, 2023.
[131] MBTA. December 2010. “Commuter Rail Service to Warwick’s T. F. Green Station Underway.” https://www.mbta.com/news/2010-12-08/commuter-rail-service-warwicks-tf-green-station-underway, accessed April 28, 2023.

As part of the Pilgrim Partnership agreement with the State of Rhode Island, the MBTA Providence Line service was expanded to T. F. Green in Warwick, Rhode Island at the end of 2010. In exchange for providing capital investments in railroad related equipment or infrastructure, Rhode Island received operating services from the MBTA to the state. The capital funds were used by the MBTA to improve facilities and purchase equipment in Massachusetts. The extension of the service benefits Boston area residents by giving them better access to employment opportunities in Providence and another airport for inter-city travel options.[132]

Framingham/Worcester to Boston Commuter Rail

The Worcester to Boston Commuter Rail is operated by the MBTA and runs between Worcester and Boston, Massachusetts. The route covers approximately 44 miles and includes stops in several towns and cities including Framingham, Newton, and Back Bay Station in Boston. The service operates seven days a week, with frequent rush hour service during weekdays and reduced service on weekends and holidays.

The Worcester to Boston Commuter Rail provides a convenient and affordable transportation option for commuters and travelers between Worcester and Boston. The trains are equipped with comfortable seating, free Wi-Fi, and onboard restrooms. Passengers can also bring bicycles on board at no additional charge. The service has undergone recent upgrades and improvements, including the addition of new locomotives and coaches, improved infrastructure, and new amenities at several stations. On-board counts done in 2018 show over 500 passengers for each train during peak hours.[133] As of June 2022, total Commuter Rail ridership had climbed to approximately 55 percent of 2019 weekday ridership (compared to below 10 percent in January 2021).[134]

5.7.2 Airport Ground Access Improvements

This section reports on recent improvements to landside access that have occurred at the airports in the region, including Hanscom Field, Logan Airport, Worcester, Bradley, and Tweed-New Haven.

Hanscom Field Improvements

Hanscom Field has a planned underground utility conduit project along Hanscom Drive. This would require the repaving of Hanscom Drive (the main access road to the Hanscom Field Terminal). Further improvements to roadways include updates to the remaining parking lots and roadways.

Adjacent to Hanscom Field, Hanscom AFB has repaved:

- The parking lot and access road located near the U.S. Postal Service, adjacent to the West Ramp, which is now directly connected to Griffiss Street (July–October 2020).
- Eglin Street from the parking lot associated with Building 1624 to the intersection of Chenault Street/Robbins Street between June 2019 and October 2020.

[132] MassDOT. May 2018. *Massachusetts State Rail Plan*. https://www.mass.gov/doc/final-state-rail-plan-spring-2018/download, accessed April 28, 2023.
[133] Commonwealth of Massachusetts. "2018 Commuter Rail Counts". https://www.mass.gov/lists/2018-commuter-rail-counts, accessed June 14, 2023.
[134] OPMI Data Blog. September 2022. "Ridership in Review: 2021 and Early 2022." https://www.massdottracker.com/datablog/?p=1542, accessed June 14, 2023.

- The section of Vandenburg Drive that connects the Hanscom AFB Visitor Center to Marrett Street/Airport Road between June 2019 and October 2020.

These renovations have improved driving conditions and safety for motorists in the area.

Route 2A Improvements near Hanscom

In 2019, MassDOT initiated a Route 2A corridor safety improvement study. This project runs from I-95/Route 128 to the Crosby's Corner intersection of Route 2, Cambridge Turnpike, and Route 2A. To support this project, MassDOT engaged staff from abutting municipalities as well as from Minute Man National Historic Park, Massport, and Hanscom AFB. Two municipal workshops were held to review conceptual designs.[135] Key town leadership boards were invited to participate in the workshops to assess opportunities to mitigate vehicle speeds, improve pedestrian and cyclist safety, preserve historical landscape, sustain the corridor's rural character, as well as improve the transportation network connectivity of roads, paths, and trails. The project started in 2019 and had two municipal workshops (one in fall 2019 and one in fall 2020). Based on a 2021 update, 75 percent design was reached in June 2021 and MassDOT announced in 2022 that the resurfacing project would proceed.

Along with the repaving project, the Route 2A bridge over I-95 was identified as needing to be replaced. The latest public hearing was conducted in April 2023 to provide the public with the opportunity to become fully acquainted with the proposed replacement of the Lexington/Route 2A Bridge. The proposal consisted of the replacement of the existing Route 2A (Marrett Road) bridge in its present location, modification of the layout of the interchange on/off ramps, roundabouts on each end of the bridge, as well as other safety improvements. Construction duration is estimated at 54 months.

Boston Logan International Airport Access Improvements

Massport has developed a comprehensive trip-reduction strategy designed to offer passengers alternative transportation methods to and from Logan Airport, with a goal of 40 percent of ground access using High Occupancy Vehicle (HOV) modes[136] by 2027. This strategy provides various options to reduce the number of vehicle trips that are reliable and convenient while also minimizing environmental and community impacts. Additionally, the strategy aims to ensure sufficient on-airport parking for those who choose to access the airport by car or who have limited access to ground-access HOV modes. Improving the connectivity of the airport through multimodal transportation options reduces the number of vehicle trips, vehicle miles travelled (VMT), and greenhouse gas (GHG) emissions which benefits the environment.[137]

Massport continually reviews both on and off-airport activity levels and modifies its ground access programs to align with air passenger levels accordingly, as discussed in the Logan Airport *2020/2021*

[135] The Town of Lincoln Massachusetts. June 2021. "MassDOT Route 2A Resurfacing & Safety Improvement Project". https://www.lincolntown.org/1270/MassDOT-Route-2A-Project-2021, accessed May 4, 2023.
[136] HOV modes are the ground access modes that have the fewest vehicle trips per air passenger and include Logan Express, MBTA transit, scheduled buses, courtesy vehicles, shared-ride vans and black car limousines, and water transportation modes. (2020/2021 EDR, Chapter 5)
[137] Massport. December 2022. *Logan Airport 2020/2021 Environmental Data Report (EDR) Overview*. https://www.massport.com/sites/default/files/2023-12/logan-edr-overview_12-15-22-final.pdf, accessed May 2, 2023.

EDR, Chapter 5.[138] Post pandemic, it is anticipated that Logan Airport will continue to be one of the top U.S. airports in terms of HOV and transit mode share. In 2019, HOV mode share (of total ground access) reached 40.4 percent, exceeding both near-term and longer-term goals. COVID-19 reduced the use of ground transportation services, particularly the use of ground-access HOV modes. Massport is striving towards the HOV mode share goal of 40 percent in 2027 (noted above). Massport remains committed to promoting numerous HOV modes to improve on-airport roadway and curbside operations, alleviate constraints on parking, and improve customer service.

Key initiatives by Massport include:

- Continuing to promote Logan Express ridership by expanding parking, frequency, and facility upgrades.
- Purchasing eight MBTA Silver Line buses in spring 2023.
- Implementing a RideApp (e.g., Uber and Lyft) management plan to reduce on-airport congestion.

The Sumner Tunnel in Boston runs under Boston Harbor to connect the North End neighborhood to East Boston. It is one of three tunnels that connect Boston and I-93 to Logan Airport; the others are the Callahan Tunnel and the Ted Williams Tunnel. The Sumner Tunnel is undergoing a restoration that began in the spring 2022. The project requires the tunnel to be closed to traffic periodically on weekends or full closures for approximately two months at a time in summer 2023 and summer 2024.[139] During holiday weekends, the tunnel remains open. Several detours have been established for those travelling from Logan Airport. The alternative routes, Callahan Tunnel or the Ted Williams Tunnel, remain open for those travelling to the Airport.[140] MassDOT[141] continues to remind drivers to plan for extra travel time during weekend closures and encourages those traveling to or from Logan Airport to leave their cars at home and explore Massport's list of transportation options to and from Logan Airport, which include the Blue Line or Silver Line, the Logan Express, or water transportation.

City of Worcester, Massachusetts Roadway Improvements

According to Massport's CIP for the FY 2023–2027, a proposal is underway to modernize the Terminal Roadway located in Worcester Airside in FY 2025. Other Worcester ground access improvements that may impact local and airport access are described in the rest of this section.

Chandler Street, a major roadway between Main Street and Park Avenue, is set to undergo a significant transformation through a Complete Streets improvement project led by the City of Worcester in partnership with MassDOT.[142] The project will involve design changes aimed at improving safety and accommodating all users of the road, from pedestrians to cyclists and drivers. Along with the design changes, the project will also include an improved streetscape which will feature new lighting and landscaping elements. Another key component of the project is to enhance accessibility and

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[138] Massport. November 2022. *Boston Logan International Airport 2020/2021 Environmental Data Report (EDR)*. https://www.massport.com/media/menn3uln/2020-2021-logan-environmental-data-report.pdf, accessed May 2, 2023.
[139] Commonwealth of Massachusetts. "Sumner Tunnel Restoration: Project details and closure schedule". https://www.mass.gov/info-details/sumner-tunnel-restoration-project-details-and-closure-schedule, Accessed August 31, 2023.
[140] Commonwealth of Massachusetts. "Sumner Tunnel". https://www.mass.gov/sumner-tunnel, accessed May 4, 2023.
[141] Mass511. Mass511.com, accessed May 4, 2023.
[142] The City of Worcester. "Chandler Street Redesign (Main Street to Park Avenue)". https://www.worcesterma.gov/chandler-street-redesign-project, accessed May 4, 2023.

accommodations for individuals with disabilities. To make public transportation more efficient and convenient, the project will also involve enhanced bus stops and improved bus stop locations. The coordination of traffic signals will also be improved to ensure smoother traffic flow. The total cost of the project is estimated to be $9.2 million, which will be covered by a combination of local funds and federal grants. Construction will take place in two phases, and the anticipated start of Phase 1 construction is 2025 and anticipated start of Phase 2 construction is 2026. The project should have a significant impact on the community by making Chandler Street a safer and more accessible route for all users.

In June 2022, a public hearing was held to discuss a proposed project to improve the design of Chandler Street and its traffic control. The project aims to enhance the safety of the area by constructing two modern roundabouts with median islands, curbing, and landscaping/hardscaping at the northern and southern intersections of May Street and Chandler Street. Furthermore, the project plans to upgrade pedestrian, transit, and cycling facilities. The project was a result of a study in 2016 which identified concerns regarding traffic volumes, vehicular speeds, safety for elementary school children, and high numbers of students parking and crossing the street.[143] The study presented different alternatives including signalization, roundabouts, and channelization alternatives, and after careful consideration, the construction of a modern, single-lane roundabout with an inscribed diameter of 120 feet at Chandler Street at May Street (North) along with a modern, single-lane roundabout with an inscribed diameter of 100 feet at Chandler Street at May Street (South) was chosen. The project will also provide a shared-use path, on-street parking, crosswalks, and a transit stop along the Chandler Street Corridor to accommodate the high frequency of pedestrians.

Since October 2019, the construction of the Kelley Square Improvement Project completed the “peanut” roundabout.[144] The project is a collaborative effort between MassDOT and the City of Worcester aimed at enhancing the safety and operational efficiency of Kelley Square as well as the surrounding roads. The project, with a total cost of $14.7 million, was designed to address the challenges faced by pedestrians, bicyclists, and motorists while also supporting the local businesses and residents in the area. Additionally, the project included improvements to the adjoining streets to ensure seamless connectivity between different areas.

Interstate 495 Improvements near Worcester

There are three ongoing I-495 improvements:

- I-495 and Route 9 interchange: This project is part of the I-495 and I-90 interchange project discussed in the next bullet. MassDOT plans to add a fourth lane on Route 495 north to Route 9. Within the existing median, a future I-495 northbound lane will be constructed, and a future I-495 southbound lane will undergo minor widening in its existing location.
- I-495 and I-90 interchange: The Interstate 495/Interstate 90 interchange averages 75,000 vehicles daily and is a well-known high-traffic and high-crash area.[145] The purpose of this project

[143] MassDOT. June 2022. *Virtual Design Public Hearing – Intersection Improvements on Chandler Street and May Street*. https://www.mass.gov/doc/massdot-hearing-handout-worcester-061522/download, accessed May 4, 2023.
[144] MassLive. May 2020. “Aerial footage of Kelley Square shows ‘peanut’ taking shape at infamous Worcester intersection”. https://www.masslive.com/worcester/2020/05/aerial-footage-of-kelley-square-shows-peanut-taking-shape-at-infamous-worcester-intersection.html, accessed May 25, 2023.
[145] Milford Daily News. July 2020. “Hope for woeful interchange”. https://www.milforddailynews.com/story/news/politics/state/2020/07/09/i-90495-reconstruction-aims-to-ease-traffic-reduce-bottlenecks-crashes/113905420, accessed May 4, 2023.

is to provide a safe and efficient interchange between interstate highways I-495 and I-90. MassDOT has developed plans to construct several ramps that lead to and from the interchange to improve safety and minimize environmental impacts. The I-495 Interchange is located adjacent to the Cedar Swamp Area of Critical Environmental Concern that contains protected species habitat, wetlands and water supply resources, and archeological sites that pose constraints on potential improvement alternatives.[146] The old toll booth area will be removed, and the interchange will be rebuilt. Minor widening will be done on the Massachusetts Turnpike (Mass. Pike) section of the interchange to accommodate new ramps and ensure a consistent shoulder width. The bridge over MBTA/CSX/Amtrak track will also be replaced along with the culvert at Whitehall Brook. Fiber optic cables in the median and eastbound shoulder will be relocated. Additionally, the I-495 bridges over the railroad tracks and the Mass. Pike will be replaced, along with the Fruit Street and Flanders Road bridges. The entire project is estimated to cost $400 million.[147]

Project design began in May 2022 and will continue through December 2024. There are five stages to the construction, the last one ending in June 2027.[148] Throughout the project, three lanes on both I-495 and the Mass. Pike will remain open for traffic except for occasions when overnight construction requires a lane restriction. MassDOT will implement a noise control program during construction to reduce noise levels for nearby residents.

- I-495 and I-290 interchange: "The proposed improvements include widening the ramp to two lanes and improvements to the ramp alignment. Additional improvements involve minor widening of I-495 to create an exit only lane and a shared through/exit lane as well as widening on I-290 to accommodate the additional ramp lane. The deceleration lane will also be extended primarily through pavement markings. The work will entail resurfacing the I-495 SB and I-290 [westbound] mainline barrels within the project limits to facilitate the changes to the pavement markings. Related work includes associated signage, minor drainage modifications and upgraded guardrail as needed."[149] The project has a construction bid price of under $6 million. Design was completed in 2022; construction is ongoing and is expected to be completed in spring 2024.

Bradley International Airport Improvements

In July 2022, Bradley unveiled a new ground transportation center, which cost $210 million to construct. The center offers enhanced access to rental cars, additional parking, and future public transit options for travelers. The primary objective behind building this facility was to streamline operations, improve access to transportation, save time for passengers, and alleviate traffic congestion, making it easier to access the airport's arrivals/departures levels. Covering an area of 13.4 acres, the center includes three buildings spanning over 1.5 million square feet. The buildings include a five-story ready/return garage, a five-story quick turnaround facility (for rental car fleet washing, vacuuming, and fueling), and a four-

[146] Commonwealth of Massachusetts. July 2013. "Interstate 495 & Route 9 Interchange Improvement Study – Executive Summary". https://www.mass.gov/doc/i-495-executive-summary/download, accessed May 4, 2023.
[147] Community Advocate. November 2022. "State Prepares for $400M Interchange Replacement". https://www.communityadvocate.com/2022/11/16/state-prepares-for-400m-interchange-replacement, accessed May 4, 2023.
[148] Commonwealth of Massachusetts. "Project schedule and public information: I-495/I-90 interchange improvements". https://www.mass.gov/info-details/project-schedule-and-public-information-i-495i-90-interchange-improvements, accessed May 4, 2023.
[149] Commonwealth of Massachusetts. "MassDOT Project Information." https://hwy.massdot.state.ma.us/projectinfo/projectinfo.asp?num=610552, accessed May 4, 2023.

story vertical circulation[150] building.[151] Furthermore, the facility features a dedicated area for buses connecting the airport to the Connecticut Rail line.

Tweed-New Haven Improvements

The existing West Terminal has primarily been accessed via Townsend Avenue and Fort Hale Road. However, Fort Hale Road, which is a narrow residential, tree-lined street that traverses an otherwise quiet residential area, is not appropriate as an airport access road. Residents have reported concerns about airport traffic "staging" on the road and occupying on-street parking that would otherwise be available to residents. To address these issues, the most recent 2022 Environmental Assessment Draft[152] (Section 2.2.3.4) calls for “a more direct access route to the airport that avoids residential neighborhoods and is able to support traffic to the airport, a key goal of the project.” The new access road needs to comply with CTDOT safety and design standards and provide standard roadway sizing for existing and expected peak hour demand and terminal location. A key goal is to provide a new airport access road that bypasses most residential areas while being compatible with local land use and offering a safe and efficient route between the terminal and I-95. In addition, guidance signage to and from the airport must be provided to ensure travelers can easily navigate the new access route.

[150] Vertical circulation: the relationship between the levels a structure and how people move between the various floors.
[151] Kristen Rindfleisch, Airport Improvement. December 2022. “Bradley Int’l Builds New Ground Transportation Center”. https://airportimprovement.com/article/bradley-int-l-builds-new-ground-transportation-center, accessed May 4, 2023.
[152] Tweed-New Haven Airport. March 2023. “NEPA Environmental Assessment Draft”. https://www.tweedmasterplan.com/nepa-documents, accessed May 4, 2023.

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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 current traffic data with data from the 2017 ESPR, (2) makes a retrospective comparison of existing conditions with forecasts from the 2017 ESPR, and (3) provides a prospective assessment of the 2030 and 2040 future airport activity scenarios.

This chapter presents the current transportation demand management (TDM) activities in proximity to Hanscom Field, describes current efforts to reduce single occupancy vehicle (SOV) trips to Hanscom Field, and discusses opportunities for expanding on existing demand reduction efforts.

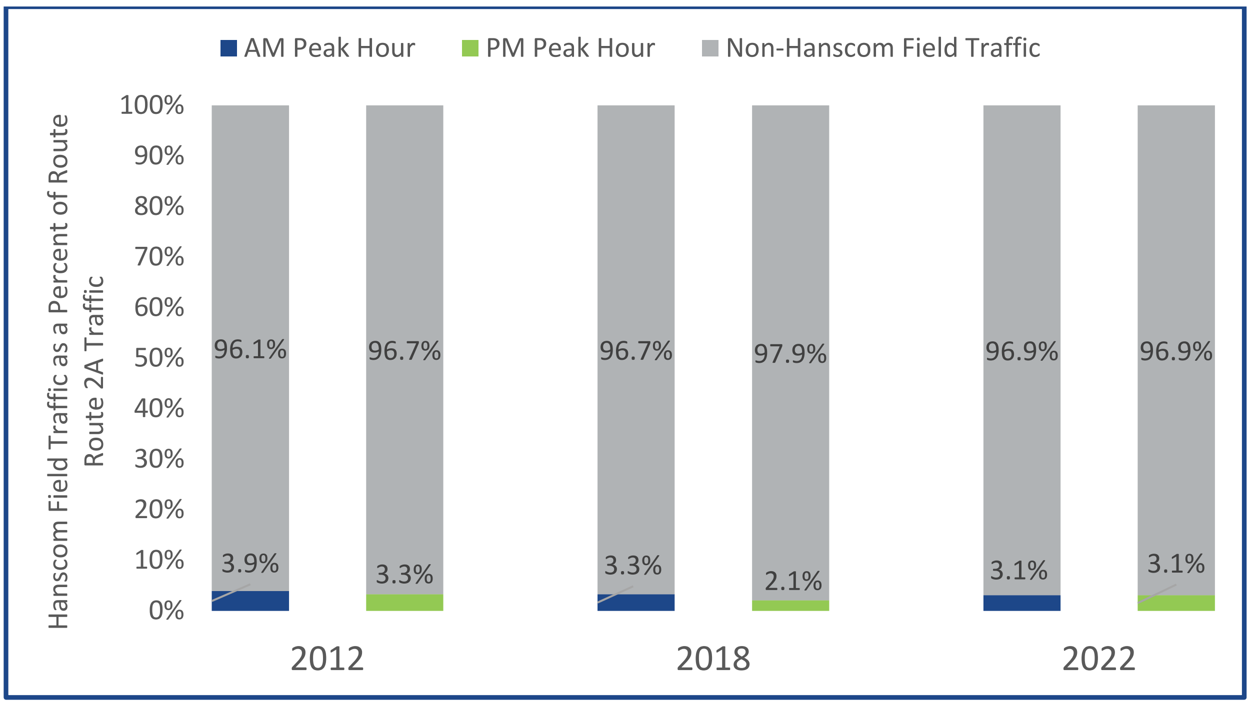
The 2022 ESPR future scenarios were used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3 of this document. The 2030 and 2040 scenarios represent estimates of what could occur depending on demand, based on forceasted operations related to airport ground transportation in the future.

6.1 Key Findings Since 2017

Traffic in and out of Hanscom Field has traditionally occurred outside of the typical morning and afternoon peak traffic hours of the surrounding area. Due to the nature of operations at general aviation airports like Hanscom Field, traffic activity by employees and passengers at the Airport typically occurs either very early or late in the day, or at midday; therefore, the traffic activity at Hanscom Field does not follow typical peak period commuting patterns. The traffic study conducted for this *2022 ESPR* confirms that this finding has not changed since the *2017 ESPR*. Furthermore, Hanscom Field-related traffic on surrounding roadways remains minimal in relation to other traffic present on these facilities. This analysis does not include review of traffic impacts related to Hanscom AFB, which is not included in the impact analysis of this ESPR.

Based on turning movement counts (TMCs) at the intersection of Route 2A and Airport Road, as shown in **Figure 6-1**, Hanscom Field-related traffic has increased since 2017, while overall Route 2A peak hour traffic volumes have decreased. Hanscom Field-related traffic only contributes to approximately 3 percent of peak hour traffic volumes along Route 2A, east of Hanscom Drive. This is consistent with the *2017 ESPR* during the morning peak hour and represents a 1-percent increase during the evening peak hour.

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



Note: Traffic data for the *2022 ESPR* was collected in November and December of 2022 and March of 2023. Traffic volume, vehicle occupancy, and parking demand in 2023 are likely comparable to what occurred in 2022.
Source: McFarland Johnson, 2023

The employee travel survey, which implied more typical peak hour commuting patterns, accounts for only a portion of the total arriving and departing trips; a more representative measure of travel patterns for all Hanscom Field trips is illustrated by the traffic count data at driveways to Hanscom Field.

The average daily traffic volumes on Hanscom Drive, the primary access road to Hanscom Field from the surrounding roadways, decreased from 1,700 vehicles per day (VPD) in 2018 to 1,500 in 2022. Although this decrease is likely partially due to the lingering effects of the COVID-19 pandemic, it also extends the long-term trend seen on Hanscom Drive since 2005, as traffic volumes have declined from an observed 2,600 VPD in 2005 to the 1,500 VPD observed during the preparation of the *2022 ESPR*. Average daily traffic volumes and related count data are contained in **Appendix C**.

The 2030 and 2040 forecast scenarios include an increase in aviation activity, as described in Chapter 3; as a result of the forecast aviation growth, peak hour vehicle trips are anticipated to increase modestly.

The traffic forecasts include vehicle trips generated by Hanscom Field, future background traffic growth, and planned developments in the area. The traffic analysis reconfirms previous ESPR findings that although Hanscom Field traffic is forecasted to increase it is still not a significant contributor to traffic volumes on the surrounding roadways, particularly during morning and evening peak hours. Commercial and residential developments, coupled with the local reliance on SOV, remain the most significant sources of existing and future traffic volumes on area roadways.

Table 6-1 presents actual Hanscom Field peak hour trip generation since 2012 and the forecast trip generation for 2030 and 2040. The data contained in **Appendix C** show an increase in Hanscom Field-related peak hour vehicular trip since 2018 and it shows projected increases to peak hour traffic volumes generated by Hanscom Field exceeding those of 2012. The forecasts represent an increase from traffic volumes seen at the airport in past years, due to the forecast aircraft operations as shown in Chapter 3.

Table 6-1. Hanscom Field Vehicular Trip Generation (Vehicles per Hour)

Year / Scenario	2012 Actual	2018 Actual	2022 Actual	2030 Forecast	2040 Forecast
Morning Peak Hour	165	110	148	197	255
Afternoon Peak Hour	121	107	130	164	207
Sources: *2017 ESPR* and McFarland Johnson, 2023					

6.2 Existing Conditions

The term Existing Conditions in the context of ground transportation in the vicinity of Hanscom Field includes access to and from the airport specifically as well as an analysis of all nearby transportation modes.

6.2.1 Regional Ground Transportation Context

This subsection describes the regional ground transportation system surrounding Hanscom Field including (1) the regional highway system; (2) regional rail and transit (commuter rail and local service); (3) the regional pedestrian, bicycle and recreation network; and (4) adjacent trip generators that contribute to trip demands in the area.

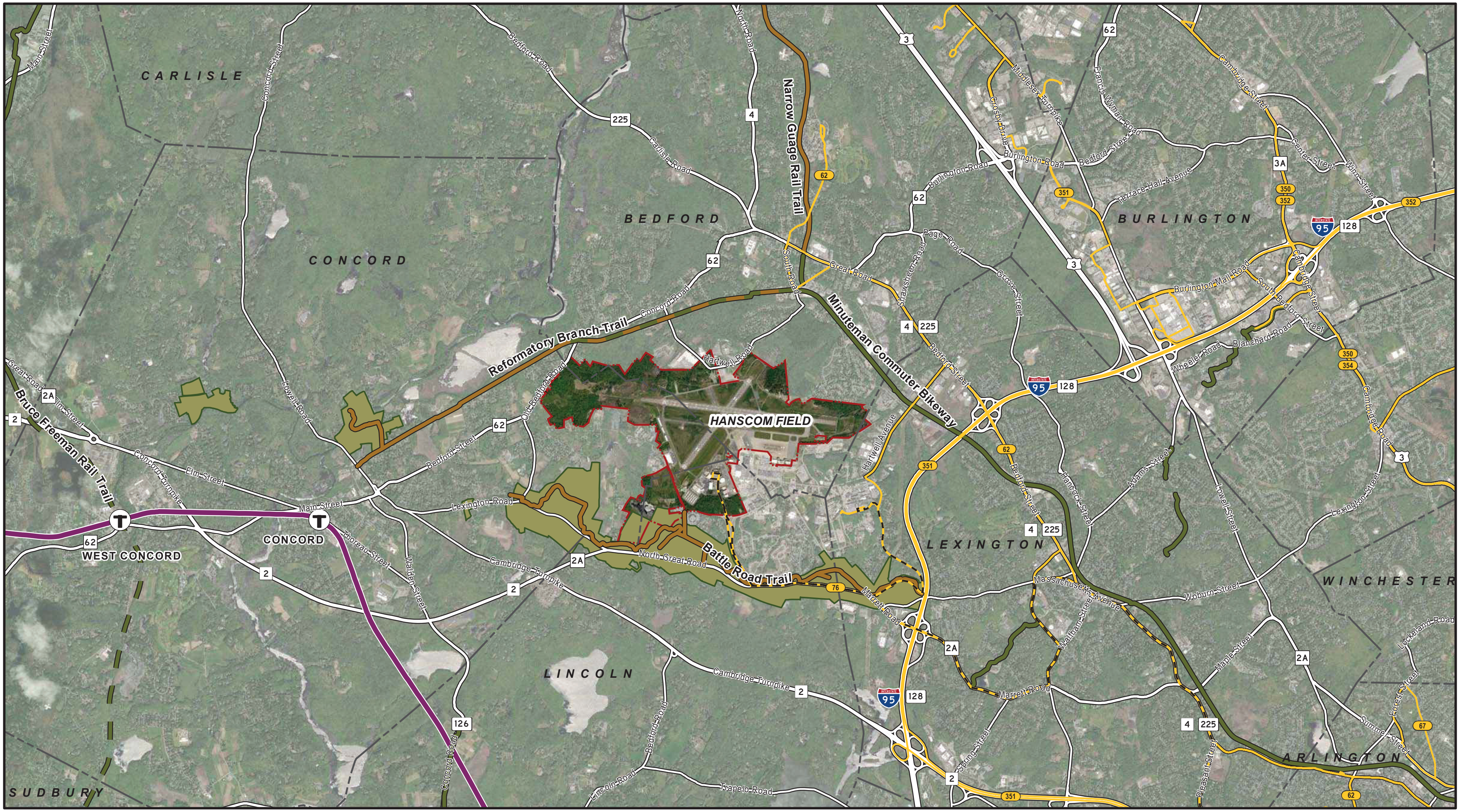
Regional Highway System

A roadway network of major expressways, including state Route 128/Interstate 95 (I-95), state Route 2, and state Route 3, surrounds Hanscom Field (see **Figure 6-2**). Route 128/I-95 Exit 30 (at Route 2A) is the closest highway exit for Hanscom Field, although Exit 31 (at Route 4/225) also provides access to Hanscom Field. Route 2A, which is designated as the Battle Road Scenic Byway, provides primary east/west access to and from Hanscom Field 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 primarily use Route 128/I-95. Route 2 generally provides connection to areas to the west of Hanscom via Route 2A and Bedford Road. In the vicinity of Hanscom Field, most intersections are unsignalized, with the exception of the Massachusetts Avenue and Route 2A intersection. Traffic flows near Hanscom Field follow the general commuting patterns of the area, with heavier eastbound flows (toward Route 128/I-95 and Boston) during the morning peak hour and heavier westbound traffic flows during the afternoon peak hour.

Regional Rail and Bus Service

The nearest commuter rail stations to Hanscom Field are located less than five miles away in Concord Center (at Concord Station) and in Lincoln (at Lincoln Station). Both Concord Station and Lincoln Station are serviced by the Fitchburg Line of the MBTA Commuter Rail, which provides the station with 18 inbound and 18 outbound trains every weekday with service to Boston's North Station (inbound) and to Wachusett Station (outbound). Service frequency is roughly every hour. Commuter rail service operates at Concord Station and Lincoln Station between approximately 5:15 a.m. and 11:45 p.m. Weekend service is provided both Saturday and Sunday with eight trains inbound and eight trains outbound, with a frequency of roughly every two hours. Weekend service operates from approximately 6:00 a.m. to 10:00 p.m. Currently, no shuttle or transit service is available between Hanscom Field and either Concord Station or Lincoln Station, limiting access to commuter rail for Hanscom Field area customers.

For public transit commuters, Hanscom Field is primarily served by MBTA Bus Route 76. This bus route operates between Alewife Station (the northern terminus of the MBTA Red Line in Cambridge), and Hanscom Field Terminal, stopping at MIT's Lincoln Laboratory. From Alewife Station the bus stops along Massachusetts Avenue in Lexington and in Lexington Center before serving Hanscom Field. The Route 76 bus frequency is designed with preference to customers commuting from Alewife Station to Lincoln Labs in the morning peak hours and the reverse in the evening peak hours. This preference is implemented by servicing Lincoln Labs first on the outbound runs in the morning periods and then the reverse in the afternoon periods. Specifically, there are six outbound buses in the afternoon/evening (between 3:30 and 7 p.m.) that serve both the air terminal and Lincoln Labs, the corresponding inbound trips only serve Lincoln Lab.



North

0 0.25 0.5 0.75 1 Mile

Data Sources: Bike Paths (MassGIS - 12/9/17, OpenStreetMaps - 9/27/18, FHI verified with aerial imagery dated 4/22/18 and government and project websites);
Minute Man National Historical Park Boundary (National Park Service - 2/22/18); Municipal Boundaries (MassGIS - 3/5/13);
Streets, MBTA Bus Routes, MBTA Commuter Rail (MassGIS - 7/17/2018); Aerial Imagery (ESRI)

- Hanscom Field Property Boundary
- Municipal Boundary
- Minute Man National Historical Park
- Interstate
- U.S. Highway
- State Route
- Local Road
- Paved Bike Path
- Paved Bike Path - Future
- Improved Natural Surface Bike Path
- MBTA Commuter Rail Station
- MBTA Commuter Rail Line (Fitchburg Line)
- MBTA Bus Route 76
- MBTA Bus Route (Multiple Routes)

L. G. Hanscom Field
2022 Environmental Status & Planning Report

Hanscom Field
Regional Transportation Network

Figure 6-2

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These two factors in the route design (local service and preference to Lincoln Labs) result in a commute from Alewife Station to Hanscom Field Terminal that takes approximately 37 minutes in the morning peak hours, while the reverse commute in the afternoon peak hours takes approximately 53 minutes. Bus Route 76 operates between the hours 5:00 a.m. and 8:00 p.m. on weekdays, with frequency provided roughly every half hour in the morning and afternoon peak hours. Saturday service is provided on an hourly basis with a combined 62/76 bus route between the hours of 7:00 a.m. and 7:00 p.m. This combined route connects the Hanscom Field Terminal with Alewife Station to the south and the Bedford Veterans Administration Hospital to the north. No MBTA bus service is provided for these routes on Sundays.

The towns of Lexington and Bedford each operate their own transit systems, called LEXPRESS and Bedford Local Transit, respectively. Lexington's system operates on four fixed routes, each with one-hour headways (the amount of time between vehicle arrivals at a stop) running from 7:30 a.m. to 7:00 p.m. on weekdays. LEXPRESS routes operate almost entirely within Lexington town limits; however, several of the LEXPRESS routes cross the MBTA Route 76, which services Hanscom Field. The LEXPRESS route closest to Hanscom Field is Route A2, which is approximately four miles from Route 2A and Hanscom Drive. Bedford's transit system is oriented more towards shopping trips for senior citizens within the town, as service is provided via a single round trip each weekday.

Another transit service in the area is the Route 128 Business Council's REV BUS service, which provides express service for commuters of the Hartwell Avenue area in Lexington from Alewife Station. Service is provided between 6:25 a.m. and 7:21 p.m., Monday through Friday on a 32-passenger bus. Trip times vary between 15 and 30 minutes, based on the time of departure from Alewife Station and traffic conditions.

Additionally, MIT operates a private shuttle between the Lincoln Labs campus on Hanscom AFB and MIT in Cambridge. Service is provided every two hours and runs between the hours of 7:00 a.m. and 7:00 p.m.

Regional Pedestrian, Bicycle, and Recreation Network

The Minuteman Commuter Bikeway is a 10-mile paved trail that extends from Alewife Station in Cambridge to Depot Park in Bedford. This popular trail provides direct access to the MBTA Red Line, which provides service to and from Cambridge and Boston. At the north end, the Minuteman Commuter Bikeway connects to the Reformatory Branch Trail and the Narrow Gauge Rail Trail. The Narrow Gauge Rail Trail extends north three miles to Billerica via a crushed stone surface, while the Reformatory Branch Trail extends four miles to Lowell Road in Concord.

The 6-mile Battle Road Trail, within the borders of the Minute Man National Historical Park, is also a resource for bicycle riders and offers cycling, pedestrian, and wheelchair access to the National Park Service's historic and natural resources. However, the Battle Road and Narrow Gauge trails are not paved and do not directly link to the other regional trails. Efforts by the Town of Lexington to connect the Battle Road Trail to the Minuteman Commuter Bikeway were undertaken with the development of a conceptual plan for a West Lexington Greenway measuring just over four miles in length. No further progress beyond conceptual plans has progressed to date.

Finally, in addition to the specified trails, there are several on-road bicycle facilities in the towns surrounding Hanscom Field, consisting mostly of bike lanes or unmarked shoulders. Marked bike lanes are sporadic in all four communities adjacent to Hanscom Field; however, bike lanes currently exist on Hartwell Avenue in Lexington and on Route 4, north of Lexington Center.

Adjacent Trip Generators

Hanscom Field is surrounded by other trip generators (land uses that produce new traffic) that contribute to the demands for travel on the roads, transit system, and bicycle/pedestrian network described here. This chapter's purpose is to isolate the impacts of trip generation to and from Hanscom Field in order to plan for the transportation needs associated with changes at Hanscom Field. To do so, it is important to recognize the presence of adjacent trip generators to put the Hanscom Field operations into perspective. These adjacent generators include Hanscom AFB, numerous commercial offices and research facilities including MIT Lincoln Labs, the Minute Man National Historical Park, and Minute Man Regional High School.

6.2.2 Regional Ground Transportation Planning Context

Regional transportation planning is primarily conducted through the Boston Region MPO, which was established to direct federally funded transportation plans and programs. The Boston MPO is responsible for prioritizing transportation projects in the region and is the key organization that programs federal transportation funding to specific projects. This section describes the structure of the MPO planning process and the key planning documents affecting ground transportation access at Hanscom Field.

In addition, MassDOT, MBTA, and organizations conduct their own planning efforts, which are described in further detail below.

Boston Region Metropolitan Planning Organization

The Boston Region MPO district encompasses 97 cities and towns in the Boston area, including Bedford, Concord, Lexington, and Lincoln. The MPO has 22 voting members, one of which is Massport. Other voting members include state agencies such as MassDOT and the MBTA; other regional organizations such as the MBTA Advisory Board, the Metropolitan Area Planning Council, the Regional Transportation Advisory Council, the City of Boston, and 12 elected members from the remaining 96 cities and towns in the region.

Among the most critical planning documents produced by the Boston Region MPO are the Transportation Improvement Program (TIP) and the LRTP. Together, these documents prioritize and program federal transportation funds in the region, with the TIP providing project programming over the course of five years and the LRTP proving broader thematic goals in transportation investment and funding over a 25-year planning horizon. Specific projects may be sponsored by organization members for consideration for federal funding, with the final list of programmed transportation projects representing a list of considered projects that have been prioritized and voted upon by the region.

The current TIP, approved by the Boston Region MPO in May 2022, includes a program of transportation funds for the years 2023–2027. The current LRTP, approved by the MPO in 2019, includes thematic goals and projects in the region for the years 2020–2040. Each of these documents includes a "Universe of Projects" list, which identifies projects sponsored throughout the region, but not programmed in any document. **Table 6-2** includes a list of relevant projects within approximately a 3-mile radius from Hanscom Field that are programmed within the 2023–2027 TIP, as well as projects identified in the 2020–2040 LRTP that are not identified in the TIP.

Table 6-2. Boston Region MPO TIP and LRTP Projects Relevant to Hanscom Field

MPO Planning Document	Project Title	Project Description	Status
2023-2027 TIP	Concord, Lexington, Lincoln – Resurfacing and Related Work on Route 2A	Resurfacing and Related Reconditioning of deficient pavement.	Programmed for funding in 2022 and in progress.
2023–2027 TIP	Lexington Bridge Replacement, L-10-010, Route 2A (Marrett Road) over Interstate 95 / Route 128	Replacement of Bridge L-10-010. Bridge is currently listed as structurally deficient and has a posted load restriction.	Currently programmed for funding in 2023 and in progress.
2020–2040 LRTP	Route 4/225 (Bedford Street) and Hartwell Avenue - Lexington	Installation of access management controls on Route 4/225 while increasing capacity to and from Hartwell Avenue.	Currently programmed for funding between and in progress.
2020–2040 LRTP	Route 2 Improvements - Concord	Reconstruction and Widening on Route 2, from Sandy Pond Road over MBTA/B&M Railroad	Planned

Sources: Boston Region MPO Transportation Improvement Program FFYS 2023–27, 2022
Boston Region MPO Destination 2040 Long-Range Transportation Plan, 2019

MassDOT Planning Efforts

MassDOT frequently engages in their own internal planning efforts to direct investment to transportation assets across the state. These planning efforts are documented in individual plans such as the MassDOT Bicycle and Pedestrian Plan (May 2019), the MassDOT Freight Plan (May 2023), and the MassDOT Rail Plan (May 2018). Review of the MassDOT Bicycle and Pedestrian Plan, the MassDOT Freight Plan, and MassDOT Rail Plan does not reveal any projects that would affect access to Hanscom Field.

MassDOT is responsible for the development of the five-year CIP, which directs state funds to MassDOT-sponsored transportation investments. While similar to the TIP developed by the Boston Region MPO, the CIP identifies additional projects outside the scope of the TIP that do not utilize federal funds. If only state funds are used, a project may appear in the CIP while not appearing in the TIP.

Relevant Projects Identified in the MassDOT CIP for Funding Between 2023 and 2027 include:

- Resurfacing and Related Work on Route 2A – Concord, Lexington, Lincoln.
- Bruce Freeman Rail Trail Phase 2B – Concord.

MBTA Planning Efforts

Focus40 is the 25-year investment plan to position the MBTA to meet the needs of the Greater Boston Region by 2040. The Focus40 Plan was finalized in March 2019. The MBTA Rail Vision final report was completed in February 2020. Additionally, the MBTA Capital Investment Plan is updated annually, with the version covering projects planned through 2027 finalized in June 2022. Review of these plans does not indicate that any changes should be expected to directly affect Concord or Lincoln Station on the Fitchburg Commuter Rail Line. MBTA is currently working on a multi-year effort called the *Better Bus Project*[153] to reevaluate the MBTA bus network from the ground up. Future areas of study include bus electrification, bus stop accessibility improvements, and bus facility modernization. As these projects are in progress or in the planning stage, review of these efforts should continue as more information is released by the MBTA.

Middlesex 3 Coalition

The Middlesex 3 Coalition is a regional partnership of nine Middlesex County Communities including Bedford, Billerica, Burlington, Chelmsford, Lexington, Lowell, Tewksbury, Tyngsborough, and Westford. The coalition communities share a common goal of fostering economic development, job growth and retention, diversification of the tax base, and enhancement of quality of life. Members include stakeholders in local government, business, finance, education, and development who have combined resources to promote the competitive advantages of the region and advance the economic vitality of the Route 3 Corridor.

Due to the significant amount of business development happening along the Route 3 Corridor, traffic and transportation resources continue to be a top priority for the Coalition. Several transportation-related efforts undertaken by the Coalition include the following:

- The Middlesex 3 Transportation Sub-committee was created as a way for members to collaborate and strategize methods for tracking transportation issues in member communities.
- The Middlesex 3 Transportation Community Compact was received in 2015; it allows the Coalition to work with the state and transportation agencies to evaluate current public transportation services in the area and develop recommendations for improvements to services that fail to meet current and future transportation demand.
- The Middlesex 3 Transportation Management Association (M3TMA) was formed in 2014 to address transportation issues such as traffic congestion and to improve air quality in the region. The M3TMA offers transportation resources to public or private businesses, educational institutions, or residential institutions.

[153] Kat Banesh, MBTA. January 2021. "Bus Transformation Update", MBTA.com, https://cdn.mbta.com/sites/default/files/2021-01/2021-01-25-fmcb-J-bus-transformation-revised.pdf, accessed May 4, 2023.

Hanscom AFB Planning Efforts

The Sartain Gate (previously called the Vandenburg Gate) project continues. Phase I, which involves major roadway changes, was started in November 2022.[154] The USAF has been working with Massport, MassDOT, Minute Man National Historic Park (MMNHP), and other organizations on the design of the new gate structure and entrance facility that is planned to replace the existing AFB entryway to enable the replacement of the intersection of Old Bedford Road, Vandenberg Drive, and Hanscom Drive with a roundabout.[155] Along with the improvements to the roadways, a bicycle lane is also included in the design to increase the safety of cyclists. As a result of traffic changes, Hanscom Air Force Base MBTA bus stop at the intersection of Old Bedford Road and Hanscom will also be relocated further into AFB property. The existing Hanscom Field Terminal MBTA bus stop will remain in place.

Other Organizational Planning Efforts

The Route 128 Business Council was established in 1987 as Massachusetts' first Transportation Management Association (TMA) to provide alternative transportation services to the Route 128 corridor between Route 2 and Route 20. Since their establishment, they have expanded to the Hartwell Avenue area and provide direct shuttle service between Alewife Station (MBTA Red Line) and member businesses. Service continues to evolve at the direction of the TMA's members and their needs.

6.2.3 Hanscom Field Trip Characteristics

There are a variety of activities at Hanscom Field that generate automobile traffic and create ground transportation needs. These include general aviation, employment, student programs at the three flight schools that operate at Hanscom Field, and other business activities that support Hanscom Field operations. Employers include Massport, Atlantic Aviation, Jet Aviation, Signature Flight Support, East Coast Aero Club, Mike Goulian Aviation, and Boston Med Flight, among others. Trips to and from Hanscom AFB *are not included* in the ground transportation impacts of this ESPR. For the purposes of the *2022 ESPR* analysis, Hanscom AFB activity includes any trips to and from any of the Hanscom AFB gates at Old Bedford Road, Airport Road, Hartwell Avenue, or Lincoln Labs.

2022 Traffic Count Results

Traffic counts were collected on roadways in the study area during a seven-day period from Tuesday, November 29, 2022 through Monday, December 5, 2022, by Automatic Traffic Recorders (ATRs). These counts provide detailed information on the current traffic patterns in certain areas surrounding Hanscom Field. The counting locations were the same as in previous ESPRs. The 2022 ATR count locations, shown in , are the following:

- Location A: Route 2A, east of Airport Road (Lexington)
- Location B: Bedford Road, south of Route 2A (Lincoln)

[154] Patty Welsh. November 2022. *Sartain Gate project work to involve major road shift*. Hanscom Air Force Base. https://www.hanscom.af.mil/News/Article-Display/Article/3205686/sartain-gate-project-work-to-involve-major-road-shift, accessed on Mar. 8, 2023.

[155] U.S. Army Corps of Engineers, U.S. Air Force. 2014. *Environmental Assessment, Hanscom Air Force Base Vandenberg Gate Complex Construction.*

- 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)

In addition to these seven-day ATR counts, manual intersection and turning movement counts were conducted on Thursday, December 1, 2022 in the morning peak period between 6:00 a.m. and 9:00 a.m. and in the afternoon peak period between 3:00 p.m. and 6:00 p.m. Manual counts were conducted at the same 10 intersections as for the *2017 ESPR*, with an 11th location added in March. These are shown on **Figure 6-3**, and include the following:

- Location 1: Route 4/225 & Hartwell Avenue (signalized), Lexington
- Location 2: Massachusetts Avenue & Route 2A (signalized), Lexington
- Location 3: Old Massachusetts Avenue & Route 2A, Lexington
- Location 4: Airport Road & Route 2A, Lexington
- Location 5: Hanscom Drive & Old Bedford Road (main entrance), Lexington
- Location 6: Hanscom Drive & Route 2A, Lincoln
- Location 7: Old Bedford Road & Lexington Road (Route 2A), Concord
- Location 8: Old Bedford Road & Virginia Road, Concord
- Location 9: Hartwell Road & Route 62, Bedford
- Location 10: South Road & Hartwell Road, Bedford

On Tuesday, March 28, 2023, another manual intersection and turning movement count was conducted at the Atlantic Aviation entrance, during the same time frames for morning and afternoon peak periods.

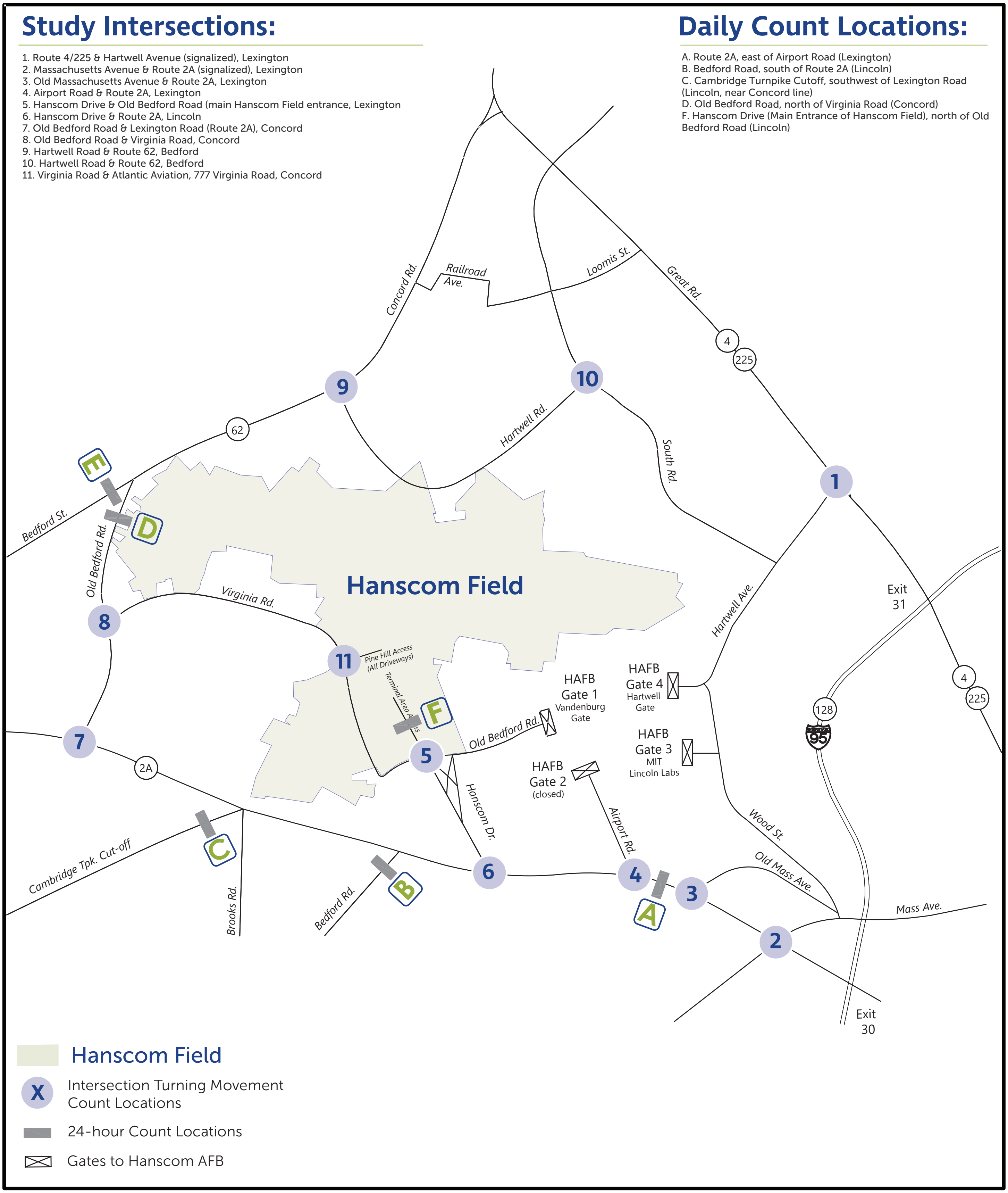
- Location 11: Virginia Road & Atlantic Aviation entrance, 777 Virginia Road, Concord

Study Intersections:

1. Route 4/225 & Hartwell Avenue (signalized), Lexington
2. Massachusetts Avenue & Route 2A (signalized), 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. Old Bedford Road & Lexington Road (Route 2A), Concord
8. Old Bedford Road & Virginia Road, Concord
9. Hartwell Road & Route 62, Bedford
10. Hartwell Road & Route 62, Bedford
11. Virginia Road & Atlantic Aviation, 777 Virginia Road, Concord

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)
F. Hanscom Drive (Main Entrance of Hanscom Field), north of Old Bedford Road (Lincoln)



Hanscom Field

X Intersection Turning Movement Count Locations

24-hour Count Locations

Gates to Hanscom AFB

North

NOT TO SCALE

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2022 Environmental Status & Planning Report

Traffic Study Area Count Locations

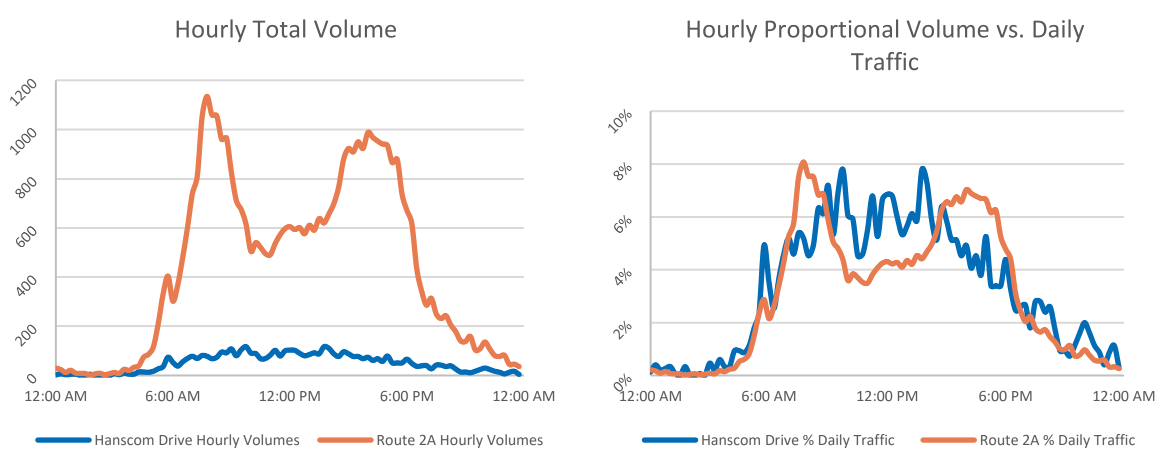
Source: McFarland Johnson, 2023

Figure 6-3

Automatic Traffic Recorder Observations

In November and December 2022, ATRs were used to conduct 24-hour traffic counts over a seven-day period on Hanscom Field roadways. Hanscom Field is an off-peak traffic generator, meaning that the peak traffic volumes for many Hanscom activities occur at a different time from the peak hours of the adjacent street traffic. That is, regional roadway traffic volumes generated by activities at Hanscom Field tend to occur outside of peak commuting hours. As shown in in **Figure 6-4**, the peak hours of overall traffic volumes on Route 2A from Tuesday, November 29, 2022 to Thursday, December 1, 2022 occurred in the morning from approximately 7:30 a.m. to 8:30 a.m. and in the afternoon from approximately 4:45 p.m. to 5:45 p.m. Hanscom Field, however, generates peak hour volumes outside of these hours. In general, Hanscom Field-related traffic is characterized by a small peak in traffic earlier in the morning (6:00 a.m. – 7:30 a.m.) before the start of the Route 2A morning commuter peak hour, followed by higher but steady traffic volumes at Hanscom Field observed throughout the middle of the day. Then traffic drops considerably before the afternoon peak hour on Route 2A begins. The left side of Figure 6-4 shows actual traffic counts reflecting the sum of the weekday (Tuesday, Wednesday, Thursday) averages, while the right side displays the same data as a proportion of the whole day's traffic so that the fluctuations are at a comparable scale.

Figure 6-4. Characteristics of Hanscom Field and Route 2A Vehicle Traffic



Source: McFarland Johnson, 2023; analysis based on data from ATR Locations A and B
Note: The Tuesday-Thursday data range is used as it provides the most typical weekly traffic volumes.

Vehicle Occupancy Survey

Vehicle occupancy data were collected on Tuesday, May 2, 2023, to quantify the number of persons per vehicle entering and exiting Hanscom Field. While Massport recognizes that occupancy counts in 2023 are likely similar to 2022 conditions, these counts were conducted in 2023 and are therefore labeled and referenced as such throughout this chapter. More detailed information on these counts is provided in **Appendix C**.

The number of vehicles, as well as passengers per vehicle, entering and exiting Hanscom Field were counted from 6:00 a.m. to 9:00 a.m. and from 3:00 p.m. to 6:00 p.m. to estimate an average Vehicle

Occupancy Rate (VOR) for Hanscom Field. The VOR is calculated by dividing the total number of passengers by the number of vehicles entering and exiting Hanscom Field. It should be noted that MBTA bus ridership is not included in the VOR. Bicyclists and pedestrians are counted in the numerator of the calculation (total number of passengers); however, they are recorded as not having arrived in a vehicle. The results of the vehicle occupancy survey are presented in **Table 6-3**.

Table 6-3. Comparison of Vehicle Occupancy Rates

Morning/Afternoon	2023 Entering	2023 Exiting	2023 Overall	*2017 ESPR* Overall
Morning Peak Hour	1.07	1.11	**1.09**	1.16
Afternoon Peak Hour	1.13	1.09	**1.11**	1.27
Sources: 2017 ESPR and McFarland Johnson, 2023				

As shown in Table 6-3, VOR for Hanscom Field have decreased since the *2017 ESPR*. The 2023 vehicle occupancy survey equates to 16 percent of people who entered and exited the site during the data collection time doing so in a vehicle with one or more other passengers. This suggests that carpooling might occur with higher frequency than the *2022 ESPR* travel survey (summarized in Section 6.2.7) indicates. However, it should be noted that the vehicle occupancy survey recorded *all* vehicles traveling to and from Hanscom Field; therefore, freight and other business vehicles could skew results.

Parking Survey

A parking demand survey was conducted from 11:00 a.m. to 1:00 p.m. on Tuesday, May 2, 2023. As described in Chapter 2, Section 2.4.2, vehicles were counted at the Hanscom Field parking lots. The parking demand survey assessed 1,015 of the 1,346 spaces currently available at Hanscom Field. Surveyors could not gain access to the parking facilities for Hangars 1, 2, and 3, for the T-Hangars, and for other secure facilities on the day of the survey. Instead, the spaces at these facilities were counted through visual inspection and recent satellite imagery.

These secured parking spaces account for an additional 331 parking spaces. Available parking has decreased, from the total of 1,385 spaces counted in 2017. As noted in Chapter 2, Table 2-3, 2017 totals did not add up to the sum of individual parking numbers and were corrected.

Of the 1,015 parking spaces surveyed, 460 were occupied on the day of the parking survey, which equates to an occupancy rate of approximately 45 percent. The largest parking lot at Hanscom Field—the 439-space public lot associated with the Hanscom Field Terminal Building—was approximately 47 percent occupied on the day of the survey. These rates are consistent with the rates observed in the *2017 ESPR*.

6.2.4 Hanscom Field Peak Hour Trip Generation

The number of trips generated by Hanscom Field (which is distinct from Hanscom AFB traffic) during the peak hour are used to determine the impacts of Hanscom Field-related traffic on study area intersections. 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 6-4** and indicates that the number of morning and afternoon peak hour vehicle trips to and from Hanscom Field in 2022 is more than the trips generated in the *2017 ESPR*. Between the 2018 and the 2022 traffic counts, there is an approximately 35 percent increase in morning peak hour trips and a 22 percent increase in afternoon peak hour trips. This contrasts with the 12 percent reduction in daily traffic volumes seen at Hanscom Drive between the 2018 and 2022 counts, presented later in Figure 6-5. The trip generation data for Hanscom Field exhibits directionality, with 74 percent of morning Hanscom Field traffic entering the facility in the morning peak hour and 63 percent of afternoon Hanscom Field traffic exiting in the afternoon peak hour.

Table 6-4 also includes the *2017 ESPR* projections for the 2025 and 2035 forecast scenarios. Comparison of 2022 traffic data with year 2025 projections from the *2017 ESPR* show that actual 2022 traffic volumes are slightly above the *2017 ESPR* projections for the morning and afternoon peak hours.

Table 6-4. Hanscom Field Main Entrance Peak Hour Trip Generation in Prior Years and 2022 Compared to 2017 Forecasts

Traffic Count Data	Morning Peak Hour			Afternoon Peak Hour*		
	In	Out	Total	In	Out	Total
2002	109	52	161	47	112	159
2005	115	42	157	75	79	154
2012	136	29	165	37	84	121
2018	74	36	110	32	75	107
2022	110	38	148	48	82	130
***2017 ESPR* Scenarios**						
2025 Forecast	90	48	138	40	85	125
2035 Forecast	106	61	167	48	98	146

* Actual counts at Hanscom Field main entrance adjusted in accordance with the traffic volume adjustment section below.
Sources: *2017 ESPR* and McFarland Johnson, 2023

Traffic Volume Adjustments

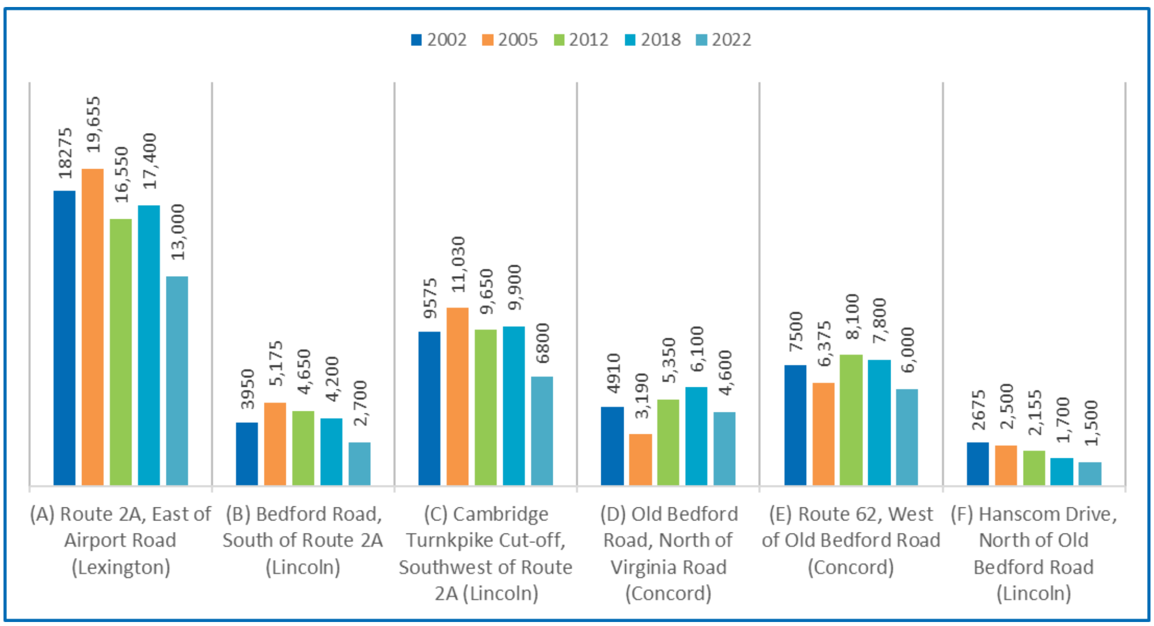
The traffic analysts adjusted the manual intersection and ATR counts from December 2022 to account for the seasonal variation in traffic volumes when developing the 2022 morning and afternoon peak hour traffic networks. Based on MassDOT Traffic Impact Assessment (TIA) Guidelines, analysis of the nearby Continuous Count Stations was reviewed for 2022. Station 4118 on I-95 at the Route 2A interchange was found to have an average day of traffic in December that was 89.2 percent of the yearly average. Thus, based on data from this counter, all traffic figures in this document incorporate a baseline upward adjustment of 12.1 percent by applying a 1.1208 adjustment factor to account for the seasonal variation in traffic. An original report from Continuous Count Station 4118 is provided in **Appendix C**.

Additionally, adjustments were made to the Hanscom Field turning count movements at the Hanscom Drive / Old Bedford Road intersection based on the ATR placed on Hanscom Drive. Review of weekly peak hour data revealed that the volumes counted during the morning on the day of the manual turning movement counts were approximately four to 6 percent higher than the weekday average (Tuesday, Wednesday, and Thursday only) and eight to 33 percent lower than the weekday average (Tuesday, Wednesday, and Thursday only) during the afternoon peak hour. Therefore, to accurately demonstrate the trip distribution of Hanscom Field, traffic volumes to and from Hanscom Field were adjusted by the appropriate percentages to represent a typical daily average. Further details of this process are shown in **Appendix C**.

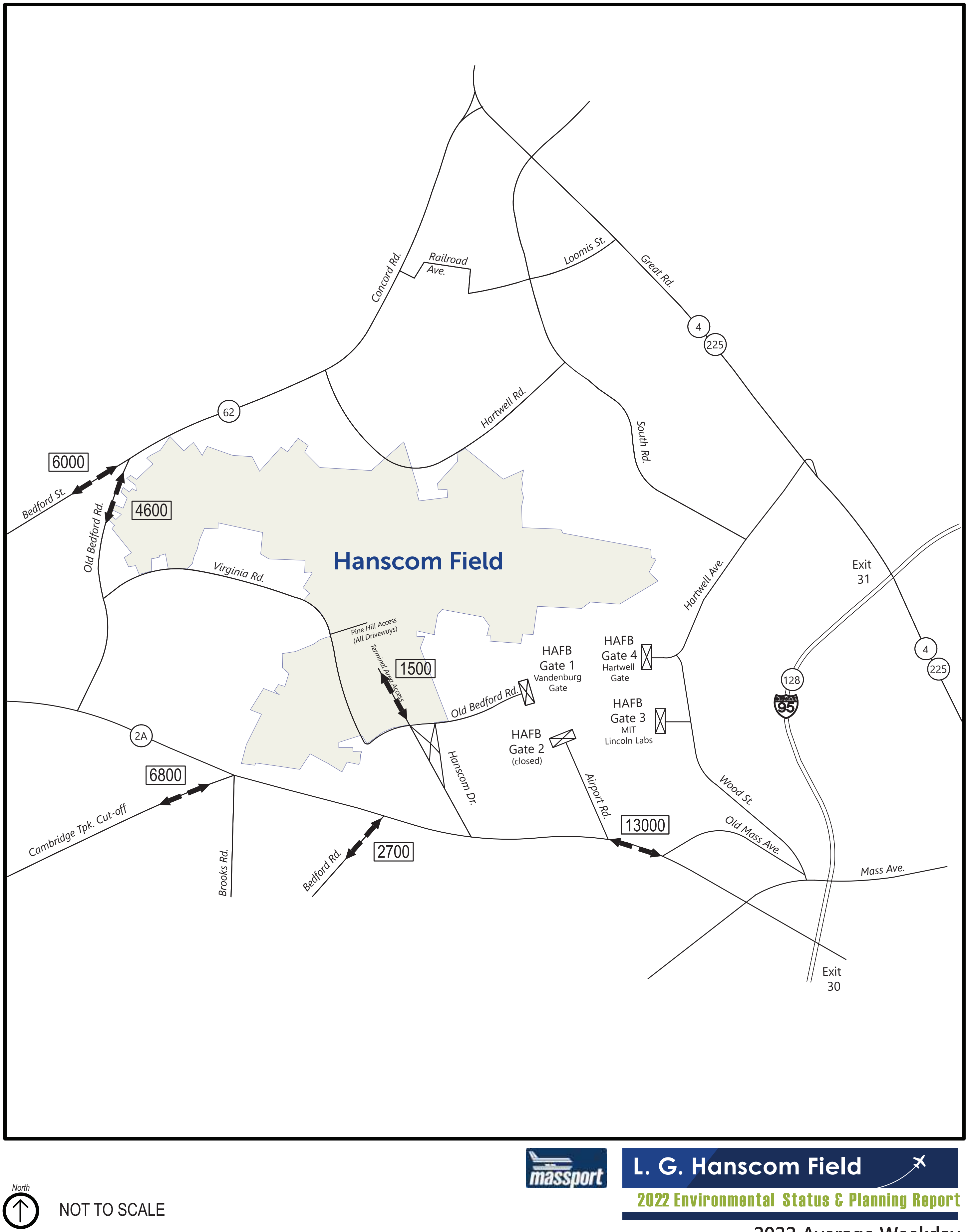
Historic Traffic Trends

Figure 6-5 presents a comparison of 2022 average weekday traffic volumes to the corresponding data from the *2002*, *2005*, *2012*, and *2017 ESPRs*; 2022 average weekday traffic volumes are also shown on **Figure 6-6**. In 2022, average weekday traffic volumes on Hanscom Drive are approximately 1,500 VPD, which is 12 percent less than the 2018 volumes at this same location. The recent decrease may be partly attributable to the lingering effects of the COVID-19 pandemic and an increase in remote working for employees of businesses in the area surrounding Hanscom Field; it is also part of a larger trend of decreasing traffic volumes on Hanscom Drive, which could be related to decreased utilization of the Sartain Gate (formerly Vandenburg Gate) at Hanscom AFB. Consistent with the Hanscom Drive counts, the data collection sites at Route 2A, Bedford Road, Cambridge Turnpike Cut-off, Old Bedford Road, and Route 62 all experienced decreases in average weekday traffic volumes between 2018 and 2022.

Figure 6-5. Comparison of 2002, 2005, 2012, 2018, and 2022 Average Weekday Traffic Volumes



Sources: *2012 ESPR* and *2017 ESPR* for historical data, and McFarland Johnson for 2022 data, 2023



L. G. Hanscom Field

2022 Environmental Status & Planning Report

2022 Average Weekday Traffic Volumes

Source: McFarland Johnson, 2023

Figure 6-6

6.2.5 Existing Conditions Capacity Analysis

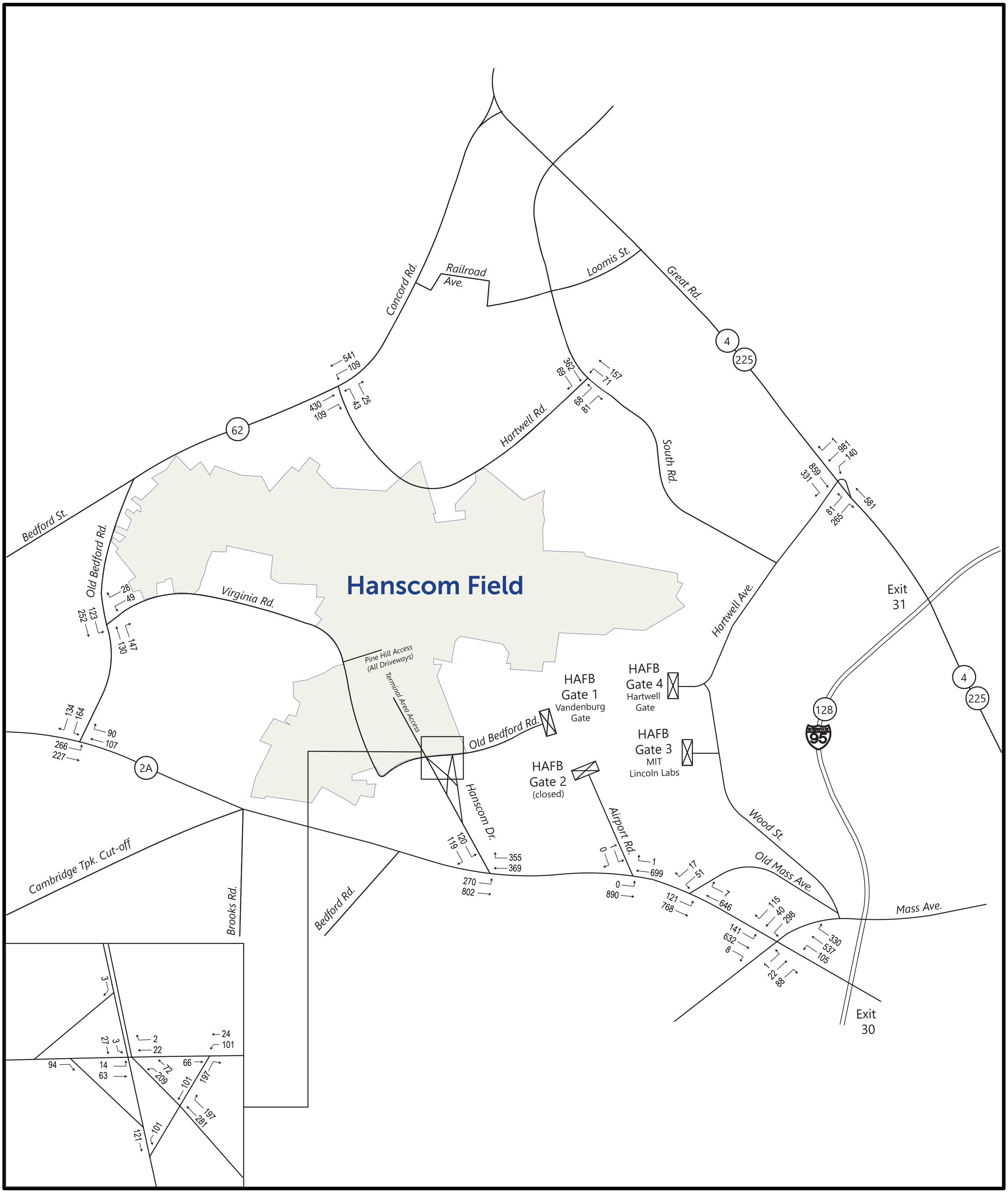
Detailed analyses of peak hour intersection operations and traffic conditions were conducted for the 10 intersections shown in Figure 6-3.

Peak Hour Networks

Figure 6-7 and **Figure 6-8** present the morning and afternoon peak hour volumes for the intersections studied in December of 2022. In the morning, most of the traffic on Route 2A travels eastbound to Route 128/I-95. In the afternoon, most traffic on Route 2A travels westbound from Route 128/I-95. These trends primarily reflect commuting patterns between the surrounding towns and regional employment centers along and within the Route 128/I-95 corridor and the Boston Metropolitan Area to the east. Along Route 4/225, traffic counts show that morning commuters are destined to Route 128/I-95 and the Hartwell Avenue area. This is because Hartwell Avenue serves as a hub of employment and as well as being one of several access points to Hanscom AFB.

Hanscom Field Trip Distribution

Figure 6-9 and **Figure 6-10** present the 2022 peak hour trip distribution and traffic volumes during the December 2022 study period for Hanscom Field-related traffic for morning and afternoon peak hours, respectively. The existing trip distribution of Hanscom Field traffic was determined based on directional peak hour traffic volumes at the Hanscom Field Main Entrance and modeling of the distribution of peak hour traffic volumes at intersections within the study area. For the purposes of this capacity analysis, the driveways serving the Pine Hill area of Hanscom Field (the Atlantic Aviation Hangar and the Pine Hill T-Hangars) were assumed to be located at one access point, as illustrated in Figure 6-9 and Figure 6-10. Dedicated turning movement counts were conducted at the Atlantic Aviation driveway in March 2023 and trips to and from this facility were added to the Hanscom Field total trip generation. Trip distribution was assigned to match the trip distribution observed at the Hanscom Field main entrance. The trip estimation and distribution estimation procedures are provided in **Appendix C**.

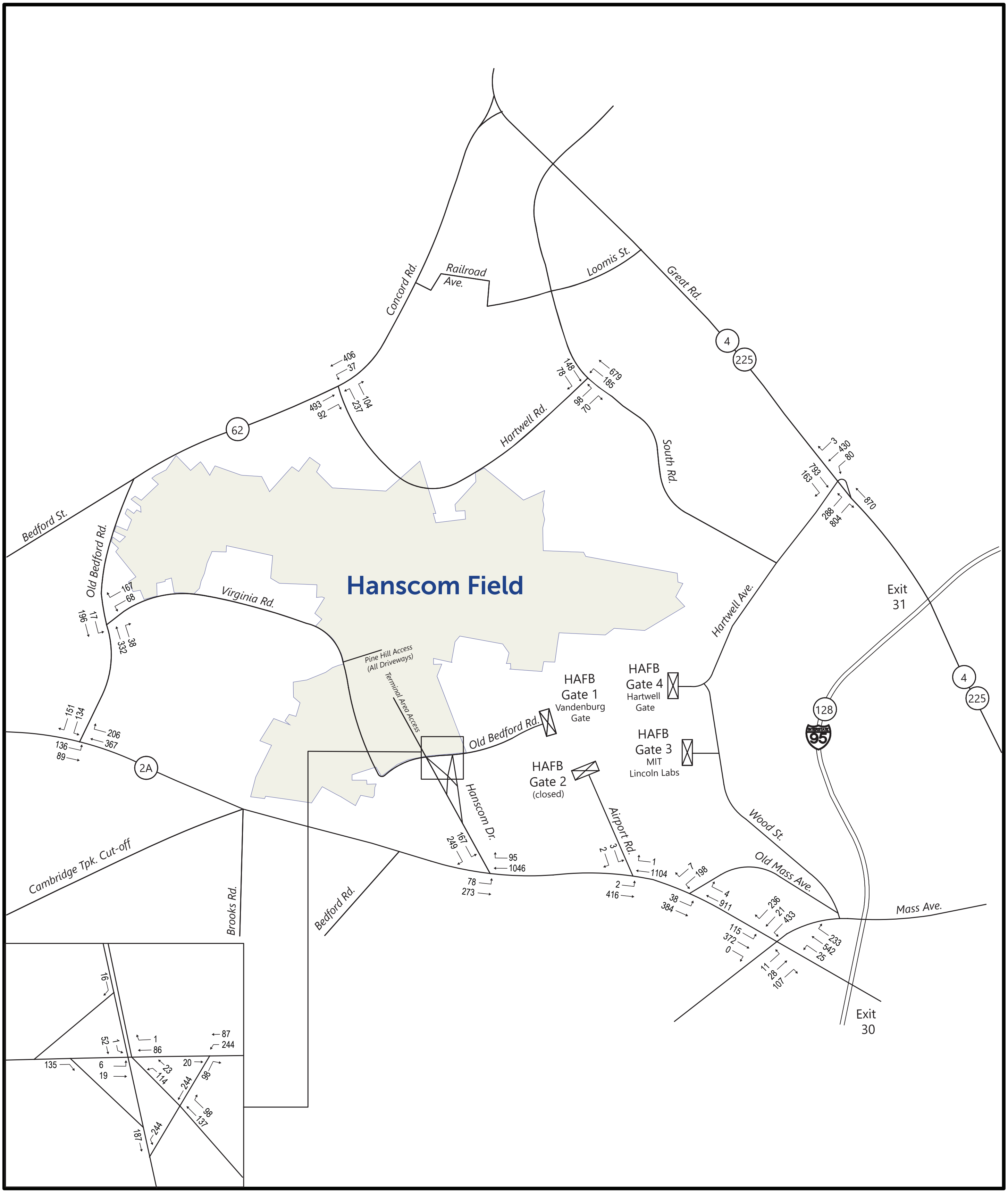


Source: December 1, 2022 Traffic Counts, McFarland Johnson

Note: All counts seasonally adjusted. Hanscom Field movements via Hanscom Drive adjusted based on weekly traffic observed on Hanscom Drive ATR.

2022 Morning Peak Hour Traffic Volumes

Figure 6-7



North

NOT TO SCALE

Source: December 1, 2022 Traffic Counts, McFarland Johnson

Note: All counts seasonally adjusted. Hanscom Field movements via Hanscom Drive adjusted based on weekly traffic observed on Hanscom Drive ATR.

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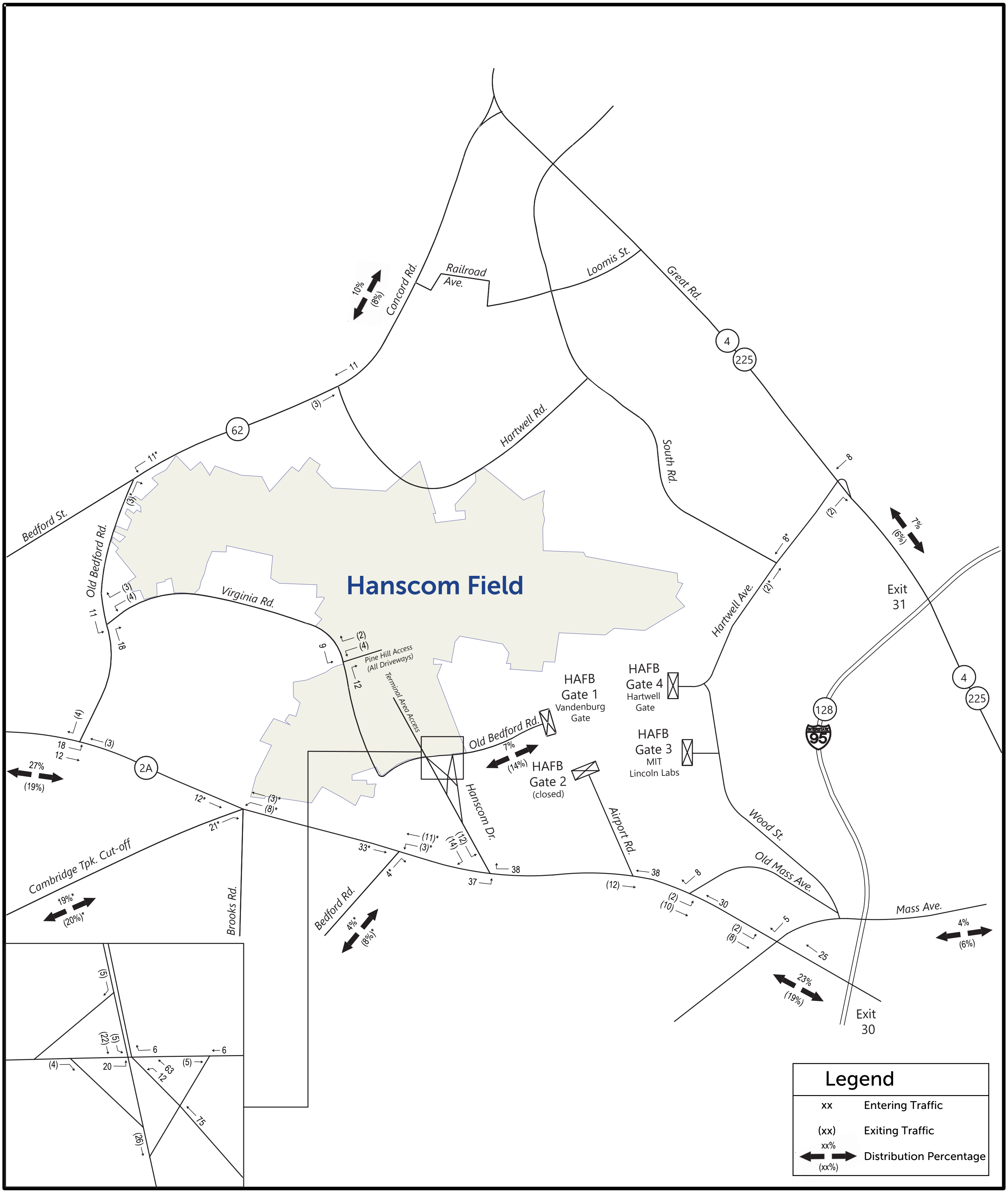
2022 Environmental Status & Planning Report

2022 Afternoon Peak Hour Traffic Volumes

Figure 6-8



North

NOT TO SCALE

Source: December 1, 2022 Traffic Counts, McFarland Johnson

Note: * Designates estimated distribution based on 2017 ESPR and 2022 observed counts at adjacent locations.

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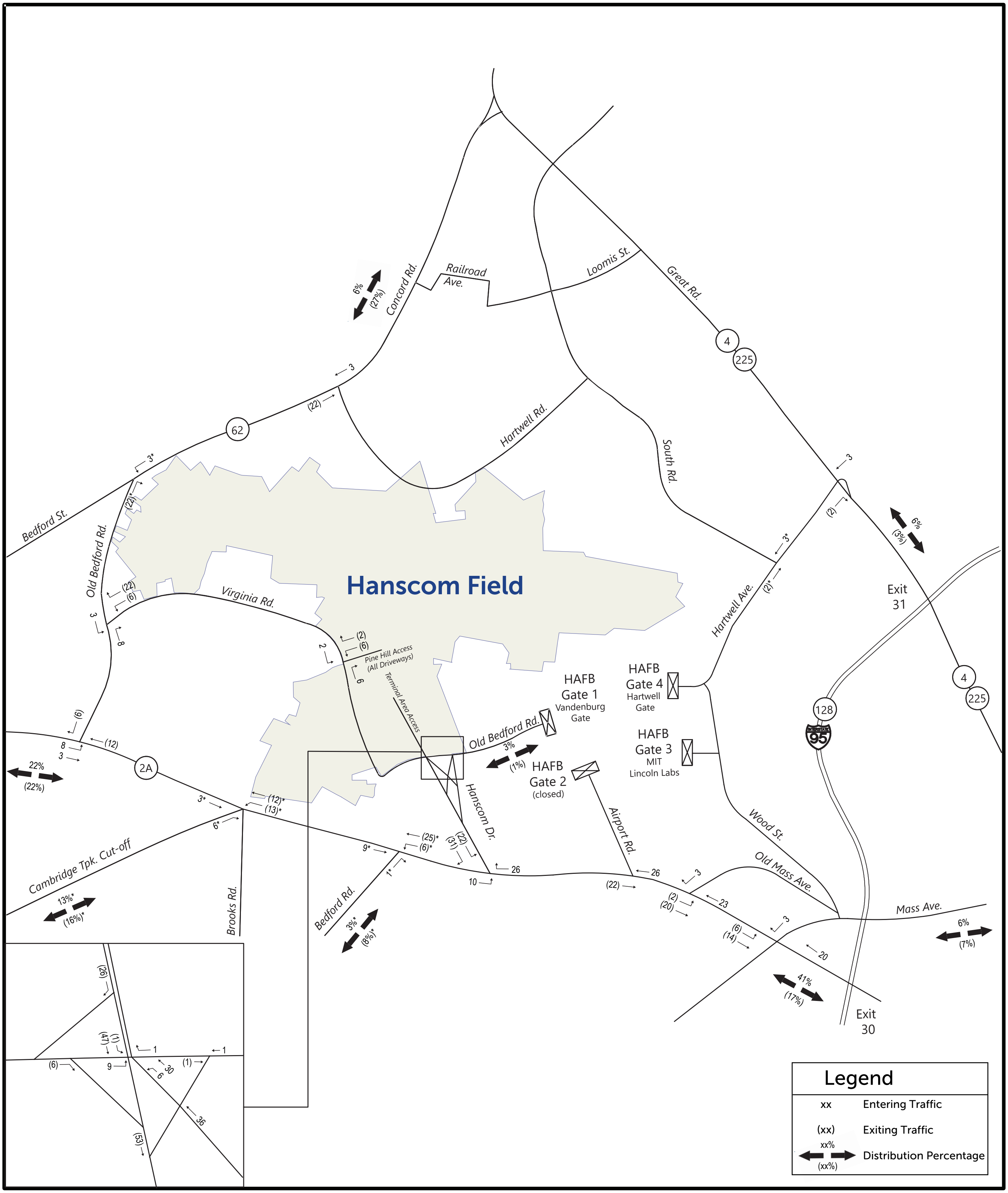
2022 Morning Peak Hour
Trip Distribution (Hanscom Field Only)

Figure 6-9



NOT TO SCALE

Source: December 1, 2022 Traffic Counts, McFarland Johnson

Note: * Designates estimated distribution based on 2017 ESPR and 2022 observed counts at adjacent locations.

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2022 Environmental Status & Planning Report

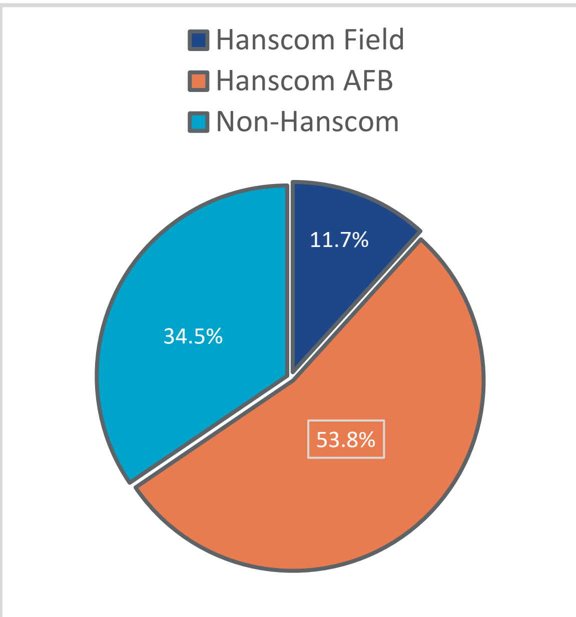
2022 Afternoon Peak Hour Trip Distribution (Hanscom Field Only)

Figure 6-10

Hanscom Drive Traffic Volumes

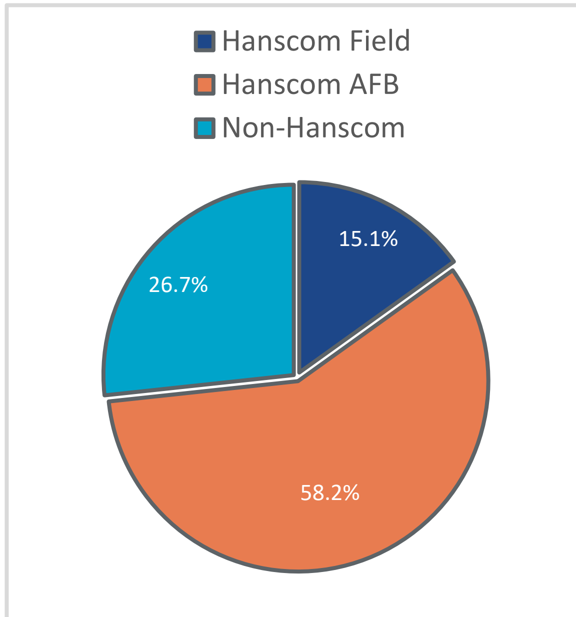
Figure 6-11 and **Figure 6-12** illustrate the different traffic contributors on Hanscom Drive in 2022 during the morning and afternoon peak hours using data from the turning movement counts. In 2022, Hanscom Field-related traffic accounts for 11.7 percent of volumes during the morning peak hour and 15.1 percent of volumes during the afternoon, as compared to 8.3 percent in the morning peak and 8.9 percent in the afternoon peak hours in 2018. This can be attributed to the increase in Hanscom Field traffic from 2018 to 2022, and the decrease in non-Hanscom Field traffic on Hanscom Drive, increasing the overall percentage of Hanscom Field traffic on Hanscom Drive. Hanscom AFB traffic continues to be the largest component of Hanscom Drive traffic. In 2022, Hanscom AFB accounted for 53.82 percent of traffic in the morning peak hour and 58.2 percent of traffic in the afternoon peak hour, as compared to 63.2 percent and 60.0 percent, respectively in 2018.

Figure 6-11. 2022 Morning Peak Hour Traffic on Hanscom Drive



Source: McFarland Johnson, 2023.

Figure 6-12. 2022 Afternoon Peak Hour Traffic on Hanscom Drive



Source: McFarland Johnson, 2023

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Intersection Screening Process

The 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 movements consists of 10 percent or greater Hanscom Field-related traffic. The traffic volumes at each of the study intersections were assessed to determine which intersections had individual turning movements that met or exceeded the 10 percent MEPA threshold. **Table 6-5** lists the four intersections that have exceeded the 10 percent threshold for the 2002 through 2022 analysis years. Intersection operations were calculated for 2022 conditions for intersections that exceeded the threshold.

Table 6-5. Intersections Exceeding Ten Percent Threshold (2002–2022)

Intersection	Peak Hour	Analysis Years				
		2002	2005	2012	2018	2022
#5 Hanscom Drive/ Old Bedford Road (Lincoln)	Morning	X	X	X	X	X
	Afternoon	X	X	X	X	X
#6 Hanscom Drive/ Route 2A (Lincoln)	Morning	X	X	X	X	X
	Afternoon	X	X	X	X	X
#8 Old Bedford Road/Virginia Road (Concord)	Morning	X	X		X	X
	Afternoon	X	X	X	X	X
#12 Old Bedford Road/Route 62 (Concord)	Morning					
	Afternoon		X			

Note: "X" denotes intersection with turning movement exceeding 10 percent MEPA threshold.
Sources: *2017 ESPR* and McFarland Johnson, 2023

Analysis of Intersection Operations

This section provides the results of the intersection operation analysis in terms of overall intersection level of service (LOS), volume-to-capacity (v/c) ratios, and intersection delay (in seconds) for the screened intersections. LOS calculation sheets are provided in **Appendix C**. The performance of the study intersections was analyzed using the traffic modeling software program Synchro 10. LOS is a generally accepted measure of the quality of service determined based on the process specified in the 6th Edition of the Transportation Research Board Highway Capacity Manual (HCM). Intersection LOS ranges from A to F where LOS A represents optimal conditions with fewer than 10 seconds of delay, while LOS 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 each LOS designation at signalized and unsignalized intersections.

Table 6-6. Intersection Level-of-service (LOS) Criteria (HCM, 6th Edition)

LOS	Average Delay per Vehicle (seconds)	
	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

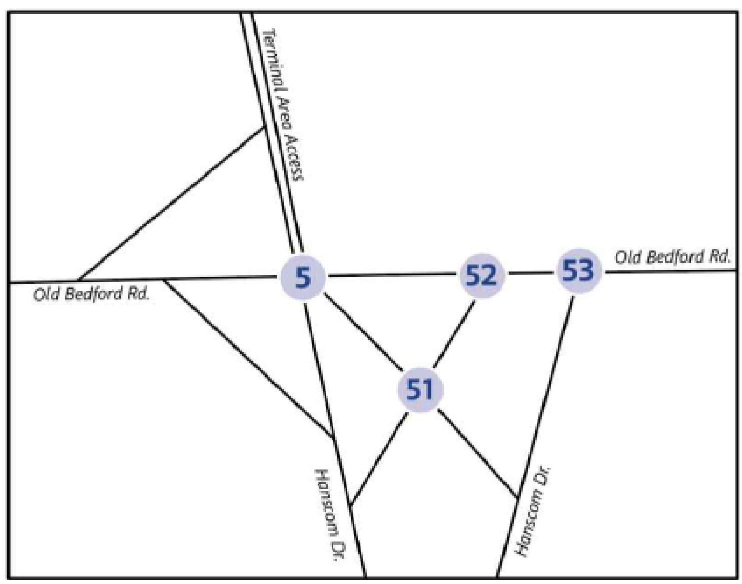
Source: National Academy of Sciences, Engineering, and Medicine, 2016

Table 6-7 and **Table 6-8** summarize the morning and afternoon 2022 peak hour traffic operations for the intersections where Hanscom Field traffic represented more than 10 percent of all traffic movement. Detailed traffic capacity analysis reports are included in **Appendix C**. Interpretation of Table 6-7 and Table 6-8 for the Hanscom Drive and Old Bedford Road intersection requires an understanding of how this single intersection is modeled using Synchro. While the main intersection functions as a two-way, stop-controlled intersection, with Hanscom Drive given priority, the entire intersection is, in fact, controlled by three other separately modeled intersections (see **Figure 6-13**).

This includes the following:

- Intersection #51 - The stop-controlled intersection between northbound traffic on Hanscom Drive and southbound traffic from Hanscom AFB
- Intersection #52 - the stop-controlled intersection between eastbound traffic on Old Bedford Road and southbound traffic from Hanscom AFB
- Intersection #53 - the yielding action that northbound vehicles headed to Hanscom AFB must make to vehicles continuing eastbound on Old Bedford Road.

Figure 6-13. Diagram of Sub-Intersections Analyzed at the Hanscom Drive and Old Bedford Road Intersection



Source: McFarland Johnson, 2023

Table 6-7. Morning Peak Hour Operations at Screened Intersections

Intersection	Weekday Morning Peak Hour		
	LOS	Delay (s)	v/c
#5 Hanscom Drive/Old Bedford Road			
Hanscom Drive NB (L)	A	7.8	0.160
Hanscom Drive SB (L)	A	7.4	0.003
Old Bedford Road EB (L T)	C	18.6	0.109
Old Bedford Road WB (T)	C	17	0.056
#51 Hanscom Drive/Old Bedford Road WB L Ramp			
Hanscom Drive NB (T)	B	14.2	0.470
#52 Hanscom Drive/Old Bedford Road WB L Turn			
Old Bedford Road EB (T)	A	9.2	0.040
#53 Hanscom Drive NB R Ramp/Old Bedford Road			
Hanscom Drive NB (R)	A	9.4	0.210
#6 Hanscom Drive/Route 2A			
Hanscom Drive SB (L)	F	> 5 min.	4.329
Hanscom Drive SB (R)	C	15.7	0.296
Route 2A EB (L)	A	9.4	0.281
#8 Old Bedford Road/Virginia Road			
Virginia Road WB (L R)	C	18.8	0.276
Old Bedford Road SB (L)	A	8.5	0.124

Note: “L” denotes left-turn, “T” denotes thru-traffic, “R” denotes right-turn. V/C numbers indicate the volume/capacity ratio, or the amount of traffic at a given intersection relative to the amount of traffic the intersection was designed to accommodate.
Source: McFarland Johnson, 2023

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, based on field observations, it appears that the analysis does not accurately represent actual operating conditions. Several unique behaviors are occurring at this intersection requiring additional interpretation:

- There are sufficient gaps available on Route 2A during the morning and evening peak hours to limit the left turn queue length on Hanscom Drive. A maximum queue of seven vehicles was observed during the morning peak hour, and 10 vehicles during the evening peak hour. In contrast, the Synchro model shows a queue length of 17 and 19 vehicles during the morning and evening peak hours, respectively.
- Motorists in both the left-turn lane and the right-turn lane on Hanscom Drive were seen doing “rolling stops,” or not stopping fully before traveling through the intersection.
- Due to the longer wait times experienced by left-turning vehicles on Hanscom Drive, several vehicles were observed making “risky” turns, or turning during a gap between vehicles that is smaller than what is typically considered safe.

Thus, real-world conditions differ from modeled conditions, which are based on vehicles following standard driving rules. Therefore, nonstandard conditions and behaviors, such as drivers taking advantage of available traffic gaps on Route 2A, drivers not making a full and complete stop, and drivers making "risky" turns in small gaps, mean that modeled conditions can be substantially different than observed conditions. These factors result in Synchro overestimating the delay and queues at this intersection. However, while these observed behaviors may improve the capacity of the intersection, the large delay at this intersection can encourage drivers to make riskier maneuvers than they otherwise might, increasing risks of collision and causing a safety hazard for all users of the intersection.

Table 6-8. Afternoon Peak Hour Operations at Screened Intersections

Intersection	Weekday Afternoon Peak Hour		
	LOS	Delay [S]	v/c
#5 Hanscom Drive/Old Bedford Road			
Hanscom Drive NB (L)	A	7.7	0.109
Hanscom Drive SB (L)	A	8.2	0.001
Old Bedford Road EB (L T)	B	14.7	0.056
Old Bedford Road WB (T)	B	14	0.112
#51 Hanscom Drive/Old Bedford Road WB L Ramp			
Hanscom Drive NB (T)	B	14.0	0.330
#52 Hanscom Drive/Old Bedford Road WB L Turn			
Old Bedford Road EB (T)	A	9.8	0.010
#53 Hanscom Drive NB R Ramp/Old Bedford Road			
Hanscom Drive NB (R)	A	8.7	0.100
#6 Hanscom Drive/Route 2A			
Hanscom Drive SB (L)	F	> 5 min.	2.517
Hanscom Drive SB (R)	F	228.8	1.354
Route 2A EB (L)	B	12.1	0.157
#8 Old Bedford Road/Virginia Road			
Virginia Road WB (L R)	C	18.1	0.512
Old Bedford Road SB (L)	A	8.2	0.017

Note: "L" denotes left-turn, "T" denotes thru-traffic, and "R" denotes right-turn. V/C numbers indicate the volume/capacity ratio, or the amount of traffic at a given intersection relative to the amount of traffic the intersection was designed to accommodate.
Source: McFarland Johnson, 2023

6.2.6 Safety Analysis

The crash history of the three screened intersections was evaluated to identify safety deficiencies and determine if any location experiences a higher-than-average annual crash rate. The safety data is summarized in **Table 6-9**.

Twenty-three crashes were reported at the three screened intersections from 2018 to 2022. The majority of crashes involved property damage only; no fatalities were reported. Angled crashes, rear-end crashes, and single-vehicle crashes, combined, comprised approximately 96 percent of the crashes at the screened intersections.

The 13 crashes that occurred at Hanscom Drive/Route 2A (Lincoln) ranked highest among the three screened intersections, with an average of 2.6 crashes per year; this is the same as the crashes per year reported in the *2017 ESPR* for that intersection. Additionally, the crash rate at this intersection is lower than the state-wide and district-wide averages (which are both 0.57 crashes per year[156]) for unsignalized intersections. The MassDOT Crash Rate Worksheets for the three screened intersections are provided in **Appendix C**.

The Hanscom Drive/Old Bedford Road (Lincoln) intersection crash rate is higher than the state-side and district-wide average for an unsignalized intersection. Based on the nature of the accidents (rear-end and angle), it can be surmised that the nonstandard geometry of the intersection and lack of lighting cause confusion for drivers unfamiliar with the intersection's operation. The installation of lighting and additional signage at this intersection would increase driver awareness and likely lower the crash rate.

6.2.7 Multi-Modal Assessment

SOV trips are more frequently associated with higher environmental impacts than alternative modes of travel. Transit, carpooling, bicycling, and walking have the potential to reduce Hanscom Field-related vehicle trips and traffic impacts on area roadways. Thus, it is important to document existing conditions for those modes to understand recommendations for the future.

[156] Commonwealth of Massachusetts. "Intersection and roadway crash rate data for analysis", https://www.mass.gov/info-details/intersection-and-roadway-crash-rate-data-for-analysis, accessed August 21, 2023.

Table 6-9. Intersection Crash Summary

Traffic Control	#5) Hanscom Drive / Old Bedford Road (Lincoln) Unsignalized	#6) Hanscom Drive / Route 2A (Lincoln) Unsignalized	#8) Old Bedford Road / Virginia Road (Concord) Unsignalized
YEAR			
2018	2	5	0
2019	3	4	0
2020	3	0	0
2021	0	2	1
2022	0	2	1
Total	8	13	2
TYPE			
Angle	3	5	0
Rear-End	4	4	0
Head-on	0	0	0
Sideswipe	0	0	1
Single Vehicle	1	4	1
Total	8	13	2
SEVERITY			
Property Damage Only	7	8	1
Personal Injury	0	4	1
Fatality	0	0	0
Other	1	1	0
Total	8	13	2
WEATHER			
Clear	5	12	2
Cloudy	2	1	0
Rain	0	0	0
Snow	1	0	0
Unknown/Other	0	0	0
Total	8	13	2
TIME			
7:00 a.m. to 9:00 a.m.	1	4	0
9:00 a.m. to 4:00 p.m.	6	9	1
4:00 p.m. to 6:00 p.m.	0	0	0
6:00 p.m. to 7:00 a.m.	0	0	1
Total	8	13	2
RATES			
Average Crashes Per Year	1.6	2.6	0.4
Intersection Rate	0.84	0.35	0.23

Source: McFarland Johnson, 2023

2023 Pedestrian and Bicycle Count Results

Manual traffic counts collected in June 2023 for this project also included counts of bicycles and pedestrians at all 10 count locations. This data was collected separately from the vehicle traffic volumes as the vehicle traffic data was collected during November and December, and thus did not accurately represent pedestrian traffic due to inclement weather conditions. **Table 6-10** presents the bicycle and pedestrian counts collected at the studied intersections.

It is important to note that pedestrian and bicycle counts are sensitive to seasonal temperature patterns as well as daily weather. Weather conditions at Hanscom Field on June 1 were reported to be between 55°F and 91°F with partly cloudy skies and no precipitation. While seasonal variation between peak summer conditions and winter season likely exists in this area, no equivalent to a seasonal adjustment factor is available for these counts. However, bicycling and walking are not a significant component of Hanscom Field ground access activity.

Table 6-10. Total Cyclists and Pedestrians Counted in Morning and Afternoon Peak Hours on Thursday, June 1, 2023

Location	Cyclists Counted		Pedestrians Counted	
	AM Total	PM Total	AM Total	PM Total
Bedford Street & Hartwell Avenue	2	1	14	7
Mass Avenue and Route 2A	3	17	1	0
Old Mass Avenue and Route 2A	13	17	3	0
Airport Road and Route 2A	12	12	0	0
Hanscom Drive and Old Bedford Road	28	21	0	1
Hanscom Drive and Route 2A	36	33	0	0
Old Bedford Road and Lexington Road	34	65	1	3
Old Bedford Road and Virginia Road	37	50	19	6
Concord Road and Hartwell Road	27	28	1	0
South Road and Hartwell Road	41	25	19	6

Note: AM peak hour is between 6:00 a.m. to 9:00 a.m.; PM peak hour is between 3:00 p.m. to 6:00 p.m.
Source: McFarland Johnson, 2023

Travel Survey Findings

An online commuter travel survey was administered to Hanscom Field employees and tenants between April and June of 2023 when work on this chapter began to identify and understand current travel patterns and opportunities to reduce SOV trips to and from Hanscom field. In total, 45 survey responses were collected in 2023, which is lower than the number of responses (62) collected in 2017. The results of the travel survey can be found in **Appendix C**.

Out of the 45 responses, 38 percent were Massport employees and 62 percent indicated they were employees of a Hanscom Field tenant. **Table 6-11** provides a comparison of survey results of similar surveys conducted for the *2012* and *2017 ESPRs* as well as the 2023 survey. The 2023 results show that 100 percent of survey respondents drive alone to Hanscom Field. Overall, the results of the 2023 survey are consistent with previous ESPR surveys, showing that the majority of commuters are traveling to the study area with personal vehicles. This high level of auto use is consistent with the general travel patterns in the area. Additional details on the results of the survey can be found in **Appendix C**.

Table 6-11. Mode of Choice to Hanscom Field

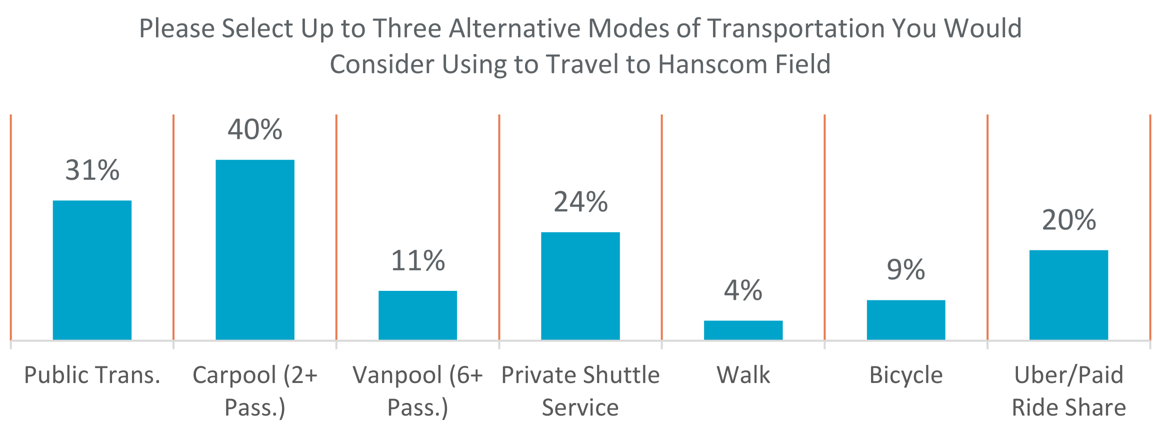
Mode	2012 ESPR Survey	2017 ESPR Survey	2022 ESPR Survey
Drive Alone	86%	90%	100%
Dropped Off	0%	0%	0%
Carpool	0%	5%	0%
Public Transportation	12%	0%	0%
Bicycle	2%	0%	0%
Other	0%	5%	0%
Total	100%	100%	100%
Sources*:* *2012 ESPR*, *2017 ESPR*, and McFarland Johnson, 2023			

Survey respondents were asked questions on their travel habits and specific actions that could be taken which may make commuting via an alternative mode of transportation more viable. Overall, 100 percent of survey respondents stated they drive to Hanscom Field alone. These results are consistent with findings in the *2012* and *2017 ESPRs* which show that the majority of commuters to Hanscom Field do so by SOV.

Many respondents showed some interest in exploring alternative modes of transportation to get to, from, and around the Hanscom Field area as shown in **Figure 6-14**. These findings demonstrate that while SOV trips remain the dominant means of transportation to and from Hanscom Field, further exploration into other modes of transportation is valuable.

In particular, interest in exploring transit, private shuttle service, and promoting carpooling were identified by survey respondents.

Figure 6-14. Travel Survey Results Showing Interest in Alternative Travel to Hanscom Field



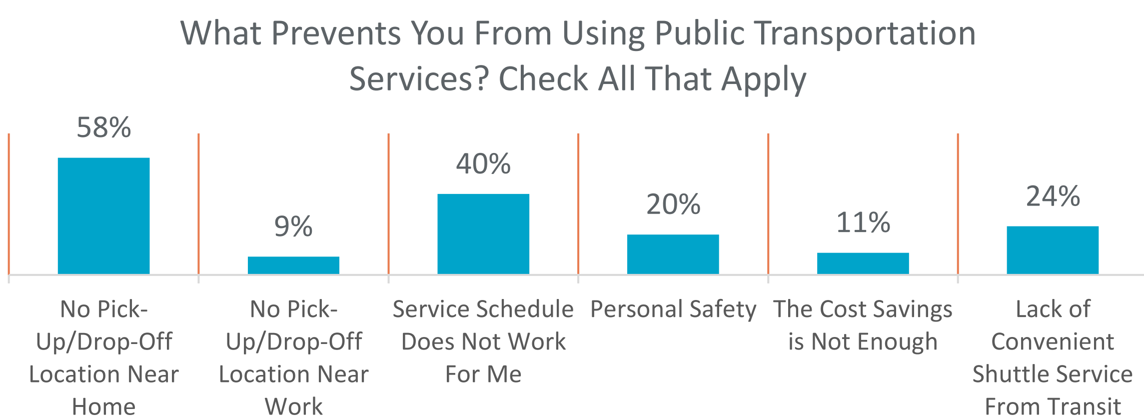
Source: McFarland Johnson, 2023

Public Transportation and Shuttle Services

Figure 6-14 illustrates that fourteen respondents (31 percent) answered that they would consider taking public transportation as an alternative mode of transportation, but respondents also identified significant barriers in current public transportation access to Hanscom Field. This includes the lack of direct routes from home, no pick-up and drop-off location near home, and a transit schedule which is perceived as inconvenient. One survey respondent indicated that using the current public transportation system would result in a commute time of over four hours.

Notably, and as illustrated in **Figure 6-15**, 24 percent of respondents stated that lack of convenient shuttle service prevented them from considering the use of public transportation services, and 40 percent of respondents stated that the service schedule did not work for their personal work schedule.

Figure 6-15. Travel Survey Results Showing Factors Constraining Use of Public Transportation of Those Indicating Interest in Using Public Transportation



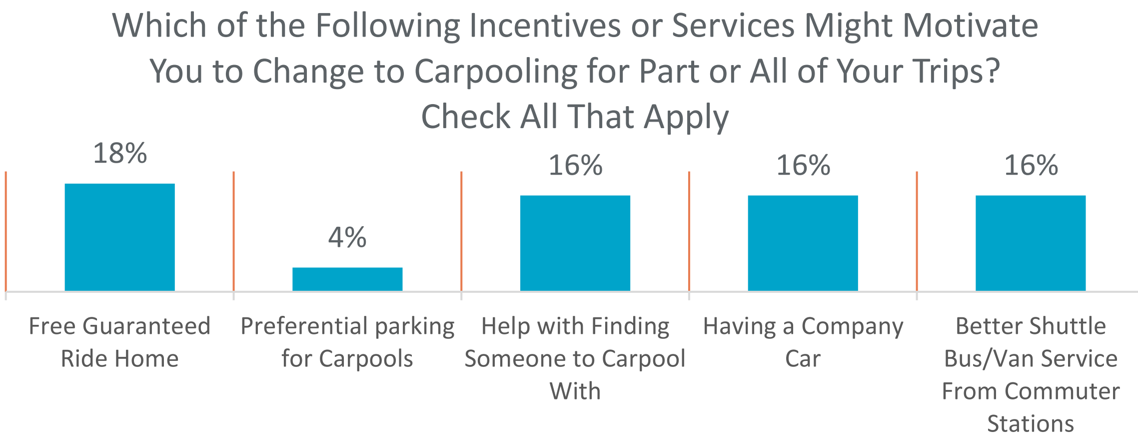
Source: McFarland Johnson, 2023

Car/Vanpooling

Of all respondents to the travel survey, no one indicated that they carpool on most days, but 4 percent indicated they sometimes carpool as secondary means to get to Hanscom Field. A number of respondents were receptive to the prospect of carpooling with other Hanscom employees, with 40 percent indicating interest. However, analysis of the respondent data shows that carpooling may be difficult to implement. For example, only 40 percent of respondents indicated they travel to Hanscom Field five or more days a week, and analysis of respondent zip code data shows a wide geographic spread of commuters to Hanscom Field. Both these factors make finding adequate carpooling matches difficult.

As illustrated in **Figure 6-16**, of the respondents who answered a question soliciting responses on incentives which would motivate respondents to carpool, eight respondents (18 percent) indicated that a free guaranteed ride home program would be most likely to promote a switch to carpooling, followed equally (at 16 percent each) by: help finding a car/vanpool, access to a company car, and/or better shuttle bus/van service from commuter stations.

Figure 6-16. Travel Survey Results Showing Factors Which Would Encourage Carpooling of Those Indicating Interest in Carpooling or Vanpooling



Source: McFarland Johnson, 2023

Active Transportation

In general, the commuter/travel survey highlights the wide geography of commuters to the study area. Notably, none of the survey respondents indicated they live less than one mile away from Hanscom Field, while 9 percent live between one and 10 miles from Hanscom Field. Therefore, walking and bicycling cannot be considered a viable means of commuting for survey respondents.

However, bicycling could be an option for commuters to Hanscom Field. While no respondents indicated that cycling was a primary means of travel to the study area, 4 percent indicated that they sometimes walk or bicycle to Hanscom Field, and 9 percent of respondents indicated some level of interest in bicycling as an alternative to their primary means of travel. The travel survey further shows that 13 percent of commuters live within 10 miles of Hanscom Field, making cycling a reasonable alternative for this population.

Even with 9 percent of respondents indicating some level of interest in bicycling to Hanscom Field, 69 percent of respondents indicated that bicycle facilities are not adequate to make biking a viable option. This includes street infrastructure—as many respondents feel there is no safe route for them to bike.

In particular, respondents noted several locations in and near the study area in need of pedestrian and bicycling improvements. These include the following: (1) Hanscom Drive between the Hanscom Field Terminal to Route 2A, (2) the intersection of Hanscom Drive and Old Bedford Road, (3) Virginia Road to the north of Old Bedford Drive, and (4) Route 2A connecting Hanscom Drive to Lexington to the east.

Public Transportation

MassDOT releases MBTA bus ridership data by bus stop on an annual basis. As of June 2023, the most recent data available was for the year 2019. As described previously, Hanscom Field is served by MBTA Route 76 on weekdays and a combined Route 62/76 on Saturdays with no service provided on Sundays. Route 76 service is provided approximately every half-hour during peak hours and hourly during midday hours. Saturday service is provided hourly. Average weekday ridership at the Hanscom Field Terminal averages roughly eleven boardings and departures per day, compared to eight boardings and departures as described in the *2017 ESPR*, while ridership at the intersection of Hanscom Road and Old Bedford Road on weekdays averages about 17 boardings and departures per day, consistent with the 17 boardings and departures outlined in the *2017 ESPR*.

Route 76 provides local service between Alewife Station and Hanscom Field via Lexington Center. The route requires a stop-over at the Lincoln Labs stop before connecting to the Hanscom Field Terminal at Hanscom Field and the route utilizes local roadways instead of traveling on Route 2. The design of this route (with the stop-over at Lincoln Labs and utilizing only local roadways) reduces the time-competitiveness of public transit as compared to driving a private automobile.

128 Business Council Shuttle Service

The 128 Business Council operates The REV Bus-Hartwell Area Shuttle, which is a commuter shuttle service that operates each rush hour between the MBTA Red Line Alewife Station in Cambridge and worksites along Hartwell Avenue. The REV Bus is partially funded by major property developers in the Hartwell Avenue corridor of Lexington and Bedford, and partially funded by the Towns of Lexington and Bedford. In the morning peak hour, shuttles depart Alewife Station at 6:25 a.m., 7:05 a.m., 7:50 a.m., 8:30 a.m., 9:10 a.m., and 9:50 a.m., arriving at 131 Hartwell Avenue (near the Hartwell Gate to the Hanscom AFB) within 15 to 25 minutes; in the afternoon peak hour, shuttles depart 131 Hartwell Avenue at 3:51 p.m., 4:31 p.m., 5:16 p.m., 6:01 p.m., 6:41 p.m., and 7:21 p.m., arriving at Alewife Station about 35 minutes later.

6.3 Future Analysis Conditions

This section describes the background assumptions and methodology used to evaluate future roadway and traffic volume conditions within the study area for the 2030 and 2040 scenarios. The *2022 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. The 2030 and 2040 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 traffic volumes were estimated for the 2030 and 2040 scenarios and were added to the study area roadway network. The potential increases in traffic volumes include vehicle trips generated by future background growth, or specific non-Hanscom Field developments planned or programmed in the area by the towns, as well as forecast activity 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 10 percent or more for any traffic movement, as required by MEPA.

6.3.1 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.

Regional Background Growth

To develop future traffic networks, the study team determined a general growth rate to account for the increase in all non-Hanscom related trips in the analyzed roadway network. For this effort, four sources of information were reviewed including 1) the seasonally-adjusted turning movement counts collected for both the *2017 ESPR* and the *2022 ESPR*; 2) the seasonally-adjusted ATR volumes for both *ESPR*s; 3) the five-year traffic growth measured at nearby MassDOT continuous count stations; and 4) projections of vehicle miles traveled (VMT) for the four Hanscom Field area towns (Bedford, Concord, Lexington, and Lincoln) from the Boston Region MPO Needs Assessment published in 2019. A summary of this data is provided in **Table 6-12**.

Based on review of this data, a background traffic growth rate of 0.50 percent per year between 2022 and the 2040 model year was used to reflect predictions from the Boston Region MPO. It should be noted that while decreasing traffic volumes have been observed at the MassDOT Continuous Count Stations and there has been a decrease in traffic counts between the *2017 ESPR* and the *2022 ESPR*, the 0.50 percent per year growth rate between 2022 and 2040 is a conservative estimate that generally aligns with estimates for future growth outlined in the Boston Region MPO Destination 2040 Needs Assessment.

Planned and Potential Future Developments

A review of planned future developments indicated that non-Hanscom development within the study area is limited to the construction of a two-story lab/office building within the campus at 180 Hartwell Road, in Bedford, north of Hanscom field. According to the traffic study for the project, the development is expected to generate a total of 112 new trips during the morning peak hour and 107 new trips during the afternoon peak hour. These additional trips were distributed through the two closest study area intersections, at the intersection of Route 62 and Hartwell Road and South Road at Hartwell Road. As the project is scheduled to be completed by 2029, these additional trips were applied to both the 2030 and 2040 scenarios.

Table 6-12. Background Traffic Growth Sources Reviewed for *2022 ESPR*

Source	Commentary
2017 and 2022 ESPR Peak Hour Turning Counts	- AM Peak Period experienced an average of a 3.34 percent annual decrease in traffic volumes between 2018 and 2022. - PM Peak Period experienced an average of a 2.42 percent annual decrease in traffic volumes between 2018 and 2022.
2017 and 2022 ESPR Automated Traffic Recorders (ATR's)	- Review of the seasonally adjusted weekly counts by the automated traffic recorders in 2017 and 2022 at four locations shows an average annual decrease of 4.26 percent. - These four locations include 1) Bedford Road South of Route 2A, 2) Cambridge Turnpike Cutoff South of Lexington Road, 3) Old Bedford Road south of Bedford Street, and 4) Bedford Street west of Old Bedford Road.
MassDOT Continuous Count Stations	- Station 4118 on I-95 at Route 2A experienced an average annual decrease of 2.14 percent between the years 2017 and 2022. - Station 4013 on Route 2 just west of I-95 experienced an average annual increase of 1.46 percent between the years 2017 and 2022. - Station 403 on Route 2 just East of Commonwealth Ave. in Concord experienced an average annual decrease of 0.84 percent between the years of 2017 and 2022.
Boston Region Metropolitan Planning Organization	- The Boston Region MPO predicts an average annual VMT growth of 0.38 percent between the years of 2016 and 2040 for the four towns in the Hanscom Field area (Bedford, Concord, Lexington, and Lincoln).
Sources: 2017 ESPR and McFarland Johnson, 2023	

6.3.2 Hanscom Field Future Traffic Volume Scenarios

To assess the potential future traffic impacts of Hanscom Field-related trips, the study team estimated the number of trips generated by possible future activity at Hanscom Field for the 2030 and 2040 forecasts. Vehicular traffic at Hanscom Field is generated by both aviation activities and other airport-related businesses. General aviation (GA) includes flights for training, personal use, and business/corporate use. Future growth estimates for airside operations (GA, limited commercial aviation, and light cargo operations) are based on the aviation forecasts presented in Chapter 3. The growth rates were 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.

Table 6-13 presents vehicle trip generation estimates for 2022 and for the 2030 and 2040 scenarios. In general, the *2022 ESPR* Hanscom Field trip generation estimates for future years are higher than the forecasted rates in the *2017 ESPR*. These differences reflect the forecasted increase in aviation operations, as well as the greater volume of Hanscom Field-related traffic counted during 2022. A full report on projected trip generation by year is presented in **Appendix C**.

Table 6-13. Hanscom Field Trip Generation for 2030 and 2040 Scenarios

Scenario	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	Total	In	Out	Total
2022	110	38	148	48	82	130
2030 Forecast	143	54	197	63	101	164
2040 Forecast	183	72	255	81	126	207
2017 ESPR Scenarios						
2025 Forecast	90	48	138	40	85	125
2035 Forecast	106	61	167	48	98	146
Sources: *2017 ESPR* and McFarland Johnson, 2023						

As described in Chapter 4, two sites in the West Ramp area continue to be identified as strategic reserves for development in the 2040 scenario (see Table 4-8). While no specific proposals currently exist, the sites could accommodate a range of potential developments which could generate traffic impacts, such as the hotel, conference center, or museum previously considered in both the *2012* and *2017 ESPR*s. When this potential development is more specifically defined, its impacts on traffic at specific locations (as well as air quality and natural resources) can be more fully evaluated.

6.3.3 Hanscom Field Trip Distribution

To account for development at the Pine Hill area (adjacent to Virginia Road) and the North Airfield area (located on Hartwell Road), traffic was first estimated and assigned to either the Terminal Area access, the Pine Hill access, or the North Airfield access. This estimation process is detailed in **Appendix C**, and the assumptions are summarized below in **Table 6-14**. While Table 6-14 indicates that 15 and 18 vehicles during the morning and afternoon peak hours, respectively (25 percent of GA trips) will be assigned to the North Airfield access in 2040. It should be noted that, based on trip generation estimates provided in Appendix C, no more than five peak hour vehicles were assigned to any individual turning movement on the Hartwell Road access in either the morning or afternoon peak hours as shown in the following figures for the 2030 and 2040 distribution results.

Table 6-15 shows the distribution of all trips aggregated by driveway access in the current and future scenarios as a percentage of total trips either inbound to or outbound from Hanscom Field. This table shows that even with future development outside the Terminal Area, the majority of trips into and out of the airport will still be found at this access point on Hanscom Drive. Based on the assumptions above**,** at least 76 percent of the vehicles accessing Hanscom during any of the analysis time frames/directions would be via the Terminal Area access point. For example, in the 2040 forecast year, 76 percent of vehicles entering Hanscom Field are estimated to use the main entrance at Hanscom Drive to access the Terminal Area during the afternoon peak hour, while 15 percent would use Pine Hill, and the remaining 9 percent would use the North Airfield access point.

Table 6-14. Hanscom Field Trip Distribution Assumptions

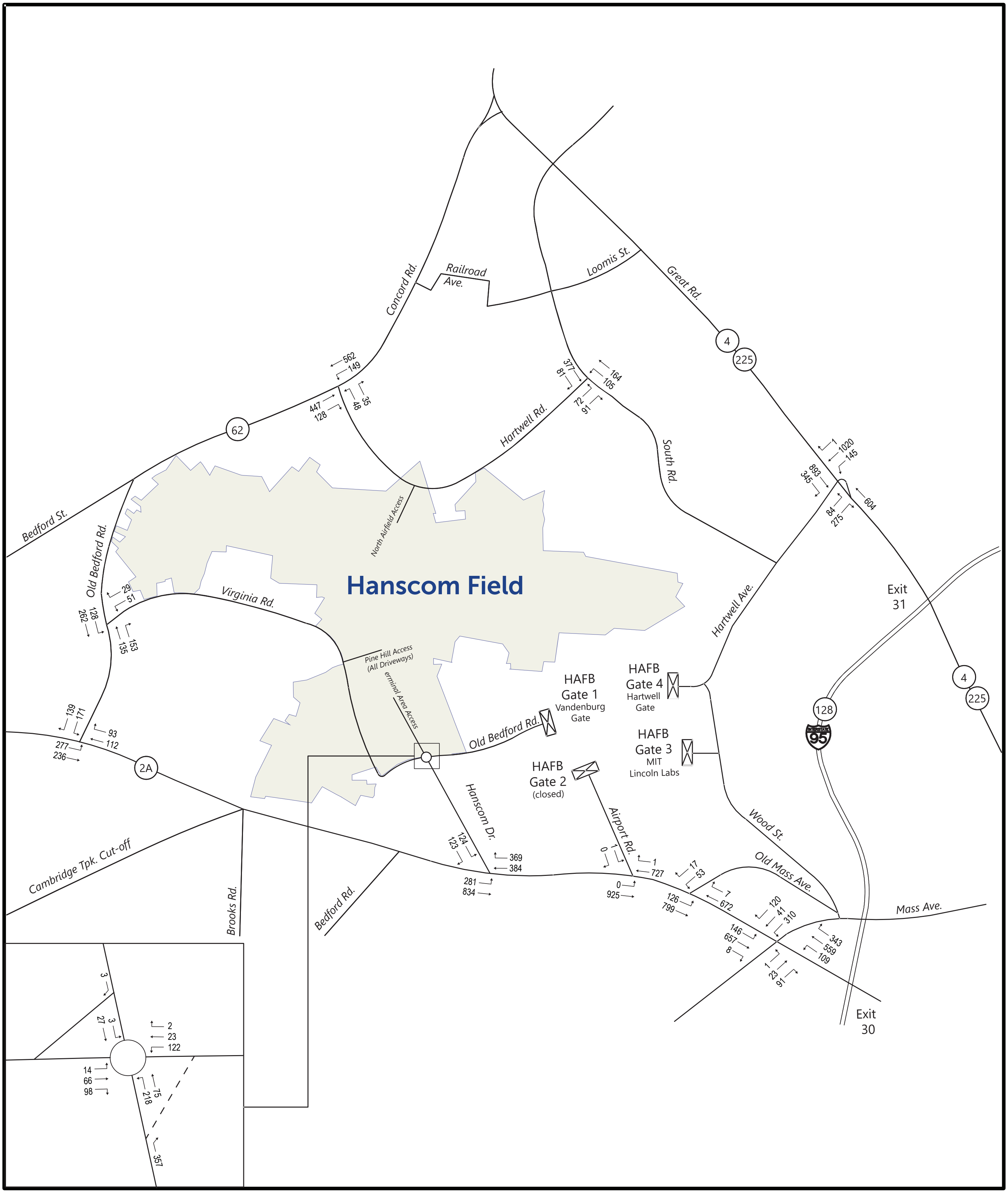
Location	2030 Assumptions	2040 Assumptions
Pine Hill Access	Receives 2022 Trips + 10% of 2030 GA Trips	Receives 2022 Trips + 15% of 2040 GA Trips
North Airfield Access	Receives 20% of 2030 GA Trips	Receives 25% of 2040 GA Trips
Terminal Area	Receives remainder of GA trips, receives all commercial related trips, receives all 'other'-based trips	Receives remainder of GA trips, receives all commercial related trips, receives all 'other'-based trips
Source: McFarland Johnson, 2023		

Table 6-15. Trip Distribution by Driveway

Scenario	Location	Morning Peak Hour		Afternoon Peak Hour	
		In	Out	In	Out
2022	Pine Hill	19%	21%	17%	10%
	North Airfield	0%	0%	0%	0%
	Terminal Area	81%	79%	83%	90%
	Total	100%	100%	100%	100%
2030 Forecast	Pine Hill	17%	13%	13%	8%
	North Airfield	6%	6%	8%	8%
	Terminal Area	77%	81%	79%	84%
	Total	100%	100%	100%	100%
2040 Forecast	Pine Hill	15%	11%	15%	11%
	North Airfield	6%	6%	9%	9%
	Terminal Area	79%	83%	76%	80%
	Total	100%	100%	100%	100%
Source: McFarland Johnson, 2023					

Trips destined to and originating from the Terminal Area access were then distributed based on existing trip distribution patterns (as was done in the *2017 ESPR*). Volumes at intersections that were not counted for the *2022 ESPR* were estimated using the same travel patterns as in previous *ESPR* analyses and the 2022 ATR counts. Traffic originating from or destined for the Pine Hill area was distributed using the same method used for Terminal Area access. Traffic originating from or destined for the North Airfield area was assigned to enter and exit the network at three points: Bedford Street to the west, Concord Road to the north and Route 4/225 to the southeast.

Figures 6-17 through 6-28 present the full set of future traffic volume scenarios analyzed for this *2022 ESPR*.



North

NOT TO SCALE

massport

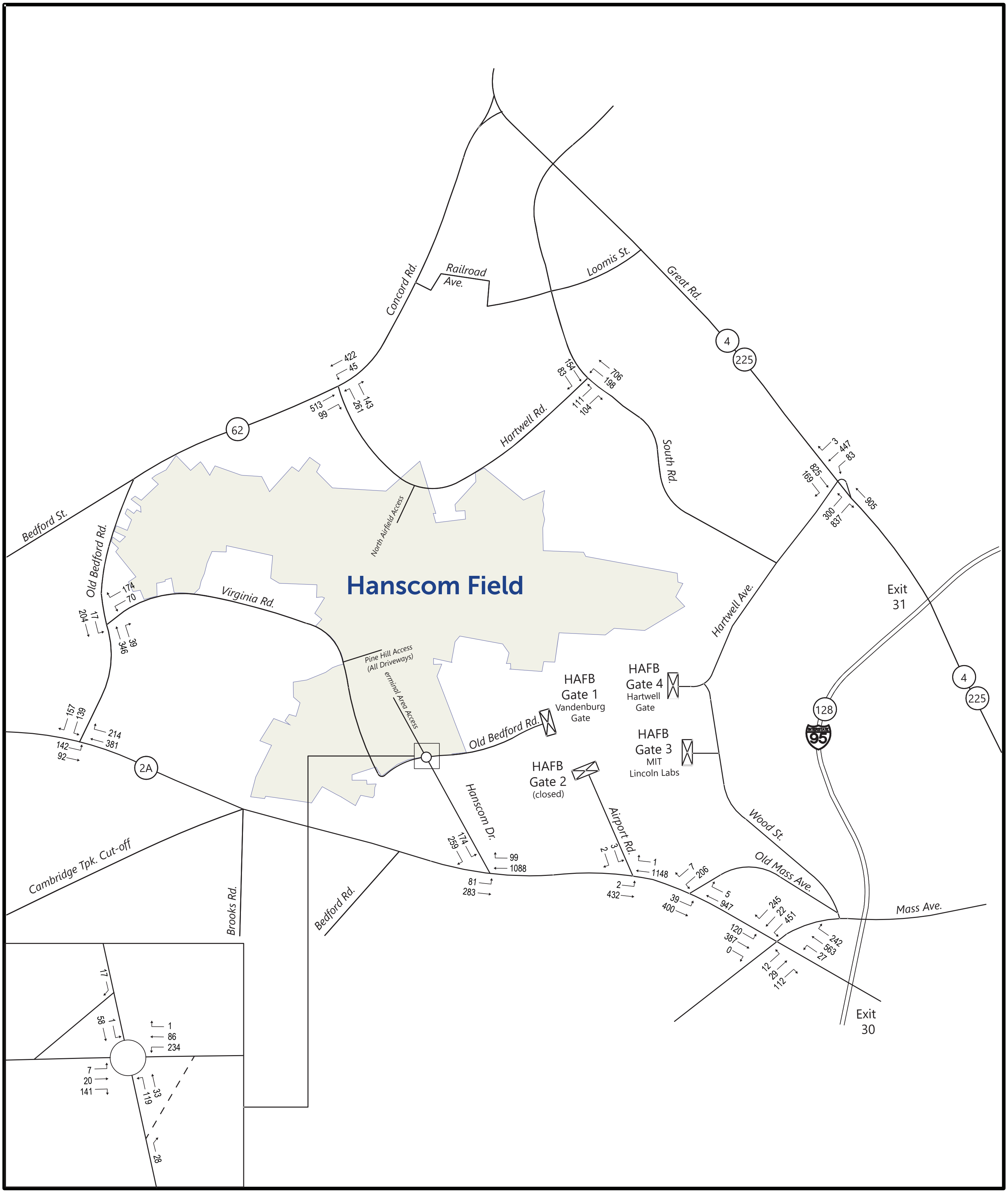
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2030 Background Growth Only
Morning Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023

Figure **6-17**



North

NOT TO SCALE

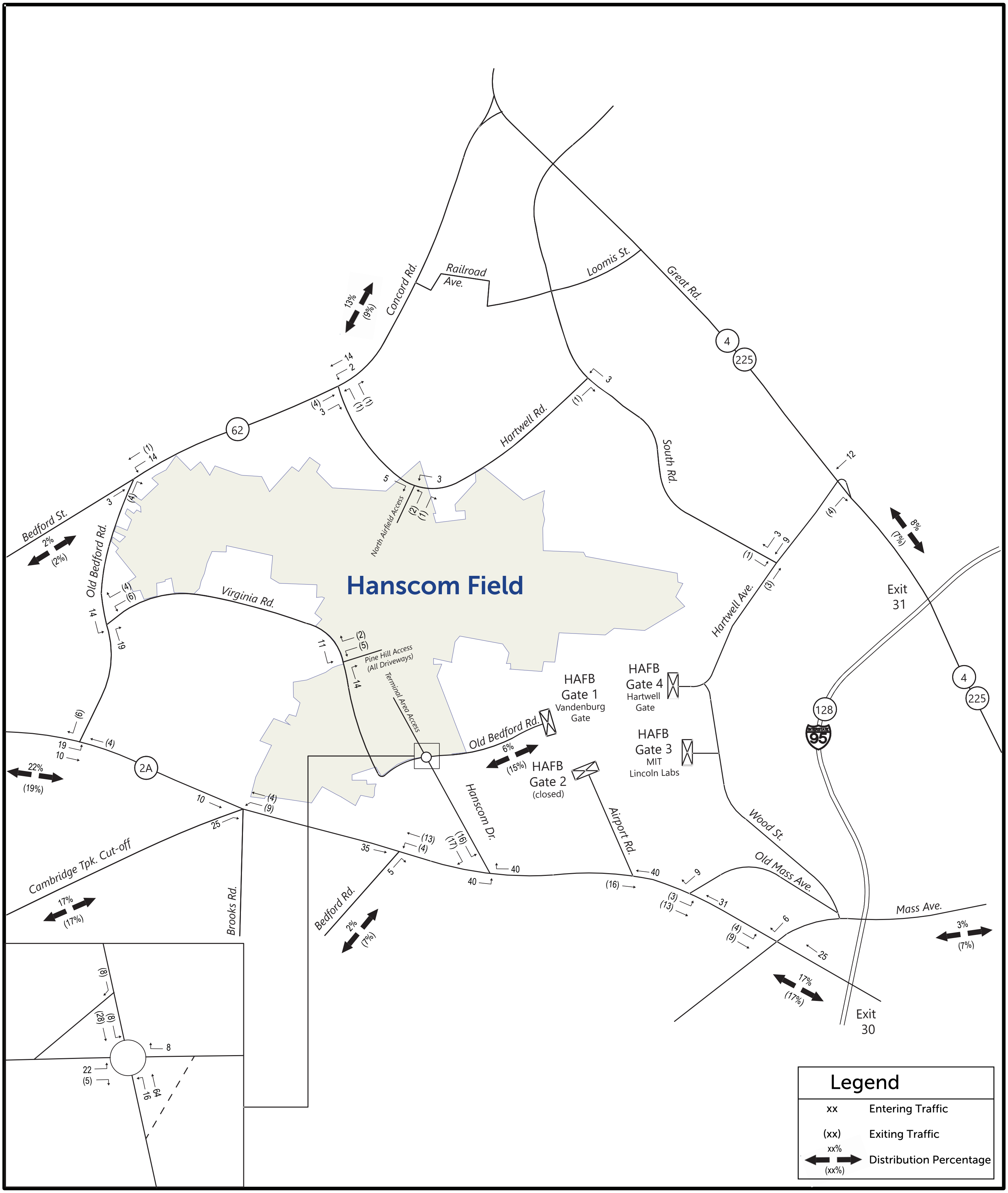
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2030 Background Growth Only
Afternoon Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023

Figure **6-18**



North

NOT TO SCALE

massport

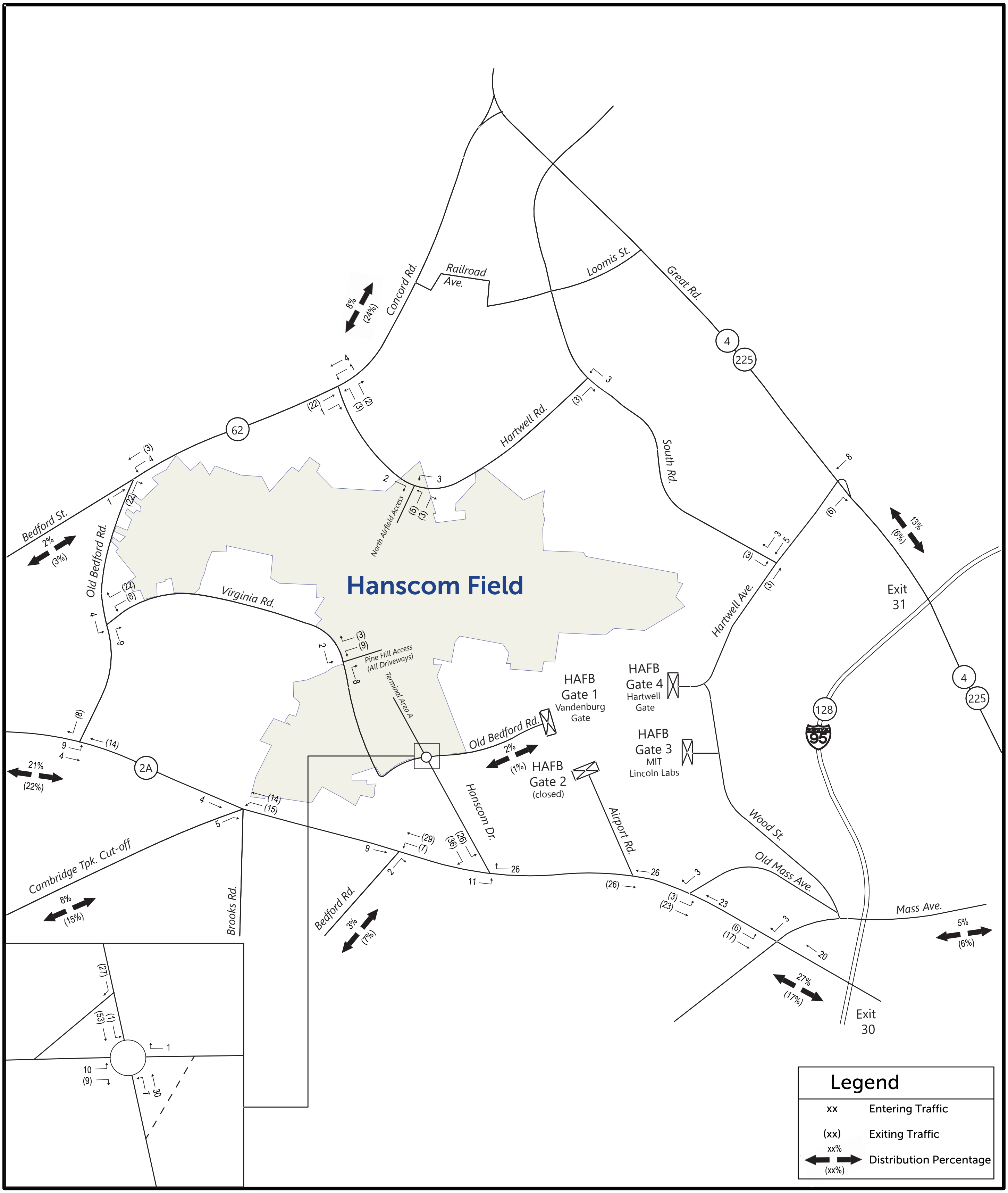
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2030 Morning Peak Hour
Trip Distribution (Hanscom Field Only)

Source: McFarland Johnson, 2023

Figure **6-19**



North

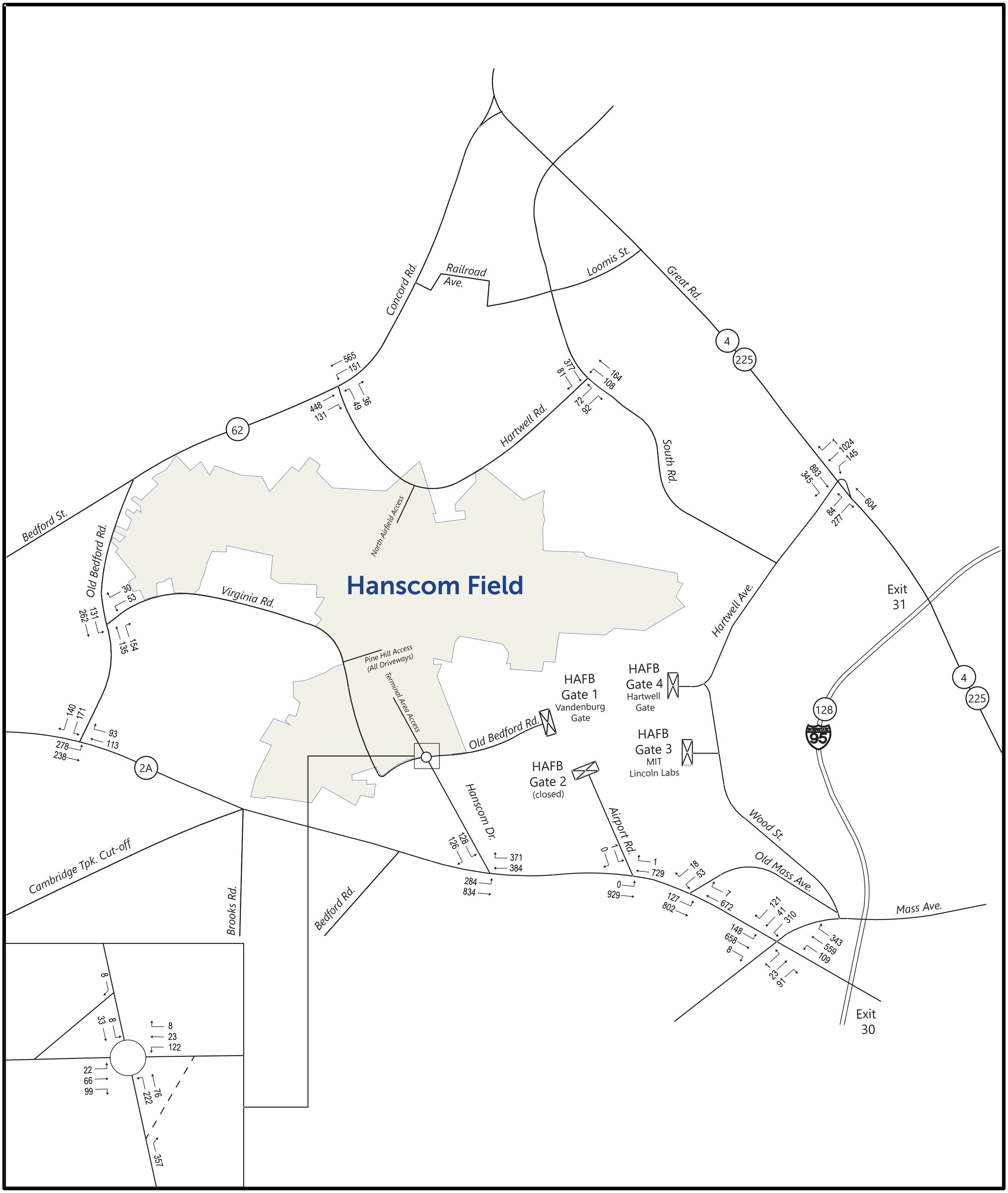
NOT TO SCALE

L. G. Hanscom Field

2022 Environmental Status & Planning Report

2030 Afternoon Peak Hour Trip Distribution (Hanscom Field Only)

Source: McFarland Johnson, 2023



North

NOT TO SCALE

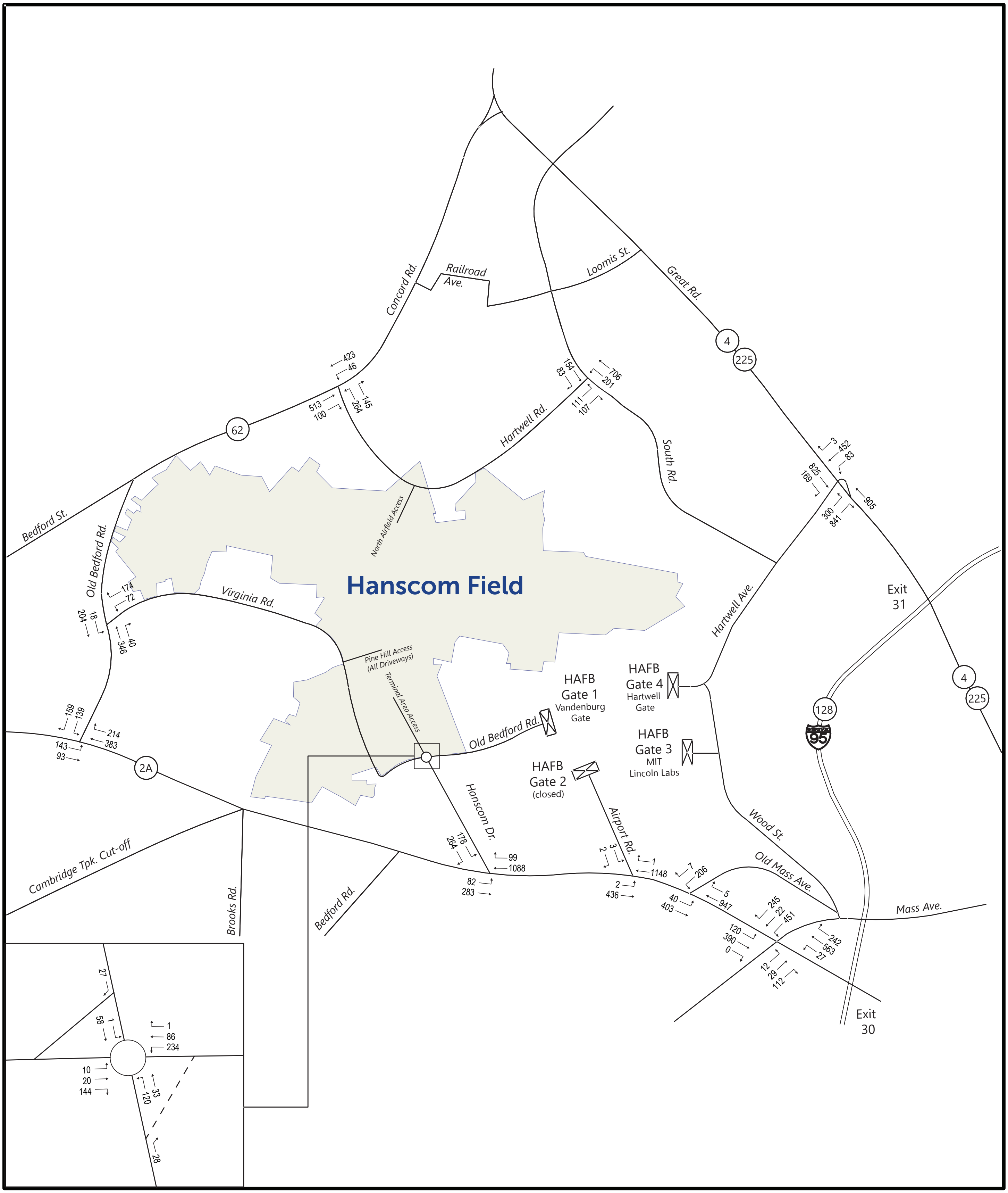
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2030 Hanscom and Background Growth Morning Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023

Figure **6-21**

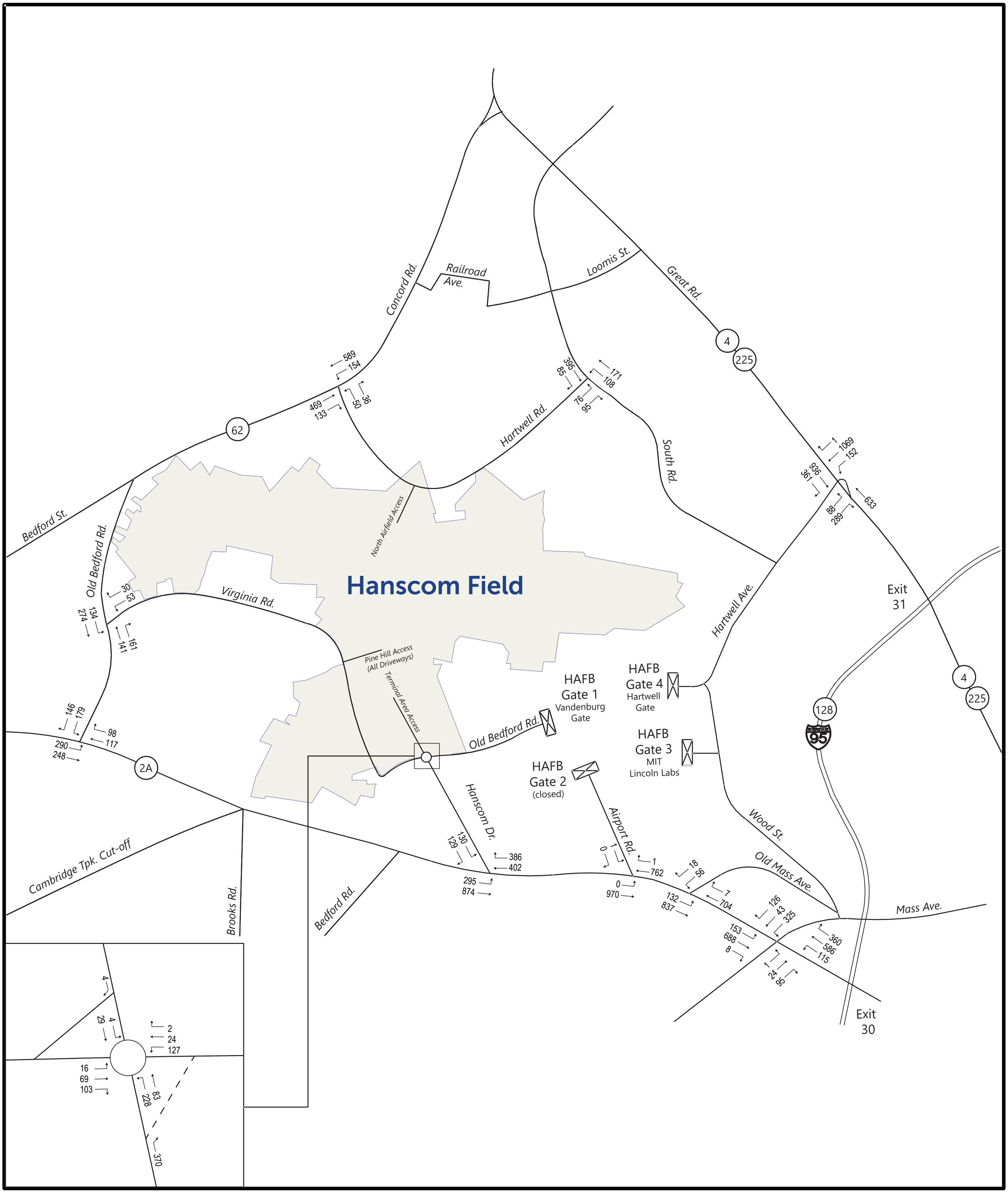


L. G. Hanscom Field
2022 Environmental Status & Planning Report

2030 Hanscom and Background Growth
Afternoon Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023

Figure **6-22**



North

NOT TO SCALE

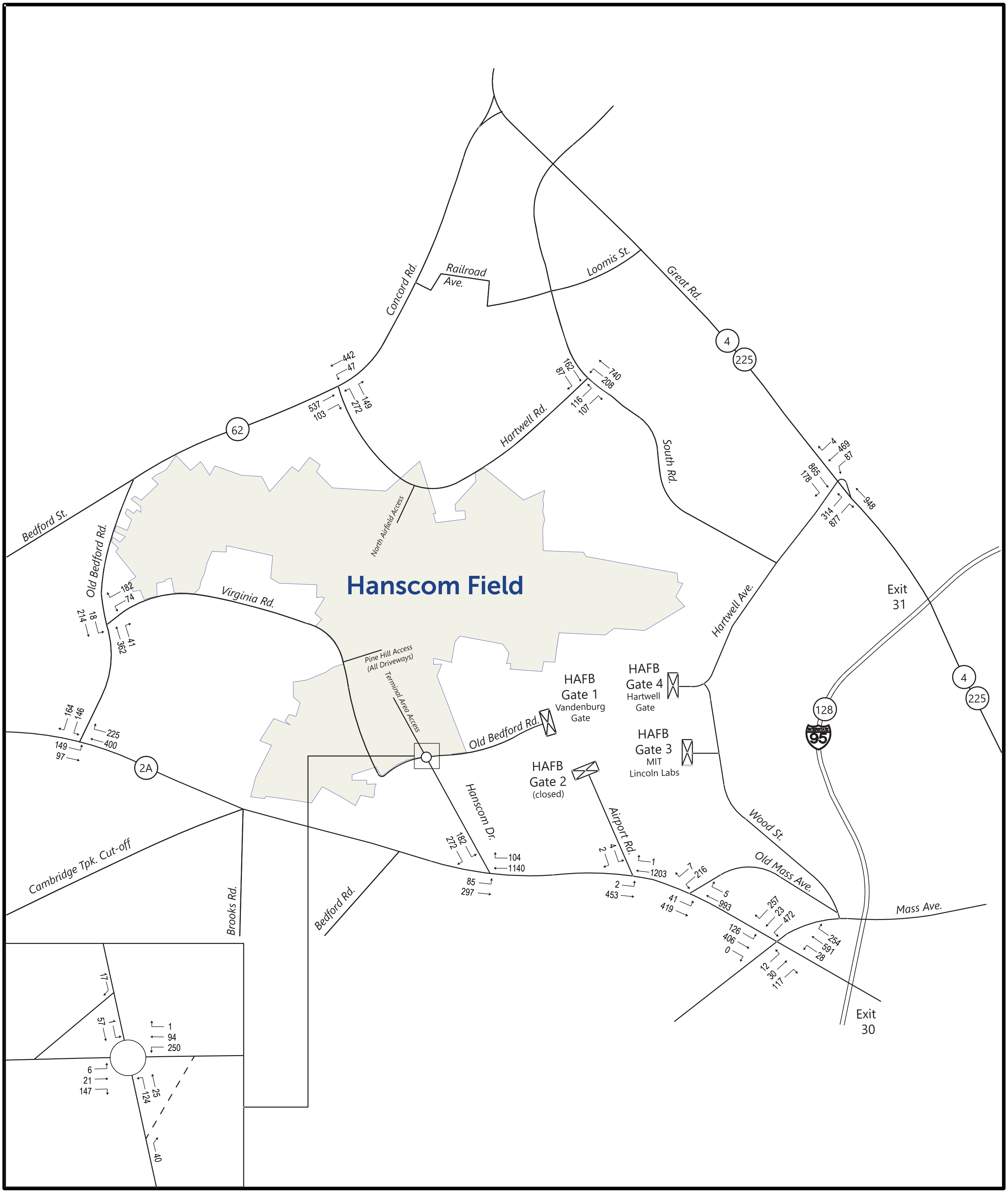
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2040 Background Growth Only
Morning Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023

Figure **6-23**



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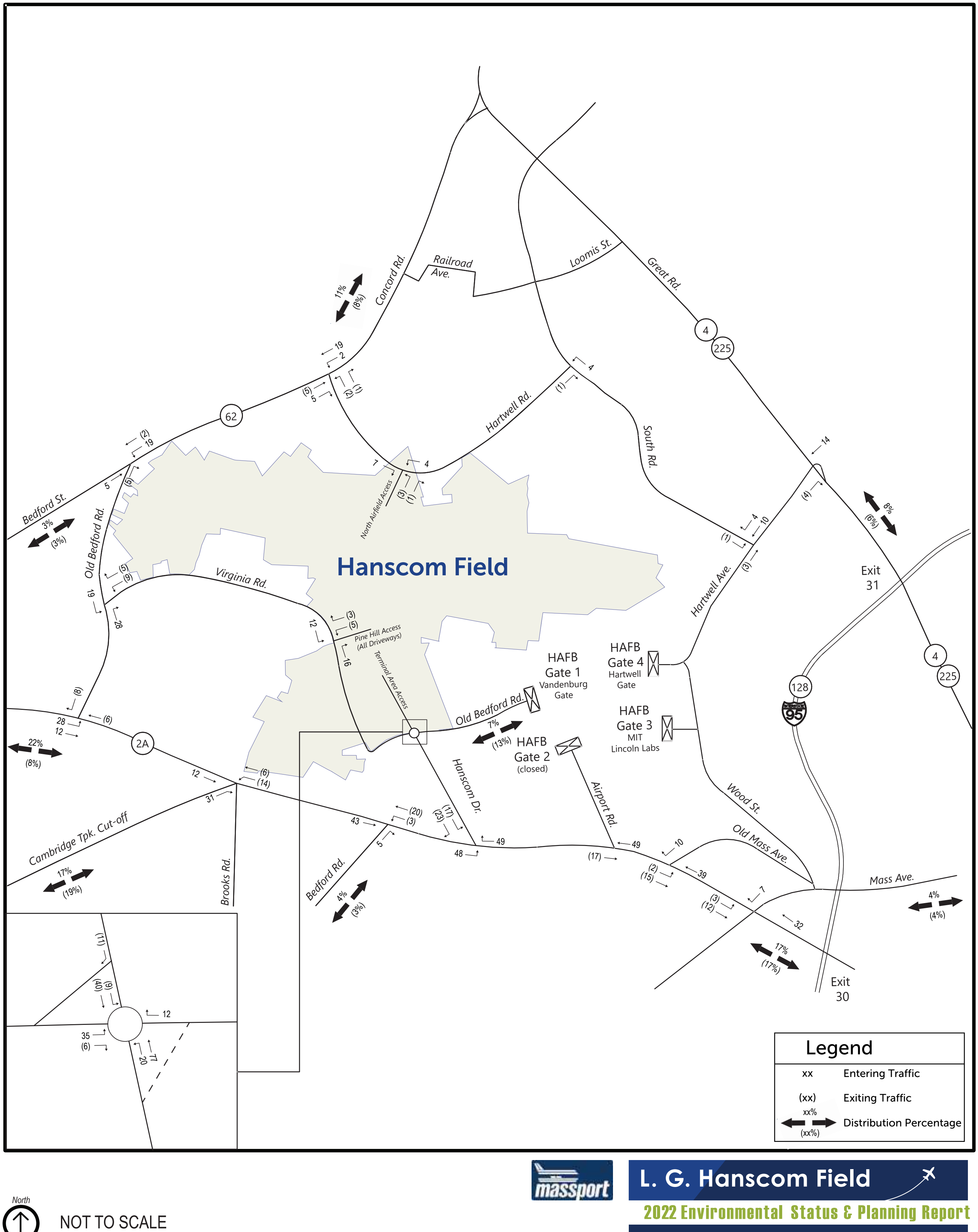
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2040 Background Growth Only
Afternoon Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023

Figure **6-24**



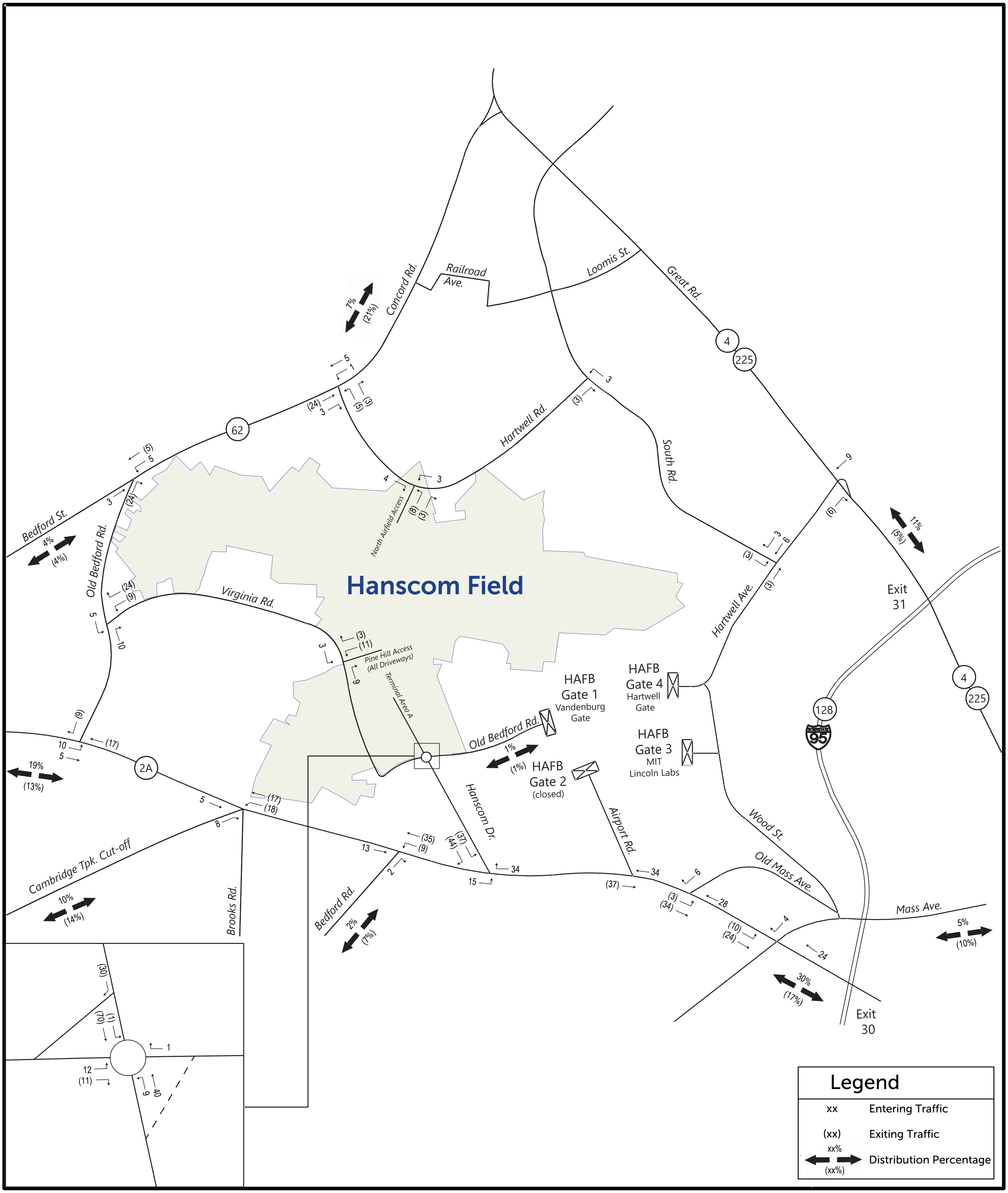
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2040 Morning Peak Hour Trip Distribution (Hanscom Field Only)

Source: McFarland Johnson, 2023

Figure 6-25



North

NOT TO SCALE

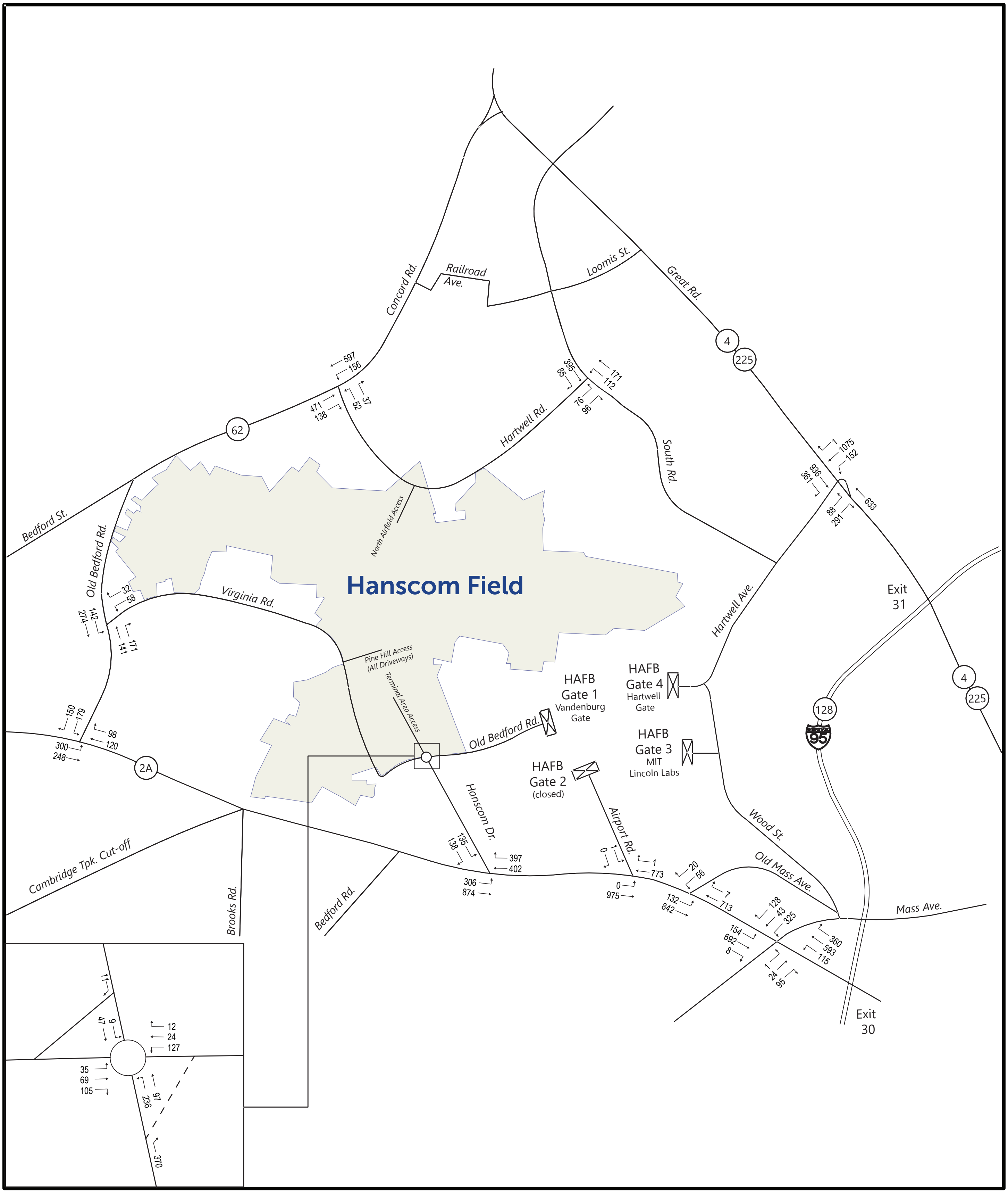
L. G. Hanscom Field

2022 Environmental Status & Planning Report

2040 Afternoon Peak Hour Trip Distribution (Hanscom Field Only)

Source: McFarland Johnson, 2023

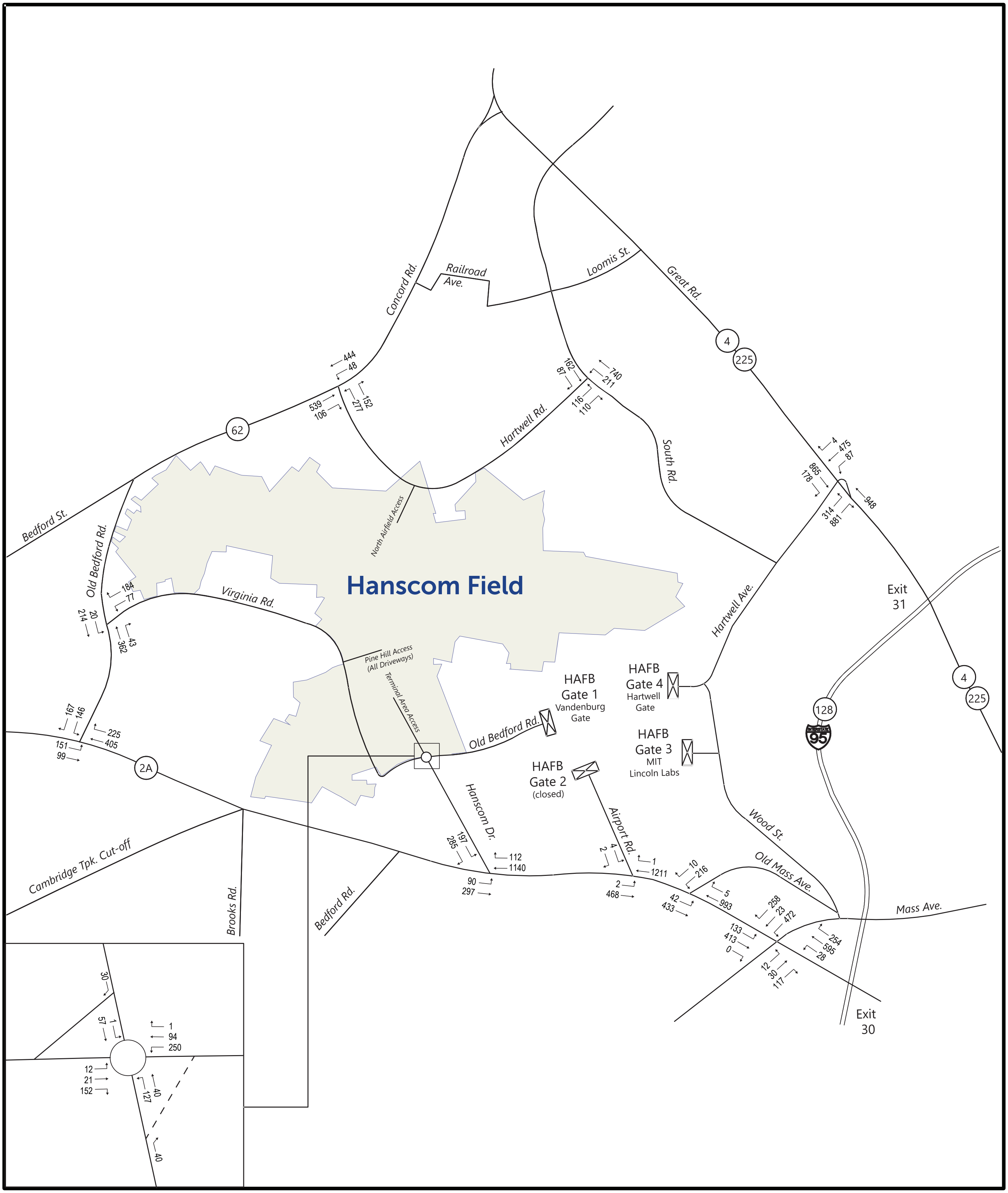
Figure **6-26**



L. G. Hanscom Field
2022 Environmental Status & Planning Report

2040 Hanscom and Background Growth
Morning Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023



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L. G. Hanscom Field

2022 Environmental Status & Planning Report

2040 Hanscom and Background Growth
Afternoon Peak Hour Traffic Volumes

Source: McFarland Johnson, 2023

Figure **6-28**

6.3.4 Planned Roadway Improvements

To analyze future intersection operations and build a comprehensive set of recommendations, it is necessary to understand planned and proposed roadway improvements in the study area. The modification of the intersection of Hanscom Drive and Old Bedford Road through a Hanscom AFB project (described in Section 6.2.2) is a key project affecting traffic operations in and out of Hanscom Field. This improvement project will install a modern, single-lane roundabout at this location which is expected to be operational by 2030; therefore, the roundabout is used in evaluating capacities for the 2030 and 2040 planning scenarios. Capacity results for the 2030 and 2040 traffic volumes under the existing roadway configuration are included in the appendix for reference.

Review of other ongoing planning efforts (detailed in Section 6.2.2) revealed that the identified future modifications to Route 4/225 and Hartwell Avenue is the only other relevant project. However, since this project is not listed in the TIP, funding has not yet been identified and thus it is not included in either the 2030 or 2040 scenario.

6.3.5 Future Conditions Capacity Analysis

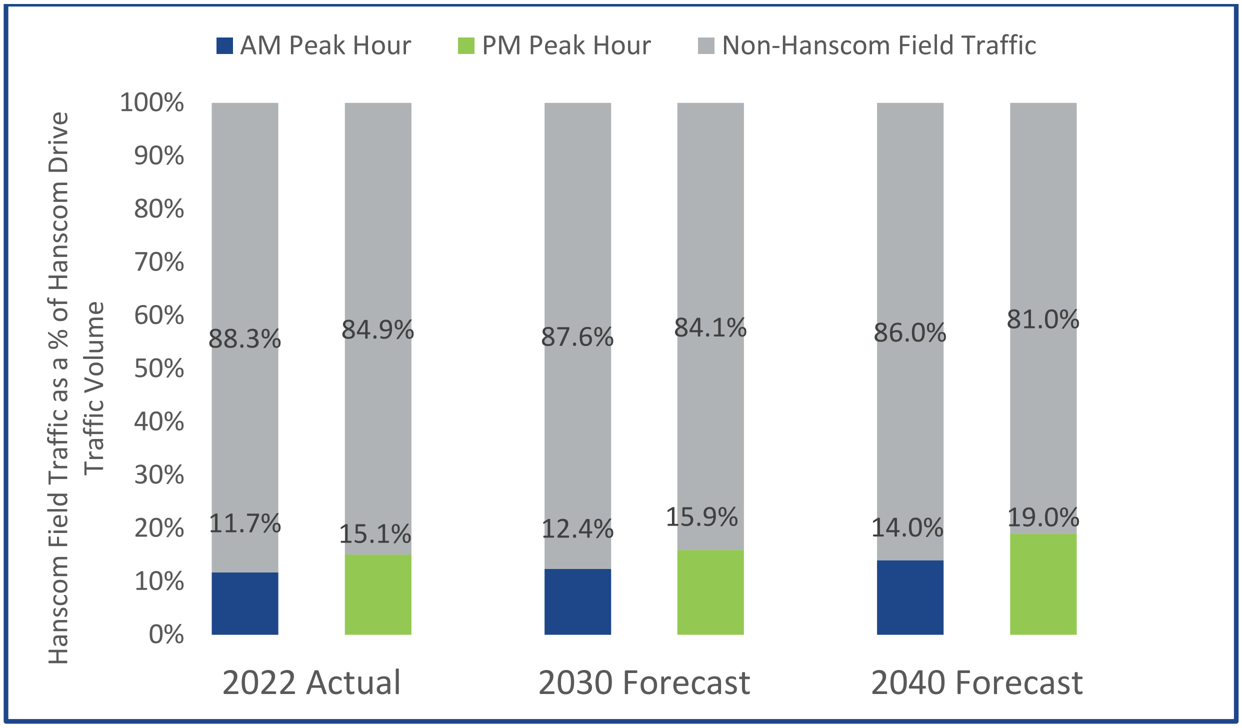
In order to quantify the impacts of expected changes in activity at Hanscom Field on the ground transportation network, a capacity analysis of intersections with movements accounting for more than 10 percent of total volume were analyzed for the following conditions:

- 2030 and 2040 morning and afternoon peak hour networks, including background growth but without Hanscom Field traffic growth.
- 2030 and 2040 morning and afternoon peak hour networks, including both background growth and Hanscom Field traffic growth.

Hanscom Drive Traffic Volumes

Figure 6-29 illustrates the percentage of peak hour traffic volumes on Hanscom Drive that are Hanscom Field-related trips for the existing (2022) and the 2030 and 2040 forecast scenarios. In the 2030 forecast scenario, Hanscom Field traffic on Hanscom Drive (as a proportion of total traffic) is projected to increase by approximately 1 percent for the morning and evening peak period in relation to the corresponding 2022 proportions. This is primarily due to the increase in future traffic at Hanscom Field expected from the increase in operations, including the potential for scheduled passenger service, and the lower volumes of non-Hanscom Field traffic on Hanscom Drive and the surrounding roadway network in general. In the 2040 forecast scenario, Hanscom Field traffic on Hanscom Drive (as a proportion of total traffic) is projected to increase by approximately 2 percent from the 2030 forecast scenario for the morning peak period 3 percent for the afternoon peak periods.

Figure 6-29. Hanscom Field 2030 and 2040 Peak Hour Traffic Volumes as a Percent of Hanscom Drive Traffic Volume

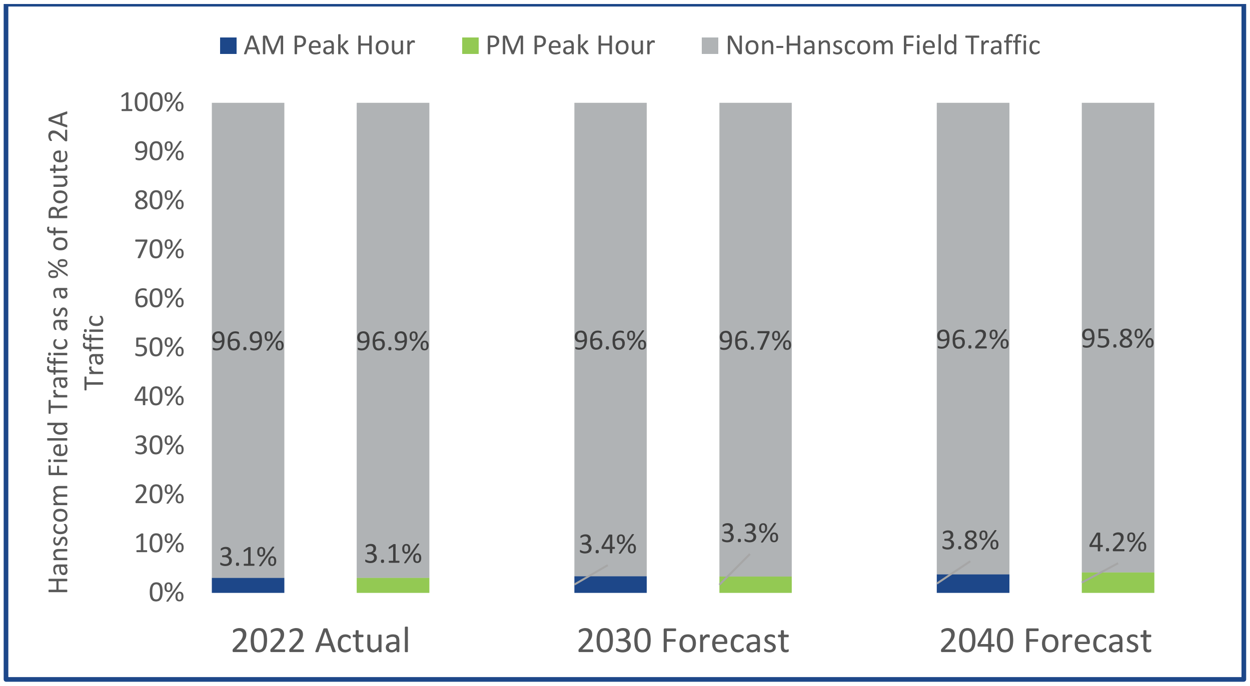


Source: McFarland Johnson, 2023
Note: Annual percent increase between 2022 and 2040 is 0.1% per year during the a.m. peak hour, and 0.2% per year during the p.m. peak hour, consistent with standard background traffic growth.

Route 2A Traffic Volumes

Figure 6-30 illustrates the percentage of Hanscom Field-related peak hour traffic volumes on Route 2A for the existing (2022) and the 2030 and 2040 forecast scenarios. It is expected that Hanscom Drive traffic volumes, measured as a percentage of total traffic on Route 2A, will increase proportionally to the expected future growth at Hanscom Field, as Route 2A will continue to remain the most common route for vehicles entering and exiting Hanscom Field.

Figure 6-30. Hanscom Field 2030 and 2040 Peak Hour Traffic Volumes as a Percent of Route 2A (East of Hanscom Drive) Traffic Volumes



Source: McFarland Johnson, 2023

Future Intersection Analysis

Future intersection operations were evaluated for study intersections with movements that exceed the 10 percent threshold under the 2030 and 2040 forecasts. **Table 6-16** shows the intersections that could have one or more traffic movements with 10 percent or higher Hanscom Field-related traffic volumes under the future 2030 and 2040 future scenarios. The procedures described earlier in this chapter were used to determine the future weekday peak hour intersection operations. To identify the potential effects related to Hanscom Field and the surrounding study area, an analysis was also conducted for the 2030 and 2040 scenarios that assumed 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 6-16 shows that Hanscom Field forecast traffic exceeds the 10-percent threshold at five locations, adding intersections #3 and #7 to those identified in the existing conditions analysis (see Table 6-5). This is an increase over the three intersections meeting the 10-percent threshold for the 2018 2025 and 2035 forecasts in the *2017 ESPR*.

Table 6-16. Intersections Exceeding 10-Percent Threshold

Intersection	Peak Hour	Analysis Years			
		2018 Existing	2022 Existing	2030 Forecast	2035 Forecast
#3 Route 2A / Old Massachusetts Avenue	Morning	Unknown		X	X
	Afternoon	Unknown			
#5 Hanscom Drive/ Old Bedford Road (Lincoln)	Morning	X	X	X	X
	Afternoon	X	X	X	X
#6 Hanscom Drive/ Route 2A (Lincoln)	Morning	X	X	X	X
	Afternoon	X	X	X	X
#7 Lexington Road / Old Bedford Road	Morning	Unknown			X
	Afternoon	Unknown			
#8 Old Bedford Road/Virginia Road (Concord)	Morning	X	X	X	X
	Afternoon	X	X	X	X

Note: "X" denotes intersection with turning movement exceeding 10 percent MEPA threshold
Sources: *2017 ESPR* and McFarland Johnson, 2023

2030 Forecast Scenarios

Table 6-17 and **Table 6-18** 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, regardless of Hanscom Field-related traffic growth. At the intersection of Route 2A and Hanscom Drive, the analysis indicates that the southbound movements would operate with significant delay during the morning and afternoon peak hours. However, as described in Section 6.2.5, the analysis does not accurately represent actual operating conditions based on observations of several unique motorist behaviors at this intersection. Therefore, the expected delay in the 2030 forecast year is likely to be less than indicated by the Synchro results. However, the continuance of nonstandard driving behavior, as described in Section 6.2.5 creates a potential safety concern due to heavy traffic conditions that are projected to increase in future forecast years.

Modification of the intersection of Hanscom Drive and Old Bedford Drive to a single-lane roundabout is projected to improve operations in the 2030 forecast year over existing conditions. LOS results show notable improvements in traffic operations on most approaches to this intersection over existing conditions. Furthermore, the removal of the nonstandard intersection design (i.e., where some approaches have multiple yield locations) would further reduce waiting times at this intersection. Hanscom Field development is expected to have a minimal impact on the future operation of this new roundabout.

The increase in traffic volumes from all sources at the intersection of Old Bedford Road and Virginia Road and the intersection of Route 2A and Old Massachusetts Avenue has a minimal impact on the intersection's operations in both the no-build scenario (no future increase in Hanscom Field Traffic) and build scenario (assumed projected future increase in Hanscom Field Traffic).

Table 6-17. Total Level of Service Including 2030 Hanscom Field Forecast: Morning Peak Hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#3 Route 2A/Old Massachusetts Avenue						
Old Mass. Ave. SB (L)	B	10.1	0.17	B	10.1	0.17
Route 2A EB (L)	A	0	0	A	0	0
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	5.6	0.29	A	5.8	0.30
Hanscom Drive SB	A	4.9	0.06	A	5.1	0.08
Old Bedford Road EB	A	5.0	0.19	A	5.3	0.20
Old Bedford Road WB	A	6.2	0.23	A	6.4	0.25
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	> 5 min.	5.09	F	> 5 min.	5.44
Hanscom Drive SB (R)	C	16.3	0.32	C	16.5	0.33
Route 2A EB (L)	A	9.5	0.30	A	9.5	0.30
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	C	20.1	0.30	C	20.7	0.32
Old Bedford Road SB (L)	A	8.6	0.13	A	8.6	0.13
Source: McFarland Johnson, 2023						

Table 6-18. Total Level of Service Including 2030 Hanscom Field Forecast: Afternoon Peak Hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#3 Route 2A/Old Massachusetts Avenue						
Old Mass. Ave. SB (L)	B	11.0	0.07	B	11.0	0.07
Route 2A EB (L)	A	0	0	A	0	0
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	4.4	0.18	A	4.5	0.18
Hanscom Drive SB	A	6.6	0.12	A	6.6	0.12
Old Bedford Road EB	A	6.4	0.24	A	6.5	0.25
Old Bedford Road WB	A	6.9	0.35	A	6.9	0.35
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	> 5 min.	2.96	F	> 5 min.	3.03
Hanscom Drive SB (R)	F	293.3	1.50	F	305.3	1.53
Route 2A EB (L)	B	12.55	0.17	B	12.6	0.17
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	C	19.4	0.55	C	19.8	0.55
Old Bedford Road SB (L)	A	8.3	0.02	A	8.3	0.02
Source: McFarland Johnson, 2023						

While the Synchro analysis indicates that the southbound approach at Hanscom Drive/Route 2A is of concern in the 2030 forecast, attention to the difference between the no-build (only non-Hanscom-related traffic growth) and build scenarios (assumed projected future increase in Hanscom Field traffic) indicate that growth in projected Hanscom Field traffic has limited impact on the operational deficiencies of this intersection. Furthermore, the analysis indicates that Hanscom Field will contribute approximately 15 to 18 percent of traffic to this movement in the 2030 forecast year. As such, these operational deficiencies are largely the result of regional background traffic growth and not Hanscom Field-related traffic.

2040 Forecast Scenarios

Table 6-19 and **Table 6-20** present the comparison of traffic operations for the 2040 forecast scenarios, with and without potential increases in Hanscom Field-related 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 regardless of Hanscom Field-related traffic growth.

Table 6-19. Total Level of Service Including Hanscom Field 2040 Forecast: Morning Peak Hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#3 Route 2A/Old Massachusetts Avenue						
Old Mass. Ave. SB (L)	B	10.4	0.18	B	10.4	0.18
Route 2A EB (L)	A	0	0	A	0	0
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	5.9	0.31	A	6.4	0.34
Hanscom Drive SB	A	5.1	0.06	A	5.6	0.11
Old Bedford Road EB	A	5.2	0.20	A	5.8	0.23
Old Bedford Road WB	A	6.5	0.25	A	7.2	0.28
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	2911.8	6.73	F	3184.3	7.31
Hanscom Drive SB (R)	C	17.3	0.35	C	17.9	0.37
Route 2A EB (L)	A	9.7	0.32	A	9.8	0.33
#7 Lexington Road/Old Bedford Road						
Lexington Road EB (L)	A	8.2	0.23	A	8.3	0.24
Old Bedford Road SB (R)	A	9.8	0.19	A	9.9	0.19
Old Bedford Road SB (L)	C	15.5	0.38	C	15.6	0.38
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	C	22.0	0.34	C	24.0	0.38
Old Bedford Road SB (L)	A	8.65	0.14	A	8.7	0.15
Source: McFarland Johnson, 2023						

Table 6-20. Total Level of Service Including Hanscom Field 2040 Forecast: Afternoon Peak Hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#3 Route 2A/Old Massachusetts Avenue						
Old Mass. Ave. SB (L)	B	11.3	0.07	B	11.31	0.07
Route 2A EB (L)	A	0	0	A	0	0
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	4.4	0.17	A	4.7	0.20
Hanscom Drive SB	A	6.9	0.12	A	6.9	0.12
Old Bedford Road EB	A	6.6	0.26	A	6.9	0.27
Old Bedford Road WB	A	7.1	0.37	A	7.6	0.39
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	> 5 min.	3.55	F	> 5 min.	3.98
Hanscom Drive SB (R)	F	> 5 min.	1.72	F	> 5 min.	1.81
Route 2A EB (L)	B	13.1	0.19	B	13.2	0.20
#7 Lexington Road/Old Bedford Road						
Lexington Road EB (L)	A	8.8	0.16	A	8.9	0.17
Old Bedford Road SB (R)	B	13.5	0.31	B	13.7	0.32
Old Bedford Road SB (L)	C	19.7	0.41	C	20.0	0.41
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	C	21.6	0.59	C	22.3	0.61
Old Bedford Road SB (L)	A	8.3	0.02	A	8.3	0.02
Source: McFarland Johnson, 2023						

Similar to the 2030 forecast scenario, the intersection of Route 2A and Hanscom Drive would continue to experience the most operational deficiencies on the southbound approach from Hanscom Drive. The analysis indicates that the southbound movements would operate with lengthy delays during the morning and afternoon peak hours, regardless of Hanscom Field growth.

Furthermore, the 2040 forecast scenario indicates adequate operations at the intersection of Route 2A and Old Massachusetts Avenue, the intersection of Lexington Road and Old Bedford Road, and the intersection of Old Bedford Road and Virginia Road. Negligible increases in delay are expected at these intersections with the additional Hanscom Field-related traffic growth.

Finally, similar to the findings in the 2030 forecast scenario, the 2040 forecast scenario shows adequate traffic operations in the new single-lane roundabout, which is expected to be constructed before the 2030 forecast year. All approaches at the roundabout are expected to operate at LOS A for both peak hours during the no-build and build scenario. Future growth in Hanscom Field traffic would have minimal impact on the operations of this intersection.

Similar to the 2030 forecast, however, the 2040 forecast analysis of the Hanscom Drive/Route 2A intersection indicates that the operational deficiencies would exist at these intersections regardless of the forecasted growth at Hanscom Field. In 2040, Hanscom Field would contribute approximately 8 to

13 percent of traffic to these movements. These operational deficiencies are likely a result of regional background traffic growth and traffic from the planned project near Hanscom Field (described in Section 6.3.1), not Hanscom Field-related traffic.

6.4 Traffic Management Approaches

Analysis of the 10-intersection network presented earlier in the chapter reveals that Hanscom Field has limited operational impact on the ground transportation network in the vicinity of the airport for the scenarios analyzed (2022 existing, 2030 forecast, and 2040 forecast). Hanscom Field accounts for at least 10 percent of individual turning movements at four intersections for the 2030 forecast: Route 2A and Old Massachusetts Avenue; Hanscom Drive and Old Bedford Drive; Hanscom Drive and Route 2A; and Virginia Road and Old Bedford Road. For the 2040 forecast, an additional intersection, Lexington Road and Old Bedford Road, also has individual turning movements that exceed the 10 percent screening criteria. Potential improvements for the two intersections that are currently experiencing or are projected to experience operational deficiencies are described in the following sections.

6.4.1 Improving Hanscom Drive and Old Bedford Road Intersection

As discussed throughout this chapter, the intersection of Hanscom Drive and Old Bedford Road is expected to be modified to a single-lane roundabout through a Hanscom AFB-led project associated with gate improvements. The capacity analysis shows that this intersection would operate more efficiently in the future analysis years, even with expected traffic growth. Furthermore, the project is expected to clarify vehicular navigation through the intersection. The inclusion of a bus pull-out south of the proposed roundabout on Hanscom Drive will improve transit accommodations. Bike lanes along Hanscom Drive and sidewalks from the proposed bus pull-out and eastbound and southbound approaches with crosswalks are also planned.

The intersection modifications are expected to alleviate problems identified in the travel survey conducted for this study, which revealed that some motorists find the intersection confusing to navigate.

6.4.2 Improving Hanscom Drive and Route 2A Intersection

As noted in the *2012 ESPR* and the *2017 ESPR*, the intersection of Hanscom Drive and Route 2A continues to be operationally deficient, with the southbound Hanscom Drive movements lacking sufficient gaps between vehicles traveling on Route 2A for vehicles to turn either east or west. The results of the Synchro analysis indicate that this approach is over capacity during both peak hours.

Operational and geometric changes at this intersection would improve conditions. Specifically, the potential installation of a traffic signal should be evaluated. Initial review suggests that the criteria for a signal warrant[157] would be met based on forecasted growth, and that a traffic signal may be a promising solution to improve operations at this intersection in the future. An alternative solution could be a single lane roundabout with channelized movements.

[157] A signal warrant is a method of determining if an intersection is a candidate for a traffic signal. The guidelines are outlined in the Manual on Uniform Traffic Control Devices by the Federal Highway Administration.

6.4.3 Transportation Demand Management

Reducing peak hour trips to and from Hanscom Field through TDM could also improve conditions. While Hanscom Field operations are projected to continue having only a small impact on ground transportation infrastructure in the surrounding area, development of demand management programs could have mutually beneficial effects for area traffic conditions and for the commuting employees/tenants at Hanscom Field. However, options are limited for managing vehicle demand – largely due to the geographic context in which Hanscom Field exists. As a large airport in a suburban environment, many traditional TDM strategies frequently promoted in urban areas are less suitable for implementation at Hanscom Field. Even so, the following sections describe the steps that could be undertaken at Hanscom Field to manage demand.

Enhancing Transit Connections

As discussed in Section 6.2.1, Hanscom Field could benefit from its proximity to the Fitchburg Line of the MBTA Commuter Rail, as well as from the MBTA Route 76 bus route with service to the MBTA's Alewife Station (at the terminus of the Red Line). As described in Section 6.2.7, service via the Route 76 bus route is slow and therefore is not convenient as a direct connection for Hanscom Field commuters. Not only does Route 76 operate as a local bus between Alewife Station and its terminus at Hanscom Field, but the route is also circuitous and is designed with preference to the larger employment base at the MIT-Lincoln Laboratory.

The Route 128 Business Council continues to operate their express bus service for commuters destined to Hartwell Avenue from Alewife Station. Coordination between Hanscom Field, Hanscom AFB, and the Virginia Road corporate neighbors on another express shuttle connecting these three facilities with either the MBTA Alewife Station or the MBTA Concord commuter station could increase transit options for daily commuters. An express shuttle could also be combined with a free, guaranteed ride home program to further increase transit options and use.

Furthermore, the on-going Better Bus Project plan and Rail Vision final report have the potential to reimagine commuter rail transit and bus services in the region which will directly impact the accessibility of Hanscom Field from these systems.

Promoting Ride Share

As noted in Section 6.2.7, approximately 40 percent of the travel survey respondents indicated an interest in carpooling; however, only 4 percent of survey respondents actually carpool and only then as a secondary means of travel to and from Hanscom Field on a daily basis. Therefore, while ridesharing and carpooling may be a viable travel demand management strategy, the variability in daily commuter schedules, the geographic dispersion of employee trip origins, and the relatively low volume of peak-hour commuters to and from Hanscom Field may make carpooling programs difficult to establish and sustain. Other ways to reduce SOV trips include:

- Offer parking incentives to carpool participants (i.e. reserved spaces).
- Provide cars for errands or emergencies to carpool participants.
- Promote app-based tools (e.g., Waze Carpool and NuRide) to provide ride-matching services with nearby employees with similar commutes.

6.4.4 Promoting Active Transportation

Since 100 percent of the travel survey respondents live more than one mile away from Hanscom Field, walking is not a viable commute option. However, survey respondents noted that several local improvements could be made to enhance the pedestrian environment at Hanscom Field. Specifically, recommendations include:

- Pedestrian improvements at the intersection of Hanscom Drive and Old Bedford Road to include crosswalks and sidewalks along Hanscom Drive to the Terminal Building. MBTA ridership data shows daily riders at the bus stop at this location, and pedestrian accommodations should be improved accordingly.
- Enhanced pedestrian connections to the Battle Road Trail. Restriping on Old Bedford Road to remove the painted median could create increased flexible shoulder space, while also connecting to the branch of the Battle Road Trail located at the intersection of Virginia Road and Old Bedford Road (Lincoln).
- Greater pedestrian connectivity at the Hanscom Field Main Terminal between all major facilities and parking locations. While these improvements may not increase the number of walking trips to Hanscom Field, they may increase the number of walking trips to the Battle Road Trail for recreation or increase walking between buildings and for trips internal to Hanscom Field.

Cycling to and from Hanscom Field may provide a reduction in SOV trips. With approximately 13 percent of survey respondents living 10 miles or less from Hanscom Field, and with 9 percent of survey respondents indicating an interest in cycling to Hanscom Field as an alternative means to their primary mode of travel, cycling could account for a larger mode share in the future. However, 69 percent of survey respondents indicated that bicycle facilities are not adequate to make cycling a viable commute option. Recommendations to improve the viability of cycling in the future include:

- Improve cycling accommodations on Hanscom Drive between the Hanscom Field Terminal and Route 2A by converting existing shoulder space on Hanscom Drive to a bike lane and installing “Share the Road” signs at the southern and northern entrances to the drive.
- Install “Share the Road” signs at bicycle crossing locations at the intersection of Hanscom Drive and Old Bedford Road and install bicycle chevrons on turning lanes while maintaining consideration of bicycle users in any long-term plans to reconfigure the geometry of the intersection.
- Improve Virginia Road to its intersection with Old Bedford Drive by installing bike chevrons and “Share the Road” signs along this route.
- Expand the shoulder for bicyclists on Route 2A to the east to Massachusetts Avenue.

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7 Noise

This chapter presents the noise conditions at Hanscom Field for the existing (2022) conditions and for two forecasted scenarios (2030 and 2040).

A broad array of metrics is used to describe noise conditions including the FAA's primary metric, the Day-Night Sound Level (DNL), and several supplemental metrics including Time Above a decibel threshold (TA), Total Noise Exposure (EXP), and distribution of Sound Exposure Levels (SEL).[158] Noise levels for each of the metrics are evaluated at noise-sensitive receptors including hospitals, schools, religious sites, public facilities, and sites on the National Register of Historic Places and/or State Register of Historic Places. This chapter also describes Massport's noise abatement program, including how Massport is working with local stakeholders to assess noise and mitigate its effects.

The 2022 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. The 2030 and 2040 scenarios are estimates of what could occur (not what will occur) in the future using certain planning assumptions and are heavily dependent upon demand. The future service scenarios remain fully consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

[158] Section 7.2 provides details on the noise metrics.

7.1 Key Findings Since 2017

Since the *2017 ESPR,* overall operations at Hanscom Field have decreased and remain well below historical peaks. Noise levels also remain below historical peaks, with the 65 decibel (dB) DNL contour[159] entirely within Hanscom Field and Hanscom AFB properties. The increase by jet aircraft operations and forecasted growth of annual operations through the 2040 forecast scenario (approximately 147,000 annual operations) results in a modest projected increase in overall noise levels over 2022 conditions. However, noise levels in 2030 and 2040 are projected to remain lower than what was experienced in 2005. Through 2040, no residential land use is forecasted to be exposed to DNL 65 dB or greater.

Massport has continued to pursue measures to reduce noise impacts, including an initiative that began in 2009 to reduce noise over MMNHP. Previously, touch-and-go operations circled to the south of the Airport, often taking the aircraft over areas of the Battle Road Trail that runs through the park and is used for outdoor programs and interpretive talks. A partnership of Massport, National Park Service (NPS), the FAA, Hanscom Field flight schools, and Hanscom Field 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.

Key noise statistics:

- The total population exposed to DNL greater than 65 dB remains at zero in 2022 (from zero in 2017 and 2012), which is a decrease from 17 in 2005 (which were all in Bedford).
- Through 2040, no residential land use or people are forecasted to be within the DNL 65 dB contour.
- Continued aircraft fleet modernization and lower overall activity levels compared to historical levels decrease noise since 2005.
- The Time Above analysis shows less acreage and smaller populations exposed to time above 55 and 65 dB in 2022 as compared to 2017.
- Noise levels in 2030 and 2040 are projected to remain lower than what was experienced in 2005.

Massport's Fly Friendly program at Hanscom Field continues to support quieter arrival and departure procedures, including supporting the use of the National Business Aviation Association's (NBAA's) noise abatement procedures for jet aircraft, publicizing the Aircraft Owners and Pilot Association's (AOPA's) noise abatement procedures for piston aircraft, and by developing and publicizing quiet flying procedures for helicopters. Part of this effort included the development of a multi-faceted publicity program that results in pilots being exposed and re-exposed to the importance and understanding of the quiet-flying techniques (see Section 7.9.7 for additional discussion of the Fly Friendly Program).

[159] FAA land use compatibility guidelines generally consider aircraft noise greater than DNL 65 dB to be incompatible with residential and other noise-sensitive land uses. No residential land uses were exposed to a DNL value above DNL 65 dB in 2022.

The noise analysis for this *2022 ESPR* utilized the latest version of the FAA's airport noise software, the Aviation Environmental Design Tool (AEDT), version 3e. AEDT combines the FAA's legacy tools for airport noise, emissions, and fuel burn into a single package to ensure consistency across the analyses. The database structure of this tool allows for the use of a nearly unlimited number of aircraft flight paths and operations to model the full detail of operations at an airport. Several new aircraft types have been added to AEDT since the *2017 ESPR*, and some noise and performance computation algorithms have been updated. However, the current AEDT aircraft noise and performance database and algorithms are largely the same as the most recent versions of the AEDT and the change in noise model had little impact on the differences in computed noise levels between 2017 and 2022.

Comparison of year 2022 DNL noise contours to 2017 contours shows that overall noise levels have decreased. Though total operations decreased between 2017 and 2022, as shown in **Figure 7-1**, operations by jet aircraft and the number of nighttime flights increased which resulted in some increase in noise under the main flight paths.

Noise model results from 2012 are also included in this section; they demonstrate a longer-term trend of decreasing noise. This is largely due to overall lower activity levels and the continued modernization of the aircraft fleet. FAA land use compatibility guidelines generally consider aircraft noise greater than DNL 65 dB to be incompatible with residential and other noise-sensitive land uses. No residential land uses were exposed to a DNL 65 dB in 2022, as only a small portion of the DNL 65 contour extends beyond Massport property (which extends into AFB property).

With an increase in the forecasted level of aircraft operations, noise is anticipated to increase from 2022 to 2030 and then again to 2040. However, noise levels in 2030 and 2040 are projected to remain lower than what was experienced in 2005 and through 2040, no residential land use is forecasted to be within the DNL 65 dB contour.

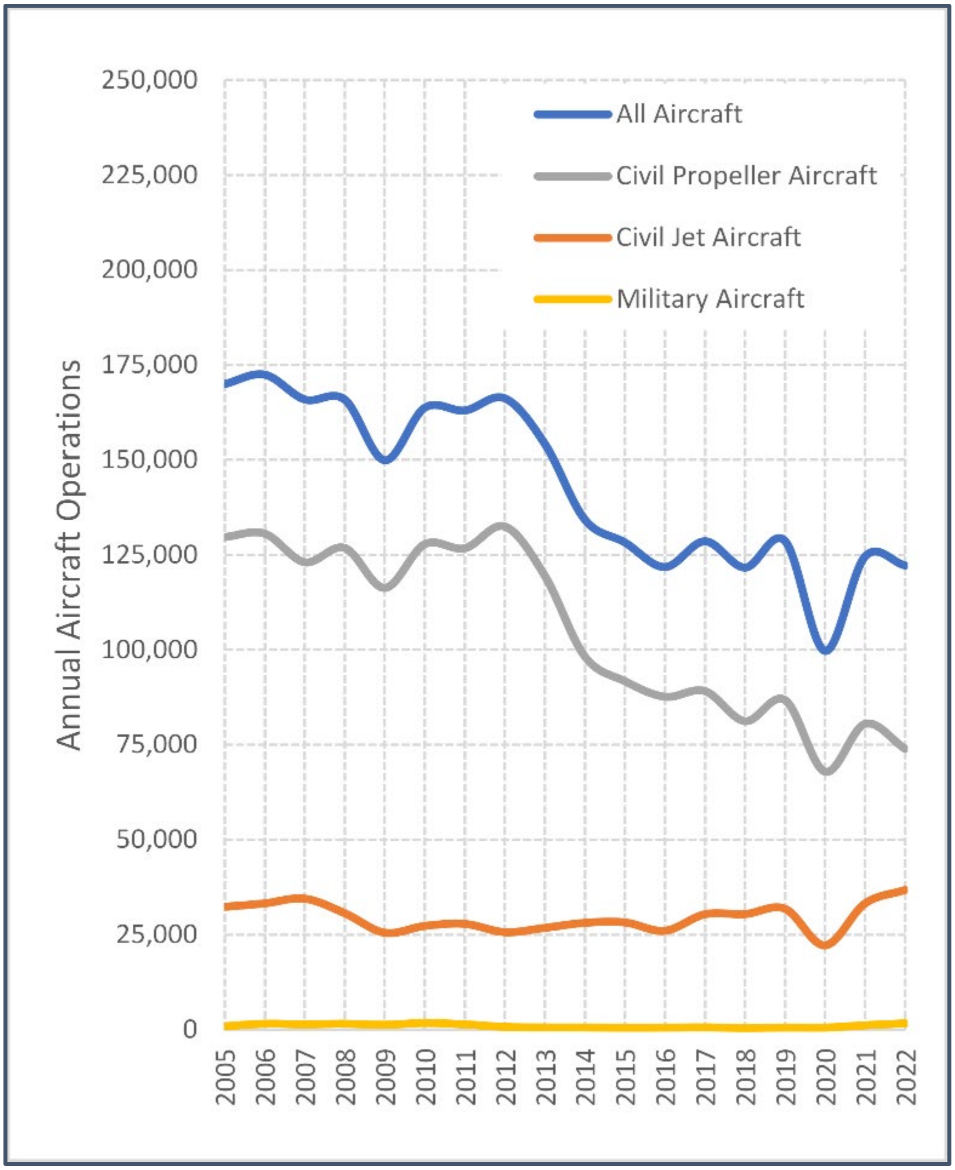
Table 7-1 presents population estimates within the 65 and 55 DNL contours for 2005, 2012, 2017, 2022, and the forecasted 2030 and 2040 scenarios.

Table 7-1. Summary of U.S. Census Population Counts within DNL Contours

Year/Scenario	Population[1]	
	65 dB or Greater[2]	55 dB or Greater[3]
2005	17	2,953
2012	0	1,041
2017	0	1,271
2022	0	1,324
2030	0	1,521
2040	0	1,757

Notes:
1. 2022, 2030, and 2040 data based on the 2020 U.S. Census; 2012 and 2017 data based on the 2010 U.S. Census; 2005 data based on the *2005 ESPRs* using the 2000 U.S. Census.
2. These population estimates fall between the 65 and 70 DNL contours.
3. These population estimates include population within the 55, 60, 65, and 70 DNL contours
Source: HMMH 2023

Figure 7-1. Historical Aircraft Operations Trends



Source: Massport 2022 Hanscom Annual Noise Report

In addition to noise contours, the *2022 ESPR* includes detailed noise results at noise analysis locations throughout MMNHP and towns of Bedford, Concord, Lexington, and Lincoln, as summarized below:

- No historic sites were within the 60 DNL or greater contour for 2017 or 2022.
- There are two historic sites that have DNL values greater than 55 dB in 2022. Noise levels decreased at both sites in 2022 relative to 2017:
  - The Deacon John Wheeler/Capt. Jonas Minot Farmhouse (NC-18) in Concord
  - The Wheeler-Meriam House (NC-19) in Concord

- No noise analysis locations in Bedford, Concord, Lexington, or Lincoln are forecasted to experience a DNL value greater than 60 dB under the forecasted 2030 or 2040 scenarios.
- The Deacon John Wheeler/Capt. Jonas Minot Farmhouse in Concord, and the Wheeler-Meriam House in Concord remain the only study sites with a projected DNL of 55 dB or greater in the forecasted 2030 scenario. These two sites and Simonds Tavern (NLX-1) in Lexington are the only three study sites with a projected DNL of 55 dB or greater in the forecasted 2040 scenarios.
- No portion of the MMNHP is located within the 60 DNL contour in 2022 or in the forecasted 2030 and 2040 scenarios.
- Though the 2022 and forecasted 55 dB DNL contours do extend into MMNHP, no identified noise analysis sites in MMNHP are projected to experience a DNL value of 55 dB or greater for the forecasted 2030 and 2040 scenarios.

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 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 order of increasing complexity.

Commonly used noise metrics include:

- ⇨ Decibel (dB);
- ⇨ A-weighted decibel, or sound level (dBA);
- ⇨ Sound Exposure Level (SEL);
- ⇨ Equivalent Sound Level (Leq);
- ⇨ Day-Night Average Sound Level (DNL);
- ⇨ Total Noise Exposure (EXP);
- ⇨ Time Above (TA).

The *2022 ESPR* reports noise levels at Hanscom Field in terms of these metrics, which include Sound Exposure Level (SEL) for typical individual events, a Hanscom Field screening metric, Total Noise Exposure (EXP), as well as Time Above (TA) contours and DNL contours for typical 24-hour exposure periods. All four of these metrics utilize A-weighted Sound Levels as their basis. The *2022 ESPR* uses SEL, EXP, and TA to supplement DNL contours and DNL values at noise analysis locations. **Appendix D.1** provides a discussion of the effects of aircraft noise on people.

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 (abbreviated dB) is used to represent the intensity of sound. This representation is called 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 that are easier to detect than others 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.

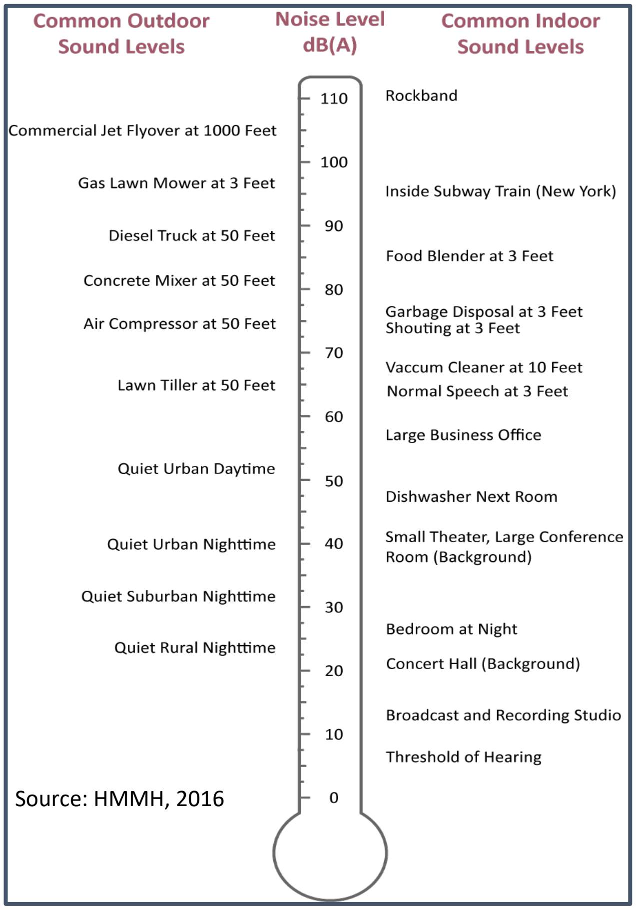
A-weighted Sound Levels for some common sounds are shown in **Figure 7-2**. In this document, all Sound Pressure Levels are A-weighted and, as is customary, are referred to simply as "Sound Levels," where the adjective "A-weighted" has been omitted. Sound Levels are designated in terms of A-weighted decibels, abbreviated dBA. With A-weighting, a noise source having a higher Sound Level than another is generally perceived as louder.

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 true for loud sounds as well as for quieter sounds.

7.2.3 Sound Exposure Level (SEL)

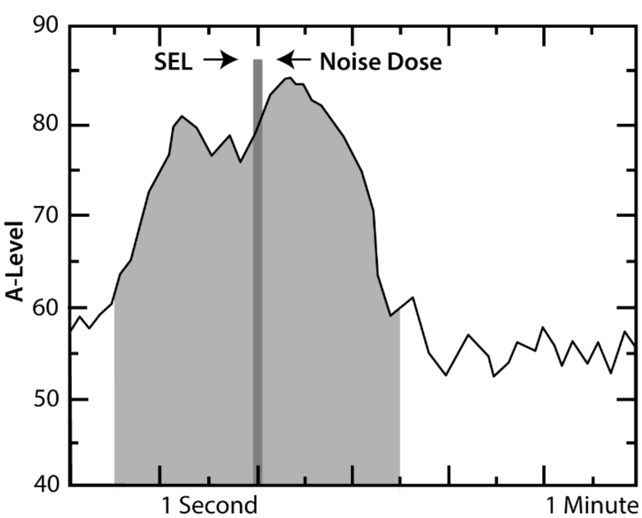
A further complexity in judging the impact of a sound is how long it lasts. Long duration noises are generally more annoying than short ones. The period over which a noise is heard is accounted for in noise measurements and analyses by integrating sound pressures over time. In the case of an individual 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 7-3**). 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 (SEL), measured in A-weighted decibels.

Figure 7-2. Common A-Weighted Sound Levels



Source: HMMH, 2016

Figure 7-3. Illustration of Sound Exposure Level



Source: HMMH, 2016

Because aircraft noise events last longer than one second, the time-integrated SEL has a higher number value than the maximum Sound Level of the event – usually about 7 to 10 dB higher. SELs are used in this study as a means of comparing the noise of several different common aircraft types operating at Hanscom Field. SELs are also correlated with sleep disturbance, an impact that is discussed in **Appendix D.1.3**.

The remaining noise metrics discussed in this section refer to cumulative 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.

7.2.4 The Day-Night Sound Level (DNL)

The most widely used cumulative noise metric is the day-night average sound level, abbreviated DNL, which is 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 for airport noise studies funded by the FAA. The FAA's recommended guidelines for noise/land use compatibility evaluation, found in 14 CFR Part 150, are based on a compilation of extensive scientific research and state that DNL values of 65 dB and lower are compatible with all land uses including residential land use.

In simple terms, DNL represents an average over a 24-hour period, with noise levels occurring at night (defined specifically as 10:00 p.m. to 7:00 a.m.) which are artificially increased by 10 dB. This weighting reflects the added intrusiveness of nighttime noise events as community activity subsides and ambient noise levels get quieter. The 10 dB weighting is mathematically equivalent to multiplying the number of night operations 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:[160]

- 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 principle, 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 DNL meeting these criteria, the lay public often criticizes the use of DNL as an inaccurate representation of 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 fact, DNL takes into account both the noise levels and duration 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.

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 SEL, Maximum Sound Level, or TA metrics to help describe the environments around Hanscom Field and Logan International Airport.

The Federal Interagency Committee on Noise (FICON), comprising of member agencies such as the FAA, Department of Defense (DoD), 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

[160] U.S. Environmental Protection Agency. September 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, EPA Report No. 550/9-74-004.

summary report stated, "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric".[161]

In 2015, the FAA began a multi-year effort to update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports.[162] This was the most comprehensive study using a single noise survey ever undertaken in the United States, polling communities surrounding 20 airports nationwide.

The survey provided a contemporary update to the Shultz Curve and the number of people “highly annoyed”. Compared to the Schultz Curve, the NES results show a substantially higher percentage of people highly annoyed over the entire range of aircraft noise levels at which the NES was conducted. For detailed information on the survey, please review the survey introduction and read the survey report[163]. Further information on FAA's aircraft noise research program, can also be found on a Federal Register notice published on January 13, 2021[164]. This notice invited comments on the FAA's aircraft noise research program, including the survey, through a 90-day total period which closed on April 14, 2021. The FAA is currently reviewing the over 4,000 comments received to this docket (FAA-2021-0037-001).

In late 2021, the FAA initiated a review of its noise policy as part of their ongoing commitment to address aircraft noise. The civil aviation noise policy sets forth how the FAA analyzes, explains, and publicly presents changes in noise exposure from aviation activity. This effort will build on the FAA’s work to advance the scientific understanding of noise impacts as well as the development of analytical tools and technologies. From May 2023 through September 2023, FAA opened a public comment period including four virtual public meetings on the FAA’s Noise Policy Review, soliciting comments to questions in 11 noise policy categories.

The FAA will not make any determinations based on the findings of these research programs for the FAA's noise policies, including any potential revised use of the DNL noise metric, until it has carefully considered public and other stakeholder input along with any additional research needed to improve the understanding of the effects of aircraft noise exposure on communities.

The FAA Reauthorization Act of 2018 under Section 188 and 173, required FAA to complete the evaluation of alternative metrics to the DNL standard within one year. After completing a review of noise metrics in 2020, the FAA concluded that while no single noise metric can cover all situations, DNL provides the most comprehensive way to consider the range of factors influencing exposure to

[161] Federal Interagency Committee on Noise. August 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*.

[162] Federal Aviation Administration. Press Release – FAA To Re-Evaluate Method for Measuring Effects of Aircraft Noise. https://www.faa.gov/news/press_releases/news_story.cfm?newsId=18774

[163] Federal Aviation Administration. Analysis of the Neighborhood Environmental Survey. https://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety-Detail/ArtMID/3682/ArticleID/2845/Analysis-of-NES

[164] Federal Aviation Administration. Overview of FAA Aircraft Noise Policy and Research Efforts: Request for Input on Research Activities to Inform Aircraft Noise Policy. https://www.federalregister.gov/documents/2021/01/13/2021-00564/overview-of-faa-aircraft-noise-policy-and-research-efforts-request-for-input-on-research-activities

aircraft noise. In addition, use of supplemental metrics is both encouraged and supported to further disclose and aid in the public understanding of community noise impacts.[165] [166]

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. The vast majority of airport noise studies are based on computer-generated DNL estimates, depicted in terms of equal-exposure noise contours.[167]

7.2.5 Total Noise Exposure (EXP)

The EXP metric was developed in 1982 as a screening tool for Massport[168] 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 generated by airport operations and expected resultant changes in DNL, without the need to prepare noise contours. The 2022 EXP calculations use the FAA aircraft noise database from AEDT, Version 2d. This is the same database used to compute EXP since 2017.

EXP is calculated by logarithmically summing the representative SELs for each departure of an airplane, assuming it flies over a single point on the ground. 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. 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. Separate computations are performed for civil and military operations. Similar calculations are performed for arrival operations.

Historically, departure noise was the largest contributor to the DNL contours and Massport has used civil departure EXP as the annual tracking metric for changes in noise exposure at Hanscom Field. Over time, aircraft manufacturers have made significant decreases in aircraft engine noise and thus departure noise levels. Arrival noise has not decreased at the same rate due to its lower proportion of engine noise and higher proportion of airframe noise from deployed flaps, slats, and landing gear. The increased relative importance of arrival noise means that changes in departure EXP may not align with changes in DNL contours in areas where arrivals provide a large share of the total aircraft noise.

[165] Federal Aviation Administration. Report to Congress on an evaluation of alternative noise metrics. https://www.faa.gov/about/plans_reports/congress/media/Day-Night_Average_Sound_Levels_COMPLETED_report_w_letters.pdf

[166] Federal Interagency Committee on Aviation Noise. February 2002. *The Use of Supplemental Noise Metrics in Aircraft Noise Analyses.*

[167] The contour lines connect computed grid points with the same DNL values, much as topographic maps have contour lines that connect points of equal elevation.

[168] EXP is not a commonly used noise metric at other airports; Massport uses a similar-concept metric called Cumulative Noise Index at Logan Airport, which is defined in the Logan Airport Noise Rules developed in 1986.

7.2.6 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, abbreviated TA55 or TA65 in this document, representing Time Above 55 dB or Time Above 65 dB, respectively, are usually reported for a 24-hour period.

Note that TA does not tell the loudness of the various noise events but focuses only on the duration of an event above a specified threshold. For this reason, TA alone as a noise metric doesn't provide a full understanding of the noise environment. In contrast to the SEL, DNL, and EXP metrics which all incorporate the loudness and the duration of noise events. Nevertheless, TA can be helpful in better understanding the noise environment because it expresses, in units of time, the exposure above a given level of aircraft noise over the course of a 24-hour period.

7.3 Noise Prediction Methodology

This section documents the methodology for preparing the DNL and TA contours for the *2022 ESPR* and discusses changes in the noise modeling software, AEDT. The AEDT is a complex computer program that calculates aircraft noise and emissions levels around an airport from user input data combined with an extensive internal database of aircraft noise and performance statistics. Noise-related AEDT outputs for this ESPR include DNL and TA in the form of contours and values at specific points. Chapter 8 addresses emissions-related AEDT calculations.

The FAA developed AEDT as the primary tool for analyzing and evaluating noise levels from aircraft operations. Its use is prescribed for all FAA-sponsored projects requiring environmental evaluation. While MEPA ESPR process does not require FAA approval, Massport performed the analyses in this *2022 ESPR* to FAA standards, as was done for all previous ESPRs.

AEDT 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. This study used the most recent version of AEDT at the time of analysis, Version 3e (AEDT 3e) and did not use any nonstandard data. The *2017 ESPR* calculations used AEDT version 2d. AEDT interprets all inputs and computes the noise exposure around an airport as a grid of values for many different metrics, including DNL. The grid information is the basis for the development of noise contours. An AEDT analysis requires both physical and operational inputs.

7.3.1 Physical Input

AEDT physical inputs include airport layout and flight tracks. They determine the paths on the runways and in the air where the aircraft travel in the noise model. Other physical inputs are terrain (ground elevation) data throughout the study area and average annual weather data.

> **The preparation of airport noise exposure contours requires compilation of several categories of information about the operation of an airport, including:**
>
> - 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 – Number of departures, arrivals, and pattern operations by type of aircraft and time of day during the year
> - Aircraft Noise and Performance – Specific noise and performance data is required for each aircraft

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 AEDT to calculate runway gradients, which influence modeled take-off roll distances. The runway end locations, elevations, displaced thresholds and the location and elevation of the airport reference point were verified with the FAA's Form 5010 airport data system[169]. The Form 5010 data does not contain a helipad nor does Hanscom Field have a designated helipad, though helicopters operate at Hanscom Field. The location of representative helipads for modeling was chosen through the examination of helicopter radar tracks, aerial photographs, and discussion with Hanscom Field personnel.

Flight Tracks

Flight tracks represent the ground projection of paths flown by aircraft to and from an airport. Prior to the *2012 ESPR*, the very broad range of operations and conditions actually occurring at Hanscom Field were represented using a set of average model tracks representing general paths. Starting with the *2012 ESPR*, individual flight tracks from Massport's Noise and Operations Monitoring System (NOMS) were used directly as noise model inputs. For this *2022 ESPR*, a similar process was followed. HMMH prepared the 2022, 2030, and 2040 contours using an AEDT pre-processor which converts aircraft flight track data into a format which can be directly input into AEDT. The AEDT is then run and provides DNL results based on the modeling of each individual flight track. It should be emphasized that AEDT is used for all noise calculations.

In total, 88,016 individual flight tracks were directly used for the preparation of the 2022 DNL and TA contours; these operations were scaled to the 124,867 total actual operations (121,096 daytime

[169] https://adip.faa.gov/agis/public/#/simpleAirportMap/BED

and 3,771 nighttime operations[170]). The difference between the number of flight tracks modeled and the total operations counts are expected; the difference occurs because the AEDT pre-processor filters the track data to make sure it is usable for modeling. Each flight track must meet several criteria, including having a runway assignment, a valid aircraft type designation and enough suitable flight track points to represent an entire flight operation within our study area. The most important of these factors at Hanscom Field is the presence of a valid aircraft type designation. Over 36,000 local and over 30,000 itinerant operations were conducted by piston aircraft at Hanscom Field in 2022. The approximately 40,000 valid radar tracks modeled in the *2022 ESPR* for these aircraft represent an excellent sample showing the distribution of flight paths off all runway ends. Also, one radar flight track for a local operation may represent multiple operations at the airport (for example, one track might consist of one departure, six touch-and-go's and one landing). Scaling factors are applied in the modeling process to account for the total noise energy from all reported flights.

Figure 7-4 and **Figure 7-5** present density plots for jet arrivals and departures in and out of Hanscom Field. Areas of red represent the highest density of flight paths. Areas of light blue show the lowest density. Figure 7-5 displays a small change in the location of jets that turn to the south when departing Runway 29 as they are now slightly west of Route 62 compared to these departures in 2017. **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 density of tracks for local activity (tracks that both depart and arrive at Hanscom Field) by light propeller aircraft. This includes tracks in the pattern and local flights that remain within 20 nautical miles of the airport. Figure 7-8 shows the higher density of pattern traffic remaining just north of MMNP reflecting Massport's continued outreach to pilots operating at Hanscom. **Appendix D.2.1** provides additional flight track graphics, showing samples of the individual flight paths for jet aircraft arrivals and departures, propeller aircraft arrivals and departures, and local tracks by propeller aircraft. While the majority of pattern traffic performs a tight circuit, as evidenced by Figure 7-8, some local operations use an elongated circuit path, as can be seen in **Figure D-9**.

[170] Massport tracks daytime operations as 7 a.m. to 11 p.m., when the air traffic control tower is open and nighttime operations as 11 p.m. – 7 a.m., when the tower is closed. Chapter 3 of this ESPR reports 122,216 daytime and 2,651. nighttime operations for 2022. FAA defines "nighttime" as the period from 10 p.m. to 7 a.m. for the purposes of calculating exposure to aircraft noise with the Day-Night Sound Level (DNL) metric. Thus, the 1,120 operations in 2022 occurring between 10 p.m. and 11 p.m. have been classified as nighttime here.

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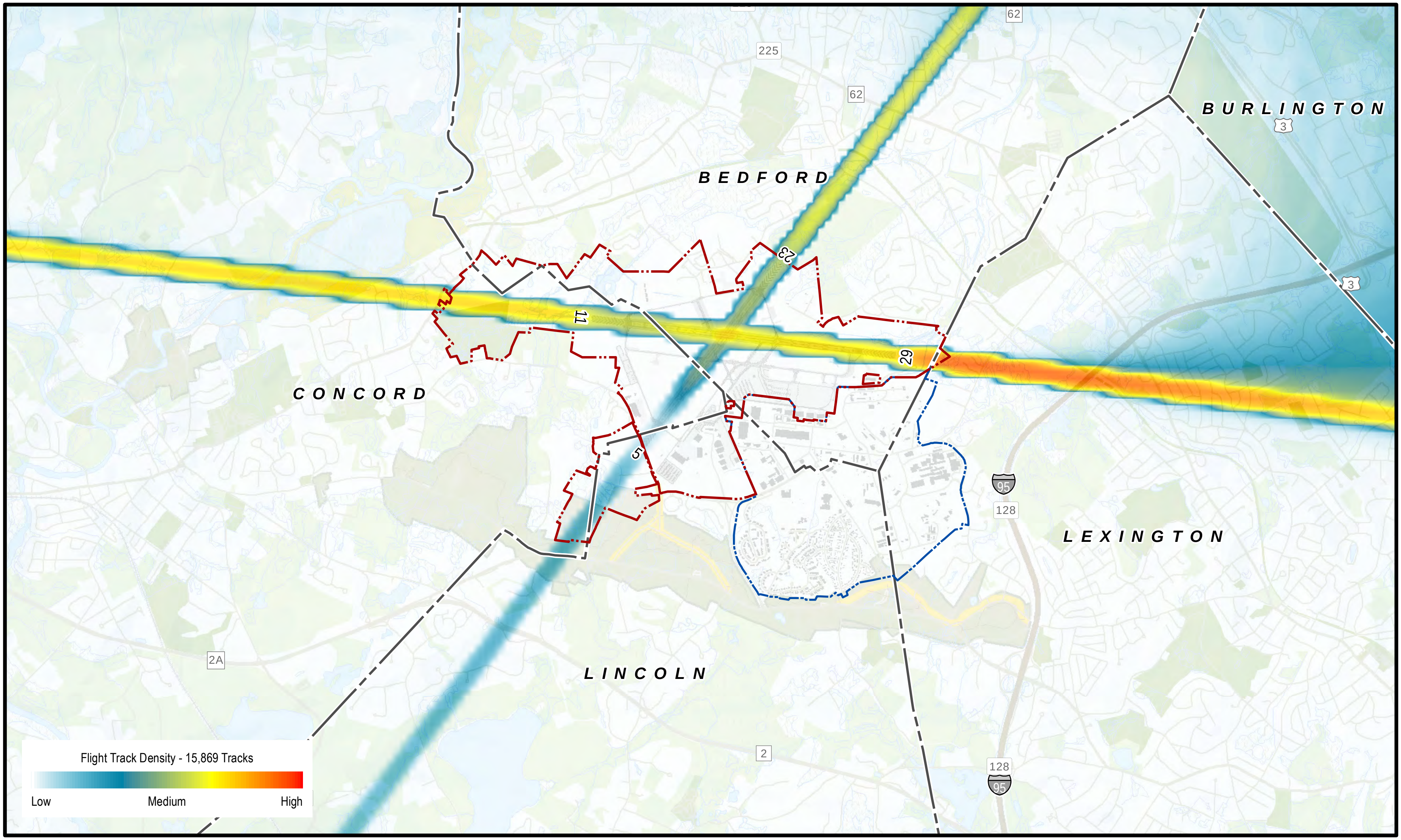

North

0 2,000 4,000 Feet

Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary
Historic Road
Interstate
Highway
Road
Trail
MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water / Wetland
Stream

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

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Jet Aircraft Flight Track Density Plot – Arrivals

Figure **7-4**

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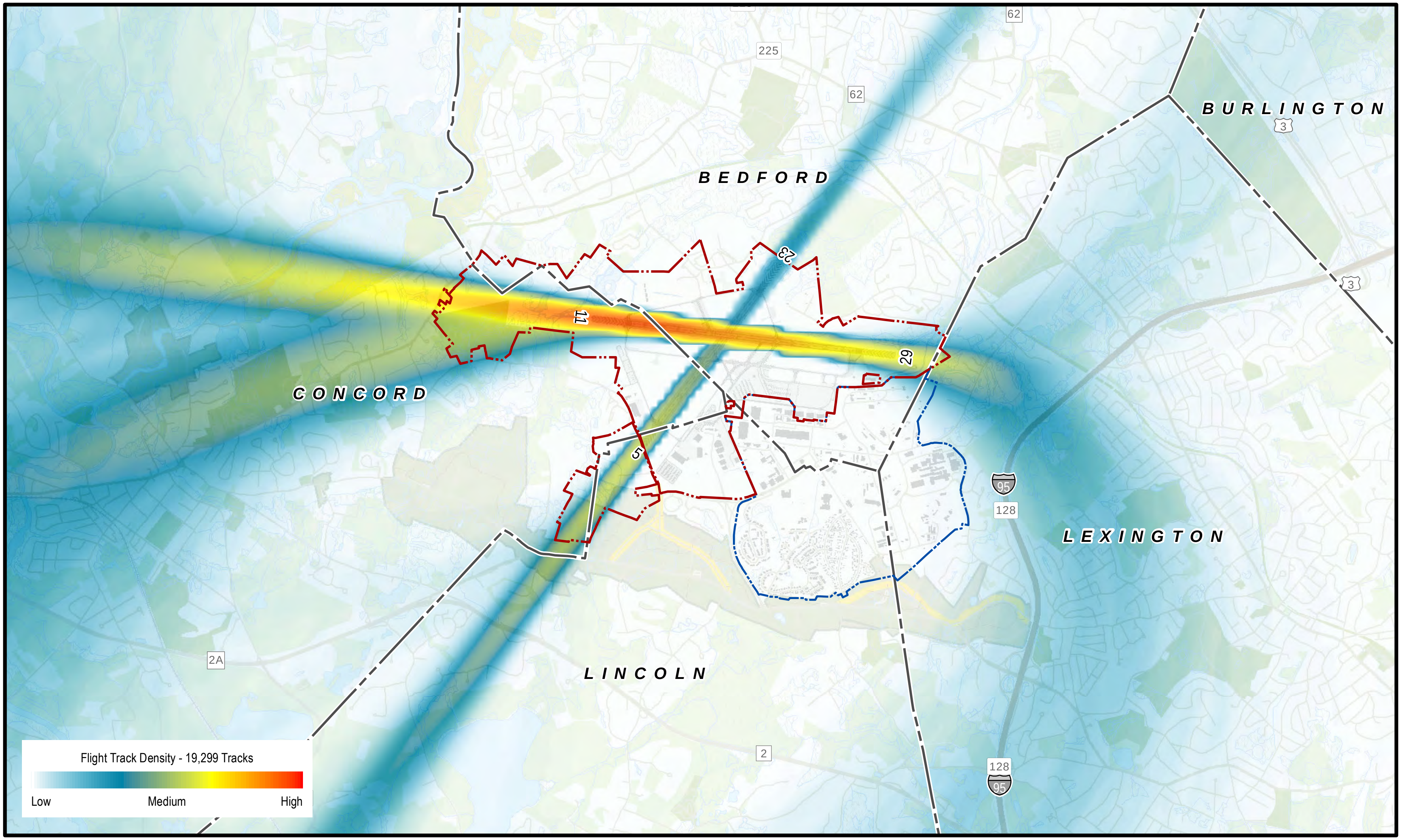

North

0 2,000 4,000 Feet

Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary
Historic Road
Interstate
Highway
Road
Trail
MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water / Wetland
Stream

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

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2022 Environmental Status & Planning Report

Jet Aircraft Flight Track Density Plot – Departures

Figure 7-5

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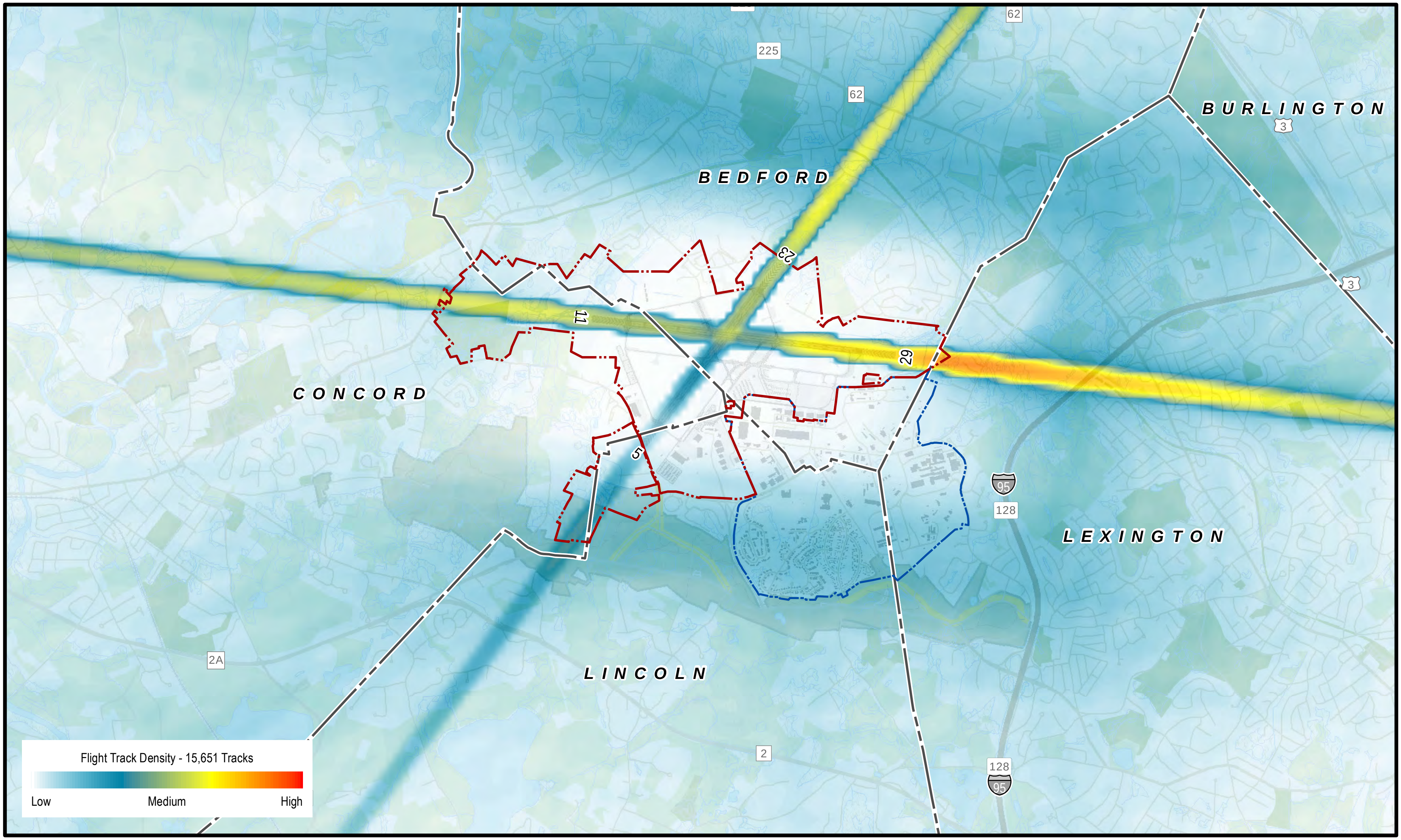

North

0 2,000 4,000 Feet

Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Historic Road
Interstate
Highway
Road
Trail

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

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

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2022 Environmental Status & Planning Report

Propeller Aircraft Flight Track Density Plot – Arrivals

Figure **7-6**

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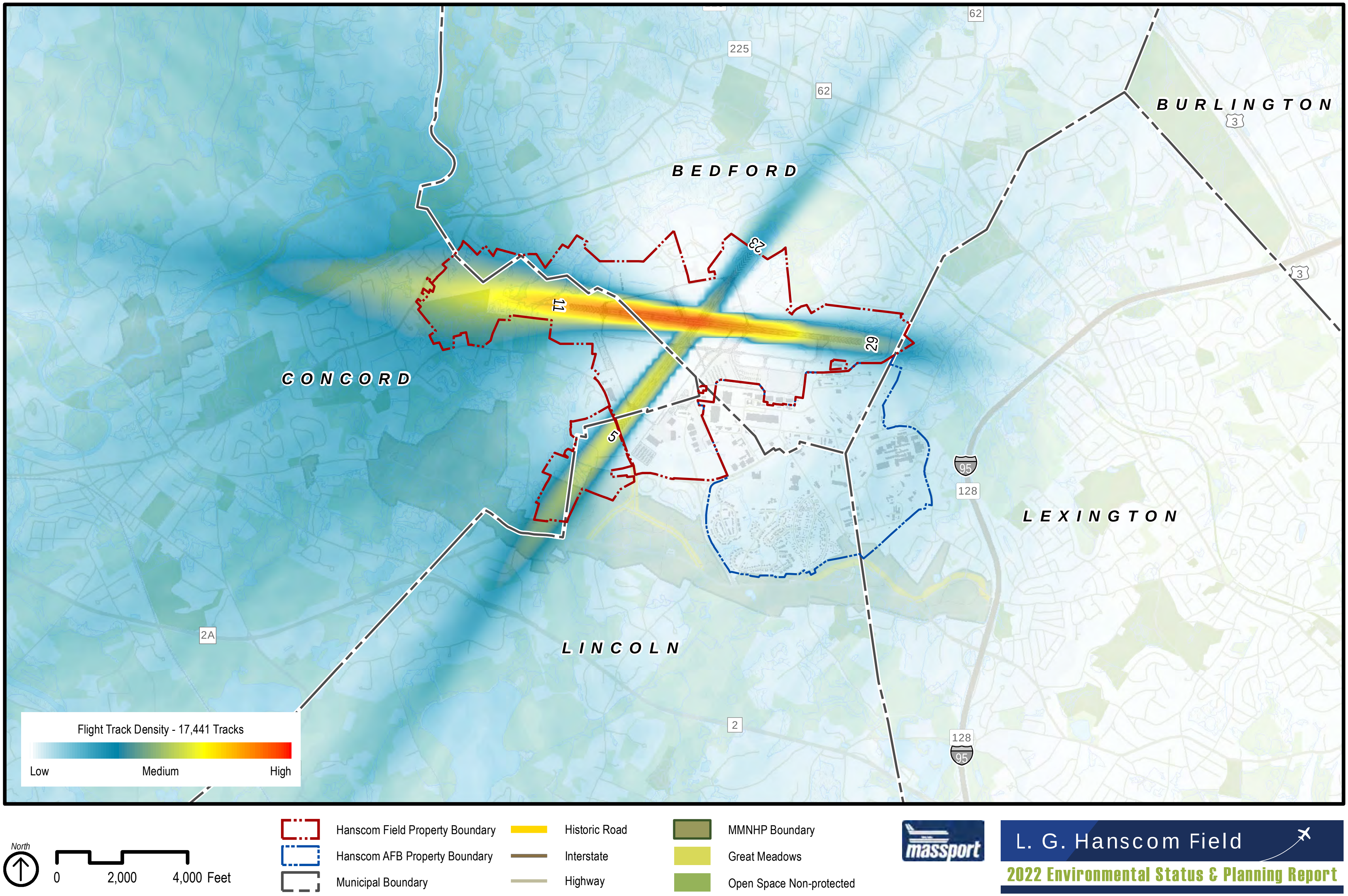

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Propeller Aircraft Flight Track Density Plot – Departures

Figure 7-7

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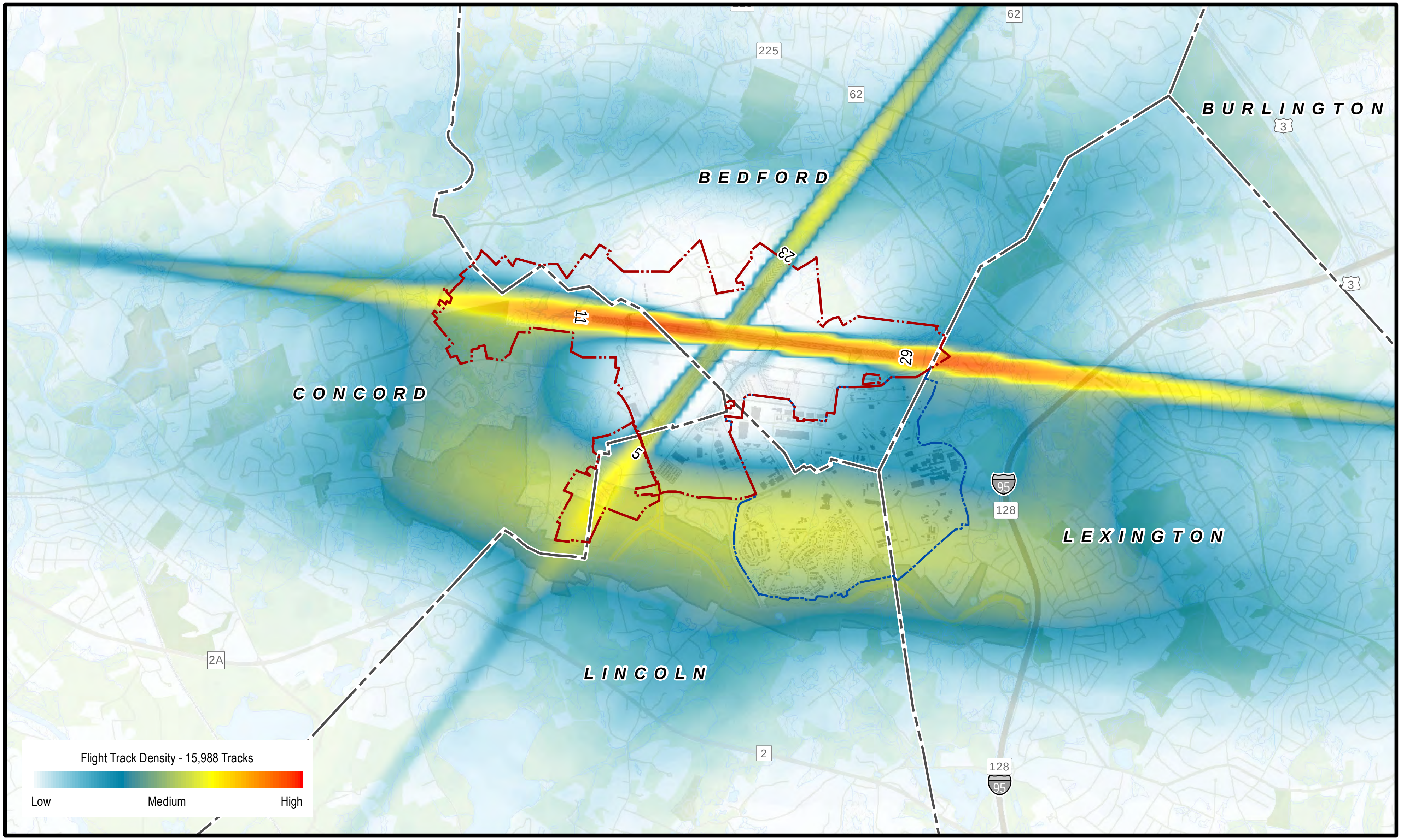

North

0 2,000 4,000 Feet

Hanscom Field Property Boundary
Hanscom AFB Property Boundary
Municipal Boundary
Historic Road
Interstate
Highway
Road
Trail
MMNHP Boundary
Great Meadows
Open Space Non-protected
Open Space Protected in Perpetuity
Open Water / Wetland
Stream

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

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2022 Environmental Status & Planning Report

Propeller Aircraft Flight Track Density Plot – Local Traffic

Figure **7-8**

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7.3.2 Operational Input

The remaining AEDT input falls under the category of operational input and includes runway use, aircraft operation counts, and aircraft noise and performance data. The operational inputs determine the number, type, flight time, and other characteristics of the aircraft traveling on the paths defined in the physical input.

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, all valid individual flight tracks from Massport's NOMS for the entire year of 2022 were used as noise model inputs. This large sample of over 80,000 flight tracks provides an excellent estimate of runway use for 2022 at Hanscom Field. 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.

Tables 7-2 through 7-6 show the calculated runway use by operation and aircraft group. Helicopters are not included in these tables. Table 7-6 is not differentiated by aircraft group as all local flight pattern activity was modeled using piston aircraft.

Many of the helicopters in the radar sample followed runway headings on arrival and dispersed quickly off the runway centerline after departure, similar to light propeller aircraft. However, with their maneuverability, helicopters often hover along taxiways and depart from or land on ramp areas as well as runway ends. No hard data on arrival and departure locations on the airfield are maintained by Massport or the FAA.

To simplify the modeling of helicopter operations, they were all assumed to originate or terminate at one of two locations, designated H1 and H2 for modeling purposes. Location H1 is north of the control tower along Taxiway E near Taxiway F. All helicopter operations in the radar data which originated from or terminated at the east ramp were modeled at H1. Location H2 is south of the control tower and east of Hanscom Drive. All helicopter operations originating from or terminating at the west ramp or FBO ramps were modeled at H2. Each radar flight track defined the remainder of the modeled flight path, the portion that determines the noise exposure away from the center of the airport.

Table 7-2. Daytime (7:00 a.m. to 10:00 p.m.) Departure Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	3.2%	0.8%	6.8%	3.3%
11	20.7%	25.2%	18.5%	13.0%
23	11.8%	1.1%	18.2%	16.8%
29	64.4%	72.8%	56.6%	66.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Source: Massport Noise and Operations Monitoring System flight tracks, 2022				

Table 7-3. Nighttime (10:00 p.m. to 7:00 a.m.) Departure Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	5.5%	0.0%	18.5%	7.7%
11	30.6%	34.5%	17.4%	6.7%
23	4.6%	0.0%	6.1%	8.1%
29	59.3%	65.5%	58.0%	77.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Source: Massport Noise and Operations Monitoring System flight tracks, 2022				

Table 7-4. Daytime (7:00 a.m. to 10:00 p.m.) Arrival Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	2.2%	0.0%	3.1%	2.9%
11	23.7%	27.5%	20.7%	15.9%
23	15.0%	0.0%	21.0%	18.9%
29	59.2%	72.5%	55.1%	62.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Source: Massport Noise and Operations Monitoring System flight tracks, 2022				

Table 7-5. Nighttime (10:00 p.m. to 7:00 a.m.) Arrival Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	0.5%	0.0%	3.6%	2.9%
11	43.1%	42.1%	26.2%	24.2%
23	6.2%	0.0%	19.9%	15.3%
29	50.1%	57.9%	50.3%	57.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Source: Massport Noise and Operations Monitoring System flight tracks, 2022				

Table 7-6. Touch-and-Go Runway Utilization

Runway	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime[1] (10:00 p.m. to 11:00 pm)
05	3.1%	0.0%
11	16.5%	31.3%
23	15.6%	13.9%
29	64.8%	54.8%
Total[2]	**100.0%**	**100.0%**
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, 2022		

Operations

Massport's database of operations at Hanscom Field described in Section 7.5.4 provides the information necessary for the calculation of the average annual daily operations by aircraft type for 2022. **Table 7-7** presents a summary of the 2022 operations modeled for the noise analysis. **Table 7-8** compares the total operations by group since 2005 and shows that jet operations have increased (to slightly above 2005 levels) while piston aircraft and overall operations have decreased. (Piston engine aircraft show a decrease of almost 50 percent compared to 2005 levels.) **Appendix D.2.2** provides a refined breakdown of the activity by individual aircraft types with their corresponding noise model representation.

Table 7-7. Year 2022 Average Annual Daily Operations Summary by Group

Group	Departures		Arrivals		Total
	Daytime	Nighttime	Daytime	Nighttime	
Jets	50.1	2.5	48.8	3.9	**105.3**
Turboprops	10.0	0.4	9.9	0.5	**20.7**
Piston	91.1	0.3	90.8	0.6	**182.9**
Military	2.3	0.0	2.3	0.0	**4.7**
Helicopters	13.4	0.9	13.0	1.3	**28.6**
All Groups	**166.9**	**4.1**	**164.8**	**6.2**	**342.1**

Source: Massport EXP System, HMMH 2023
Daytime (7:00 a.m. to 10:00 p.m.) and Nighttime (10:00 p.m. to 7:00 a.m.) defined for DNL calculation

Table 7-8.Comparison of 2022 Average Annual Daily Operations by Group to Previous ESPR Years

Group	2005	2012	2017	2022	Change from 2017
Jets	91.6	67.1	85.8	105.3	+20.5
Turboprops	19.4	9.1	21.8	20.7	-1.1
Piston	336.8	356.1	225.1	182.9	-42.2
Military	1.7	0.6	2.1	4.7	+2.6
Helicopters	20.6	20.4	23.2	28.6	+5.4
All Groups	**470.1**	**453.2**	**358.0**	**342.1**	**-15.9**

Aircraft Noise and Performance Data

Specific noise and performance data are necessary to model each aircraft type. The AEDT database contains noise data 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 in the AEDT database include thrust, speed, and altitude profiles for takeoff and landing operations. The AEDT database contains standard noise and performance data for over 300 different fixed-wing aircraft and rotorcraft types, most of which are civilian aircraft. Over 5,000 airframe and engine combinations are specifically defined in the AEDT database to use these noise and performance data.

The program automatically accesses the applicable noise and performance data for departure and approach operations by the specified aircraft. Due to the large number of airframe and engine combinations in the AEDT standard database, there was no need to include additional non-standard aircraft data for this study.

7.4 Year 2022 Noise Levels

This section describes current (year 2022) noise levels at Hanscom Field. **Figure 7-9** depicts noise exposure levels in terms of DNL contours resulting from 2022 operations at Hanscom Field. 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 *2017 ESPR* DNL contours are included in **Figure 7-10** for comparison. DNL 65 dB is the focus of much of the noise analysis, as it is the threshold for noise incompatibility with residential land use,[171,172] for both FAA and the U.S. Department of Housing and Urban Development.[173]

Table 7-9 presents the cumulative acreage within each DNL contour interval for 2005, 2012, 2017, and 2022 and indicates a general decrease in the size of the 2022 contours as compared with 2005, 2012, and 2017 contours. Housing counts only indicate the change in noise overpopulated areas, whereas the acreage is provided to show the total area within the DNL contour levels and how the size of the contour increases or decreases over time. As shown in Table 7-9, the total area within each contour level has decreased since 2017.

Table 7-9. Comparison of the Area within the 2022 DNL Contours to Previous ESPR Years

DNL Contours (dB)	Cumulative Area (Acres)[1]				Percent Change from 2017
	2005	2012	2017	2022	
70	311	181	216	177	-18%
65	635	391[2]	423[2]	363[2]	-14%
60	1,437	856	909	837	-8%
55	3,291	2,045	2,227	2,115	-5%

Notes:
1. Area within contour includes all greater DNL values.
2. All areas contained within Hanscom Field boundaries.
Source: HMMH 2023.

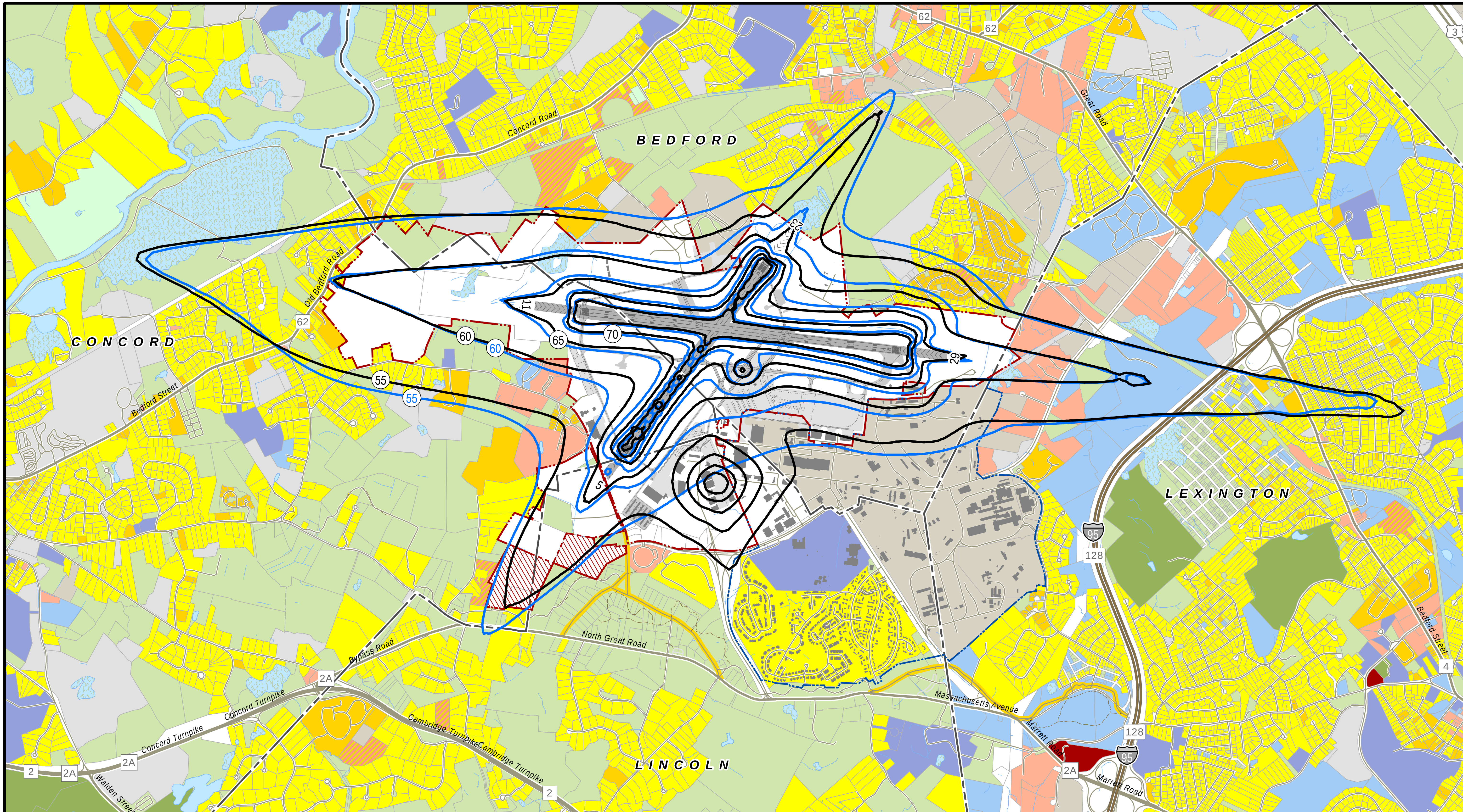
7.4.1 Comparison of Year 2022 Contours with 2017 Contours

The differences between the year 2022 contours and the year 2017 contours are influenced by a number of factors, as discussed below:

- The number of total operations decreased by 4 percent in 2022 relative to 2017.
- Daily jet operations increased by 23 percent in 2022 relative to 2017.
- The number of average daily nighttime operations (between 10 p.m. and 7 a.m.) increased from 7.8 average daily nighttime operations in 2017 to 10.3 average daily nighttime operations in 2022.

[171] 14 Code of Federal Regulations Part 150, Appendix A to Part 150 Noise Exposure Maps, Sec. A150.101(d).
[172] 24 Code of Federal Regulations Part 51, Subpart B Noise Abatement and Control, Sec. 51.103(c).
[173] Subpart B (Noise Abatement and Control) of 24 CFR Part 51. Noise Abatement and Control - HUD Exchange

- The size and shape of the year 2017 contours shows the effect of the August 2017 temporary closure of Runway 11/29 with larger contour lobes associated with Runway 5/23 operations.
- The 2022 DNL contours reflect typical historical runway use patterns.
- Reduction of older louder aircraft such as MIT's Boeing 707 which retired in 2020 resulted in reductions in sideline noise along Runway 11/29 even with increased use of the runway since 2017.
- The shape of the year 2022 contours shows the effect of helicopter operations departing from and landing on the spot modeled as "helipad" H2. Boston Medflight helicopters began using that location in 2018.



North

0 2,000 4,000 Feet

2022 DNL Noise Contour
2017 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
Stream
Single Family Residential
Multi-Family Residential
Mobile Home
Transient Lodging
Mixed Use
Public Use 1 (Non-Compatible)
Public Use 2 (Compatible)
Agriculture
Open Land
Open Space / Recreation
Commercial Use
Manufacturing and Production
Vacant / Undefined
Transportation / Utility
Open Water
Wetland / Marsh
Wooded Swamp
Buildings

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

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2022 Environmental Status & Planning Report

2017 and 2022 DNL Contours Comparison

Figure **7-9**

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7.4.2 Measured vs. Modeled Noise Levels

Hanscom Field has a system of six permanent noise monitors near Hanscom Field (see **Figure 7-10**). **Table 7-10** presents the minimum, the mean, and the maximum total DNL values (including all aircraft and ambient noise) as measured at each of these locations in 2022. Massport's NOMS calculates aircraft-only DNL by summing the energy of all noise events that are identified with specific aircraft operations; these values are reported in Table 7-10 and are compared to the AEDT-calculated DNL for those locations.

Table 7-10. Measured and Modeled DNL Values (in dB) at Permanent Monitoring Locations

Site Number	Location	Measured Noise (Aircraft and Ambient Sources)[1]			Measured Aircraft-only DNL[2]	AEDT Modeled 2022 DNL (Aircraft Noise Only)	Measured Aircraft-only DNL Minus AEDT Modeled
		Minimum	Mean	Maximum			
31	Concord Localizer	52.5	62.9	70.4	61.5	60.6	0.9
32	Bedford Localizer	54.4	61.7	71.9	58.8	61.2	-2.4
33	Lincoln Brooks Road	47.1	55.6	61.7	54.8	53.2	1.6
34	Bedford De Angelo Road	57.7	61.3	69.1	52.4	52.3	0.1
35	Lexington Preston Road	51.2	59.1	69.8	52.1	55.6	-3.5
36	Concord Wastewater	54.7	60.6	71.5	47.2	50.2	-3

1. DNL values for each monitor are reported by the NOMS for each day of the year. These values include all sound occurring at the site, without regard to noise source.
2. Massport's system upgrades now allow calculation of aircraft-only DNL by summing the energy of all noise events identified with specific aircraft operations.
Source: Massport Noise and Operations Monitoring System, HMMH 2023

The measured DNL values agree with the model-calculated values within 3.5 dB. The AEDT calculation is higher than the measured value where Table 7-10 shows a negative value.

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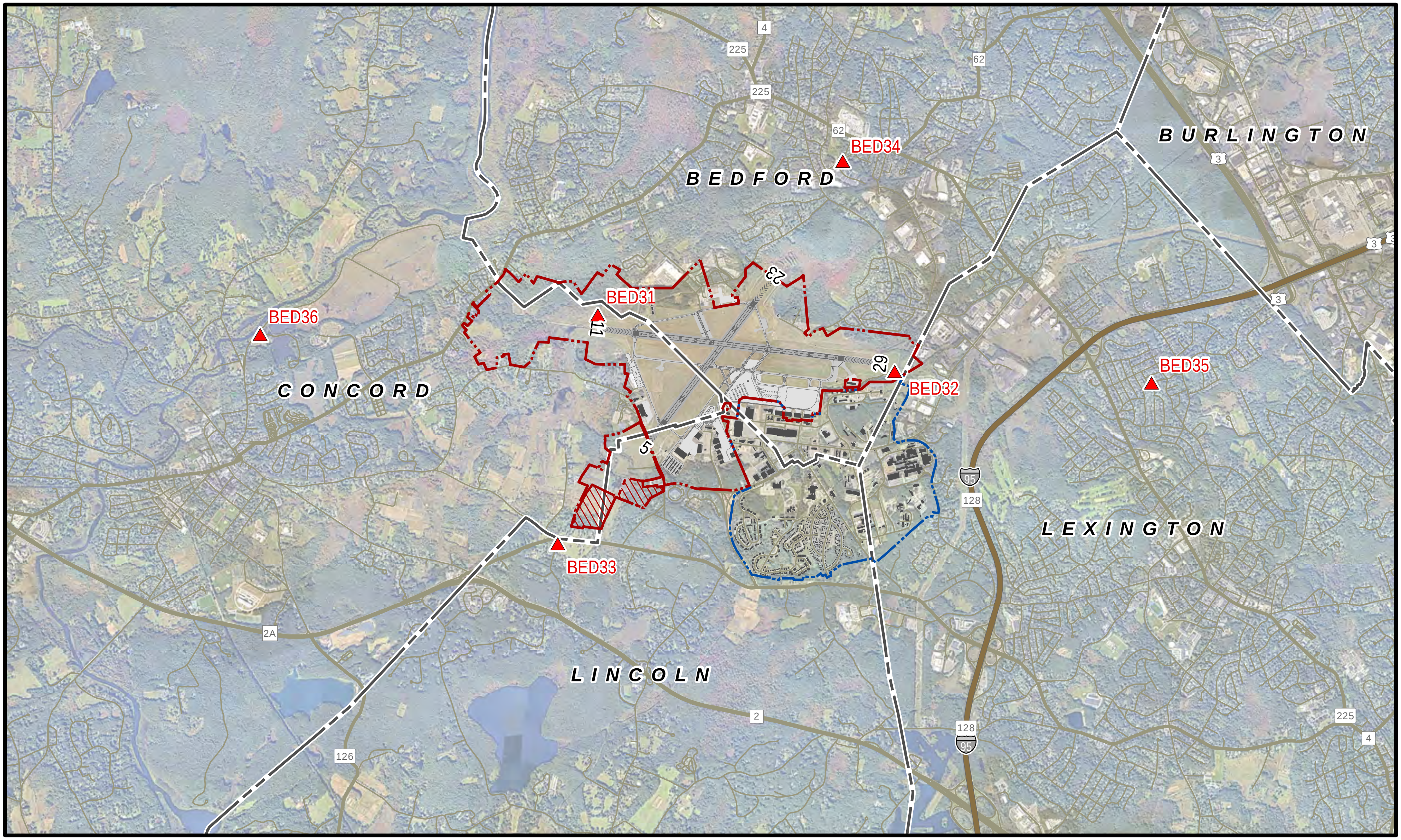

North

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

Interstate

Highway

Road

massport

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2022 Environmental Status & Planning Report

Noise Monitoring Locations

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NearMap USA (Aerial) October 2, 2023

Figure 7-10

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7.4.3 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.

Land Use Compatibility Standards

DNL is the standard noise metric for evaluating community noise exposure and decision-making regarding the compatibility of land uses by most federal agencies in the United States. 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 14 CFR Part 150. The Part 150 regulation 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 dB and lower are compatible with all land uses including residential land use. However, to be consistent with the 2017 ESPR and the MEPA Secretary's Certificate, this ESPR also reports DNL 55 and DNL 60 dB results.

Pursuant to the Noise Control Act of 1972, the EPA published 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.

In their application to airport noise in particular, DNL projections have two principal 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.

The 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 does not 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.1** discusses additional implications of various DNL levels and their effects on people.

Land Use Analysis Methodology

The number of people exposed to DNL 55 and greater for 2022 was estimated from updated land use data and 2020 census data obtained from the U.S. Census Bureau. A detailed discussion of this methodology is provided in **Appendix D.2.3**. **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 2022 is compared to past analyses for 2012 and 2017. These population numbers do not include people staying at the Hanscom AFB FamCamp since the campground is considered a transient population.

The number of people within the DNL 60 dB decreases to 44 people compared to 2017 due to the reduction of sideline noise levels from the runway extending into Bedford. The number of people within the DNL 55 dB contour decreased in Bedford and Lincoln but increased in Lexington and Concord compared to 2017. The increase in Lexington in 2022 is primarily due to the extension of the contour to the east over residential areas due to arrivals to Runway 29.

Table 7-11. Estimated Population within Hanscom Field 2022 DNL Contours

Town	Total Population between DNL Contours:			
	65 dB or greater	60 to 65 dB	55 to 60 dB	Total 55 dB or Greater
2012				
Bedford	0	87	369	456
Concord	0	0	542	542
Lexington	0	0	43	43
Lincoln	0	0	0	0
Total	0	87	954	1,041
2017				
Bedford	0	78	491	569
Concord	0	3	446	449
Lexington	0	0	245	245
Lincoln	0	0	8	8
Total	0	81	1,190	1,271
2022				
Bedford	0	42	347	389
Concord	0	2	517	519
Lexington	0	0	416	416
Lincoln	0	0	0	0
Total	0	44	1,280	1,324
Source: HMMH 2023				

No population is exposed to DNL greater than 65 dB for the 2012, 2017, or 2022 study years. The total population in Bedford, Concord, Lexington, and Lincoln exposed to DNL values of 55 dB or greater increased from 1,041 in 2012, to 1,271 in 2017, and to 1,324 in 2022.

7.4.4 Time Above

A TA threshold level of 65 dBA is considered useful when considering speech interference. People can generally carry on acceptable outdoor conversations in a normal voice at typical communication distances of 3 to 4 feet as long as the background noise (including aircraft noise) remains less than 65 dBA. 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 6 feet.

This *2022 ESPR*, like the *2012* and *2017 ESPR*s, provides information on TA using 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 10 to 15 feet, and indoor conversations (with windows open) would be acceptable using a normal voice effort at distances of 15 feet or more (see **Appendix D.1.2**).

Massport reports the TA analysis 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. **Figure 7-11** presents TA65 dBA contours and **Figure 7-12** presents TA55 dBA contours. The cumulative areas within the TA contours for 2012, 2017, and 2022 are provided by **Table 7-12**. The acreage data is classified as Massport property, Hanscom AFB, and “off property” (meaning outside Hanscom Field and Hanscom AFB). The sizes of the TA55 dBA and TA65 dBA contours generally decreased in 2022 relative to 2017 for the 30-minute, 60-minute, and 90-minute contours. Slower aircraft, such as single-engine piston propeller aircraft, have higher contributions to TA than a faster aircraft with a similar sound level due to the length of time the aircraft would be audible. Single-engine aircraft activity (both local and itinerant operations) decreased between 2017 and 2022.

Table 7-12. 2022 Area within Time Above 65 and 55 dBA Contours

Time Above Contour Level	Cumulative Area (Acres)											
	2012	2012 Massport	2012 AFB	2012 Off Airport	2017	2017 Massport	2017 AFB	2017 Off Airport	2022	2022 Massport	2022 AFB	2022 Off Airport
TA65 dBA Contour												
90 mins	**289**	275	0	14	**100**	100	0	0	**69**	64	5	0
60 mins	**526**	489	12	25	**405**	394	0	11	**220**	212	6	2
30 mins	**1,238**	933	89	216	**996**	833	43	120	**751**	673	18	59
TA55 dBA Contour												
90 mins	**2,362**	1247	336	779	**1,729**	1,078	166	485	**1,026**	785	81	159
60 mins	**4,006**	1301	640	2,065	**3,566**	1,301	398	1,868	**2,057**	1,184	197	676
30 mins	**7,542**	1,302	782	5,458	**9,209**	1,302	762	7,146	**5,945**	1,302	649	3,994
Source: HMMH 2023												

Table 7-13 presents the population between the contour levels for the TA65 and 55 dBA metrics for 2012, 2017, and 2022. **Appendix D.2.3** describes the methodology used to compute these population counts based on the contour geometry, U.S. Census data, and land use polygons.

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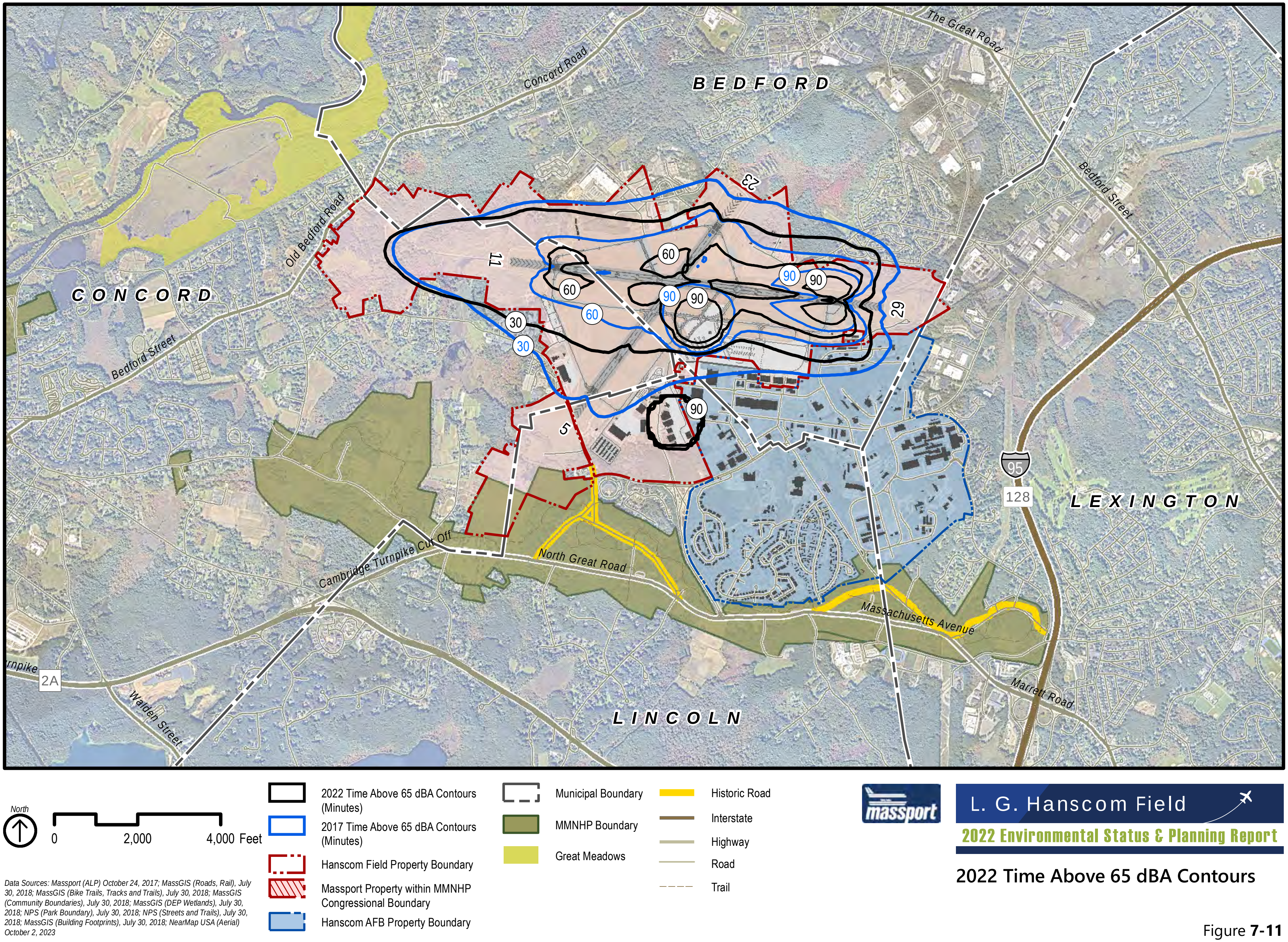

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

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2022 Time Above 65 dBA Contours

Figure **7-11**

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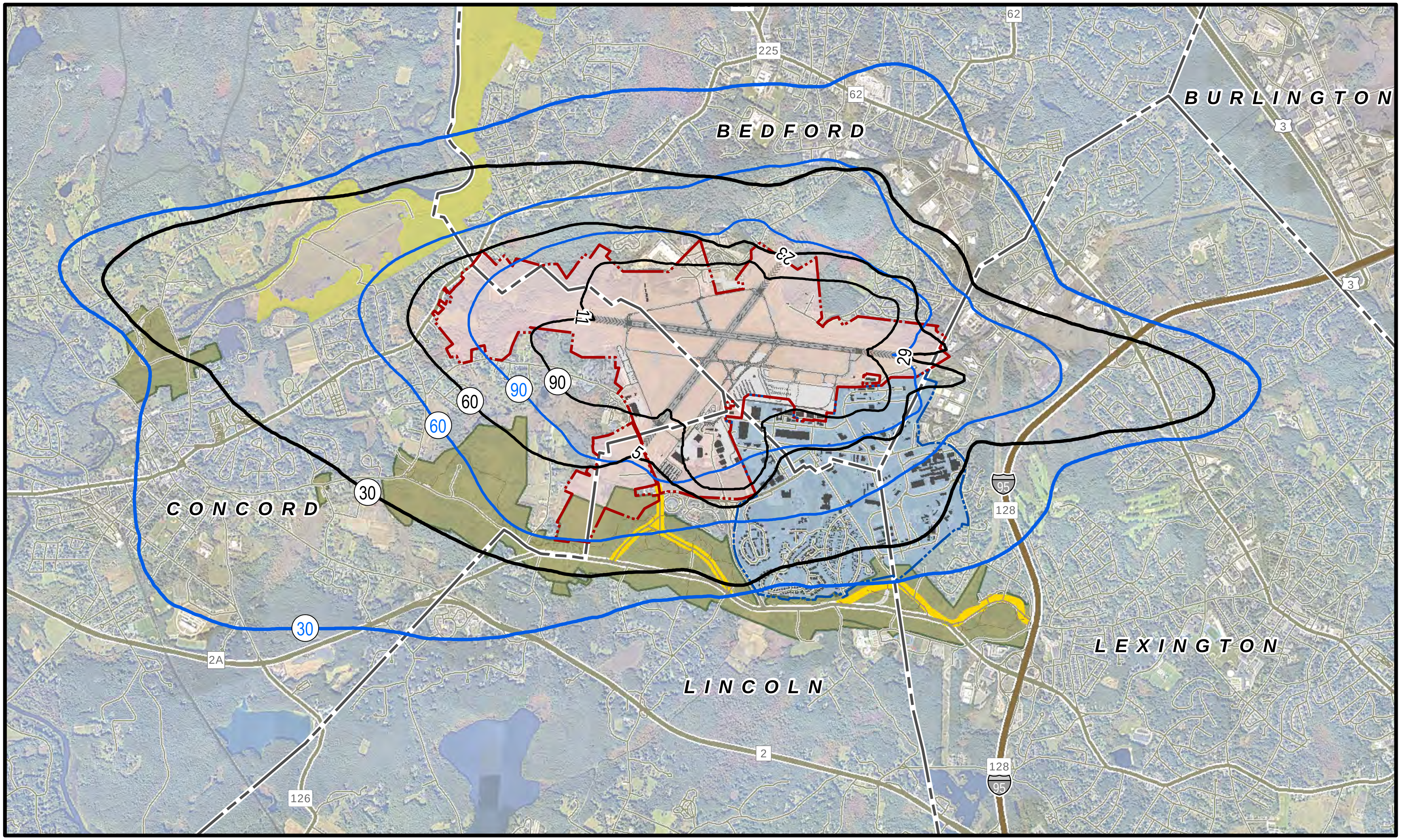

North

0 2,000 4,000 Feet

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

- 2022 Time Above 55 dBA Contours (Minutes)
- 2017 Time Above 55 dBA Contours (Minutes)
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- MMNHP Boundary
- Great Meadows
- Historic Road
- Interstate
- Highway
- Road
- Trail

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2022 Environmental Status & Planning Report

2022 Time Above 55 dBA Contours

Figure 7-12

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Table 7-13. 2022 Population within Time Above 65 and 55 dBA Contours

Time Above Contour Level	Population between Contours		
	2012	2017	2022
TA65 dBA Contour			
90 minutes or greater	0	0	0
60 to 90 minutes	52	6	0
30 to 60 minutes	349	175	83
Total 30 Minutes or Greater	401	181	83
TA55 dBA Contour			
90 minutes or greater	1,139	696	209
60 to 90 minutes	2,610	2,001	793
30 to 60 minutes	6,234	9,391	5,771
Total 30 Minutes or Greater	9,983	12,088	6,773
Source: HMMH 2023			

7.4.5 Total Noise Exposure (EXP)

Massport calculates EXP annually and publishes results in the Hanscom Field Noise Report. **Table 7-14** presents the EXP analysis results for 2022. **Appendix D.3.2** presents detailed results of the 2022 EXP calculation. For 2022, the total EXP for civil departures was 107.6 dB using SEL data from AEDT Version 2d. Historically, civilian departure EXP has been calculated and tracked as it more closely reflected changes in DNL than did changes in arrival EXP or changes in total EXP. Massport began tracking arrival EXP in 1988 and this ESPR presents all three values for 2022. Advances in noise reduction technology have reduced departure noise levels over time to the point where arrival EXP values exceed departures in most categories, as shown in Table 7-14.

Table 7-14. Year 2022 Total Noise Exposure (EXP) (in dB)

Groups	Departure Only	Arrival Only	Total
All civil aircraft except single piston	106.9	110.4	112.0
All civil aircraft	107.6	111.0	112.6
All military aircraft	96.2	93.2	98.0
All civil and military aircraft except single piston	107.3	110.5	112.2
All civil and military aircraft	107.9	111.1	112.8
Source: Massport EXP System 2023			

Table 7-15 presents a historic comparison of civilian departure EXP values from 1987 to 2022. Massport upgraded the EXP process several times during those three decades, using SEL values derived from then-current versions of the FAA's noise models (INM and AEDT) as discussed in Section 7.2.5. The EXP values vary slightly from one year to the next, but the 36-year history displays a clear downward trend.

Table 7-15. Historic Trends in EXP

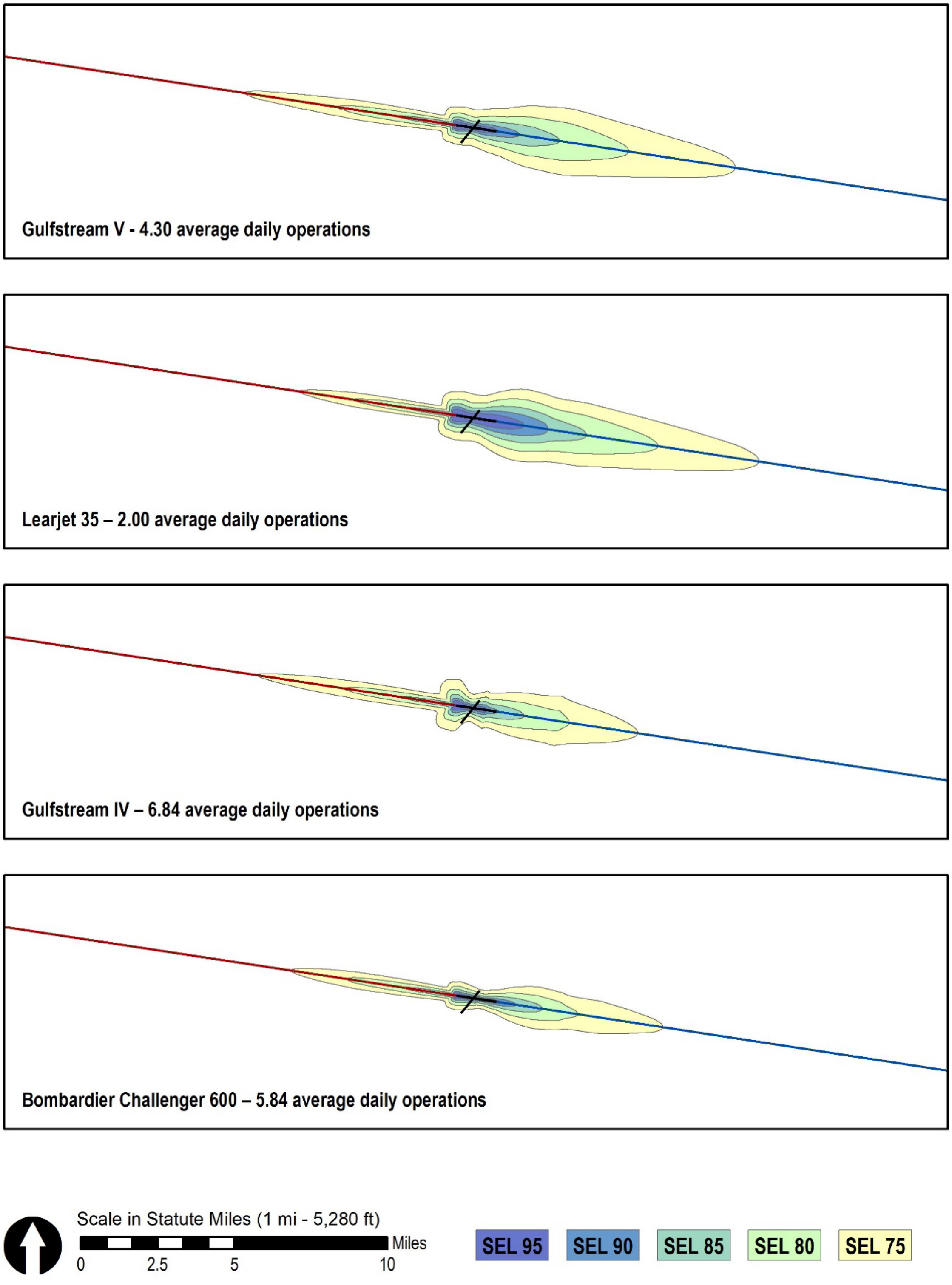
Noise Model	Year	Civilian Aircraft Departure EXP
INM Version 3.9	1987	112.0
	1988	112.4
	1989	111.6
	1990	110.8
	1991	110.7
	1992	111.4
	1993	110.6
	1994	111.4
	1995	111.6
INM Version 5.1	1996	112.0
	1997	112.3
	1998	113.1
	1999	113.0
INM Version 6.0c	2000	112.3
	2001	111.6
	2002	112.4
	2003	111.9
	2004	111.9
INM Version 6.1	2005	111.4
	2006	111.0
	2007	111.3
	2008	110.2
	2009	109.2
	2010	109.2
	2011	109.1
	2012	107.4
	2013	108.5
	2014	108.6
	2015	108.2
INM Version 7.0c	2016	106.8
AEDT Version 2d	2017	106.7
	2018	107.0
	2019	107.3
	2020	105.8
	2021	107.2
	2022	107.6
Source: Massport and HMMH, 2023		

7.4.6 SEL Contours and Distribution of Noise Events

An SEL contour can be thought of as a “noise footprint” for a particular aircraft type. **Figures 7-13 and 7-14** depict SEL contours for comparison of some common aircraft types at Hanscom Field. Figure 7-13 shows SEL contours for departure and arrival of four typical general aviation jets: the Gulfstream V, the Learjet 35, the Gulfstream IV, and the Bombardier Challenger 600.

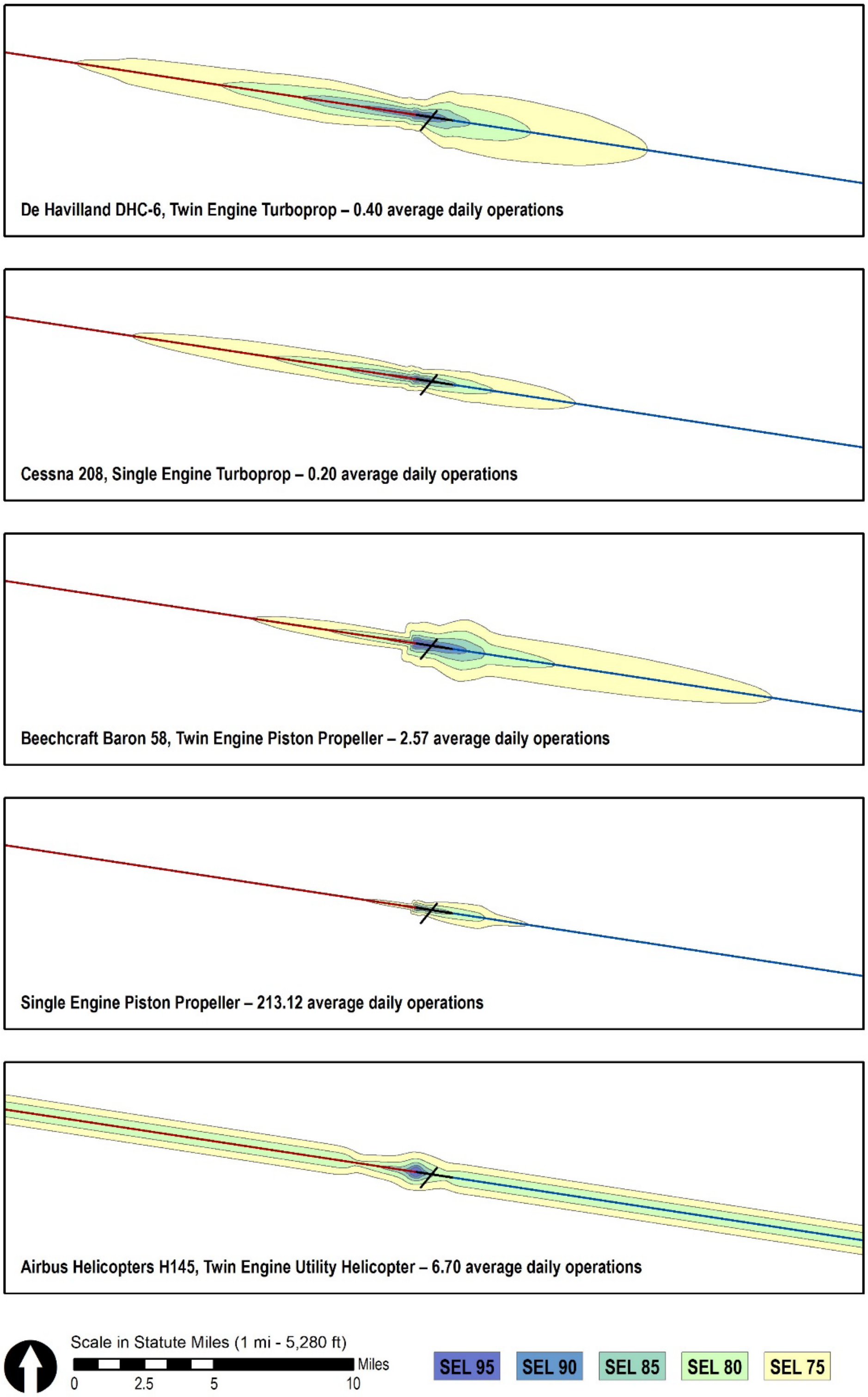
Figure 7-14 shows the single-event noise contours for common propeller aircraft and helicopters at Hanscom Field: a de Havilland DHC-6 twin turboprop, a Cessna 208 single-engine turboprop, a Beechcraft Baron 58 twin-engine piston propeller, a single-engine piston propeller, and an Airbus H145 (Eurocopter EC145) twin-engine utility helicopter. The image for the helicopter SEL extends off both sides of the frame because the aircraft reaches level flight altitude relatively close to the airport. In contrast, the fixed-wing aircraft SEL contours “end” where their altitude is high enough to result in SEL on the ground below 75 dB (the outermost level).

Figure 7-13. SEL Contours for Common General Aviation Jet Aircraft



Source: HMMH 2023

Figure 7-14. SEL Contours for Common Propeller Aircraft

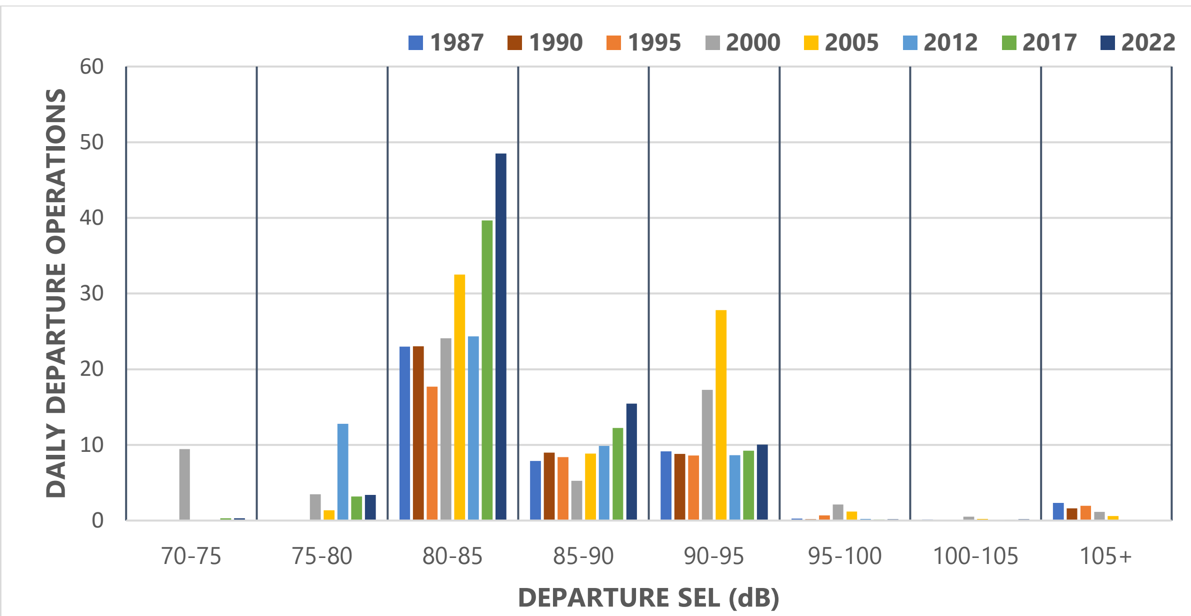


Source: HMMH 2023

In order to understand the distribution of noise levels created by aircraft at Hanscom Field, the AEDT-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 2022.

Figure 7-15 presents a plot of the distribution of the SEL values from the EXP calculations for historical data: 1987, 1990, 1995, 2000, 2005, 2012, 2017, and 2022. Data were derived from Massport's Annual Noise Report for 1987, the 1995 GEIR for 1995, and the ESPRs for 2000, 2005, 2012, and 2017. Single-engine piston propeller aircraft (which fall in the 75-80 SEL range) 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 (93 per day in 2022) 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) no longer occur, while operations in the 80-85 dB range occur most often. Daily departure operations with SEL values in the 80-85, 85-90 and 90-95 ranges are all higher for 2022 than for 2017 due to the increase in civilian jet operations. However, the primary increase is in the 80-85 SEL range rather than in the higher noise ranges.

Figure 7-15. Historical Distribution of Daily Departure SELs (Excluding Single Engine Prop)



Source: Massport, HMMH 2023

7.5 Analysis of Future Scenarios

All aspects of AEDT input required for the 2022 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 scenarios. The operations data, which consist of the types of aircraft and number of operations, were changed to reflect forecast future activity levels.

The *2022 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. The 2030 and 2040 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 7-16** 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 7-16. Forecast Average Daily Operations

Group	Departures		Arrivals		Total
	Daytime	Nighttime	Daytime	Nighttime	
2030					
Jets	55.8	2.7	54.4	4.2	117.2
Turbo Prop	12.0	0.3	11.9	0.4	24.7
Piston	98.6	0.6	98.2	1.0	198.5
Military	2.3	0.0	2.3	0.0	4.7
Helicopters	14.5	0.8	14.1	1.1	30.5
All Groups	183.3	4.5	181.0	6.8	375.5
2040					
Jets	62.1	3.1	60.4	4.7	130.3
Turbo Prop	13.2	1.1	13.8	0.4	28.5
Piston	103.2	0.7	102.8	1.1	207.8
Military	2.3	0.0	2.3	0.0	4.7
Helicopters	15.1	0.8	14.8	1.1	31.9
All Groups	196.0	5.6	194.2	7.4	403.2

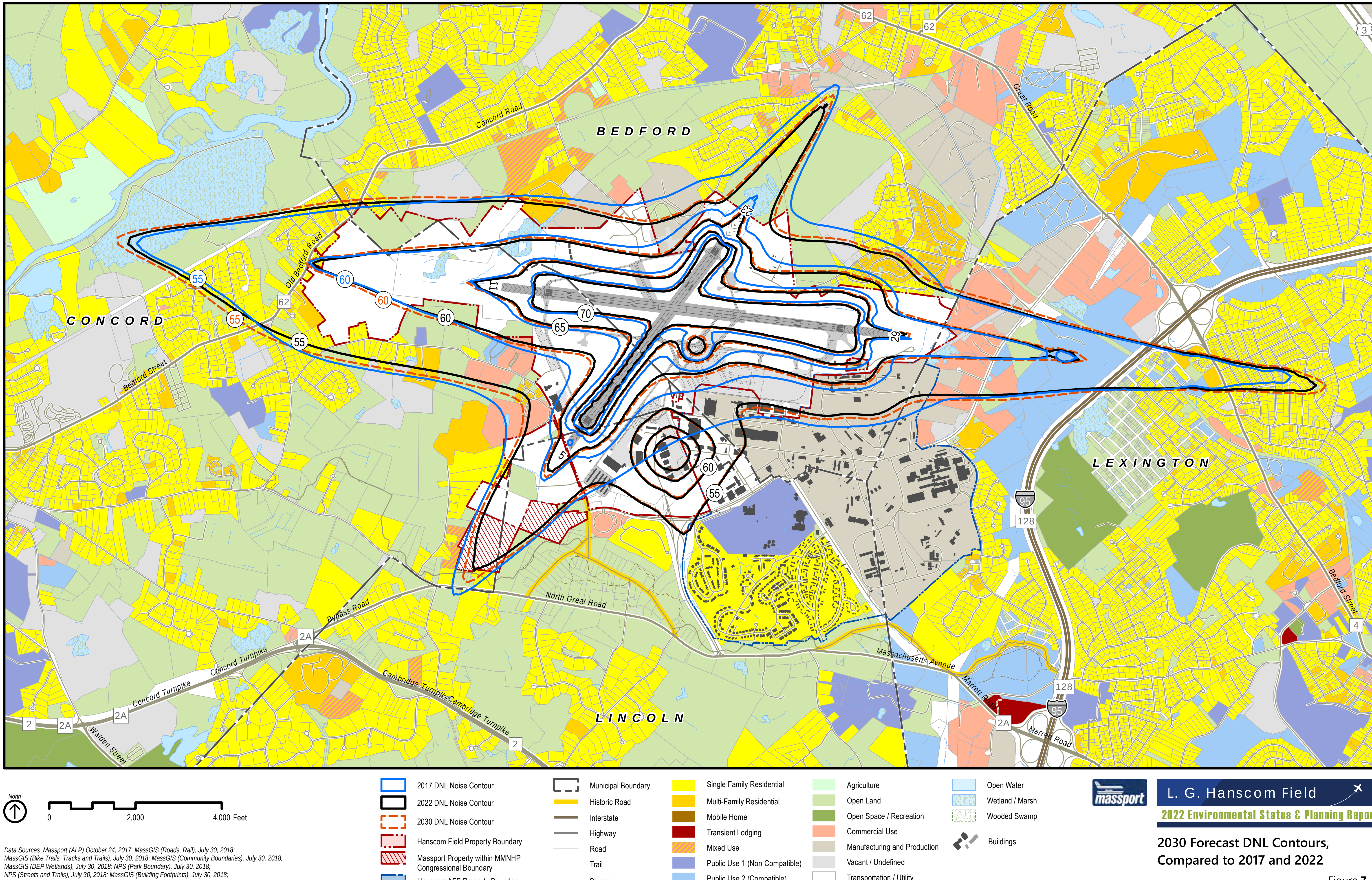
Source: McFarland Johnson, HMMH 2023
Daytime (7:00 a.m. to 10:00 p.m.) and Nighttime (10:00 p.m. to 7:00 a.m.) defined for DNL calculation

7.5.1 Forecast DNL Contours

Figures 7-16 and 7-17 depict the 55, 60, 65, and 70 dB DNL contours for the two future scenarios. In each figure, the 2017 and 2022 contours are also shown for comparison. In both figures, the area within each contour level increases in the future scenarios from the 2022 acreage. The area within each contour interval is presented in **Table 7-17** for the forecast years of 2030 and 2040 and the corresponding data for 2022 and previous ESPR years are provided for comparison. The areas of future growth in the contours relative to 2022 shown in Figure 7-16 and Figure 7-17 are reflected in Table 7-17. As a result of projected operations increases, acreage within the DNL contours increase from 2022 to 2030 and 2040. However, even with the increase in operations, the acreage values for 2040 at the DNL 65 and DNL 70 levels remain below 2017 levels and there are large decreases in acreage at all DNL contour levels from 2005 to 2040.

Table 7-17. Forecast Area within DNL Contours

DNL Contours (dB)	Cumulative Area (Acres)					
	2005	2012	2017	2022	2030	2040
70	311	190	214	177	187	198
65	635	391	419	363	381	404
60	1,437	857	904	837	888	951
55	3,291	2,045	2,216	2,115	2,249	2,409
Source: HMMH 2023						



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

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2022 Environmental Status & Planning Report

2030 Forecast DNL Contours, Compared to 2017 and 2022

Figure 7-16

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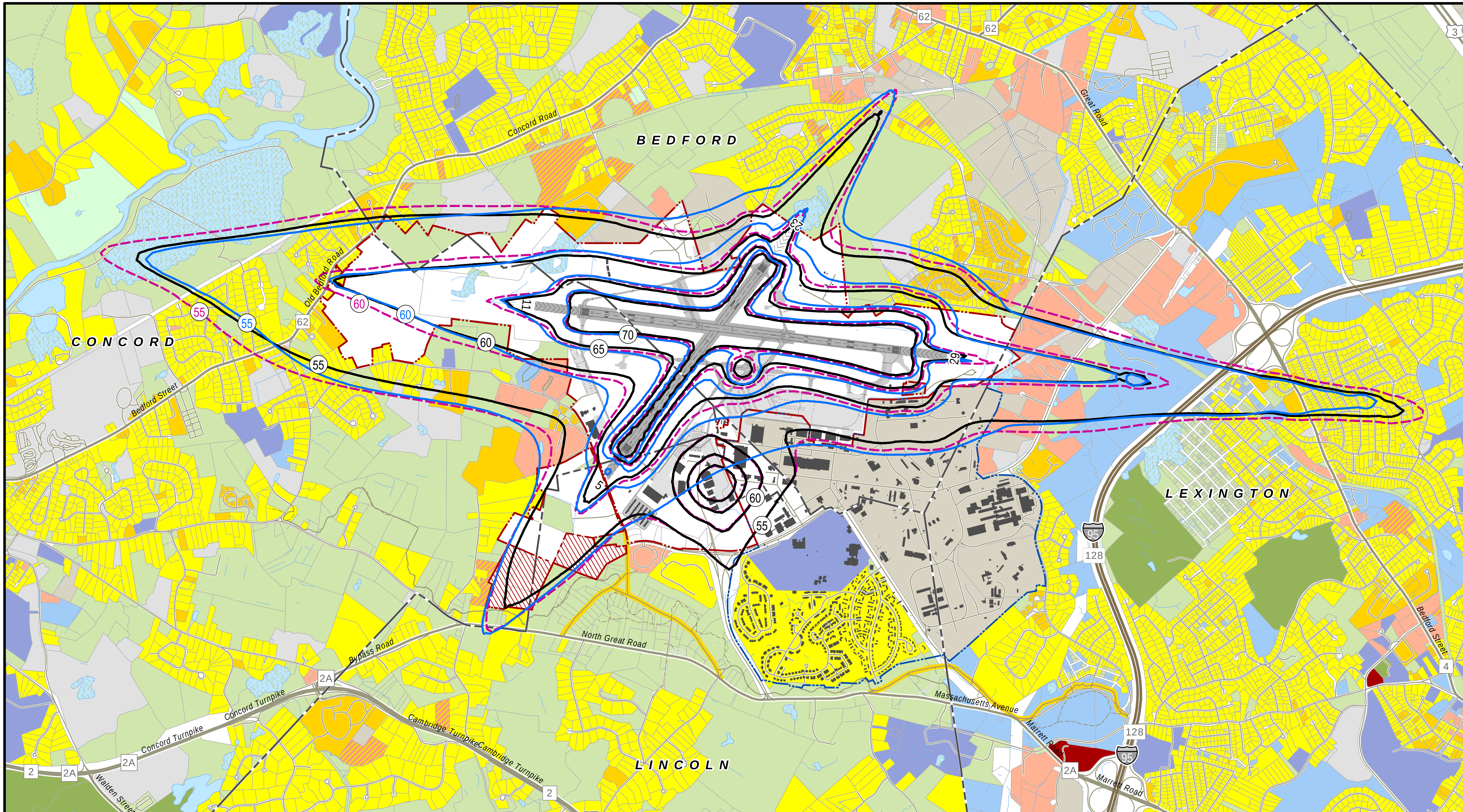

North

0 2,000 4,000 Feet

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018;
MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018;
MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018;
NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018;
NearMap USA (Aerial) October 2, 2023

- 2017 DNL Noise Contour
- 2022 DNL Noise Contour
- 2040 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
- Stream
- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging
- Mixed Use
- Public Use 1 (Non-Compatible)
- Public Use 2 (Compatible)
- Agriculture
- Open Land
- Open Space / Recreation
- Commercial Use
- Manufacturing and Production
- Vacant / Undefined
- Transportation / Utility
- Open Water
- Wetland / Marsh
- Wooded Swamp
- Buildings

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2022 Environmental Status & Planning Report

2040 Forecast DNL Contours, Compared to 2017 and 2022

Figure **7-17**

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7.5.2 Residential Land Use Impacts

Massport prepared population estimates for the forecast cases using 2020 U.S. Census data and the same techniques described in **Appendix D** for the 2022 analysis. **Table 7-18** presents the population within the 55, 60, 65, and 70 dB DNL contours for the forecast cases in 2030 and 2040. The values calculated for 2022 and prior ESPR years are listed by town and included for comparison. In the future, if all projected operations occur, the population between the 55 dB and 60 dB DNL contours is expected to increase (relative to 2022) in Bedford, Concord, and Lexington with Lincoln remaining at zero. The population between the 60 dB and 65 dB DNL contours is projected to increase (relative to 2022) in Bedford and Concord with Lincoln and Lexington remaining at zero. Overall, total population estimates greater than DNL 55 dB in 2030 and 2040 increase compared to 2022 but remain well below the values for 2005. For both forecast years, the population within the 65 dB DNL contour remains zero in all four towns.

Table 7-18. U.S. Census Population Counts within Current and Forecast DNL Contours

Year	Total Population between DNL Contours			
	65 dB or greater	60 to 65 dB	55 to 60 dB	Total: 55 dB or Greater
Bedford				
2005	17	256	872	1,145
2012	0	87	369	456
2017	0	78	491	569
2022	0	42	347	389
2030	0	54	400	454
2040	0	67	459	526
Concord				
2005	0	209	1075	1284
2012	0	0	542	542
2017	0	3	446	449
2022	0	2	517	519
2030	0	4	576	580
2040	0	11	638	649
Lexington				
2005	0	0	524	524
2012	0	0	43	43
2017	0	0	245	245
2022	0	0	416	416
2030	0	0	487	487
2040	0	0	582	582
Lincoln				
2005	0	0	0	0
2012	0	0	0	0
2017	0	0	8	8
2022	0	0	0	0
2030	0	0	0	0
2040	0	0	0	0
Total				
2005	17	465	2,471	2,953
2012	0	87	954	1,041
2017	0	81	1,190	1,271
2022	0	44	1,280	1,324
2030	0	58	1,463	1,521
2040	0	78	1,679	1,757
Source: HMMH 2023				

7.5.3 Time Above (TA)

The amount of time that aircraft noise is projected to be above the 65 and 55 dBA thresholds during the full day was also computed for the two forecast scenarios using AEDT. **Figures 7-18 through 7-21** display the TA 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 2022 TA contours for comparison. The cumulative area within each contour interval is presented for each forecast scenario in **Table 7-19**, with 2022 and prior ESPR years' values for comparison. TA increases in area coverage for both the 65 and 55 dBA thresholds over time, in relation to 2022, which is expected, given the increasing activity levels modeled. The trends of population within the TA contours are similar to the area trends, with increases from 2022 through 2040, as shown in **Table 7-20**. It is noteworthy that the area and population estimates related to the TA contours are lower for 2022, 2030, and 2040 than the corresponding values for 2017, 2012, and 2005.

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 evaluate the change in noise environment that is expected under the forecast scenarios.

Table 7-19. Areas within Time Above Contours for Existing and Forecast Operations

Contour Level	Cumulative Area (Acres)					
	2005	2012	2017	2022	2030	2040
Time Above 65 dBA						
90 minutes	281	289	100	69	84	98
60 minutes	498	526	405	220	311	364
30 minutes	1,326	1,238	996	751	841	930
Time Above 55 dBA						
90 minutes	1,828	2,362	1,729	1,026	1,232	1,386
60 minutes	3,551	4,006	3,566	2,057	2,430	2,752
30 minutes	8,405	7,542	9,209	5,945	6,676	7,337
Source: HMMH 2023						

Table 7-20. Population within Time Above Contours for Existing and Forecast Operations

Contour Level	Population between Time Above Contours					
	2005	2012	2017	2022	2030	2040
Time Above 65 dBA						
90 minutes or greater	0	0	0	0	0	0
60 to 90 minutes	50	52	6	0	0	5
30 to 60 minutes	470	349	175	111	102	116
Total 30 minutes or greater	520	401	181	111	102	121
Time Above 55 dBA						
90 minutes or greater	937	1,139	696	237	317	422
60 to 90 minutes	1,301	2,610	2,001	793	1,071	1,346
30 to 60 minutes	9,112	6,234	9,391	5771	6,826	7,610
Total 30 minutes or greater	11,350	9,983	12,088	6,801	8214	9378
Source: HMMH 2023						

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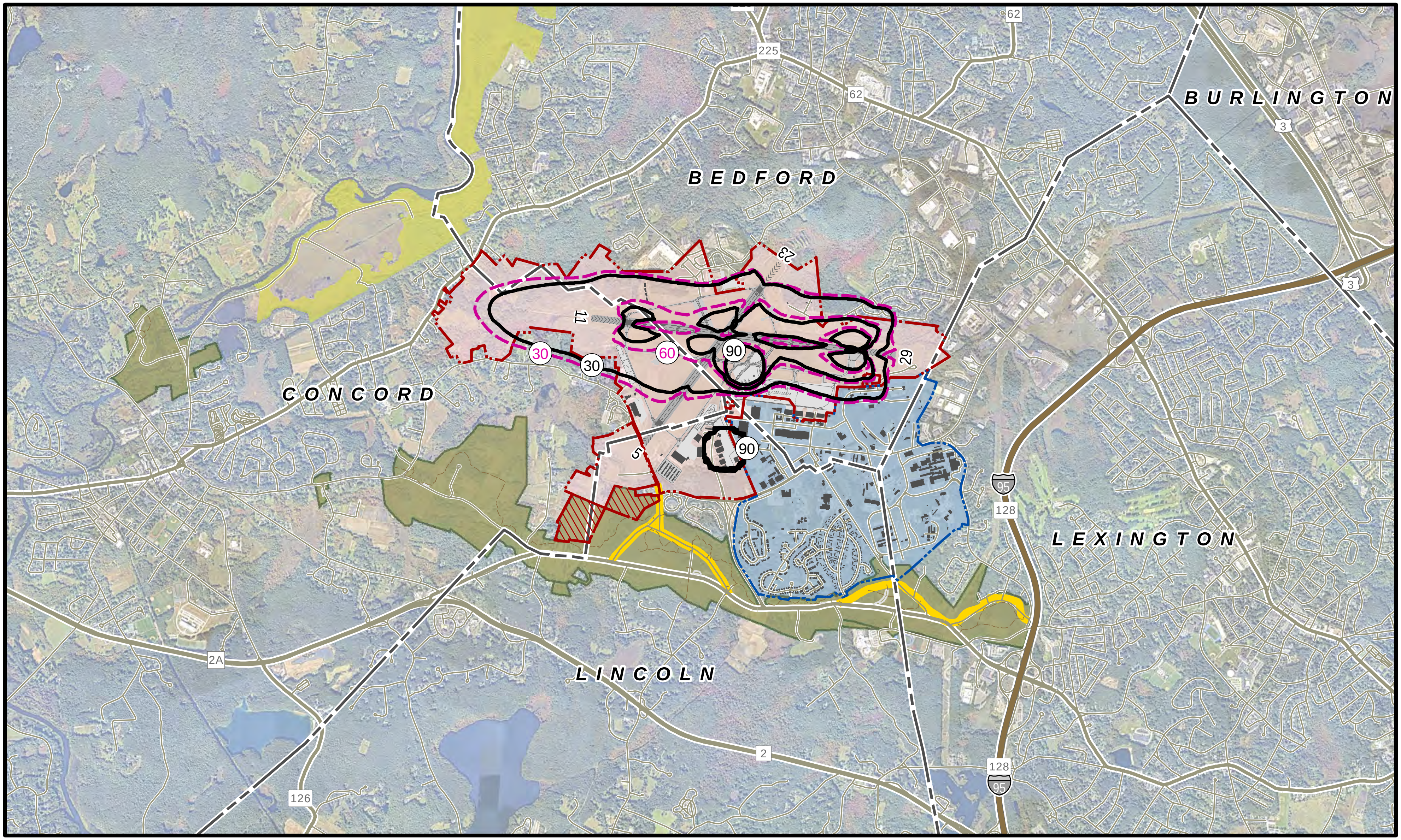

North

0 2,000 4,000 Feet

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

- 2022 Time Above 65 dBA Contours (Minutes)
- 2030 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
- MMNHP Boundary
- Great Meadows

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2022 Environmental Status & Planning Report

2022 and 2030 Forecast Time Above 65 dBA Contour Comparison

Figure 7-18

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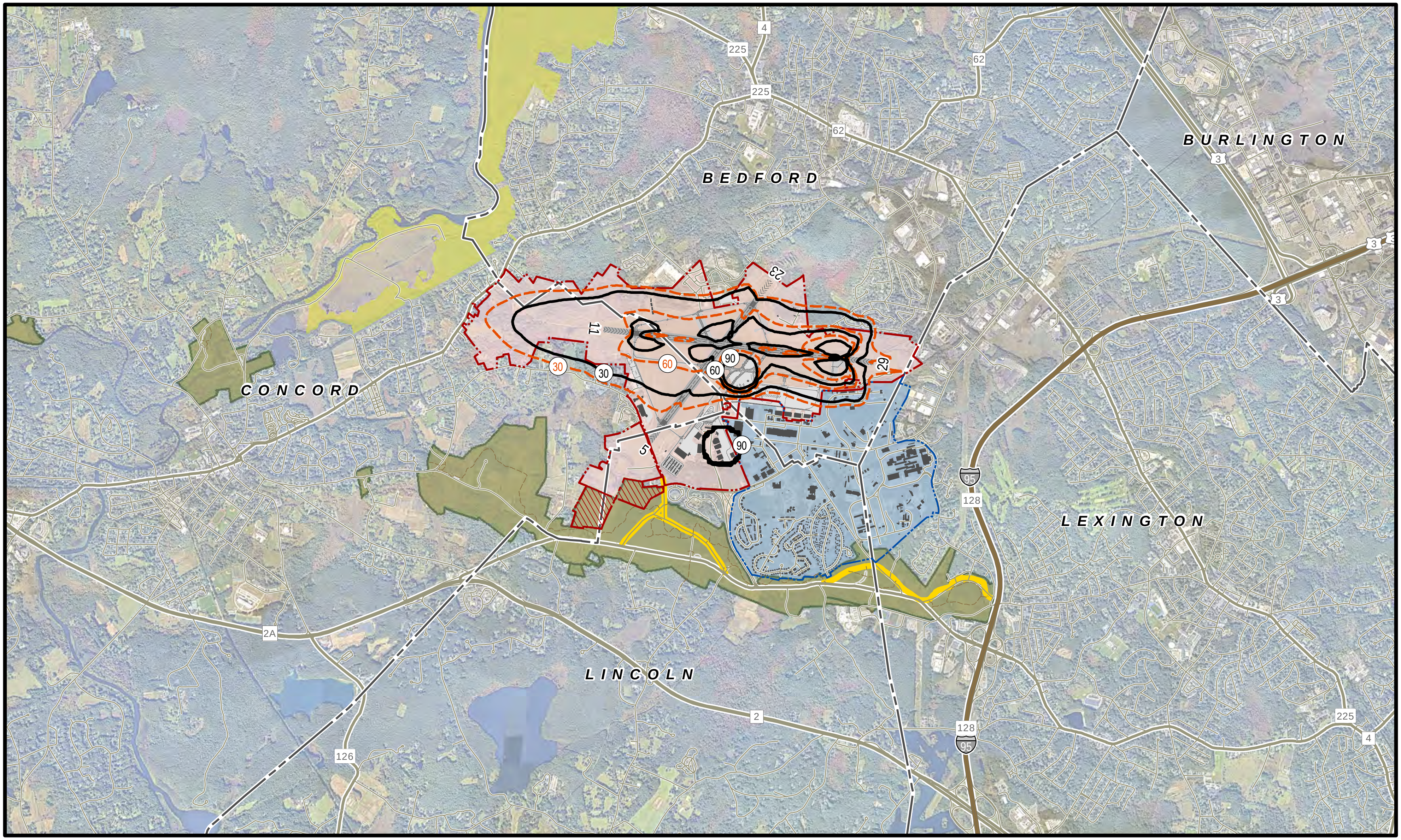

North

0 2,000 4,000 Feet

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

2022 Time Above 65 dBA Contours (Minutes)
2040 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
MMNHP Boundary
Great Meadows

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2022 and 2040 Forecast Time Above 65 dBA Contour Comparison

Figure **7-19**

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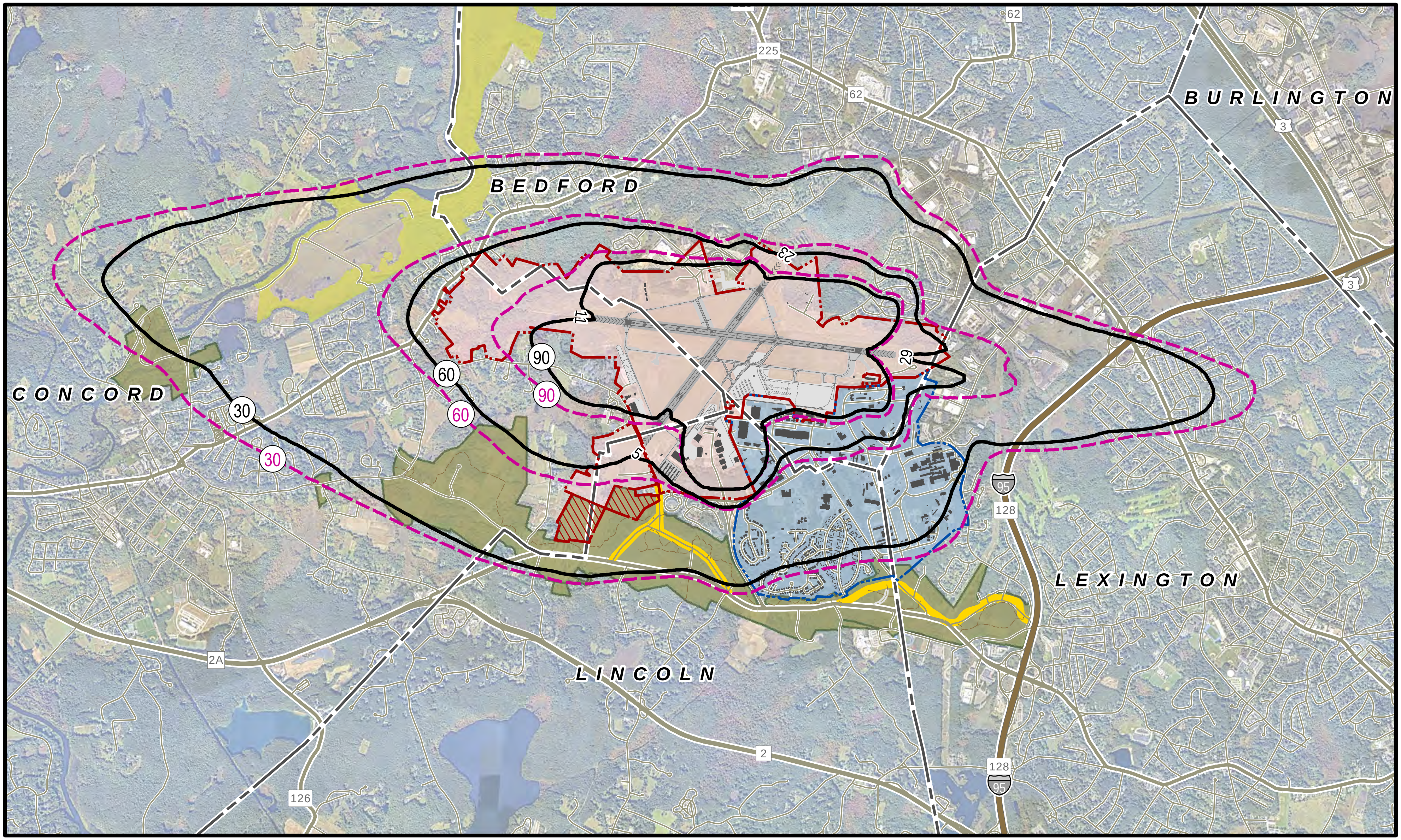

North

0 2,000 4,000 Feet

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

2022 Time Above 55 dBA Contours (Minutes)
2030 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
MMNHP Boundary
Great Meadows

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2022 Environmental Status & Planning Report

2022 and 2030 Forecast Time Above 55 dBA Contour Comparison

Figure 7-20

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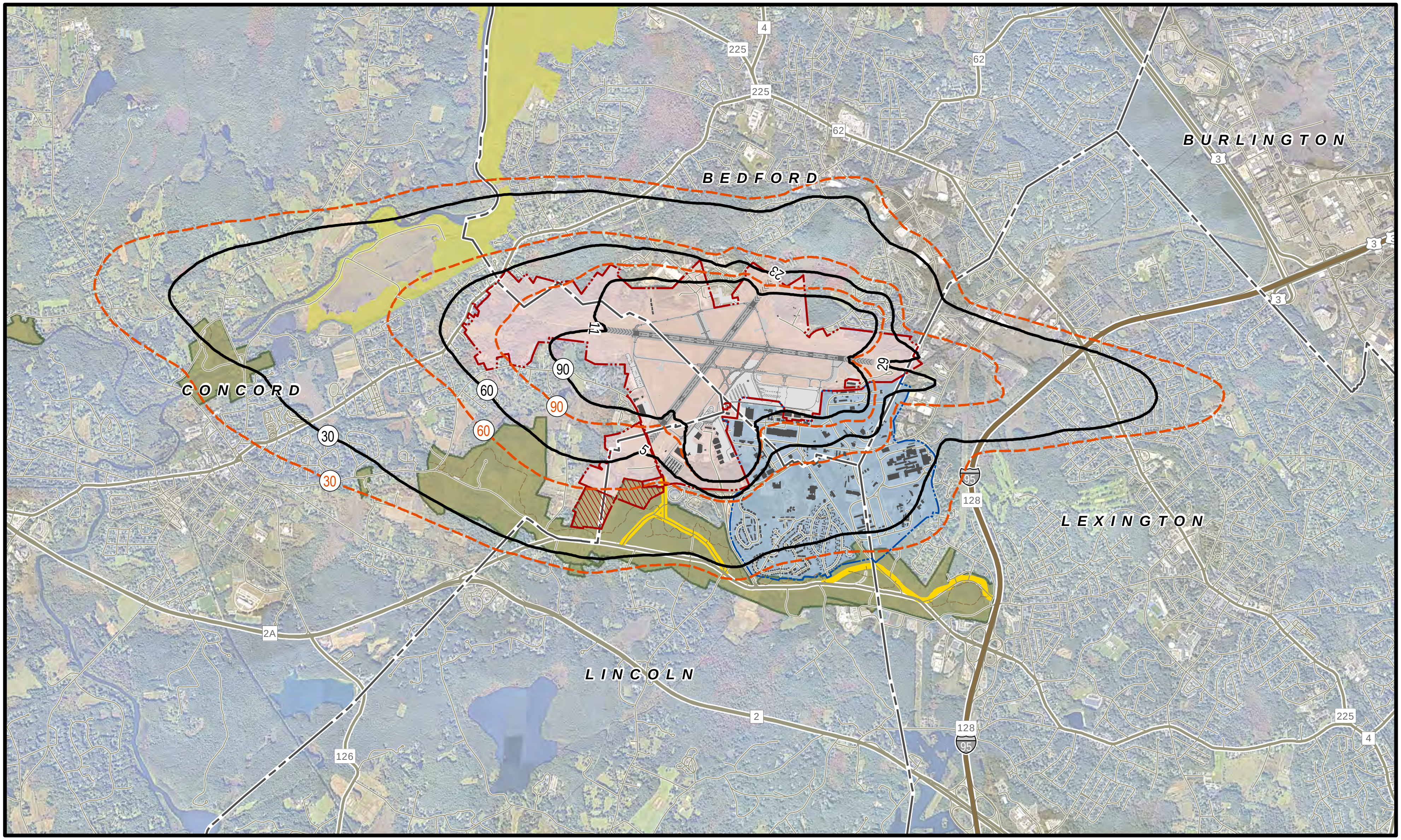

2022 Time Above 55 dBA Contours (Minutes)
2040 Time Above 55 dBA Contours (Minutes)
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary
Historic Road
Interstate
Highway
Road
MMNHP Boundary
Great Meadows

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

2022 and 2040 Forecast Time Above 55 dBA Contour Comparison

Figure 7-21

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7.5.4 Total Noise Exposure (EXP)

As Massport does for annual operations, the forecasts were also used to compute EXP values, as summarized in **Table 7-21**. The primary means of tracking EXP is through civilian aircraft departures, highlighted in bold in the table. Historical EXP values vary slightly from one year to the next, but since 1987 have demonstrated a downward trend.

As expected, the EXP computations show the same trends as the DNL forecasts. Compared to 2022, the component attributable to civil departures is projected to increase for both the 2030 and 2040 forecasts from 107.6 dB in 2022 and to 107.8 in 2030 and 108.2 dB in 2040, respectively. While these show small increases over 2022 they are still less than historical levels before 2011, as shown by Table 7-15. The 2030 and 2040 results are increasingly conservative as they are based on the same available aircraft types in the AEDT and may not reflect various future improvements in the fleet. EXP values 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 7-21. Total Noise Exposure (EXP) for Existing and Forecast Operations (in dB)

Groups	Departure EXP	Arrival EXP	Total EXP
2022			
All civil aircraft except single piston	107.0	110.5	112.1
All civil aircraft[1]	**107.6**	111.1	112.7
All military aircraft	97.7	94.7	99.5
All civil and military aircraft except single piston	107.5	110.6	112.3
All civil and military aircraft	108.0	111.2	112.9
2030			
All civil aircraft except single piston	107.1	110.8	112.3
All civil aircraft	**107.8**	111.4	112.9
All military aircraft	97.7	94.8	99.5
All civil and military aircraft except single piston	107.6	110.9	112.5
All civil and military aircraft	108.2	111.4	113.1
2040			
All civil aircraft except single piston	107.6	111.2	112.7
All civil aircraft	**108.2**	111.7	113.3
All military aircraft	97.7	94.8	99.5
All civil and military aircraft except single piston	108.0	111.3	112.9
All civil and military aircraft	108.5	111.8	113.5

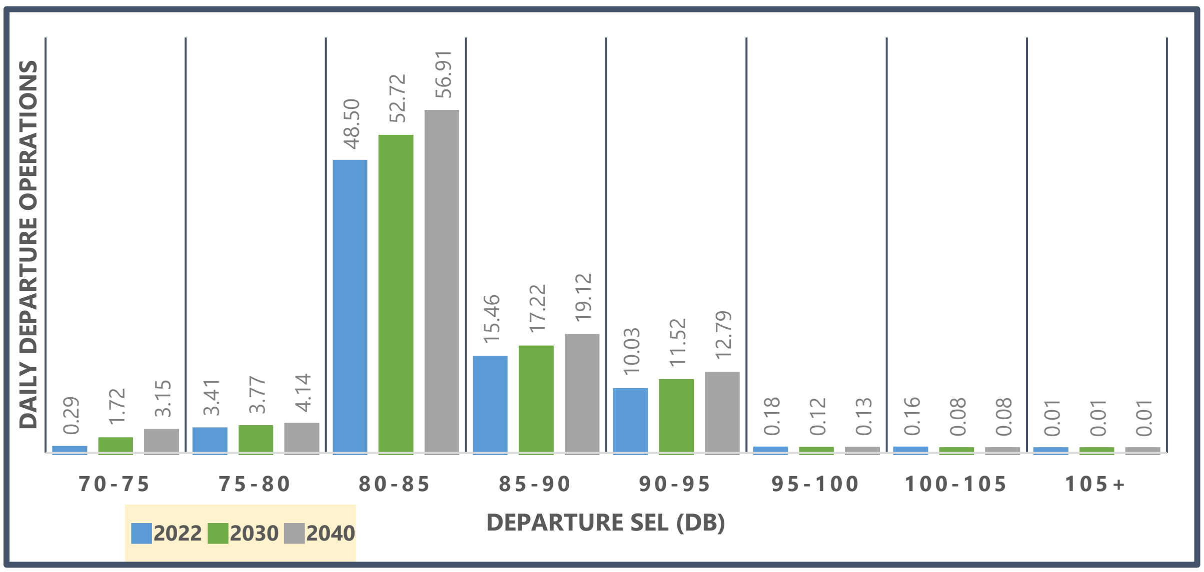
Note:
1. Civil air departures, which are the primary means of tracking EXP, are highlighted in bold.
Source: HMMH 2023

7.5.5 Distribution of Noise Events

Figure 7-22 shows the forecasted distribution of daily departure SELs from the EXP calculations for each of the two future scenarios with the values for 2022 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 operations over time; growth is forecasted for operations at all noise level categories with the exception of the noisiest groups (greater than 95 dB). Operations by these louder aircraft are generally very small in number and are expected to remain small. Operations by single-engine pistons which would be shown in the 75-80 dB SEL category are expected to increase in the future.

The 2030 and 2040 results are increasingly conservative and show little change as they are based on the same available aircraft types in the AEDT and may not reflect various improvements in the fleet.

Figure 7-22. Existing and Forecast Distribution of Daily Departure SELs (Excluding Single Engine Prop)



Source: HMMH 2023

7.6 Noise Analysis Locations

Massport calculates DNL for a large number of specific noise analysis locations and reports results in each ESPR. Information from the *2017 ESPR* was reviewed and updated to confirm use and address location and identify new locations of interest. **Tables 7-22 through 7-25** list the noise analysis locations within the Hanscom Field study area. As part of each ESPR cycle, Massport solicits further input from the Town Planners and Historic Commissions of Bedford, Concord, Lexington, and Lincoln and the NPS to complete this process. Chapter 10 provides additional details on the coordination with local officials and NPS. The labeling format of the noise analysis locations indicates their use: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, P for public facilities, R for religious sites, S for schools. O (for other) indicates sites that town representatives specifically requested be added to the noise receptor list, but do not fit elsewhere in the list. Consistent with the *2017 ESPR*, this format also delineates the location of the site by town.

None of these sites are currently exposed to a DNL value above the FAA land use compatibility recommendation of DNL 65 dB and none are within the DNL 60 dB contour. Two sites (both in Concord) have DNL values greater than 55 dB for 2022:

- Deacon John Wheeler/Capt. Jonas Minot Farmhouse, NC-18, in Concord at 57.3 dB
- Wheeler-Meriam House, NC-19, in Concord at 57.0 dB

The DNL generally decreased between 2017 and 2022. The average decrease in DNL across all sites was 1.1 dB, with sites in Bedford recording an average decrease of 2.2 dB, 1.3 dB in Concord, 0.4 dB in Lexington, and 0.4 dB in Lincoln.

The largest individual DNL increase from 2017 to 2022 for a site was 1.9 dB, from 46.6 dB to 48.5 dB, at the Mile Three Location in MMNHP in Lincoln. The largest individual DNL decrease was 3.1 dB, from 47.6 dB to 44.5 dB, at the Concord/Carlisle High School on Walden Road in Concord. Generally, 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 *2017* or *2022 ESPR* DNL of 50 dB or more were a decrease of 2.6 dB, from 50.1 dB to 47.5 dB, at the Concord School of Philosophy on Lexington Road in Concord, and an increase of 0.5 dB, from 51.4 dB to 51.9 dB, at the Diamond Middle School on Hancock Street in Lexington. All seven of the locations with a DNL decrease had a DNL of 50 dB or greater in 2012.

For the forecast scenario analyses, the computed noise levels at the noise analysis locations show results consistent with the DNL contours and population assessments. The 2040 forecast scenario would yield the highest DNL values. No noise analysis locations are projected to be exposed to a DNL of 60 dBA or above in 2030 or 2040. Three sites would be exposed to DNL values between 55 and 60 dB in the 2030 and 2040 scenarios including:

- Deacon John Wheeler/Capt. Jonas Minot Farmhouse, NC-18, in Concord at 57.7 dB DNL in 2030 and 58.1 dB DNL in 2040
- Wheeler-Meriam House in Concord, NC-19, at 57.5 dB DNL in 2030 and 57.9 dB DNL in 2040
- Simonds Tavern, NLX-1, in Lexington at 54.9 dB DNL in 2030 and 55.3 dB DNL in 2040

While future noise levels at noise analysis locations are generally forecasted to increase relative to the year 2022, 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 *2022 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 1050.1F, "Environmental Impacts: Policies and Procedures,"[174] identifies a change of 1.5 dB or more at a "noise-sensitive area"[175] within the DNL 65 dB as the significance threshold for noise. 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. If such changes are found to occur, additional analysis of noise analysis locations is to be

[174] U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Environmental Impacts: Policies and Procedures, FAA Order 1050.1F, Washington, DC.
[175] Using FAA guidelines, "noise-sensitive areas" are generally assumed to be residential areas within the DNL 65 dB contour.

conducted between DNL values of 60 and 65 dB to determine whether those noise analysis locations would experience changes of 3 or more dB.[176] No noise analysis sites had a DNL of 60 dB or greater in 2022 and no site is projected to have a DNL of 60 dB or greater in either of the forecast years.

Tables 7-22 through 7-25 present the DNL at the noise analysis locations at each town, accompanied by a summary of the results. TA results for the noise analysis locations in each town are presented in **Appendix D**.

Table 7-22 presents the DNL at the noise analysis locations in Bedford for 2012, 2017, 2022 and the projected DNL for 2030 and 2040. Examination of the results yields the following conclusions:

- No sites in Bedford were at or above 55 dB DNL in 2022.
- In 2022, all Bedford sites have a decrease in DNL relative to 2017 due to reduced operations on Runway 5/23.
- All Bedford sites are forecast to be at or above 2022 DNL levels in 2030 and 2040.
- No Bedford sites are forecast to be at or above 55 dB DNL in 2030 and 2040.

Table 7-22. DNL at Noise Analysis Locations in Bedford (dB)

Label[1]	Name[2]	Address (Bedford)	DNL				
			2012	2017	2022	2030	2040
HB-1	Veterans Administration Medical Center*	200 Springs Rd	41.8	43.8	41.7	42.1	42.4
NB-1	Bedford Historic District	Great Rd.	44.6	46.1	43.2	43.7	44.0
NB-2	Old Bedford Center Historic District	Great Rd.	45.4	47.1	44.3	44.7	45.1
NB-3	Old Burying Ground	7 Springs Rd.	45.7	47.4	44.9	45.3	45.7
NB-4	Old Town Hall	16 South Rd.	46.1	47.8	45.2	45.7	46.0
NB-5	Bedford Depot Park Historic District	80 Loomis St./120 South Rd.	49.8	52.0	49.7	50.2	50.5
NB-6	Nathaniel Page House	89 Page Rd.	45.9	48.4	47.3	47.7	48.0
NB-7	Christopher Page House	50 Old Billerica Rd.	44.2	46.9	45.6	46.1	46.4
NB-8	Bacon-Gleason-Blodgett Homestead	118 Wilson Rd.	41.5	43.3	41.9	42.3	42.6
NB-9	Historic Wilson Mill-Old Burlington Road Historic Dist.	Old Burlington and Wilson Rds.	41.3	43.1	41.8	42.2	42.5
NB-10	Shawsheen Cemetery **	Shawsheen Rd.	45.2	46.4	44.5	44.9	45.3
NB-11	David Lane House	137 North Rd.	42.1	43.9	41.3	41.8	42.1
NB-12[3]	Col. Timothy Jones House	231 Concord Rd.	-	-	47.0	47.4	47.7

176 Federal Interagency Committee on Noise (FICON), 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.

Label[1]	Name[2]	Address (Bedford)	DNL				
			2012	2017	2022	2030	2040
NB-13[4]	Old Billerica Road Area	Old Billerica Rd.	44.0	47.6	46.7	47.2	47.5
NB-14[3]	Old Billerica Road Historic District**	Old Billerica Rd.	-	-	43.6	44.1	44.4
PB-1	Town Hall *	10 Mudge Way	45.5	47.1	44.2	44.7	45.0
PB-2	Library **	7 Mudge Way	45.0	46.4	43.5	43.9	44.2
PB-3	Bedford School District	11 Mudge Way	45.6	47.1	44.2	44.6	45.0
PB-4	Department of Public Works	314 Great Rd.	45.4	46.8	45.0	45.4	45.8
RB-1	The Lutheran Church of the Savior	426 Davis Rd.	48.6	49.3	48.8	49.2	49.6
RB-2	First Baptist Church of Bedford	155 Concord Rd.	46.0	47.1	44.9	45.2	45.6
RB-3	St. Michael's Church	90 Concord Rd.	44.9	46.1	43.6	43.9	44.2
RB-4	Boston Buddha Vararam Temple	125 North Rd.	42.2	44.0	41.4	41.9	42.2
RB-5	The First Church of Christ Congregational/ United Church of Christ *	25 Great Rd.	45.1	46.7	43.8	44.2	44.6
RB-6	The First Parish in Bedford Unitarian Universalist *	75 Great Rd.	46.0	47.7	45.0	45.5	45.8
RB-7	St. Paul's Episcopal Church	100 Pine Hill Rd.	41.8	43.7	41.2	41.7	42.0
RB-8	March for Jesus	54 Summer St.	52.2	52.4	51.4	51.9	52.3
RB-9	Immanuel Baptist Church	400 Great Rd.	45.8	46.8	45.1	45.5	45.9
SB-1	Davis School	Davis Rd.	43.1	45.0	42.9	43.2	43.5
SB-2	Bedford High School **	9 Mudge Way	45.1	46.4	43.5	44.0	44.3
SB-3	John Glenn Middle School	99 McMahon Rd.	46.7	47.6	44.7	45.1	45.4

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 receptor list, but do not fit into the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the *2017 ESPR*.
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/Massachusetts Cultural Resources Information System (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. Two newly designated locations on the National Register have been added to this table; NBR-12 and NBR13.
4. The label has been updated for the 2022 ESPR from OB-1 to NB-14 as the site is now listed on the National Register.
Source: HMMH 2023

Table 7-23 presents the DNL at the noise analysis locations in Concord for 2012, 2017, 2022 and the projected DNL for 2030 and 2040. Examination of the results yields the following conclusions:

- Two sites in Concord, NC-18 and NC-19, were at or above 55 dB DNL in 2022.
- In 2022, all Concord sites are at or below the 2017 DNL levels, except for Site NC-10, which has an increase in DNL relative to 2017. This increase is due to a small change in the location of jet flight tracks that turn to the south when departing Runway 29; they are now slightly west of Route 62.
- All Concord sites are forecast to be at or above 2022 DNL levels in 2030 and 2040.
- Two Concord sites, NC-18 and NC-19, are forecast to be at or above 55 dB DNL in 2030 and 2040.

Table 7-23. DNL at Noise Analysis Locations in Concord (dB)

Label[1]	Name[2]	Address (Concord)	DNL				
			2012	2017	2022	2030	2040
NC-1	Barrett Farm Historic District†	Barrett's Mill Rd.	43.5	44.8	44.6	44.7	45.1
NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd.	47.4	48.1	48.1	48.2	48.6
NC-3	Joseph Hosmer House	572 Main St.	44.3	45.4	44.9	45.3	45.8
NC-4	Thoreau-Alcott House	255 Main St.	46.1	46.9	46.1	46.5	46.9
NC-5	Hubbardville Historic District†	324-374 Sudbury Rd.	46.5	47.3	44.9	45.4	45.9
NC-6	Hubbard-French Historic District	324-374 Sudbury Rd.	46.5	47.3	44.9	45.4	45.8
NC-7	Deacon Thomas Hubbard/ Judge Henry French House	342 Sudbury Rd.	46.4	47.2	45.0	45.5	46.0
NC-8	Pest House	158 Fairhaven Rd.	46.3	47.1	44.2	44.7	45.2
NC-9	Main Street Historic District†	Main St. between Monument Sq. and Wood St.	48.0	48.3	47.1	47.6	48.0
NC-10	North Bridge-Monument Square Historic District†	Monument St., Liberty St. and Lowell St.	48.2	48.4	48.7	49.0	49.4
NC-11	Wright Tavern	Lexington Rd. & Main St.	48.2	48.4	47.1	47.6	48.0
NC-12	Sleepy Hollow Cemetery	24 Court Ln.	49.0	49.0	48.2	48.6	49.0
NC-13	American Mile Historic District†	Lexington Rd.	48.5	48.6	47.1	47.6	48.0
NC-14	Concord Monument Square-Lexington Road Historic District	Monument Sq. and Lexington Rd.	48.1	48.3	47.2	47.7	48.1
NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike	49.1	49.1	46.7	47.2	47.6
NC-16	Walden Pond	MA Rte 126 (Main Beach)	43.4	46.2	44.4	44.8	45.1

Label[1]	Name[2]	Address (Concord)	DNL				
			2012	2017	2022	2030	2040
NC-17	Orchard House	399 Lexington Rd.	50.2	50	47.4	47.8	48.2
NC-18	Deacon John Wheeler/ Capt. Jonas Minot Farmhouse	341 Virginia Rd.	58.4	57.8	57.3	57.7	58.1
NC-19	Wheeler-Meriam House	477 Virginia Rd.	58.1	57.7	57.0	57.5	57.9
NC-20	Concord Armory-Concord Veteran's Building	51 Walden St.	48.1	48.3	46.8	47.3	47.7
NC-21	Concord School of Philosophy	391 Lexington Rd.	50.3	50.1	47.5	48.0	48.4
NC-22	Hosmer Homestead	138 Baker Ave.	41.6	43.1	42.9	43.2	43.6
NC-23[3]	North Center Schoolhouse	34A Bedford St.	-	-	47.7	48.2	48.6
PC-1	Library **	129 Main St.	47.1	47.6	46.5	46.9	47.4
PC-2	Town Hall ††	22 Monument Sq.	48.1	48.3	47.4	47.8	48.3
PC-3	Middlesex County Court House	305 Walden St.	48.4	48.6	45.7	46.2	46.6
RC-1	Trinity Episcopal Church **	81 Elm St.	45	46	45.6	46.0	46.4
RC-2	Redeemer Presbyterian Church	191 Sudbury Rd.	46.7	47.4	45.7	46.2	46.6
RC-3	New Life Community Church (meeting at the Emerson School Building **)	40 Stow St.	47.4	47.8	46.3	46.8	47.2
RC-4	Trinitarian Congregational Church **	54 Walden St.	48	48.2	46.7	47.1	47.6
RC-5	First Church of Christ Scientist††	7 Lowell Rd.	47.7	48	47.3	47.7	48.1
RC-6	St. Bernard's Parish††	70 Monument Square	47.9	48.2	47.2	47.7	48.1
RC-7	Christian Science Reading Room	20 Main St.	47.9	48.2	47.1	47.5	48.0
RC-8	First Parish in Concord ††	20 Lexington Rd.	48.2	48.4	47.0	47.5	47.9
SC-1	Nashoba/Brooks School	200 Strawberry Hill Rd.	46.5	47.8	47.5	47.7	48.1
SC-2	Middlesex School**	1400 Lowell Rd.	40.4	42.3	41.5	41.2	41.5
SC-3	Fenn School **	498-516 Monument St.	50.9	51.2	51.2	51.4	51.8
SC-4	Concord Academy **	166 Main St.	46.6	47.2	46.4	46.8	47.3
SC-5	Alcott School	91 Laurel Rd.	48.1	48.4	45.7	46.1	46.6
SC-6	Concord/Carlisle High School	500 Walden Rd.	46.8	47.6	44.5	45.0	45.4
SC-7	Ripley School	120 Meriam Rd.	53.6	52.7	51.5	51.9	52.3

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 receptor list, but do not fit into

Label[1]	Name[2]	Address (Concord)	DNL				
			2012	2017	2022	2030	2040
the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the *2017 ESPR*. 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 Concord Monument Square-Lexington Road Historic District. 3. One newly designated location on the National Register has been added to this table. Source: HMMH 2023							

Table 7-24 presents the DNL at the noise analysis locations in Lexington for 2012, 2017, 2022 and the projected DNL for 2030 and 2040. Examination of the results yields the following conclusions:

- No sites in Lexington were at or above 55 dB DNL in 2022.
- In 2022, all Lexington sites are at or below the 2017 DNL levels, except for Site NLX-1, RLX-10, SLX-1 and SLX-9, have an increase in DNL relative to 2017.
- All Lexington sites are forecast to be at or above 2022 DNL levels in 2030 and 2040.
- One site, NLX-1, is forecast to be at or above 55 dB DNL in 2040.

Table 7-24. DNL at Noise Analysis Locations in Lexington (dB)

Label[1]	Name[2]	Address (Lexington)	DNL				
			2012	2017	2022	2030	2040
NLX-1	Simonds Tavern	331 Bedford St.	53.0	54.5	54.6	54.9	55.3
NLX-2	Hancock-Clarke Historic District†	Hancock St.	42.8	42.9	42.7	42.9	43.3
NLX-3	Hancock-Clarke House	35 Hancock St.	42.6	42.9	42.5	42.8	43.2
NLX-4	Garrity House	9 Hancock St.	42.7	42.9	42.7	42.9	43.4
NLX-5	Lexington Green Historic District	Mass. Ave., Harrington Rd. and Bedford St.	42.9	43.1	43.0	43.2	43.6
NLX-6	Lexington Green	Mass. Ave., Harrington Rd. and Bedford St.	42.7	42.9	42.8	43.0	43.5
NLX-7	Buckman Tavern	1 Bedford St.	42.5	42.7	42.5	42.8	43.2
NLX-8	General Samuel Chandler House	8 Goodwin Rd.	42.5	42.7	42.5	42.7	43.1
NLX-9	Hancock School	33 Forest St.	42.6	43.0	42.9	43.1	43.6
NLX-10	U.S. Post Office Building	1661 Mass. Ave.	40.8	41.1	41.1	41.3	41.7
NLX-11	Warren E. Shelburne House	11 Percy Rd.	38.4	39.3	39.1	39.3	39.7

Label[1]	Name[2]	Address (Lexington)	DNL				
			2012	2017	2022	2030	2040
NLX-12	Munroe Tavern Historic District†	Mass. Ave.	36.6	37.9	37.5	37.6	38.0
NLX-13	Sanderson House-Munroe Tavern	1314 & 1332 Mass. Ave.	37.4	38.5	38.2	38.4	38.8
NLX-14	John Mason House	1303 Mass. Ave.	37.7	38.7	38.4	38.7	39.0
NLX-15	East Village Historical District†	Mass Ave.	35.3	37.4	36.6	36.8	37.1
NLX-16	M.H. Merriam and Company	7-9 Oakland Ave.	41.6	41.9	41.7	42.0	42.4
OLX-1	Battle Green Historic District**	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave. and B&M Railroad	42.8	42.9	42.8	43.1	43.5
OLX-2	National Heritage Museum	33 Marrett Rd.	36.2	38.1	37.5	37.6	38.0
PLX-1	Library **	1874 Mass. Ave.	43.1	43.3	43.2	43.4	43.8
PLX-2	Town Hall **	1625 Mass. Ave.	39.3	39.8	39.7	40.0	40.4
PLX-3	Lexington School District Administration **	1557 Massachusetts Ave.	40.0	40.4	40.4	40.7	41.1
RLX-1	Lexington United Methodist Church/ St. John's Korean United Methodist Church[3]	2600 Massachusetts Ave.	45.9	47.4	46.1	46.5	46.8
RLX-2	Temple Isaiah	55 Lincoln St.	44.2	45.6	44.7	45.1	45.5
RLX-3	Grace Chapel of Lexington	59 Worthen Rd.	44.6	44.8	44.7	44.9	45.3
RLX-4	St. Brigid's Parish *	2001 Mass. Ave.	44.0	44.2	44.2	44.4	44.8
RLX-5	First Parish-Unitarian Church††	7 Harrington Rd.	43.2	43.4	43.3	43.5	43.9
RLX-6	Hancock United Church of Christ ††	1912 Mass. Ave.	43.0	43.2	43.1	43.3	43.8
RLX-7	Church of Our Redeemer	6 Meriam St.	42.3	42.5	42.3	42.6	43.0
RLX-8	Christian Science Reading Room	10 Muzzy St. #12	41.8	42.1	42.0	42.3	42.7
RLX-9	Greek Orthodox Church of St. Nichols **	17 Meriam St.	42.0	42.2	42.0	42.2	42.6
RLX-10	Chabad Center **	9 Burlington St.	49.9	50.9	51.3	51.5	51.9
RLX-11	Pilgrim Congregational Church	55 Coolidge Ave.	44.9	45.8	45.5	45.8	46.2
RLX-12	First Baptist Church of Lexington **	1580 Mass. Ave.	40.1	40.5	40.4	40.7	41.1
RLX-13	Jehovah's Witnesses	196 Woburn St.	36.7	38.3	37.6	37.8	38.1
RLX-14	Follen Church Society-Unitarian Universalists *	755 Massachusetts Ave.	34.0	37.4	36.6	36.7	37.0

Label[1]	Name[2]	Address (Lexington)	DNL				
			2012	2017	2022	2030	2040
RLX-15	Countryside Bible Chapel	480 Lowell St.	37.3	40.2	39.0	39.2	39.5
RLX-16	St. Paul Evangelical Church	451 Lowell St.	36.2	39.2	37.9	38.1	38.4
SLX-1	Minuteman Regional Vocational High School	758 Marrett Rd.	44.8	45.5	45.7	45.9	46.2
SLX-2	Maria Hastings School	2618 Mass. Ave.	45.4	47.1	45.8	46.2	46.5
SLX-3	Methodist Weekday School	2600 Massachusetts Ave.	46.0	47.5	46.1	46.5	46.9
SLX-4	Community Nursery School	2325 Massachusetts Ave.	45.8	47.0	46.0	46.3	46.7
SLX-5	Bridge Elementary School**	55 Middleby Rd.	42.2	44.5	43.8	44.0	44.4
SLX-6	Lexington High School	251 Waltham St.	41.7	43.0	42.6	42.8	43.2
SLX-7	Jonas Clarke Middle School	17 Stedman Rd.	37.6	41.9	41.0	41.1	41.4
SLX-8	Estabrook School**	117 Grove St.	44.5	45.7	45.1	45.3	45.6
SLX-9	Diamond Middle School	99 Hancock St.	50.1	51.4	51.9	52.2	52.6
SLX-10	Fiske Elementary School	146 Maple St.	42.4	43.9	43.4	43.6	44.0
SLX-11	Armenian Sisters Academy	20 Pelham Rd.	37.2	38.9	38.4	38.6	39.0
SLX-12	Harrington Elementary School	148 Maple St.	33.5	36.1	35.4	35.5	35.8

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 receptor list, but do not fit into the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the *2017 ESPR*.
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.
Source: HMMH 2023

Table 7-25 presents the DNL at the noise analysis locations in Lincoln for 2012, 2017, 2022 and the projected DNL for 2030 and 2040. Examination of the results yields the following conclusions:

- No sites in Lincoln were at or above 55 dB DNL in 2022.
- In 2022, all Lincoln sites are at or below the 2017 DNL levels, except for Site NLN-5 which has an increase in DNL relative to 2017.
- All Lincoln sites are forecast to be at or above 2022 DNL levels in 2030 and 2040.
- No Lincoln sites are forecast to be at or above 55 dB DNL in 2030 and 2040.

Table 7-25. DNL at Noise Analysis Locations in Lincoln (dB)

Label[1]	Name[2]	Address (Lincoln)	DNL				
			2012	2017	2022	2030	2040
NLN-1	Walden Pond	Rte. 126, Walden St., Concord Rd.	42.6	46.2	43.5	43.9	44.2
NLN-2	Henry Higginson House	44 Baker Farm Rd.	42.5	46.5	44.8	45.2	45.6
NLN-3	Daniel Brooks House	Brooks Rd.	48.4	51.9	51.0	51.4	51.8
NLN-4	Lincoln Center Historic District	Bedford Rd., Lincoln Rd., Old Lexington Rd., Sandy Pond Rd., Trapelo Rd., Weston Rd.	41.0	43.1	43.0	43.3	43.5
NLN-5	Hoar Tavern	268 Cambridge Tpke.	41.8	44.0	45.5	45.6	45.8
SLN-1	Carroll School	25 Baker Bridge Rd.	40.8	44.3	42.9	43.3	43.7
SLN-2	Hanscom Middle School	Hanscom AFB	50.2	49.9	49.2	49.5	49.7
SLN-3	Hanscom Primary School[3]	Hanscom AFB	50.2	49.9	49.2	49.5	49.7

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 receptor list, but do not fit into the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the *2017 ESPR*.
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. Noise values for the Hanscom Primary School were incorrectly reported in the *2017 ESPR*.
Source: HMMH 2023

7.7 Minute Man National Historical Park (MMNHP)

In 1991, Congress directed the NPS to conduct research on the impacts of aircraft overflying the National Park System in Public Law 100-91, the National Parks Overflights Act. The NPS 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. The NPS completed an internal draft soundscape plan for MMNHP in 2010, including noise monitoring with professional and volunteer staff. Noise 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 incorporated aspects of approaches that have been used at other NPS properties.

To address noise levels at various locations in MMNHP, 31 sites were included in the list of noise analysis locations. Massport also evaluates these sites in the ESPRs. **Table 7-26** presents the DNL at the noise analysis locations in MMNHP for 2012, 2017, 2022 and the projected DNL for 2030 and 2040.

The table shows that none of these 31 locations were exposed to DNL greater than 60 dB in 2022 or are projected to in 2030 or 2040. Additionally, no portion of the park fell within the DNL 65 dB or 60 dB contours in 2022 (see Figure 7-9) or is projected to in 2030 or 2040 (see Figure 7-16 and Figure 7-17). None of the Historic Battle Road Interpretive Trail fell within the 55 dB DNL contours in 2022. A portion of the Historic Battle Road Interpretive Trail is projected to fall within the 55 dB DNL contours in 2030 or 2040.

The area of the park within the 55 dB DNL contour is projected to increase in 2030 and 2040 relative to the area in 2022. The Noah Brooks Tavern (MM-13) had the highest DNL in 2022 at 54.1 dB and is projected to remain the site with the highest DNL in 2030 and 2040, slightly above current levels.

Table 7-26. DNL at Noise Analysis Locations in the Minute Man National Historical Park (dB)

Label[1]	Name[2]	Unit/Town[3]	DNL				
			2012	2017	2022	2030	2040
MM-1	Major John Buttrick House	North Bridge Unit / Concord	48.7	48.9	49.1	49.3	49.7
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (North Bridge Visitor Center)	North Bridge Unit / Concord	48.3	48.4	48.7	49.0	49.3
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	48.2	48.3	48.6	48.9	49.3
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	47.9	47.9	48.4	48.7	49.1
MM-5	North Bridge	North Bridge Unit / Concord	48	48.1	48.5	48.8	49.2
MM-6	Old Manse *	North Bridge Unit / Concord	48.1	48.2	48.7	49.0	49.4
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	50.3	50.1	47.5	48.0	48.4
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	50.3	50.3	48.1	48.5	48.9
MM-9	Meriam House	Battle Road Unit / Concord	50.6	50.5	48.5	48.9	49.3
MM-10	Historic Farming Fields	Battle Road Unit / Concord	50.7	50.9	49.8	50.2	50.5
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	49.2	50.6	49.5	49.8	50.2

Label[1]	Name[2]	Unit/Town[3]	DNL				
			2012	2017	2022	2030	2040
MM-12	Samuel Brooks House	Battle Road Unit / Concord	50.8	54.4	53.5	53.9	54.3
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	51.4	55.0	54.1	54.5	54.9
MM-14	Job Brooks House	Battle Road Unit / Lincoln	51.5	54.6	53.9	54.3	54.6
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	50.7	53.6	52.9	53.2	53.6
MM-16	Bloody Angle	Battle Road Unit / Lincoln	50.9	51.7	51.2	51.5	51.8
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	49.2	49.3	49.3	49.4	49.7
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	48.5	48.7	49.4	49.5	49.7
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	47.0	47.6	49.3	49.3	49.5
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	45.8	46.3	46.5	46.8	47.0
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	45.5	46.6	48.5	48.5	48.7
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	46.0	46.3	46.2	46.6	46.8
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	47.0	46.9	46.9	47.2	47.4
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	47.1	46.9	47.1	47.4	47.6
MM-25	Parkers Revenge	Battle Road Unit / Lexington	47.0	46.8	47.2	47.4	47.7
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	46.1	46.2	46.5	46.8	47.0
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	46.4	46.5	46.8	47.0	47.2
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	45.9	46.3	46.4	46.6	46.9
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	46.2	46.4	46.6	46.8	47.1
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	46.2	47.6	46.3	46.7	47.0
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	43.5	44.8	44.5	44.7	45.1

Notes:
1. The Minute Man National Historical Park (MMNHP) is a national historic landmark district. All sites are in the National Register of Historic Places.
2. Sites within MMNHP are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.

Label[1]	Name[2]	Unit/Town[3]	DNL				
			2012	2017	2022	2030	2040
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. Source: HMMH 2023							

TA 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 or require the use of a raised voice at distances of 3 to 4 feet and 10 to 15 feet, respectively. This is relevant to activities such as outdoor interpretive programs within MMNHP. Available research data also 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 MMNHP range from high-30s to mid-40s dBA, the TA5 dBA data suggest that these are times when park visitors could notice aircraft.

Table 7-27 and **Table 7-28** show that the 2022 TA values for the 31 points within MMNHP ranged from 1 to 8 minutes per day over 65 dBA and 15 to 51 minutes per day over 55 dBA. The higher TA values 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 experience 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. Location MM-10, the Historic Farming Fields, had the highest TA55 in 2022 and is projected to have the highest TA55 in 2030 and 2040.

The sites in MMNHP are expected to experience TA65 for the future scenarios that range from 1 to 9 minutes per day for the 2030 scenario and 1 to 10 minutes per day for the 2040 scenario. The highest times above 65 dBA were in the range of 8 to 10 minutes per day and occurred in Concord and Lincoln near the Brooks Tavern and houses. These are among the closest sites in the park to Hanscom Field's runways and experience noise from Runway 29 and Runway 23 as well as pattern operations. The sites in MMNHP are expected to experience TA55 for the future scenarios that range from 17 to 55 minutes per day for the 2030 scenario and 18 to 59 minutes per day for the 2040 scenario.

Table 7-27. Time Above 65 dB at Noise Analysis Locations in the Minute Man National Historical Park (minutes)

Label[1]	Name[2]	Unit/Town[3]	2012	2017	2022	2030	2040
MM-1	Major John Buttrick House	North Bridge Unit / Concord	3.1	4.2	5.2	5.7	6.3
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (North Bridge Visitor Center)	North Bridge Unit / Concord	2.8	3.9	5.1	5.6	6.2
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	2.7	3.8	5.0	5.5	6.1
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	2.5	3.4	4.7	5.2	5.7
MM-5	North Bridge	North Bridge Unit / Concord	2.7	3.5	4.9	5.4	5.9
MM-6	Old Manse *	North Bridge Unit / Concord	2.9	3.7	5.1	5.7	6.2
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	5.7	6.3	3.3	3.6	3.9
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	5.7	6.3	3.4	3.7	4.0
MM-9	Meriam House	Battle Road Unit / Concord	6.2	6.7	3.8	4.1	4.5
MM-10	Historic Farming Fields	Battle Road Unit / Concord	7.0	7.9	5.2	5.6	6.1
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	4.7	6.9	4.6	4.9	5.3
MM-12	Samuel Brooks House	Battle Road Unit / Concord	6.6	10.5	7.7	8.1	8.8
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	7.3	10.4	8.1	8.6	9.2
MM-14	Job Brooks House	Battle Road Unit / Lincoln	8.0	10.5	8.3	8.8	9.5
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	7.1	9.6	7.7	8.1	8.8
MM-16	Bloody Angle	Battle Road Unit / Lincoln	7.3	8.1	6.1	6.4	6.8
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	4.1	4.9	3.9	4.1	4.3
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	2.9	3.6	4.1	4.3	4.5
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	1.5	2.3	3.8	3.9	4.1
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	1.1	2.0	1.5	1.6	1.7

Label[1]	Name[2]	Unit/Town[3]	2012	2017	2022	2030	2040
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	1.0	2.0	3.1	3.3	3.4
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	1.3	2.0	1.3	1.5	1.5
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	1.8	2.2	1.8	2.0	2.1
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	1.9	2.3	2.0	2.1	2.2
MM-25	Parkers Revenge	Battle Road Unit / Lexington	1.9	2.3	2.1	2.3	2.4
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	1.4	2.0	1.8	2.0	2.1
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	1.6	2.2	2.0	2.1	2.2
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	1.5	2.4	1.9	2.1	2.2
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	1.6	2.3	1.9	2.1	2.2
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	2.0	3.2	1.9	2.1	2.3
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	0.7	1.4	1.4	1.5	1.6

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.
Source: HMMH 2023

Table 7-28. Time Above 55 dB at Noise Analysis Locations in the Minute Man National Historical Park (minutes)

Label[1]	Name[2]	Unit/Town[3]	2012	2017	2020	2030	2040
MM-1	Major John Buttrick House	North Bridge Unit / Concord	26.6	33.4	30.7	33.8	37.1
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	26.1	32.2	30.1	33.1	36.2
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	25.8	32.0	29.8	32.8	35.9
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	25.1	31.4	28.2	31.0	33.8
MM-5	North Bridge	North Bridge Unit / Concord	25.8	32.1	28.8	31.7	34.6
MM-6	Old Manse *	North Bridge Unit / Concord	26.3	32.8	28.6	31.4	34.3
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	34.4	42.3	28.2	30.7	33.4
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	47.0	49.6	35.9	38.9	42.1
MM-9	Meriam House	Battle Road Unit / Concord	51.0	51.4	38.3	41.5	44.9
MM-10	Historic Farming Fields	Battle Road Unit / Concord	77.2	65.1	50.9	54.9	59.1
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	57.1	58.3	40.5	43.4	46.6
MM-12	Samuel Brooks House	Battle Road Unit / Concord	52.3	55.3	35.6	38.0	40.7
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	51.1	52.4	34.0	36.3	38.8
MM-14	Job Brooks House	Battle Road Unit / Lincoln	57.2	54.9	36.5	39.1	41.8
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	53.2	51.5	34.2	36.6	39.1
MM-16	Bloody Angle	Battle Road Unit / Lincoln	84.4	64.0	43.2	46.2	49.1
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	72.5	50.7	37.2	39.7	41.9
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	63.5	44.7	35.2	37.5	39.5
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	45.7	33.3	29.9	32.0	33.5
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	31.0	24.9	21.3	23.0	24.1

Label[1]	Name[2]	Unit/Town[3]	2012	2017	2020	2030	2040
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	25.9	22.5	23.2	24.8	25.9
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	32.7	25.2	19.9	21.7	22.8
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	42.6	30.0	23.0	25.1	26.6
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	43.1	30.1	23.3	25.5	27.0
MM-25	Parkers Revenge	Battle Road Unit / Lexington	41.1	28.7	22.8	24.9	26.4
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	31.3	23.9	19.7	21.5	22.8
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	32.5	24.2	20.4	22.3	23.7
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	24.4	20.3	17.9	19.5	20.7
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	29.7	22.9	19.6	21.4	22.7
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	19.8	18.1	15.6	17.1	18.3
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	11.9	16.5	15.5	17.0	18.5

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. 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.
Source: HMMH 2023

7.8 Stakeholder Engagement and Beneficial Measures

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 Massport regulations in 1980.[177] The regulation included restrictions on touch-and-go training activity, as well as a 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, installation and maintenance of a Noise and Operations Monitoring system, implementation of a Fly Friendly program, and membership in Sound Initiative. In 2009, Massport made some adjustments to

[177] Part F of the General Rules and Regulations for Laurence G. Hanscom Field Effective July 31, 1980.

the touch-and-go flight tracks, which reduced the number 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 through Massport's website;[178] it is required training for all tenants who receive airport badges.

Restrictions on touch-and-go activity and nighttime use fees at Hanscom are measures that were established before such measures were prohibited by the Airport Noise and Capacity Act of 1990 (ANCA) and are grandfathered in.[179] 14 CFR Part 161.3 (a) exempts restrictions on aircraft operations in effect prior to October 2, 1990.

7.8.1 Community Meetings

Massport strives to build positive community relations and public confidence by maintaining open communications and by supporting programs that assist in addressing the concerns of Hanscom Field's stakeholders and host communities. Massport sponsors informational meetings with the communities and other interested parties when appropriate. Massport staff regularly attend the monthly meetings of the Hanscom Field Advisory Commission (HFAC) to inform the public of airport planning and policy developments. Massport staff also attend the Hanscom Area Towns Committee (HATS) meetings when they are held.

The HFAC was established by the legislature in 1980 to review Massport decisions regarding its goals, policies, and plans for the Airport. It includes representatives from the aviation and residential communities as well as advisory members who represent MMNHP, Hanscom AFB, the FAA, and Massport. Massport staff members provide HFAC with information regarding Massport's goals, policies, and plans for the Airport. Additionally, staff members prepare and present monthly aircraft activity and noise reports, capital program and third-party development status reports, as well as the annual State of Hanscom report and the Annual Noise Report.

HATS was created to consider matters of common interest to the towns of Bedford, Concord, Lexington, and Lincoln, which are all contiguous to Hanscom Field and Hanscom AFB. One select board member from each town serves on HATS along with planning board representatives and two at-large members from the towns. HATS representatives consider regional traffic, planning, land use and other issues. Massport staff members attend the HATS meetings to address Massport-related agenda items, participate in discussions, and respond to questions relating to Hanscom Field and Massport.

7.8.2 Community Contributions

Massport's Charitable Contribution, Scholarship, Summer Internship, and Community Summer Jobs Programs benefit organizations located in communities that host its facilities. The organizations serve a

[178] Massport Noise Abatement at Hanscom Field website, accessed at: https://www.massport.com/hanscom-field/about-hanscom/noise-abatement/

[179] Passage of ANCA subsequently prohibited operation of Stage 2 aircraft with a maximum weight above 75,000 pounds within the United States after December 31, 1999. This prohibition provided noise benefits around airports nationwide. As a result of ANCA, airport operators could not establish additional operational restrictions on Stage 2 (or quieter) aircraft in flight except by request through 14 CFR art 161, Notice and Approval of Airport Noise and Access Restrictions. The FAA Modernization and Reform Act of 2012 prohibits operation of any aircraft not complying with Stage 3 within the 48 contiguous United States after December 31, 2015, eliminating any further airport sponsored efforts to do so.

diverse constituency and a variety of worthwhile purposes. In 2022, Massport sponsored summer internship positions at various municipal departments in the towns surrounding Hanscom as well as various youth recreational and educational organizations.

7.8.3 Run-up Procedures

Hanscom Airport Activity Monitor website includes:

- Noise disturbance entry
- Near-real-time and historical aircraft flight tracks
- Customized reports for any time period for DNL, hourly Leq, and noise events at the permanent noise monitors

Note: Flight track data is delayed by 10 minutes for security purposes.

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 5/23. 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 In 1999, 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 relocated 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. Operators are required to request permission to perform nighttime maintenance run-ups.

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 5/23, 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 more recently constructed homes along Virginia Road (relative to levels during run-ups conducted at the run-up pad). This heading is desirable for any 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.

7.8.4 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 their use is part of takeoff procedures, or for 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.

7.8.5 Nighttime 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" surcharge was instituted to discourage the use of the field during those hours. The fee is based on aircraft weight and doubles for aircraft that conduct more than five nighttime operations in a calendar year. In 1980, the surcharges were $20 for aircraft weighing 12,500 pounds or less and $150 for aircraft weighing more than 12,500 pounds.

In 1989, Massport's 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 1 to June 30 annually. As a result, the surcharges were $66 and $477 for the first six months of 2022, and $72 and $518 for the second half of 2022.

Some operations are exempt from the fee. The overwhelming majority of exemptions are medical flights, which are dominated by the medical evacuation service Boston MedFlight based at Hanscom Field. Exemptions also included military, FAA, and Civil Air Patrol operations, as well as Hanscom Field 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.

7.8.6 Noise and Operations Monitoring System

Massport's original NOMS was installed in 1989. It included six permanent noise monitors near Hanscom Field. In 2004, Massport selected Rannoch Corporation, which became Harris Corporation, to replace the system's microphones and software. In February 2023, Passur Aerospace acquired the NOMS license. The current NOMS incorporates state-of-the-art capabilities that have improved the accuracy, efficiency, usefulness, reliability, and user-friendliness of the system. Massport recently upgraded all of the permanent noise monitoring equipment. The NOMS is continuously improved to increase the accuracy and usefulness of the data as well as ease of use. 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 was available in the past. An interactive website has been developed for public use.[180] Data from the system are shared with the communities on a monthly basis at the HFAC meetings.

7.8.7 Fly Friendly Program

Massport began supporting the use of the NBAA's noise abatement procedures for jet aircraft in the mid-1980s and the Fly Friendly program at Hanscom Field provided an opportunity to broaden such

[180] http://www.massport.com/hanscom-field/about-hanscom/airport-activity-monitor/

efforts. Massport expanded its support of quiet arrival and departure techniques by publicizing the AOPA's noise abatement procedures for piston aircraft and by developing and publicizing quiet flying procedures for helicopters. Part of this effort included the development of a multi-faceted publicity program that results in pilots being exposed and re-exposed to the importance and understanding of the quiet-flying techniques, as follows:

- Handouts outlining the procedures are distributed at the FBOs, the flight schools, and in Massport's Hanscom Field offices.
- Framed posters describing noise abatement procedures are located in the flight schools' offices, Massport's offices, and the fixed base operators' facilities.
- Videos describing the techniques for both jet and piston aircraft are incorporated into the training required to qualify for a Hanscom Field security badge.
- Descriptions of these quiet flying procedures are posted on Massport's website.
- Signage on the airfield provides a last-minute reminder to departing pilots to use quiet flying techniques.

7.8.8 Touch-and-Go Program

In late 2009, Massport staff began using flight track data created by the new noise monitoring system to identify potential opportunities for reducing touch-and-go traffic over the Hartwell Tavern area in the MMNHP. Massport also initiated communications with the FAA and the Hanscom Field flight schools to identify practical recommendations and help create an implementation program. Working together, the group devised touch-and-go patterns for each runway to safely increase the number of flights that fly over airport property as opposed to over the park, which inherently minimizes aircraft noise for the park's visitors. An aggressive publicity program was implemented, including the display of framed posters, mailings, meetings with pilots and flight instructors, and local press coverage.

Massport staff has since continued to work with local pilots and the FAA to reduce the number of flights over the MMNHP. Flight track data is reported quarterly. Results of the touch and go program are shared with pilots, certified flight instructors, the FAA and MMNHP staff. Massport also communicates MMNHP special events to local pilots and encourages the flying community to review Hanscom Field's Fly Friendly recommendations.

7.8.9 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 Field'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.

8 Air Quality

This chapter of the 2022 ESPR describes air quality and pollutant emissions within the Hanscom Field study area from aircraft activity and from motor vehicles accessing the airport. The 2030 and 2040 future scenarios represent estimates of what could occur (not what will occur) in the future using the forecast assumptions as described in Chapter 3.

This chapter also provides background information on regulations addressing air quality at the state and federal levels, includes a summary of the current state of FAA research into a replacement for leaded aviation fuel, and discusses sustainable alternatives for jet fuel. Carbon monoxide, nitrogen oxides, volatile organic compounds, lead, sulfur dioxide, and particulate matter emissions from aircraft operations, ground support equipment, and vehicular traffic are described and quantified. Current emissions levels are compared to those described in prior ESPRs, as well as to projected future levels in 2030 and 2040.

Massport has a sustainability and resiliency plan, which includes the preparation of Greenhouse Gas (GHG) emission inventories from their facilities and operations. This document includes a GHG emissions inventory for Hanscom Field, which is compared to the inventory prepared for the 2017 ESPR.

8.1 Air Quality Key Findings

> **Air quality in the region currently meets standards**
>
> - Regional air quality currently meets all National and Massachusetts Ambient Air Quality Standards (NAAQS & MAAQS) set by the EPA and the Massachusetts Department of Environmental Protection (MassDEP).
> - The region is forecasted to be "in attainment" for all pollutants in both future year scenarios (2030 and 2040).
> - Aircraft emissions for CO, PM, and CO_2 decreased between 2017 and 2022, while NO_X and VOCs increased.

The EPA has set standards for six criteria pollutants to protect human health and welfare, which include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2). To maintain consistency with previous ESPRs, Massport calculated the 2022 annual emissions of CO, PM, Carbon Dioxide (CO_2), Nitrous Oxides (NO_X), and Volatile Organic Compounds (VOC) from aircraft operations and motor vehicles at Hanscom Field. Ozone is not calculated and reported directly, rather, the analysis reports on NO_X and VOCs, which are precursors to O_3. As explained in section 8.2.1, NO_X includes NO_2. Pb analysis is provided in section 8.6.4. Middlesex County has never been classified as nonattainment for SO_2, so that pollutant is not included in the emissions inventory in this chapter.

Emissions values for 2022 are compared in this chapter to previous operational emissions calculated for Hanscom Field in 1995, 2000, 2005, 2012, and 2017, as published in the *2017 ESPR*. Results of the analysis demonstrate that emissions associated with the operations at Hanscom Field continue to represent a very small fraction of Middlesex County's total emissions. The forecasted emissions from Hanscom Field for both forecast years are not anticipated to result in adverse air quality effects. The results demonstrate that air quality concentrations in Bedford, Concord, Lexington, Lincoln, MMNHP, and GMNWR will be in compliance with Massachusetts and National Ambient Air Quality Standards (NAAQS).

The Massachusetts Department of Environmental Protection (MassDEP) air monitoring data for the Greater Boston area was summarized and analyzed for the *2022 ESPR* to evaluate air quality trends in the region for 10 to 20 years (varies by pollutant) prior to and including 2022. As with prior ESPRs, Massport utilized MassDEP air quality monitoring data from Kenmore Square and Chelmsford monitoring locations as the closest most representative locations to determine air quality levels for Hanscom Field. Historical air quality monitoring data from MassDEP shows that air quality in the Greater Boston area has improved significantly since 2002, as shown in Figure 8-4 in Section 8.3.2.

Key findings of the current and estimated emissions from Hanscom Field include the following:

- Middlesex County is classified as in attainment for all six criteria pollutants.
- Hanscom Field emissions comprise a very small portion of the total emissions in Middlesex County, ranging from 0.02 percent of PM_{10} emissions to 0.54 percent of CO emissions.
- Estimated emission dispersion concentrations forecasted for 2040 at all 10 community receptors related to aircraft and traffic emissions are in compliance with the NAAQS and MassDEP 1-hour NO_2 policy guidelines.
- From 2017 to 2022, estimated total emissions of CO, PM, and CO_2 decreased between 2017 and 2022, and NO_X, and VOC increased.
- From 2022 to 2030, estimated total emissions of CO and PM are expected to decrease, and emissions of NO_X, VOC, and CO_2 are expected to increase.

- Estimated total emissions for all reported pollutants are expected to increase from 2030 to 2040 due to forecasted increases in operations.
- Ground transportation emissions of CO, NO_X, VOC, and PM are expected to decrease in the future year scenarios due to the phasing out of older, less efficient vehicles in addition to implementation of more stringent EPA emission standards which will offset any expected increases in vehicle miles traveled.

To maintain consistency with the Logan Airport environmental reporting process, Massport added an airport-wide GHG inventory to the Hanscom Field ESPR analyses in 2017 to establish a GHG baseline condition for Hanscom Field. The GHG inventory has been updated for 2022 and is compared to the *2017 ESPR* baseline conditions in this *2022 ESPR*. Key findings for GHG emissions include the following:

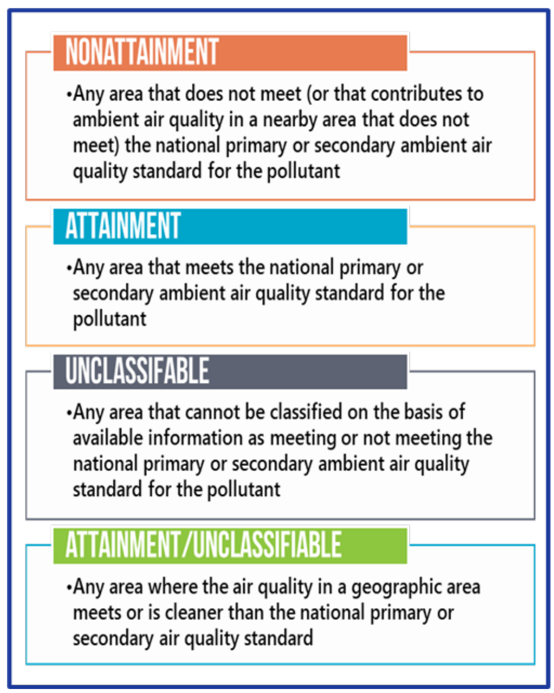
- In 2022, Hanscom Field accounted for less than 0.01% of 2019 Massachusetts statewide CO_{2e} total emissions.
- GHG emissions have decreased from the 2017 baseline year to the 2022 analysis year.
- Aircraft and vehicle GHG emissions for the 2030 and 2040 future year scenarios are forecasted to be higher than for 2022 but would continue to be a small fraction of Massachusetts statewide totals.

8.2 Regulatory Background

The United States Clean Air Act (CAA) requires the EPA to set, review, and periodically update the NAAQS for six common pollutants known as criteria air pollutants: CO, Pb, NO_2, O_3, PM (specifically, PM_{10} and $PM_{2.5}$), and SO_2.

The EPA sets the NAAQS at levels that are intended to protect public health and the environment. A geographical region (such as a county) is deemed as "in attainment" (in compliance), or "nonattainment" (not in compliance) with the standards based on emission levels of each criteria pollutant.[181] Areas without sufficient air quality monitoring data to make a determination of attainment are designated as unclassifiable. **Figure 8-1** provides definitions of air quality designations under the NAAQS.

Figure 8-1. Clean Air Act Designations for NAAQS



Source: EPA NAAQS Implementation Process

States are required to develop State Implementation Plans (SIPs)[182] to meet and maintain air quality standards while complying with the EPA to set

[181] The NAAQS include primary standards designed to protect public health, including the most vulnerable populations, and secondary standards, intended to protect public welfare (i.e., visibility, animals, crops, vegetation, and buildings).

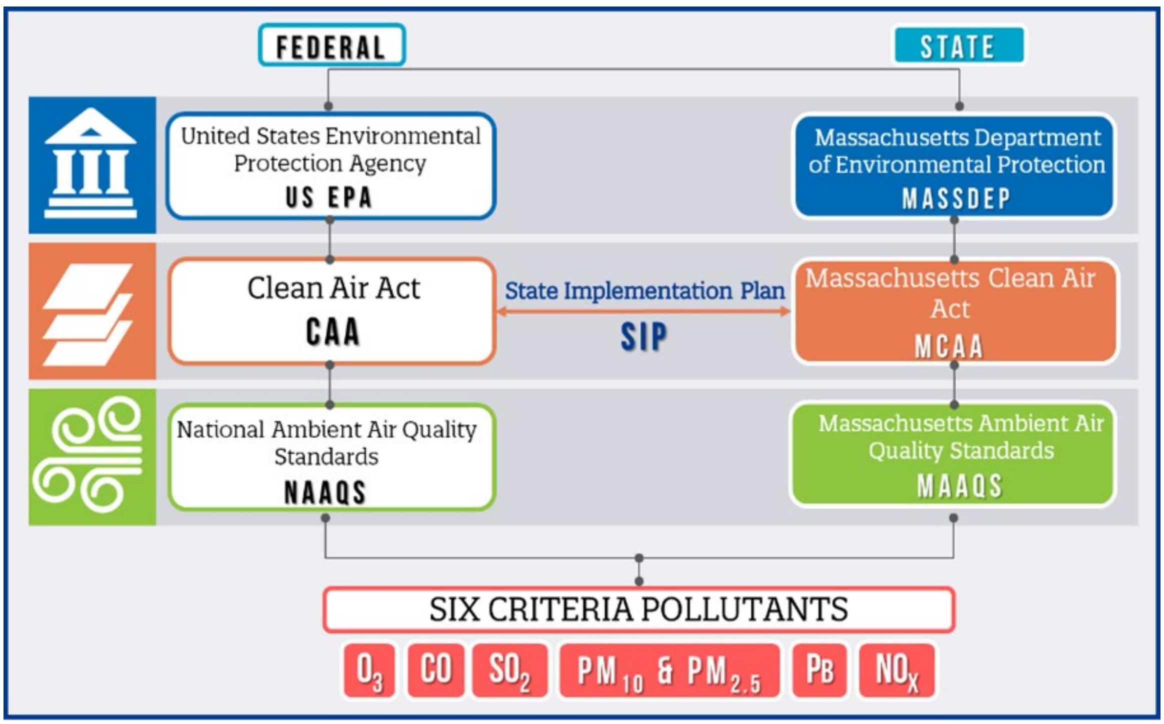
[182] *Massachusetts State Implementation Plans (SIPs).* https://www.mass.gov/lists/massachusetts-state-implementation-plans. Accessed on August 18, 2023.

timeframes and milestones for compliance. The SIP serves two main purposes:

1. Demonstrate that the state has the basic air quality management program components in place to implement a new or revised NAAQS.
2. Identify the emissions control requirements the State will rely upon to attain and/or maintain the primary and secondary NAAQs.[183]

MassDEP is the designated state agency for the implementation of the SIP for Massachusetts. MassDEP is responsible for monitoring outdoor air quality in the state as well as developing plans and regulatory programs to reduce emissions of pollutants that can adversely affect public health, welfare, and the environment. MassDEP ensures compliance with the Massachusetts Clean Air Act (MCAA)[184] and its associated Massachusetts Ambient Air Quality Standards (MAAQS)[185] for criteria pollutants in addition to the federal air quality regulations. The MAAQS vary from federal standards in both acceptable pollutant emission quantities and the methodology of determining compliance. The relationship between the federal and state air quality regulations are shown in **Figure 8-2**. Hanscom Field is in compliance with both the NAAQS and the MAAQS standards, as reported in Section 8.4.3.

Figure 8-2. Relationship Between Federal and State Air Quality Regulations



Source: EPA NAAQS Implementation Process

183 U.S. EPA. June 2023. *NAAQS Implementation Process*. https://www.epa.gov/criteria-air-pollutants/naaqs-implementation-process. Accessed on August 17, 2023.

184 *Commonwealth of Massachusetts General Laws Title XVI Chapter 111 Section 142A. Massachusetts Clean Air Act.* https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section142a. Accessed on August 17, 2023.

185 Massachusetts Department of Environmental Protection 310 CMR 6.00: Ambient Air Quality Standards 06/14/2019. https://www.mass.gov/regulations/310-CMR-600-ambient-air-quality-standards. Accessed on August 17, 2023.

8.2.1 Criteria Air Pollutant Definitions and Air Quality Standards

The primary sources of CO, Pb, NO_2, O_3, PM, and SO_2 at Hanscom Field are aircraft operations, ground support equipment (GSE), stationary sources (such as generators), motor vehicles, and construction activity. Fuel storage and transfer is a source of both NO_2 and volatile organic compounds (VOCs), which are precursors to O_3. Low-lead fuel used in piston-engine aircraft operations is still a source of lead emissions at Hanscom Field.

Pollutant concentrations are measured in units of micrograms of pollutant per cubic meter of air ($\mu g/m^3$) or in parts per million (ppm) or parts per billion (ppb). For clarity, the data given in this chapter provide both metrics wherever possible.

Carbon Monoxide (CO)

CO is an odorless, colorless, and tasteless gas which is most chemically stable at lower temperatures, allowing CO to accumulate temporarily in cool, calm weather conditions during times of peak fuel use. CO from natural sources usually dissipates quickly, posing no threat to human health. Transportation sources (e.g., motor vehicles), energy generation, and open burning are among the predominant man-made sources of CO. In the EPA's most recent review of the CO standards in August 2011, the EPA retained the existing primary CO standards of 9 ppm measured over 8 hours, and 35 ppm measured over 1 hour. Section 8.4 contains additional discussion and emissions of CO at Hanscom Field for 2022 and forecast years 2030, and 2040.

Lead (Pb)

The main producers of lead in the atmosphere are generated from industrial sources including waste oil and solid waste incineration, iron and steel production, lead smelting, and battery and lead manufacturing. The lead content of motor vehicle emissions, which was the major source of air-borne lead in the past, has significantly declined with the widespread use of unleaded fuel. Low-lead fuel[186] used in piston-engine general aviation (GA) aircraft is still a source of airport-related lead in the atmosphere.[187] Lead emissions can enter the body though inhalation or can be ingested via plants, water, and soil.

The most recent lead NAAQS were set in 2008 at 0.15 $\mu g/m^3$, when the EPA revised the prior standard following a finding that serious health effects can occur with much lower levels of lead in the blood stream than previously identified.[188] On September 16, 2016, the EPA issued a decision following review of the air quality criteria for lead, confirming the existing 2008 standards without revision. Periodic review of the standard is intended to protect public health, specifically protecting at-risk groups in the population, including children.

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[186] Leaded Avgas contains Tetraethyl Lead (TEL), an organic compound which is utilized to boost octane. Octane is a performance measure which is defined as a "a measure of a gasoline's ability to resist detonation, or knock". Without TEL, octane levels in some aircraft would be too low, which can lead to engine failure.

[187] FAA. Leaded Aviation Fuel and the Environment, https://www.faa.gov/newsroom/leaded-aviation-fuel-and-environment#:~:text=First%20and%20foremost%2C%20the%20use,could%20lead%20to%20engine%20failure. Accessed on April 3, 2024.

[188] EPA. *National Ambient Air Quality Standards (NAAQS) for Lead (Pb).* https://www.epa.gov/lead-air-pollution/timeline-lead-pb-national-ambient-air-quality-standards-naaqs" Accessed on September 17, 2023.

On October 20, 2023, the EPA published a "Finding that Lead Emissions from Aircraft Engines that Operate on Leaded Fuel Cause or Contribute to Air Pollution that May Reasonably Be Anticipated to Endanger Public Health and Welfare".[189] Most aircraft that operate on leaded aviation gasoline are piston-engine aircraft. More discussion of lead fuel use and information on the current status of lead research is included in Section 8.6.4.

Nitrogen Dioxide (NO_2)

Nitric oxide (NO), nitrogen dioxide (NO_2), and the nitrate radical (NO_3) are collectively known as oxides of nitrogen (NO_X). These three compounds are interrelated, often changing from one form to another in chemical reactions. NO_2 is the compound commonly measured for comparison to the NAAQS. NO_X is generally emitted in the form of NO, which is oxidized to NO_2. In addition to aircraft engines, the principal man-made sources of NO_X are fuel combustion in motor vehicles and power plants. Reactions of NO_X with other atmospheric chemicals can lead to formation of ozone (O_3) and as a result, acidic precipitation. In April 2018, the EPA reviewed and retained the existing primary NO_2 standard of 100 ppb measured over 1 hour, and a primary and secondary standard of 53 ppb averaged over 1 year.[190]

In addition to the federal regulatory standards, Massachusetts has a specific 1-hour ambient NO_2 guideline value of 320 $\mu g/m^3$ which is typically applied to new large stationary sources. Because Hanscom Field is not considered a stationary source, this value is not applicable to Hanscom Field in a regulatory sense, but Massport has used the guideline in previous airport air quality assessments (including the *2017 ESPR*), so it is applied in this *2022 ESPR* for consistency. The federal 1-hour standard of 100 ppb was also considered in the air dispersion modeling of the baseline and future conditions in 2030 and 2040. Section 8.4 provides additional discussion and emissions of NO_X at Hanscom Field for 2022 and forecast years 2030, and 2040.

Ozone (O_3)

O_3 is a secondary pollutant, primarily formed from reactions of NO_X and VOCs in the presence of sunlight. VOCs are a subset of hydrocarbons and are not regulated at the federal level through the NAAQS. VOCs are released into the atmosphere mainly through industrial processes and from evaporation of gasoline and solvents. of O_3 are not reported directly in the emissions analysis provided in section 8.4; NOx and VOC emissions are quantified.

In 2015, the EPA lowered the 8-hour ozone standards to 0.070 ppm. In December 2017, the EPA designated all of Massachusetts as Unclassifiable/Attainment for the 2015 standard. Following its most recent review of the ozone standards, in December 2020 the EPA retained the existing ozone standards.[191]

Tropospheric O_3 (at ground level) and Stratospheric O_3 (in the upper atmosphere) are the same chemical compound found at different heights within the earth's atmosphere. Stratospheric O_3 (above 30,000 feet from the surface) is beneficial to life on earth as it helps to filter out the sun's harmful UV radiation before it reaches the earth's surface. However, ground-level O_3 poses a threat to health and the environment. Tropospheric O_3 can be transported long distances due to wind and atmospheric circulations. This means

[189] Finding that Lead Emissions From Aircraft Engines That Operate on Leaded Fuel Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare. https://www.govinfo.gov/content/pkg/FR-2023-10-20/pdf/2023-23247.pdf. Accessed on December 11, 2023.
[190] EPA. *National Ambient Air Quality Standards (NAAQS) for Nitrogen Dioxide.* https://www.epa.gov/no2-pollution/primary-national-ambient-air-quality-standards-naaqs-nitrogen-dioxide. Accessed November 27, 2023.
[191] MassDEP, https://www.mass.gov/doc/2022-annual-air-quality-report/download. Accessed November 22, 2023.

that rural areas may have high levels of ozone depending on the wind flow and proximity to large urban areas.[192] The discussion of O_3 in this report pertains exclusively to ground level O_3. Additional discussion and emissions of NO_X and VOC (precursors to Ozone) at Hanscom Field for 2022 and forecast years 2030, and 2040 can be found in Section 8.4.

Particulate Matter (PM)

PM is comprised of very small particles of dirt, dust, soot, or liquid droplets also known as aerosols. The NAAQS for PM are segregated by particle size (i.e., less than 10 microns and less than 2.5 microns are designated as PM_{10} and $PM_{2.5}$, respectively). PM can be formed and emitted as an exhaust product in an internal combustion engine. PM can also be generated from the breakdown and dispersion of other solid materials (e.g., fugitive dust).

On February 7, 2024, the EPA strengthened the NAAQS for PM. Particle or “soot” pollution is one of the most dangerous forms of pollution, and extensive science links particle pollution to a range of serious and sometimes deadly illnesses. The EPA has set the new primary annual $PM_{2.5}$ standard at 9.0 µg/m^3 to help reduce PM pollution and to provide increased public health protection.[193] The EPA is not changing the primary and secondary (welfare-based) 24-hour $PM_{2.5}$ standards, secondary annual $PM_{2.5}$ standard, and primary and secondary PM_{10} standards. The EPA is also revising the Air Quality Index to improve public communications about the risks of $PM_{2.5}$ exposures and making changes to the monitoring network to protect and enhance air quality in communities. Section 8.4 contains additional discussion and emissions of PM at Hanscom Field for 2022 and forecast years 2030, and 2040.

Sulfur Dioxide (SO_2)

SO_2 is emitted through natural processes and from man-made sources such as combustion of fuels containing sulfur and manufacturing of sulfuric acid. Sulfur oxides (SO_X) are primarily composed of SO_2 and sulfur trioxide SO_3. In 2019, the Primary SO_2 standards were reviewed, and the EPA made a determination to keep the existing primary SO_2 standard of 75 ppb without revision.[194] Furthermore, in December 2018, the EPA designated all of Massachusetts as Unclassifiable/Attainment for the 2010 standard.

The national and state standards for each criteria pollutant are summarized in **Table 8-1**.

[192] Ground Level Ozone Basics. https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics . Accessed April 3, 2024.
[193] https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm. Accessed February 8, 2024
[194] Timeline of Sulfur Dioxide National Ambient Air Quality Standards (NAAQS). https://www.epa.gov/ground-level-ozone-pollution/ozone-national-ambient-air-quality-standards-naaqs. Accessed August 20, 2023.

Table 8-1. National and Massachusetts Criteria Pollutant Standards (NAAQS and MAAQS)

Pollutant	Averaging Time	NAAQS		MAAQS Standard
		Primary Standards	Secondary Standards	
CO	8-Hour[1]	9 ppm	None	9 ppm
	1-Hour[1]	35 ppm	None	35 ppm
Lead (Pb)	Rolling 3-Month Average	0.15 µg/m^3	Same as Primary	0.15 µg/m^3
NO_2	Annual	53 ppb	Same as Primary	53 ppb
	1-Hour[2]	100 ppb	None	100 ppb
Ozone (O_3)	8-Hour (1997 Standard) (Revoked)[3]	0.08 ppm	Same as Primary	None
	8-Hour[4] (2008 Standard)	0.075 ppm	Same as Primary	None
	8-Hour (2015 Standard)[5]	0.070 ppm	Same as Primary	0.070 ppm
	1-Hour[6]	None	None	None
PM_{10}	Annual[7]	None	None	None
	24-Hour[8]	150 µg/m^3	Same as Primary	150 µg/m^3
$PM_{2.5}$	Annual[9,10]	9 µg/m^3	15 µg/m^3	None
	24-Hour[11]	35 µg/m^3	Same as Primary	None
SO_2	3-Hour[1]	None	0.5 ppm	None
	1-Hour	75 ppb	None	75 ppb

Notes:
1. Not to be exceeded more than once a year.
2. To attain this standard, the three-year average of the 98th percentile of the daily maximum one-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010). MassDEP NO_2 Policy Guideline level not to be exceeded more than one day per year.
3. The 1997 8-hour ozone standard was revoked in 2015. Federal Register, March 6, 2015
4. Three-year average of annual 4th highest daily maximum 8-hour ozone concentration.
5. The 2015 8-hour ozone standard was lowered in 2015 to 0.070 ppm. Standard based on the annual fourth-highest daily maximum concentration averaged over 3 years.
6. The 1-hour ozone standard was revoked for most areas nationwide in 2005. https://www.govinfo.gov/content/pkg/FR-2005-08-03/pdf/05-15218.pdf#page=1
7. The annual PM_{10} standard was revoked nationwide in 2006. https://www.govinfo.gov/content/pkg/FR-2006-10-17/pdf/06-8477.pdf
8. Not to be exceeded on an average over 3 years
9. Three-year average of annual $PM_{2.5}$ arithmetic means.
10. On February 7, 2024, the EPA strengthened its annual $PM_{2.5}$ standard to 9.0 µ/m^3 from 12.0 µ/m^3.
11. Three-year average of 98th percentile 24-hour $PM_{2.5}$ concentrations.
Sources: 40 CFR 50, 310 CMR 6.0, EPA, MassDEP

8.2.2 Non-Criteria Pollutant Emissions

Non-criteria pollutants have no NAAQS but are federally regulated under the federal CAA because of their potentially adverse effects on human health and the environment. They can contribute to the formation of O_3 and PM and pose a threat to human health. The non-criteria pollutants that are monitored by MassDEP are known as air toxics. These pollutants are comprised of a wide array of organic and inorganic compounds and such emissions are present in the exhaust of aircraft, APUs, GSE, and motor vehicle engines.[195] Additional information on these non-criteria pollutant emissions can be found in **Appendix E**.

Ultrafine Particulate Matter

Ultrafine particles (UFP) are defined as air particles with diameters of less than 0.1 microns. Their threat to human health is due primarily to their small size. These particles are small enough to pass through the lung tissue and into the blood stream, allowing the particles to circulate like oxygen molecules.[196] The primary sources of UFP's are combustion processes associated with burning wood or fuel or those associated with industrial manufacturing processes. UFPs also occur naturally in the environment in the form of sand and dust.[197] Aircraft emissions at Hanscom Field are just one of the many sources that contribute to UFP concentrations in the study area. Other contributors of UFPs include, but are not limited to, motor vehicle exhaust and generators.

As noted in Section 8.2.1, the EPA has recently made revisions to the PM NAAQS, including revisions to the Air Quality Index (AQI) and monitoring requirements. This decision does not include any further monitoring or regulatory standards for UFPs but does include data from a recent study conducted by the EPA on the potential health impacts of PM on the Nervous System.

Black Carbon (BC)

PM of all sizes is comprised of multiple components. One of the main components of PM is known as Black Carbon (BC). BC is the strongest light-absorbing component of PM and is primarily formed by the incomplete combustion of fossil fuels, biofuels, and biomass.[198] BC, also referred to as soot, is emitted directly into the atmosphere in the form of fine particles ($PM_{2.5}$) primarily from mobile sources, especially those with diesel engines.

In addition to the climatological impacts posed from the emissions of BC, the EPA has stated that BC poses serious health effects to those with prolonged exposure to the pollutant. "Exposure to fine particles ($PM_{2.5}$) including black carbon, can cause premature death and harmful effects on the cardiovascular system (the heart, blood, and blood vessels). Fine particle exposure is also linked to a variety of other

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[195] FAA Air Quality Handbook: https://www.faa.gov/sites/faa.gov/files/regulations_policies/policy_guidance/envir_policy/airquality_handbook/Air_Quality_Handbook_Appendices.pdf. Accessed December 6, 2023.

[196] *American Lung Association: Particle Pollution*. https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/particle-pollution#:~:text=Ultrafine%20particles%20(not%20shown)%20are,particles%20can%20harm%20your%20health. Accessed August 21, 2023.

[197] Habre R, Zhou H, Eckel SP, Enebish T, Fruin S, Bastain T, Rappaport E, Gilliland F. Short-term effects of airport-associated ultrafine particle exposure on lung function and inflammation in adults with asthma. Environ Int. 2018 Sep; 118:48-59. doi: 10.1016/j.envint.2018.05.031. Epub 2018 May 26. PMID: 29800768; PMCID: PMC6368339. Accessed August 21, 2023.

[198] Basic Information: What is Black Carbon? https://www3.epa.gov/airquality/blackcarbon/basic.html. Accessed August 21, 2023.

public health problems, including respiratory diseases. The most at-risk populations include those with heart or lung disease (including asthma), older adults, children, and people of economically disadvantaged status.[199]

8.2.3 Climate Change and Greenhouse Gas Emissions

As defined by the EPA, climate change is defined as "significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects that occur over several decades or longer."[200] These changes have both natural and man-made causes, and the latter are the result of increasing atmospheric concentrations of carbon dioxide (CO_2), methane (CH_4), nitrogen dioxide (NO_2) and other GHGs. Human activities that produce these gases include energy production and transportation activities which have resulted in the warming of the Earth's surface.[201]

In 2009, the EPA issued a finding that GHGs also contribute to air pollution that may endanger public health or welfare, which is referred to as the "Endangerment Finding."[202] This finding led to the EPA working collaboratively with the International Civil Aviation Organization (ICAO) to introduce U.S. standards with the international carbon dioxide (CO_2) emissions standards, keeping domestically manufactured aircraft competitive in the global marketplace. Aircraft that are covered by the rule account for 10 percent of all U.S. transportation GHG emissions[203] and 3 percent of total U.S. GHG emissions. Additionally, the EPA has established a Greenhouse Gas Reporting Program, which requires certain entities directly emitting more than 25,000 metric tons (MT) of CO_2 equivalent annually to report their emissions.[204]

The state of Massachusetts acknowledges climate change as an important environmental and economic issue and has taken a number of actions designed to address both the Commonwealth's contribution to climate change as well as preparing for the anticipated effects of climate change. On December 21, 2022, the Secretary of the Executive Office of Environmental Affairs released the Clean Energy and Climate Plan for 2050 (2050 CECP), which is defined as "the Commonwealth of Massachusetts' comprehensive and aggressive plan to achieve Net Zero greenhouse gas emissions in 2050. The 2050 CECP highlights a broad suite of specific goals, strategies, policies, and actions to reduce statewide gross GHG emissions by at least 85% below the 1990 baseline level, and to conserve and enhance carbon sequestration on natural and working lands to help achieve Net Zero in 2050. The 2050 CECP charts out the way Massachusetts will

[199] Fann et al., 2012, Estimating the National Public Health Burden Associated with Exposure to Ambient PM2.5 and Ozone, Risk Analysis 32(1) 81-95.

[200] EPA: Agriculture and Climate https://www.epa.gov/agriculture/agriculture-and-climate#:~:text=Climate%20change%20refers%20to%20any,over%20several%20decades%20or%20longer. Accessed August 21, 2023.

201 Causes and Effects of Climate Change. https://www.un.org/en/climatechange/science/causes-effects-climate-change#:~:text=As%20greenhouse%20gas%20emissions%20blanket,the%20usual%20balance%20of%20nature. Accessed September 6, 2023.

202 EPA GHG Endangerment Finding: https://www.epa.gov/sites/production/files/2016-08/documents/federal_register-epa-hq-oar-2009-0171-dec.15-09.pdf. Accessed August 23, 2023.

203 Regulations for Greenhouse Gas Emissions from Aircraft. https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-aircraft. Accessed August 23, 2023.

204 Total carbon dioxide equivalent, or CO2e, is calculated by applying the Global Warming Potential (GWP) values for each type of GHG in order to convert each to its equivalent mass in CO2.

achieve the emissions limit and sublimit in 2050 through building a future in which the heat in homes, power in vehicles, and the electric grid can all operate with minimum reliance on fossil fuels."[205]

In 2022, Massport launched their roadmap to reach net zero emissions by 2031, a comprehensive plan to mitigate climate impacts approximately 20 years ahead of federal- and state-mandated deadlines. Massport plans to improve energy efficiency in facilities, develop more renewable energy, invest in electric vehicles, and continue to expand their high-occupancy vehicle transportation program.[206]

The first GHG emissions inventory for Hanscom Field was a component of the *2017 ESPR*; it serves as a baseline for comparing the 2022 GHG emission inventory. Additional information on the GHG inventory prepared for this ESPR can be found in **Appendix E**.

8.2.4 Federal and State Mobile Source Emissions Standards and Regulations

Both the EPA and Massachusetts have enacted various vehicle emissions standards and measures to improve air quality and reduce airborne pollutant emissions from mobile sources.

The Corporate Average Fuel Economy (CAFE) standards were enacted in 1975 with the intention of improving the average fuel economy of passenger cars and light trucks and decreasing national fuel consumption. Today, the standards set fleet-wide average fuel economy requirements for automakers manufacturing passenger cars and light trucks, as well as medium and heavy- duty vehicles. The standards are regulated by the National Highway Traffic Safety Administration (NHTSA) and supported by the EPA GHG standards.[207]

In August 2022, the NHTSA published a notice of intent (NOI) in the federal register to prepare an EIS for to analyze potential environmental impacts of new CAFE standards for passenger cars and light trucks with model years 2027 and beyond as well as new fuel efficiency standards for heavy-duty pickup trucks and vans (HDPUVs) with model years 2029 and beyond.[208] The Draft EIS was published in July 2023. Subsequently, the NHTSA proposed rulemaking for new fuel economy standards for model years 2027 – 2032 in passenger vehicles and new fuel efficiency standards for model years 2030 – 2035 in HDPUVs, which was published in the federal register in August 2023 for public comment. If adopted, the proposal would require an industry fleet-wide average of approximately 58 miles per gallon for passenger cars and light trucks in model year 2032, in turn, increasing fuel economy by 2 percent annually for passenger cars

[205] Massachusetts Clean Energy and Climate Plan for 2050. https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2050#:~:text=Also%20on%20December%2021%2C%202022,greenhouse%20gas%20emissions%20in%202050. Accessed September 5, 2023.

[206] Massport Commitment to Net Zero. https://www.massport.com/environment/sustainability#:~:text=In%202022%2C%20Massport%20launched%20its,most%20important%20of%20all%E2%80%94achievable. Accessed on January 11, 2024

[207] *Corporate Average Fuel Economy*. https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy. Accessed on August 23, 2023.

[208] Federal Register, National Highway Traffic Administration, 87 FR 50386, https://www.federalregister.gov/documents/2022/08/16/2022-17558/notice-of-intent-to-prepare-an-environmental-impact-statement-for-model-years-2027-and-beyond. Access March 14, 2024.

and 4 percent annually for light trucks. For heavy-duty pickup trucks and vans, this proposal will increase fuel efficiency by 10 percent each year.[209]

MassDEP has enacted various emissions and fuel standards designed to improve air quality and reduce airborne pollutant emissions from mobile sources, such as the enhanced Motor Vehicle Emissions Inspection and Maintenance (I/M) Program. The program requires all vehicles to pass a vehicle safety inspection and vehicle emissions test annually. Massachusetts set up its emissions testing program with the intent of improving the air quality as well as the health of the citizens of Massachusetts. The program requires vehicles to pass an annual emissions test.[210] The Commonwealth of Massachusetts has also adopted other state programs to reduce emissions from mobile sources, including the California Low Emissions Vehicle (LEV) program and the California Zero Emissions Vehicle (ZEV) program. See **Appendix E** for details on these regulations.

The Multi State Zero Emission Vehicle (ZEV) Action plan is governed by the following initiatives:

- Increase consumer awareness and confidence in ZEVs.
- Make ZEV more affordable and provide incentives.
- Support the development of electric charging and hydrogen fueling infrastructure.

As of August 8, 2023, Massachusetts has begun offering rebates for electric vehicles through their flagship MOR-EV program. The goal of this program is to reduce air pollution and greenhouse gas emissions while supporting greater adoption of electric vehicles across the Commonwealth by offering rebates to consumers (residents, corporations, and other entities) who register their on-road zero emissions vehicles in Massachusetts. MOR-EV provides rebates for purchase or lease of eligible battery electric vehicles and fuel-cell electric vehicles, including passenger cars and medium- and heavy-duty trucks and other vehicle types.[211]

These regulations and standards are intended to further reduce mobile source emissions while increasing the prevalence of alternative fuel vehicles such as hybrid, electric, and biodiesel vehicles in the fleet mix. Alternative fuel vehicles are more efficient, resulting in much lower emissions compared to gasoline and diesel vehicles. As these newer more efficient vehicles continue to replace older, less efficient vehicles, emissions are expected to decrease. Additional information on federal and state mobile source emission standards can be found in **Appendix E**.

Reformulated Gasoline (RFG) and Vapor Recovery Systems

Although not required under the CAA, the State of Massachusetts has adopted the federal regulations for reformulated gasoline (RFG). RFG is designed to produce lower emissions of toxic substances from evaporation and to burn cleaner than conventional gasoline, resulting in improved air quality and less smog-forming pollutants. The first phase of the RFG program began in 1995, and the second (current) phase began in 2000.[212]

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[209] 88 Federal Register 56128. National Highway Traffic Safety Administration (NHTSA). https://www.federalregister.gov/documents/2023/08/17/2023-16515/corporate-average-fuel-economy-standards-for-passenger-cars-and-light-trucks-for-model-years; 49 CFR Parts 531, 533, 535, and 537. NHTSA. "Notice of proposed rulemaking; correction." https://www.govinfo.gov/content/pkg/FR-2023-08-25/pdf/2023-18310.pdf

[210] Massachusetts Vehicle Check. https://www.mavehiclecheck.com/motorists-basicinfo Accessed on January 11, 2024.

[211] Massachusetts Offers Rebates for Electric Vehicles. https://mor-ev.org/. Accessed August 23, 2023.

[212] EPA. Reformulated Gasoline. https://www.epa.gov/gasoline-standards/reformulated-gasoline. Accessed August 23, 2023.

All Massport-owned gasoline underground storage tanks are equipped with Stage II vapor control. A survey of fixed based operators (FBOs) at Hanscom Field found that Jet Aviation has Stage I vapor recovery on their fuel storage tanks and Signature Flight Support has Stage I vapor recovery on both their Avgas and gasoline fuel tanks.

8.3 Year 2022 Existing Background Conditions

The greater Boston Area, including Hanscom Field communities, is currently "in attainment" for all NAAQS[213] and MAAQS. Ozone levels remain in compliance with the new 8-hour standard and no violations of the standards were detected at the nearby Chelmsford monitoring location. Ozone concentrations in eastern Massachusetts are greatly affected by air pollution transported from the New York, New Jersey, and Connecticut metropolitan areas.

8.3.1 Local Climate

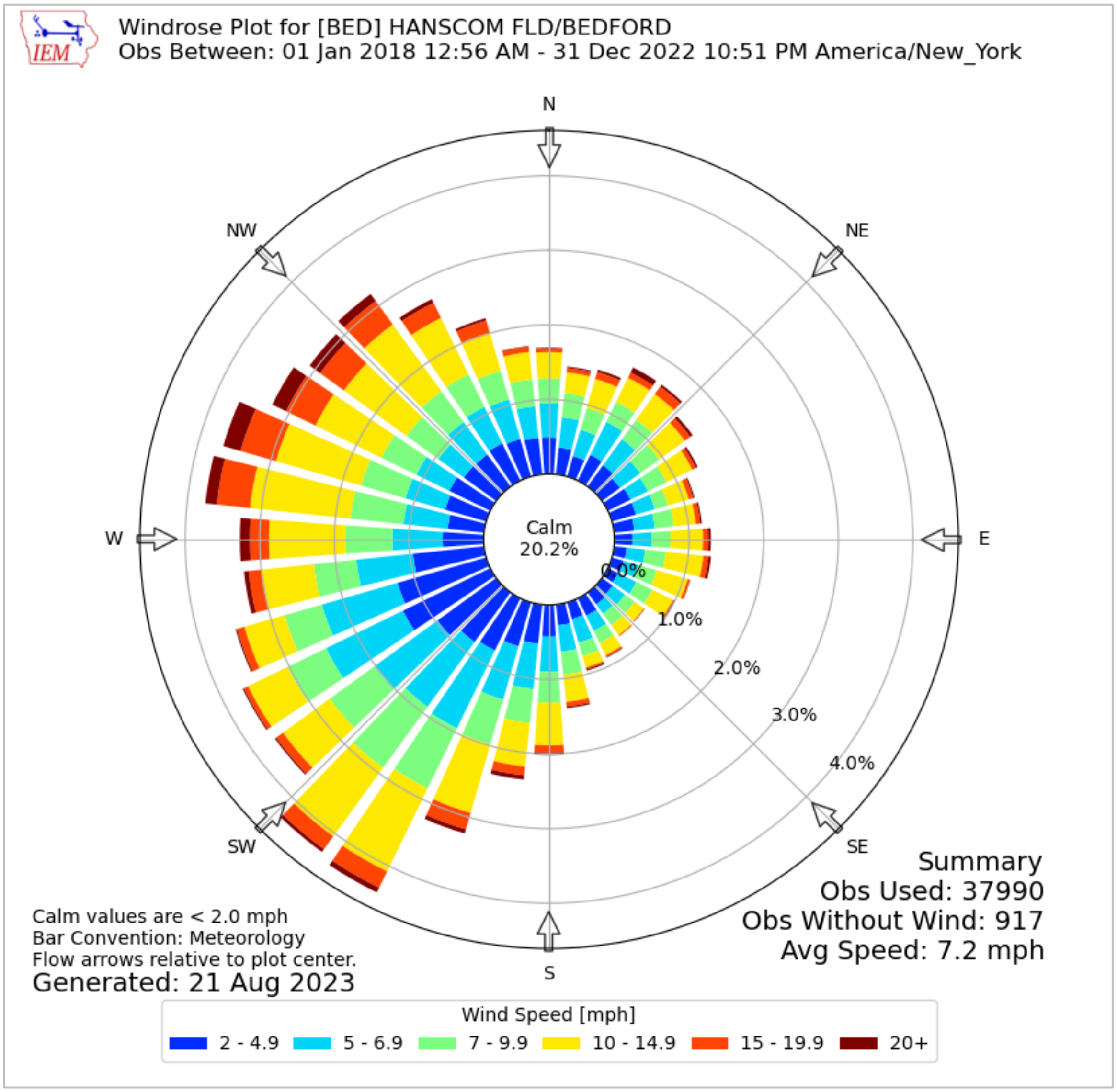
The climate at Hanscom Field is determined in part by its proximity to the Atlantic Ocean. The airport is located 16 miles inland with an elevation of approximately 130 feet above mean sea level (msl). Wind patterns at Hanscom Field are different from those in Boston, including a greater occurrence of 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, known as "Nor'easters", move up the east coast of the United States from the Carolinas and in most cases pass to the south and east of the area, resulting in northeast and easterly winds with rain, snow, and fog.[214] Annual winds are predominantly from the southwest, with winter winds from the northwest and summer winds from the southwest. **Figure 8-3** presents a wind rose for Hanscom Field, depicting a 5-year climatological average of hourly measurements taken at the airport from 2018 to 2022. The diagram shows that winds were predominantly from the southwest over the 5-year period.

Determinant factors for pollutant dispersion include:

- **Wind Direction**: Determines where emissions will travel during dilution and dispersion 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. Atmospheric instability is caused by the difference in temperature between a parcel of air and the surrounding atmosphere. Warmer air masses are less dense than the surrounding cooler atmosphere, and thus the warmer air parcel will rise. Stable conditions occur when there is less differential in temperature between an air parcel and the surrounding atmosphere, for example, at night when there is no solar heating of the ground to

[213] EPA Greenbook: Massachusetts. https://www3.epa.gov/airquality/greenbook/anayo_ma.html. Accessed August 21, 2023.
[214] National Weather Service. What is a Nor'easter. https://www.weather.gov/safety/winter-noreaster. Accessed April 3, 2024.

Figure 8-3. Annual Frequency of Wind Speed and Direction Observed at Hanscom Field



Source: Iowa State University Mesonet, HMMH 2024

8.3.2 Background Air Quality Data Sources

Following EPA guidance,[215] background concentrations of pollutants are typically determined using quality assured monitoring data from monitoring sites closest to and upwind of the project area; however, in the absence of available monitors in the vicinity of a project site, "regional sites" may be used (i.e., sites located outside of the area of interest but similar in characteristic and affected by similar or representative sources of air pollution). Since there are no MassDEP ambient air monitoring stations in the four Hanscom Field towns, the MassDEP monitoring stations in the Greater Boston area that have historically had the

[215] Title 40 Code of Federal Regulations Part 51, *Appendix W – Guideline on Air Quality Models*. December 20, 2016. https://www.gpo.gov/fdsys/pkg/CFR-2017-title40-vol2/xml/CFR-2017-title40-vol2-part51.xml. Accessed on September 7, 2023.

highest pollution levels and the longest historical records were selected to represent the Hanscom Field communities. These stations (Kenmore Square and Harrison Avenue in Boston) are located in more urban areas than Hanscom Field; therefore, the estimates are more conservative (i.e., higher pollutant concentrations) than the immediate Hanscom Field area. This approach was approved by both the MassDEP and the Secretary of Energy and Environmental Affairs as part of the scoping process for this *2022 ESPR*. The nearby Chelmsford monitor was used for evaluating ozone concentrations as it is more representative of the Hanscom Field area than the Boston monitors and is consistent with the previous *2017 ESPR*.

For the purposes of the *2022 ESPR*, the existing background air quality concentrations were added to the 2022 concentrations and forecast year concentrations for the community receptor analysis as described in Section 8.4.3.

Table 8-2 presents the background level data for the six criteria pollutants (CO, NO_2, SO_2, PM_{10}/$PM_{2.5}$, Pb, and O_3) for 2020, 2021, and 2022. MassDEP does not perform VOC monitoring on a regular basis because there is no state or national air quality standard for VOC. Although there is no background level data for VOCs, later sections of this chapter include year 2022 VOC emission inventories from Hanscom Field aircraft operations and motor vehicle traffic. Similarly, CO_2 is not a regulated air pollutant under the NAAQS; therefore, it is not included in the MassDEP data. The far-right column of Table 8-2 identifies the selected background level used for the 2022 ESPR air quality analyses; it is the highest value measured in any of the three most recent years.

The monitoring data in Table 8-2 for CO, NO_2, and $PM_{2.5}$ are from the Kenmore Square monitoring station.[216] All CO, Pb, and PM_{10} monitoring data come from the Harrison Avenue monitor in Boston. Data for O_3 is collected from the Chelmsford monitor. There are no ambient lead monitors at or near Hanscom Field; however, MassDEP actively monitors lead at its Harrison Avenue site in Boston. A review of lead monitoring data from the Harrison Avenue location shows that lead levels are well below the national lead standard of 0.15 $\mu g/m^3$.

For all pollutants except ozone, the selected monitor is in the City of Boston, where emission densities are higher than in the Hanscom Field communities. Ozone is not directly emitted from any source and tends to have higher concentrations downwind of large urban areas. Hanscom Field air quality assessments over the past three decades have used ozone data from monitoring stations in nearby towns of Sudbury, Stow, and Chelmsford.[217] 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. No violations of the ozone standard were ever recorded at the Lexington monitoring site near Hanscom Field.

Since the preparation of the *1995 GEIR*, Massport had worked with MassDEP Division of Air Quality Control to ensure that the selected monitoring data was appropriate for Hanscom Field communities. MassDEP determined that the selected monitoring data were both conservative and acceptable for use in the *1995 GEIR*.[218] Since the background data are chosen to be conservatively elevated, their use in forming total

[216] https://www.mass.gov/doc/2022-annual-air-quality-report/download. Accessed on January 11, 2024.
[217] 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.
[218] Personal communication, Mr. Charles Mentos, MassDEP Division of Air Quality Control, Boston, July 9 and 30, 1996.

forecasted concentrations, which are then compared to air quality standards, serves to protect public health with an added margin of safety.

Site-specific monitoring for NO_2 was performed for the *1995 GEIR* to test the accuracy of the analysis. 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 in Boston. Thus, the Kenmore Square data were shown to be conservative, and MassDEP did not recommend additional air quality monitoring be performed for subsequent ESPRs.[219] The air quality analysis for this *2022 ESPR* is consistent with the approach approved by MassDEP for the *2000, 2005, 2012* and *2017 ESPR* documents. As shown in Table 8-2, all background monitoring levels for each criteria pollutant are below the NAAQS standards.

Table 8-2. Background Air Quality Levels at Monitoring Locations

Pollutant[1]	Averaging Time	Levels[2] Measured In:			Background Selected	NAAQS Standards	NAAQS Classification
		2020	2021	2022			
CO (ppm)	8-Hour	1.1	1.0	1.0	1.1	9	Attainment
	1-Hour	1.573	1.499	1.568	1.573	35	Attainment
Lead ($\mu g/m^3$)	Monthly	0.007	0.004	0.009	0.009	0.15	Attainment
NO_2 (ppb)	Annual	10.32	10.12	11.51	11.51	53	Attainment
	1-Hour	46	49	55	55	100	Attainment
Ozone (ppm)	8-hour	0.067	0.059	0.059	0.067	0.070	Attainment
PM_{10} ($\mu g/m^3$)	24-Hour	25	28	34	34	150	Attainment
$PM_{2.5}$ ($\mu g/m^3$)	Annual	6.28	8.81	6.58	8.81	9	Attainment
	24-Hour	14.5	19.3	16.7	19.3	35	Attainment
SO_2 ($\mu g/m^3$)	1-hour	2.1	1.9	1.9	2.1	75	Attainment

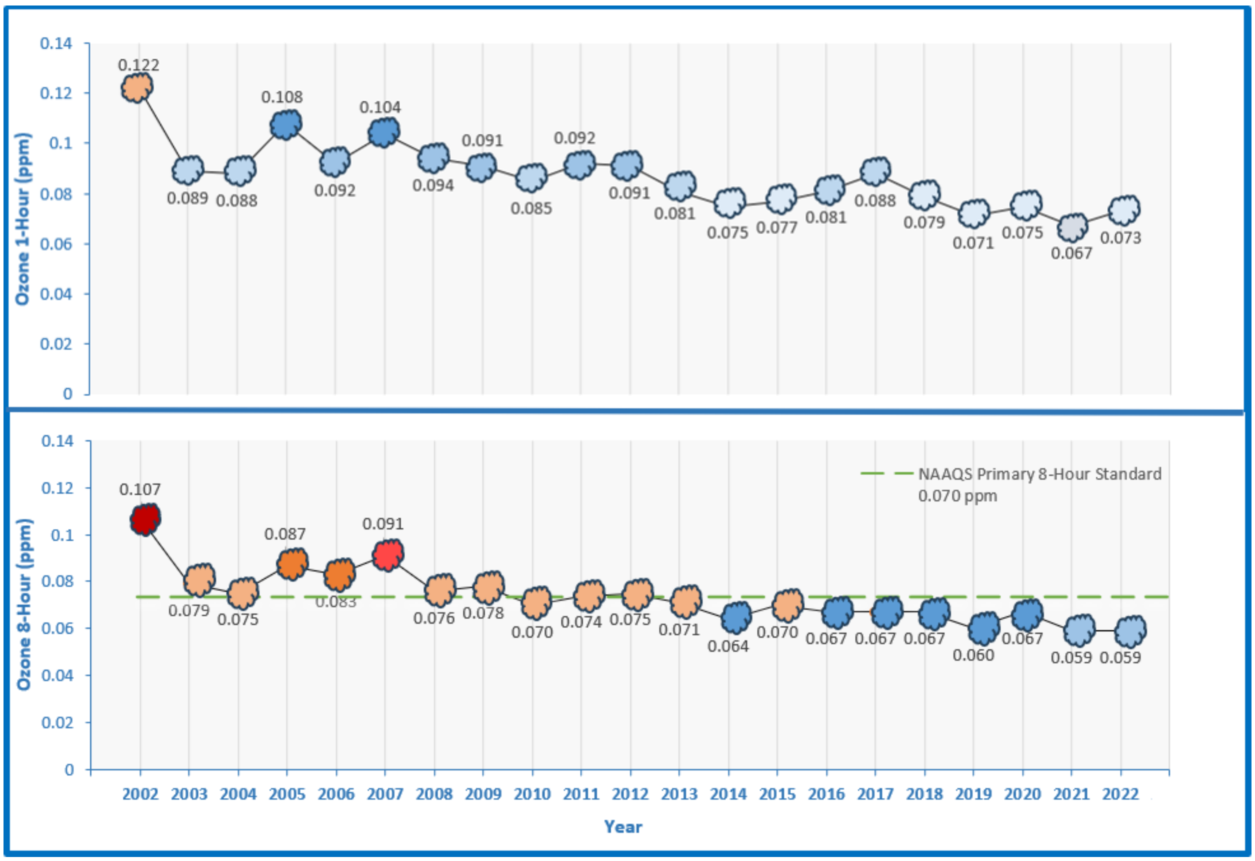
Notes:
1. Data for many pollutants come from Kenmore Square, Boston, exceptions are noted below. Concentrations for 1-hour, 8-hour and 24-hour averages are annual second-highest values, except for 1-hour NO_2 and 24-hour average $PM_{2.5}$ which are 98th percentile values. Selected $PM_{2.5}$ background 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.
The CO, PM_{10}, and Lead monitor values were collected at Harrison Avenue.
The ozone values were collected at Chelmsford. Ozone values are presented in ppm consistent with the standard.
2. Levels above 10 μ/m^3 (or 10 ppm, ppb) are rounded to the nearest whole number. Other levels are provided to at least 2 significant figures.
Sources: MassDEP Annual Air Quality Report: https://www.mass.gov/air-quality-reports-plans-data,
NAAQS Table: https://www.epa.gov/criteria-air-pollutants/naaqs-table

[219] Refer to the *2022 ESPR* Scope Certificate in Appendix B.

8.3.3 Summary of Background Conditions

Since the *2017 EPSR*, the Greater Boston area has been classified as "in attainment" with the NAAQS for all criteria pollutants. The EPA designated Middlesex County and the surrounding counties as "in attainment/ unclassifiable" for the 2015 ozone standards in November of 2017. Since 2017, there has been no change to the ozone designation in Middlesex County. In 2022, there were four days when the 8-hour ozone standards of 0.070 ppm were exceeded in Massachusetts; however, at the monitor closest to Hanscom Field (in Chelmsford) the 0.070 ppm standard was not exceeded. While ozone concentrations have trended downward over the past several decades due to air pollution control programs, ozone concentrations vary each year due to weather patterns.[220] **Figure 8-4** displays the 1-hour and 8-hour ozone levels in Middlesex County for the last 20 years.

Figure 8-4. Middlesex County Ozone Level Trends (2002–2022)



Notes:
1. One-hour Ozone from 2017-2022 was retrieved from EPA's Air Quality Monitor Values Report.
2. O_3 measurements are taken from Middlesex County monitor locations: 2002–2012 values are from US MILITARY RES monitor in Stow, MA, and 2012–present values from 11 Technology DR. monitor Chelmsford, MA.
3. O_3 8-Hour data became available in 1998.
4. Blue icons in the figure represent years in which the O_3 levels met the standard; orange and red icons indicate an exceedance.

Source: MassDEP Annual Air Quality Reports, EPA Outdoor Air Quality Data Monitor Values Report

[220] MassDEP Annual Air Quality Report: https://www.mass.gov/doc/2022-annual-air-quality-report/download. Accessed March 18, 2024

Using actual air quality measurements collected throughout the region by MassDEP over the last 30 years, the following progress has been documented:

- CO levels in the Greater Boston area have steadily declined since their peak in the 1970s. The entire state, including Hanscom Field area, has been considered "in attainment" with the CO standard since April 2002.

- In 2022, there were two exceedances of the 24-hour $PM_{2.5}$ standard (35 µg/m^3). The Lynn monitor exceeded the standard on August 19, 2022, and the Greenfield monitor exceeded the standard on December 31, 2022. The exceedances were attributed to local forest fire smoke and wood smoke, respectively. Despite these exceedances, there was no violation of the $PM_{2.5}$ NAAQS standards.

- In general, NO_X, SO_2, PM, and ozone pollutant concentrations have been decreasing. The reduction in these emissions is due to a variety of control measures that have been implemented over the last two decades, including motor vehicle emission controls and reductions in evaporative emissions from gasoline stations and consumer products, as well as reductions from power plants, businesses, and residential combustion sources.

- Lead levels in the air have declined significantly since the early 1980s mostly due to the removal of lead in gasoline. In October 2008, the EPA tightened the lead standard from 1.5 µg/m^3 to 0.15 µg/m^3, averaged over a 3-month period. No violations of the lead air quality standard have ever been recorded in the Greater Boston area.

The Greater Boston area has had "clean air" (i.e., no violations of the air quality standards for these pollutants):

- ⇨ PM_{10}, NO_2, SO_2 and Pb – For over 30 years.
- ⇨ CO – For over 25 years.
- ⇨ $PM_{2.5}$ – Since 1999, when monitoring for this pollutant commenced.
- ⇨ O_3 – With the standard set in 2015, EPA designated Middlesex County as in attainment/unclassifiable.

8.4 Hanscom Field Emissions

This section and the next provide estimates of total annual air emissions generated by activities associated with Hanscom Field for the year 2022 and for the forecast scenarios. The primary sources of air pollution at Hanscom Field are airfield 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 aircraft emission and groundside roadway traffic emissions, so they are excluded from the analysis.

Annual aircraft emissions were calculated for the year 2022 at Hanscom Field for each of the following: CO, NO_X, PM_{10}, $PM_{2.5}$, CO_2, and VOCs.[221] For reference, the complete list of NAAQS and MAAQS levels for the pollutants are listed earlier in this chapter in Table 8-1.

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[221] NO_X is a group of compounds comprised of Nitric Oxide (NO), Nitrogen Dioxide NO_2, and the nitrate radical (NO_3). These three compounds are interrelated and often change forms from one to another. As described in the FAA Aviation Emissions and Air Quality Handbook Version 3 Air_Quality_Handbook_Appendices.pdf, when reporting aircraft emissions for Nitrogen Oxides, it is standard practice to report as NO_X. To maintain consistency with previous ESPRs, Pb and SO_2 are not reported in the aircraft emissions tables.

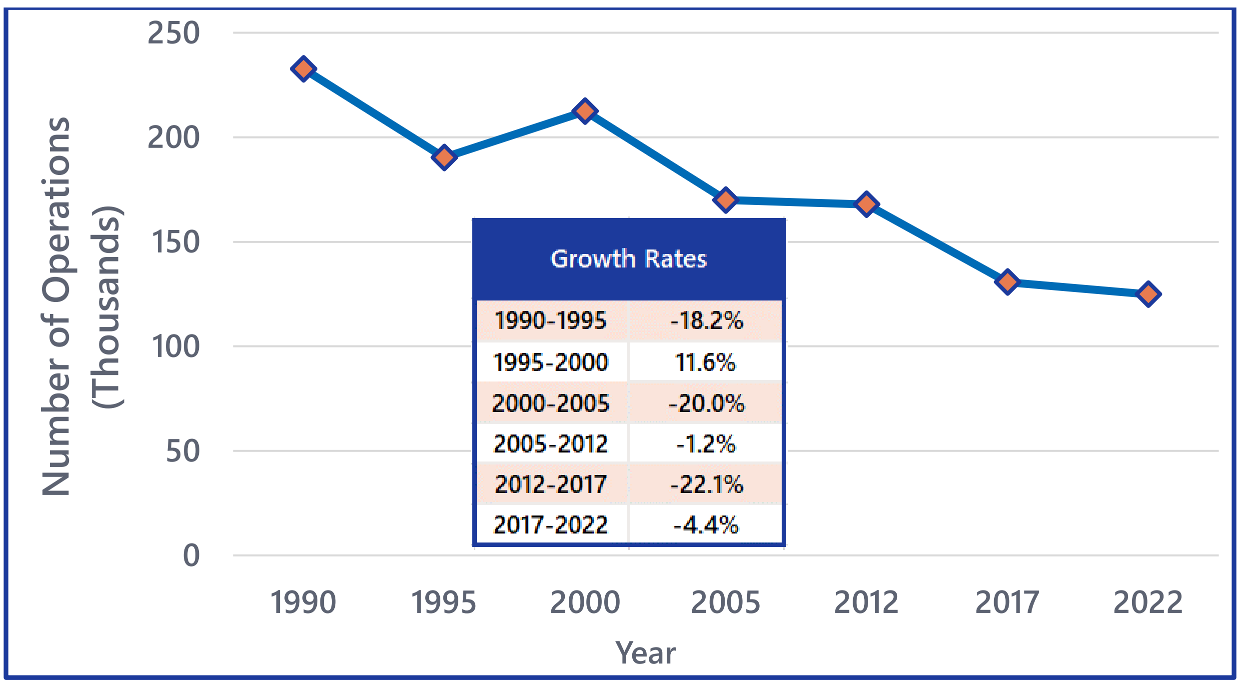
According to the EPA, an airport emission inventory should concentrate on the emission characteristics of aircraft relative to the vertical column of air around and above the airport that ultimately affects ground level pollutant concentrations.[222] This section of the atmosphere, extending from the earth's surface up to 3,000 feet above ground level, is referred to in air quality models as the "mixing height." The aircraft operations of interest are defined as the Landing and Takeoff Cycle (LTO). 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, heading back up to cruising altitude.

The five specific operating modes in a Landing/Take-off (LTO) cycle are:

1) Approach from 3,000 feet
2) Taxi/idle-in
3) Taxi/idle-out
4) Takeoff
5) Climb out to 3,000 feet

Actual numbers of aircraft operations at Hanscom Field for the years 2012, 2017, and 2022 are described in detail in Chapter 3**.** Relative operations levels at Hanscom Field over the past three decades are shown in **Figure 8-5** for reference. The annual aircraft operations data used for the air quality analysis are consistent with the operations used in the noise analysis presented in Chapter 7. The number of aircraft operations at Hanscom Field in 2022 decreased by 4.4 percent compared to the 2017 annual total.

Figure 8-5. Aircraft Operations at Hanscom Field Over Time



Source: Massport operations data and HMMH, 2024

[222] U.S. EPA, Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, Office of Air and Radiation, EPA-450/4-81-026d (Revised), 1992.

In addition to aircraft emissions, a mesoscale air quality analysis was conducted for motor vehicle traffic associated with activities at Hanscom Field. In comparison to a microscale analysis (e.g., an intersection), a mesoscale analysis calculates emissions over a larger area.[223] Consistent with MassDEP guidance for performing a mesoscale analysis,[224] Massport calculated total annual emissions of CO, NO_X, PM_{10}, $PM_{2.5}$, CO_2, and VOCs using emission factors from the latest version of EPA's MOtor Vehicle Emission Simulator (MOVES4).[225] The mesoscale air quality study area in this *2022 ESPR* is the same as the mesoscale air quality study area analyzed for the *2017* and *2012 ESPRs*.

8.4.1 Analysis of 2022 Conditions

Year 2022 Aircraft Emissions

The *2022 ESPR* analysis uses FAA's Aviation Environmental Design Tool (AEDT) version 3e [226] to model emissions from aircraft operations at Hanscom Field. The aircraft emissions analysis for the *2017 ESPR* used AEDT version 2d; prior ESPR's used FAA's Emission and Dispersion Modeling System (EDMS). Discussion of the differences between the prior model and AEDT 3e is included in **Appendix E**; additional details can be found on the FAA's AEDT website.[227] FAA continually works to improve the accuracy of the AEDT and maintain a current aircraft database; version updates are released every year or two, on average.

The FAA's AEDT model provided the aircraft emission factors for CO, NO_X, PM_{10}, $PM_{2.5}$, CO_2, and VOCs used to calculate the annual aircraft emissions at Hanscom Field for this *2022 ESPR*. As of May 2015, FAA requires the use of AEDT to compile air emissions inventories from aircraft operations. The AEDT model is a combined noise and air quality emissions model that has the ability to calculate air quality impacts, pollutant emissions, and fuel burn. Aircraft engine emission factors (expressed as the mass of emission per unit of time, such as grams per second or kilograms per hour) within the AEDT database are specified for each aircraft and engine type for each of the operating modes (taxi/idle, takeoff, climb out, and approach movements). Operating modes are a function of the engine's power setting and resultant fuel flow. The AEDT's default time-in-mode (TIM) data were used for each of the phases of the LTO cycle. AEDT calculated aircraft emissions for each of the modes within an LTO for each type of aircraft by multiplying the number of operations by the emission factor for each operation phase and TIM.

Changes in emissions estimates over time are dependent on:

- ⇨ The number of operations,
- ⇨ The fleet mix of aircraft types using Hanscom Field, and
- ⇨ The use of various versions of the EDMS model, now replaced by AEDT.

Table 8-3 presents aircraft emissions calculations for 2022 in thousands of kilograms per year, along with a comparison to emissions reported in previous ESPRs. Aircraft emissions of CO, PM, and CO_2 decreased from 2017 to 2022 primarily due to a reduction in operations. Emissions of the remaining criteria pollutants, NO_X, and VOC (precursors to ozone) increased. These increases are largely attributable to

[223] NASA. https://eospso.nasa.gov/files/ocp/pdf/Page_296_new.pdf. Accessed on November 24, 2023.
[224] A mesoscale analysis covers an area larger than the immediate project area, but smaller than an entire regional network. The size of a mesoscale analysis depends on the specific project, but typically includes all roadways affected by the project.
[225] https://www.epa.gov/moves. Accessed January 16, 2024
[226] Version 3e was the most current AEDT release at the time of this *2022 ESPR* analysis in 2023.
[227] FAA. Aviation Environmental Design Tool (AEDT). https://aedt.faa.gov/

changes in the fleet mix from 2017 to 2022, which includes a 23 percent increase in jet aircraft operations and a 19 percent decrease in single engine piston aircraft as compared to 2017.[228] In addition to a change in the fleet from 2017, differences between AEDT 2d (used in the *2017 ESPR*) and AEDT 3e (used in the *2022 ESPR*)—which includes more efficient aircraft and more precise emission factors in the updated version—can also be attributed to the change in calculated emissions.[229]

Table 8-3. 2022 Aircraft Operation Emissions at Hanscom Field Compared to Previous ESPRs

Year	CO	NOx	VOC	PM_{10}	$PM_{2.5}$	CO_2
	Emissions in thousands of kilograms per year					
2000[1]	591.2	25.4	39.4	2.3	2.3	10,108
2005[2]	1670.0	34.1	112.7	13.5	13.5	19,233
2012[3]	1,123.0	31.9	80.4	9.9	9.9	16,356
2017	1,557.0	34.8	51.4	1.9	1.9	17,735
2022	502.5	45.8	55.3	1.9	1.9	16,971
Percent Change: 2012-2017[4]	+39%	+9%	-36%	-81%	-81%	+8.4%
Percent Change: 2017-2022[5,6]	-68%	+32%	+8%	-2%	-2%	-4.3%

Notes:
1. Emissions for 2000 were revised from the *2000 ESPR* using the EDMS Version 4.3.
2. Emissions for 2005 were revised from the *2005 ESPR* using EDMS Version 5.1.4.1.
3. 2012 emissions calculated using EDMS Version 5.1.4.1.
4. Percent change is based on the difference in results between 2012 (from EDMS Version 5.1.4.1) and 2017 (from AEDT version 2d).
5. Percent change is based on the difference in results between 2017 (from AEDT version 2d) and 2022 (from AEDT version 3e)
6. Due to rounding, 2017 and 2022 PM emissions appear to be the same, but actually decreased approximately 2%.
Sources: previous ESPRs and HMMH analysis, 2023

The changes in the aircraft emissions between the different years shown in Table 8-3 do not directly correlate with the changes in the number of aircraft operations shown in Figure 8-5 for two reasons. First, the fleet mix of aircraft types varies and, second, the aircraft emissions estimates each year were developed using then-current versions of the FAA's emissions model software. As the models were updated over time, the emissions factors within the models also changed. Aircraft emission rates within AEDT do not change over time for each individual aircraft and are dependent on two major characteristics unique to aircraft types: (1) the time each aircraft spends in each mode of the LTO cycle at the airport and (2) the passenger-carrying capacity of the aircraft.

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 8-4** shows the total air emissions for Middlesex County compared to the 2022 Hanscom inventory. The emissions data for Middlesex County were obtained from the EPA's National Emissions Inventory for the most recent available year, 2020.[230] As shown in the table, Hanscom comprises a very small portion of the total

[228] The most common aircraft in the fleet mix operating at Hanscom Field are compared in Appendix E.
[229] A comparison between emission factors utilized in AEDT 3e and AEDT 2d can be found in Appendix E.
[230] https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data. Accessed on November 24, 2023.

emissions in Middlesex County ranging from 0.02 percent of PM_{10} emissions to 0.54 percent of CO emissions.

Table 8-4. Total Criteria Pollutant Emissions from all Sources in Middlesex County (2020)

Source Type		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	CO_2
		Emissions in thousands of kilograms per year					
2020 Middlesex County emissions[1]	Point Source	15,450	4,905	22,081	10,016	3,818	975,213
	Mobile Source	77,833	6,364	4,920	957	470	5,963,725
	Total	93,283	11,269	27,001	10,973	4,288	6,938,938
2022 Hanscom Field Aircraft Emissions		502.5	45.8	55.3	1.9	1.9	16,971
Hanscom Field Aircraft Emissions percentage of Middlesex County total[2]		*0.54%*	*0.41%*	*0.20%*	*0.02%*	*0.04%*	*0.24%*

Notes:
1. Middlesex County Emissions obtained from National Emissions Inventory (2020). https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data
2. The 2022 aircraft emissions totals as a percentage of the total 2020 Middlesex County emissions.

2022 Motor Vehicle Emissions

The *2022 ESPR* utilized the latest version of EPA's MOVES (MOVES4), released in 2023, to model ground transportation emissions related to Hanscom Field. Motor vehicle emissions in the *2017 ESPR* were calculated using a previous version of the software, MOVES2014a. The main differences include updates on vehicle populations, fuel supply, travel activity, and emission rates. More discussion on the improvement of the MOVES model between the *2017 and 2022 ESPRs* is included in **Appendix E** and is on the EPA's MOVES website.[231]

The Hanscom Field motor vehicle emissions methodology calculates the vehicle miles traveled (VMT) for each roadway segment in the study area by multiplying the length of each segment by that segment's average daily weekday Hanscom Field traffic volume. Average 24-hour traffic volume estimates are based on peak AM and PM volumes, assuming that peak volumes represent 10 percent of the daily traffic. The average weekday daily traffic volumes are typically greater than the average daily volumes for an entire week including weekends. To provide a conservative estimate of annual emissions for the study area, the average weekday volumes were multiplied by 365 (days).

Air pollutant emissions for each roadway segment were calculated by multiplying the VMT of each segment by the latest forecasted pollutant specific emission factors[232] (in grams per vehicle-mile) for daily speed ranges of 20 to 40 miles per hour (mph) for each roadway link. The emissions were summed for all the links to determine the 2022 motor vehicles emissions for each pollutant. Emission pollutant spreadsheets for the mesoscale analysis are included in **Appendix E**.

As shown in **Table 8-5**, emissions from Hanscom Field vehicular traffic for 2022 declined for all pollutants compared to all prior ESPR years shown. The general decline in motor vehicle emissions is primarily

[231] USEPA (2023) Motor Vehicle Emission Simulator: MOVES4. Office of Transportation and Air Quality. US Environmental Protection Agency. Ann Arbor, MI. August 2023 https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

[232] The emissions factors are included in the traffic emissions model, MOVES (MOVES4).

attributed to a decrease in traffic generated by Hanscom Field in 2022, as compared to 2017 (as detailed in Chapter 6) as well as the phasing out of older, less-efficient vehicles and implementation of stricter vehicle emissions standards promulgated by the EPA over that time. These changes as well as other standards enacted by the EPA are reflected in the MOVES4 model, which is an upgrade to the older version of MOVES used in previous ESPRs.

An updated version of EPA's MOVES4 estimated the motor vehicle emissions for this *2022 ESPR.*[233] Motor vehicle emission estimates, along the nearby roadways for all pollutants at Hanscom Field, have decreased from 2017 due to a variety of factors, including:

- Lower Traffic volumes,
- Implementation of CAFE and Safer Affordable Fuel Efficient standards, and
- Phasing out of older, less efficient vehicles.

Table 8-5. Emissions from Hanscom Field Vehicular Traffic

Year	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	CO_2
	Emissions in thousands of kilograms per year					
2000	61	6.9	3	0.2	0.2	1496
2005	36	4.1	1.6	0.1	0.1	1,312
2012	19.1	2.2	1.0	0.1	0.1	1,555
2017	2.9	0.3	0.1	0.01	0.01	407
2022[2]	1.8	0.1	0.020	0.001	0.001	375
Percent Change: 2012 to 2017	-85%	-86%	-92%	-90%	-83%	-74%
Percent Change: 2017 to 2022	-39%	-68%	-76%	-85%	-92%	-8%

Notes:
1. The 2022 emissions were estimated using the MOVES4, which replaced the version MOVES2014a which was used in the *2017 ESPR*.
2. Emissions for VOC, and PM are calculated out to two significant figures

Total Year 2022 Emissions

The combined pollutant emissions from both the aircraft operations at Hanscom Field and the airport-associated motor vehicle travel are shown in **Table 8-6** for each of the six pollutants in 2000, 2005, 2012, 2017, and 2022. The data shows that the sum of emissions from aircraft operations and motor vehicle traffic for CO, CO_2, and PM decreased while NO_X, and VOC increased. The reasons for the changes are included with the results for each component above.

[233] Motor vehicle emissions for the 2017 ESPR were estimated using MOVES2014a.

Table 8-6. 2022 Total Air Emissions at Hanscom Field Compared to Previous ESPRs

Year	Source	CO[5]	NO_x[5]	VOC[6]	PM_{10}[6]	$PM_{2.5}$[6]	CO_2
		Emissions in thousands of kilograms per year					
2000	Aircraft	591.2	25.4	39.4	2.3	2.3	10,108
	Ground Vehicles	60.8	6.9	3	0.2	0.2	1496
	Total	**652.0**	**32.3**	**42.4**	**2.5**	**2.5**	**11604**
2005[1]	Aircraft	1670.0	34.1	112.7	13.5	13.5	19,233
	Ground Vehicles	36.1	4.1	1.6	0.1	0.1	1,312
	Total	**1706.1**	**38.2**	**114.3**	**13.6**	**13.6**	**20,545**
2012[2]	Aircraft	1123.0	31.9	80.4	9.9	9.9	16,356
	Ground Vehicles	19.1	2.18	0.9	0.1	0.1	1,555
	Total	**1142.1**	**34.1**	**81.3**	**10**	**10**	**17,911**
2017 (AEDT)[3]	Aircraft	1557.0	34.8	51.4	1.92	1.92	17,735
	Ground Vehicles	2.9	0.4	0.1	0.01	0.01	407
	Total	**1559.9**	**35.2**	**51.5**	**1.93**	**1.93**	**18,141**
2022 (AEDT)[4]	Aircraft	502.5	45.8	55.3	1.87	1.86	16,971
	Ground Vehicles	1.8	0.1	0.02	0.001	0.001	375
	Total	**504.3**	**45.9**	**55.4**	**1.87**	**1.86**	**17,346**

Notes:
1. The *2005 ESPR* used EDMS version 4.3, but the emissions were recalculated using EDMS version 5.1.4.1 when it was released for consistency with the *2012 ESPR.*
2. The *2012 ESPR* used EDMS 5.1.4.1.
3. The 2017 *ESPR* used AEDT 2d.
4. The 2022 *ESPR* used AEDT 3e.
5. Emissions of CO and NOx are calculated to the first decimal place.
6. Emissions for VOC and PM are calculated out to two significant figures.

8.4.2 Analysis of Future Scenarios

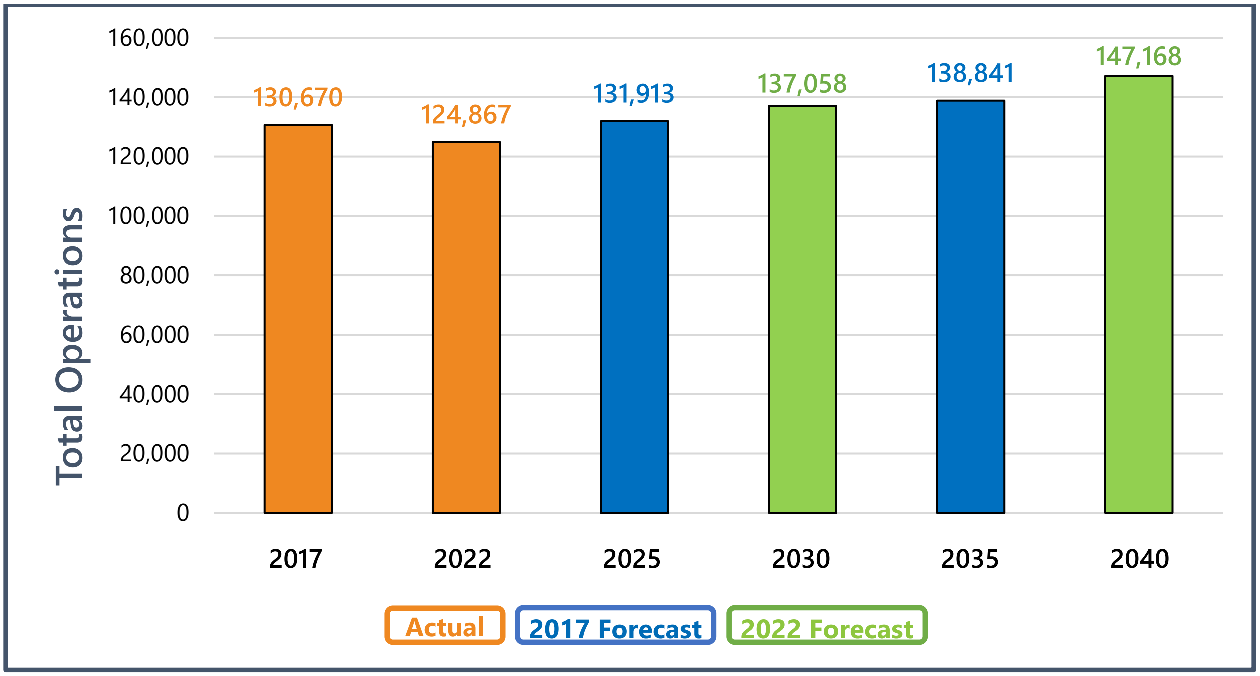
As discussed, predictions of future air quality effects from Hanscom Field are based on an emissions analysis of airside operations and groundside motor vehicle traffic for the 2030 and 2040 future planning scenarios. The *2022 ESPR* planning scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels described in Chapter 3. The 2030 and 2040 scenarios represent estimates of what could occur (not what will occur) in the future, using certain planning assumptions. 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.

As both future scenarios forecast an increase in aircraft operations over current levels (as shown in **Figure 8-6**), the airport's current emission levels are expected to rise. However, there are limitations in predicting future emissions beyond 15 to 20 years from the baseline. The AEDT model is constantly reviewed and updated to include new aircraft, engine types, and the latest emission factors from the ICAO engine exhaust emission data bank. It does not incorporate expected or potential future technological changes such as the use of alternative fuels, more efficient engines, or future regulatory emissions standards, all of which would decrease emissions. Therefore, the forecasted 2030 and 2040 emission levels represent a conservative estimate of future conditions. Estimated emissions levels increase and their associated impacts on air quality under the future scenarios are described below.

Future Aircraft Emissions

The estimate of future aircraft emissions follows the methodology outlined earlier in this chapter for the 2022 emissions. For comparative purposes, **Figure 8-6** shows the annual number of operations for 2017 and 2022, as well as the future planning scenario operations analyzed in this ESPR (2030 and 2040) in comparison with the operations total for the *2017 ESPR* forecasts (2025 and 2035). Tables containing the aircraft data used for the emissions calculations can be found in **Appendix D**.

Figure 8-6. Actual and Forecast Aircraft Operations at Hanscom Field



Note: Figure 8-6 in the *2017 ESPR* included only daytime operations, while this graph also includes operations occurring during hours when the air traffic control tower is closed.
Source: *2022 ESPR,* Tables 3-5 and 3-8. McFarland Johnson 2023. Massport 2023.

Table 8-7 summarizes the expected annual aircraft emissions for the 2030 and 2040 future planning scenarios and compares them to estimated emissions from years 2017 and 2022. In general, aircraft emissions forecasted for each of the future scenarios would be higher than those for the year 2022, based on forecasted growth in operations. The exception is emissions of CO for both 2030 and 2040, which show a slight decrease compared to 2022. This is attributed to the forecast change in the fleet mix in the future scenarios, with an increase in jet aircraft operations and a decrease in single engine piston aircraft (which emit higher levels of CO than jet aircraft).

The largest increases in aircraft emissions are forecasted for NO_X, VOC, and CO_2, with the smallest increases forecasted for PM_{10} and $PM_{2.5}$. The increases in these pollutants are expected due to the increase in operations. These are conservative estimates as the air pollutant emission rates for each aircraft/ engine combination are not assumed to change with time in the model.

Table 8-7. Emissions from Aircraft Operations at Hanscom Field for 2017, 2022 and Forecast Scenarios

Year	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	CO_2
	Emissions in thousands of kilograms per year					
2017[1]	1,557.0	34.8	51.4	1.92	1.92	17,734
2022[2]	502.5	45.8	55.3	1.87	1.86	16,971
2030[2]	424.0	49.1	58.8	1.86	1.86	18,477
2040[2]	445.6	53.9	65.0	2.02	2.02	20,544

Notes:
Calculations for emissions were calculated below the mixing height (3,000 feet). Massport expects that, by the year 2035, 90% of the GSE fleet servicing Hanscom will be Electric. By the forecast year 2040, 100% of the GSE fleet servicing Hanscom is expected to be electric.
1. AEDT 2e was used to estimate emissions for 2017.
2. Calculations were generated using AEDT version 3e for 2022 and 2030 and 2040 forecasts.

Massport predicts that up to 10 percent of the aircraft servicing Hanscom field may be electric powered by 2030, reducing the forecasted aircraft emissions for each criteria pollutant presented above. Therefore, the forecast emissions presented above are conservative estimates.

Future Vehicular Emissions

Similar to the 2022 vehicular analysis, a mesoscale air quality emissions analysis was conducted for the motor vehicle traffic associated with Hanscom Field. The study area and methodology for calculating groundside vehicular emissions is the same as described for 2022. **Table 8-8** summarizes the annual emissions from groundside vehicular traffic for the future scenarios. Tables showing the data used to calculate the forecast year motor vehicle emissions are included in **Appendix E**. Emissions for 2030 and 2040 are estimated to decrease for all pollutants except CO_2, as compared to 2022.

The decrease in motor vehicle emissions reflects the projected decreases in vehicle emissions rates forecasted by MOVES4 even with additional traffic volumes forecast in 2030 and 2040. The MOVES model also incorporates assumptions about the changes in average fleet fuel economy over time. Ongoing fleet turnover and the continued implementation of increasingly more stringent emission and fuel quality regulations are expected to reduce pollutants.

Table 8-8. Emissions from Hanscom Field Vehicular Traffic for 2017, 2022 and Forecast Scenarios

Year	CO^1	NO_x^1	VOC^1	PM_{10}^1	$PM_{2.5}^1$	CO_2
	Emissions in thousands of kilograms per year					
2017	2.9	0.3	0.1	<0.1	<0.1	407
2022	1.8	0.096	0.020	0.0015	0.0013	375
2030	1.6	0.028	0.015	0.0013	0.0012	420
2040	1.0	0.007	0.014	0.0012	0.0011	495

Notes:
1. Emissions levels for CO, NOx, VOC, and PM are calculated to two significant figures.
Source: HMMH 2024

Hanscom Field-generated traffic is only a small percent of the total traffic in the 9-square-mile traffic study area (i.e., 0.96 percent of total traffic during the AM peak hour, and 0.82 percent of total traffic during the PM peak hour in the year 2022).

Total Future Emissions and Air Quality Concentrations

Table 8-9 combines the aircraft and ground vehicle results to obtain total emission forecasts for each pollutant. This table shows that, with the exception of CO, total emissions are expected to increase in the forecast years as compared to the 2022 emissions. Aircraft operations dominate the emissions totals. The highest emissions for the future planning years occur in the 2040 scenario, due to projected increases in operations.

Table 8-9. Total Air Emissions at Hanscom Field for 2017, 2022 and Forecast Scenarios

Year	Source	CO^1	NO_x^1	VOC^1	PM_{10}^1	$PM_{2.5}^1$	CO_2
		Emissions in thousands of kilograms per year					
2017	Aircraft	1,557.0	34.8	51.4	1.92	1.92	17,734
	Ground Vehicles[2]	2.9	0.3	0.1	<0.1	<0.1	407
	Total	**1,559.9**	**35.1**	**51.5**	**1.92**	**1.92**	**18,141**
2022	Aircraft	502.5	45.8	55.3	1.87	1.86	16,971
	Ground Vehicles[2]	1.8	0.096	0.020	0.0015	0.0013	375
	Total	**504.3**	**45.9**	**55.4**	**1.87**	**1.86**	**17,346**
2030	Aircraft	424.0	49.1	58.8	1.86	1.86	18,477
	Ground Vehicles[2]	1.6	0.028	0.015	0.0013	0.0012	420
	Total	**425.6**	**49.2**	**58.8**	**1.86**	**1.86**	**18,896**
2040	Aircraft	445.6	53.9	65.0	2.02	2.02	20,544
	Ground Vehicles[2]	1.0	0.0067	0.014	0.0012	0.0011	495
	Total	**446.7**	**53.9**	**65.0**	**2.02**	**2.02**	21,039

Notes:
1. Emissions levels for CO. NOx, VOC and PM were prior reported to one now reported to two significant figures.
2. Ground vehicle emissions are calculated to two significant figures.
Source: HMMH, 2024

8.4.3 Community Receptor Analysis

As for previous ESPRs, Massport analyzed expected air quality for the 2040 future scenario for a set of points representing community locations near the airport. Maximum air quality concentrations in the future year scenario 2040 for CO, NO_2, PM_{10}, and $PM_{2.5}$ were estimated at 10 modeled receptors surrounding Hanscom Field (the same receptors used for the *2017 ESPR* analysis). Ozone was not modeled as it is not directly emitted (rather it is formed by the emission of precursors including VOCs and NO_2), and SO_2 was not modeled due to the extremely low concentrations in the region.

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 homes in one of the four adjoining towns will be less than those forecasted for receptors one through four.

The maximum concentrations calculated for the 10 community locations for the year 2035 presented in the *2017 ESPR* were scaled with the emissions calculated for the *2022 ESPR* to obtain year 2040 results. Scaling is appropriate given that modeling parameters (i.e., source and receptor locations) have not changed from the *2017 ESPR*, and only the emission rate for each pollutant is changing.

To derive the scale factors, the total emissions for the scenario with the largest forecasted emissions levels (i.e., the 2040 future scenario) was divided by the 2017 total emissions presented in the *2017 ESPR*. Then the concentration of each air pollutant for the year 2017 was multiplied by the corresponding scaling factor. After adding in current (2022) background concentrations, the maximum forecasted concentration for each air pollutant for the 2040 future scenario was obtained (see **Table 8-10**). This scaling methodology is consistent with that used for prior ESPRs.

Maximum air quality concentrations in 2040 for CO, NO_2, PM_{10}, and $PM_{2.5}$ were estimated at the following ten receptors:

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 concentration levels presented in Table 8-10 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 forecasted concentrations in Table 8-10 come from the conservative background levels assumed in the analysis, not Hanscom Field operations. Thus, actual concentrations for the 2040 planning scenario will be less than those listed, even if activity levels reach those of the future scenarios. The Air Quality Standard or Guideline data provided on the bottom line of Table 8-10 for comparison comes from NAAQS and MassDEP air quality standards.

Table 8-10. Modeled Maximum Air Concentrations in 2040 at 10 Community Receptors (µg/m^3)

Source	Receptor	CO 1 Hour	CO 8 Hour	NO_2 1 Hour	NO_2 Annual	PM_{10} 24 Hour	PM_{10} Annual	$PM_{2.5}$ 24 Hour	$PM_{2.5}$ Annual
Concentration from Hanscom Operations[1]	1	1101.5	739.8	76.5	5.3	1.4	0.2	1.4	0.2
	2	913.8	639.5	65.3	4.6	1.4	0.2	1.4	0.2
	3	572.1	400.4	40.9	3.3	0.7	0.1	0.8	0.2
	4	554.0	387.5	37.6	3.3	0.7	0.1	0.8	0.2
	5	680.0	456.0	48.8	4.0	0.7	0.1	0.8	0.2
	6	394.5	276.1	27.7	1.9	0.4	0.1	0.4	0.1
	7	266.7	187.0	19.1	1.9	0.4	0.1	0.4	0.1
	8	521.7	365.2	35.6	3.3	0.7	0.1	0.8	0.1
	9	262.6	183.5	19.1	1.9	0.4	0.1	0.4	0.1
	10	269.1	188.8	19.1	1.9	0.4	0.1	0.4	0.1
Total Concentration Including Background[2]	1	2910.4	2004.8	179.9	27.0	35.4	14.5	20.7	9
	2	2722.8	1904.5	168.7	26.3	35.4	14.5	20.7	9
	3	2381.0	1665.4	144.3	24.9	34.7	14.4	20.1	9
	4	2362.9	1652.5	141.0	24.9	34.7	14.4	20.1	9
	5	2489.0	1721.0	152.2	25.6	34.7	14.4	20.1	9
	6	2203.4	1541.1	131.1	23.6	34.4	14.4	19.7	8.9
	7	2075.7	1452.0	122.5	23.6	34.4	14.4	19.7	8.9
	8	2330.7	1630.2	139.0	24.9	34.7	14.4	20.1	8.9
	9	2071.5	1448.5	122.5	23.6	34.4	14.4	19.7	8.9
	10	2078.0	1453.8	122.5	23.6	34.4	14.4	19.7	8.9
Air Quality Standard or Guideline (µg/m^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 various MassDEP monitoring locations, see Table 8-2.
3. For NO_2, the 188 µg/m^3 represents the EPA 1-hour NAAQS, while the 320 µg/m3 represents the MassDEP 1-hour NO_2 Policy Guideline.

Comparison with the standards guidelines shows that the estimated concentrations forecasted for 2040 would be in compliance with the NAAQS and the MassDEP 1-hour NO_2 Policy Guidelines. Concentration levels for the 2030 future scenarios would be lower because forecasted activity levels for 2030 are lower than those forecasted for 2040. Thus, it can be concluded that the air pollutant emissions shown in this *2022 ESPR* for aircraft and motor vehicles at Hanscom Field for all future planning scenarios would not have an adverse impact on local air quality. Aircraft emissions from Hanscom Field are minimal compared to air emissions from all sources within Middlesex County; the forecast analysis shows that Hanscom Field will continue to contribute minimally to the county emissions under the future operating scenarios.

8.5 Greenhouse Gas (GHG) Emissions inventory

This *2022 EPSR* contains the second development of the airport-wide GHG emissions inventory for Hanscom Field. The first GHG emissions inventory, developed for the *2017 ESPR*, is used as a baseline for comparison. The analysis follows methodological guidance from the Transportation Research Board's Airport Cooperative Research Program (ACRP) and the World Resources Institute's Greenhouse Gas Protocol.[234]

For consistency with the GHG Emission Inventories conducted at Boston Logan International Airport since 2008, as well as for comparative purposes, GHG emissions are segregated by ownership and control into three categories.[235] These categories (as described below and listed in **Table 8-11**) are further characterized by the degree of control that Massport has over the GHG emission sources.

- **Category 1**: **Massport-Owned** – These GHG emissions arise from sources that are owned and controlled by the reporting entity (in this case, Massport). The precise definition of Category 1 is sources which are owned by the entity, or sources which are not owned by the entity, but over which the entity can exert control. At Hanscom Field, these sources include Massport-owned and controlled stationary sources (boilers, generators, etc.), Massport fleet vehicles, and purchased electricity. On-airport ground transportation and off-airport employee vehicle trips are also included as Category 1 emissions as they are partly controlled by Massport.
- **Category 2**: **Tenant-Owned** – This category comprises sources owned and controlled by airport tenants and include aircraft (on-ground taxi/idle and within the LTO up to 3,000 feet), GSE/APU, electrical consumption, and tenant employee vehicles.
- **Category 3: Public/Private-Owned** – This category comprises GHG emissions associated with passenger ground access vehicles. These include private automobiles, taxis, limousines, buses, and shuttle vans operating on the off-airport roadway network.

Consistent with ACRP guidelines, the operational boundaries of the GHG emissions are also delineated, reflecting the scope of the emission source according to the GHG protocol. **Table 8-11** lists the scope of each source, which include:

- **Scope 1/Direct** – GHG emissions from sources that are owned and controlled by the reporting entity (in this case, Massport) such as stationary sources and airport-owned fleet motor vehicles.
- **Scope 2/Indirect** – GHG emissions associated with the generation of electricity consumed on-site but generated off-site at public utilities.
- **Scope 3/Indirect and Optional** – GHG emissions that are associated with the activities of the reporting entity (in this case, Massport), but are associated with sources that are owned and controlled by others. Scope 3 emissions include aircraft-related emissions, emissions from airport tenant's activities, as well as emissions from ground transportation to and from the airport.

[234] Transportation Research Board, Airport Cooperative Research Program, ACRP Report 11, Project 02-06, Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories. https://nap.nationalacademies.org/catalog/14225/guidebook-on-preparing-airport-greenhouse-gas-emissions-inventories . Accessed January 11, 2024

[235] The categorization is based on the methodological precedent set by Massport's greenhouse gas (GHG) emissions inventories over the past decade for Boston Logan International Airport's annual EDR and 5-year ESPR updates.

Table 8-11. Massport Ownership Categorization and Emissions Scope

Massport Emission Ownership Category	Source	GHG Protocol Scope
Category 1 – Massport-Owned and/or Controlled	Massport Fleet Vehicle	Scope 1
	On-airport Ground Transportation	Scope 1
	Off-airport Employee Vehicle Trips, including employee commuting	Scope 3
	Ground Service Equipment/Auxiliary Power Units	Scope 1
	Stationary Sources (generators, boilers, etc.)	Scope 1
	Electrical Consumption	Scope 2
Category 2 – Tenant-Owned and/or Controlled (includes airlines, government, aircraft operators, fixed-base operators, etc.)	Aircraft (on-ground, within the LTO up to 3,000 feet)	Scope 3
	Auxiliary Power Units/Ground Support Equipment	Scope 3
	Off-airport Employee Vehicle Trips, including employee commuting	Scope 3
	Stationary Sources (including generators, boilers, etc.)	Scope 3
	Electrical Consumption[1]	Scope 3
Category 3 – Public-Owned and Controlled	Off-airport Vehicle Trips (Includes private automobiles, taxis, limousines, buses, shuttle vans, etc., operating on the off-airport roadway network)	Scope 3

Note: 1. Tenant electricity was categorized as Scope 2 emissions in the *2017 ESPR*. However, tenant electricity consumption is considered Massport's Scope 3 emissions and has been categorized as such for this analysis.

8.5.1 Greenhouse Gas Emissions Inventory Summary

Table 8-12 displays the summary GHG inventory for Hanscom Field, categorized both by ownership category as well as scope. Emissions for CO_2, CH_4 and NO_2 are calculated and collectively converted to carbon dioxide equivalent[236], CO_{2e}. The total CO_{2e} for Hanscom Field in 2022 is estimated at 22,344 metric tons (MT). Massport-controlled emissions are around 3 percent of the total. For comparison, MassDEP's estimated statewide total GHG emissions for 2019 is provided at the bottom of Table 8-12; total Hanscom Field GHG emissions represent less than one-tenth of a percent of the state total.

The GHG emissions from Massport's electricity consumption (Massport Scope 2) is much less in 2022 (at 329 MT CO_{2e}) than the scope 2 emissions of 844 MT CO_{2e} reported in the 2017 ESPR. This is true despite the airport's solar production being down because the grid power is much cleaner (more renewables, less coal, more natural gas) in the fuel mix used by electricity providers in 2022 than in 2017. This represents a nationwide trend.

[236] CO_{2e} is a measurement based on the Global Warming Potential of each of those three greenhouse gases https://www.epa.gov/ghgemissions/understanding-global-warming-potentials

Table 8-12. 2022 Hanscom Field GHG Emissions Inventory Summary

Massport Ownership Category	Source	Scope	CO_2[1]	N_2O[1]	CH_4[1]	Total CO_{2e}[2]
			Emissions Expressed in MT per year			
Category 1 – Massport Owned/ Controlled Emissions	GSE/APUs	1	1	0.000	0.000	1
	Stationary Sources	1	163	0.000	0.003	163
	Off-Airport Roadways[3]	3	135	0.001	0.001	135
	Electricity Consumption[4, 5]	2	326	0.006	0.046	329
	Total Massport Emissions		625	0.007	0.047	628
Category 2 - Tenant Owned and/or Controlled	Aircraft[6] – Ground Operations	3	7,058	0.223	0.033	7,120
	Aircraft[6] – Ground to 3000 ft.	3	9,913	0.314	0.149	10,003
	Stationary Sources[7]	3	1535	0.029	.003	1,543
	GSE/APUs	3	277	0.032	0.045	288
	Off-Airport Roadways[3]	3	979	0.006	0.006	981
	Electricity Consumption[4]	3	1,429	0.027	0.200	1,442
	Total Tenant Emissions		21,063	0.629	.436	21,248
Category 3 – Public Owned/ Controlled	Off-Airport Roadways[8]	3	339	0.002	0.002	339
Total Hanscom Field GHG Emissions			22,155	0.640	0.485	**22,344**
Massachusetts Statewide Totals (2019)[9]			62,909,067	714,047	1,640,629	**71,667,107**
Hanscom Field Emissions as a % of Statewide Totals			0.03%	<0.01%	<0.01%	**0.03%**

Notes:
1. Fuel emissions were calculated utilizing EPA emission factors https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub.
2. Total carbon dioxide equivalent, or CO_2e, is calculated by applying the Global Warming Potential (GWP) values for each type of GHG in order to convert each to its equivalent mass in CO_2. GWP values are from the IPCC's Fifth Report (AR6), 2021.
3. Employee commuting travel was calculated utilizing 2022 Hanscom Travel Survey.
4. Electricity was calculated utilizing ISO New England and EPA standards.
5. Solar PV energy production at Hanscom provided a 4.34MT reduction in 2022 CO_{2e} emissions from what would otherwise be generated by electricity use from the grid.
6. Aircraft emissions rates were produced by AEDT v3e.
7. For hourly generator use, these are assumed to be diesel generators with <600 hp. The source for CO_{2e} emissions rates is https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf.
8. MOVES4 was used to calculate vehicle emissions rates for off-airport roadway traffic associated with Hanscom Field.
9. Figures obtained from the MassDEP Greenhouse Gas Inventory. https://www.mass.gov/lists/massdep-emissions-inventories#greenhouse-gas-baseline,-inventory-&-projection-. MA Statewide totals are calculated based on GWPs in IPCC AR4, where the GWP for N_2O is 298 in CO_2e, as opposed to the most recent set of GWP values, IPCC AR5, where the GWP for N_2O is 265 in CO_2e, resulting in a .09% difference. The statewide total for CO_2e in MT includes a wider range of GHGs, whereas the scope of this inventory and the character emissions from materials used on site at the airport are primarily limited to CO_2, N_2O, and CH_4. The most recent year of data available is 2020. However, 2019 was used here as more representative of annual statewide emissions, without the reduced emissions impacts stemming from Covid-19.
10. Emissions levels above 10 MT/yr are rounded to the nearest whole number.

As shown in **Figure 8-7** and **Figure 8-8**, both methods of categorization demonstrate that Massport owned or controlled emissions make up a small percentage of the total GHG emissions for Hanscom Field. Category 1 emissions account for less than 3 percent of total emissions. The major difference between the two categorizations is that “Category 1- Massport Owned/ Controlled Emissions” includes emissions from electricity usage, which is considered Scope 2 under the GHG protocol.

When segregated by the GHG protocol scopes, as displayed in Figure 8-7, Scope 3 GHG emissions include aircraft operations up to 3,000 feet, APUs/GSEs, tenant roadway use, tenant stationary sources (including emergency generators and boilers), and public roadway use. These Scope 3 sources represent the largest source of GHG emissions at Hanscom Field, at greater than 97 percent. Scope 2 GHG emissions from electrical consumption on site are the second largest source at 1.5 percent. Finally, Scope 1 GHG emissions, including Massport-owned and controlled emissions from vehicles and stationary sources (like generators and boilers), represent less than 1 percent of total emissions. Assumptions and methodology related to GHG analysis produced for this ESPR can be found in **Appendix E**.

Figure 8-7. Sources of 2022 GHG Emissions at Hanscom by GHG Protocol Scopes

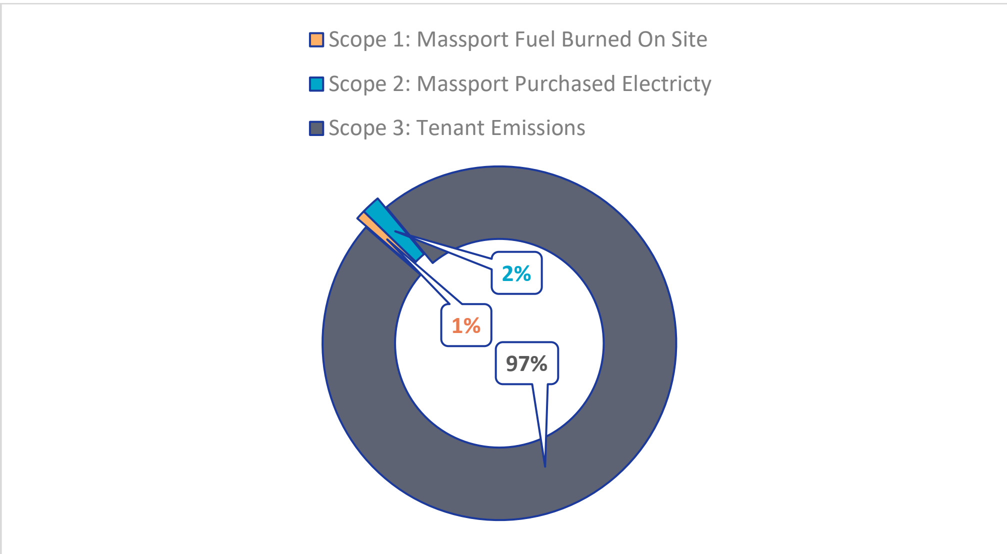
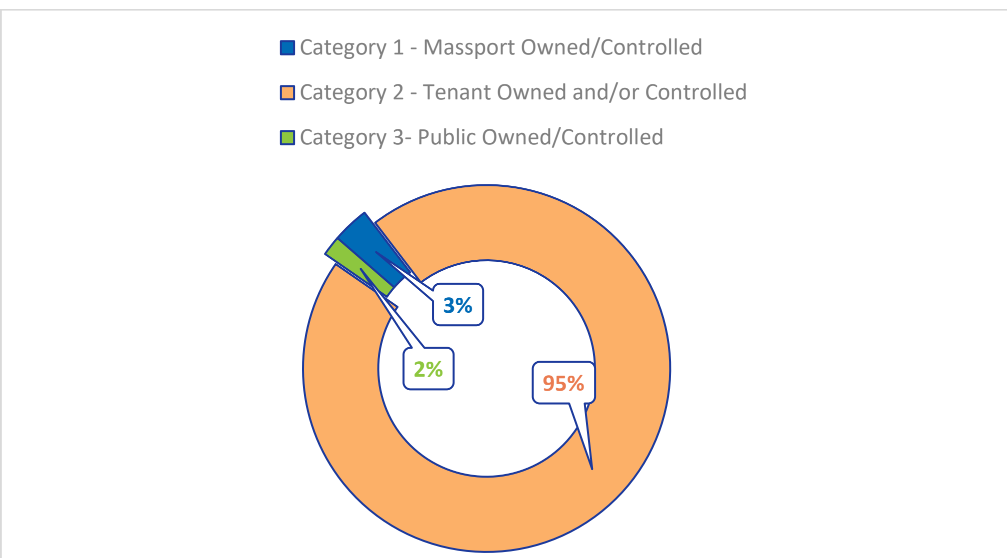


Figure 8-8. Sources of 2022 GHG Emissions at Hanscom by Ownership/Control Category

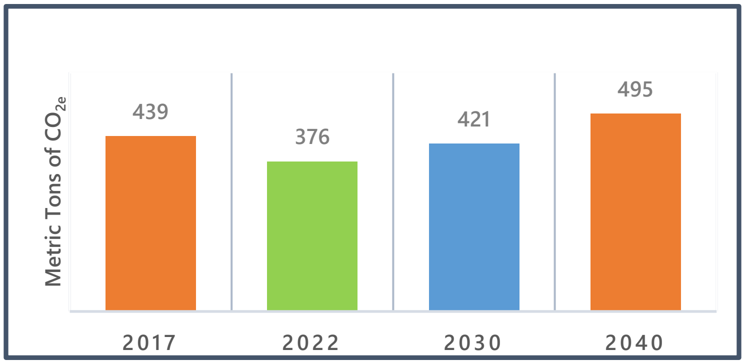


8.5.2 Analysis of Future Greenhouse Gas Emissions

Based on results from the aircraft operational analysis in AEDT version 3e as well as the mesoscale traffic analysis conducted in MOVES4, future GHG emission scenarios for 2030 and 2040 were forecasted. As stated in this document, these projections represent conservative estimates due to a variety of reasons including model limitations, unknown future regulatory requirements, technological advancements, and potential use of alternative fuels.

Figure 8-9 displays the GHG emissions in metric tons of CO2e[237] from public owned/ controlled vehicular traffic according to the mesoscale analysis conducted for this 2022 ESPR, as documented in Section 8.4. The GHG emissions value is larger than the CO_2 emissions from vehicular traffic reported earlier in the chapter because it incorporates methane (CH_4), and nitrous oxides (N_2O) as modeled in MOVES.

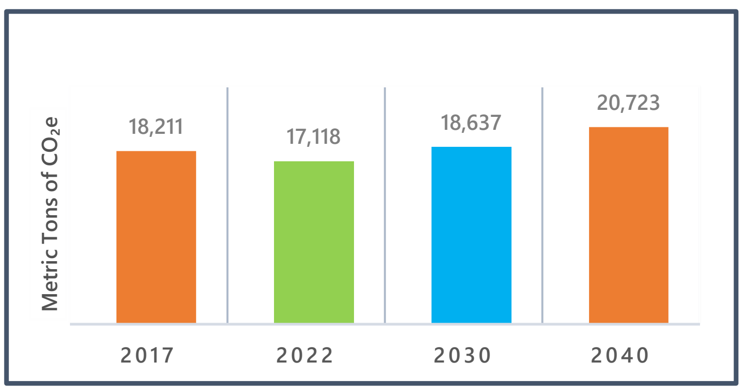
Figure 8-9. Forecast GHG Emissions from Vehicular Traffic



As the figure shows, there is a decrease in GHG emissions from the baseline inventory completed in the 2017 ESPR. GHG emissions in 2022 were below the 2017 actual analyzed value and 2030 GHG emissions are forecasted to be below the baseline 2017 value as reported in the 2017 ESPR. GHG emissions from public owned/ controlled vehicular traffic are forecasted to rise above the 2017 baseline value in the forecast year 2040. Emissions for the forecast years are an estimate based upon the aggregate fleet mix assumptions for Middlesex County and the forecasted traffic growth as a result of increased flight operations in the future conditions.

Figure 8-10 displays a decrease in GHG emissions from aircraft operations at Hanscom Field from 2017 (calculated in the previous ESPR) to 2022. The decrease in emissions can be primarily attributed to decreased aircraft operations, updated emission factors in AEDT 3e, and the decommissioning of older less efficient aircraft. Emissions from 2022 through 2040 display a steady increase in GHG emissions from aircraft operations in the forecast scenarios, which aligns with the increase in operations forecasted in Chapter 3. It should be noted that these GHG estimates are conservative because the AEDT air quality model does not assume any improvements in engine performance and efficiency over time. Assumptions and methodology related to the future GHG analysis produced for this ESPR can be found in **Appendix E**.

Figure 8-10. Forecast GHG Emissions from Aircraft Operations



[237] Emissions of various GHGs can be converted to an equivalent amount of CO_2 based on global warming potential values. This measure is referred to as carbon dioxide equivalent (CO_2e).

8.6 Potential Environmentally Beneficial Measures

As described within this chapter, the maximum air quality concentrations for all criteria pollutants in the future planning scenarios comply with the NAAQS. Massport continues to implement beneficial measures to reduce on-site emissions where possible. These measures address fuel handling, ground service equipment, building heating/cooling, energy efficiency, renewable energy, aviation support, airside operations, and the clean fuel vehicle program.

8.6.1 Fuel Conversion of Ground Service Equipment and Massport Groundside Vehicles

An inventory of current GSE and Massport groundside vehicles at Hanscom Field is provided in **Table 8-13**. Currently, approximately 11 percent of GSE and fleet vehicles are powered with alternative fuels. Since the *2017 ESPR*, there has been a decrease in the overall number of GSE vehicles, from 238 vehicles listed in 2017 to 214 vehicles listed in 2022.

8.6.2 Sustainability and Resiliency at Hanscom Field

In October 2011, Hanscom installed 222 PV solar panels, mounted on the roof and side of the Hanscom Field Terminal building. Panels are located on the south-facing side of the building roof and a series of wall-mounted panels are on the façade of the building. The system has a nameplate capacity[238] of 51 kilowatts and produced 17,962 kWh of electricity in 2022, equivalent to approximately 1 percent of Massport's total electricity consumption at Hanscom Field.[239] In addition to the solar panels utilized at Hanscom Field, since the writing of the previous ESPR, there have been significant upgrades to the lighting infrastructure at Hanscom Field. Jet Aviation, Liberty Mutual Insurance, North Star Facilities LLC, Signature Flight Support, Stream Enterprises, Boston MedFlight, and Atlantic aviation have increased sustainability throughout their facilities with the installation of new LED lighting.

As described below, Massport and Hanscom Field tenants have undertaken other measures to improve energy efficiency and reduce emissions from their facilities, using green design and construction standards, such as the U.S Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system.

- Jet Aviation is currently in the process of reviewing the steps needed to gain LEED certification for Building 17.
- Liberty Mutual performed an LED lighting upgrade project in 2019. This project upgraded all of the lights in the high bays and interior offices to LED lights, this has led to an annual kWh saving of 232,451 and an estimated CO_2 reduction of 1,111 MT.
- Boston MedFlight's new facility has been completed in 2018 and was designed to LEED Silver standards (and is waiting for completion of certification as of February 2024).
- Atlantic Aviation's Pine Hill complex was built to LEED Silver specifications.

[238] Nameplate capacity is the intended, full load sustained output of a power plant or renewable energy system.
[239] Figure obtained from Massport annual utility data renewable energy generation statistics.

Table 8-13. Ground Service Equipment and 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	12	6	--	--
ARFF Truck	--	2	--	--
Golf Carts	--	--	--	1
Trucks/Snowblowers/Plow/Sweepers	---	11	--	--
Front-end Loaders	--	3	--	--
Forklifts	--	--	1	
Small Tractors/Mowers/Bobcat	--	9	--	--
FBO: Signature				
Cars/Vans/Pickup Trucks	6	--	--	3
Snowplows/Deicing Trucks	--	2	--	--
Fuel Tanker Trucks	--	7	--	--
Belt Loader/Tugs/Air Stairs	6	3	--	3
Forklifts	--	1	--	--
FBO: Jet Aviation				
Cars/Vans/Pickup Trucks	1	--	--	--
Tugs/Belt Loaders/Air Stairs	8	3		7
Deicing Trucks	2	--	--	--
Fuel Tanker Trucks	--	7	--	--
Small Tractors/Mowers/Bobcat	2	--	--	--
Forklifts	--	--	1	--
FBO: Atlantic Aviation				
Cars/Vans/Pickup Trucks	1	--	--	--
Deicing Trucks	--	1	--	--
Fuel Tanker Trucks	1	3	--	--
Tugs/Belt Loaders/Air Stairs	1	--	--	3
Small Tenants[2]				
Cars/Vans/SUVs	48	9	--	--
Snowplows/Deicing Trucks	--	1	--	1
Fuel Tanker Trucks	--	3	--	--
Belt Loader/Tugs/Air Stairs	2	3	--	4
Ground Power Units	1	--	--	--
Dump Trucks	--	1	--	--
Small Tractors/Mowers/Bobcat	1	11	--	--
Snow Removal Contractors (seasonal)				
Heavy Equipment – Trucks, Loaders	--	12	--	--
Total[3]	92	98	2	**22**

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 were categorized as small tenants.
[3] Electric or propane powered vehicles represent 11.21% of total GSE and fleet vehicles (24 of 214).
Source: Massport, 2023

8.6.3 Clean Fuel Vehicle Program

As Massachusetts has adopted the California Low Emission Vehicle program, any new conventional-fueled vehicle added to the Hanscom Field 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).[240]

8.6.4 Status of Lead-Free Avgas in the United States

In February 2022, aviation and petroleum industry leaders and the FAA announced a new initiative that outlines how the United States can safely eliminate the use of leaded aviation fuel by the end of 2030 without adversely affecting the existing piston-engine aircraft. The new initiative is titled Eliminate Aviation Gasoline Lead Emissions (EAGLE).[241] It is a government-industry partnership that also encompasses fuel producers and distributors, airport operators, communities that support general aviation airports, and environmental experts.

As of September 2022, the FAA has approved the use of 100 Octane Unleaded (100UL) avgas produced by General Aviation Modifications, Inc. (GAMI).[242] This represents the first approval of a high-octane unleaded fuel for general aviation aircraft and moves the industry a step closer to an unleaded future. The price for 100UL avgas is not yet determined but will likely be more than traditional avgas; GAMI estimates that 100UL will cost more than the currently used 100 Octane Low Lead (100LL), but the price gap could close once 100UL production increases and the market adapts. The price difference will be a critical consideration for pilots because both 100UL and 100LL compete in the same market. GAMI notes that the price differential will most likely be offset by a reduction in engine maintenance costs when using 100UL. As of writing, it is still unknown exactly when 100UL will become a readily available resource at all airports.[243]

While the FAA continues to work with fuel producers to safely implement an unleaded variant of 100LL fuel, unleaded avgas 94 (UL94) is currently being produced and delivered to airports nationwide. UL94 is a Motor-Octane aviation gasoline that is produced without Tetraethyllead that still meets the American Society for Testing Materials (ASTM) D7547 Unleaded Avgas Specifications. UL94 has an identical density to 100LL and satisfies the minimum octane requirements for 66 percent of the U.S. piston fleet. Currently, Swift fuels is the primary provider of UL94 to airports across the country. Swift fuels allow for licensing of their unleaded products for low-cost bulk production by other fuel producers.[244]

Path to a Lead-Free Future at Hanscom

Figure 8-11 presents the forecasted adoption rates for unleaded avgas at Hanscom and the correlated forecast of lead emissions. Currently, there is no use of unleaded avgas at Hanscom Field as supplies are small and infrequent. The adoption of unleaded avgas at Hanscom Field is forecasted to align with the FAA's EAGLE initiative which plans to eliminate the use of leaded aviation gasoline by the year 2030. As a

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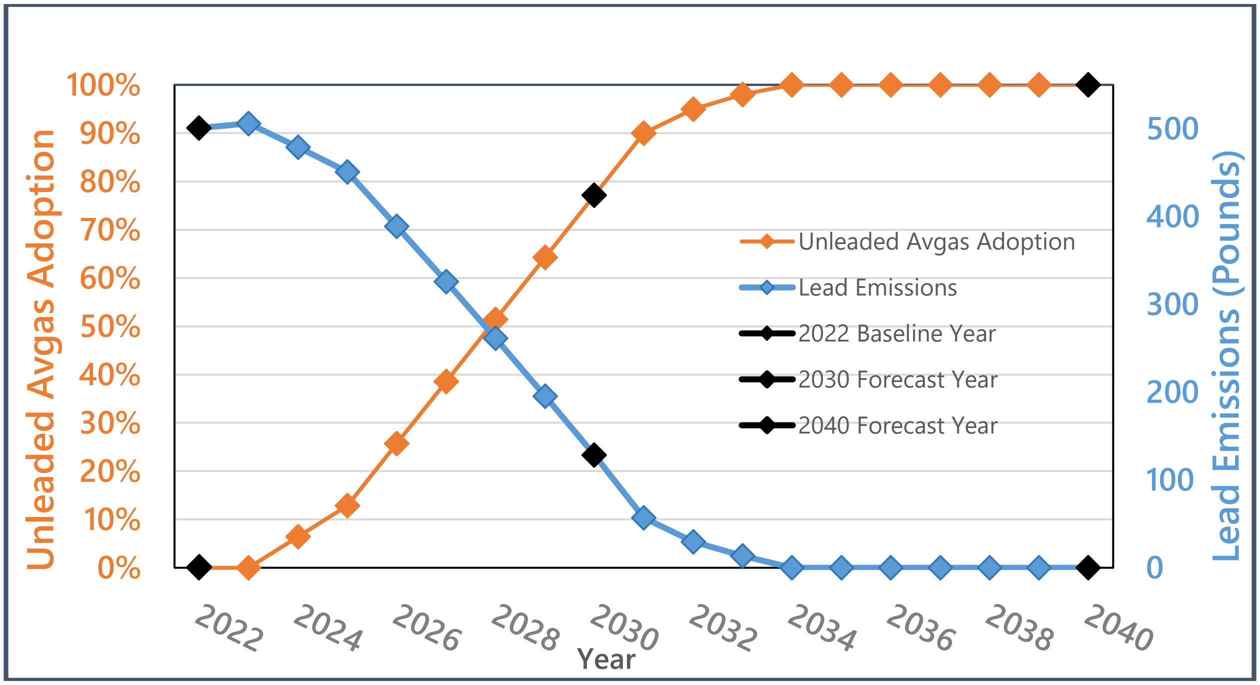
[240] 40 CFR 88, Clean-Fuel Vehicles. https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-88. Accessed November 21, 2023.
[241] FAA. "Building an Unleaded Future by 2030." https://www.faa.gov/unleaded. Accessed November 21, 2023.
[242] EAA. "Transition to Unleaded Avgas – What Does the Future Hold, How Much Work Remains?" https://www.eaa.org/eaa/news-and-publications/eaa-news-and-aviation-news/news/unleaded-avgas. Accessed on November 27, 2023.
[243] AOPA. 2022. "FAA Approves Unleaded Fuel for Piston Fleet." https://www.aopa.org/news-and-media/all-news/2022/september/01/closer-to-an-unleaded-future Accessed February 15, 2024.
[244] Swift Fuels. Frequently Asked Questions. https://www.swiftfuelsavgas.com/faq Accessed March 11, 2024.

conservative estimate, it is assumed that by 2030, approximately 80 percent of all piston-engine aircraft operations at Hanscom Field will use unleaded aviation gasoline and that 100 percent of all such operations will use unleaded fuel by 2034. The benefit of the adoption of unleaded avgas is evident in future lead emissions as shown in **Figure 8-11**, with a steady decline in lead emissions from the current levels as the adoption of unleaded avgas increases. When unleaded avgas is utilized by all GA aircraft operations at Hanscom Field, there will be zero lead emissions.

Figure 8-11. Adoption of Unleaded Avgas at Hanscom Field Compared to Lead Emissions



Note:
1.Lead emissions between forecast years 2030 and 2040 are interpolations, assuming a linear adoption rate of unleaded avgas between each forecast year.
2. 2023 lead emissions does not assume any implementation were scaled based upon the increase in GA operations from 2022 fleet and does not include any implementation of unleaded avgas.
3. The adoption of unleaded Avgas at Hanscom Field begins in 2024
4.Existing conditions (2022) and forecast years (2030 and 2040) are marked on the chart in black.
Source: HMMH, 2024

8.6.5 Adoption of Sustainable Aviation Fuel (SAF) at Hanscom Field

SAF is a form of biofuel produced from non-petroleum sources. It is an alternative fuel source that reduces net emissions from air transportation. SAF can be produced from, several potential fuel sources known as "feedstocks." These can be derived from waste materials such as municipal solid waste or used cooking oil, biomass-based matter such as wood waste, sugar cane, and plant-based oils, or seaweeds and algae.[245] There are several different technological processes that may produce sustainable fuel that meets ASTM standards. SAF can be blended with JET-A fuel at different levels ranging from 10 percent SAF to 50 percent SAF, depending on the feedstock used and on how the fuel is produced. The U.S. Department of Energy,

[245] FAA. *Potential Sources of Sustainable Aviation Fuels*. https://www.faa.gov/sites/faa.gov/files/2022-04/FACTS_Aviation_Fuels.pdf. Accessed February 12, 2024.

U.S. Department of Transportation, and U.S Department of Agriculture have coalesced around the Sustainable Aviation Fuel Grand Challenge, a strategy to expand the production of SAF to meet 100 percent of aviation fuel demand by 2050.[246] This strategy is an integral part of reducing aviation-related transportation emissions which are currently approximately 12 percent of the total U.S. transportation GHG emissions.[247]

The purpose of SAF is to help reduce life-cycle emissions of GHGs. Although the GHG emissions from the combustion of SAF are comparable to those from the combustion of conventional jet fuel, GHG reductions from SAF are attributable to the entire lifecycle of the fuel, from the growth of a biomass-based feedstock, or the avoidance of landfill emissions of a waste-based feedstock. Emissions values for different feedstocks and different technological processes utilized for SAF production can vary widely. Because SAF production and use is still in its infancy, there is significant uncertainty in the feedstock and production processes that will be used to deliver future fuel to Hanscom Field.

Although SAF is primarily considered for having lower life cycle GHG emissions over conventional jet fuel, the utilization of SAF has additional air quality considerations, as described below.[248]

- **SO_X** – Emissions have been found to be 50 percent to 90 percent lower with SAF fuels compared to conventional aviation fuels.
- **PM** – Studies have shown that there are significantly lower emissions of both volatile and nonvolatile PM from SAF compared to that of conventional aviation fuels. Reductions in the number of particles have been found to range from 22 percent to 99 percent depending on the type of SAF.
- **CO** – SAF tends to have high hydrogen to carbon ratios and therefore have higher combustion efficiency and lower CO emissions compared to conventional aviation fuels.
- **VOCs** – Studies have shown that there are negligible differences in VOCs emission from aircraft exhaust between SAF and conventional aviation fuels.
- **NO_X** – According to past studies, most SAF fuels showed either no change or reduction in NO_X emissions, but about 20 percent of SAF fuels have shown increases in NO_X emissions of up to 5 percent.

Using ICAO's methodology, Massport estimates a reduction of approximately 2,230 MT CO_2 at Hanscom Field by the year 2030.[249] This equates to a 12 percent reduction from the 2030 total CO_2 emissions reported in Table 8-7 (which assumes no SAF usage at Hanscom Field).[250] Emission reductions will continue as a result of SAF adoption as the FAA works to expand production to meet 100 percent of the aviation fuel demand by 2050. The assumptions and calculations leading to this estimate are included in **Appendix E**.

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[246] Office of Efficiency and Renewable Energy. "Sustainable Aviation Fuel Grand Challenge". https://www.energy.gov/eere/bioenergy/sustainable-aviation-fuel-grand-challenge. Accessed March 9,2024.
[247] U.S. Department of Energy. "Sustainable Aviation Fuel". https://afdc.energy.gov/fuels/sustainable_aviation_fuel.html. Accessed on January 11, 2024
[248] TRB ACRP Web-Only Document 35: State of the Industry Report on Air Quality Emissions from Sustainable Alternative Jet Fuels. https://www.trb.org/Publications/Blurbs/177509.aspx . Accessed on January 16, 2024.
[249] Appendix E contains ICAO's estimation equation and the assumptions leading to this conclusion.
[250] International Civil Aviation Organization (ICAO)- An Overview of CORSIA eligible Fuels (CEF), 2019 https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg228-231.pdf . Accessed March 9,2024.

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9 Wetlands, Wildlife, and Water Resources

This chapter presents an overview of the natural environment at Hanscom Field as well as a summary of Massport's current efforts to minimize impacts to the natural environment from airport activities. The potential impacts to the natural environment and water quality are presented for the 2030 and 2040 scenarios.

This chapter provides information about wetlands, wildlife, and water resources. The information establishes year 2022 conditions by reporting data from various sources that include the 2017 ESPR, various wetland delineation reports, the 2019 Hanscom Field Vegetation Management Plan (VMP) Update, the Massachusetts Natural Heritage and Endangered Species Program's (NHESP's) current inventory of rare species, Geographic Information System (GIS) data provided by MassGIS, reports to the National Wildlife Strikes Database, and other sources. This chapter also reports on the status of the VMP, the Shawsheen River water quality monitoring program, the Multi-Sector General Permit under the National Pollutant Discharge Elimination System (NPDES) program, and the Stormwater Pollution Prevention Plan (SWPPP) prepared under that program.

9.1 Key Findings Since 2017

Wetlands, wildlife, and water resource areas at Hanscom Field are fundamentally unchanged from the *2017 ESPR*. With only minor exceptions, the surrounding habitat areas are well-established with little variation from year to year. Based on the relatively static nature of field conditions and the large extent of the airfield, updates to wetland mapping tend to occur on a project-by-project basis. As stated in Chapter 2, there have been a series of airport facility and infrastructure improvements, initiatives, and/or studies undertaken at Hanscom Field since the *2017 ESPR*. During the planning process for each of these improvements, project-specific wetland delineations, if needed, were undertaken. The new wetland delineations completed since 2017 include the Runway 11-29 Rehabilitation Project (Wetland 1-1, 2017), North Airfield Development Project (Wetlands 2-1 and 2-9, 2020), Taxiway R Reconstruction Project (Wetlands 2-1 and 2-9, 2023), and a hangar project (Wetland S, 2018). See **Table 9-1** and **Figure 9-1**.

Since the *2017 ESPR*, Massport prepared a 2019 VMP update and continued to mitigate runway safety obstructions using the recommendations for the 2019-2024 time period. The next VMP update addressed the next management interval period and was completed in 2023.

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) revised the statewide inventory mapping in 2021 and released the 15th edition of the Natural Heritage Atlas[251]. At Hanscom Field, the Priority Habitat has been relabeled PH 1512 and relatively minor refinements were made to its limits. It still encompasses the larger grass areas on the airfield along with other habitat types along portions of Elm Brook.

In the Hanscom Field vicinity, three bird species and two turtle species observed by the NHESP or others have been identified as Endangered, Threatened, or Special Concern species in Massachusetts. The habitat for the three bird species is the open grasslands found on the airfield. The habitat for the Threatened Blanding's turtle lies adjacent to, but outside of the Hanscom Field property, while the mapped habitat for the Special Concern wood turtle lies on Hanscom Field property. Also, the northern long-eared bat (*Myotis septentrionalis*) was reclassified as Endangered under the federal Endangered Species Act effective January 30, 2023, and Hanscom Field is within the range of the northern long-eared bat. As of January 2024, the northern long-eared bat had not been found to occur on airport property.

Massport does not expect any potential indirect habitat impacts to disrupt the Endangered, Threatened, or Special Concern populations since these species currently occupy an active airport environment with a managed (regularly mowed) airfield. Potential water quality impacts will be avoided through the continued implementation of construction-phase SWPPPs under the EPA's NPDES Construction General Permit, the update of the airport operations SWPPP required by the Multi-Sector General Permit (MSGP), and conformance with applicable standards for stormwater management as required for site development or redevelopment by the Massachusetts Department of Environmental Protection (MassDEP). Where practicable, Massport also looks for opportunities to enhance groundwater infiltration.

There were no active MassDEP-listed disposal sites that Massport was responsible for in 2017. Currently, there is one active MassDEP-listed disposal site that Massport is responsible for bringing to regulatory

[251] Commonwealth of Massachusetts. "Natural Heritage Atlas, 15th Edition, Town Priority Habitat Maps". https://www.mass.gov/info-details/natural-heritage-atlas-15th-edition-town-priority-habitat-maps

closure under the Massachusetts Contingency Plan (MCP) within airport property; it is listed in the MassDEP Reportable Releases database under Release Tracking Number (RTN) 3-0037062. This site is located at the southeastern portion of Hanscom Field and is associated with a 2021 release of approximately 200 gallons of 3-percent aqueous film forming foam (AFFF) containing per- and poly-fluoroalkyl substances (PFAS). Massport will continue to perform Comprehensive Response Actions to achieve a Permanent Solution[252] for RTN 3-0037062.

A search of MassDEP Waste Site/Reportable Releases database was conducted for sites where a release of oil or hazardous material was reported to the MassDEP and where closure was received since 2017; the results are presented in Section 9.2.7.

Hanscom AFB continues to conduct environmental restoration efforts under the U.S. Air Force Installation Restoration Program (IRP), which is described in Section 9.2.7. There have been no additional sites added to the IRP list at Hanscom Field since the *2017 ESPR*.

During 2003 and 2004, Massport conducted a deicing study and monitoring effort at Hanscom Field. That study concluded that neither current nor future scenario deicing activities at Hanscom Field would adversely affect the water supply for Bedford or Burlington, nor would they adversely affect the ecosystem of the Shawsheen River or Elm Brook. Hanscom uses less than 100,000 gallons of deicing fluid on an average annual basis (averaging 30,218 gallons per year from 2003 to 2023) and is therefore not subject to benchmark monitoring that is typically required as part of the NPDES MSGP (see Section 9.2.9 for more details). Since future scenario deicing efforts are not expected to change, the conclusion of no adverse outcomes remains.

9.2 Year 2022 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. They also describe Massport's efforts to maintain and improve the quality of stormwater runoff from the site. In addition, an update on MassDEP-listed sites and the Hanscom AFB environmental restoration program is provided.

9.2.1 Geographic and Geologic Conditions

Geography and Topography

Hanscom Field is situated in the Eastern Plateau Physiographic Region, a low-lying and well-dissected[253] 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

[252] Per 310 CMR 40.0006, "Permanent Solution means a measure or combination of measures which will, when implemented, ensure attainment of a level of control of each identified substance of concern at a disposal site or in the surrounding environment such that no substance of concern will present a significant risk of damage to health, safety, public welfare, or the environment during any foreseeable period of time."
[253] "Dissection" here refers to the dissection of the land by many streams and rivers.

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.

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 developed in wetland areas, and fill material was added during the development of the airfield in the last century.

Native soils within the perimeter of Hanscom Field have been disrupted by construction and associated earth-moving activities. The United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) has classified most of the soils on the airfield as udorthents. Udorthents are defined by the NRCS as a map unit consisting of well-drained to excessively well-drained soil composed of cut areas, filled areas, or both. They are often associated with urban areas. In areas that were cut, the surface layer has been removed and in fill areas typically more than 20 inches of soil material has been placed on the surface. Often both cut and fill areas occur in close proximity, as areas were often graded and smoothed during development, forming a complex pattern of cuts and fills. Massport obtained Middlesex County-wide soils data from the Soil Survey Geographic Database[254], which includes updates to soil boundaries and their respective acreages, and which identified no changes to the mapped soils since 2017.

9.2.2 Wetlands

This section describes the status of the state and federally protected wetland resource areas at Hanscom Field in the Towns of Bedford, Concord, Lexington, and Lincoln. **Table 9-1** presents descriptions of the individual Hanscom Field wetland areas' vegetation, soils, and hydrology. **Figure 9-1** depicts the locations of wetland areas. Descriptions of wetland resource types and the criteria for their identification follow. This information was derived from a review of existing documents, including the *2017 ESPR*; wetland delineations performed for the 2004-2008 Hanscom Field VMP; wetland delineations performed for a variety of environmental studies associated with airport facility and infrastructure improvement projects; and a review of all available GIS data from multiple sources including MassGIS.[255] No on-site field investigations or delineations were conducted as part of this wetland update. Delineated wetland boundaries and jurisdictional determinations are typically valid for a period of five years, after which time a new delineation will need to be performed prior to the construction of any project. As such, the information provided in this ESPR pertaining to existing wetlands may be subject to change following any updated wetland delineations.

[254] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.nrcs.usda.gov/.

[255] MassGIS is the Commonwealth's Bureau of Geographic Information, within the Executive Office of Technology Services and Security (formerly MassIT and ITD)

The wetland resources at Hanscom Field have been delineated by wetland scientists many times over the past 20 or more years as part of various airport facility and infrastructure improvement projects. Additional site-specific reviews have been conducted under VMP, SWPPP, and drainage planning. Table 9-1 includes the tentative state resource area designations and federal classifications of the wetlands along with a general description of each wetland and its dominant vegetation (to the extent this information is available). The naming and mapping conventions used in previous ESPRs and other planning documents have been retained to ensure a consistent means to evaluate the known wetland resources at Hanscom Field.

Delineations undertaken since the *2017 ESPR* were project-specific and focused on the North Airfield area. This information has been incorporated into Table 9-1 and Figure 9-1. The wetland boundaries and state or federal jurisdictional status of these wetlands cannot be determined with certainty until up-to-date delineations are completed and submitted to regulatory authorities. The regulatory authorities (towns, Army Corps) would confirm boundaries and jurisdictional status through permitting, Requests for Determination of Applicability (towns), Requests for Jurisdictional Determination (Army Corps), or other processes.

Overall, based on existing wetland mapping and available reports, the status of the wetland resource areas at Hanscom Field is little changed from those identified in the *2017 ESPR*.

Wetland delineations are conducted on a project-specific basis and include the following:

- 1998 – MPA
- 2001 – Dufresne-Henry, Inc.
- 2008 – McFarland Johnson
- 2010 – Stantec
- 2011 – McFarland Johnson
- 2012 – Wetlands & Wildlife, Inc.
- 2016 – McFarland Johnson
- 2016 – GZA
- 2017 – McFarland Johnson
- 2018 – Stantec
- 2020 – Mason & Associates, Inc.

Table 9-1. Description of Wetland Resources

Wetland I.D. and Year of ID	MA WPA Resource Areas[1]	Federal Wetland Type[2]	Soil Type[3]	Notes	2023 Update
1-1 20102017	BVW, Bank, LUWB, Riverfront Area	PFO1, PSS, R3	Saco	This wetland complex is comprised of forested and scrub/shrub wetland types with several channelized drainage swales which flow into the Shawsheen River. Dominant species include Red Maple, Trembling Aspen, Glossy Buckthorn, Highbush Blueberry, Silky Dogwood, Speckled Alder, and Cinnamon Fern. This wetland boundary was left open at the property limit.	2017 delineation updated a portion off Runway 29 end
1-2 1998 2010	BVW, Bank, LUWB	PFO1, PSS1, R4, PEM	Scarboro, Freetown	This wetland complex is a former cranberry bog and is a mixture of red maple swamp, scrub/shrub and emergent wetland areas. Dominant vegetation includes Red Maple, Highbush Blueberry, Glossy Buckthorn, Tussock Sedge, Soft Rush, and Sphagnum. Beaver activity has periodically flooded portions of this wetland.	No update
1-3 2010 2016	BVW	PSS1	Udorthents-Sandy	This scrub/shrub wetland was constructed to compensate for adjacent wetland impacts. It wraps around two sides of the Runway 23 Safety Area.	No update
1-4 1998 2016	BVW, Bank	PSS1, PEM1	Scarboro, Udorthents -Sandy	This wetland is a detention basin that is adjacent to a larger red maple swamp.	No update
1-5 1998	Non-Jurisdictional	PSS1	Udorthents -Sandy	This wetland is a relatively small, isolated depression within a mowed area. It is not a state jurisdictional area.	No update
2-1 1998 2010 2016 2020 2023	BVW, Bank, LUWB, Riverfront Area	PFO1, PSS1, PEM1, R3, R4	Freetown, Wareham, Scarboro, Swansea	This wetland complex is associated with Elm Brook and contains a 200-foot Riverfront Area. 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 Moss.	Delineation partially updated

Wetland I.D. and Year of ID	MA WPA Resource Areas[1]	Federal Wetland Type[2]	Soil Type[3]	Notes	2023 Update
2-2 2010	Non-Jurisdictional	PSS1, PEM1	Udorthents-Sandy	Not a state-jurisdictional wetland area; location to be verified	No update
2-3 2010	Non-Jurisdictional	PUB	Deerfield	This is an isolated non-jurisdictional wetland area with limited vegetation. This area was previously identified in the *1995 GEIR* and 2000 ESPR as a possible vernal pool. Location to be verified.	No update
2-4 2010	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 to the Massachusetts Natural Heritage Atlas 15th edition, this area contains two certified vernal pools.	No update
2-5 2010	Certified Vernal Pools	PSS1	Deerfield	This isolated area is also apparently formed in a man-made depression and contains Purple Loosestrife and Sphagnum Moss. According to the Massachusetts Natural Heritage Atlas, this area has been certified as a vernal pool. Location to be verified.	No update
2-6 1998 2010	Non-Jurisdictional	PSS1 PFO1	Deerfield	This isolated wetland has formed in an apparently man-made depression in a disturbed area. It is a forested and scrub/shrub wetland type dominated by Red Maple, American Elm, Glossy Buckthorn, Silky Dogwood, Northern Arrowwood, and Multiflora Rose.	No update
2-7 2010	Non-Jurisdictional	PFO1 PSS1	Scarboro	This isolated wetland has formed in an apparently man-made depression in a disturbed area. It is a forested and scrub/shrub wetland type dominated by Red Maple, American Elm, Glossy Buckthorn, Silky Dogwood, Northern Arrowwood, and Multiflora Rose.	No update
2-8 1998	BVW	PFO1, PSS1, PEM1	Scarboro	This wetland is a red maple swamp that also contains portions of scrub/shrub wetland and emergent	No update

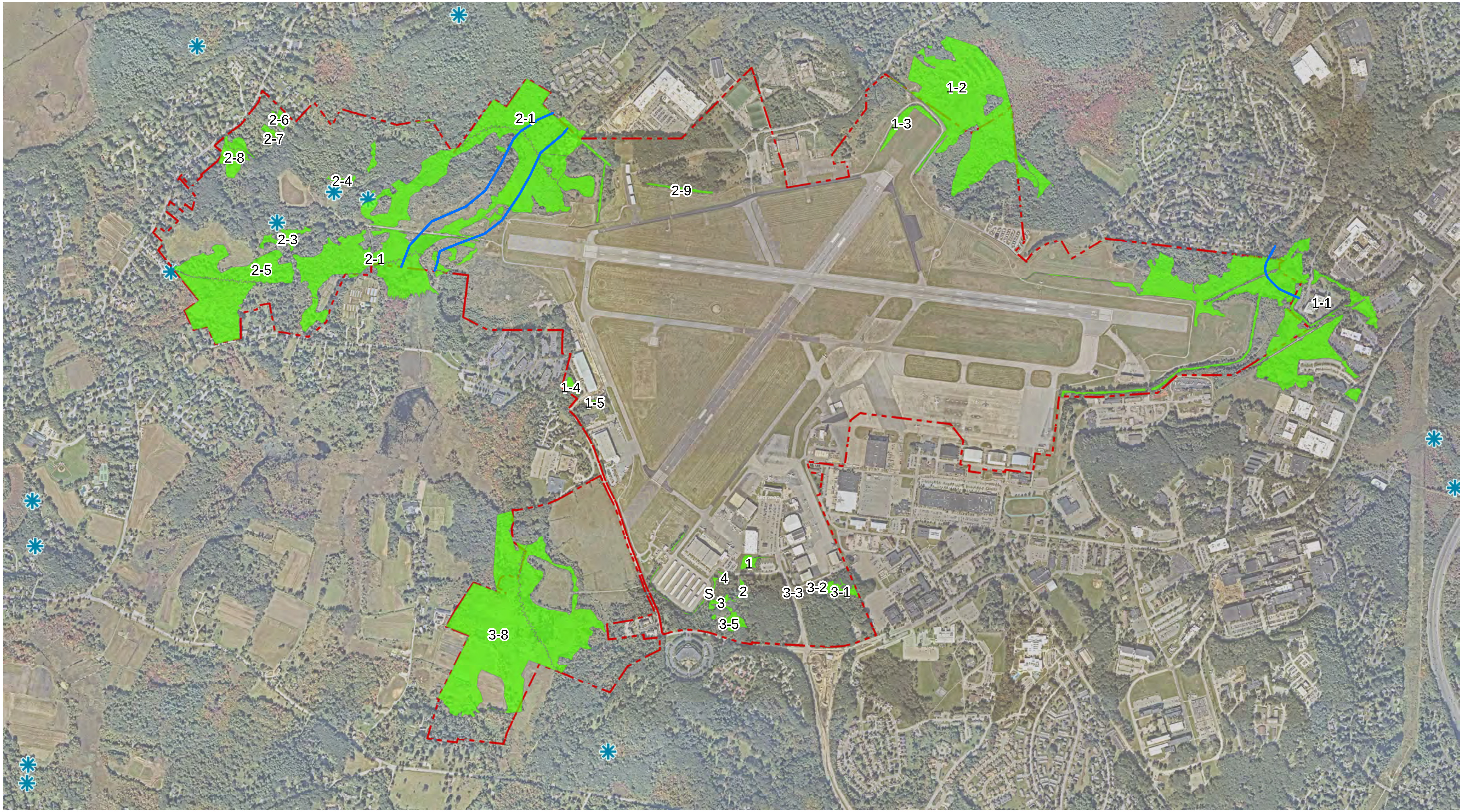
Wetland I.D. and Year of ID	MA WPA Resource Areas[1]	Federal Wetland Type[2]	Soil Type[3]	Notes	2023 Update
2010				wetland. It receives road drainage from Old Bedford Road.	
2-9 1998 2016 2020 2023	Bank, LUWB	R4	Udorthents - Loamy	This area is an open drainage ditch that outlets to Elm Brook.	Delineation updated
3-1 1998	ILSF Possible	PFO1	Canton	This wetland appears to be man-made, either inadvertently or for stormwater management purposes. Wetland 3-1 is 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.	No update
3-2 1998	Potential BLSF or BVW	PFO1	Canton	This wetland appears to be man-made, either inadvertently or for stormwater management purposes. Wetland 3-2 includes both 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.	No update
3-3 1998 2016	BLSF	PEM1	Canton	Wetlands 3-3 is a vegetated swale dominated by emergent species such as Cattail and Purple Loosestrife.	No update
3-5 1998	Non-Jurisdictional	PFO1	Canton	This wetland appears to be relatively undisturbed forested wetland dominated by Red Maple, Trembling Aspen, and Winterberry.	No update
3-8 1998 2010	BVW, Bank, BLSF, Riverfront	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 and has a 200-foot Riverfront Area. Forested red maple swamp with a Glossy Buckthorn understory dominates this complex. Portions of the complex also include	No update

Wetland I.D. and Year of ID	MA WPA Resource Areas[1]	Federal Wetland Type[2]	Soil Type[3]	Notes	2023 Update
				Purple Loosestrife dominated marsh and farmed areas.	
Wetland No. 1 2012 2016	BVW	PEM1	Canton	This wetland consists of an emergent plant community with a large number of soft rush present. Hydric soils are present and are abundantly mottled and saturated at the surface, with some standing water.	No update
Wetland No. 2 2012	BVW	PSS1, PEM1, PFO1	Canton	This wetland contains forested scrub/shrub and emergent wetlands. It is located south of Wetland No. 1, (wetland 3-9) but is not connected to it. The most abundant canopy species include Red Maple and Eastern Cottonwood. The most common understory species include Speckled Alder, Pussy Willow, Oriental Bittersweet, Jewelweed, and Cattail. Within a portion of this wetland, the vernal pool characteristics have been observed. To date the pool has not been certified by the Massachusetts Natural Heritage and Endangered Species Program.	No update
Wetland No. 3 2012	BVW	PFO1	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 Northern Arrowwood, Norther 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.	No update
Wetland No. 4 2012	BVW	PSS1, PEM1	Canton	This wetland is primarily scrub/shrub and emergent wetland. Dominant species include Pussy Willow, Blue Vervain, Woolgrass, and Tussock Sedge. Groundwater and surface runoff flow in the direction of the	No update

Wetland I.D. and Year of ID	MA WPA Resource Areas[1]	Federal Wetland Type[2]	Soil Type[3]	Notes	2023 Update
				drainage channel adjacent to the existing T-hangars (Wetland S).	
Wetland S 2010 2018	BVW	R4	NA	This is a drainage channel which circles the T-hangar facility. Several existing wetlands drain into this system. Vegetation is unknown at this point. There is a culverted inlet located at the northeast corner and northwest corner of the T-hangars.	Delineation updated

Definitions:
BLSF – Bordering Land Subject to Flooding (Floodplain); BVW – Bordering Vegetated Wetland; ILSF – Isolated Land Subject to Flooding; LUWB – Land Under Water Bodies and Waterways; PEM1 – Palustrine Emergent/Persistent; PFO1 – Palustrine Forested/Broad-Leaved Deciduous; PFO4 Palustrine Forested/Needle-Leaved Evergreen; PSS1 – Palustrine Scrub-Shrub/Broad-Leaved Deciduous; PUB – Palustrine Unconsolidated Bottom; R3 – Riverine (perennial); R4 – Riverine (intermittent)

Sources:
1. 310 Code of Massachusetts Regulations (CMR) 10.00: Wetlands Protection Regulation Act Regulations, October 2014.
2. Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service. FWS/OBS-79/31.
3. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.nrcs.usda.gov/.
4. *2017 ESPR* and wetland mapping and reports provided by Massport



North

0 1,200 2,400 Feet

MA Riverfront Area

Delineated Wetlands

NHESP Certified Vernal Pools

Airport Property Boundary

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Previously Delineated Wetlands and Surface Waters

Figure **9-1**

Data Sources: MassGIS, NHESP, Nearmap US Inc. Oct. 2023

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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 Wetland Protection Act (WPA) [310 Code of Massachusetts Regulations (CMR) 10.00 et seq.] define five freshwater wetland resource areas subject to protection: Banks, Bordering Vegetated Wetlands, Land Under Waterbodies/Waterways, Land Subject to Flooding (Bordering and Isolated), 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 the *Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands*.[256] 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 BLSF 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 6 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 but can be also determined by watershed size or other characteristics.

A 100-foot buffer zone is associated with state-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. The USACE requires the acquisition of permit approvals for impacting federal-jurisdictional wetland resources. The USACE has approved 23 General Permits for the Commonwealth of Massachusetts under which projects with minor impacts to federal wetlands may receive USACE approval. For projects with very minor impacts to federal wetlands, the USACE allows approval under the "Self-Verification" process, which requires notification but does not require submittal of a permit application. If a project does not meet

[256] MassDEP. September 2022. Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands, Second Edition. https://www.mass.gov/doc/massachusetts-handbook-for-delineation-of-bordering-vegetated-wetlands/download

the criteria for Self-Verification, it may require either a Preconstruction Notification or an Individual Permit, both of which involve formal permit applications. The USACE permitting requirements do not affect the need for permits from local conservation commissions under the Massachusetts WPA.

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* (the Manual),[257] 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 because of excessive water content. The National Wetland Plant List published by the USACE, which was most last updated in 2020, is 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**: 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.

9.2.3 Vernal Pools

Three vernal pools have been certified at Hanscom Field, all outside of the actively-mowed airfield. Based on a review of MassMapper online GIS data[258] accessed October 25, 2023, there are no visible changes to these resources within airport property since 2017. Additionally, no new vernal pools have been certified and no previously existing certified vernal pools have been removed from the list since 2017[259]. These three vernal pools (within Wetlands 2-4 and 2-5), are located within the Town of Concord to the west of Runway 11/29; their approximate locations are shown on Figure 9-1. A fourth area with potential vernal pool characteristics occurs within Wetland 2-3 also to the west of Runway 11/29. During 2012 wetland delineations, characteristics of certified vernal pools were identified in Wetlands Numbers 3 and 4. However, 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.

9.2.4 Perennial Streams

As identified by the USGS topographic map[260], two perennial waterways exist at Hanscom Field: the Shawsheen River in Bedford and Elm Brook in Bedford, Concord, and Lincoln. Elm Brook is a tributary of the Shawsheen River. As perennial streams, both the Shawsheen River and Elm Brook have 200-foot-

[257] USACE. January 1987. Wetlands Delineation Manual. https://www.lrh.usace.army.mil/Portals/38/docs/USACE%2087%20Wetland%20Delineation%20Manual.pdf
[258] Mass Mapper. https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html?bl=MassGIS%20Basemap__100&l=massgis:GISDATA.CVP_PT__GISDATA.CVP_PT::Default__ON__100&b=-73.69628906250001,41.104190944576466,-69.74121093750001,43.014689161895184
[259] Commonwealth of Massachusetts. “MassGIS Data: NHESP Certified Vernal Pools”. https://www.mass.gov/info-details/massgis-data-nhesp-certified-vernal-pools
[260] USGS. CONCORD, MA TNM GEOSPATIAL PDF. https://store.usgs.gov/product/475888

wide Riverfront Areas extending landward from each bank. Work within Riverfront Areas is subject to regulation under the Massachusetts WPA. There have been no apparent changes to these resources since 2017. Hanscom Field is in the upper reaches of the Shawsheen River watershed and within two USGS HUC-12 basins[261]: 010700050206 Concord River mainstem and 010700061301 Shawsheen River-headwaters to McKee Brook.

9.2.5 Vegetation and Wildlife

Native vegetation near 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 which are mowed regularly to maintain operational safety.

The variety of vegetative cover types, presence of wetlands and waterways, and undeveloped parcels on and near Hanscom Field provide known and potential habitat for wildlife species capable of coexisting with human activities and development. Animals can sometimes pose a hazard to aircraft operations and thus require appropriate management. Management of hazardous wildlife is governed by the FAA-approved Wildlife Hazard Management Plan prepared for Hanscom Field.

Wildlife that may be expected to inhabit the area include larger mammals such as whitetail deer and red fox, and smaller mammals such as eastern cottontail rabbits, gray squirrels, and various species of mice, voles, and shrews. Characteristic 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. According to the Cornell Laboratory of Ornithology, a total of 158 species of birds have been recorded by birders on and around Hanscom Field since 1980. Various reptiles and amphibians may be expected to occupy portions of the property as well. Perennial watercourses (i.e., Elm Brook and Shawsheen River) around the periphery of Hanscom Field are Class B surface waters, according to Massachusetts Surface Water Quality Standards [314 CMR 4.05(3)(b)], and are suitable as "habitat for fish, other aquatic life, and wildlife…and for primary and secondary contact recreation."

State Rare and Endangered Species

Portions of Hanscom Field are within an area identified by the NHESP as a Priority Habitat of Rare Species, as shown on **Figure 9-2**. Pursuant to the Massachusetts Endangered Species Act and implementing regulations [321 CMR 10.05(1)], all state agencies are required to "review, evaluate and determine the impact on Endangered, Threatened, and Special Concern species or their habitats of all works, projects or activities conducted by them…"

Work proposed in Priority Habitat typically requires submission of a Project Review Checklist to NHESP. If it is determined there will be a taking of rare species, the proponent must prepare a Conservation and Management Permit application and demonstrate a net benefit to the impacted species. Work within mapped Estimated Habitat of Rare Species (a subset of Priority Habitat within the jurisdiction of the WPA) or near certified vernal pools would normally be reviewed by the NHESP through the submission

[261] "HUC" refers to hydrologic unit codes, which are watersheds designated by the USGS. They are divided into successively smaller watershed or hydrologic units, with the numbers indicating the number of digits in the code. See https://www.usgs.gov/tools/hydrologic-unit-maps.

of a copy of a Notice of Intent prepared as part of the WPA filing process. Rare species impacts would also be addressed in NEPA and MEPA documentation, and NHESP would be involved in reviewing and commenting on the documentation.

As listed in **Table 9-2**, there are five species identified as state Endangered, Threatened, or Special Concern that have been observed at Hanscom by the NHESP or others. This data was obtained from previous NHESP correspondence, including the *2017 ESPR* and more recent projects at the Airport, such as the North Airfield Development project.

All three of the listed bird species, the Upland Sandpiper, Grasshopper Sparrow, and Eastern Meadowlark, require grassland habitat (e.g., hayfields and pastures), such as those found on airfields. These species have previously been observed within areas of maintained grassland vegetation between runways and taxiways at Hanscom Field, and nesting by the Upland Sandpiper and Grasshopper Sparrow was confirmed during past field surveys. The specific locations of nesting pairs of these species have varied somewhat over the years, according to Massachusetts Audubon Society observations at Hanscom Field.

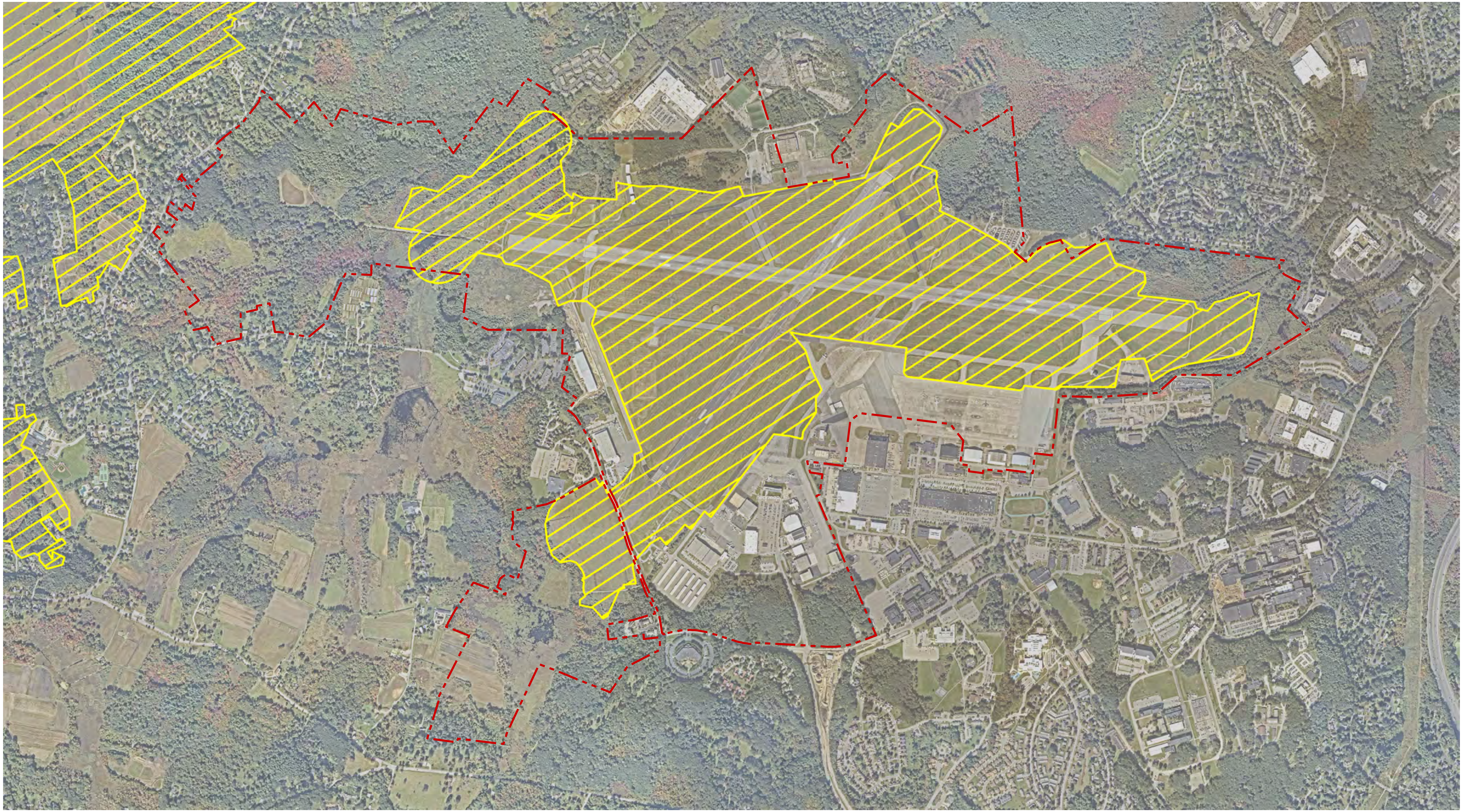
Implementing regulations for the Massachusetts Endangered Species Act define three categories of species [321 CMR 10.03(6)]:

- **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."

Table 9-2. State-listed Species at Hanscom Field

Common Name	Scientific Name	MA State Status[1]	Location of Habitats in Relation to the Airport
Upland sandpiper	*Bartramia longicauda*	Endangered	Within airfield
Grasshopper sparrow	*Ammodramus savannarum*	Threatened	Within airfield
Eastern meadowlark	*Sturnella magna*	Special Concern	Within airfield
Blanding’s turtle	*Emydoidea blandingii*	Threatened	Adjacent to the west end of the airfield
Wood turtle	*Glyptemys insculpta*	Special Concern	Within the airfield

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, August 24, 2018 letter



North

0 1,200 2,400 Feet

NHESP Priority Habitats of Rare Species

Airport Property Boundary

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

NHESP Priority Habitat

Figure **9-2**

Data Sources: MassGIS, NHESP, Nearmap US Inc. Oct. 2023

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The Blanding's turtle requires a variety of wetland and terrestrial habitats, including ponds, marshes, scrub-shrub wetlands, and uplands. The wood turtle requires both streams and riparian areas. Wood turtles hibernate underwater in streams, and during the spring and summer, spend time in mixed or deciduous forests, fields, and wet meadows. Fact sheets obtained from the NHESP for all five species are included in **Appendix F**.

Federal Rare and Endangered Species

Species listed under the Federal Endangered Species Act as Threatened or Endangered would also automatically be protected by the Massachusetts Endangered Species Act [321 CMR 10.03(4)]. The United States Fish and Wildlife Service (USFWS) has jurisdiction over protection of terrestrial and aquatic (i.e., non-marine) species that are listed and therefore protected under the Federal Endangered Species Act. The potential occurrence of federally listed Threatened and Endangered species on the Hanscom Field property was evaluated using the USFWS online Information for Planning and Conservation (IPaC) system.[262] According to the IPaC results obtained April 6, 2023, federally Endangered northern long-eared bat (*Myotis septentrionalis*) was listed, and therefore impact to this species should be considered in future activities on the property that result in tree disturbance. The monarch butterfly (*Danaus plexippus*) was listed as a candidate species, but candidate species do not receive regulatory protection under the Endangered Species Act.

The northern long-eared bat is generally associated with forests with an intact forest interior habitat. Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. During the summer, northern long-eared bats roost individually or in colonies underneath tree bark, in tree cavities, or in crevices of both live trees and dead trees. Males and non-reproductive females may also roost in caves and mines where it is cooler. This species of bat has also been found roosting in structures like barns and sheds. The northern long-eared bat population in the northeast has been greatly impacted by the spread of *Pseudogymnoascus destructans*, a fungal pathogen that causes a respiratory disease in bats known as "white-nose syndrome." Massachusetts is wholly within the white-nose syndrome zone.

The USFWS published a final rule to reclassify the northern long-eared bat as Endangered on November 30, 2022. The final rule went into effect on March 31, 2023 and the 2015 4(d) rule for northern long-eared bats is no longer valid. Any future projects that result in tree removal will require consultation with the USFWS to evaluate potential impacts to northern long-eared bats.

The Massachusetts NHESP maintains these records for municipalities in the Commonwealth. In various recent project correspondence, NHESP indicated there are no caves or mines on or within one-quarter mile of Hanscom Field, nor do any occur within the Towns of Lexington, Concord, Lincoln, and Bedford. There are no Massachusetts NHESP records of known maternity roost trees within the project area or the surrounding area.

Other Species of Conservation Concern

There have been observations of other grassland bird species of interest at Hanscom Field co-occurring with the upland sandpiper, grasshopper sparrow, and eastern meadowlark. These included the American kestrel and the bobolink. According to the 2015 Massachusetts Wildlife Action Plan, the American kestrel is a Regional Species of Greatest Conservation Need (RSGCN) with a high priority for

[262] https://ipac.ecosphere.fws.gov/

conservation, while the bobolink is an RSGCN with a very high priority. Additionally, the USFWS Birds of Conservation Concern (BCC) list identifies the migratory and non-migratory bird species (beyond those already designated as federally Threatened or Endangered) that represent USFWS's highest conservation priorities. The list is based on an assessment of several factors, including population abundance and trends, threats on breeding and nonbreeding grounds, and size of breeding and nonbreeding ranges. Bird species considered for the BCC list include nongame birds, gamebirds without hunting seasons where harvest is minimal, and subsistence-hunted nongame birds in Alaska. Excluded from the BCC list are bird species not protected under the Migratory Bird Treaties Act, species already listed as Threatened or Endangered under the Endangered Species Act, or species that occur irregularly in the United States. According to the BCC list, there are 18 BCC that occur within the vicinity of Hanscom Field:

- Bald eagle
- Black-billed cuckoo
- Blue-winged warbler
- Bobolink
- Canada warbler
- Chimney swift
- Eastern whip-poor-will
- Golden eagle
- Lesser yellowlegs
- Long-eared owl
- Prairie warbler
- Prothonotary warbler
- Red-headed woodpecker
- Ruddy turnstone
- Rusty blackbird
- Short-billed dowitcher
- Willer
- Wood thrush

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 of aircraft strikes associated with certain wildlife species, the FAA issued an Advisory Circular (AC) on Hazardous Wildlife Attractants on or near Airports (AC 150/5200-33C) to provide guidance on land uses that have the potential to attract wildlife that pose hazards. The FAA also maintains the National Wildlife Strike 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. A total of 151 strikes have been recorded at Hanscom Field since the *2017 ESPR,* as shown in **Table 9-3**.

Table 9-3. National Wildlife Strike Database – Wildlife Strikes at Hanscom Field Airport

Common Name	Scientific Name	Animal Category	Number of Strikes Since Last ESPR (2019–2023)	Number of Strikes Since 1990
American black duck	*Anas rubripes*	Bird	0	1
American crow	*Corvus brachyrhynchos*	Bird	0	4
American golden plover	*Pluvialis dominica*	Bird	1	2
American kestrel	*Falco sparverius*	Bird	34	60
American pipit	*Anthus rubescens*	Bird	0	1
American robin	*Turdus migratorius*	Bird	0	2
Bank swallow	*Riparia riparia*	Bird	2	5
Barn swallow	*Hirundo rustica*	Bird	22	35
Big brown bat	*Eptesicus fuscus*	Mammal	0	1

Common Name	Scientific Name	Animal Category	Number of Strikes Since Last ESPR (2019–2023)	Number of Strikes Since 1990
Black-bellied plover	*Pluvialis squatarola*	Bird	1	2
Blackpoll warbler	*Setophaga striata*	Bird	0	1
Bobolink	*Dolichonyx oryzivorus*	Bird	0	3
Brown-headed cowbird	*Molothrus ater*	Bird	1	1
Budgerigar	*Melopsittacus undulatus*	Bird	0	1
Canada goose	*Branta canadensis*	Bird	2	5
Cedar waxwing	*Bombycilla cedrorum*	Bird	0	1
Chimney swift	*Chaetura pelagica*	Bird	4	8
Coyote	*Canis latrans*	Mammal	0	1
Dark eyed junco	*Junco hyemalis*	Bird	0	1
Ducks (species unknown)	*n/a*	Bird	-	4
Eastern bluebird	*Sialia sialis*	Bird	0	1
Eastern meadowlark	*Sturnella magna*	Bird	0	8
European starling	*Sturnus vulgaris*	Bird	2	12
Goose	*Species unknown*	Bird	0	1
Great blue heron	*Ardea herodias*	Bird	1	2
Great horned owl	*Bubo virginianus*	Bird	0	2
Gull	*Species unknown*	Bird	0	9
Hawk	*Species unknown*	Bird	1	4
Herring gull	*Larus argentatus*	Bird	0	1
Horned lark	*Eremophila alpestris*	Bird	10	15
Killdeer	*Charadrius vociferus*	Bird	12	20
Least sandpiper	*Calidris minutilla*	Bird	3	5
Mallard/American black duck complex	*Anas platyrhynchos/Anas rubripes*	Bird	1	2
Merlin	*Falco columbarius*	Bird	1	1
Mourning dove	*Zenaida macroura*	Bird	8	22
Peregrine falcon	*Falco peregrinus*	Bird	1	3
Red-tailed hawk	*Buteo jamaicensis*	Bird	4	9
Ring-billed gull	*Larus delawarensis*	Bird	2	3
Sandpipers, curlews, phalaropes, allies	*Species unknown*	Bird	0	1
Savannah sparrow	*Passerculus sandwichensis*	Bird	5	7
Semipalmated plover	*Charadrius semipalmatus*	Bird	0	1
Short-billed dowitcher	*Limnodromus griseus*	Bird	0	1
Snow bunting	*Plectrophenax nivalis*	Bird	5	10

Common Name	Scientific Name	Animal Category	Number of Strikes Since Last ESPR (2019–2023)	Number of Strikes Since 1990
Snowy owl	*Bubo scandiacus*	Bird	0	1
Sparrow	*Species unknown*	Bird	0	2
Striped skunk	*Mephitis mephitis*	Mammal	1	4
Swallow	*Species unknown*	Bird	1	4
Tree swallow	*Tachycineta bicolor*	Bird	6	16
Turkey vulture	*Cathartes aura*	Bird	0	1
Unknown bird	*n/a*	Bird	19	72
Vesper bat	*Species unknown*	Mammal	0	1
Winter wren	*Troglodytes hiemalis*	Bird	0	1
Source: The FAA Wildlife Strike Database, accessed October 2023, https://wildlife.faa.gov/home				

Status of Vegetation Management Plan

Massport routinely develops VMPs to comply with FAA regulations and Massachusetts General Laws regarding protected airspace. Massport developed a comprehensive VMP in 2004, which was updated in 2008, 2014, and most recently in 2019. The 2019 update serves as a guide for vegetation removal projects conducted at the Airport for management years 2019 through and including 2024. No major additions or changes to the previous update were required; however, the 2019 update did address variations to vegetation removal methods, and new removal areas in Concord and Lexington. Notices of Intent were submitted to the Conservation Commissions of Bedford, Concord, Lincoln, and Lexington for work subject to the WPA.

Grassland Management Plan

Areas of Hanscom Field are mapped as Priority Habitat under the Massachusetts Endangered Species Act. Many of these areas are regularly mowed as required by the FAA to meet aviation safety standards. In 2004, Massport developed a Grassland Management Plan with the goal to provide safe operating conditions at Hanscom Field while protecting rare grassland bird species such as the grasshopper sparrow and upland sandpiper. The plan was finalized with input from the USDA Wildlife Services, FAA, and the NHESP. An updated review was conducted in October 2020 and an updated draft of the Grassland Management Plan was submitted to NHESP in 2023.

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:

- Conduct annual pre-breeding season review of grassland management procedures and protected grassland bird identification with operations and maintenance staff.
- Conduct early season bird call survey (late April/early May).
- Develop an airport grassland mowing plan that would maintain managed grassland areas at a height of 4 to 14 inches.
- Develop a map of grassland areas, numbered for identification.

- Mow all grassland areas in the air operations area prior to May 1.
- Continue mowing of runway and taxiway safety areas throughout the breeding season.
- Minimize mowing during the breeding (nesting and brood-rearing) season.
- Conduct pre-mowing field reconnaissance to observe and mark locations of nesting birds in grassland areas.
- Avoid, as practical, activities on grassland portions of airfield and approach areas not directly adjacent to taxiways during the breeding season (May 1 to July 15).
- Provide an annual summary report to NHESP.
- Evaluate alternative strategies.

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. NHESP would be notified of any modifications to the plan and the process will involve timely notification of the Conservation Commissions in Bedford, Concord, Lexington, and Lincoln.

9.2.6 Water Resources

The locations of public water supplies within Bedford, Concord, Lexington, and Lincoln are shown on **Figure 9-3**. **Table 9-4** 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 6.8 miles. The only change in the public water resources since the *2017 ESPR* was removal of a transient well from the list: Well Number 1 in Bedford with Source ID 023000-01G. Groundwater beneath Hanscom Field/Hanscom AFB is not currently used as a drinking water supply, and it is not expected to be so used in the future. Drinking water is supplied to Hanscom Field through the Towns of Bedford and Lexington.

Table 9-4. Public Water Supply in the Towns of Bedford, Concord, and Lincoln

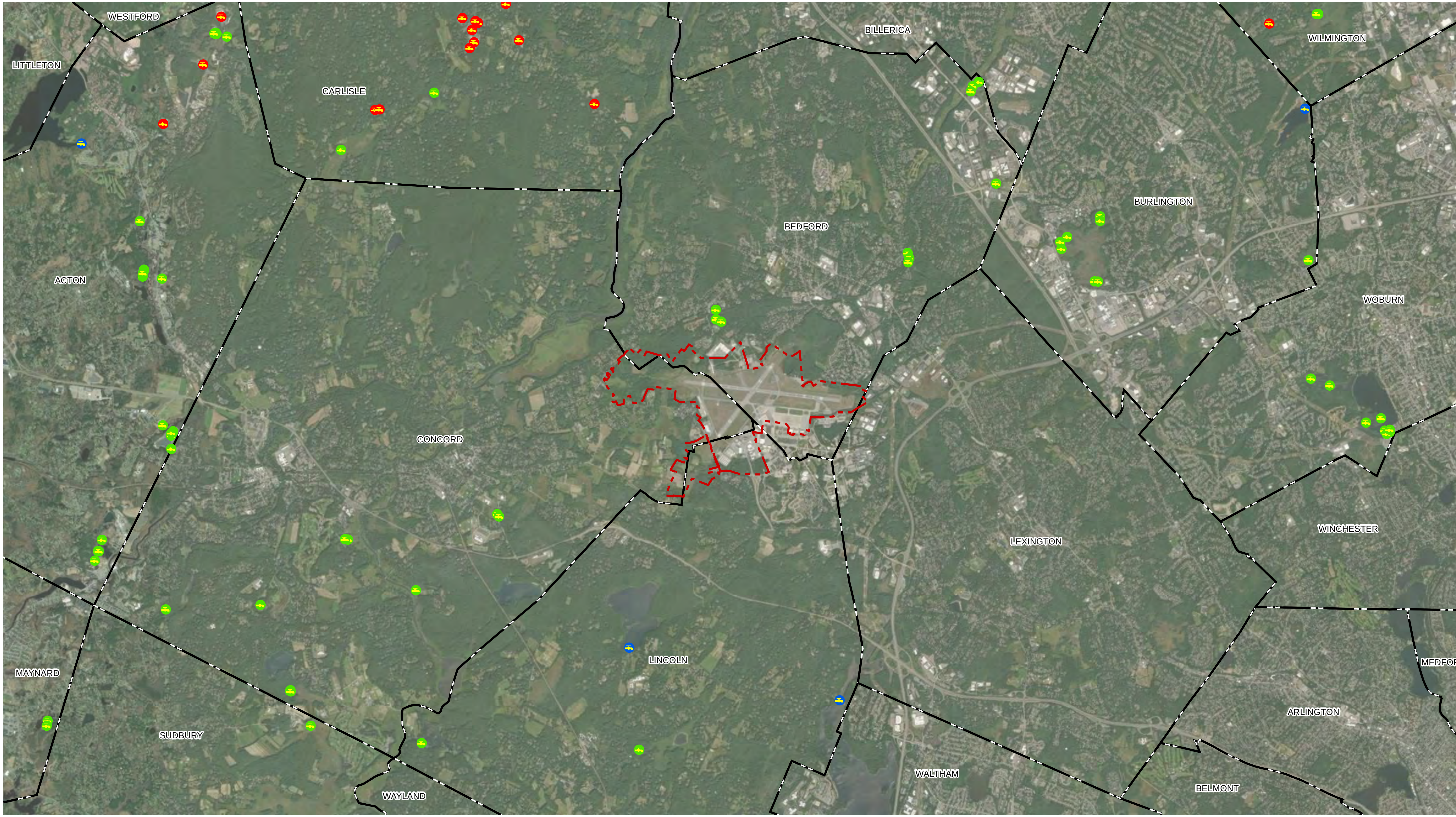
Town[1]	Source[2] ID Number	Site Name	Type	Distance from Hanscom Field[3]
Bedford	3023000-11G	Well No. 11 (Hartwell Rd. G.P. Well No. 11	Groundwater	0.9 miles
	3023000-10G	Well No. 10 (Hartwell Rd. G.P. Well No. 10)	Groundwater	0.9 miles
	3023000-12G	Well No. 12 (Hartwell Rd. G.P. Well No. 12)	Groundwater	1.0 miles
	3023000-09G	Well No. 5 (Shawsheen G.D. Well No. 5)	Groundwater	2.2 miles
	3023000-08G	Well No. 4 (Shawsheen G.D. Well No. 4	Groundwater	2.2 miles
	3023000-02G	Well No. 2 (Shawsheen Rd. G.P. Well No. 4	Groundwater	2.3 miles
	3023000-03G	Well No. 3 (MITRE/Rte. 62 G.P. Well	Groundwater	3.5 miles

Town[1]	Source[2] ID Number	Site Name	Type	Distance from Hanscom Field[3]
	3023000-05G	Well No. 7 (Turnpike G.P. Well No. 7)	Groundwater	4.0 miles
	3023000-07G	Well No. 9 (Turnpike G.P. Well No. 9)	Groundwater	4.0 miles
	3023000-06G	Well No. 8 (Turnpike G.P. Well No. 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 G.P. Well	Groundwater	4.7 miles
	3067000-10G	Deaconess Satellite G.P. 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 No. 1 GP Well	Groundwater	6.0 miles
	3067000-09G	White Pond Satellite No. 2 GP Well	Groundwater	6.0 miles
	3067000-05G	Second Division GP Well	Groundwater	6.8 miles
Lincoln	3157000-01S	Flints Pond	Surface water	2.2 miles
	3049000-04S	Hobbs Brook Res Upper (serves Cambridge)	Surface water	2.7 miles
	3157000-01G	Tower Road GP Well	Groundwater	3.3 miles
	3157000-02G	Farrar Pond GP Well	Groundwater	4.4 mile

Note:
1. There are no public water supply wells in Lexington.
2. Source: MassGIS Data Public Water Supplies Shapefile, accessed April 2023.
3. Approximate distance from runway intersection.

In 2022, Bedford's water supply was entirely provided by the Massachusetts Water Resources Authority (MWRA) and ultimately from Quabbin Reservoir.[263] Previously, approximately 10 percent of Bedford's water was supplied by the Shawsheen Treatment Facility; however, those wells were turned off in October 2018 due to the presence of PFAS in water samples collected from the wells. The wells remain off-line while the town coordinates with MassDEP. Concord is served by six active public groundwater supply wells and one surface water supply. Lexington is served by the MWRA and has no local water supply sources. Lincoln is served by both surface water and a groundwater well, with the primary supply being Flint's Pond.

[263] Massachusetts Water Resources Authority 2022 Drinking Water Test Results, Town of Bedford, MA. https://www.bedfordma.gov/DocumentCenter/View/1071/Annual-Drinking-Water-Report-PDF



North

0 1 2 Miles

Community Groundwater Source
Surface Water Intake
Non-Community Groundwater Source
Airport Property Boundary
Town Boundary

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Public Water Supply Wells

Figure **9-3**

Data Sources: Esri, Maxar, Earthstar Geographics, the GIS User Community, MassGIS

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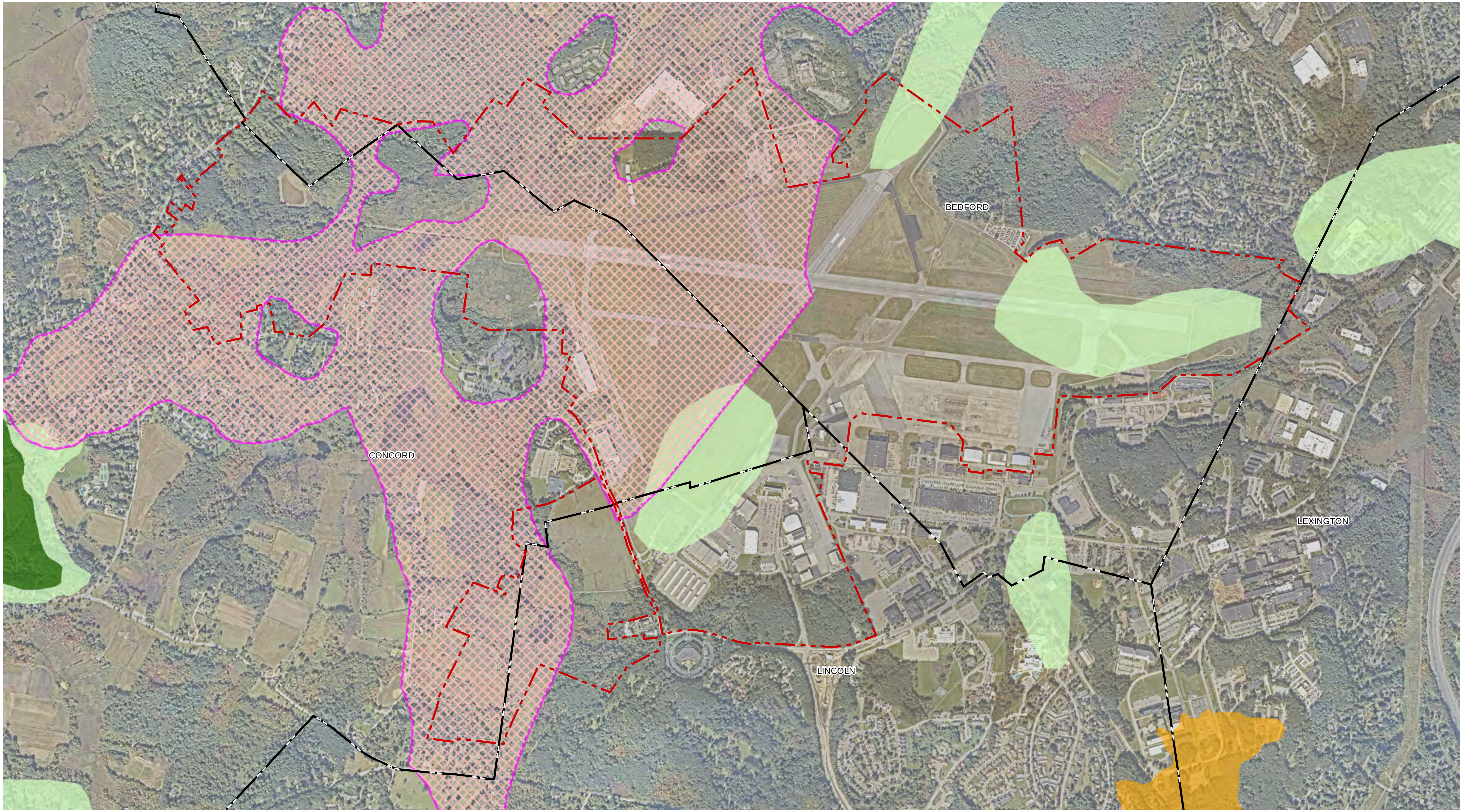

North

0 1,200 2,400 Feet

Medium Yield Aquifer
High Yield Aquifer
Approved Wellhead Protection Areas (Zone II)
Suface Water Protection Zone C
Airport Property Boundary
Town Boundary

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Zone II Wellhead Protection Areas and Aquifers

Figure **9-4**

Data Sources: MassDEP, MassGIS, Nearmap US Inc. Oct. 2023

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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 II areas and restrict certain land uses and activities in Zone II areas which may result in the contamination of a groundwater drinking supply. **Figure 9-4** shows the approved Zone II Wellhead Protection Area and aquifers that overlap Hanscom Field. The Zone II area is associated with three Hartwell Road wells in Bedford that were closed in 1984. There are no Surface Water Supply Protection Areas (Zone A, B, C) on Hanscom Field.

9.2.7 Regulated Remediation Sites and PFAS

Hanscom Field

For this document, a search of MassDEP Reportable Releases database[264] was conducted for sites where a release of oil or hazardous material was reported to MassDEP.

There is one active MassDEP-listed disposal site within airport property that Massport is responsible for bringing to regulatory closure under the MCP; it is listed in the MassDEP Reportable Releases database under Release Tracking Number (RTN) 3-0037062.

The disposal site is located in the southeastern portion of Hanscom Field, at 200 Hanscom Drive. According to the most recent Immediate Response Action (IRA) Completion Report[265] (November 2022) by TRC Environmental Corporation, on September 14, 2021, during Massport Fire Rescue truck operational inspections, approximately 200 gallons of 3-percent AFFF PFAS[266] were accidentally released to the southeastern corner of Hanscom Field at 200 Hanscom Drive. Various IRA activities were performed from September 14, 2021 through present, which included vacuuming the foam from the pavement, storm drains, and the Shawsheen River, the replacement of storm drain outfall absorbent booms, pressure washing the pavement in the release area, and sampling activities. The initial IRA activities and response actions are summarized in the November 2021 IRA Plan. Since then, additional soil, surface water, and groundwater samples have been collected from various locations in the release area and analyzed for PFAS. The analytical results were compared to relevant MCP water standards based on the potential risk of harm posed by the concentrations detected in the soil or water samples.[267]

To date, TRC has conducted two surface water sampling events to evaluate potential impacts to the Shawsheen River. Fifteen PFAS compounds were detected in the September 2021 surface water samples at concentrations exceeding laboratory reporting limits. Laboratory analyses of the 12 surface water samples collected in September 2021 exhibited concentrations exceeding the Method 1 GW-1 groundwater standards (for potential drinking water)[268]; however, none of the surface water samples

[264] Energy & Environmental Affairs Data Portal, https://eeaonline.eea.state.ma.us/portal/dep/wastesite/
[265] TRC. *Immediate Response Action Completion Report, Hanscom – Civil Air Terminal – East Ramp*. https://eeaonline.eea.state.ma.us/DEP/wsc_viewer/FileViewer.aspx?fileEncryptionId=ghgjjjcj
[266] 194 gallons of water mixed with 6 gallons of AFFF concentrate containing 2.5 pounds of PFAS.
[267] MassDEP. 2017. *MCP Numerical Standard*. https://www.mass.gov/doc/mcp-numerical-standards-derivation/download#:~:text=MCP%20Numerical%20Standards%3A%20GW%2D1,-The%20MCP%20GW&text=These%20standards%20are%20intended%20to,in%20contact%20with%20the%20water
[268] GW are groundwater standards and S are soil standards as defined here: https://www.mass.gov/doc/mcp-numerical-standards-derivation/download#:~:text=MCP%20Numerical%20Standards%3A%20GW%2D1,-The%20MCP%20GW&text=These%20standards%20are%20intended%20to,in%20contact%20with%20the%20water

exhibited PFAS at concentrations exceeding the Method 1 GW-3 groundwater standards (for discharges to surface waters).

To date, TRC has collected 32 soil samples from the site (excluding duplicate samples collected for quality control purposes) and has submitted them for PFAS analysis. None of the 32 soil samples had concentrations of PFAS compounds at levels that exceed the applicable standards (known as Method 1 S-3/GW-3 standards). The Completion Report also references the more conservative S-3/GW-1 standards for sample locations within 500 feet of the Shawsheen River. Laboratory analyses of eight of the nine soil samples within 500 feet of the river exhibited PFAS at concentrations exceeding the Method 1 S-3/GW-1 soil standards. The S-3/GW-1 standards are provided for comparison only and are not applicable to the soil samples at the Disposal Site.

To date, three groundwater samples have been collected from the site and submitted for PFAS analysis. Twelve PFAS compounds were detected in the groundwater samples at concentrations exceeding laboratory reporting limits.

Although the Method 1 GW-1 standards were used for comparison purposes, the disposal site is not technically located within a GW-1 area, and PFAS concentrations were not detected in disposal site soil or groundwater samples at concentrations exceeding the Method 1 GW-3 standards. Massport will continue to perform appropriate investigation and remediation efforts until the site receives closure for RTN 3-0037062.

AFFF containing PFAS is stored in the Massport Maintenance Garage for use in firefighting activities pertaining to aircraft and training exercises on the airfield. Massport Fire Rescue performs equipment testing using water only. Best management practices (BMPs) for the proper storage of AFFF containing PFAS are documented in the SWPPP[269], along with appropriate response protocols for potential releases.

Other sites have been reported since 2017 but have received a compliance status of Permanent Solution with No Conditions (PSNC, defined in table) or were otherwise closed. These are listed in **Table 9-5**.

BMPs for the storage of AFFF containing PFAS:

- Conduct loading/unloading under cover.
- Transfer materials in paved areas, away from storm drain inlets.
- Contain and absorb leaks/spills that occur during material transfer.
- Store drums/containers on pallets
- Handle materials in a bermed area
- Provide secondary containment for stored materials.
- Develop/implement SPCC Plan
- Perform and document periodic inspections

[269] Storage of AFFF and other chemicals are addressed in Appendix C of the SWPPP in two sections: BED 09 – Outdoor Handling of Material and BED 10 – Outdoor Material Storage

Table 9-5. 2018-2022 MassDEP Reported Releases on Hanscom Field Property that Were Closed or Achieved a Compliance Status of Permanent Solution with No Conditions (PSNC)

RTN	Town	Release Address	Site Name	Notification Date	Compliance Status[1]	Date
3-0036452	Bedford	180 Hanscom Drive	Signature Facility at Hanscom Field	8/24/2020	PSNC	10/23/2020
3-0034930	Lincoln	180 Hanscom Drive	Bed General Aviation Ramp Near Hangar 10	5/20/2018	PSNC	5/20/2019
3-0036057	Concord	711 Virginia Road	Special Test Facility, Draper Labs	12/24/2019	RTN Closed	11/14/2023
3-0037537	Concord	777 Virginia Road	Fuel Farm	6/14/2022	PSNC	8/13/2022
3-0037307	Bedford	191 Hartwell Road	Adjacent to the Edge Sports Center	2/8/2022	PSNC	6/3/2022
3-0035926	Bedford	154 Hartwell Road	Former Southern Flight Test Area	10/23/2019	PSNC	12/30/2020

Notes:
1. Compliance Statuses are defined in https://www.mass.gov/doc/understanding-the-waste-siterelease-look-up-search-results/download
PSNC (Permanent Solution No Conditions) = A site/release where a Permanent Solution Statement was submitted indicating that response actions were sufficient to achieve a level of No Significant Risk for all current and foreseeable future uses of the site without the need to restrict the use of the property.
RTNClosed = Future response actions addressing the release associated with this Release Tracking Number (RTN) will be conducted as part of the response actions planned for the site under another "primary" RTN. This occurs at sites where multiple releases (RTNs) have been combined under one primary RTN to simplify and streamline timelines and deadlines

Hanscom Air Force Base (AFB)

Hanscom AFB maintained and operated Hanscom's airfield until 1974 and retains responsibility for any required cleanup that stems from activities during that time as well as for any remediation sites on Hanscom AFB property. Hanscom AFB is conducting environmental restoration efforts under the U.S. Air Force Installation Restoration Program (IRP), which was initiated by the Department of Defense concurrently with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund"). The National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP) is the primary IRP response process for releases identified under this program. However, because petroleum releases are excluded from the Superfund program, the MCP is the primary IRP response process at the sites where a release of petroleum has occurred. The EPA is the lead agency for NCP sites, and the MassDEP is the regulatory agency for 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
- 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, seven 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. In addition, investigations have been completed and long-term remedies are in place at the six remaining IRP Sites (including four IRP Sites on Hanscom Field)[270]; these are grouped into three Operable Units (OUs).

There have been no additional sites added to the IRP list at Hanscom since the *2017 ESPR*. **Figure 9-5** illustrates the location of the remaining active IRP sites/ OUs. 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 (FYRs) 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 (sixth) *Five-Year Review for the Hanscom Field/Hanscom AFB Superfund Site* was completed in September 2022, by Versar, Inc. Hanscom AFB Records of Decision and other decision documents, including MCP Licensed Site Professional Opinions/Response Action Outcome Statements and Five-Year Review Reports issued for IRP actions, are all subject to concurrence from the EPA and/or MassDEP. Site Close-Out designation, when issued, indicates that all required actions are complete and the U.S. Air Force has received concurrence from the regulatory agencies to that effect, as applicable.

Operable Unit-1 / IRP Sites 1, 2, 3

Groundwater beneath OU-1 is contaminated with chlorinated volatile organic compounds (VOCs) and PFAS because of the previous U.S. Air Force airfield maintenance and training activities. The remedy includes a vacuum-enhanced recovery system and groundwater treatment. An Interim Record of Decision was issued in January 2001 by the U.S. Air Force for National Priorities List[271] (NPL) OU-1 which includes IRP Site 1 (Fire Training Area II), IRP Site 2 (Paint Waste Disposal Area), and IRP Site 3 (Jet Fuel Residue/Tank Sludge Disposal Area). The document 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.

Subsequently, two emerging contaminants, PFAS and 1,4-dioxane, were sampled and detected in OU-1 groundwater at levels above the MCP GW-1 standard at several wells. In addition, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) were detected in the groundwater treatment plant effluent and in a surface water sample from downstream of the discharge location.

The U.S. Air Force's Sixth FYR Report identified the following issues related to the OU-1 groundwater treatment plant: the age of the groundwater treatment plant, the reduction in volume and mass of

[270] The sites known as IRP 1, IRP 2 and IRP 3 (which are in OU-1) and IRP 4 (which alone makes up OU-2) are all on Hanscom Field property. The other two, IRP 6 and IRP 21, are both in OU-3, on Hanscom AFB property.
[271] The National Priorities List is a list of hazardous waste sites designated by the EPA as being eligible for long-term remedial action under the federal Superfund program.

contaminant removal, and a lack of progress in cleaning up groundwater contamination. In addition, the groundwater treatment plant was not designed to remove PFAS compounds. For the remedy to be protective in the long term, the U.S. Air Force recommended evaluating the treatment plant and proceeding with any recommended actions, as well as conducting a plume stability study to determine if potential optimization or alternative remedial actions are required. The U.S. Air Force Sixth FYR Report's milestone date for this work is listed as 2027. On September 22, 2022, the U.S. Air Force indicated that its milestone date for this work to be completed is August 31, 2026; the EPA agreed with this determination and accepted the milestone date.

Hanscom AFB developed a Land Use Control Implementation Plan (LUCIP) for OU-1 in December 2022. In addition, a site investigation for PFOS and PFOA is currently in progress.

Operable Unit-2 / IRP Site 4

IRP Site 4 was used as the Hanscom AFB municipal waste landfill from December 1964 until December 1974. The site covers 10.5 acres and is located approximately 1,800 feet southeast of the approach end of Runway 5/23 on Hanscom Field. The landfill is situated predominantly in the Town of Lincoln, with a small portion protruding into the bordering Town of Concord. The landfill ranges from 10 to 15 feet deep and is estimated to have a volume of 210,000 cubic yards of mixed waste from various sources. An impervious cap was placed over the landfill in 1988. The area is also bermed with drainage ditches to channel runoff from the capped area to the wetlands. The area is grassed open space with a softball field in the southern half.

While OU-2 (IRP Site 4) has been included in prior FYRs, there has never been a CERCLA remedy for this OU; therefore, no CERCLA protectiveness statement is appropriate, and the U.S. Air Force notes in its FYR Report that its review of OU-2 is discretionary. The U.S. Air Force believes that its low-permeability landfill cover is functioning as intended by its 1988 Remedial Action Plan, which was implemented prior to the listing of the site on the NPL. As outlined in its November 9, 2021 letter, and acknowledged in its FYR Report, the U.S. Air Force has agreed to follow the CERCLA process, issue a Record of Decision, and implement a CERCLA remedy for the site. The U.S. Air Force intends to initiate a streamlined Remedial Investigation for OU-2. By email dated September 22, 2022, the U.S. Air Force indicated that its milestone date for this work is December 18, 2025, and the EPA agreed with this determination and accepted this milestone date.

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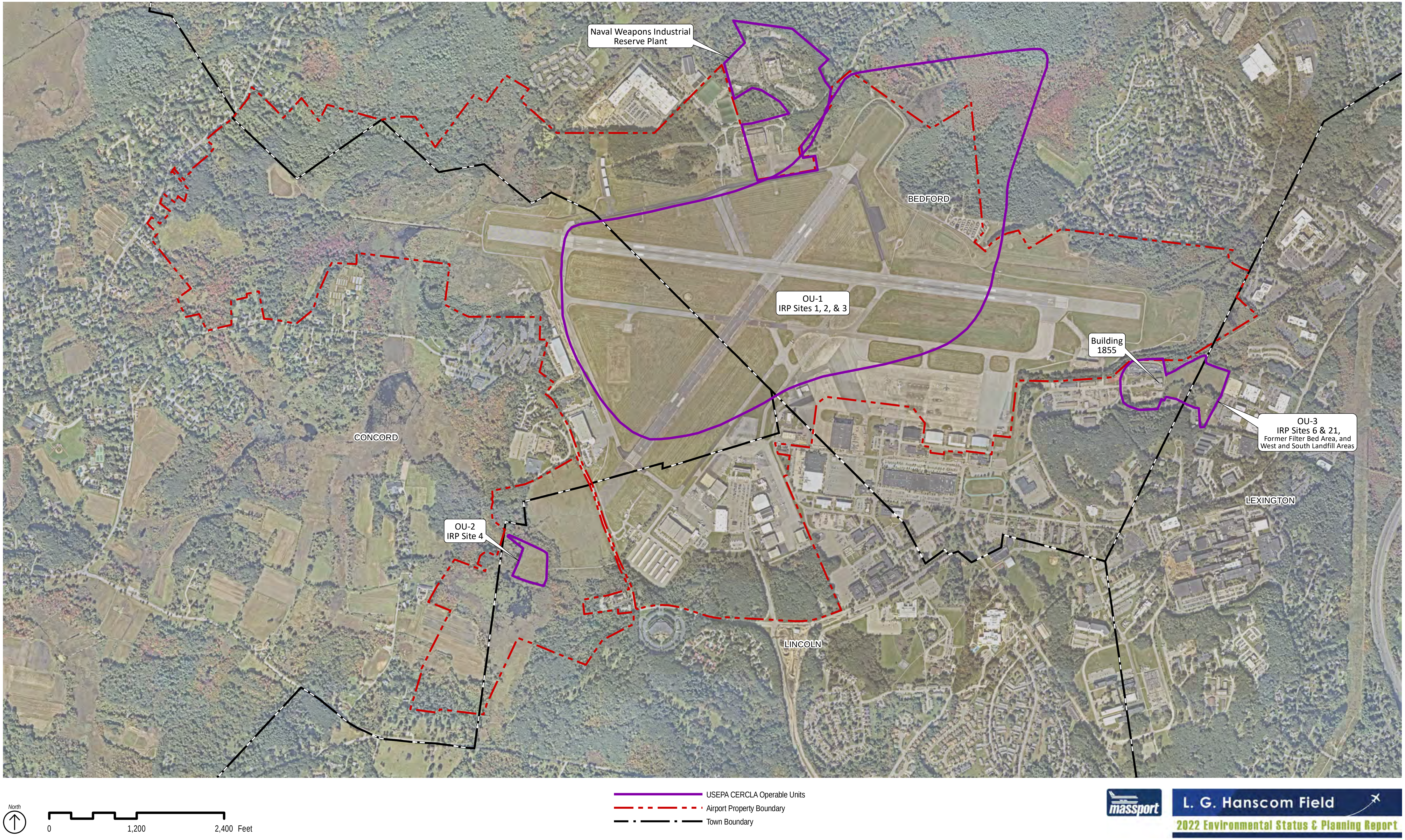

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Operable Units and IRPs

Figure **9-5**

Data Sources: MassGIS, NHESP, Nearmap US Inc. Oct. 2023

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Operable Unit-3 / IRP Site 6

The approximately 15-acre IRP Site 6 is in the northeast portion of Hanscom AFB in the Towns of Bedford and Lexington. The site is bounded to the north by a former railroad spur, to the northeast by a wetland area and small pond, to the east by a commercial industrial park, to the south by a service road (Hunter Street), and to the west by IRP Site 21 (the former aviation fuel facility).

The former filter bed area is the original sanitary waste treatment system (used from 1947 until the mid-1950s) for Hanscom AFB before it was abandoned in place and the AFB connected to a municipal sanitary waste system. Following the abandonment of the treatment system, this area became a disposal site for municipal wastes, construction debris, and clean fill. As a result, the filter beds were overlain by approximately 5 to 15 feet of solid waste material. Two hillside landfill areas, identified as South and West Landfill Areas on Figure 9-5, are immediately adjacent to the filter bed area (to the south and west). Disposal in these two areas was mainly clean fill and/or construction debris.

The south landfill area was used for the disposal of building foundation excavation and construction debris in the late 1980s/early 1990s. The southernmost portion of the south landfill area includes a suspected ash disposal area and the former location of a 1,000-gallon Number 2 fuel oil underground storage tank on the west side of Building 1855. When the tank was removed in 1990, evidence of a petroleum release was found. Building 1855 formerly housed an incinerator and is currently a licensed solid waste transfer station for Hanscom AFB.

The Remedial Investigation of the site was completed in 1998 and Human Health and Ecological Risk Assessments were completed in 1999. Taken together, these assessments found potential for future adverse impact to human health and the environment. Based on the Remedial Investigation and risk assessments, a Focused Feasibility Study and a Proposed Plan for Hanscom AFB were prepared and approved by the Commonwealth. The remedial action remedy (containment and capping, removal of contaminated sediment, and the implementation of engineering and institutional controls) was implemented in September 2001. Immediately following construction of the remedy, a long-term inspection, maintenance, and monitoring program commenced to ensure the continued protectiveness of the remedy.

A Five/Thirty Year Monitoring Plan was specified by the Remedial Design for the wetland areas remediated during the construction phase of the Site 6 Remedial Action. The initial five-year wetland mitigation monitoring program was successfully completed in 2006. Subsequent wetland mitigation and ecosystem evaluation events were successfully completed in the ensuing five-year interval years of 2011 and 2016, with the latter event documenting that the objectives of the initial Five-Year Monitoring Plan and long-term Operation and Maintenance Plan have been met. The Five-Year Wetlands Ecosystem Evaluations were thus discontinued as recommended in the 2016 wetland report.

Long-term monitoring data continues to indicate that the surface water quality in the adjacent wetlands and the Shawsheen River are not being adversely impacted by residual groundwater contamination. A Downgradient Investigation was conducted in 2014 and 2015 to determine the source of arsenic detected at and north of the compliance boundary at concentrations above the Massachusetts Maximum Contaminant Levels. The evaluation determined that arsenic concentrations that exceed the Maximum Contaminant Levels beyond the compliance boundary are representative of background concentrations and thus the compliance boundary is adequate as currently delineated.

According to the data review, site inspections, and interviews conducted in 2021, the sixth FYR concluded that the remedy at OU-3/IRP Site 6 is protective of human health and the environment. Land use controls/institutional controls (LUCs/ICs) prevent exposure to and use of contaminated groundwater and ensure that excavation at the three capped landfill areas is controlled to prevent exposure to any residual contamination in the subsurface soil.

Operable Unit-3/IRP Site 21

IRP Site 21 is an area with groundwater contamination, with three separate areas of petroleum products floating on the groundwater table that were identified by the Remedial Investigation. These areas are referred to as light non-aqueous phase liquid pools, which means that the liquid contaminant is not dissolved in the water column but remains in a separate phase (i.e., “non-aqueous”) which floats atop the groundwater surface because the contaminant’s specific gravity is lighter than water. IRP Site 21 is approximately 5 acres in area, situated in the Town of Bedford in the northeast portion of Hanscom AFB and adjacent to IRP Site 6. IRP Site 21 is the area of a former aviation fueling facility that was used for storage, off-loading, and dispensing of jet fuel and aviation gasoline from at least 1945 through 1973 and was used to store and distribute Number 2 fuel oil during the early 1970s. Fuel was stored in aboveground and underground storage tanks, which had associated pump houses and a network of underground piping. This area was also used for the storage of cleaning solvents and other petroleum products (oils and lubricants) associated with aircraft and vehicle maintenance.

Following the discovery of IRP Site 21 in 1990, several interim remedial actions, including a Remedial Investigation and risk assessments, were conducted. The assessments were completed in July 2000. Based on the documents and data gathered during the interim remedial actions, a Feasibility Study, dated June 2001, and a Proposed Plan for Hanscom AFB, dated July 2001, were prepared, and released for public comment (for which the U.S. Air Force received no comments). A Record of Decision selecting the remedy for OU-3/IRP Site 21 is dated October 2001. The Commonwealth of Massachusetts formally concurred with this Record of Decision by letter dated January 22, 2002, and it was signed by the U.S. Air Force on August 20, 2002 and by the EPA on August 29, 2002.

The construction of the final remedy in accordance with the OU-3/IRP Site 21 Record of Decision commenced in June 2003 and was substantially completed in September 2003. The selected remedial action for cleaning up OU-3/IRP Site 21 centered on a 10-well recovery system. While the active recovery system had made progress towards the Response Action Outcome to return groundwater to federal and state drinking water standards and to state groundwater risk characterization standards within an acceptable period (less than 100 years), the focus changed from active remedial efforts to passive in-situ treatment methods, with a goal of achieving a higher rate of contaminant destruction.

According to the data review, site inspections, and interviews conducted in 2021, the sixth FYR concluded that the remedy at OU-3/IRP Site 21 is protective of human health and the environment. LUCs/ICs prevent exposure to and use of contaminated groundwater, ensure that excavation at IRP Site 21 is controlled to prevent exposure to any residual contamination in the subsurface soil or groundwater and ensure that future land use does not increase the risk of exposure to contaminants remaining on site.

Naval Weapons Industrial Reserve Plant (NWIRP), Bedford

The NWIRP, which consists of five sites, is located on 46 acres of land on the north side of the airfield within the Bedford town limits, as shown on Figure 9-5. It is bounded by Hanscom Field to the south; by businesses (Instrumentation Laboratory and Edge Sports Center), wetlands, and residences to the west; forested upland and wetlands to the north; and woodland, residences, and wetlands to the east. NWIRP Bedford is divided into northern and southern sections that are separated by Hartwell Road.

NWIRP Bedford was established in 1952 and its mission was to design, fabricate, and test prototype equipment for missile guidance and control systems. This facility was involved in active research from the mid-1950s until December 2000 when its mission ended, and the facility was closed. The Navy sold its hangar site at public auction administered by the General Services Administration in February 2019 to Runway Realty Ventures LLC.

An Initial Assessment Study was conducted in 1986 which identified potentially contaminated sites at NWIRP Bedford. Initially, four sites were identified for investigation. The results of the study led to the placement of NWIRP Bedford on the NPL on May 31, 1994. The Navy and EPA signed a Federal Facilities Agreement on February 2, 2000, related to conducting investigations at NWIRP Bedford. Impacted groundwater associated with the NWIRP flows in a north-northwest direction.

Two sites (Sites 1 and 2) received “No Further Action” decisions in September 2000. An interim remedial action for Site 3 was initiated in 1997; this action consisted of constructing and continually operating a groundwater extraction system to contain a subsurface contaminant plume at Site 3. A Site 3 Time Critical Removal Action report was completed in May 2023 for the chlorinated solvent groundwater plume (EPA ID: MA6170023570). Trichloroethylene (TCE) concentrations in monitoring wells have increased, and concentrations exceed Massachusetts Contingency Plan Method 1 screening criterion for category GW-2 groundwater, as well as the EPA Vapor Intrusion Screening Level (VISL) for groundwater-to-indoor air under a residential exposure scenario. Vapor intrusion sampling (near-slab sampling) was performed at the adjacent residential property from October 2021 through June 2022. In 2021, TCE was above near source soil gas VISL screening levels under a residential exposure scenario in one location. Soil gas samples collected in 2022 were below VISL screening values. Site 4 includes groundwater contaminated from fuel and waste petroleum products; the plume extends to the north-northwest. Several remedial actions have taken place since the 1980s including impacted soil excavation and tank removals. Currently, benzene is the only contaminant of concern being monitored in the groundwater at Site 4.

In 2014, an Explanation of Significant Differences (ESD) was finalized that modified the Record of Decision (ROD) to incorporate the [Southern Flight Test Area (SFTA)] into the existing remedy. Site 3, Site 4, and the SFTA are still in the post-decision phase and under investigation and/or remedial action. The Navy will continue to conduct Five-Year Reviews at these sites while contamination remains in the subsurface. In addition, LUCs are implemented at all three sites.

9.2.8 Stormwater

This section describes policies and procedures in place at Hanscom Field to reduce the risk of pollution leaving the site via stormwater. Further details on specific policies and procedures are available in the Airport’s SWPPP, which is available upon request from Massport. Hanscom Field is permitted by the EPA under the NPDES as an industrial site and is required to conduct regular testing of stormwater discharges, educate employees on standards of practice, and implement BMPs to prevent the release of pollutants to nearby receiving waters.

Massport requires all Hanscom Field site development, including that performed by tenants, to conform to the MassDEP Stormwater Management Standards when feasible or applicable. Improved stormwater runoff control has been achieved through the requirement that compensatory storage for stormwater be provided for any projects which result in increases in impervious surfaces, to not increase peak runoff rates.

National Pollution Discharge Elimination System (NPDES)

Industrial sites in the United States, including airports like Hanscom Field, are required to apply for coverage under a MSGP in accordance with the NPDES permit program, a part of the federal Clean Water Act. Under this permit program administered by the EPA, owners and/or operators of airports must satisfy specific requirements for operations conducted at the facility that may affect stormwater quality. The current MSGP was issued by the EPA in January 2021 and an updated version became effective in September 2021.Tenants who lease property on Hanscom Field and engage in activities covered under the permit program are listed in **Table 9-6**. However, tenants that conduct air transportation, aircraft cleaning, servicing, maintenance, or storage operations are required to obtain separate permit coverage under the MSGP.

Massport complies with the 2021 MSGP through the SWPPP, SPCC, and stormwater management practices in general. Hanscom's most recent SWPPP was originally prepared in 2015, revised in 2023, and certified in January 2023. Permit details include:

- MSGP Permit ID: MAR053045
- MSGP Permit Expiration Date: February 28, 2026
- Annual Report Due Date: January 30, every year of permit coverage

A Notice of Intent to renew coverage under the MSGP is required 30 days prior to the current permit's expiration date. An annual report summarizing the previous year's monitoring results and changes to the site is due every year in January for the prior year's coverage.

Table 9-6. Hanscom Field Tenants Listed in the SWPPP

Tenant	Address	Contact Phone Number
Signature Flight Support	180 Hanscom Drive, Bedford, MA 01730	(781) 274-0010
Jet Aviation	380 Hanscom Drive, Bedford, MA 01730	(781) 274-0030
Atlantic Aviation (FKA Ross Aviation)	777 Virginia Road, Concord, MA 01742	(781) 274-0400
Stream Enterprises	140 Hanscom Drive, Bedford, MA 01730	(518) 409-2254
Liberty Mutual	230 Hanscom Drive, Bedford, MA 01730	(781) 274-8114
East Coast Aero Club	200 Hanscom Drive, Bedford, MA 01730	(781) 274-6322
North Star Aviation	130 Hanscom Drive, Bedford, MA 01730	(339) 368-1749
Boston MedFlight	150 Hanscom Drive, Bedford, MA 01730	(781) 879-3951
Source: Stormwater Pollution Prevention Plan, L.G. Hanscom Field, Bedford, MA, revised January 2023.		

Stormwater Pollution Prevention Plan (SWPPP)

In accordance with the 2023 SWPPP, as the operator of the site, Massport is responsible for:

- Implementing the policies and procedures for preventing stormwater pollution as outlined in the SWPPP, including Baseline and Activity-Specific BMPs.
- Conducting periodic reviews of policies and procedures to evaluate the effectiveness of the SWPPP.
- Updating the SWPPP and related information when there is a significant physical change to the site or a significant change in operational procedures that could potentially result in increased risk of the discharge of pollutants via stormwater runoff.
- Maintaining records of required inspections, operations, materials use, etc. as required in the SWPPP.

The SWPPP describes each of the five baseline BMPs designed to reduce the risk of discharging pollutants to the environment via stormwater:

- Good Housekeeping
- Preventative Maintenance
- Materials Compatibility and Inventory System
- Spill Prevention and Response
- Employee Training

Each category of baseline BMP includes activity-specific practices that should be used by all personnel during normal facility operations. Activity-specific BMPs can be found in Chapter 3 of the SWPPP.

NPDES Visual Inspection Program

Visual inspections are conducted and submitted on a quarterly basis as required under the site's NPDES MSGP to monitor the quality of stormwater discharges. The inspection procedures consist of collecting samples at multiple stormwater outfall locations within 30 minutes of the first discharge during a storm event. Samples are then visually inspected for color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other indications of stormwater pollution.

A visual assessment is performed on samples from the following outfall locations: 1, 2, 4, 8, and 10. Because Outfalls 3, 5, 6, 9, and 10[272] are all from similar drainage areas, only a sample from Outfall 10 is required. A data form is then completed for each observation (see SWPPP for maps and inspection form). Annual certification of compliance is submitted to the EPA. If contaminants are observed during the inspections, follow-up investigations are performed to determine the probable source of contamination. The results of such investigations are also recorded, and appropriate actions are taken to address the situation. To date, inspections conducted at the outfalls have not identified unauthorized discharges.

[272] Drainage Area 7 was not mentioned in the SWPPP because it is not an outfall.

Water Quality Monitoring

Hanscom Field discharges stormwater to two impaired waters[273]: Elm Brook and Shawsheen River. Annual testing of impaired waters is required for pollutant indicators that do not currently have a Total Maximum Daily Load (TMDL) assigned to them. The *Massachusetts Year 2016 Integrated List of Waters*[274] was used in the 2023 SWPPP and approved in the latest MSGP permit renewal. According to the 2016 list, Shawsheen River is impaired for E. coli and Fecal Coliforms (TMDL) and Dissolved Oxygen (No TMDL), and Elm Brook is impaired for E. coli and Fecal Coliforms (TMDL) and Sedimentation/Siltation (No TMDL).

Based on these impairments, annual testing is conducted for total phosphorus and total nitrogen at Outfalls 1 and 4 and for total suspended solids at Outfall 8. Per the MSGP, monitoring may cease after one year until year four if the pollutant for which the waterbody is impaired is not detected above natural background levels in the stormwater discharge.

Annual impaired waters monitoring was conducted in August 2021, and all monitored analytes were either not detected or were within acceptable levels for the receiving waters. Thus, no further impaired waters testing will be required until 2024.

In addition, Massport conducts Biannual Indicator Monitoring in accordance with Parts 4.2.1 and 8.S of the 2021 MSGP. Bi-annual indicator monitoring for Polycyclic Aromatic Hydrocarbons (PAHs) was conducted on June 8, 2022, at stormwater Outfalls 1, 4, 8, and 10. PAHs were below the laboratory reporting limit of 2 micrograms per liter for all sampled outfalls. PAH indicator monitoring is report-only; there are no thresholds or baseline values for comparison, and the sampling does not trigger any follow-up actions. The results are used as a baseline to understand stormwater quality and any potential water quality issues. The June 2022 results did not indicate any current water quality issues, and indicator monitoring will be conducted again in the fourth year of the NPDES permit.

Spill Prevention Efforts

Massport has maintained a Spill Prevention Control and Countermeasures (SPCC) Plan for Hanscom Field since the *1995 GEIR*. The SPCC, last updated in October 2019, 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. The action plan includes notification procedures, identification of key personnel, listing of available response equipment, tank and fuel delivery checklists, and contact numbers in case of an emergency. The SPCC also 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 spills or Massport tenant spill events at Hanscom Field. In addition, the Massport Fire Rescue

[273] Impaired waters are those that do not meet water quality standards, either because pollutant levels are exceeded, designated uses are not supported, or other factors.

[274] MassDEP. 2019. *Massachusetts Year 2016 Integrated List of Waters*. https://www.mass.gov/doc/final-massachusetts-year-2016-integrated-list-of-waters/download

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.

Massport 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.

9.2.9 Deicing Activities

Deicing Practices

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 the airfield to increase traction. Salt is applied to roadways and parking areas, but its use on the airfield is prohibited. 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 fixed base operators, Jet Aviation, Signature Flight Support, and Atlantic Aviation (formerly Ross Aviation and Rectrix). These entities use products that are a dilute solution of propylene glycol. Most aircraft deicing is conducted near the Hanscom Field Terminal or the hangars. Deicing data provided by Massport indicates that the total amount of fluid applied each year varies widely. From 2003 to 2022, total deicing fluid applied ranged from an annual low of 13,595 gallons in winter 2011–2012 to a high of 88,093 gallons in 2007–2008. The annual average over that period was 30,218 gallons.

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 BMPs. 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 and the SWPPP.

2003 Deicing Study and Follow-up Monitoring

In April 2003, Massport completed a computer modeling study of proposed airfield and existing aircraft deicing at Hanscom Field.[275] 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 were considered harmful by ingestion or have known long-term health effects. The study showed that neither

[275] CDM, 2003. Hanscom Field Deicing Study, Prepared by CDM, April 15, 2003, for Massachusetts Port Authority

current nor future scenario deicing activities at Hanscom Field would adversely affect the water supply for Bedford, Burlington, or any other nearby communities.

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 for deicing impacts has occurred since then. The sampling program consisted of seven sampling events, testing 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 Hanscom Field. One event quantified sodium concentration 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. Samples were analyzed for propylene glycol concentration, sodium concentration, dissolved oxygen, chemical oxygen demand, carbonaceous biological oxygen demand, salinity, conductivity, temperature, and ph. Data from the monitoring program are presented in **Appendix F**.

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 did not exceed established levels for aquatic toxicity and did not adversely affect other aquatic parameters (e.g., dissolved oxygen). Therefore, the use of these deicing/ anti-icing agents did not result in adverse effects on the receiving waters.

9.3 Analysis of Future Scenarios

The *2022 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects on natural resources that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3. The 2030 and 2040 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 2030 and 2040 planning scenarios are presented in Chapter 4. Massport encourages new development to be focused within areas with existing impervious surfaces that take advantage of available infrastructure and minimize impacts on habitat and water quality.

Since Massport's long-standing strategy is to maximize re-use of pre-developed areas of the Airport, the 2030 and 2040 scenarios are designed to avoid impacts on vernal pools, rare or endangered species habitat, and water quality. Wherever practicable, Massport also looks for opportunities to enhance existing environmental conditions. Each of the future planning concepts that could occur over these time periods are focused on areas more than one-half mile from any of the certified vernal pools in the western portion of the Airport. As has been Massport's policy, planning for any facilities would seek to avoid or minimize both direct and indirect adverse impacts through the design and permitting process. In the event there are unavoidable impacts, mitigation will be proposed.

Several of the facilities described in the future scenarios could overlap with potential habitat of the rare species of grassland birds in the infields of the airport runways or aquatic areas and adjacent uplands utilized by Blanding's turtles and wood turtles. Potential indirect impacts from projects in the vicinity of these nesting areas are not expected to disrupt these populations since these species currently occupy an active airport environment.

Potential water quality impacts will be avoided or minimized to the maximum extent practicable through the continued implementation and updating of the SWPPP and conformance with applicable standards for stormwater management required for site development or redevelopment by the MassDEP. Where practicable, Massport also looks for opportunities to enhance groundwater infiltration.

Some of the planning areas in the 2030 and 2040 scenarios contain wetland resources or are located near wetlands. Massport would assess every practicable 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.

The future concept scenarios are discussed by the following planning areas: North Airfield, Northeast Airfield, East Ramp, West Ramp, and Pine Hill. There are two sets of future development considered, the 2022 through 2030 development concepts referred to as the 2030 scenario, and the 2031 through 2040 development concepts referred to as the 2040 scenario, all of which are outlined in further detail in Chapter 4 and summarized in Table 4-8.

9.3.1 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.

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 (Notice of Intent, 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 (Sections 54 through 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 to the extent practicable.

2030 Scenario

The 2030 scenario for the North Airfield includes new general aviation box and corporate hangars with parking. There are no mapped wetlands within the area identified for the 2030 scenario; however, a field visit prior to any development should be performed to confirm absence of regulatory wetlands.

The 2030 scenario for the Northeast Airfield includes an area for potential aeronautical use, currently with no formal development plans. There is a mapped palustrine forested wetland (swamp) in the northwestern portion of this planning area.

The 2030 scenario for the East Ramp includes expansion of the fuel farm, relocation of the sand storage facility to the West Ramp, expansion of the airport maintenance facility, and hangar improvements. These development concepts are located within existing areas of development and therefore are not expected to result in impacts to wetlands.

The 2030 scenario for the West Ramp includes upgrading or replacing the corporate hangars with new aircraft parking spaces, salt storage facility relocation, enhancements to the Hanscom Terminal, rehabilitation of the West Ramp, and rehabilitation of and geometry improvements to Taxiway M. There are no mapped wetlands within the area identified for the 2030 scenario; however, a field visit prior to any development should be performed to confirm absence of regulatory wetlands.

The 2030 scenario for the Pine Hill area includes corporate facilities with new aircraft parking spaces, Taxiway E rehabilitation, a Runway 23 departure engineering materials arresting system, and rehabilitation of and geometry improvements to Taxiway M. There is a palustrine emergent wetland (marsh) and potential stream mapped on the western border of the Pine Hill area.

A wetland delineation performed according to the 1987 USACE *Wetlands Delineation Manual* and the 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* will be required prior to any future development in areas where wetlands could be present.

2040 Scenario

There are no additional development plans for the 2040 scenario for the North Airfield area or the Pine Hill area.

The 2040 scenario for the Northeast Airfield includes an area for potential aeronautical use, with no other formal development plans. There are no mapped wetlands within the area identified for the 2040 scenario; however, a field visit prior to any development should be performed to confirm absence of regulatory wetlands.

Development concepts proposed within the 2040 scenario for the East Ramp include potential aeronautical development, which are located within existing areas of development and are not expected to result in impacts to wetlands.

The 2040 scenario for the West Ramp includes Hanscom Terminal enhancements, replacement of public parking spaces, expansion of the fuel farm, hangar upgrades, and potential aviation development. There are no mapped wetlands within the area identified for the 2040 scenario; however, a field visit prior to any development should be performed to confirm absence of regulatory wetlands.

9.3.2 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 Notice of Intent prepared under the WPA. None of the proposed projects proposed for either the 2030 or 2040 scenarios would be located near the three vernal pools and therefore no impacts are expected to occur under either the 2030 scenario or the 2040 scenario.

9.3.3 Rare and Endangered Species

All three of the state-listed bird species, the upland sandpiper, grasshopper sparrow, and eastern meadowlark, require grassland habitat (e.g., hayfields and pastures), such as those found on airfields, which are frequently mowed to maintain safe heights and reduce wildlife attractants for aircraft operations. The Blanding's turtle requires a variety of wetland and terrestrial habitat, including ponds, marshes, scrub-shrub wetlands, and uplands and the wood turtle requires both streams and riparian areas and use adjacent upland habitats during spring. As discussed in section 9.2.5, the Priority Habitat is mapped by NHESP based on the known geographical extent of habitat for all state-listed rare species. Any future development located within the Priority Habitat mapped for these grassland bird species will be reviewed by NHESP prior to construction.

The northern long-eared bat is listed as federally Endangered under the Endangered Species Act. Suitable summer habitat for northern long-eared bat consists of forested areas, where bats may be found roosting individually or in colonies in trees under bark, in crevices, or cavities of both living and dead trees. Loss of this summer habitat has the potential to impact northern long-eared bats; therefore, consultation with USFWS will be required for any future development that proposes to remove trees.

2030 Scenario

The southern tip of the North Airfield area and the airfield portion of the Northeast Airfield area contain NHESP-mapped Priority Habitat, unit PH 1512, (shown in Figure 9-2 in Section 9.2.5) and grassland habitat that may contain suitable habitat for the state-listed bird species that occur on airport. The 2030 scenario development concepts within the East Ramp and West Ramp sites are located entirely within previously disturbed areas and do not contain NHESP-mapped Priority Habitat or suitable habitat for the listed species, but they abut Priority Habitat unit PH 1512 to the north. which consists of mowed grass. Land within the 2030 scenario for the Pine Hill area consists of partially developed areas, mowed grass, and small clusters of trees. The Pine Hill 2030 scenario does not contain any NHESP-mapped Priority Habitat; however, it abuts unit PH 1512 to the north.

The 2030 scenario for the North Airfield, Northeast Airfield, and Pine Hill areas all contain partially wooded areas, which is potential habitat for northern long-eared bats. Therefore, consultation with USFWS will be required prior to any tree removal activities within these wooded areas to analyze potential impacts to the species.

2040 Scenario

There are no additional development plans for the 2040 scenario for the North Airfield area or the Pine Hill area. The entirety of the Northeast Airfield development area in the 2040 scenario is located within NHESP-mapped Priority Habitat unit PH 1512 and consists of mowed grass which may provide habitat for the state-listed birds. The 2040 scenario for the East Ramp site includes a small portion of the grass within the airfield that is mapped NHESP Priority Habitat, unit PH 1512. The 2040 scenario for the West Ramp area does not contain any NHESP-mapped Priority Habitat but abuts unit PH 1512 to the west. Portions of the 2040 West Ramp are forested; therefore, consultation with USFWS will be required prior to any tree removal activities within these wooded areas to analyze potential impacts to Northern Long-eared Bats.

9.3.4 Water Quality

2030 Scenario

The 2030 scenario for the North Airfield, Northeast Airfield, and Pine Hill areas each include potential development within previously undisturbed areas. Any development will be required to meet NPDES permit requirements and applicable MassDEP standards for stormwater development. The 2030 scenario for the East Ramp and West Ramp areas are located entirely within previously disturbed areas; therefore, an increase in impervious surfaces is not anticipated.

A portion of the 2030 scenario for the West Ramp is located over an area with a medium yield aquifer (100–300 gallons per minute). Development in the North Airfield and Pine Hill areas under the 2030 scenario are located within the Bedford Water Department Zone II Wellhead Protection Area. Water quality will continue to be protected through compliance with the NPDES program and MassDEP stormwater standards, and through the implementation of SWPPPs, appropriate stormwater BMPs, and spill prevention, control, and countermeasure plans.

2040 Scenario

There are no additional development plans for the 2040 scenario for the North Airfield area or the Pine Hill area. The 2040 scenario for the Northeast Airfield and East Ramp includes areas for potential aeronautical use, with no other formal development plans. These areas are not located within a wellhead protection zone or in state mapped aquifers. The 2040 scenario for the Northeast Airfield and the West Ramp is located partially over areas of a medium yield aquifer. Water quality will continue to be protected through compliance with the NPDES program and MassDEP stormwater standards, and through the implementation of SWPPPs, appropriate stormwater BMPs, and spill prevention, control, and countermeasure plans.

10 Cultural and Historic Resources

This chapter provides updated information about the inventory of existing cultural and historical resources within, and in areas adjacent to, Hanscom Field. These historic and archaeological resources include those listed in the State and National Registers of Historic Places, the Inventory of the Historic and Archaeological Assets of the Commonwealth, and the Massachusetts Cultural Resource Information System (MACRIS) online database. The Massachusetts Historical Commission maintains these sources. The analysis in this chapter builds on the 2012 ESPR and the 2017 ESPR; it involved review of existing documentation, field data collection, and outreach. This chapter also discusses the 2022 conditions and future scenarios for noise, traffic, air quality, and airport planning and infrastucture in relation to cultural and historic resources.

10.1 Key Findings Since 2017

This *2022 ESPR* updates the *2017 ESPR* status for cultural and historic resources, gathers input from identified stakeholders, and analyzes current conditions and potential effects to these resources based on future forecast scenarios for noise, traffic, air quality, and airport planning.

Inventory Update

Comprehensive reconnaissance surveys of historic and archaeological resources (herein referred to as “inventory update”) were conducted for this *2022 ESPR* that include resources in one of the following categories:

- Listed in or eligible for the National Register of Historic Places and and/or the Massachusetts State Register (herein referred to as “National and State Registers”)
- Listed in the Inventory of the Historic and Archaeological Assets of the Commonwealth (herein referred to as “Inventory”)
- Listed in the Massachusetts Cultural Resource Information System (MACRIS) online database
- Resources that are 50 years or older and not yet surveyed

Hanscom Field currently contains 12 airport-related historic resources that are 50 years old or older. Six non-historic buildings have been demolished since 2017. Hanscom AFB contains one State and National Registers-eligible historic district and approximately 22 previously surveyed historic buildings.

Key Findings:

- ⇨ Few changes have occurred to cultural and historic resources inventories and the National and State Registers listings in the four host towns and MMNHP since 2017. One survey area and one new National Register-listed property have been added to the four towns.
- ⇨ Few changes have occurred to historic resources inventory within MMNHP, and the boundary has not changed.
- ⇨ The archaeologically sensitive area of Hanscom Field is reduced.
- ⇨ No historic resources are exposed to noise levels of 65 dB DNL or higher in 2022 or any future scenarios.
- ⇨ The 2040 forecast scenario shows a similar number of cultural and historic resources within the DNL 55 dB DNL noise contour as was forecasted for 2035 in 2017.
- ⇨ Three historic National Register-listed resources will have a projected DNL exposure of between 55 and 60 dB in the forecasted scenarios.
- ⇨ A slightly larger portion of MMNHP is within the DNL 55 dB noise contour forecast for 2040 than was forecasted for 2035 in 2017. However, no identified noise analysis sites in MMNHP will experience noise levels of DNL 60 dB or greater in the forecasted scenarios.
- ⇨ Road traffic has increased in some locations since 2017, and one resource at one location has been National Register-listed. Possible future improvements at two intersections may affect cultural and historic resources.
- ⇨ Potential air quality impacts to cultural and historic resources have decreased since 2017.

An historic resources survey was conducted for the *2022 ESPR* that updates information for two overlapping geographic areas: the General Study Area and the Reconnaissance Survey Area (described in Section 10.2.1) and is intended to provide the cultural and historic resources data needed for analysis and planning (described in Section 10.3).

In the General Study Area**,** the historic resources survey update for 2022 contained a total of 75 historic resources that consists of 47 individual properties and 25 historic districts[1], including 12 National Historic Landmarks[2] (NHLs) that are listed in or determined eligible for the National and State Registers. Since the *2017 ESPR*, one survey area, one new National Register-listed property, and one new determined-eligible property have been added to the four towns.

In the Reconnaissance Survey Area, the historic resources survey update contained four individual properties and a part of one historic district (MMNHP) that are listed in the National and State Registers. The Reconnaissance Survey Area also includes 156 individual resources and nine survey areas in the MHC Inventory and MACRIS. Since the *2017 ESPR*, the MMNHP historic resources inventory has had few additions, and the boundary has not changed.

As with the *2012 and 2017 ESPRs*, an archeological resources update was conducted for the area within the boundary of Hanscom Field. The 2022 update found changes in the status of archaeological information since the first reconnaissance survey was conducted for the *2012 ESPR* (which was updated for the *2017 ESPR)*. Most of Hanscom Field property has been previously disturbed by construction, but some areas of high pre-contact archaeological sensitivity and areas of moderate-to-high archaeological sensitivity for post-contact resources[3] were identified for the *2012 ESP*R. One area previously identified with some moderate-to-high archaeological sensitivity has been subjected to a professional archaeological survey[4] and, based on the survey, has been reassessed with having low archaeological sensitivity based on the results. With this exception, the existing conditions within the study area have remained unchanged since the *2017 ESPR*. Overall, the archaeologically sensitive area of Hanscom Field is reduced.

- Portions of Hanscom AFB and Massport property leased by the U.S. Air Force are located within the 2022 55 DNL contour, including the north one-quarter of the main Base. One resource in the General Study Area, but outside the Reconnaissance Survey Area boundary, the Air Force Cambridge Research Laboratories Historic District, has been determined eligible for the National Register.

Noise

This *2022 ESPR* provides an update to the noise analyses for the historic properties which are forecasted to have maximum noise exposure from Hanscom Field operations. **Table 10-1** shows the locations of the historic resources analyzed for noise exposure, as presented in Chapter 7, and provides a summary of the noise exposure to cultural and historic properties.

Table 10-1. Summary of Noise Exposure to Cultural and Historic Properties Around Hanscom Field

Resource[1,2]	2017	2022	2030	2040	2017	2022	2030	2040
	Properties/Areas within DNL 65 Contour[3]				Properties/Areas within DNL 55 Contour			
National and State Registers - 43 Individual Properties[4]	0 properties	0 properties	0 properties	0 properties	3 properties	3 properties	3 properties	3 properties
National and State Register – 25 Historic Districts[5] (in 1,646 acres)	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park (975 acres)	0 acres	0 acres	0 acres	0 acres	52.9 acres	32.1 acres	42.5 acres	53.8 acres
Battle Road Interpretive Trail (4 miles)	0 miles	0 miles	0 miles	0 miles	0 miles	0 miles	0 miles	400 ft

Notes:
1. Refers to resources in the General Study Area around Hanscom Field. See Tables 10-2 through 10-6 for more detail on National and State Registers individual properties and historic districts.
2. All surveyed historic properties; total acreage of surveyed historic districts, MMNHP.
3. DNL 65 is the exposure level that the FAA identifies as a guideline for determining potential land use incompatibilities.
4. Does not include MMNHP sites. In this table, the noise effects are quantified through the estimation of park acreage within a given contour level.
5. Includes Bedford Depot Park Historic Dist., Bedford Historic Dist., and Old Bedford Center Historic Dist. in Bedford; Hubbard-French Historic Dist., Hubbardville 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.

The noise analysis for historic resources includes a conservative evaluation for the forecast years of 2030 and 2040 that incorporates the largest area based on the maximum forecasted noise values, as presented in Chapter 7. For this *2022 ESPR*, this is the area contained within the 2040 forecast year DNL 55 dB contour line (depicted in Figure 7-17).

The projected DNL 55 contour for 2040 in the *2022 ESPR* is similar in shape to the corresponding forecasted 2035 contour in the *2017 ESPR*, but covers a somewhat smaller area, by approximately 176 acres. The 2040 contour extends slightly further south over a portion of MMNHP. The numbers of historic resources within the contours are slightly lower for the 2040 forecast than for the projected 2035 scenario in the *2017 ESPR*.

Massport and the NPS continue to cooperate 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.

Transportation

Using information in Chapter 6, this *2022 ESP*R analyzes potential traffic effects to historic and archaeological resources within a 200-foot radius of the 11 Traffic Study Areas (TSAs) at road intersections in the four towns. Ten of the TSAs are the same as in the *2017 ESPR* and one additional intersection is included. The inventory update indicates that historic and archaeological resources present at the TSAs have changed slightly since the *2017 ESPR* due to the change in status of some resources at the ten TSAs in the *2017 ESPR* and the addition of the one new TSA in this *2022 ESPR*. In 2022, Hanscom Field traffic exceeded the 10 percent MEPA threshold at four intersections. In the forecasted 2030 and 2040 scenarios for the *2022 ESPR*, the threshold is exceeded at the same four intersections identified in the *2017 ESPR* forecast years plus an additional two intersections, for a total of six TSAs. Intersection improvements under consideration at two TSAs may require archaeological surveys; one of these TSAs is within MMNHP. The overall environmental effects of traffic on cultural and historic resources have remained similar between 2017 and 2022.

Airport Planning

As discussed in Chapter 4, Massport's five-year CIP for 2023 to 2027 includes various projects, such as Hanscom Field Terminal renovations, communications upgrades, fire protection infrastructure, taxiway and apron pavement rehabilitation, compliance with FAA-mandated airfield geometry and equipment replacement. Some of these activities could involve any of the 12 resources that are 50 years old or older, including the Hanscom Field Terminal (built in 1953). Some of the current planning initiative projects in the CIP may have an effect on historic resources at Hanscom Field.

Air Quality

The environmental effects of air pollutant emissions from Hanscom Field airport operations are discussed in Chapter 8. Aircraft emissions have decreased for most of the criteria pollutants between 2017 and 2022. Aircraft emissions are not expected to have adverse effects to historic resources in the 2030 and 2040 forecast scenarios.

10.2 Inventory Update Methodology

This *2022 ESPR* updates information gathered for the 2012 and 2017 ESPRs to reflect the current status of historic and archaeological resources in and around Hanscom Field. This section discusses the background and methodologies used for the inventory update. Section 10.4.1 focuses specifically on archaeological resources.

The inventory update information included in this *2022 ESPR* (supplemented by the tables in **Appendix G**) is appropriate for the document's status and planning purposes. However, the inventory is not finite or fixed, and it is therefore updated with each ESPR cycle. In the future, as modifications to historic resources may occur and additional historic resources reach 50 years of age, the inventory of historic resources will likely change. The towns and state or federal agencies may conduct intensive-level surveys for general or specific planning purposes. Such surveys would include detailed examination of the history, context, and physical characteristics of currently unrecorded historic resources on MHC inventory forms, evaluation of their National and State Registers eligibility, and their potential inclusion in MACRIS. As part of potential development or improvement project planning, resources may be evaluated and found eligible for or listed in the National and State Registers. Future surveys and research may identify new archaeological sites and sensitive areas.

10.2.1 Historic Resources Survey Area Definitions

Updated information on historic and archaeological resources in this *2022 ESPR* is based on current identification data collected in a series of planning steps for two geographic areas, the General Study Area and the Reconnaissance Survey Area, which are described below.

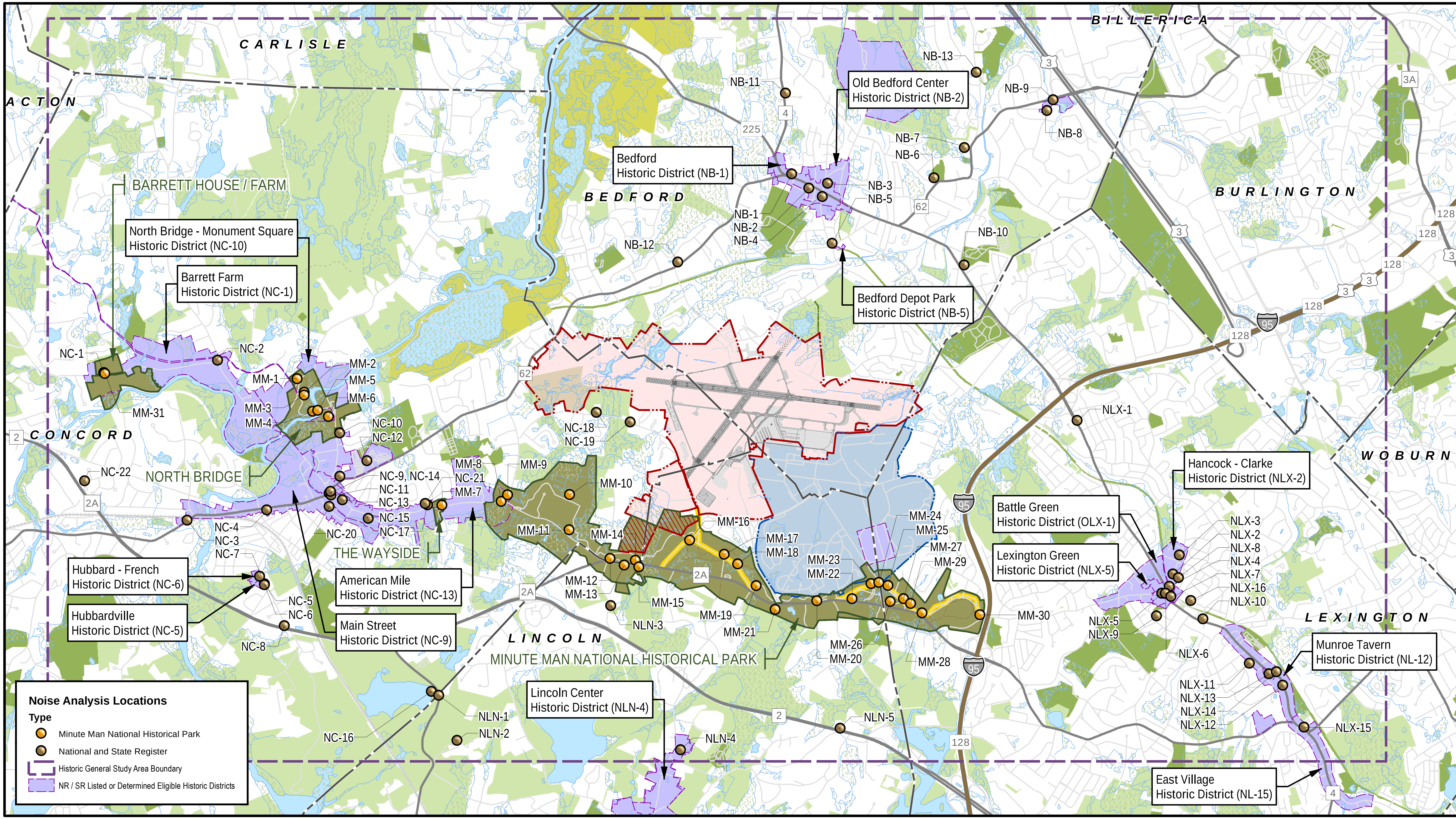
General Study Area

The General Study Area is a roughly 9.7-by-4.5-mile rectangular area within and around Hanscom Field, depicted in **Figure 10-1**. The General Study Area remains consistent among the ESPRs as a baseline area that encompasses the variable Reconnaissance Survey Area, which is made up of noise analysis locations and the traffic study intersections used for potential effects analyses. The General Study Area falls within the towns of Bedford, Concord, Lexington, and Lincoln. It includes all of Hanscom Field, Hanscom AFB, and MMNHP. An MHC file review and field verification update of recorded National- and State Register-listed or eligible properties was completed throughout the General Study Area to provide a broad understanding of the historic resources in the vicinity of Hanscom Field.

Reconnaissance Survey Area

The Reconnaissance Survey Area used for the *2022 ESPR* analyses is fully contained within the General Study Area. The area falls within the towns of Bedford, Concord, Lexington, and Lincoln. It encompasses all of Hanscom Field and parts of Hanscom AFB and MMNHP. This area varies from one ESPR to the next as it is defined by of two sets of noise and transportation data: the area of the maximum future forecasted DNL 55 dB contour and a 200-foot radius around each of the noncontiguous intersections designated as TSAs.[276]

[276] Figure 6-3 in Chapter 6 depicts the TSAs for this *2022 ESPR*.



North

0 3,500 7,000 Feet

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Road
- Interstate
- Highway
- Road
- Trail
- Open Water
- Stream
- Wetland/Marsh
- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Historic Resources Included as Noise Analysis Locations

Figure 10-1

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The Reconnaissance Survey area for the *2022 ESPR* is defined as the forecast 2040 DNL 55 contour and 11 TSAs. It is approximately a 5.4-by-2.3-mile asymmetrical, cross-shaped area related to the configuration of the Hanscom Field runways. Three TSAs are within the forecasted noise contour, and eight TSAs are outside the noise contour within the General Study Area. Five of the eight TSAs outside the noise contour are within MMNHP, and the other three are in different locations in the General Study Area.

Data collection methodologies for the Reconnaissance Survey Area included the collection of National and State Registers information conducted as part of the General Study Area. In addition, the survey updated information on resources documented in the MHC's Inventory and MACRIS, and on the preliminary identification of resources 50 years old or older that have not been previously surveyed. Available planning studies conducted within or adjacent to Hanscom Field were reviewed, and a drive over/walkover field survey was conducted to verify current conditions.

The study team exchanged letters and conducted information-sharing meetings with NPS representatives from MMNHP and the local historical commissions of Bedford, Concord, Lexington, and Lincoln, which provided additional information and input.

10.2.2 National and State Registers of Historic Places

Listing (or eligibility for listing) in the National Register of Historic Places and/or the Massachusetts State Register (National and State Registers) is a threshold factor for environmental review of historic and archaeological resources during project planning. Any specific projects that may be considered at Hanscom Field would require review at listed sites.

The National Register is the nation's official list of historic properties deemed worthy of protection by the NPS. To be eligible, resources must:

- Meet criteria of significance established by the NPS,
- Possess historic integrity,
- Be significant in local, state or national history, and
- Be properties nominated through the MHC.

The National Register is the nation's official list of historic properties deemed worthy of protection by the NPS. In Massachusetts, the nomination process and records are managed by the MHC. Historic properties eligible for National Register listing must retain historic integrity and meet at least one criteria of significance, as follows:[277]

- A – Association with notable historic events and patterns in American history
- B – Association with important persons during the productive period of their life
- C – Good examples of their design and construction type or as the work of a master, or as part of a collection of resources that together form a significant group
- D – Potential to reveal information important in prehistory or history

[277] The Criteria for Evaluation are found in Title 36 Code of Federal Regulations (CFR), Part 60, Section 60.4. https://www.ecfr.gov/current/title-36/chapter-I/part-60/section-60.4.

The State Register is maintained by the MHC and 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, or national level. The State Register consists of inventoried historic resources that have been evaluated and formally designated as historically significant due to meeting established criteria for listing, as follows:[278]

- NHLs designated by the U.S. Congress
- Resources listed or formally determined eligible for inclusion in the National Register
- Massachusetts Archaeological or Historic Landmarks designated by MHC
- Local Landmarks or Local Historic Districts determined by a community
- Regional Historic Districts established by State legislature
- Resources subject to a Preservation Restriction managed by the MHC

The MHC updates the State Register regularly, and the current edition was consulted for information included in the 2022 *ESPR*.

10.2.3 Inventory of Historic and Archaeological Resources

The Inventory of the Historic and Archaeological Resources (“Inventory”), maintained by the MHC, is the statewide comprehensive inventory. It is a compilation of paper inventory forms files MACRIS searchable online database for historic resources that are typically 50 years old or older and archaeological sites. It serves as a basic planning tool for communities and for state and federal agencies in the recording, evaluating, and protecting of historic resources. MACRIS includes a database portal with inventory and National Register forms and a linked map portal. The MHC Inventory includes historic resources that have not yet been formally evaluated for their historical significance according to specific regulatory criteria, resources that have been evaluated and found eligible (or not eligible) for inclusion in the State and National Registers, and those currently listed in the National and State Registers. Access to the archaeological records is restricted and under the purview of the Massachusetts State Archaeologist.

10.2.4 Local Historical Commissions Outreach

Massport’s ESPR team met with the local historical commissions in Bedford, Concord, Lexington, and Lincoln and with representatives of the MMNHP (discussed separately below) to explain the purpose and process of the ESPR and to collect updated data. Each historical commission provided information about updates to the MHC Inventory and to the list of individual resources and historic districts that are listed (or eligible for listing) in the National and State Registers that have occurred since the *2017 ESPR*. The Bedford Historic Preservation Commission noted that the Col. Timothy Jones House, previously in the Inventory, was added to the National and State Registers in 2021. The Commission also noted the existence of two State Register properties at the edge of the General Study Area that were omitted in the *2017 ESPR*; they have been added to the survey update and the *2022 ESPR*. No new Bedford entries have been made to the MHC Inventory or to the National and State Registers listings for this *2022 ESPR*.

[278] Massachusetts State Register of Historic Places, established by M.G.L. 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 Concord Historical Commission noted that some existing National Register properties are not referenced in the *2017 ESPR*. The information on one property, the Isaac Davis Trail, has been updated, but the other properties are outside the General Study Area. No new Concord entries have been made to the MHC Inventory or to the National and State Registers listings for this *2022 ESPR*.

The Lexington Historical Commission noted that four individual resources and one survey area of 34 resources have been added MHC Inventory, and that the existing Inventory of resources dating from the 17th and 18th century was updated. No new Lexington entries have been made to the National and State Registers listings for this *2022 ESPR*.

The Lincoln Historical Commission noted that individual historic resources were added to three existing National Register historic districts and that one property in the General Study Area, 5 Partridge Lane, is being designated a Local Landmark and added to the MHC Inventory, MACRIS, and the State Register. No new Lincoln entries have been made to the MHC Inventory or to the National and State Registers listings for this *2022 ESPR*.

10.3 Historic Resources Update - Existing Conditions and Analyses

This section provides an update for the current conditions status and provides analyses of historic resources within the General Study Area and the Reconnaissance Survey area. The 2022 historic resources update presents historic resources starting with National and State Registers resources, then MHC Inventory resources. The descriptions of the current conditions of each resource group in the Reconnaissance Survey Area are followed by analyses of current noise, traffic and TSAs, airport planning, and air quality. A tally of the updated National and State Registers listed historic resources in the General Study Area and the Reconnaissance Survey Area is provided in **Table 10-2**.

Table 10-2. Tally of Historic Resources in the General Study and Reconnaissance Survey Areas

Town	Historic Resource Types	Number in General Study Area	Number in 2022 Reconnaissance Survey Area
Bedford			
	Individual Properties[1]	7	1
	Historic Districts	7	1
Concord			
	Individual Properties[2]	22	2
	Historic Districts[3]	8	2
Lexington			
	Individual Properties[4]	13	1
	Historic Districts[3]	10	1
Lincoln			
	Individual Properties[5]	5	0
	Historic Districts[3]	2	1
Totals			
	Individual Properties	**47**	**4**
	Historic Districts[6]	**25**	**2**

Notes:
1. RSA property Newly determined eligible for National Register listing.
2. Includes seven National Historic Landmarks.
3. Each Historic District category in Concord, Lexington, and Lincoln includes a portion of Minute Man National Historical Park, which is a National Historic Landmark.
4. Includes three National Historic Landmarks.
5. Includes one National Historic Landmark.
6. Minute Man National Historic Park is counted as one district in the totals.

10.3.1 Existing National and State Registers Resources

The 2022 reconnaissance survey update for historic resources identified a total of 72 historic resources across the four towns (i.e., 47 individual resources and 25 districts[279]) that are listed in (or determined eligible for) the National and State Registers within the General Study Area. These resources include 12 NHLs.[280] As a result, six individual resources and one district have been added to the General Study Area inventory since the *2017 ESPR*. Historical resources in the General Study Area are listed separately by town in **Table 10-3** through **Table 10-6**.

The General Study Area resources listed in (or eligible for) the National and State Registers range from individual houses to large historic districts with structures and associated landscape settings. The largest single historic resource is MMNHP, an NHL district with four separate units in Concord, Lexington, and Lincoln that contains numerous historic buildings and places, including two individual NHLs.

[279] MMNHP counts as one district.
[280] MMNHP counts as one NHL.

Table 10-3. Bedford: Historic Resources in General Study Area

MHC #	Noise Label[1]	Name	Street Address	Style-Date	Status[2]
BED.V	NB-5	Bedford Depot Park Historic District	80 Loomis St. and 120 South Rd.	Eclectic 1874-1877	NRHP
BED.A	NB-1	Bedford Historic District	Great Road	Various ca. 1730-1850	LHD
BED.Z	NB-2	Old Bedford Center Historic District	Great Road	Various ca. 1730-1860	NRHP
BED.K	NB-9	Historic Wilson Mill-Old Burlington Road Area	Old Burlington, Burlington, and Wilson Roads	Various 1676-1924	NRHP
BED.D	HB-1	Veterans Administration Hospital	Springs Road	Georgian Colonial ca. 1920	NRHP DOE
BED.21	NB-8	Bacon-Gleason- Blodgett Homestead	118 Wilson Road	Georgian ca. 1750	NRHP
BED.23	NB-4	Bedford Old Town Hall	16 South Road	1856	NRHP, LHD
BED.37	NB-7	Christopher Page House	50 Old Billerica Road	Federal ca. 1730	NRHP
BED.17	NB-6	Nathaniel Page House	89 Page Road	First Period 1687	NRHP
BED.AD	NB-3	Old Burying Ground	7 Springs Road	1729	LHD
BED.801	NB-10	Shawsheen Cemetery	Shawsheen Road	1849	NRHP
BED.36	NB-11	David Lane House	137 North Road	Federal 1781	NRHP
BED.4	NB-12	Col. Timothy Jones House	231 Concord Road	Federal 1775	NRHP

Notes:
1. 2022 Noise Analysis Location label.
2. DOE = Determined Eligible; LHD = Local Historic District; NHL = National Historic Landmark; NRHP = National Register of Historic Places; PR = Preservation Restriction

Table 10-4. Concord: Historic Resources in General Study Area

MHC #	Noise Label[1]	Name	Street Address	Style-Date	Status[2]
CON.DS	NC-13	American Mile Historic District	Lexington Road	Various ca. 1650-1950	LHD
CON.DT	NC-1	Barrett Farm Historic District	Barrett's Mill and Lowell Roads, Liberty Street	Various ca. 1700-1940	LHD
CON.A	NC-14	Concord Monument Square- Lexington Rd Historic District	Monument Square and Lexington Road	Various ca. 1720-1890	NRHP
CON.EA	NC-6	Hubbard-French Historic District	324-374 Sudbury Road	Georgian 1787-1950	NRHP
CON.DZ	NC-5	Hubbardville Historic District	324-374 Sudbury Road	Georgian 1787-1950	LHD
CON.DU	NC-9	Main Street Historic District	Main St. bet. Monument Sq. & Wood St.	Various 1757-1976	LHD
CON.C CON.DW CON.EC	Multiple	Minute Man National Historical Park[3]	Lexington and North Great Rds., Massachusetts Ave.	Various ca. 1655-1959	NHL, NRHP
CON.DV	NC-10	North Bridge- Monument Square Historic District	Monument Sq., Monument St., Lowell Rd.	Various 1635-1979	LHD
CON.177	NC-18	Deacon John Wheeler-Captain Jonas Minot Farmhouse (Henry David Thoreau Birthplace)	341 Virginia Rd.	Colonial ca. 1730	NRHP
CON.405	NC-7	Deacon Thomas Hubbard-Judge Henry French House	342 Sudbury Rd.	Georgian ca. 1787	NRHP, LHD
CON.241	NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd.	Georgian ca. 1750	NRHP, LHD
CON.269	NC-3	Joseph Hosmer House	572 Main St.	Colonial 1672	NRHP, LHD
CON.347 CON.EE	MM-6	Old Manse[4]	269 Monument St.	Georgian 1769	NHL, NRHP, LHD
CON.170	NC-17	Orchard House	399 Lexington Rd.	Georgian ca. 1750	NHL, NRHP, LHD
CON.414	NC-8	Pest House	158 Fairhaven Rd.	Vernacular ca. 1750	NRHP
CON.317	NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike	Greek Revival 1828	NHL, NRHP, LHD
CON.802 (CON.DY)	NC-12	Sleepy Hollow Cemetery	24 Court Ln.	Burial Ground 1823	NRHP

MHC #	Noise Label[1]	Name	Street Address	Style-Date	Status[2]
CON.56	NC-4	Thoreau-Alcott House	255 Main St.	Greek Revival 1820	NRHP, LHD
CON.936	NC-16	Walden Pond [5]	MA Rte. 126	Pond 1845	NRHP, LHD
CON.71 CON.EF	MM-7	The Wayside – Samuel Whitney House [4]	455 Lexington Rd.	Colonial ca. 1714	NHL, NRHP, LHD
CON.178	NC-19	Wheeler-Meriam House	477 Virginia Rd.	Colonial 1690	NRHP
CON.329	NC-11	Wright Tavern	1-8 Lexington Rd.	Georgian 1747	NHL, NRHP, LHD
CON.X[8]	--	Naval Flight Test Facility	154 Hartwell Road	No style/Double Cantilever Hangar	NRHP DOE
CON.32	NC-20	Concord Armory-Concord Veteran's Building	51 Walden Street	Queen Anne-1887	NRHP, LHD
CON.197	NC-23	North Center Schoolhouse	34A Bedford Street	1849	NRHP
CON.256	NC-1	Col. James Barrett Farm[6]	448 Barrett's Mill Road	Colonial-1705	NRHP, LHD
CON.263	NC-22	Hosmer Homestead	138 Baker Avenue	Georgian-ca. 1710	NHL, NRHP
CON.900	--	Davis, Isaac Trail[7]	Strawberry Hill Road	1775	NRHP, LHD
CON.1839	NC-21	Concord School of Philosophy	391 Lexington Road	Gothic Revival-1880	NRHP, LHD
CON.118	--	John Scotchford-Deacon Edward Wheeler House	99 Sudbury Road	1655	PR

Notes:
1. 2022 Noise Analysis Location label.
2. DOE = Determined Eligible; LHD = Local Historic District; NHL = National Historic Landmark; NRHP = National Register of Historic Places; PR = Preservation Restriction
3. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.
4. Old Manse and The Wayside are individually listed National Historic Landmarks in MMNHP.
5. Walden Pond State Reservation is in Concord and Lincoln.
6. The Col. James Barrett Farm is an individually listed National Register property that is also located within Minute Man National Historical Park.
7. The Isaac Davis Trail is an individually listed National Register property that is also located within Minute Man National Historical Park.
8. MHC # unassigned

Table 10-5. Lexington: Historic Resources in General Study Area

MHC #	Noise Label1	Name	Street Address	Style-Date	Status[2]
LEX.AQ	Multiple	Minute Man National Historical Park[3]	Lexington and North Great Rds., Mass. Ave.	Various ca. 1655-1959	NHL, NRHP
LEX.B	OLX-1	Battle Green Historic District	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave., & B&M Railroad	Various 1713-1960	LHD
LEX.E	NLX-15	East Village Historic District	Massachusetts Ave.	Various ca. 1750-1950	LHD
LEX.C	NLX-2	Hancock-Clarke Historic District	12-41 Hancock St., 3-13 Hancock Ave., 8 Goodwin Rd.	Various 1698-1900	LHD
LEX.AG	NLX-6	Lexington Green	Massachusetts Ave., Harrington Rd., Bedford St.	Town Common 1711	NHL, NRHP, LHD
LEX.AC	NLX-5	Lexington Green Historic District	Massachusetts Ave., Bedford St., Harrington Rd.	Various 1713-1960	NRHP, LHD
LEX.D	NLX-12	Munroe Tavern Historic District	Massachusetts Ave.	Various 1700-1900	LHD
LEX.AS	NLX-16	7-9 Oakland Street	M.H. Meriam and Company	Various-1882-1958	NRHP
LEX.AZ	--	Tower, Richard Gleason Estate	39 Marrett Rd.	Colonial Revival-1905	LHD
LEX.51 LEX.AH	NLX-7	Buckman Tavern	1 Bedford St.	Georgian ca. 1690	NHL, NRHP, LHD
LEX.52	NLX-4	Garrity-Col. John Parkhurst Meriam House	9 Hancock St.	Federal/ Greek Revival ca. 1830	NHL, NRHP, LHD
LEX.101	NLX-8	General Samuel Chandler House	8 Goodwin Rd.	Italianate 1846	NRHP, LHD
LEX.119	NLX-3	Hancock-Clarke House	35 Hancock St.	Colonial 1698	NHL, NRHP, LHD
LEX.440	NLX-9	Hancock School	33 Forest St.	Victorian 1890	NRHP
LEX.129	NLX-14	John Mason House	1303 Massachusetts Ave.	Federal ca. 1715	NRHP, LHD
LEX.127 LEX.128	NLX-13	Sanderson House - Munroe Tavern	1314-1332 Massachusetts Ave.	Colonial ca. 1720	NRHP, LHD
LEX.413	NLX-1	Simonds Tavern	331 Bedford St.	Georgian 1795-1810	NRHP
LEX.16	NLX-10	United States Post Office	1661 Massachusetts Ave.	Colonial Revival 1938	NRHP

MHC #	Noise Label[1]	Name	Street Address	Style-Date	Status[2]
LEX.134	NLX-11	Warren E. Sherburne House	11 Percy Rd.	Eclectic 1893	NRHP, LHD

Notes:
1. 2022 Noise Analysis Location label.
2. DOE = Determined Eligible; LHD = Local Historic District; NHL = National Historic Landmark; NRHP = National Register of Historic Places; PR = Preservation Restriction
3. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.

Table 10-6. Lincoln: Historic Resources in General Study Area

MHC #	Noise Label[1]	Name	Street Address	Style-Date	Status[2]
LIN.A LIN.D	NLN-4	Lincoln Center Historic District	Bedford, Lincoln, Old Lexington, Sandy Pond, Trapelo, & Weston Rds.	Various ca. 1850	NRHP, LHD
LIN.F LIN.G	Multiple	Minute Man National Historical Park[3]	Lexington & North Great Rds., Massachusetts Ave.	Various ca. 1655-1959	NHL, NRHP
LIN.63	NLN-3	Daniel Brooks House	Brooks Rd.	Colonial 1695	NRHP
LIN.182	NLN-2	Henry Higginson House	44 Baker Farm Rd.	Tudor Revival 1905	NRHP
LIN.60	NLN-5	Hoar Tavern	268 Cambridge Turnpike	Colonial ca. 1713	NRHP
LIN.917	NLN-1	Walden Pond[4]	MA Rte. 126	Pond 1845	NHL, NRHP

Notes:
1. 2022 Noise Analysis Location label.
2. DOE = Determined Eligible; LHD = Local Historic District; NHL = National Historic Landmark; NRHP = National Register of Historic Places; PR = Preservation Restriction.
3. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.
4. Walden Pond State Reservation is in Concord and Lincoln.

The 2022 inventory update for the Reconnaissance Survey Area identified historic properties in the 2040 DNL 55 dB contour and for 11 TSAs. There are a total of seven historic resources across the four towns in the Reconnaissance Survey Area, which consist of the following:

- Four individual historic properties,
- One State Register district,
- A small section of one historic district (MMNHP) that are listed in the National and State Registers, and
- One property determined eligible for listing.

Since the *2017 ESPR*, there has been the addition of one individual National and State Register-listed property and one determined eligible property in Bedford. Additionally, since the *2017 ESPR*, the former Naval Flight Test Facility in Bedford has been determined eligible for National Register.

The 2040 DNL 55 contour encompasses three National and State Register-listed properties:

- Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace), 341 Virginia Road in Concord
- Wheeler-Meriam House, 477 Virginia Road in Concord
- Simonds Tavern, 331 Bedford Street in Lexington

Eight of the 11 TSAs contain historic resources, including the Col. Timothy Jones House (231 Concord Road, Bedford), which was listed in the National Register in 2021 at TSA #9. One local historic district listed in the State Register and within MMHNP, American Mile Historic District, is at TSA #7. Five of the TSA #s 2, 3, 4, 6, 7 are within MMNHP (counted as one district/NHL) and have eight contributing resources to MMNHP within the study areas.

Changes to Hanscom Field airport facilities and infrastructure since the *2017 ESPR* are described in Chapter 2. The historic resources inventory update shows there are currently 12 buildings at Hanscom Field that are 50 years old or older, constructed between 1948 and 1971 (see **Appendix G**). Key projects including demolition and new construction of buildings, runway maintenance, and vegetation management since 2017 have had no effect on historic and archaeological resources.

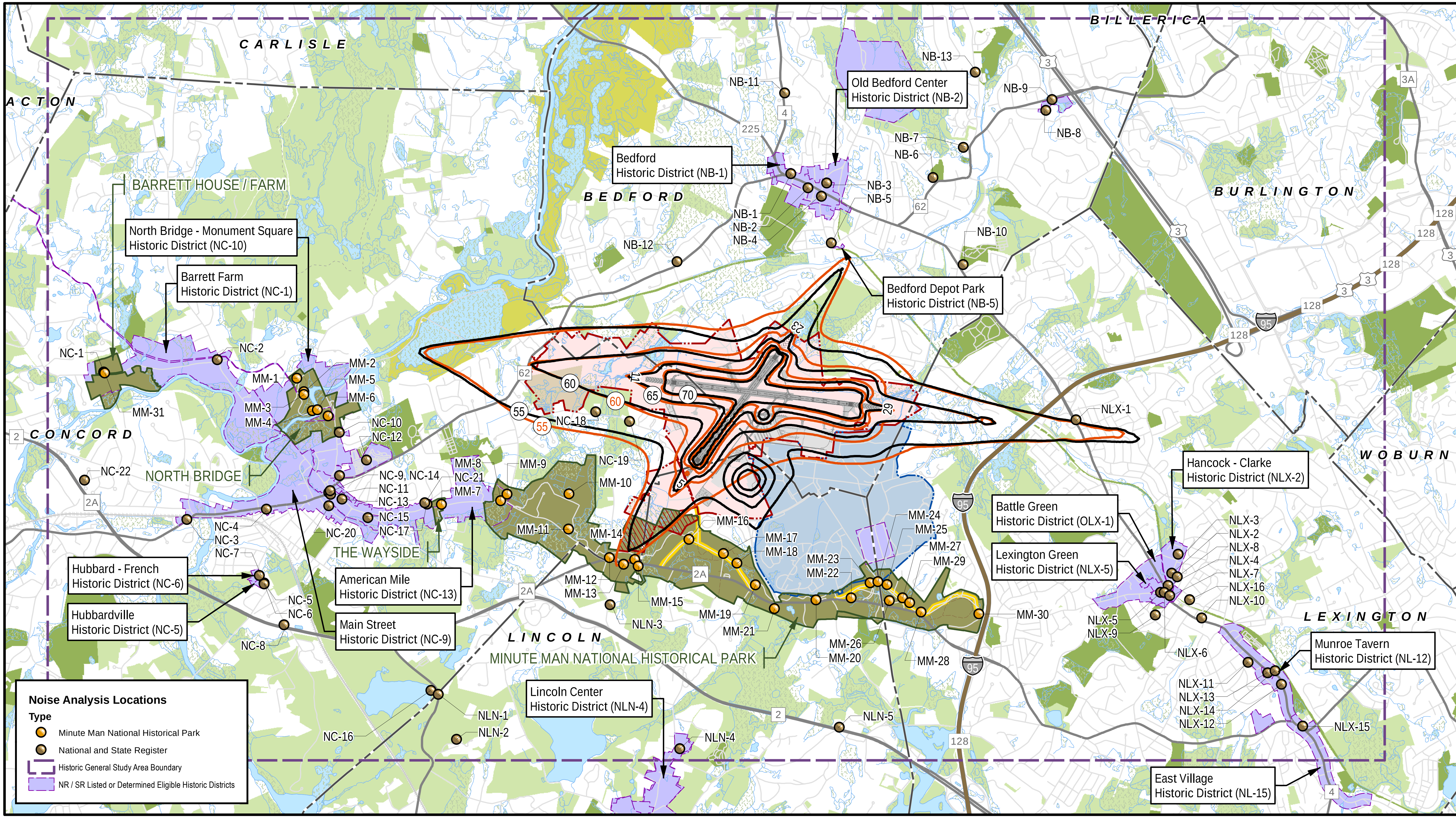
All National and State Register-listed and determined eligible resources are included in the MHC Inventory and MACRIS (see Section 10.3.4), but they are also discussed separately here.

10.3.2 Existing Noise Conditions for National and State Register Resources

Existing noise conditions for the 47 individual properties and 25 historic districts (including MMNHP) listed in the National and State Registers within the General Study Area were evaluated using the DNL contours and the Time Above analyses provided in Chapter 7. The relationship of these resources to 2017 and 2022 noise levels is shown in **Figure 10-2**.

None of the individual resources or historic districts are within the DNL 65 contour in 2017 or 2022, which the FAA has defined as the threshold for significant noise exposure, and none have noise exposure above DNL 60. There are no National and State Register historic districts within the 55 DNL contour for 2017 or 2022, except for a small portion of MMNHP, which is discussed in Section 10.8. Two individual National and State Registers-listed properties in Concord have DNL values greater than 55 dB in both 2017 and 2022. Further detail on the DNL analysis is presented in Chapter 7 (see 7-22 through Table 7-25). Noise levels at both of the following sites have decreased relative to 2017:

- Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace) (NC- 18) in Concord at 57.3
- Wheeler-Meriam House (NC-19) in Concord at 57.0



North

0 3,500 7,000 Feet

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

2022 DNL Noise Contour	Historic Road	Open Water	Stream		
2017 DNL Noise Contour	Interstate	Wetland/Marsh			
Hanscom Field Property Boundary	Highway	MMNHP Boundary			
Massport Property within MMNHP Congressional Boundary	Road	Great Meadows			
Hanscom AFB Property Boundary	Trail	Open Space Non-protected			
Municipal Boundary		Open Space Protected in Perpetuity			

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Historic Resources in Relation to the 2017 and 2022 DNL Contours

Figure 10-2

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The highest DNL noise exposure at a historic National and State Registers noise analysis location in 2022 is 57.3 dB. This level was calculated at the Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace). The 2022 noise value is 0.5 dB lower than the 2017 value (57.8 dB), which was 1.4 dB lower than the 2012 value (58.4 dB). This noise analysis location also had the highest DNL exposure levels for a historic resource in 2005, 2012, and 2017.

Time Above (TA) is a separate noise analysis metric that calculates the time during a 24-hour period that aircraft noise exceeds a given threshold level.[281] TA 65 dBA indicates periods when speech interference is possible unless the speaker uses a raised voice. Further details on TA analysis are presented in Chapter 7. TA values generally decreased in 2022 as compared to 2017. TA65 values in 2022 range from 0.1 minute a day at the East Village Historic District in Lexington to approximately 23.9 minutes per day at the Deacon John Wheeler/ Capt. Jonas Minot Farmhouse in Concord (compared to 0.2 minutes and 26.4 minutes in 2017, respectively). TA55 values in 2022 range from 1.3 minutes per day at the East Village Historic District to 95.9 minutes per day at the Wheeler-Meriam House (compared to 2.4 minutes and 121.5 minutes in 2017, respectively).

10.3.3 Existing Traffic Conditions for National and State Register Resources

The relationship of National and State Registers properties and the 11 TSA intersections is shown in **Figure 10-3**. Eight TSAs have adjacent historic resources, of which six TSAs have National and State Registers-listed resources. Five TSAs are within the boundary of MMNHP, and contributing historic resources within the park are present at all five: #2, #3, and #4 in Lexington; #6 in Lincoln; and #7 in Concord. One National Register-listed resource and one inventoried resource are present at #9 in Bedford. Two TSAs have inventoried resources: #8 in Concord and #10 in Bedford. Three TSAs have no historic resources present: #1 in Lexington; #5 in Lincoln; and #11 in Concord.

The TSAs and historic resources with town locations for each intersection are listed in **Table 10-7**. Within eight of the 11 the TSAs, there is one individual historic resource and two historic districts, MMNHP counted as one district, listed in the National and State Registers. There are 12 individual historic resources and two areas included in the MHC Inventory and MACRIS.

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 10 percent or more of Hanscom Field-related traffic. For the 2022 ESPR traffic analysis, four intersections met this threshold: #5 and #6 in Lincoln and #8 in Concord (see Table 6-6). One of these intersections, #6 in Lincoln, is within MMNHP. Hanscom Field contributes less than 10 percent of traffic movements at the other seven TSAs in the 2022 conditions.

281 TA65 indicates the time in the average annual day when the aircraft noise exceeds 65 dBA; TA55 indicates time above 55 dBA.

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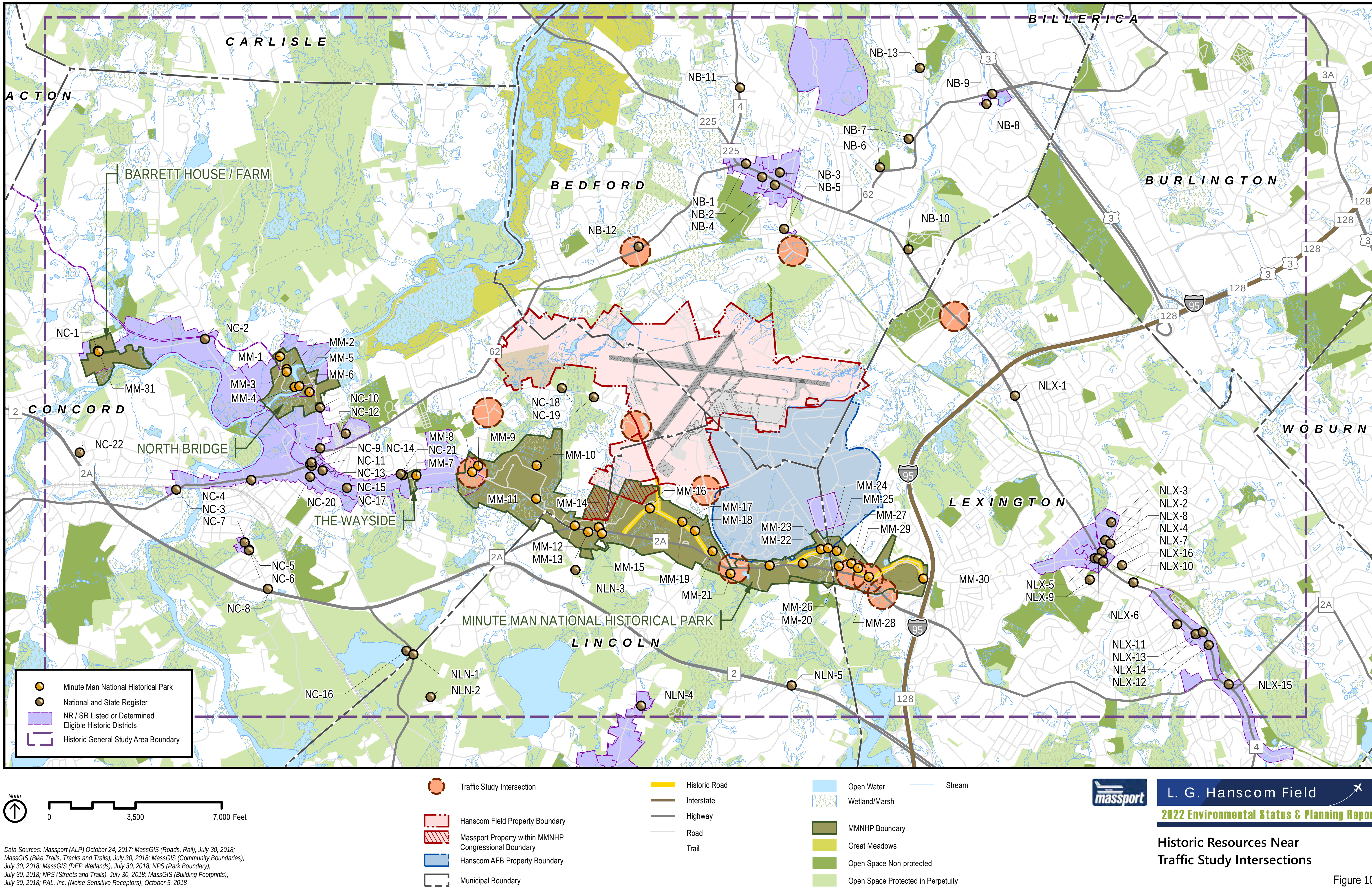

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

Historic Resources Near Traffic Study Intersections

Figure 10-3

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Table 10-7. Historic Resources in the 11 Traffic Study Areas

TSA No.	Town	Intersection	Historic Resource Name (Designation)[1]
1	Lexington	Route 4/225 (Great Rd/Bedford St)/Hartwell Ave	No historic resources identified
2	Lexington	Route 2A (Marrett Rd)/Mass Ave	Minute Man National Historical Park (MMNHP) (NHL, NR)
3	Lexington	Route 2A (Mass Ave)/Old Mass Ave	Minute Man National Historical Park (NHL, NR) LEX.929 Bluff Monument (MMNHP)
4	Lexington	Route 2A (Mass Ave)/Airport Rd (Marrett St)	Minute Man National Historical Park (NHL, NR) LEX.932 Whittemore-Muzzey Stone Walls (MMNHP)
5	Lincoln	Hanscom Dr./Old Bedford Rd	No historic resources identified
6	Lincoln	Route 2A (North Great Rd)/Hanscom Dr	Minute Man National Historical Park (NHL, NR)
7	Concord	Lexington Rd/Old Bedford Rd	Minute Man National Historical Park (NHL, NR) CON.DS American Mile Historic District (LHD/SR, partly in MMNHP) CON.BL Lower Old Bedford Rd/Virginia Road Area (MACRIS) CON.175 Deacon Sampson Mason-Terrence McHugh House (in MMNHP/CON-BL) CON.349 Daniel Taylor House (in MMNHP/CON.BL) CON.9020 Taylor Retaining Wall (in MMNHP/CON.DS) CON.9012 Meriam's Corner Stone Walls (in MMNHP/CON.DS) CON.9015 Meriam's Corner Monument (in MMNHP/CON.DS) CON.9029 Meriam's Corner Stone Culvert (in MMNHP/CON.DS)
8	Concord	Old Bedford Rd/Virginia Rd	CON.BL Lower Old Bedford Rd/Virginia Road Area (MACRIS) CON.1068 Frank Peterson House (in CON.BL) CON.1069 Patrick Dalton House (in CON.BL)
9	Bedford	Route 62 (Concord Rd)/Hartwell Rd	BED.H Concord Road Area (MACRIS) BED.342 230 Concord Road (in BED.H) BED.4 Col. Timothy Jones House (NR, BED.H)
10	Bedford	South Rd/Hartwell Rd	BED.928 Hartwell Town Forest Horse Trough Memorial (MACRIS)
11	Concord	Virginia Rd/ Pine Hill Access	No historic resources identified

Note:
[1] MACRIS – Massachusetts Cultural Resource Information System, LHD – Local Historic District, NHL – National Historic Landmark, NR – National Register of Historic Places, SR – State Register of Historic Places.

10.3.4 MHC Inventory Resources

Within the General Study Area, there are extensive existing inventory entries of hundreds of historic resources and many resources that reach 50 years of age each year but are not yet inventoried. The *2012 ESPR* included a baseline comprehensive reconnaissance survey within the fixed General Study Area. The Reconnaissance Survey Area falls within the General Study Area and changes with each ESPR because its boundary is based on the maximum forecasted 55 DNL and the traffic study intersections used for analysis in that ESPR. This *2022 ESPR* provides updated information on MHC Inventory and MACRIS historic resources within the 2022 Reconnaissance Survey Area. **Appendix G** includes the updated historic resources for the *2022 ESPR*.

2022 Reconnaissance Survey Area Update, Inventory and MACRIS historic resources in each town

- **Bedford** contains 3 survey areas and 13 individual historic resources in the MHC Inventory and MACRIS.
- **Concord** contains 7 survey areas and 22 individual historic resources in the MHC Inventory and MACRIS.
- **Lexington** contains 2 survey areas and 119 individual historic resources in the MHC Inventory and MACRIS.
- **Lincoln** contains no survey areas and 1 individual historic resource in the MHC Inventory and MACRIS.
- **TOTAL** of 12 survey areas/historic districts and 155 individual properties.

There have been few changes to MHC Inventory and MACRIS historic resources within the Reconnaissance Survey Area since the *2017 ESPR*. There are a total of 155 individual historic resources and 12 survey areas in the MHC Inventory and MACRIS historic resources.

The 2022 historic resources survey update also confirmed the presence of approximately 100 individual resources that are 50 years old or older and three potential survey areas that have not been previously recorded within the Reconnaissance Survey Area in Bedford, Concord, and Lexington (see **Appendix G**).

10.3.5 Existing Noise and Traffic Conditions for MHC Inventory Resources

Table 10-8 summarizes the number of historic resources in the MHC Inventory and MACRIS by town which are identified as within the DNL 55 contour in the 2022 existing conditions. Due to reductions in overall noise at Hanscom, the DNL 55 contour is smaller in 2022 than in 2017. As a result, there are fewer historic resources within the DNL 55 contour as compared to 2017. There are 155 individual and 12 survey area MHC Inventory resources listed for 2022, as compared to 176 individual and 13 survey area resources in 2017. None of the historic resources in the MHC Inventory and MACRIS are within the DNL 65 contour in 2022, which is consistent with the findings of the *2017 ESPR*.

Table 10-8. Historic Resources within the DNL 65 and DNL 55 Contours for 2017 and 2022

Location[1]	2017 MHC Inventory	2017		2022 MHC Inventory[2]	2022[3]		TSAs Outside Noise Contour
		65 dB	55 dB		65 dB	55 dB	
Survey Areas							
Bedford	2	-	5	2	-	2	1
Concord	8	-	7	4	-	4	2
Lexington	2	-	1	2	-	2	0
Lincoln	2	-	-	0	-	0	0
Total	**14**	**-**	**13**	**8**	**-**	**8**	**3**
Individual Properties							
Bedford	14	-	14	11	-	11	2
Concord	25	-	25	26	-	22	1
Lexington	137	-	137	119	-	119	0
Lincoln	-	-	-	1	-	1	0
Total	**176**	**-**	**176**	**157**	**-**	**157**	**3**

Notes:
1. Based on research for the 2022 ESPR, which resulted in adjusted counts.
2. Appendix G tables list these historic resources.
3. The numbers of areas listed are fully or partially within the 2040 55 DNL contour.

Three TSAs have inventoried historic resources that are not listed in the National or State Registers: #8 in Concord, and #9 and #10 in Bedford. One of these TSAs, #8, is among the four TSAs that currently meet the MEPA threshold of 10 percent of traffic generated by Hanscom Field. No changes are currently proposed at this intersection. See Table 10-7 for TSA location descriptions.

10.4 Archaeological Resources Methodology and Analysis

The archaeological reconnaissance survey that was completed in the towns of Bedford, Concord, Lexington, and Lincoln for the *2012 ESPR* and updated in the *2017 ESPR* has been updated again for this *2022 ESPR*. The reconnaissance survey was conducted within the Hanscom Field property boundaries and within a 200-foot radius of the 11 TSA intersections. 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 recorded sites in the four towns are listed in **Table 10-9** through **Table 10-12**.

2022 Reconnaissance Survey Area (noise contour and TSAs) Update, All historic resources in each town

- **Bedford** contains 1 listed and 1 determined eligible individual National Register properties; 3 survey areas and 13 individual historic resources in the MHC Inventory and MACRIS.
- **Concord** contains 2 National Register-listed individual properties, 1 State Register-listed historic district, a portion of MMNHP, an NHL; 7 survey areas and 22 individual historic resources in the MHC Inventory and MACRIS.
- **Lexington** 1 individual listed property and a portion of 1 historic district, MMNHP, an NHL; 2 survey areas and 119 individual historic resources in the MHC Inventory and MACRIS.
- **Lincoln** contains no individual National Register properties and a portion of 1 historic district, MMNHP, an NHL; one individual historic resource in the MHC Inventory and MACRIS.
- TOTAL of 5 individual properties and 2 historic districts (MMNHP counted as one district) listed in or determined eligible for the State and National Registers; 155 individual properties and 12 areas/historic districts.

10.4.1 Methodology for Archaeological Resources

The archaeological survey used results of the *2017 ESPR* and other previous surveys, including archival research, informant interviews, and field walkover, that provide information about known and potential archaeological resource areas. This information is used to compile environmental and cultural pre-contact and post-contact contexts (relating to the periods before and after initial European contact with New England in about AD 1500) and to develop sensitivity models for undocumented archaeological sites.

For this *2022 ESPR* survey update, the study team conducted a site file review and field walkover to update recorded archeological sites and sensitive areas within Hanscom Field and near 11 TSAs to assess any environmental changes that have occurred since the survey update for the *2017 ESPR*.

10.4.2 National and State Registers, Archaeological Resources

A review of the current National and State Registers, site files of the MHC Inventory, and MACRIS maintained by the MHC was completed for the *2017 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. The site file review update for the *2022 ESPR* concluded that two new pre-contact and one new post-contact archaeological sites had been identified in the project vicinity since completion of the *2017 ESPR*, but all three are more than a quarter mile from Hanscom Field or any of the 11 TSAs.

Table 10-9. Bedford: Archaeological Sites in the MHC Inventory near Hanscom Field

MHC Site #	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-1022	Hanscom School Findspot	Middle Archaic	Find Spot
19-MD-1023	Fitch Farm Native American Site	Early Archaic – Late Woodland	Campsite
19-MD-1226	400-BED-1		
BED-HA-6	HAFB-2	20th C.	Other
BED-HA-7	West Railroad Station Site	19th C.	Transportation
BED-HA-11	Town Center Railroad Station and Coal Yard	19th – 20th C.	Transportation
BED-HA-20	Boston & Lowell Railroad Line Site	19th – 20th C.	Transportation
BED-HA-22	Princeton At Bedford 1	19th – 20th C.	Agriculture Other
BED-HA-23	South School Site	19th C.	Education
BED-HA-24	Barn Foundation Site	Unknown	Agriculture
BED-HA-27	Yellow Ochre Mine Site	19th C.	Industry
BED-HA-28	William W Mudge Garden	19th C.	Agriculture
BED-HA-29	Wheeler Mill Site	Unknown	Industry
BED-HA-30	West School Site	19th C.	Education

Table 10-10. Concord: Archaeological Sites in the MHC Inventory near Hanscom Field

MHC Site #	Site Name	Temporal Association	Site Type
19-MD-79	Munson Farm	Late Archaic	Campsite
19-MD-80	Munson Farm 2	Unknown	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 "Cultivated field"; likely campsite
19-MD-1000	Wayside	Middle Archaic	Find Spot
19-MD-1001	Eliphelet Fox House Site	Unknown	Campsite
19-MD-86	Asparagus Farm/Peter's Field	PaleoIndian-Woodland	Burial
19-MD-97	Campsite 3	Late Archaic	Campsite
19-MD-98	Campsite 2	Middle-Late Archaic	Campsite
19-MD-74	Balls Hill	Late Archaic	Unknown
19-MD-112		Middle Archaic- Woodland	Campsite
19-MD-1149	Burke House Site	Middle-Late Woodland	Campsite
19-MD-1150	Farwell Jones Find Spot	Late Archaic	Find Spot
19-MD-397		Late Archaic	Campsite
19-MD-412	Asparagus Farm/Davis Farm	Middle Archaic-Early Woodland	Unknown
19-MD-476	North Of Revolutionary Ridge	Archaic, Contact	Lithic Workshop
19-MD-527	Dee's Farm	Unknown	Lithic Workshop
CON-HA-14	Eliphelt Fox House Site (Casey's House)	17th- 19th C.	Other
CON-HA-15	Wayside	18th – 20th C.	Other
CON-HA-19	Job Brooks Site	18th – 19th C.	Other
CON-HA-24	Ebenezer Peirce Homestead	Unknown	Other Agriculture
CON-HA-25	George Minott Homestead	Unknown	Other Agriculture
CON-HA-26	Meriam House	Unknown	Other
CON-HA-30	Mary Ingall Site	Unknown	Other
CON-HA-33	Albano Barn Foundation	20th C.	Agriculture
CON-HA-34	Hastings Barn Foundation	19th C.	Agriculture

Table 10-11. Lexington: Archaeological Sites in the MHC Inventory near Hanscom Field

MHC Site #	Site Name	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
19-MD-1005	David Fiske Site	Unknown	Lithic Scatter
LEX-HA-6	Thomas Nelson Farm Site	18th C.	Archaeolog y, Historic Agriculture Military
LEX-HA-7	The Ebenezer Fiske Site	17th – 20th C.	Agriculture Other
LEX-HA-8	The David Fiske Site	17th – 18th C.	Agriculture Other
LEX-HA-9	HAFB-1	20th C.	Other Residential
LEX-HA-13	Battle Road On Fiske Hill	18th C.	Industry
LEX-HA-14	Blacksmith Shop	17th – 20th C.	Other Agriculture
LEX-HA-16	Bashian Barn Foundation	Unknown	Agriculture
LEX-HA-17	Parker's Revenge	18th C.	Military

Table 10-12. Lincoln: Archaeological Sites in the MHC Inventory near Hanscom Field

MHC Site #	Site Name	Temporal Association	Site Type
19-MD-119	Hartwell Farm	Woodland	Campsite
19-MD-587	Black Rabbit[1]	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

MHC Site #	Site Name	Temporal Association	Site Type
19-MD-1006	Joseph Mason Site (MMNHP)	Unknown (possibly Woodland)	Campsite
19-MD-1007	Daniel Brown Site	Unknown	Lithic Scatter
19-MD-1212	P2 2016 Locus	Unknown	Campsite
LIN-HA-2	Corner House	19th - 20th C.	Agriculture Other
LIN-HA-3	19th Century Cottage and Barn	19th- 20th C.	Agriculture Other
LIN-HA-4	Hartwell Tavern	18th – 20th C.	Agriculture Commerce
LIN-HA-6	Thomas Nelson Jr. House	18th – 19th C.	Other
LIN-HA-7	Site 23	18th C.	Other
LIN-HA-8	Josiah Nelson House Site	18th – 20th C.	Other
LIN-HA-9	Site 22	18th C.	Other
LIN-HA-21	Site Old Hop House	19th C.	Agriculture Industry
LIN-HA-22	Joseph Mason Site	17th – 19th C.	Other
LIN-HA-23	Rogers Property Site	18th – 20th C.	Other Agriculture
LIN-HA-46	Brooks Saw Mill Damn	18th C.	Industry
LIN-HA-47	Ebenezer Lameson Homestead	Unknown	Other Agriculture
LIN-HA-48	Nathan Whittemore Homestead	Unknown	Other Agriculture
LIN-HA-49	Jacob Foster Homestead	Unknown	Other Agriculture
LIN-HA-50	Ebenezer Lameson Homestead 2	Unknown	Other Agriculture
LIN-HA-51	Schoolhouse	18th C.	Other
LIN-HA-52	Thomas Brooks Farm Foundation	19th C.	Agriculture
LIN-HA-53	Lincoln Boulder Structures	Unknown	Other
LIN-HA-62	Barn Foundation	19th C.	Agricultural

Note:
1. The Black Rabbit Site has a State Preservation Restriction.

Other than 19-MD-587 in Lincoln, none of the sites listed in Table 10-9 through Table 10-12 has been evaluated for eligibility in the State and National Registers. A total of six archaeological sites have been documented that are either completely or partially within the Hanscom Field boundaries. These include three pre-contact period sites [Pine Hill (19-MD-472), Fox House (19-MD-1028), and Hartwell Farm (19- MD-119)] and three post-contact period sites [Wheeler Mill (BED-HA-29), Yellow Ochre Mine (BED-HA-27), and South School (BED-HA-23)]. 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.

10.4.3 Reconnaissance Survey of Hanscom Field, Archaeological Resources

Past reconnaissance archaeological surveys of Hanscom Field have found that a few relatively undisturbed portions 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 or 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 on Hanscom Field property and around the TSAs 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 TSAs along Route 2A were assigned moderate to high archaeological sensitivity for post-contact resources associated with the April 19, 1775 engagement along Battle Road, including the Parker's Revenge Site (LEX-HA-17), and the Bloody Angle (located partially within the MMNHP). Recent archaeological and historical research conducted at both sites has contributed important new data to better interpret the significant archaeological and historic landscape of the Revolutionary War. A number of archaeological studies are ongoing at MMNHP, and the results have not yet been reported to the MHC or entered into the MACRIS database.

The analysis completed for this *2022 ESPR* found some changes in the status of archaeological information since the initial reconnaissance survey conducted for the *2012 ESPR*. A portion of the North Airfield Area which is now developed as a sports center with two outdoor turf fields was designated as a low sensitivity area for both pre- and post-contact archaeological resources. A recently completed archaeological survey investigated an approximately 49-acre undeveloped portion of the North Airfield area and documented extensive below-ground disturbance in some areas. No archaeological resources were identified, and the entire area has been reassessed as low archaeological sensitivity. With this exception, the existing conditions within the study area have remained unchanged since the *2017 ESPR*.

The field walkover conducted for this *2022 ESPR* noted no areas where new development has occurred within the moderate and high sensitivity areas since the *2017 ESPR*. Some changes to the built environment were noted during the field walkover within the Hanscom Field property boundary; however, all changes were within areas previously assessed as having low archaeological sensitivity and the sensitivity for these areas remains the same as reported in the *2017 ESPR*.

No other portions of the Hanscom Field study area or any areas managed by the Transportation Security Agency (e.g. airside secure areas) have undergone new development since the reconnaissance survey for the *2012 ESPR*, and the sensitivity for these areas remains the same for the *2017 ESPR*.

10.4.4 Proximity of Sites to TSAs, Archaeological Resources

As presented in **Table 10-13**, a total of 17 archaeological sites have been documented within a 200-foot radius at five of the 11 TSA intersections. This total includes 10 pre-contact and seven post-contact period sites, of which 14 are within the boundaries of MMNHP. Five of the intersections were determined to have areas that are undisturbed[282] except for the immediate intersection right-of-way. The condition of three intersection areas was assessed as unknown due to intersection improvements, and one intersection area appeared to have both undisturbed and recently disturbed areas.

10.4.5 Environmental Effects for Archaeological Resources

There are several new redevelopment activities (identified in Chapter 2 of this *2022 ESPR*) for the 2030 and 2040 scenarios in the West Ramp area at Hanscom Field which have the potential for ground disturbance in sensitive areas. Therefore, there is the potential for effects to archaeological sites or sensitive areas for the 2030 and 2040 scenarios. Specific projects will be assessed as appropriate for impacts at the time of development.

Proposed improvements discussed in Chapter 6 for two of the six TSAs that meet the threshold for analysis in 2022 and/or in the 2030 and 2040 scenarios may involve physical changes, so there may be effects to archaeological sites or sensitive areas. An archaeological survey completed under MHC review and a permit from the State Archaeologist may be required if any ground-disturbing impacts are proposed in these areas.

[282] 'Undisturbed" is defined as no obvious signs of previous ground disturbance.

Table 10-13. Archaeological Resources at Traffic Study Area Intersections

Intersection	Archaeological Sites	Condition[1]
#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) Old Bedford Rd./Lexington Rd. (Concord)	19-MD-111 (MMNHP) 19-MD-180 (MMNHP) CON-HA-26 CON-HA-27 CON-HA-31	Undisturbed
#8) Old Bedford Rd./Virginia Rd. (Concord)	None documented	Undisturbed; possible house lot/landscaping disturbance
#9) Hartwell Rd./Rte. 62 (Bedford)	None documented	Undisturbed; possible house lot/landscaping disturbance
#10) South Rd./Hartwell Rd. (Bedford)	None documented	Undisturbed; possible house lot/landscaping disturbance
#11) Virginia Road/Pine Hill Access	None documented	Unknown/intersecti on improvements

Note:
[1] Undisturbed (no obvious signs of previous disturbance) except for immediate intersection right-of-way.

10.5 Minute Man National Historical Park (MMNHP)

MMNHP (the Park) is operated by the NPS. Since 1959, when MMNHP was created within the towns of Concord, Lexington, and Lincoln, the Park and Hanscom Field 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. ESPR study team members met with NPS personnel on March 28, 2023 to solicit input for this *2022 ESPR* and to discuss Hanscom Field and its relationship to MMNHP.

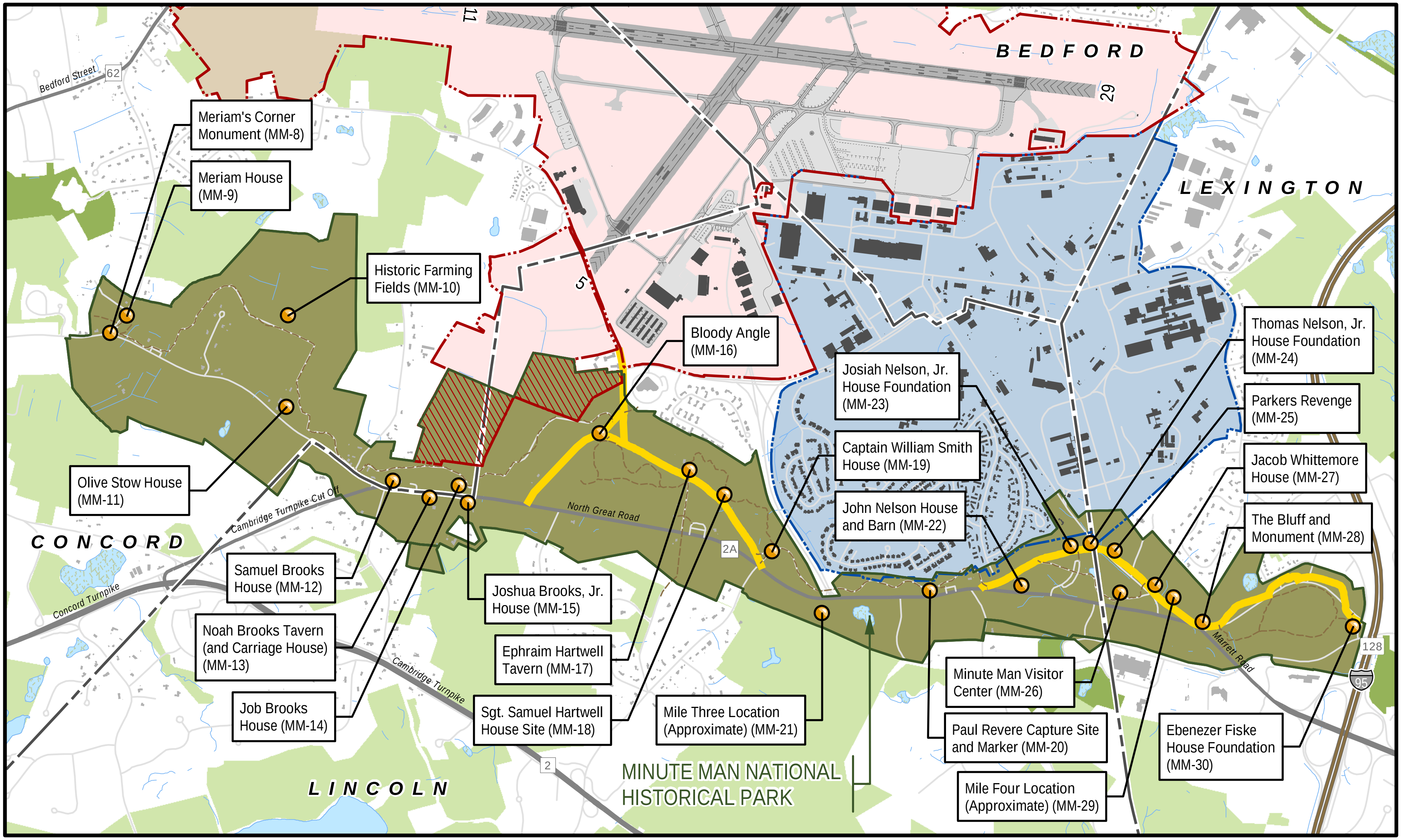
10.5.1 Overview of the Park

MMNHP is the largest National and State Registers resource in the vicinity of Hanscom Field and it is of national significance. It consists of four discontinuous sections referred to as the Battle Road, Wayside, North Bridge and Barrett Farm units, which are illustrated in **Figure 10-4** and **Figure 10-5**. The Park covers a total of 975 acres, located along Route 2A in Concord, Lexington, and Lincoln and off Monument Street in Concord.

When the U.S. 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 boundaries of the Park, comprising 50 acres in Lincoln, is within Massport land in the southwest area of Hanscom Field. There are no buildings or structures on this wooded parcel.

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 19th and 20th centuries, and as one of the earliest places in the nation to be commemorated. The Park was created to preserve and interpret the historic sites, structures, and properties that exist along the route of battle that took place in April 1775.

The NPS has reported that annual visitation to the Park is more than one million people visiting the facilities and attending the programs of MMNHP. 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.



North

0 1,000 2,000 Feet

Minute Man National Historical Park Resource

Historic Battle Road

Battle Road Trail

MMNHP Boundary

Open Space Non-protected

Open Space Protected in Perpetuity

Hanscom Field Property Boundary

Massport Property within MMNHP Congressional Boundary

Hanscom AFB Property Boundary

Municipal Boundary

Interstate

Highway

Road

Open Water

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

Historic Resources MMNHP Battle Road Unit

Figure 10-4

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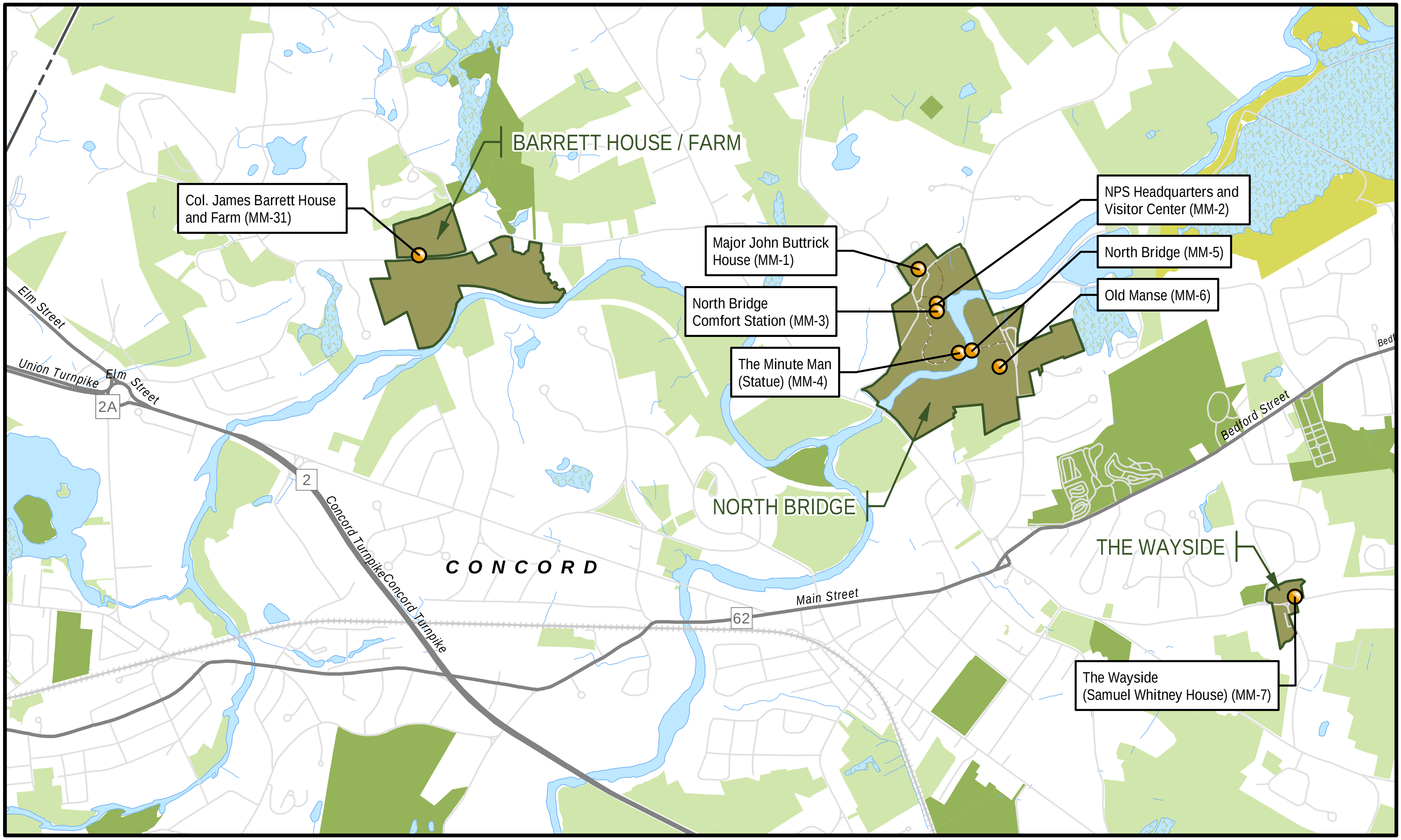

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

massport

L. G. Hanscom Field

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Historic Resources MMNHP North Bridge and Barrett Farm Units

Figure 10-5

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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 Battle Road Visitor Center accommodate auto and bus parking; six other parking lots are located in the Park. While the Park is open year-round, its main season is the seven-month period between April and October. The early spring, starting with Patriots' Day in Massachusetts, represents the first major influx of park visitors annually. Fall foliage season is the other very popular period. The Park is open daily from sun-up to sundown; the buildings are generally open from 9 a.m. to 5 p.m.

Battle Road Unit

The Battle Road Unit, the largest unit of the Park, 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 1775 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 the AFB 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 of the Park at Route 128/I-95.

Five of the 11 TSA intersections, TSA #s 2, 4, 5, 6, and 7, are located within the Battle Road Unit of the MMNHP. All of the areas around the intersections encompass historic farming and/or wooded landscapes; five contain historic buildings.

The Wayside Unit

The Wayside Unit is the smallest section of the Park, containing approximately six acres on the north side of Route 2A in Concord. This unit centers around The Wayside, an individual NHL that is the home of three notable American authors: Louisa May Alcott, Nathaniel Hawthorne, and Margaret Sidney.

North Bridge Unit

The North Bridge Park unit contains approximately 112 acres in Concord which is crossed by the Concord River. It contains the famous North Bridge where, on April 19, 1775, Colonial militia men fired the "shot heard 'round the world." The surrounding tranquil, commemorative landscape includes Daniel Chester French's Minute Man Statue.

Barrett Farm Unit

The Barrett 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 it was a site where colonial militia munitions were stored. The Col. Barrett Farm unit is also individually listed in the National Register as the Col. James Barrett House.

10.5.2 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 19th 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, as well as the creation of the 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 historic resources.

10.5.3 Historic and Archaeological Resources in MMNHP

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 **Figure 10-4 and Figure 10-5** and are summarized in **Table 10-14**. The NPS completed a comprehensive inventory of all resources in MMNHP as part of an updated National Register nomination. The NPS inventory identified approximately 106 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 complete NPS inventory for the Park is included in **Appendix G**.

MMNHP is currently updating the National Register documentation for the Park to include additional resources, note removals of buildings demolished since 2006, address district boundary updates, and provide an additional area of significance.

Table 10-14. Key Resources in Minute Man National Historical Park

Town	MHC #	Noise Label	Street Address	Name	Style-Date	NR/SR Status
Battle Road Unit						
Concord, Lexington, Lincoln	N/A[2]	Multiple	Along and off Massachusetts Avenue and Lexington Road	Battle Road	18th-20th centuries	Contributing
Concord, Lexington, Lincoln	N/A	Multiple	Off Massachusetts Avenue and Lexington Road	Battle Road Trail	1996-2001	Non-Contributing
Concord	N/A	MM-10	Off Route 2A	System of Fields/ 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	N/A	MM-30	Old Massachusetts Avenue and Wood Street	Ebenezer Fiske House Foundation	ca. 1729-late 19th century	Contributing
Lexington	N/A	MM-29	Off Route 2A	System of Fields/ 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	N/A	MM-26	Massachusetts Avenue	Minute Man Visitors Center	Modern- 1976	Non-Contributing
Lexington	N/A	MM-25	Off Massachusetts Avenue, Fiske Hill and Concord Hill	Parkers Revenge	1775	Contributing

Town	MHC #	Noise Label	Street Address	Name	Style-Date	NR/SR Status
Lincoln	N/A	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	N/A	MM-21	Off Route 2A	System of Fields/ Historic Farming Fields	18th-20th centuries	Contributing
Lincoln	N/A	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
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
Lincoln	N/A	N/A	Various	Historic		
North Bridge Unit						
Concord	CON.343	MM-1	231 Liberty 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	N/A	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

Town	MHC #	Noise Label	Street Address	Name	Style-Date	NR/SR Status
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
All Units						
Concord Lexington Lincoln	N/A	--	Various	System of Stone Walls	18th – 20th centuries	Contributing
Notes: NR – National Register of Historic Places; SR – State Register of Historic Places. N/A – Not Applicable Old Manse and The Wayside are individually listed National Historic Landmarks also located within MMNHP.						

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 farmlands also remain at the Trainor field and Fiske Hill fields in Lexington, and at fields near Bloody Angle and the Hartwell Tavern in Lincoln. An archaeological overview and assessment of MMNHP, with emphasis on the Battle Road Unit, was completed in 2005. That study reports that MMNHP contains documented archaeological resources that date from approximately 9,000 years before present to the early 20th century. More than 100 prehistoric and historic period archaeological sites have been identified within the Park, and there is a high probability of additional archaeological sites being identified there in the future.

10.5.4 MMNHP General Management Plan

As a seven-mile linear park with four distinct units, the MMNHP spans three towns—Concord, Lincoln, and Lexington—and attracts, on average, more than one million visitors a year. The park's mission is to preserve the historic sites, structures, properties, and landscapes associated with the opening battles of the American Revolution. The park also preserves resources related to America's literary tradition, including The Wayside, home of three 19th century American authors. The park maintains some 200 assets, including about 1,000 acres of maintained landscape and 12 witness structures present at the time of the Battles of Lexington and Concord on April 19, 1775. In April 2025, the Park will commemorate the 250th anniversary of that battle and anticipates numerous special events and increased visitation.

The 1989 General Management Plan for MMNHP has largely been implemented. In 2012, the Park initiated an update of the plan and, in 2015, completed a Foundation Document which provides basic guidance for the planning and management decisions of the Park. MMNHP has since completed planning for a project to address deferred maintenance throughout the Park in advance of the 250th celebration of the American Revolution. This initial effort was shared with Massport during a virtual meeting on May 7, 2020, and was further clarified during a meeting on February 2, 2022.

MMNHP completed a Strategic Facilities Plan (2017), Resource Stewardship Strategy (2019), and a Leasing Business Plan Strategy (2020). A Strategic Facilities Plan describes proposed projects to be implemented within the Park with a focus on bringing maintained assets into good condition and developing a long-term strategy for maximizing efficiencies and revenue to meet mission requirements. These efforts helped MMNHP refine its goals and identify the best uses (leasing, park housing, visitor use, park operations) for its structures.

As MMNHP prepares for the nation’s 250th anniversary, the Park will use the Legacy Restoration Fund established by the 2020 Great American Outdoors Act to address much needed maintenance of the park’s facilities, infrastructure, historic structures, and landscapes. The development strategy for the park’s Legacy Restoration Funding project was drawn from the several previous strategic planning efforts. The NPS Historic Architecture, Conservation and Engineering Center developed the project planning in conjunction with MMNHP staff. The plan is a comprehensive, realistic strategy to bring the park’s most important assets into “good” condition; it includes detailed assessments, scopes of work, and cost estimates for most of the deferred maintenance of structures and landscapes at the Park.

The ongoing Legacy Restoration Fund-Great American Outdoors Act Project (2022–2025) will address the backlog of maintenance at approximately 29 structures, 11 cultural landscapes (as defined by the cultural landscape inventories), and approximately 13 monuments and plaques. It will also improve wayfinding signage within the Park. The work varies for each property, but generally consists of in-kind repairs to wooden elements, roof replacements, repointing of foundations and chimneys, utility upgrades (including septic systems), interior painting, and renovations to bring selected buildings up to leasing standards. Landscape work includes lawn work, tree pruning and planting, repairs to fences, walls, walkways and driveways, clearing of invasive vegetation, and repairs to features in the landscape. Monuments and plaques will be cleaned, repaired, and where appropriate, protected with wax. Signage throughout the Park will be replaced in accordance with NPS messaging guidelines and the Comprehensive Sign Plan for the Park.

10.5.5 MMNHP Soundscape

The NPS issued Director’s Order 47 (DO47) “Soundscape Preservation and Noise Management” in December 2000. This was the NPS headquarters generic modeling 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.

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. Sound monitoring was conducted in 2008–2009 at MMNHP by the NPS Natural Sounds Division with volunteer staff assisting and the results are included in the internal draft plan. The processes to finalize the Acoustic Management Environmental Assessment report and the Soundscape Plan are ongoing. For this *2022 ESPR*, the NPS identified that the greatest current soundscape concern occurs at Hartwell Tavern from touch-and-go training flights and helicopter passovers.

Environmental Effects of Hanscom Field in MMNHP

As documented in Chapter 7, 31 locations within MMNHP were evaluated as noise analysis locations for this *2022 ESPR*. The analysis of 2022 conditions indicates that noise exposure levels created by aircraft flying over MMNHP ranged from DNL 46 dB to 55 dB. No sites in MMNHP experience a DNL greater than 55 dB in the existing conditions noise analysis for the *2022 ESPR*. The highest level (DNL 54.1 dB) occurred at the Noah Brooks Tavern and Carriage House (MM-13); this location had a 55.0 dB level in 2017. No specific sites in MMNHP were exposed to DNL greater than 60 dB and no portions of the Park were within the DNL 65 dB contour for 2005, 2012, 2017, or 2022.

A total of 32.1 acres of the MMNHP were within the DNL 55 dB contour in 2022, as compared to 52.9 acres in 2017. TA65 values ranged from 1 to 10.5 minutes at the 31 noise analysis locations, with the highest levels occurring at Samuel Brooks House (MM-12), the Noah Brooks Tavern and Carriage House (MM-13), and the Job Brooks House (MM-14). In 2017, the same three sites and Bloody Angle (MM-16) had the highest TA65 values. TA55 values ranged from 18 to 65 minutes, with the highest levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels in Concord.

Under current (2022) conditions, 32.1 acres of MMNHP are within the 55 DNL noise contour (see Table 10-1). The 55 DNL noise contour for 2022 is larger in the south-central area of the Park, as compared to the 2017 conditions (see Figure 7-15). The noise contour overlaps a very small area of the Massport property that falls within the MMNHP boundary.

As noted in Chapter 6, in 2022, Hanscom Field traffic represented approximately 3 percent of the peak hour traffic on Route 2A. Only one of the studied intersections in the MMNHP (#6 Route 2A/Hanscom Dr.) meets the threshold for 10 percent or more of the traffic movements associated with Hanscom Field. The NPS identified traffic concerns at the North Great Road (Route 2A)/Bedford Road intersection due to the noise of eastbound trucks at the Hartwell Tavern/ Capt. William Smith House area of the Park.

As described in Chapter 8, 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 the future analysis years from activities at Hanscom Field.

Battle Road (Interpretive) Trail

The Battle Road Trail is an interpretive, multi-use trail within MMNHP that provides cycling, walking, and wheelchair access to the MMNHP's historical and natural resource areas. The stone-dust Battle

Road 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 are plotted in **Figures 10-6 through 10-8**. None of the Battle Road Trail falls within either the DNL 65 dB or DNL 55 dB contours for 2022. As the figures indicate, 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 subjected to 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 3 percent to the traffic volumes on Route 2A.

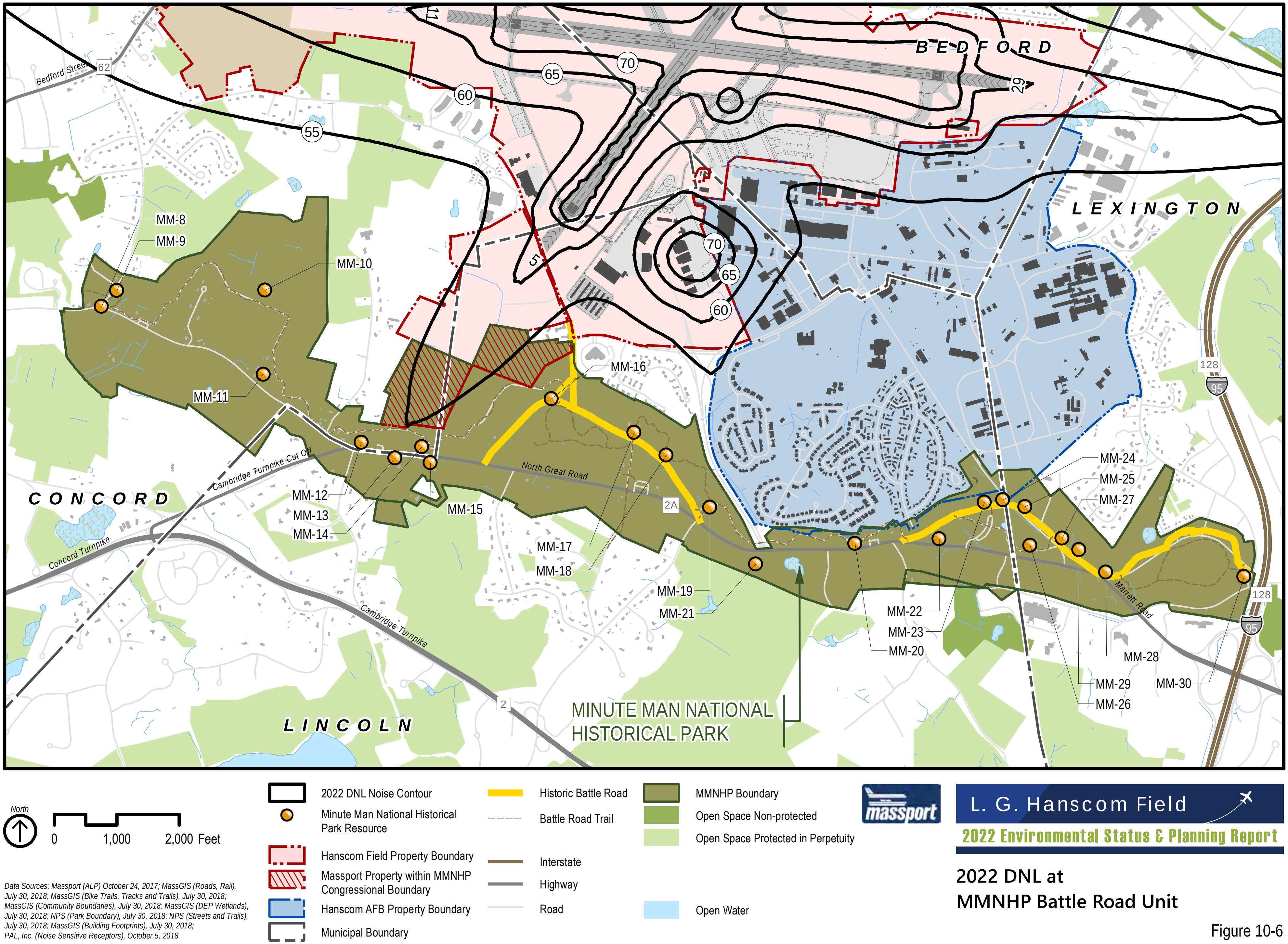
10.5.6 MMNHP Current Status and Future Concerns

At the March 2023 coordination meeting for this *2022 ESPR*, the MMNHP Superintendent noted concerns regarding how noise from aircraft affects park programming. NPS is particularly concerned about noise levels at Hartwell Tavern from touch-and-go training flights and helicopter flyovers. Park leaders indicated to Massport that a large number of interpretive talks are held at Hartwell Tavern.

Using radar data, Massport staff monitors the number of touch-and-go operations over the MMNHP. The Fly Friendly program, instituted in 2009, aims to decrease noise over Hartwell Tavern. The program vigorously promotes fly friendly techniques as well as advising voluntary measures for pilots to avoid Hartwell Tavern while performing touch-and-go training operations. Further discussion of noise levels at MMNHP locations is detailed in Chapter 7.

10.6 Analysis of Future Scenarios

This section summarizes the findings for the 2030 and 2040 forecast scenarios in relation to cultural and historic resources within and in the vicinity of Hanscom Field. The environmental analysis focuses on noise and traffic effects of the 2030 and 2040 forecast scenarios. The air quality assessment, discussed in Chapter 8, concludes that even maximum air concentrations for the 2030 and 2040 Hanscom Field scenarios comply with all health-based air quality standards and therefore will result in no adverse air quality effects to historic resources, including MMNHP.



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

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L. G. Hanscom Field

2022 Environmental Status & Planning Report

2022 DNL at MMNHP Battle Road Unit

Figure 10-6

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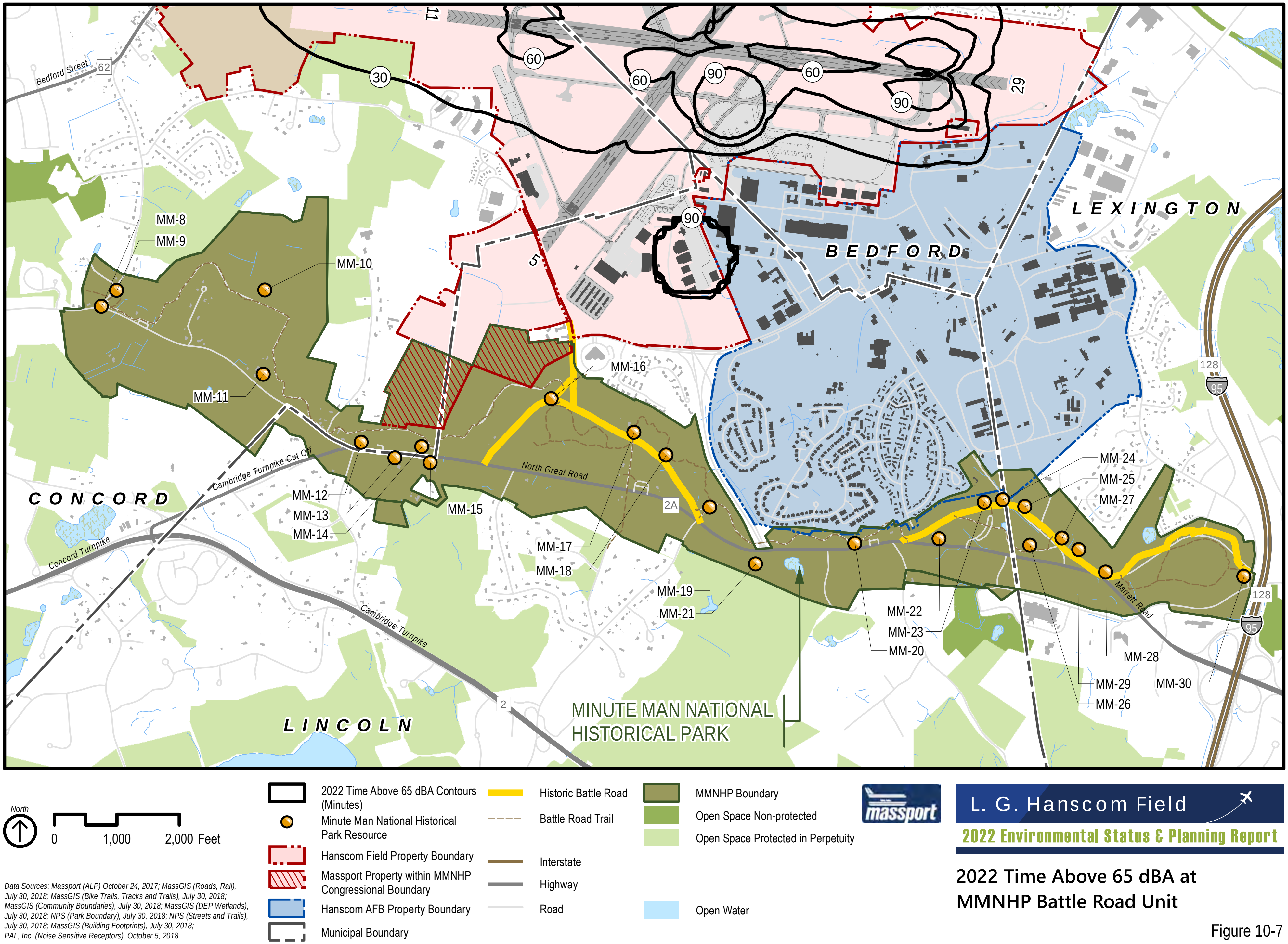

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

L. G. Hanscom Field

2022 Environmental Status & Planning Report

2022 Time Above 65 dBA at MMNHP Battle Road Unit

Figure 10-7

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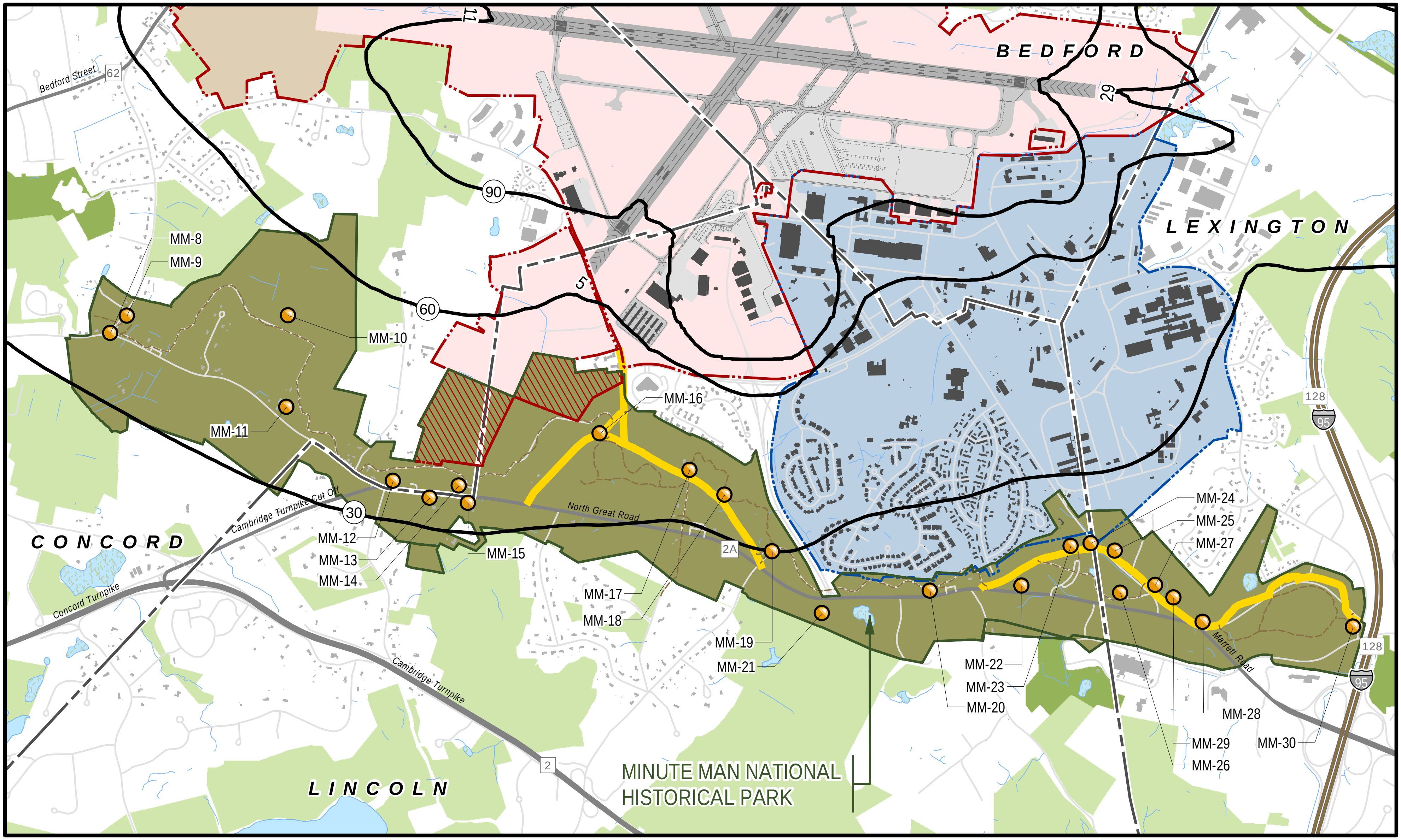

North

0 1,000 2,000 Feet

- 2022 Time Above 55 dBA Contours (Minutes)
- 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
- MMNHP Boundary
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

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2022 Environmental Status & Planning Report

2022 Time Above 55 dBA at MMNHP Battle Road Unit

Figure 10-8

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The analyses of cultural and historic resources use the information on future aviation operations activity levels presented in Chapter 3 and potential new facilities described in Chapter 4. Data is also derived from the evaluation of traffic volumes and intersection operations that are described in Chapter 6 and noise analyses for DNL and TA measurements that are presented in Chapter 7.

Any future project at Hanscom Field will undergo a project-specific environmental review process if MEPA, NEPA, or other applicable environmental review thresholds are met. The historic resources and archaeological reconnaissance surveys as updated for 2022 conditions (included in **Appendix G**), will provide baseline data for these assessments. Additional cultural and historical properties may be identified through more detailed surveys in that process and will be addressed at that time.

Traffic

The 11 TSA portions of the Reconnaissance Survey Area provide data on historic and archaeological resources within 200 feet of each intersection to assess potential traffic-related effects on historic and archaeological resources. Traffic considerations for historic and archaeological resources include potential effects from overall traffic volumes on roadways, particularly along Route 2A through MMNHP, the operation of intersections, and any physical changes that may be considered at intersections.

As discussed in Chapter 6, based on the traffic analysis data collection for the *2022 ESPR*, Hanscom Field represents approximately 3 percent of morning peak hour traffic on Route 2A, which is consistent with the *2017 ESPR* findings and represents a 1 percent increase during the evening peak hour. There has been an average reduction in traffic volumes on Hanscom Drive between 2017 and 2022.

In 2022, Hanscom Field traffic exceeded the 10-percent MEPA threshold at four TSA intersections: #5 and #6 in Lincoln, and #8 and #11 in Concord. TSA #6 is within MMNHP, Battle Road Unit. In the 2030 and 2040 future forecast scenarios, Hanscom Field traffic exceeds the 10-percent MEPA threshold at a total of six intersections, consisting of these same four intersections and adding two additional TSAs, #3 in Lexington and #7 in Concord.

For both the 2030 and 2040 scenarios, Hanscom Field-related traffic on Route 2A is expected to remain steady at about 3 percent of morning and evening peak hour traffic. Improvements with intersection modifications are anticipated or proposed at TSA #5 in Lincoln with a single-lane roundabout, a bus pullout and bike lanes. There are no historic resources identified at TSA #5. Improvements are proposed at TSA #6 in Lincoln including a possible traffic signal, which is within MMHHP. Any work at either TSA involving ground disturbance may require an archaeological survey. No physical modifications are currently proposed by Massport at TSA #3, #7, #8, and #11.

Some Hanscom Field-related traffic now uses the entrance on Virginia Road, and with projected redevelopment and increases in aviation activity in the 2030 and 2040 forecast scenarios, peak hour vehicle trips are anticipated to increase at the Pine Hill area and the North Airfield area off Hartwell Road.

Massport supports TDM strategies to reduce future Hanscom Field-related traffic to traffic volumes on area roadways, and potential traffic management strategies that do not require physical modification to intersections in as far as possible. TDM approaches are further discussed in Chapter 6.

Noise

As stated in Chapter 7, FAA guidelines assess significant changes in noise exposure using both the absolute value of the projected DNL as well as the magnitude of the change DNL changes of 1.5 dB or more for areas within the 65 dB DNL noise contour are looked for in an initial screening. The next steps in the process look for changes of 3.0 or more decibels between DNL 60 and 65 dB. 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 this *2022 ESPR* is not an environmental permitting document for a project, the use of these criteria help to highlight any notable changes in the noise environment around Hanscom Field.

Chapter 7 presents 2030 and 2040 noise exposure levels at noise analysis locations including those that are cultural and historic resources. The 65 dB DNL noise contour is used as a threshold for determining potential land use incompatibilities, in accordance with FAA guidelines. The Secretary directed Massport to evaluate the extent of the DNL 55 dB contour in this *2022 ESPR*, as for prior ESPRs.

Airport Planning

As discussed in Chapter 4, Massport's five-year CIP for 2023 to 2027 includes various projects such as Hanscom Field Terminal renovations, communications upgrades, fire protection infrastructure, taxiway and apron pavement rehabilitation, compliance with FAA mandated airfield geometry and equipment replacement. Some of these activities could involve any of the 12 resources that are 50 years old or older, including the Hanscom Field Terminal (built in 1953). The current planning initiative projects in the CIP are not likely to have any adverse effects on historic resources at Hanscom Field.

Air Quality

As described in Chapter 8, there are no adverse effects attributable to air quality in 2022 or the 2030 and 2040 scenarios for historical resources at Hanscom Field or in the surrounding area. Air quality in the region currently meets federal and state ambient air quality standards as established by the U.S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection, and the pollutant levels are expected to remain well below the regulatory thresholds in the future years 2030 and 2040.

10.6.1 Future Scenarios: Historic Resources

This section assesses potential effects to historic resources that could occur under the 2030 and 2040 forecast scenarios. Assessment of future noise effects to historic resources focuses on the National and State Registers-listed properties and the MHC Inventory and MACRIS-listed resources. The noise analysis, as presented in Chapter 7, is based on DNL (a 24-hour noise exposure metric) and time above given threshold noise levels. Information about the environmental effects to archaeological resources and to MMNHP is contained in Sections 10.6.2 and 10.6.3.

National and State Register Properties

Figure 10-9 and Figure 10-10 illustrate the location of historic National and State Register properties in the vicinity of Hanscom Field generally, and the MMNHP Battle Road Unit specifically, relative to the DNL contours for the 2030 and 2040 future scenarios. The figures include the contours for 2017 and 2022 as well for comparing future noise forecasts with levels experienced in recent years. **Table 10-15** presents DNL values for the 2030 and 2040 scenarios at the 12 locations with the highest DNL values in 2022, ranked by value. No historic properties fall within the DNL 65 dB contour or experience increased exposure of 3.0 dB or more at DNL levels between DNL 60 and 65 dB. Three resources have DNL values between 55 dB and 60 dB, and nine resources have DNL values below 55 dB in the 2030 and 2040 scenarios.

Three historic National Register-listed properties would have DNL values between 55 and 60 dB DNL under the 2030 and 2040 scenarios. Two are in Concord on Virginia Road next to Hanscom Field and one is on Bedford Street in Lexington, as shown in Figure 10-9 and listed in Table 10-15.

In Bedford, no historic resource noise analysis locations are exposed to a DNL of 55 dBA or above in 2022, or in the 2030 and 2040 scenarios. The historic resource with the highest exposure level is Bedford Depot Park Historic District (NB-5), which has DNL exposure value of 49.7 dBA in 2022 (down from 52.0 dBA in 2017) and projected exposures in the planning scenarios of 50.2 dBA in 2030 and 50.5 dBA in 2040. The existing condition is lower than the exposure in 2017, and the forecasted levels are reduced from the 2025 and 2035 forecasts in the *2017 ESPR*.

In Concord, as noted above, two historic properties have current and projected DNL noise exposure values between 55 and 60 dBA: the Deacon John Wheeler/Capt. Jonas Minot Farmhouse (NC-18) and the Wheeler-Meriam House (NC-19). The forecast scenario levels are reduced from the 2025 and 2035 forecasts, estimated at 58.4 and 58.8, respectively, in the *2017 ESPR*.

In Lexington, there are no historic sites with 2022 DNL noise values above 55 dBA. As noted above, the property with the highest exposure in 2022 is Simonds Tavern (NLX-1). The forecast scenario levels are reduced from the 2025 and 2035 forecasts, in the *2017 ESPR*.

In Lincoln, no historic resource noise analysis locations are exposed to a DNL of 55 dBA or above in 2022, or in the 2030 and 2040 scenarios. The property with the highest noise exposure level is the Daniel Brooks House (NLN-3), which has a DNL exposure value of 51.9 dBA in 2022 and projected exposures in the planning scenarios of 50.8 dBA in 2030 and 51.2 dBA in 2040, both below existing conditions.

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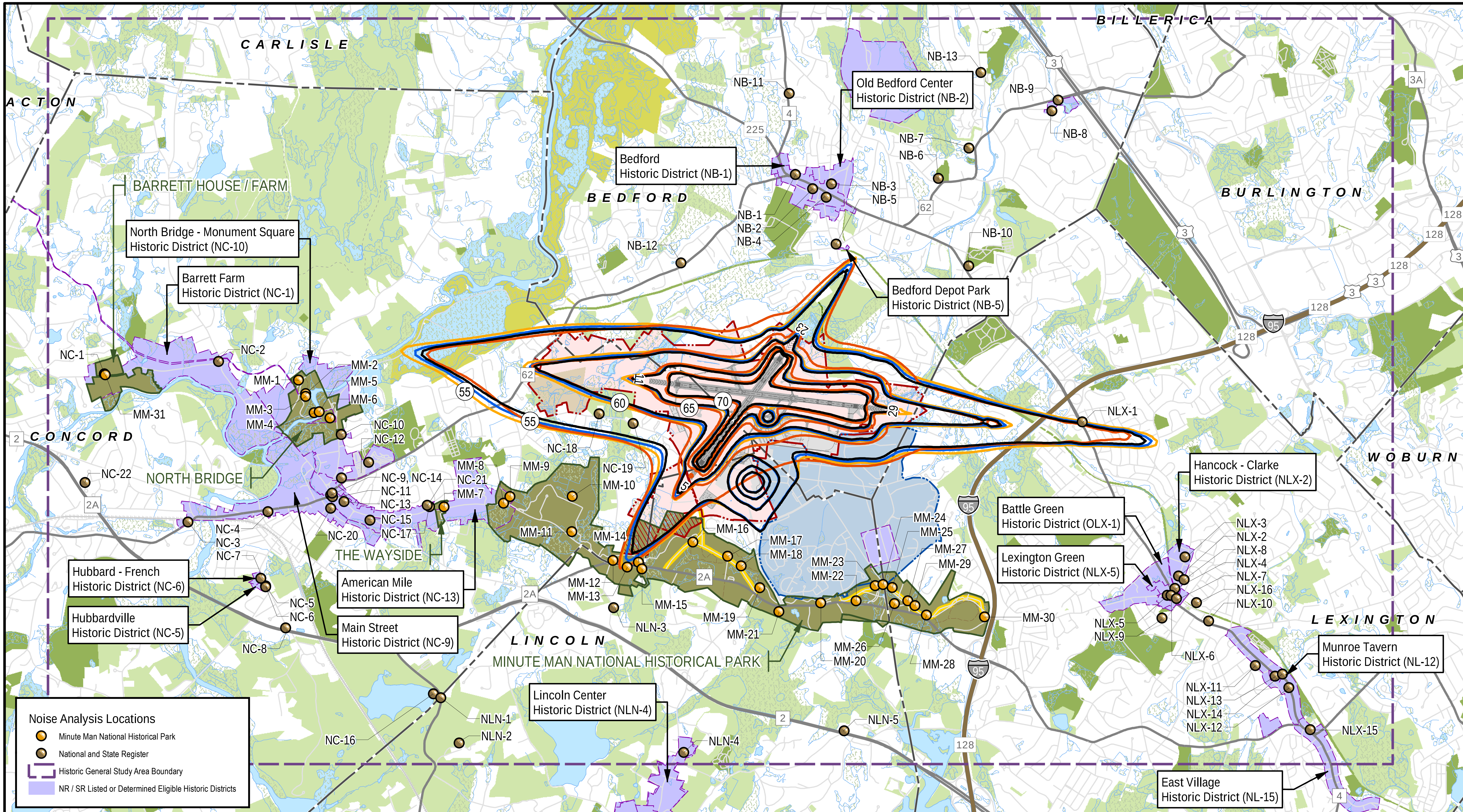

North

0 3,500 7,000 Feet

2017 DNL Noise Contour
2022 DNL Noise Contour
2030 DNL Noise Contour
2040 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

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

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

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L. G. Hanscom Field

2017 Environmental Status & Planning Report

Historic Resources within the 2017, 2022, 2030 and 2040 DNL Contours

Figure 10-9

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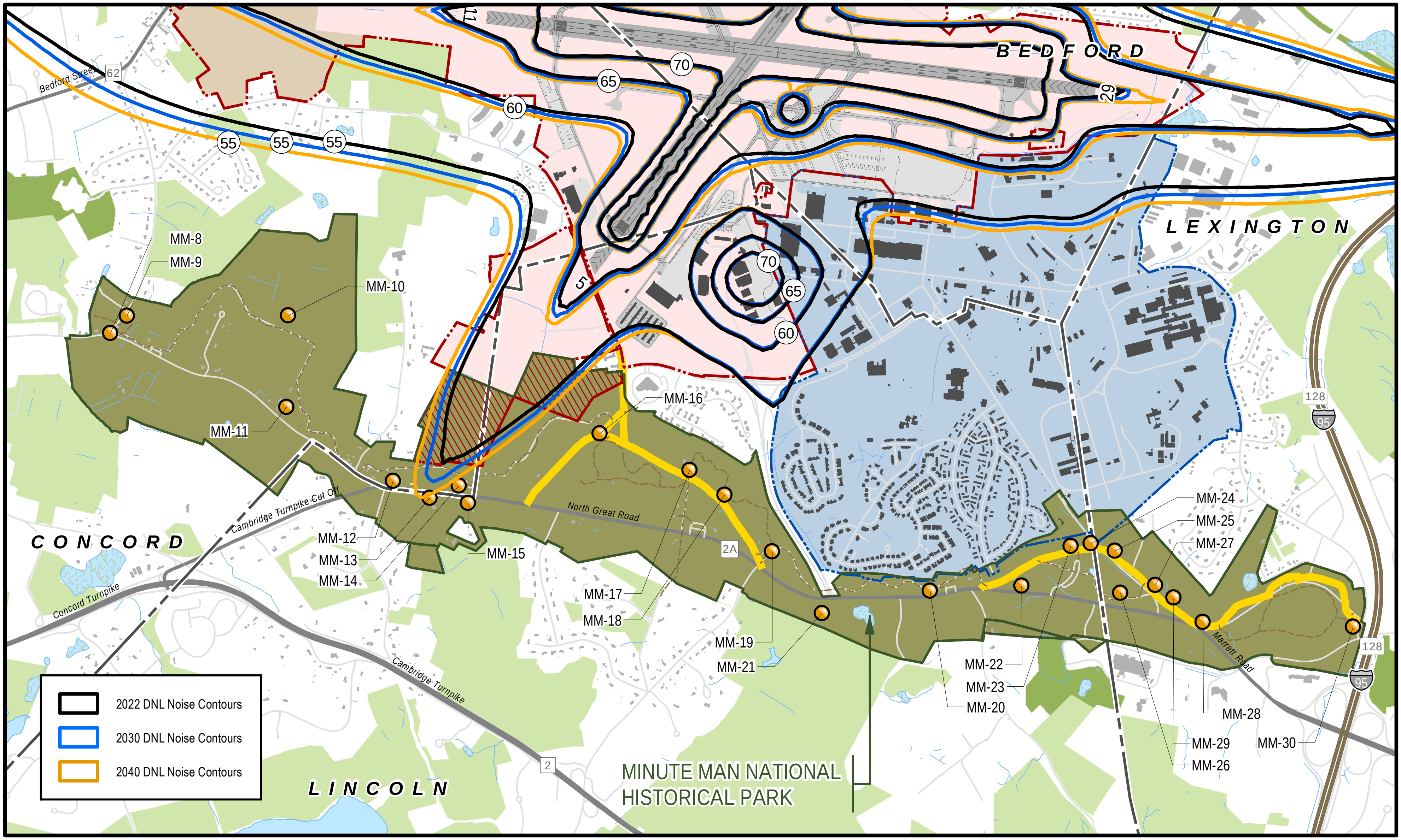

North

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

MMNHP Boundary

Open Space Non-protected

Open Space Protected in Perpetuity

Open Water

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

L. G. Hanscom Field

2017 Environmental Status & Planning Report

2022, 2030 and 2040 DNL at MMNHP Battle Road Unit

Figure 10-10

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Table 10-15. DNL Values for Historic Resources Listed in the National and State Registers of Historic Places

MHC #	Name	Street Address	Town	Noise Label	2017	2022	2030	2040
CON.177	Deacon John Wheeler-Captain Jonas Minot Farmhouse (aka Thoreau Birthplace)	341 Virginia Rd.	Concord	NC-18	57.8	57.3	57.7	58.1
CON.178	Wheeler-Meriam House	477 Virginia Rd.	Concord	NC-19	57.7	57.0	57.5	57.9
LEX.413	Simonds Tavern	331 Bedford St.	Lexington	NLX-1	54.5	55.5	55.3	55.9
BED.V	Bedford Depot Park Historic District	80 Loomis St. and 120 South Rd.	Bedford	NB-5	52.0	49.7	50.2	50.5
CON.DV	North Bridge- Monument Square Historic District	Monument St., Liberty St., and Lowell St.	Concord	NC-10	48.4	48.7	49.0	49.4
CON.802 (CON.DY)	Sleepy Hollow Cemetery	24 Court Ln.	Concord	NC-12	49.0	48.2	48.6	49.0
CON.170	Orchard House	399 Lexington Rd.	Concord	NC-17	50.0	47.4	47.8	48.2
CON.A	Concord Monument Square- Lexington Road Historic District	Monument Sq. and Lexington Rd.	Concord	NC-14	48.3	47.2	47.7	48.1
CON.DU	Main Street Historic District	Main St. between Monument Sq. and Wood St.	Concord	NC-9	48.3	47.1	47.6	48.0
CON.DS	American Mile Historic District	Lexington Road	Concord	NC-13	48.6	47.1	47.6	48.0
CON.329	Wright Tavern	Lexington Rd. & Main St.	Concord	NC-11	48.4	47.1	47.6	48.0
CON.DU	Main Street Historic District	Main St. between Monument Sq. and Wood St.	Concord	NC-9	48.3	47.1	47.6	48.0
CON.317	Ralph Waldo Emerson House	28 Cambridge Tpk.	Concord	NC-15	49.1	46.7	47.2	47.6

Notes: Historic districts and properties with the 12 highest DNL values in 2022 are listed in order of their DNL value. MMNHP resources and noise values are shown in Table 10-18.

Table 10-16 lists 18 historic districts with their total acreage and number of acres within the DNL 65- and 55-dB contours. Each of the 18 historic districts listed is fully outside the DNL 65 dB and 55 dB contours for the 2030 and 2040 scenarios, as they are for the 2022 existing conditions.

Table 10-16. Area of National and State Register Historic Districts within the DNL 55 Contour

MHC Number	Name 1	Acreage	2022	2030	2040
Bedford					
BED.V	Bedford Depot Park Historic District	6.8 acres	0 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
LEX.AZ	Richard Gleason Tower Estate	10.3 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 DNL 65 dB and 55 dB contours for 2022 and the 2030 and 2040 scenarios. MMNHP is discussed separately.

The highest forecasted TA65 levels occurs at two locations. At the Wheeler-Meriam House in Concord, TA65 increases from 23.8 minutes a day in 2022 to 26.2 minutes a day under the 2030 scenario and 28.4 minutes a day for 2040. At the Wheeler-Minot Farmhouse in Concord, TA65 increases from 23.9 minutes a day in 2022 to 26.2 minutes a day for 2030 and 28.4 minutes a day for 2040.

The highest forecasted TA55 levels also occur at the Wheeler-Meriam House, which increases from 95.9 minutes a day in 2022 to 105.3 minutes a day under the 2030 scenario and to 113.5 minutes a day for 2040.

MHC Inventory and Information from Historical Commissions

None of the historic resources in the MHC Inventory and MACRIS would be within the DNL 65 dB contour for the 2030 or 2040 scenarios. **Table 10-17** summarizes by town the number of historic resources in the MHC Inventory and MACRIS that would be within the DNL 55 dB contour for the 2030 and 2040 forecast conditions.

Table 10-17. Historic Resources within the DNL 65 and DNL 55 Contours for the 2030 and 2040 Scenarios

Location[1]	2022 MHC Inventory[2]	2022		2030		2040	
		65 dBA	55 dBA	65 dBA	55 dBA	65 dBA	55 dBA
Survey Areas[3]							
Bedford	2	-	2	-	2	-	2
Concord	6	-	6	-	6	-	6
Lexington	2	-	2	-	2	-	2
Lincoln	-	-	-	-	-	-	-
Total	10	-	10	-	10	-	10
Individual Properties							
Bedford	12	-	12	-	12	-	11
Concord	22	-	15	-	20	-	22
Lexington	120	-	55	-	107	-	120
Lincoln	1	-	-	-	-	-	-
Total	154	0	82	0	139	0	153

Notes:
1. Based on research for 2022 ESPR.
2. Appendix G lists these historic resources.
3. The areas listed are fully or partially within the 55 dBA DNL contour.

10.6.2 Future Scenarios: Archaeological Resources

Massport encourages new development in areas with existing impervious surfaces that take advantage of existing infrastructure. Any physical changes proposed near recorded archaeological sites (and/or 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 by Massport for these locations. The following is an assessment of the potential impacts from possible development to archaeological resources and/or sensitivity areas from the planning areas reviewed for 2030 and 2040 and described in Chapter 4. The five planning areas are the North Airfield, Northeast Airfield, East Ramp, West Ramp, and Pine Hill. The impacts assessment is based on the information in the archaeological reconnaissance survey update for this *2022 ESPR*.

2030 Scenario, Archaeological Resources

Development in the 2030 scenario is evaluated for potential to impact archaeologically sensitive areas at the five planning areas. These potential developments are unlikely to affect potentially significant archaeological resources. New development that may occur in the North Airfield and parts of the Northeast Airfield and Pine Hill planning areas are entirely within areas assessed as having a low archaeological sensitivity, so they are unlikely to affect potentially significant archaeological resources. All development evaluated for the East Ramp will occur on existing impervious ramp and apron and are entirely within areas assessed as having a low archaeological sensitivity. New development evaluated for the West Ramp planning area includes three possible development sites. Two are located in low sensitivity areas, but one small area in the southeastern section is within an area of moderate/high archaeological sensitivity.

The one potential West Ramp development site with potential for archeological effects is located within an area that is presently vegetated and pervious. Additional archaeological investigation within this area would be appropriate if the development concept moved forward to planning and design, and if belowground impacts are proposed.

2040 Scenario, Archaeological Resources

The development concepts considered for the 2040 scenario augment those discussed above in the 2030 scenario and the potential effects on archaeological sensitive areas would be similar in most areas. Construction activity in the North Airfield, Northeast Airfield, East Ramp, and Pine Hill areas would continue to be confined to existing impervious areas previously disturbed with low archaeological sensitivity.

In the West Ramp area, potential development could occur within areas that are presently vegetated, pervious, and are within areas of moderate/high archaeological sensitivity. Additional archaeological investigation within these areas would be appropriate if any of these concepts moved forward to planning and design, and if below-ground impacts are proposed.

10.6.3 Future Scenarios: Minute Man National Historical Park

This section assesses potential noise and traffic effects of the 2030 and 2040 scenarios on MMNHP. Specific areas of focus include the NPS's priorities of physical protection and restoration of Battle Road and safeguarding of historic resources adjacent to road intersections in the Park. NPS traffic-related goals also include providing visitors with access to park facilities, management of road traffic and truck noise, and maintaining public safety, particularly regarding traffic speed and congestion. NPS is also focused on the management of air traffic to protect the visitor's experience in the Park and the future of Hanscom AFB. As described in Chapter 8, there are no adverse effects attributable to air quality in 2022 or the 2030 and 2040 scenarios.

Noise

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 2030 and 2040 scenarios. **Table 10-18** presents the sites with the 12 highest DNL values in the Park.

Table 10-18. DNL Values of Sites in the Minute Man National Historical Park

Label[1]	Name[2]	Unit/Town[3]	2017	2022	2030	2040
MM- 13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit/Lincoln	55.0 dB	54.1 dB	54.5 dB	54.9 dB
MM- 14	Job Brooks House	Battle Road Unit/Lincoln	54.6 dB	53.9 dB	54.3 dB	54.6 dB
MM- 12	Samuel Brooks House	Battle Road Unit/Concord	54.4 dB	53.5 dB	53.9 dB	54.3 dB
MM- 15	Joshua Brooks, Jr. House	Battle Road Unit/Lincoln	53.6 dB	52.9 dB	53.2 dB	53.6 dB
MM- 16	Bloody Angle	Barrett Farm Unit/Concord	51.7 dB	51.2 dB	51.5 dB	51.8 dB
MM- 10	Historic Farming Fields	Battle Road Unit/Concord	50.9 dB	49.8 dB	50.2 dB	50.5 dB
MM- 11	Olive Stow House/Farwell Jones House/ Carty Barn	Battle Road Unit/Concord	50.6 dB	49.5 dB	49.8 dB	50.2 dB
MM-1	Major John Buttrick House	North Bridge Unit/Concord	48.9 dB	49.1 dB	49.3 dB	49.7 dB
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit/Concord	48.4 dB	48.7 dB	49.0 dB	49.3 dB
MM-9	Meriam House	Battle Road Unit/Concord	50.5 dB	48.5 dB	48.9 dB	49.3 dB
MM-8	Meriam's Corner Monument	Battle Road Unit/Concord	50.3 dB	48.1 dB	48.5 dB	48.9 dB
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit/Concord	50.1 dB	47.5 dB	48.0 dB	48.4 dB

Notes:
1. The MMNHP is a National Historic Landmark district. All sites are in the National Register of Historic Places. The sites with the 12 highest DNL values in 2022 are listed in order of their value.
2. Sites within MMNHP 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.

In both the 2030 2040 scenarios, none of the 31 noise analysis locations within MMNHP and no part of the Park would be within the 65 dB DNL contour. The area of the Park within the 55 dB DNL contour is projected to slightly increase in 2030 and 2040 relative to the area in 2022. In the 2040 scenario, 53.8 acres of the MMNHP would be within the 55 dB DNL contour, up from 42.5 acres in the 2030 scenario. The DNL values at MMNHP sites would range from 44.7 dB to 54.5 dB for 2030 and from 45.1 dB to 54.9 dB for 2040. The highest level (54.5 dB and 54.9 dB for 2030 and 2040, respectively) would occur at Noah Brooks Tavern and Carriage House (MM-13).

None of the 4.9-mile Battle Road Trail would be within the 65 dB DNL contour in either the 2030 or 2040 scenarios, as shown in Figure 10-10. A small portion of the Battle Road Trail would be within the 55 dB DNL contour in the 2030 scenario; approximately 400 feet of the Battle Road Trail would lie within the 55 dB DNL contour in the 2040 scenario (Figure 10-12). A visitor to the Battle Road portion of the Park is exposed to the background noise of road traffic from Route 128/I-95 and Route 2A throughout most of the day.

Figure 10-11 and **Figure 10-12** depict the 2022, 2030 and 2040 Time Above contours in relation to the MMNHP Battle Road Unit. Modeled DNL, TA65 and TA55 values at noise analysis locations along the Battle Road Trail are highest west of the Hartwell Tavern, reflecting the proximity of these sites to runways at Hanscom Field.

As presented in Chapter 7, TA65 values range from 1.5 to 8.8 minutes (for 2030) and from 1.5 to 9.5 minutes (for 2040) at the 31 noise analysis locations in MMNHP, with the highest levels occurring at the Job Brooks House (MM-14) in the Bedford Levels. TA55 values ranged from 17.0 to 54.9 minutes (for 2030) and from 18.3 to 59.1 minutes (for 2040) with the highest levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels area near Elm Brook in Concord.

Traffic

The evaluation of traffic identifies potential changes in Route 2A traffic volumes that are attributable to Hanscom Field. Chapter 6 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.

Hanscom Field traffic remains a very small percentage of the overall volumes on the roadway in the 2030 and 2040 scenarios. As discussed earlier in this chapter, in 2022 Hanscom Field represented 3 percent of peak hour traffic on Route 2A. Hanscom Field traffic is forecasted to remain steady at these levels in both the 2030 and 2040 scenarios. Hanscom AFB and other local and regional traffic sources account for the rest of the traffic volumes.

In both the 2030 and 2040 scenarios, Hanscom Field traffic would exceed 10 percent of a single traffic movement at one intersection in the MMNHP on Route 2A, #6 Route 2A/Hanscom Drive in Lincoln.

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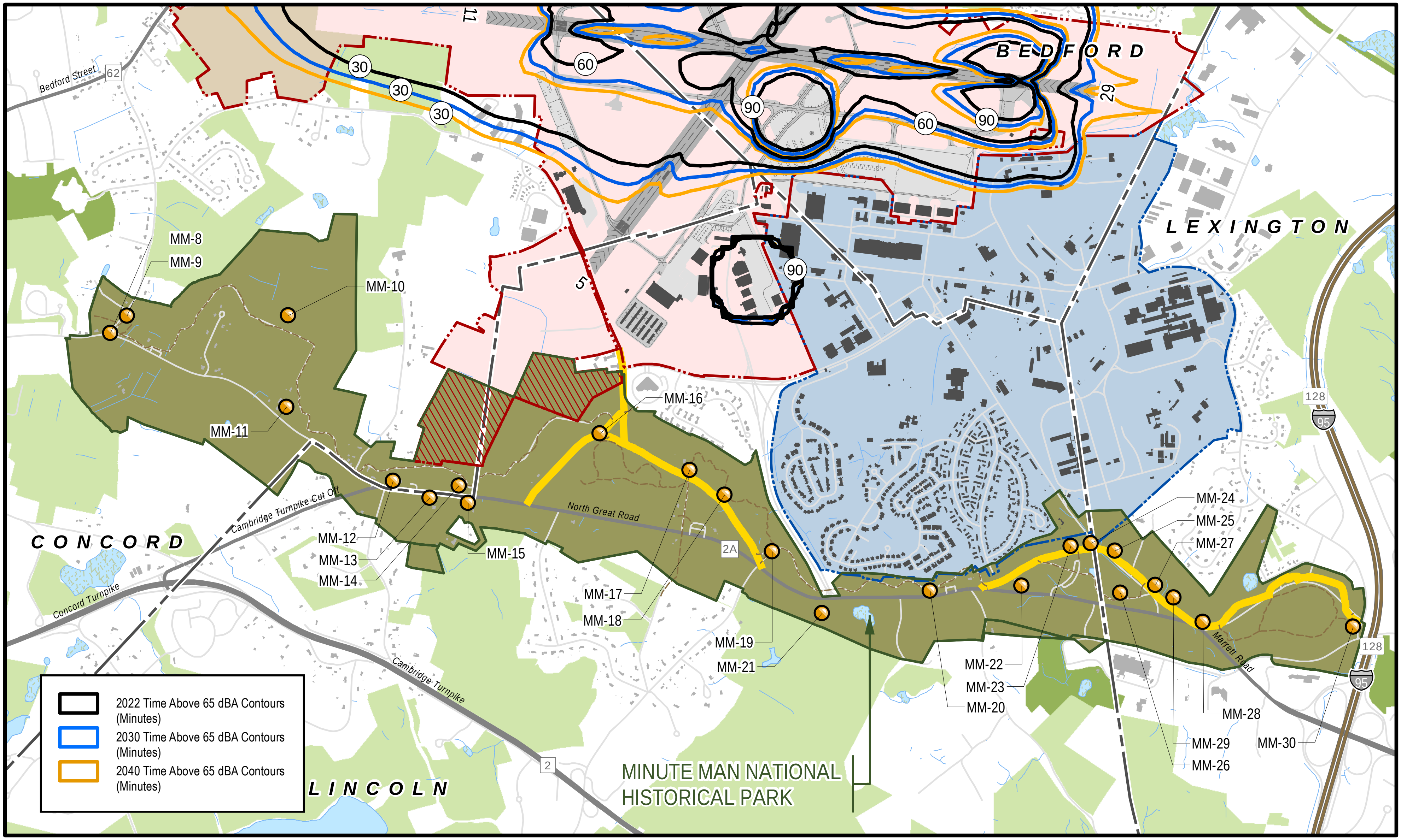

North

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
- MMNHP Boundary
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

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L. G. Hanscom Field

2017 Environmental Status & Planning Report

2022, 2030 and 2040 Time Above 65 dBA at MMNHP Battle Road Unit

Figure 10-11

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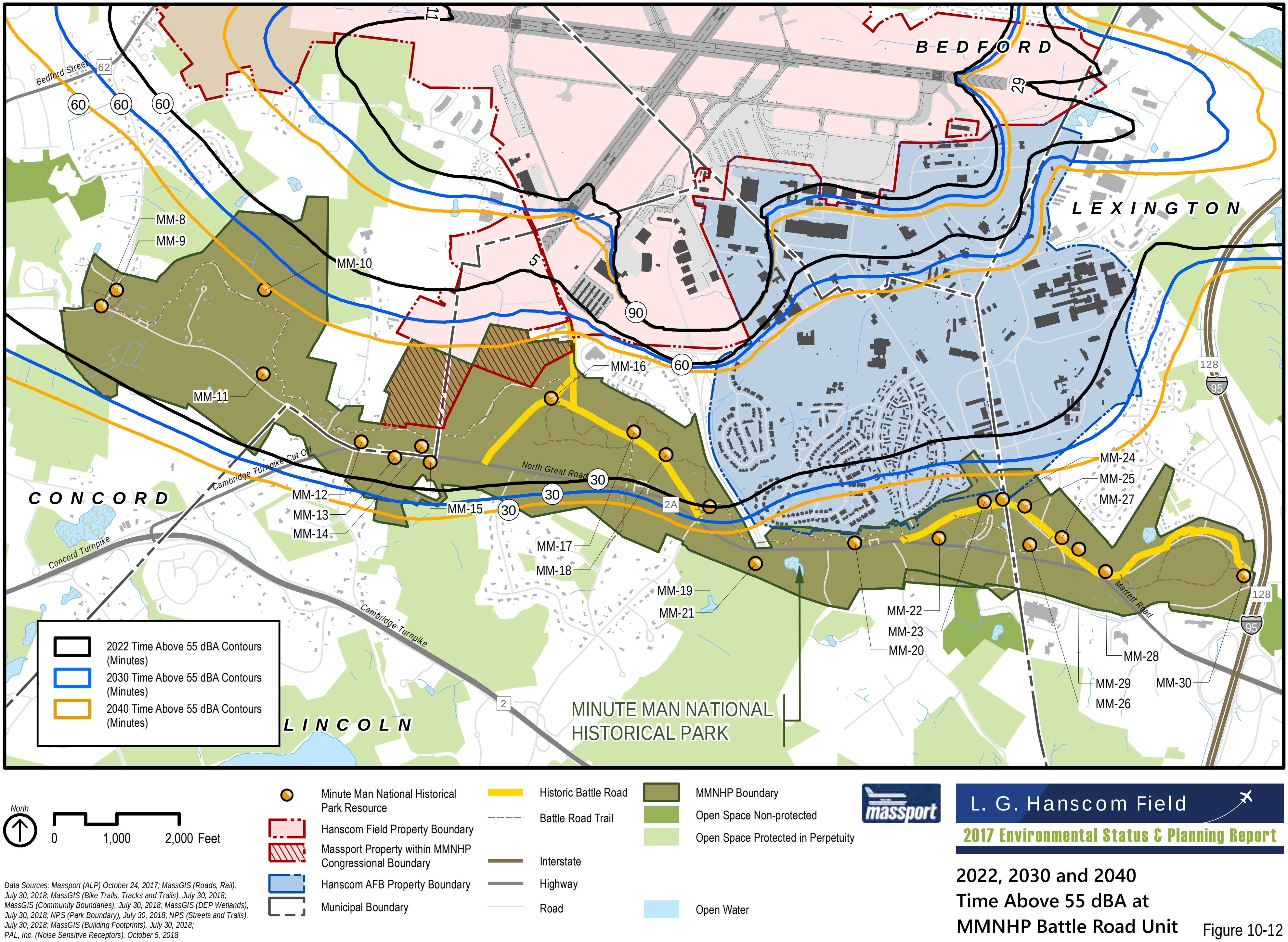

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

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L. G. Hanscom Field

2017 Environmental Status & Planning Report

2022, 2030 and 2040 Time Above 55 dBA at MMNHP Battle Road Unit

Figure 10-12

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10.7 Environmentally Beneficial Measures

This section presents a summary of possible environmentally beneficial measures that have been identified to address the forecasted effects of Hanscom Field on historic and cultural resources in the 2030 and 2040 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 11.

Historic Resources

The inclusion of several tiered categories of updated information about historic resources in this *2022 ESPR* provides a comprehensive basis for future analyses of potential impacts to historic resources in the event that a specific project is developed for implementation. The updated information is current compilations of National and State Register-listed and eligible historic resources and data on MHC Inventory and MACRIS resources. It also includes a preliminary update of the 2012 historic resources reconnaissance survey of other historic resources that are 50 years old or older within the Reconnaissance Survey Area (the 55 dB DNL noise contour for the 2040 planning scenario and the 11 TSAs), including within Hanscom Field. Six of the 11 TSAs are intersections where traffic exceeds the 10-percent MEPA threshold in the 2030 and 2040 planning scenarios. Massport has limited operational impact on the ground transportation network in the area of Hanscom Field for the scenarios analyzed (existing, 2030 forecast, and 2040 forecast). A combination of operational and physical changes are discussed in Chapter 6, with a focus on traffic measures and improvements that do not require physical changes to the roadways and TSAs. Possible noise mitigation measures could include operational measures of a voluntary nature such as those reported in Chapters 7 and 11.

Archaeological Resources

Any disturbance in areas of archaeological sensitivity or near known archaeological sites has the potential to impact archaeological resources. The reconnaissance survey for the *2012 ESPR* and the *2022 ESPR* 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.

Minute Man National Historical Park

Possible noise mitigation strategies to reduce effects on historical sites could include continued operational measures of a voluntary nature such as those reported in Chapters 7 and 11. 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.

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11 Sustainability, Resiliency, and Environmental Justice

Massport takes a holistic approach to sustainability, managing its facilities to ensure economic viability, operational efficiency, natural resource conservation, and social responsibility. Massport is focused on maintaining a safe, secure, and efficient general aviation airport while minimizing the environmental impact of its operations.
This chapter provides a high-level overview of sustainability practice in the airport industry and specific sustainability-related initiatives at Massport and Hanscom Field. The chapter also includes Massport's approach to climate adaptation. Massport's sustainability vision focuses on resiliency to improve the ability of infrastructure and operations to withstand disruptive events and recover within a reasonable timeframe.

In addition to complying with all mandatory regulations, Massport looks to voluntary guidance from the Commonwealth of Massachusetts concerning various sustainability, energy, and climate adaptation and resilience topics. This chapter describes regulations, monitoring, and reporting practices and provides an update to the current, ongoing, and planned environmentally-beneficial measures at Hanscom Field.

Additionally, this chapter includes the Environmental Justice study area for Hanscom Field, and identifies vulnerable health criteria, potential sources of pollution, and other environmental indicators for certain neighborhoods.

11.1 Key Findings Since 2017

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. This includes several initiatives to reduce impacts on neighboring communities and the broader region.

- In 2017, Massport established a Design Flood Elevation for Hanscom Field as a result of flooding due to extreme precipitation.
- From 2018 to 2022, 974,600 pounds of single-stream recyclables were collected at Hanscom Field demonstrating Massport's prioritization of waste reduction efforts.
- In 2014, Massport released the *Floodproofing Design Guide* outlining various strategies to decrease the impacts of flooding; it was most recently updated in 2018.[283]
- In 2020, Massport attained LEED Silver certification of Hanscom Field's co-located Aircraft Rescue Fire Fighting (ARFF) and United States Customs and Border Protection (CBP) facility.
- In early 2022, Massport committed to achieving net zero carbon emissions across all its properties and facilities, including Hanscom Field, by 2030 in the *Roadmap to Net Zero*[284]
- Since 2017, every taxiway which has been rehabilitated included upgrades to LED lighting. Airport planning projects are further discussed in Chapter 4.
- In 2023, Massport replaced runway lighting on Runway 5/23 with LED light fixtures to reduce maintenance costs and support energy reduction. In addition, approximately 324,000 square feet (36,000 square yards, 7.5 acres) of impervious pavement was removed from the project area.

11.2 Airport Sustainability

One of the first widely accepted definitions of sustainability was developed by the World Commission on Environment and Development in 1987, which states that sustainable development "meets the needs of the present without compromising the ability of future generations to meet their own needs."[285] Sustainability acknowledges the balance and interconnectedness among economic development, environmental stewardship, and social needs. This is commonly referred to as the "triple bottom line."

[283] Massport. November 2014. *Floodproofing Design Guide*, rev. November 2018, https://www.massport.com/media/1149/massport-floodproofing-design-guide-revised-april-2015.pdf
[284] Massport. March 2022. *Roadmap to Net Zero*. https://www.massport.com/massport/about-massport/roadmap-to-net-zero/
[285] World Commission on Environment and Development. 1987. *Our Common Future,* the Report of the Brundtland Commission, published by Oxford University Press.

Many airports have voluntarily adopted an approach to sustainability that accounts for the triple bottom line plus operations, or "EONS" (Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility), as illustrated in **Figure 11-1**. The EONS approach emphasizes operational efficiency, which is a critical consideration of all airport sustainability initiatives. Many North American airports issue sustainability or corporate social responsibility reports and some have implemented formal Sustainability Management Plans (SMP).[286] Environmental, Social, and Governance (ESG) reporting is gaining traction in the aviation industry as a framework for reporting and responding to investor needs.[287]

Figure 11-1. Airport Industry Concept of Sustainability (EONS)

Airports are also increasingly focused on sustainable design, construction, operations, and maintenance of airport facilities to improve efficiency, conserve resources, and reduce expenses. As of December 2022, there were approximately 1,500 LEED-certified and registered projects associated with airport buildings and facilities across the globe.[288] Another system that is increasingly used to develop more sustainable airport projects is the Institute for Sustainable Infrastructure's (ISI's) Envision Infrastructure Sustainability Rating System. Envision is a tool for project owners to develop infrastructure in a holistic manner that incorporates community quality of life in addition to other sustainability criteria.[289] Massport uses both LEED and Envision as frameworks to inform the planning and design phases of projects to incorporate its sustainability goals.

Additionally, the aviation sector is focused on reducing GHG emissions, with many organizations aiming for net zero emissions by 2050. The Federal Aviation Administration (FAA)[290], Airports Council International World (ACI),[291] International Civil Aviation Organization (ICAO),[292] International Air

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286 Federal Aviation Administration. December 28, 2022. *Airport Sustainability*. https://www.faa.gov/airports/environmental/sustainability

287 Airports Council International. April 20, 2022. *ACI World issues new guidance on ESG reporting*. https://airport-world.com/aci-world-issues-new-guidance-on-esg-reporting/

288 U.S. Green Building Council (USGBC). January 2023. *Applying LEED to airport projects.* https://support.usgbc.org/hc/en-us/article_attachments/13405338440723/Applying_LEED_to_airport_projects_Jan_2023.pdf

289 Institute for Sustainable Infrastructure. 2022. *Envision for Airports EXECUTIVE BRIEF.* https://sustainableinfrastructure.org/wp-content/uploads/2022/03/Airport-Executive-Brief.pdf

290 Federal Aviation Administration. Working to Build a Net-Zero Sustainable Aviation System by 2050. https://www.faa.gov/sustainability

291 Airports Council International World. June 8, 2021. Net zero by 2050: ACI sets global long term carbon goal for airports. https://aci.aero/2021/06/08/net-zero-by-2050-aci-sets-global-long-term-carbon-goal-for-airports/

292 International Civil Aviation Organization. October 7, 2022. States adopt net-zero 2050 global aspirational goal for international flight operations. https://www.icao.int/Newsroom/Pages/States-adopts-netzero-2050-aspirational-goal-for-international-flight-operations.aspx

Transport Association (IATA),[293] and many individual airports and airlines have committed to this goal in alignment with global and national climate goals informed by the work of the Intergovernmental Panel on Climate Change and set forth in the Paris Agreement.[294]

11.3 Sustainability at Massport Facilities

Massport employs a holistic sustainability approach to ensure economic viability, operational efficiency, natural resource conservation, and social responsibility (EONS). 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. Massport first identified sustainability goals in the 2015 Boston Logan International Airport SMP. Since then, Massport has published regular sustainability and resiliency reports to report on progress towards the goals.

> **Massport's Sustainability Vision:**
>
> Massport will maintain its role as an innovative industry leader through continuous improvement in operational efficiency, facility design and construction, and environmental stewardship while engaging passengers, employees, and the community in a sustainable manner.

Massport adopted the following sustainability goals in line with their sustainability vision[295]:

- **Energy and GHG Emissions:** Reduce energy intensity and GHG emissions while increasing the portion of Massport's energy generated from renewable sources.
- **Materials, Waste Management, and Recycling:** Reduce waste generation, increase the recycling rate, and utilize environmentally sound materials.
- **Ground Access and Connectivity:** Provide superior ground access to Boston Logan International Airport through alternative and high-occupancy vehicle (HOV) travel modes.
- **Water Conservation:** Conserve regional water resources through reduced potable water consumption.
- **Noise Abatement:** Minimize noise impacts via Massport's "Fly Friendly" program.
- **Water Quality/ Stormwater:** Protect water quality and minimize discharge of pollutants.
- **Community, Employee, and Passenger Well-being:** Promote economically prosperous, equitable, and healthy communities, and passenger and employee well-being.
- **Air Quality:** Decrease air pollutants from Massport sources.
- **Natural Resources:** Protect and restore natural resources near Massport facilities.
- **Resiliency:** Improve resiliency for overall infrastructure and operations.
- **Carbon Sequestration:** Forests and grasslands capture and store carbon naturally; of Hanscom's 1,305 acres, 1,003 are planted providing this ecosystem service.

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[293] International Air Transport Association (IATA). October 4, 2021. Net-Zero Carbon Emissions by 2050. https://www.iata.org/en/pressroom/pressroom-archive/2021-releases/2021-10-04-03/
[294] United Nations. Paris Agreement. https://www.un.org/en/climatechange/paris-agreement
[295] Massport. Sustainability and Resiliency Report 2020-2021. https://www.massport.com/media/bo4gmdk0/2020-2021-sustainability-and-resiliency-report-web.pdf

This section provides an overview of Massport's current and planned sustainability practices at Hanscom Field, which fall into the following categories:

1. Sustainable Planning, Design, and Construction
2. Sustainable Operations and Maintenance
3. Climate Adaptation and Resiliency
4. Regional Economic Contributions
5. Social Sustainability initiatives

As of 2020, Massport no longer pursues International Organization for Standardization (ISO) 14001 Environmental Management System certification. Due to the constraints of the COVID-19 Pandemic, Massport was not able to supply the necessary resources to continue certification. Therefore, the ESPR no longer includes a section on the Environmental Management System. Even so, continued high standards for environmental compliance of operations and facilities is ensured and managed by Massport's Safety and Operations Units.

11.3.1 Sustainable Planning, Design, and Construction

This section introduces sustainable planning, design, and construction programs at Massport that are employed at Hanscom Field. The *2022 ESPR* provides baseline conditions and a comprehensive review of the cumulative environmental effects of development and operations at Hanscom Field and can inform the planning of future activities and projects. For further information, Section 4.1.6 of the ESPR describes environmental planning considerations at Hanscom and Section 4.1.8 describes stakeholder planning initiatives.

Massport encourages sustainable and resilient planning, design, and construction of all development at Hanscom through:

- Massport's *Roadmap to Net Zero*.
- Use of Massport's *Sustainability and Resiliency Design Standards & Guidelines*.
- Encouraging LEED certification (Gold with LEED Zero Carbon and LEED Zero Energy Gold or better).
- Encouraging use of the ISI Envision Sustainable Infrastructure Rating system.
- Locating new water, sewer, and stormwater drainage systems within already developed areas when feasible.
- Implementing soil erosion and sediment control measures during construction.
- Identifying opportunities for development projects to control storm water runoff and using Best Management Practices (BMPs) to ensure that relevant stormwater runoff rates are not increased, both during construction and in future operating conditions.
- Designing facilities that require septic systems to comply with Title V regulations.
- Minimizing impacts to undeveloped areas.

Massport's Net Zero Roadmap

In early 2022, Massport committed to achieving net zero carbon emissions across all its properties and facilities, including Hanscom Field, by 2031, coinciding with the Authority's 75th anniversary. To meet this goal, Massport aims to eliminate absolute emissions from facilities under its control to the maximum extent practicable and will purchase carbon offsets for remaining emissions. Massport is not allowing itself the option of carbon offsets past 2040. This goal is more ambitious than the Commonwealth's goal of net zero emissions by 2050 as set forth in the 2021 *Act Creating a Next Generation Roadmap for Massachusetts Climate Policy.*[296]

Massport will achieve net zero GHG emissions through five primary pathways:

- Energy conservation and efficiency measures
- Clean and renewable energy sources
- Sustainable ground transportation
- Partnerships
- Culture of sustainability and innovation

To assess pathways for achieving net zero, Massport established a GHG existing emissions baseline by inventorying and categorizing existing emissions sources:

- **Scope 1:** Sources that are under Massport's direct control, for example electrical generators that Massport owns and operates.
- **Scope 2:** Sources that can be indirectly controlled by Massport, for example purchased electricity providers.
- **Scope 3:** Sources that are not under Massport's control or ownership, but Massport may be able to influence the owners or operators of those sources to implement GHG emission reduction initiatives. Examples include energy consumed by tenant-owned or operated facilities or equipment, like fleet vehicles, commercial aircraft, and GSE.

Table 11-1 includes the inventoried emissions from Hanscom Field as reported in the *2017 ESPR* in comparison to total Massport emissions and includes 2022 GHG emissions as reported in **Chapter 8**.

[296] https://malegislature.gov/Laws/SessionLaws/Acts/2021/Chapter8

Table 11-1. Hanscom Field GHG Emissions

Facility	Inventory Year	Scope 1 Emissions (MT CO_2e)	Scope 2 Emissions (MT CO_2e)	Scope 3 Emissions (MT CO_2e)	Total Facility Emissions (MT CO_2e)
Hanscom Field	2017	212	844	22,836	23,892
	2022	164	329	21,851	22,344
Massport Total Emissions[1]	2019 Baseline[2]	60,951	48,512	768,483	877,947
Hanscom % of Massport Total	2017 compared to Baseline	0.35%	0.17%	2.97%	2.72%

Notes:
1. The Massport Total Emissions (2019 baseline) represents data from various years because inventory availability varies by facility.
2. As of publication of the draft 2022 Hanscom ESPR, 2022 Massport GHG total emissions are not available.

As demonstrated in Table 11-1, in 2017 Scope 1 and 2 emissions at Hanscom Field comprised less than 1 percent of total Massport emissions. Scope 1 and 2 emissions at Hanscom Field decreased in the 2022 inventory.

To meet its net zero goals, Massport identified five pathways which address the largest sources of Massport controlled GHG emissions as well as the emissions over which it has influence. Initiatives that are being considered for Hanscom Field that align with these pathways include:

- Repair or re-commission existing solar installations as some are either inoperable or not operating to design;
- Continue to determine the feasibility for microgrid and storage opportunities (e.g., at Hanscom Field), and pursue new microgrid and storage opportunities, as feasible;
- Share electric ground service equipment (eGSE) among airlines where feasible;
- Work with utilities on electrical infrastructure redundancy and capacity; and
- Coordinate with the MBTA and private shuttle operators to determine the feasibility of improved public transit options.

Massport has created a Program Management Office to facilitate the implementation of the *Roadmap to Net Zero* by 2031 and is working with stakeholders to ensure progress toward this objective. Chapter 8 of this *2022 ESPR* provides more detail related to Hanscom Field's 2022 GHG emissions.

Sustainability and Resiliency Design Standards and Guidelines (SRDSG)

Massport adopted a comprehensive set of standards and guidelines for sustainable planning, design, and construction in 2009, followed by an updated version released in December of 2018.[297] The

[297] Massachusetts Port Authority, *Sustainability and Resiliency Design Standards and Guidelines (SRDSG)*. December 2018. Available at: http://www.massport.com/media/3111/massport-sustainability-and-resiliency-design-standards-and-guidelines-dec2018.pdf

Sustainability and Resiliency Design Standards and Guidelines (SRDSG) are available electronically as a resource for architects, engineers, and planners working on Massport capital projects, as well as to tenants and third-party developers of Massport properties.

The SRDSG provides a framework of general standards relating to project management, documentation, public involvement, systems commissioning, and operational and maintenance programs. It also includes guidance on project site design and project materials. The guidelines cover energy management and efficiency measures, air quality measures, water management and efficiency measures, and measures to improve indoor air quality and occupant comfort. Examples of technologies encouraged in the SRDSG include natural daylighting, passive solar gain, natural cooling, energy-efficient HVAC equipment, environmentally beneficial building materials, and energy use monitoring.

According to the USGBC and substantiated by many case studies, LEED buildings generally:

- Cost less to operate and maintain,
- Generate higher energy and/or water-efficiencies,
- Demonstrate higher rent values than conventional buildings in their markets,
- Provide a healthier and safer indoor environment for occupants, and
- Embody the environmental or sustainability values of the organizations that build, own, and occupy them.

LEED Certification

Massport encourages development projects greater than 20,000 square feet in size to meet the U.S. Green Building Council's (USGBC's) LEED Silver certification requirements or better. The LEED Green Building Rating System was established in 2000, as a third-party certification program for "the design, construction, and operation of high-performing green buildings." The LEED rating system can be used to evaluate many project types, including new construction, renovations, retrofits, and the operation of existing buildings.

In 2019, Massport finished construction of a co-located ARFF and CBP facility at Hanscom Field. Sustainability considerations were incorporated throughout the project's planning, design, and construction phases, enabling the facility to attain LEED Silver certification in 2020. The building was designed to exceed the Massachusetts Building Energy Code[298] by 30 percent. Additionally, the building was designed to reduce annual water use by 40 percent.[299] Massport is evaluating the potential for future solar installation at this site.

At Hanscom Field, designers of tenant facilities are also encouraged to achieve higher levels of LEED certification through the incorporation of innovative sustainable design and operational elements. As of 2023, both Boston MedFlight (shown in **Figure 11-2**) and Signature Flight Support are pursuing LEED Silver certification for facilities they occupy at Hanscom Field. Atlantic Aviation's Pine Hill Hangar Complex was designed and built in accordance with LEED Silver certification standards. Jet Aviation is also considering pursuing LEED certification for a building on their campus.

[298] Commonwealth of Massachusetts. 2023. Building Energy Code. https://www.mass.gov/info-details/building-energy-code
[299] Massachusetts Port Authority, *Sustainability & Resiliency Report*, 2020/2021. https://www.massport.com/media/bo4gmdk0/2020-2021-sustainability-and-resiliency-report-web.pdf

Figure 11-2. Boston MedFlight's New Facility, Completed in 2018

Envision Certification

Massport works to leverage the Envision sustainable infrastructure framework as a tool for ensuring sustainability is considered holistically throughout the project lifecycle (from planning through end-of-life), where feasible within scope. The Envision rating system, managed by the Institute for Sustainable Infrastructure (ISI), is similar to the LEED rating system for buildings, but was designed for infrastructure—including runways, taxiways, and roadways for example. It provides a point-based framework for assessing 64 sustainability and resiliency indicators (or credits), across five credit categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate & Resilience.

An assessment of each of the credit areas requires documentation to demonstrate a project's level of achievement for each applicable credit. Envision emphasizes stakeholder engagement and considers how well the project contributes to holistic sustainability, examining project impacts on the environment and community alike. Independent third-party verification is required to obtain formal award and public recognition of achievement. Obtaining Envision Verification and leveraging the framework in planning is a way project owners and private teams can demonstrate commitment to sustainability and resiliency. It also encourages the pursuit of innovative sustainable approaches in projects completed by Massport or development teams.

Energy Efficiency and Renewable Energy

Environmental permitting documents and lease agreements often stipulate energy efficiency and renewable energy requirements. Massport encourages reducing energy consumption and GHG emissions through energy efficiency as outlined in the SRDSG. Massport supports efforts to design and build to LEED standards for energy efficiency in new or rehabilitated buildings. Massport has also invested significantly in post-construction energy-efficiency projects.

Figure 11-3. Solar PV Panels on Hanscom Field Terminal

Hanscom Field's Terminal includes a 51-kilowatt capacity solar photovoltaic (PV) facility comprised of 222 solar panels that were installed in 2011. The solar panels are mounted on the roof and on the south facing wall of the structure (as shown in **Figure 11-3**). The U.S. Air Force Office of Energy Assurance conducted a feasibility study for a community microgrid at Hanscom AFB funded through the Massachusetts Clean Energy Center Community Microgrids Program. The program intends to advance community microgrid projects through their early feasibility stages to attract future investment. Microgrids are beneficial for communities as they can lower energy costs for customers, improve efficiency, decrease GHG emissions, and increase resilience of energy systems.[300] The feasibility study was completed in collaboration with Hanscom AFB and Massachusetts Institute of Technology Lincoln Laboratory. Hanscom AFB owns and operates an electric utility system that consists of two substations that power Hanscom AFB, Massachusetts National Guard Joint Forces Headquarters, and FAA, MIT-Lincoln Laboratory, and Massport facilities at Hanscom Field. The study covered critical facilities on both the Hanscom AFB and the MIT-Lincoln Laboratory campus. A microgrid project would support the objectives of the partner organizations and ensure that Hanscom Field maintains the power to serve as a reliever airfield to Boston Logan International Airport during regional emergencies and natural disasters. The next steps for the microgrid project are to determine critical loads and create a detailed design, complete necessary interrelated infrastructure upgrades, and continue engagement with the electricity utility for approval and implementation.[301]

Hanscom AFB is also participating in an Energy-as-a-Service (EaaS) pilot project intended to develop examples of viable strategies for partnering with industry to improve the capability of the Air Force to provide on-base electric utility systems.[302] The pilot program involves installation of solar arrays and battery energy storage on site at Hanscom AFB. The pilot program will span 3 years, including a period for design-build, 12 months of operation, and an evaluation and reporting period.[303] The

[300] Massachusetts Clean Energy Center. 2023. Community Microgrids Program. https://www.masscec.com/program/community-microgrids

[301] TRC / Tom Rooney. March 4, 2020. Hanscom Air Force Base and MIT-Lincoln Laboratory Microgrid Feasibility Study. https://files-cdn.masscec.com/reports/Hanscom%20-%20Community%20Microgrid%20-%20Final%20Report.pdf

[302] Official United States Air Force Website. "Air Force seeks energy innovation ideas." July 21, 2017. https://www.safie.hq.af.mil/News/Article-Display/Article/1254551/air-force-seeks-energy-innovation-ideas/

[303] Air Force Office of Energy Assurance Public Affairs. "Air Force launches Energy-as-a-Service pilot program at Hanscom AFB." Feb. 15, 2023. https://www.af.mil/News/Article-Display/Article/3299294/air-force-launches-energy-as-a-service-pilot-program-at-hanscom-afb/#:~:text=The%20pilot%20project%20is%20the,that%20will%20benefit%20an%20installation

microgrid feasibility study acknowledges that the emerging EaaS financing model could be used to finance the microgrid.[301]

Hanscom Field tenants have also taken on their own projects to increase energy efficiency and embrace renewable energy options. Several tenants report replacing conventional lights with LED lighting in their buildings and hangars. One tenant converted all incandescent and florescent lighting to LED where possible, making their campus lighting approximately 95 percent LED. They have also begun to convert their parking lot lighting from metal halide to LED arrays, with a portion completed in 2023. Another tenant performed an LED lighting upgrade project in 2019 in their high bays and interior office, resulting in annual savings of 232,451 kWh and carbon dioxide reduction of 2,448,897 pounds. Another tenant replaced all overhead mercury vapor lights with LED fixtures and installed overhead fans to assist in heating and cooling. Another tenant utilizes LED lighting, lighting motion detectors, and updated HVAC controls. They have also conducted a solar panel feasibility survey. Another tenant installed LED lighting and light sensors, along with a solar installation. One of Hanscom's FBOs installed LED lighting in five hangars. Another FBO completed an exterior LED light replacement for Hangar 24 in 2021.

Water Efficiency and Wastewater Reduction

Massport continuously seeks opportunities to manage water resources more sustainably at Hanscom Field. Massport encourages reducing water use as outlined in the SRDSG and supports efforts to design and build to LEED standards for water efficiency and wastewater reduction in new or rehabilitated buildings. Massport has installed low-flow faucets that include automatic water shut-off throughout its facilities, as well as installation of low-flow toilets. For example, the combined ARFF/CBP facility is designed to reduce water use by 40 percent.[304]

Some tenants at Hanscom have also made investments in technologies to improve efficiency of water use. Some examples include low-flow fixtures in restrooms, infrared touch-free mechanisms restroom fixtures that automatically turn off after use, and drought-tolerant landscaping to reduce the need for irrigation.

Sustainable Construction Measures

Massport seeks to mitigate the impacts of construction projects at Hanscom Field to limit the impact on surrounding communities and neighboring lands. Massport recognizes that construction projects may cause short-term impacts such as increased noise, increased emissions from the exhaust of construction equipment, and fugitive dust generated from earth-moving activities. Massport's *Guide*

[304] Massachusetts Port Authority. *Sustainability & Resiliency Report*, 2020/2021. https://www.massport.com/media/bo4gmdk0/2020-2021-sustainability-and-resiliency-report-web.pdf

to Tenant Construction[305] establishes guidelines for tenants who seek to construct, improve, or alter their leased spaces. The guidance requires tenants to consult with Massport's Environmental Management Team to determine applicable standards for sustainability, net zero, resiliency, and environmental mitigation.

Construction-Period Traffic Management Plans will include the following components:

- General project information
- Expected work hours
- Delivery and construction truck routes
- Worker access and parking plans
- Track unloading and staging
- Construction site signs
- Protection of utilities

In addition to supporting the use of the tenant construction guidelines, Massport actively seeks opportunities to employ environmentally friendly technologies. Contractors are recommended to retrofit heavy construction equipment such as front-end loaders, backhoes, cranes, and excavators with advanced pollution control devices, such as oxidation catalysts and diesel particulate filters to mitigate emissions impact of construction projects.[306] These devices filter and break down emissions from diesel fuel burn, including hydrocarbons, particulate matters, and carbon dioxide. A Massachusetts state anti-idling law is also applicable during construction; equipment is not authorized to idle for any longer than five minutes unless it is in active operation.

Control measures are undertaken to mitigate emissions impacts of fugitive dust generated during construction as a result of disturbing dry soil. Fugitive dust emissions are temporarily mitigated using application of water to exposed soils. Some projects may require long-term mitigation strategies such as seeding or mulching to remove the chance of soil erosion due to dry or windy periods.

Prior to any temporary period of construction, Massport will develop a project-specific Construction-Period Traffic Management Plan to be published and accessible. The Plans are intended to improve communication with neighboring communities regarding construction projects, and to reduce impact as much as possible. Plans are provided to the HFAC prior to construction. When feasible, construction will occur on weekdays between 7:00 a.m. and 7:00 p.m., or at times consistent with local noise ordinances. In some circumstances, specialized construction activities may be warranted and require work outside this targeted period.

11.3.2 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.

Energy Efficiency

In addition to promoting energy efficiency in planning, design, and construction, Massport strives for continuous improvement in operational energy use. At Hanscom Field, digital energy meters were installed to document and track energy consumption data. The digital energy metering systems

[305] Massachusetts Port Authority. Guide to Tenant Construction. Massport Owned Properties – 2023 Edition. https://www.massport.com/media/rrfj13qa/guide-to-tenant-construction-massport-owned-2023.pdf
[306] Massport Sustainability and Resiliency Design Standards and Guidelines, 2018.

provide data necessary for annual reporting and review through its Utilities and Sustainability departments. Massport will continue to consider opportunities to re-lamp facilities, airfield lighting, and streetlights with LED systems. In addition, automatic, power-saver light switches are evaluated during project design for installation.

Clean Fuel Vehicle Programs

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 operates 15 fleet vehicles at Hanscom Field, one of which is electric. Massport will continue to consider AFVs for new vehicle purchases in the future, when appropriate. As part of the program, any new conventional-fueled vehicle added to the Hanscom fleet in the future will automatically comply with the low emission goals of the federal Clean Fuel Fleet Program (40 Code of Federal Regulations Part 88). Starting in 2005, on-road diesel vehicles began to use ultra-low sulfur diesel fuel as part of these regulations.

In addition, several tenants are installing EV charging infrastructure and some have switched to electric ground service equipment, resulting in reduced emissions at the Airport.

Recycling

Since the *2017 ESPR*, Massport has continued waste reduction efforts, focusing on single-stream recycling, which encompasses a wide range of materials. From 2018 to 2022, 974,600 pounds of recyclables were collected at Hanscom Field.

At Hanscom Field facilities, scrap metal is recycled in addition to traditional paper, cardboard, metal, plastic, and glass. Hanscom Field and tenant facilities are provided with dumpsters for recycling through Massport's recycling contractor.

Tenants at Hanscom Field also recycle their facility waste, as feasible. One tenant recycled 148,467 pounds of non-hazardous waste in 2022 and 48,344 pounds of hazardous waste. Another tenant reported recycling 1.08 tons of waste (year was not specified). A third tenant recycles approximately 17,000 pounds of non-hazardous waste per year.

11.3.3 Climate Adaptation and Resiliency

Massport's Resiliency Program aims to:

- Work with key influencers and decision makers to strengthen the understanding of the human and national/economic security implications of extreme weather, changing climate, and man-made threats to Massport's facilities and the region.
- Inform operations and policy, and implement design/build decisions, through the application of sound scientific research and principles that consider threats, vulnerabilities, and cost-benefit calculations.
- Become a knowledge-sharing exemplar of a forward-thinking, resilient port authority.

In 2017, a severe precipitation event at Hanscom Field resulted in over 30 inches of water flooding the first floor of the Hanscom Field Terminal. Since then, Massport has incorporated new floodproofing and resiliency measures to better prepare for severe precipitation events. For example, Massport has determined the design flood elevation (DFE) [307] for all new buildings and upgrades and they have implemented floodproofing enhancements. The ARFF/CBP facility, built in 2019, was sited on a higher elevation to avoid damage from potential future flooding.

In response to Massachusetts Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth, issued on September 16, 2016, and the subsequent State Hazard Mitigation and Climate Adaptation Plan for the Commonwealth, the Resilient MA Action Team (RMAT) developed the Climate Resilience Design Standards Tool to screen and identify climate risks. The MEPA Interim Protocol on Climate Change Adaptation and Resiliency requires projects to utilize the RMAT Tool during the environmental review process.[308] The tool relies on user inputs specific to the proposed project. It uses that data to provide a preliminary climate change risk rating, recommend climate resilience design standards, and guide implementation practices for projects constructing or rehabilitating physical assets. Since this *2022 ESPR* is a planning report it involves no physical assets to be constructed or refurbished making it challenging to utilize the RMAT tool which relies on project-specific inputs. In the spirit of consistency with the MEPA Interim Protocol on Climate Change Adaptation and Resiliency, this section presents data from the Resilient MA Map Viewer.[309]

The Resilient MA Map Viewer displays geospatial information related to climate change projections and impacts, vulnerability, and adaptation across Massachusetts. This section reports on map layers within the Map Viewer that mirror the output information from the RMAT tool. Map layers included in the analysis are shown in **Table 11-2**. The temperature and precipitation projections are provided at the watershed scale; Hanscom Field is located in the Merrimack watershed.[310]

[307] The DFE corresponds to the maximum level of water that an engineered structure is designed to resist.
[308] MEPA Interim Protocol on Climate Change Adaptation and Resiliency. October 1, 2021. https://www.mass.gov/doc/mepa-interim-protocol-on-climate-change-adaptation-and-resiliency-effective-oct-1-2021/download
[309] MA Executive Office of Energy and Environmental Affairs (EEA). Resilient MA Map Viewer. https://eeaonline.eea.state.ma.us/ResilientMAMapViewer/
[310] https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/#ClimateDashboard

Table 11-2. Resilient MA Maps Viewer Layers and Definitions

Resilient MA Maps Viewer Layer	Definition
Maximum Precipitation, Percent Change	The maximum daily precipitation in the entire record, referenced to baseline values.
Total Precipitation, Percent Change	The average total precipitation within a calendar year, referenced to baseline values.
Sea Level Rise Inundation	Potential extent of flooding from sea level rise varying from 1 foot to 6 feet of inundation.
Massachusetts Coast Flood Risk Model (MC-FRM)- 1% Annual Exceedance Probability (AEP)	Flooding risk due to sea level rise and coastal storms produced from the MC-FRM. A 1% AEP describes a flood with a one in a hundred chance of being exceeded in any year.
Federal Emergency Management Agency (FEMA) Flood Data	Current effective flood risk data from FEMA.
Days above 90 Degrees Fahrenheit	The number of days with temperature above 90 degrees Fahrenheit.
Impervious Surface, 2016	All constructed surfaces such as buildings, roads, parking lots, brick, asphalt, concrete. Also included are areas of man-made compacted soil or material such as mining or unpaved parking lots (no vegetation present).[311] Data obtained from 2016 aerial imagery.
Tree Canopy, 2016	Evergreen and deciduous forest land cover from 2016 aerial imagery.
Source: Resilient MA Maps Viewer, https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/	

Data from relevant layers in the Resilient MA Map Viewer Tool concern the climate resilience of Hanscom Field in three categories:

- Sea Level Rise/Storm Surge
- Precipitation and Urban/Riverine Flooding
- Extreme Heat

Sea Level Rise/Storm Surge

Due to its inland location, there is no coastal flooding at the airport. Based on data available within the Resilient MA Map Viewer, Hanscom Field does not experience risk related to sea level rise or hurricane storm surge. Hanscom Field is not located within the coastal flooding zones specified in the Massachusetts Coast Flood Risk Model (MC-FRM) or the hurricane surge inundation zone.

Precipitation and Urban/ Riverine Flooding

Precipitation causes Hanscom Field to experience risks associated with riverine and urban flooding. **Figure 11-4** shows that parts of the property are located within zones that have a 0.2 percent or 1-

[311] MassGIS. "MassGIS Data" Impervious Surface 2005." https://www.mass.gov/info-details/massgis-data-impervious-surface-2005

percent chance of flooding each year. In addition, the precipitation projections for 2030 predict an 8.5 percent change in maximum precipitation from the baseline and for 2050, a 16.5 percent change from the baseline, as shown in **Table 11-3**. The baseline values for both maximum and total precipitation are calculated from models based on observational data from 1950 to 2013.[312] Total annual precipitation values are projected to increase 6.6 percent from the baseline by 2030 and 8.8 percent from the baseline by 2050 due to thermodynamic changes. These metrics are averaged across 30 years and centered over the target decades (2030 and 2050).[312]

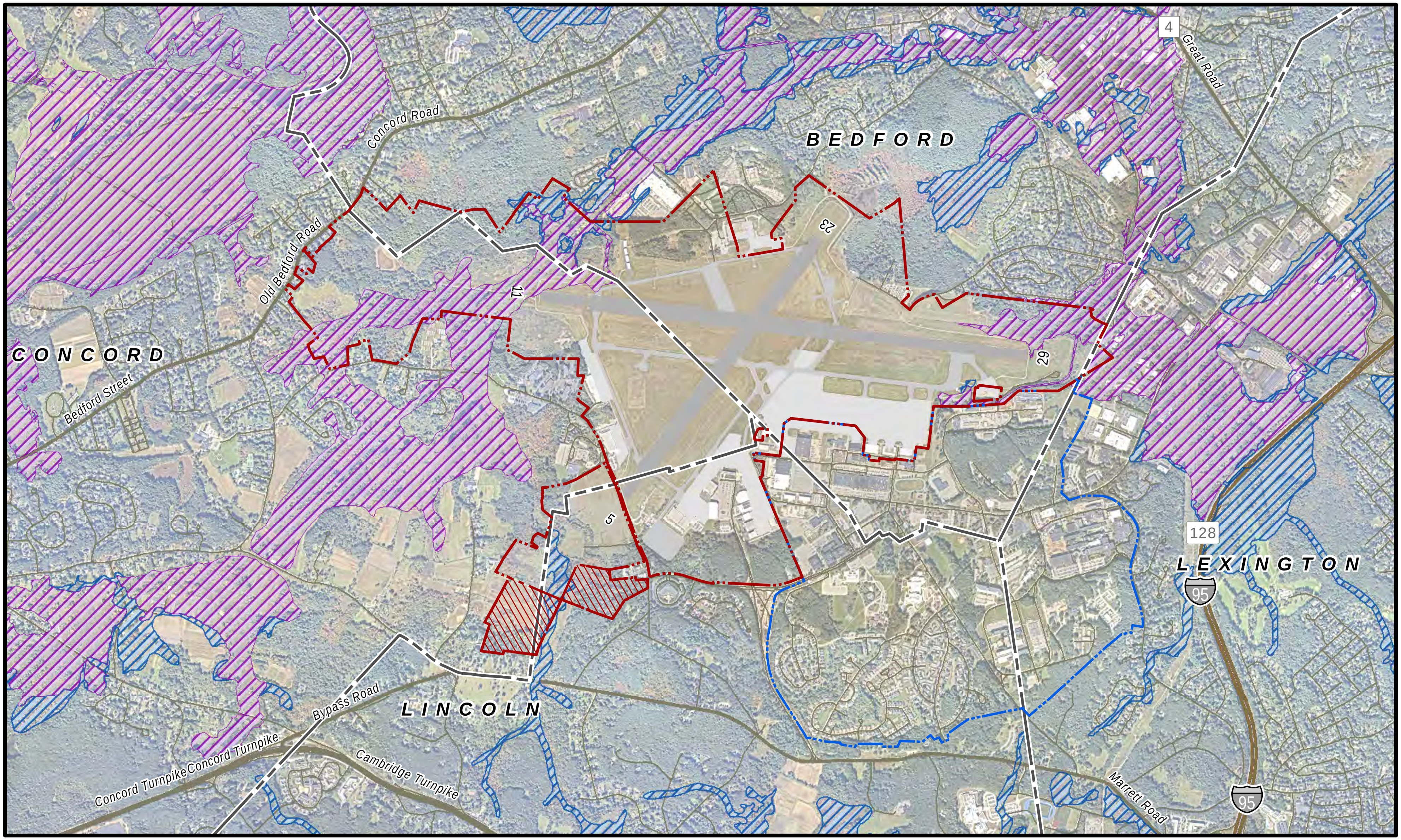
Table 11-3. Precipitation Projections

Maximum Annual Precipitation Baseline	Maximum Annual Precipitation (Percent Change from Baseline)		Total Annual Precipitation Baseline	Total Annual Precipitation (Percent Change from Baseline)	
	2030	2050		2030	2050
1.7 inches	8.5 %	16.5 %	40.9 inches	6.6 %	8.8 %
Source: Resilient MA Maps Viewer, https://eeaonline.eea.state.ma.us/ResilientMAMapViewer					

Hanscom Field experiences risks associated with urban flooding risk due to the amount of impervious surfaces both on and surrounding Hanscom Field, as shown in **Figure 11-5**. Increasing impervious surface area over time may make the area more prone to urban flooding. Riverine flooding risk is also high due to the proximity of wooded marshes and bogs, as discussed in Chapter 9 of this *2022 ESPR*. With increased precipitation, rainfall can exceed the absorptive capacity of these areas and overflow onto adjacent dry land, causing flooding.

To increase resiliency at Hanscom Field, floodproofing measures are reviewed and implemented in new or reconstructed assets. The Massport *Floodproofing Design Guide*[313] outlines various strategies to decrease the impacts of flooding, such as installing watertight shields on doors and windows and ensuring that any soil or fill is appropriately compacted.

312 ResilientMass Maps and Data Center. https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/#ClimateDashboard
313 Massport. November 2014. *Floodproofing Design Guide*, rev. November 2018, https://www.massport.com/media/1149/massport-floodproofing-design-guide-revised-april-2015.pdf



North

0 1,250 2,500 Feet

Data Sources: These data were obtained from Mass EOEEA (FEMA Flood Hazard Areas), July 21, 2023; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NearMap USA (Aerial) October 2, 2023

1% Annual Chance of Flooding
0.2% Annual Chance of Flooding
Hanscom Field Property Boundary
Massport Property within MMNHP Congressional Boundary
Hanscom AFB Property Boundary
Municipal Boundary

Interstate
Highway
Road

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

FEMA Flood Zones

Figure **11-4**

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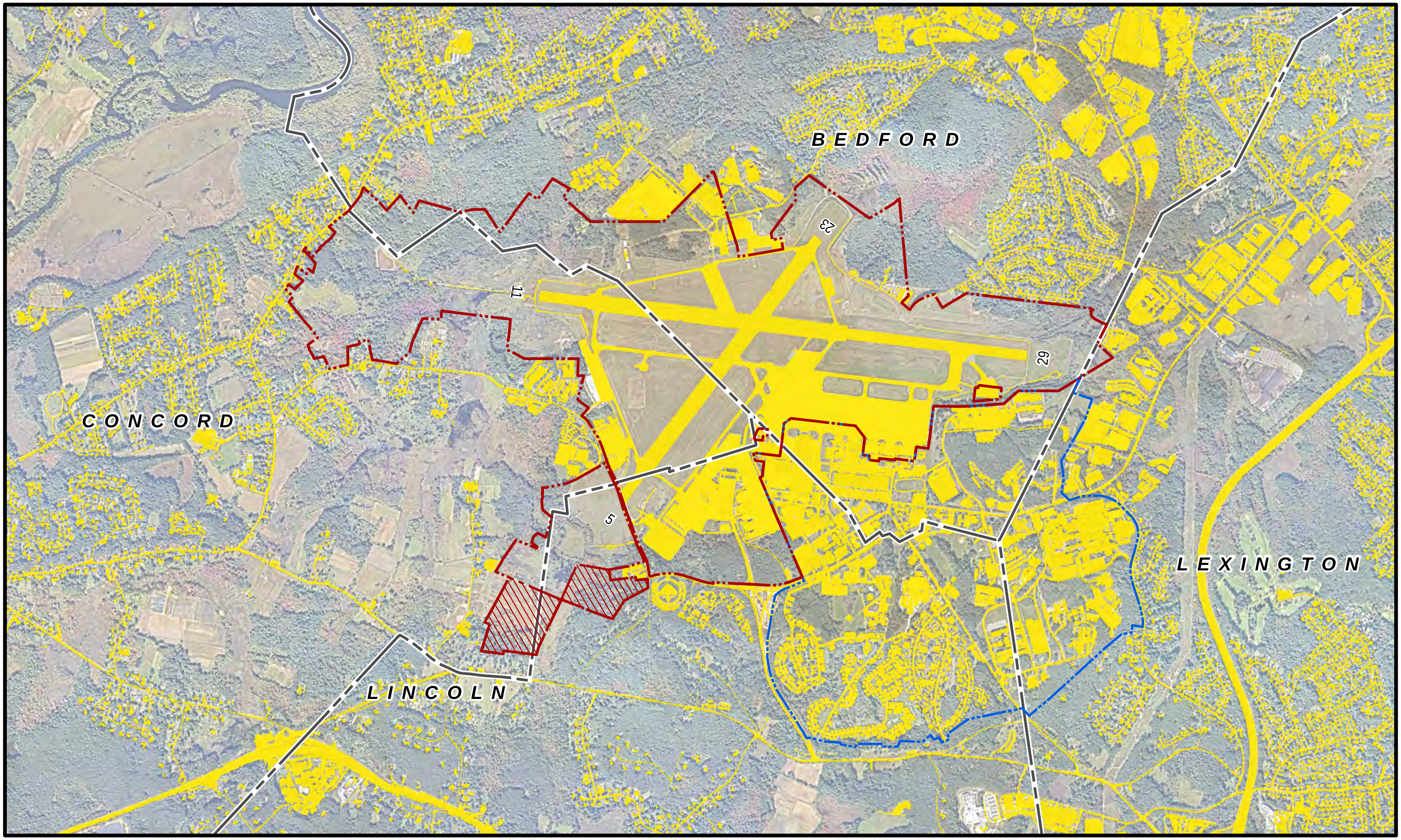

North

0 1,250 2,500 Feet

Data Sources: These data were obtained from MassGIS (Land Cover 2016), July 21, 2023; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NearMap USA (Aerial) October 2, 2023

Impervious Surfaces

Hanscom Field Property Boundary

Massport Property within MMNHP Congressional Boundary

Hanscom AFB Property Boundary

Municipal Boundary

Interstate

Highway

Road

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Impervious Surfaces Surrounding Hanscom Field

Figure **11-5**

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Extreme Heat

Hanscom Field experiences risks related to extreme heat. The Resilient MA Maps Viewer tool predicts the number of days above 90 degrees Fahrenheit will increase by over 100 percent from 2030 to 2050, as shown in **Table 11-4**. Additionally, the average annual temperature at Hanscom is expected to increase 3.6 degrees Fahrenheit by 2030 and 6.3 degrees by 2050 due to both natural and anthropogenic changes, in comparison to the baseline. The baseline value is modeled based on observational data from 1950-2013.

Table 11-4. Heat Projections

Days above 90 Degrees Fahrenheit		Average Annual Temperature Baseline (Degrees Fahrenheit)	Average Annual Temperature Change (Degrees Fahrenheit)	
2030	2050		2030	2050
11	25	46.7	3.6	6.3
Source: Resilient MA Maps Viewer, https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/#ClimateDashboard				

The amount of impervious area surrounding Hanscom may increase the risk of extreme heat since impervious surfaces store heat during the day and prevent cooling at night. The tree canopy provides shade and protects against surface heat, allowing surfaces to stay cool longer. The tree canopy map is shown in **Figure 11-6**.

In order to decrease the impact of extreme heat and reduce the chance of a heat island formation, the Massport SRDSG requires all new building projects to use light-colored materials on roofs and exposed surface areas. Hanscom has a very robust vegetation management process; 76 percent of the area of Hanscom Airfield is planted and serves as a significant carbon sink.

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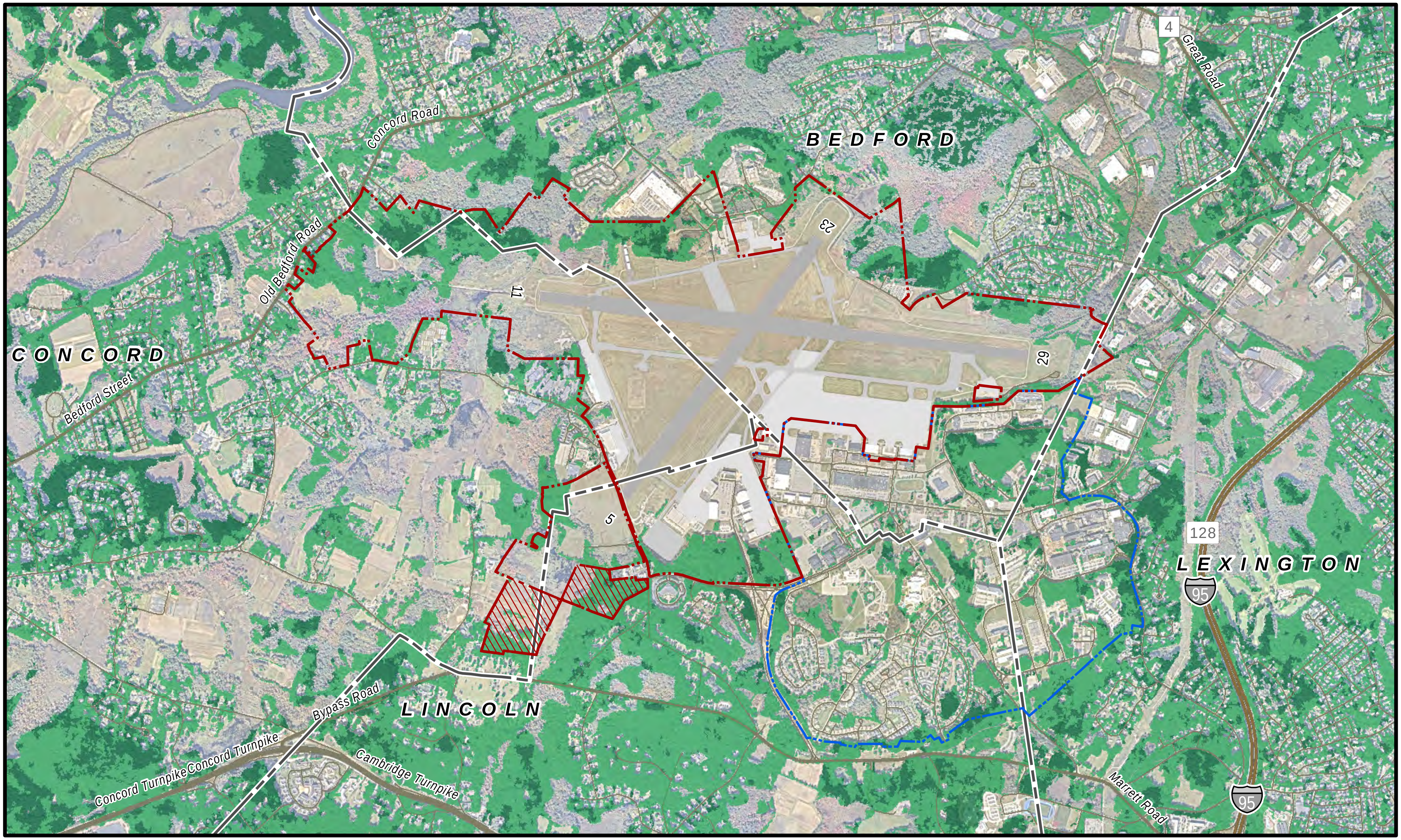

North

0 1,250 2,500 Feet

Data Sources: These data were obtained from MassGIS (Land Cover 2016), July 21, 2023; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NearMap USA (Aerial) October 2, 2023

- Deciduous Forest
- Evergreen Forest
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Interstate
- Highway
- Road

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Tree Canopy Surrounding Hanscom Field

Figure **11-6**

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11.3.4 Regional Economic Contributions

Massport adheres to the aviation industry's definition of sustainability (EONS, see Section 11.2), which includes economic viability as an area of focus. Due to its unique location and facilities, Hanscom Field provides many economic benefits to the region. Hanscom serves as a vital link to domestic and international destinations for individual pilots, air taxi and charter customers, and local employers, including innovative technology corporations, research and development firms, and educational institutions. Businesses look for accessible air travel when deciding where to locate, and Hanscom provides them with easy access to corporate travel opportunities.

Massport regularly invests in airfield, terminal, equipment, and other facility improvements required to maintain the Airport, as shown in **Table 11-5**. Past and future investments ensure that Hanscom will continue to be prepared to support future economic growth by serving the diverse needs of users who operate a wide variety of aircraft.[314]

Table 11-5. Massport Investments at Hanscom Field

Fiscal Year	Amount
2019	$14.8 million[1]
2021	$2.05 million[2]
2022	$4.5 million[3]

Notes:
2020 data was not available due to the COVID-19 pandemic.
1. https://www.massport.com/media/xxnhegbv/state-of-hanscom-2019.pdf
2. https://www.massport.com/media/khjo0oua/2021-state-of-hanscom.pdf
3. https://www.massport.com/media/bmxfopij/2022-state-of-hanscom.pdf

The Aeronautics Division of the Massachusetts Department of Transportation conducts periodic airport economic impact studies every 3 to 5 years, which includes information concerning the economic impact of regional airports, including Hanscom Field. The most recent study was published in March 2019.[315] It determined that Hanscom Field activity results in 2,243 full-time jobs. Annual wages for those workers whose employment is directly related to airport activity are nearly $134 million. Hanscom Field generated estimated economic benefits of approximately $679 million when direct, indirect, and induced economic benefits of the Airport were aggregated. The estimated economic benefits described above do not include economic benefits generated by Hanscom AFB.

11.3.5 Social Sustainability Initiatives

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

[314] Massachusetts Port Authority. The State of Hanscom. March 2023. https://www.massport.com/media/bmxfopij/2022-state-of-hanscom.pdf
[315] Massachusetts Department of Transportation, *Massachusetts Statewide Airport Economic Impact Study Update*. March 2019. Available at: https://www.mass.gov/files/documents/2019/03/25/AeroEcon_ImpactStudy_January2019.pdf

environmental efforts that create community benefits. Massport often coordinates efforts with the four towns surrounding Hanscom: Bedford, Concord, Lexington, and Lincoln. Hanscom Field's social sustainability initiatives since 2017 include promoting programs focused on bringing benefit to Massport employees, tenants, and community members.

Massport invests in programs benefiting people and organizations in the communities that host its facilities, including making charitable contributions and sponsoring scholarships, summer internships, and community summer jobs. The donations and training opportunities are intended to serve a diverse constituency and support a wide variety of worthwhile purposes. For example, in 2022, Massport contributed approximately $5,000 to educational, scholarship, and youth programs in the Hanscom Field area. Additionally, Massport provided approximately $12,000 to sponsor summer internship positions at various municipal departments in the four towns surrounding Hanscom as well as the MMNHP. They also invested in future leaders by spending over $14,000 to support the salaries of local college students that worked directly for Massport.

Massport is also focused on increasing public accessibility to the parks and open space near Hanscom Field. Massport maintains a 40-acre conservation area and local trail network. Massport worked closely with the towns of Bedford and Concord to develop the 2-mile trail network and incorporate new trails into existing trail networks at the Mary Putnam Webber Wildlife Preserve and the Dellovo and Vanderhoof conservation areas in Bedford, as well as provide access to open space parcels in Concord. The trails allow community members to enjoy their natural surroundings and take advantage of Massport conservation efforts. Massport supports community gardening initiatives through its lease of MPA property to Gaining Ground, a nonprofit organic farm that grows and donates fresh produce to support regional meal programs and food pantries. Massport also worked closely with the National Park Service to complete a noise abatement program.[316]

In addition, Massport continues to update its Vegetation Management Plan (VMP) in accordance with Massachusetts vegetation removal guidelines and in conjunction with the conservation commissions of the four surrounding towns. This plan ensures that vegetation that grows into Hanscom Field airspace is managed in an environmentally sensitive manner. Historically, a vegetation removal project has been required every 5 years at Hanscom Field. Preparation for the 2019–2023 VMP Update began in 2017 and development, as well as aerial mapping continued throughout 2018. Massport received Orders of Conditions for vegetation removal in 2020, and work continues as prescribed in the 2019–2023 VMP Update to include vegetative restoration efforts in cooperation with the towns[317].

Tenants at Hanscom Field report a variety of social sustainability initiatives for the community and their employees. Examples of tenant initiatives include community wellness and recognition incentives, volunteer days, and donation of excess furniture and office supplies to a furniture trust that repurposes the products in the community or local schools.

[316] Hanscom Field Noise Abatement. https://www.massport.com/hanscom-field/about-hanscom/noise-abatement/
[317] Massacusetts Port Authority. The State of Hanscom. July 2022. https://www.massport.com/media/khjo0oua/2021-state-of-hanscom.pdf

11.4 Regulations, Monitoring, and Reporting

Massport complies with all federal and state environmental regulations that are applicable at Hanscom Field. Compliance with federal and state regulations is handled through monitoring and reporting initiatives as described in this section. Massport has voluntarily adopted several proactive policies and programs to assist in monitoring environmental performance and to identify opportunities to improve Massport's environmental programs.

Massport looks to guidance from the Commonwealth of Massachusetts concerning various sustainability, energy, and climate adaptation and resilience topics, in addition to complying with all mandatory regulations.

Reporting

Hanscom Field ESPRs identify current conditions and activity at the Airport, compare historical data, and evaluate potential cumulative environmental effects. ESPRs serve as planning tools for future development. This *2022 ESPR* follows the *2017 ESPR* that was published and approved by the Massachusetts Environmental Policy Act Office in 2019.

Since the development of its SMP in 2015, Massport voluntarily publishes Sustainability and Resiliency Reports that describe sustainability and resiliency initiatives and accomplishments at all their facilities, including projects implemented at Hanscom Field. Since 2017, Massport published Sustainability and Resiliency Reports in 2018, 2019, and 2020–2021[318], sharing progress towards their sustainability and resiliency goals.

Massport prepares a noise report for Hanscom Field annually[319]. The noise report is used to report on aircraft activity and the noise environment at the Airport. Additionally, Massport prepares annual *State of Hanscom*[320] reports that are presented to the HFAC, a legislatively created body comprised of representatives from the surrounding residential areas, organizations, and members of the aviation community. The presentation to the HFAC provides stakeholders with an opportunity to discuss the

Non-mandatory state-level guidance that Massport considers:

- Executive Order 385 Planning for Growth (1996)
- Executive Order 438 State Sustainability Program (2002)
- Global Warming Solutions Act (2008)
- Executive Order 569 Establishing an Integrated Climate Change Strategy for the Commonwealth (2016)
- State Hazard Mitigation and Climate Adaptation Plan (2018)
- Massachusetts Comprehensive Energy Plan (2018)
- Choices for Stewardship: Recommendations to Meet the Transportation Future (2018)
- Executive Order 594 Leading By Example: Decarbonizing and Minimizing Environmental Impacts of State Government (2021)
- Massachusetts Clean Energy and Climate Plan for 2025 and 2030 (2022)
- Statewide Resilience Master Plan

[318] Massport 2020-2021 Sustainability & Resiliency Report, https://www.massport.com/media/bo4gmdk0/2020-2021-sustainability-and-resiliency-report-web.pdf
[319] Hanscom Field 2022 Annual Noise Report, https://www.massport.com/media/hlinbpcu/2022-annual-noise-report.pdf
[320] The State of Hanscom, March 2023, https://www.massport.com/media/bmxfopij/2022-state-of-hanscom.pdf

role of Hanscom Field in the regional transportation system and Massport's objectives for the Airport, including environmental and sustainability activities.

Air Quality

The Federal Clean Air Act (CAA) requires that states meet and maintain National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter ≤10 microns (PM_{10}) and ≤ 2.5 microns ($PM_{2.5}$), lead (Pb), and nitrogen dioxide (NO_2). The U.S. Environmental Protection Agency (EPA) sets NAAQS at levels intended to protect public health and the environment. The Massachusetts Department of Environmental Protection (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. The Greater Boston area, including the Hanscom Field communities, is currently in attainment with all Massachusetts and NAAQS. Refer to Chapter 8 for further information regarding air quality terminology, standards, and conditions.

Water Quality

The Federal Clean Water Act requires permits for pollutant discharges into United States waters from a point source and for stormwater discharges associated with industrial activities. Permits are issued under the EPA's National Pollutant Discharge Elimination System (NPDES) Program. Presently, Massport complies with the NPDES Multi-Sector General Permit for stormwater discharges at industrial sites, including Hanscom. Massport requires that all development and facility operations conform to the requirements of the 2021 NPDES Multi-Sector General Permit. All activities are also required to meet applicable standards for stormwater management required for site development or redevelopment by MassDEP.

Massport collaborates with MassDEP and the USAF to take actions to reduce impacts of Hanscom Field activities on the Shawsheen River Watershed. Cooperatively, the agencies have assessed current impacts of stormwater through modeling of discharges in the drainage area. Massport continues to evaluate stormwater controls and best management practices (BMPs) for reducing peak runoff rates and increasing stormwater infiltration.

A major component of Massport's water pollution prevention program is the development and implementation of a comprehensive SWPPP. Massport originally published its most recent SWPPP for Hanscom Field in October 2015, published a revised SWPPP in January 2023, and certified it on January 30, 2023. As described in the plan, 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 education and implementation of pollution source reduction techniques, and improved handling practices. BMPs for stormwater control include preventative maintenance, material compatibility and system inventory, spill prevention and response, and employee training.

Refer to Chapter 9 for further information regarding water quality. Massport will continue to reduce or eliminate potential water quality impacts from Hanscom Field in the future by:

- Tracking the progress of the Installation Restoration Program (for environmental cleanup) and the USAF's progress toward site closure as described in Chapter 9.

- Performing regular visual inspections of water quality at Hanscom Field stormwater outfalls in accordance with its SWPPP and the NPDES permit.
- Enforcing MassDEP's policy requiring that stormwater runoff for new projects does not increase peak runoff rates.
- Implementing Hanscom Field's SPCC Plan to ensure that all Massport-operated storage tanks comply 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.
- Requiring that tenants conduct annual environmental audits to document compliance with tank regulations.
- 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.
- Providing annual spill, stormwater, and hazardous waste management training for Massport employees.
- Directing new development to areas with existing impervious surfaces and stormwater infrastructure.
- Identifying and removing existing impervious surfaces where feasible to increase infiltration.
- Installing weirs to reduce peak flows.
- Placing floating booms at outfalls.

Hazardous Materials/Toxics

Hanscom Field is a Very Small Quantity Generator (less than 220 pounds per month) of Resource Conservation and Recovery Act (RCRA)-regulated hazardous waste and a Small Quantity Generator (less than 2,200 pounds per month) of Massachusetts-regulated hazardous waste.[321] Massport is committed to reducing the potential for the discharge and release of toxic materials, and pollution prevention is part of Massport's SWPPP. Less toxic and nontoxic alternatives are evaluated and implemented where applicable. Massport and its tenants also adhere to SPCC plans, ensuring that hazardous materials storage tanks comply with regulations and are monitored to maintain compliance.

Starting in 2016, Massport has conducted a comprehensive annual audit to inventory chemicals in use and storage at Hanscom Field. In addition, improved tracking methods were employed to identify opportunities for reducing and eliminating the amount of hazardous material on site. Massport initiated improved housekeeping strategies to consistently label and store hazardous chemicals or waste and plans to further improve purchasing practices to eliminate duplicative product purchases. Reduction of toxic materials onsite means that less hazardous waste is produced, thereby minimizing impacts to the environment and costs associated with waste disposal. In keeping with this goal, potential sources of spills or contamination are also carefully managed.

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, providing ongoing technical assistance to tenants regarding

[321] Massachusetts Department of Environmental Protection. 2023. *Hazardous Waste Generation & Generators* and *List of Massachusetts Hazardous Waste Generators.* https://www.mass.gov/guides/hazardous-waste-generation-generators

new regulations. Massport's Environmental Management Unit conducts an annual training and review program for employees. Educational materials, such as notices of upcoming regulatory requirements, are distributed on pollution prevention, stormwater best management practices, spill prevention and response procedures, and other topics.

11.5 Environmentally Beneficial Measures

Previous chapters of this *2022 ESPR* have assessed the environmental impacts of Hanscom Field operations for the baseline year of 2022, analyzed historic environmental trends using information from past reports, and considered the potential future effects of operations and development scenarios for future years 2030 and 2040. The *2022 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.

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 2030 and 2040 scenarios represent estimates of what could occur in the future, using certain planning assumptions, and are not considered recommended outcomes. This section summarizes the environmentally beneficial actions described in previous chapters that are in place at Hanscom Field, as well as additional measures that could be considered to avoid or minimize potential environmental effects in the future.

Table 11-6 lists environmentally beneficial measures currently in place at Hanscom Field, along with the responsible parties, implementation schedule, and the estimated cost (where applicable and data is available) for each measure.

Table 11-6. Summary of Existing and Potential Future Environmentally Beneficial Measures

Measure Detail	Responsible Party	Timetable	Cost to Implement (Estimate)
Ground Transportation			
Transportation information on Massport website.	Massport	Complete	N/A [1]
Transit information in Hanscom Field Terminal.	Massport	Ongoing	Low cost [2]
Information about transit and non-auto travel options in prominent locations throughout Hanscom Field.	Massport	Complete	N/A
Bus stop with transit information.	Massport	Complete	N/A
Noise			
Modifications to the Fly Friendly Program using the flight tracking software to direct pilots conducting touch-and-go procedures to fly over the Airport instead of neighboring lands or MMNHP, when possible.	Massport	Complete	N/A

Measure Detail	Responsible Party	Timetable	Cost to Implement (Estimate)
Continued implementation of the Fly Friendly Program.	Massport	Ongoing	Low cost
General Rules and Regulations for Laurence G. Hanscom Field, in place since 1980, which was designed to address noise issues. The rules for Hanscom included phasing out the use of most Stage 1 aircraft, limiting touch-and-go operations to aircraft under 12,500 pounds, limiting touch-and-go activity to the hours of 7 a.m. to 11 p.m., limiting scheduled air carrier passenger service to aircraft with no more than 60 seats, and establishing the nighttime field use fee.	Massport	Ongoing	Low Cost
Run-up procedures for use of the East Ramp	Massport	Ongoing	N/A
Updates to the Noise and Operations Monitoring System. Massport maintains six noise monitors at Hanscom, including four in communities off of each runway end and two on the airfield.	Massport	Ongoing	High cost[4]
Maintaining the interactive online "Airport Activity Monitor", which has been in use since 2016 and allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance.	Massport	Ongoing	High cost
Air Quality			
Continued encouragement of tenants to consider the purchase of alternatively fueled ground service equipment, where appropriate.	Massport	Ongoing	Low cost
Encouragement of Fixed Base Operators to minimize Auxiliary Power Unit/Ground Power Unit use.	Massport	Ongoing	Low cost
Use of Ultra Low Sulfur Diesel in Massport fleet vehicles.	Massport	Ongoing	Low cost
Installation of a paved aircraft holding area at the head of Runway 23 to reduce minor aircraft delays and associated emissions from engine idling.	Massport	Complete	N/A
Continued consideration of Alternative Fuel Vehicles for any new Massport vehicle purchase.	Massport	Ongoing	Cost depends on numbers and types of vehicles

Measure Detail	Responsible Party	Timetable	Cost to Implement (Estimate)
Support industry transition to Sustainable Aviation Fuel (SAF) and unleaded avgas as availability increases.	Massport	Ongoing	Low Cost
Water Quality			
Support for Shawsheen Watershed Initiative to improve water quality and quantity flow in the Shawsheen River and its tributaries.	Massport working with MassDEP, USEPA, and Hanscom AFB	Ongoing	Moderate cost
Continuation of MassDEP Best Management Practices	Massport	Ongoing	Moderate cost
Continue to support Air Force or other remediation efforts.	Massport	Ongoing	Low cost
Continue water quality sampling in accordance with NPDES and MassDEP permit programs.	Massport	Ongoing	Moderate cost
Continue to balance new impervious surfaces with pavement removals where feasible.	Massport	Ongoing	Moderate cost
Wetlands			
Continue to minimize wetland impacts where new infrastructure is proposed.	Massport	Ongoing	Moderate cost
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, the Upland Sandpiper and the Grasshopper Sparrow.	Massport	Ongoing	Low cost
Continue implementation of all aspects of Wildlife Hazard Management Plan.	Massport	Ongoing	Moderate cost
Cultural And Historic Resources			
Refer to the compilation of National and State registers-listed resources, current MHC Inventory and MACRIS resources, and reconnaissance survey update results when planning specific project actions at Hanscom and completing state and federal regulatory review processes through MHC.	Massport	Ongoing	Moderate cost
Review information on cultural resources at traffic study intersections when physical changes are planned. Conduct additional investigations if needed, Consider avoidance or protection of any archaeological sites or sensitive areas.	Massport	Ongoing	Moderate cost

Measure Detail	Responsible Party	Timetable	Cost to Implement (Estimate)
Continue to use operational noise mitigation strategies to minimize noise at MMNHP and coordinate with the NPS.	Massport	Ongoing	Low cost
Sustainable Development			
Implementation of *Roadmap to Net Zero.*	Massport	Ongoing	Moderate to high cost
Notes: 1. N/A- Not Applicable 2. Low-cost measures < $5,000 3. Moderate cost measures: $5,000 - $50,000 4. High-cost measures: >$50,000			

11.5.1 Noise Abatement

Massport has a long history of noise abatement commitments at Hanscom Field (as described in more detail in Chapter 7), which are based on the 1978 Master Plan and 1980 noise regulations. Part F of the General Rules and Regulations for Hanscom Field 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 operations to discourage nighttime operations. The fee doubles for aircraft that conduct more than five nighttime operations in a calendar year. This nighttime field use fee applies to all aircraft. These restrictions and fees predate the Airport Noise and Capacity Act (ANCA) and are grandfathered in for Hanscom Field. Massport implements the Fly Friendly Program, which includes encouraging operators to use noise abatement procedures.

The Hanscom Field Noise Workgroup developed a number of recommendations which guided prior noise abatement efforts at Hanscom Field). Almost all of the feasible recommendations have been implemented and were reported on in the *2012 ESPR*.

Massport continues to enforce 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 5/23 during the day. There is a short "blast fence" on the east side of the pad, which deflects jet exhaust, prop wash, and debris. Massport also encourages Fixed Base Operators (FBOs) to minimize the use of APUs and GPUs to minimize noise.

Massport has also worked cooperatively with the local community, aviation groups and the MMNHP to implement a comprehensive noise abatement program known as "Fly Friendly," guided by the NBAA’s published noise abatement guidelines and the 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. Massport requires all based pilots to watch the Massport recommended Fly Friendly procedures video when getting and 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 (currently Stage 5). 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. Today, Stage 3 and Stage 4 aircraft are still allowed to operate in the US, but all newly certificated aircraft must meet Stage 5 standards which are cumulatively 17 dB quieter than the older Stage 3 aircraft.

Massport supports the Massport Community Advisory Committee (CAC)[322]. The Massport CAC is a state-legislated body that works with Massport on a range of Authority-wide topics, including environmental issues. Representatives from Hanscom Area towns participate on the Massport CAC.

Massport also launched the interactive online "Airport Activity Monitor" in 2016 which allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance. The Airport Activity Monitor is continuously updated.

11.5.2 Ground Transportation

Measures to address ground transportation considerations in the 2030 and 2040 scenarios focus on traffic management and TDM approaches, as well as planning efforts to facilitate the development of non-auto modes of travel in the area.

Hanscom Field contributes a small percentage of traffic to Route 2A traffic volumes, just east of Hanscom Drive. The 2022 peak hour volumes represent a slight decrease compared to the 2017 volumes reported in the 2017 ESPR.

Massport will continue to assess other potential TDM measures (as described in more detail in Chapter 6), such as promotion of ridesharing and enhancing transit connections that may be appropriate for Hanscom Field. These would also include measures such as updates to Massport's website and other mechanisms to distribute information regarding transportation.

11.6 Environmental Justice

The Massachusetts EEA most recently updated its Environmental Justice (EJ) Policy in June 2021.[323] The MEPA Office has implemented new requirements for project filings to address EJ as set forth in Massachusetts state legislation, *An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy*[324] (the "Climate Roadmap Act" or "the Act") and the 2021 EEA EJ Policy. The new requirements are set forth in two protocols related to public involvement[325] and analysis of project

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[322] Further information about the Massport CAC can be found at http://massportcac.org/

[323] Massachusetts EEA. 2021. *Environmental Justic Policy of the Executive Office of Energy and Environmental Affairs*. https://www.mass.gov/doc/environmental-justice-policy6242021-update/download

[324] Commonwealth of Massachusetts. 2021. Chapter 8. https://malegislature.gov/Laws/SessionLaws/Acts/2021/Chapter8

[325] *MEPA Public Involvement Protocol for Environmental Justice Populations*. 2022. https://www.mass.gov/doc/final-mepa-public-involvement-protocol-for-environmental-justice-populations-effective-date-of-january-1-2022/download

impacts on environmental justice populations.[326] The 2021 Climate Roadmap Act is based on Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* which directs federal agencies to focus on the environmental and human health effects of federal actions on minority and low-income populations.[327]

Massport will comply with the amended regulations and protocols for individual projects at Hanscom Field filed with MEPA. While Hanscom's ESPR is not subject to these new regulations and protocols, as they are not projects that require ENFs or EENFs, the ESPR meets the spirit of the 2021 EJ Policy and 2022 EJ Protocols, and as such, Massport has incorporated these new protocols in this ESPR and will incorporate them in future ESPRs.

The Climate Roadmap Act defines an EJ population as "a neighborhood that meets 1 or more of the following criteria: (i) the annual median household income is not more than 65 per cent of the statewide annual median household income; (ii) minorities comprise 40 per cent or more of the population; (iii) 25 per cent or more of households lack English language proficiency; or (iv) minorities comprise 25 per cent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 per cent of the statewide annual median household income..." According to the EEA EJ Policy, the term minority "refers to individuals who identify themselves Latino/Hispanic, Black/African American, Asian, Indigenous people, and people who otherwise identify as non-white."

The Climate Roadmap Act defines neighborhood as "a census block group as defined by the United States Census Bureau, excluding people who live in college dormitories and people who are under formally authorized, supervised care or custody, including federal, state or county prisons." According to the Climate Roadmap Act, designated geographic area (DGA) "shall mean an environmental justice population located within a distance of 1 mile of a project, unless the project affects air quality then the distance from such project shall be increased to within 5 miles of an environmental justice population."

This section first defines the EJ study area for Hanscom Field, then identifies vulnerable health criteria, potential sources of pollution, and other environmental indicators for each neighborhood.

11.6.1 EJ Study Area

The EJ study area, or DGA, represents EJ populations within a one-mile radius of the airport. It was determined using the EEA Environmental Justice Maps Viewer Tool.[328] The EEA tool is based on 2020 U.S. Census Bureau data released in October 2021 and March 2022, and was updated on November 12, 2022.[329] To determine the project's EJ study area, a one-mile buffer was drawn from the Hanscom Field property boundary. The property boundary does not include Hanscom Air

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326 *MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice Populations*. 2022. https://www.mass.gov/doc/final-mepa-interim-protocol-for-analysis-of-project-impacts-on-environmental-justice-populations-effective-date-of-january-1-2022/download

327 Federal Register, Vol. 59, No. 32. 1994. https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf

328 Massachusetts EOEEA. https://mass-eoeea.maps.arcgis.com/apps/webappviewer/index.html?id=1d6f63e7762a48e5930de84ed4849212

329 Massachusetts EOEEA. https://mass-eoeea.maps.arcgis.com/apps/MapSeries/index.html?appid=535e4419dc0545be980545a0eeaf9b53

Force Base. Using this methodology, the study area for the 2022 ESPR EJ analysis was defined as the area shown in **Figure 11-7**.

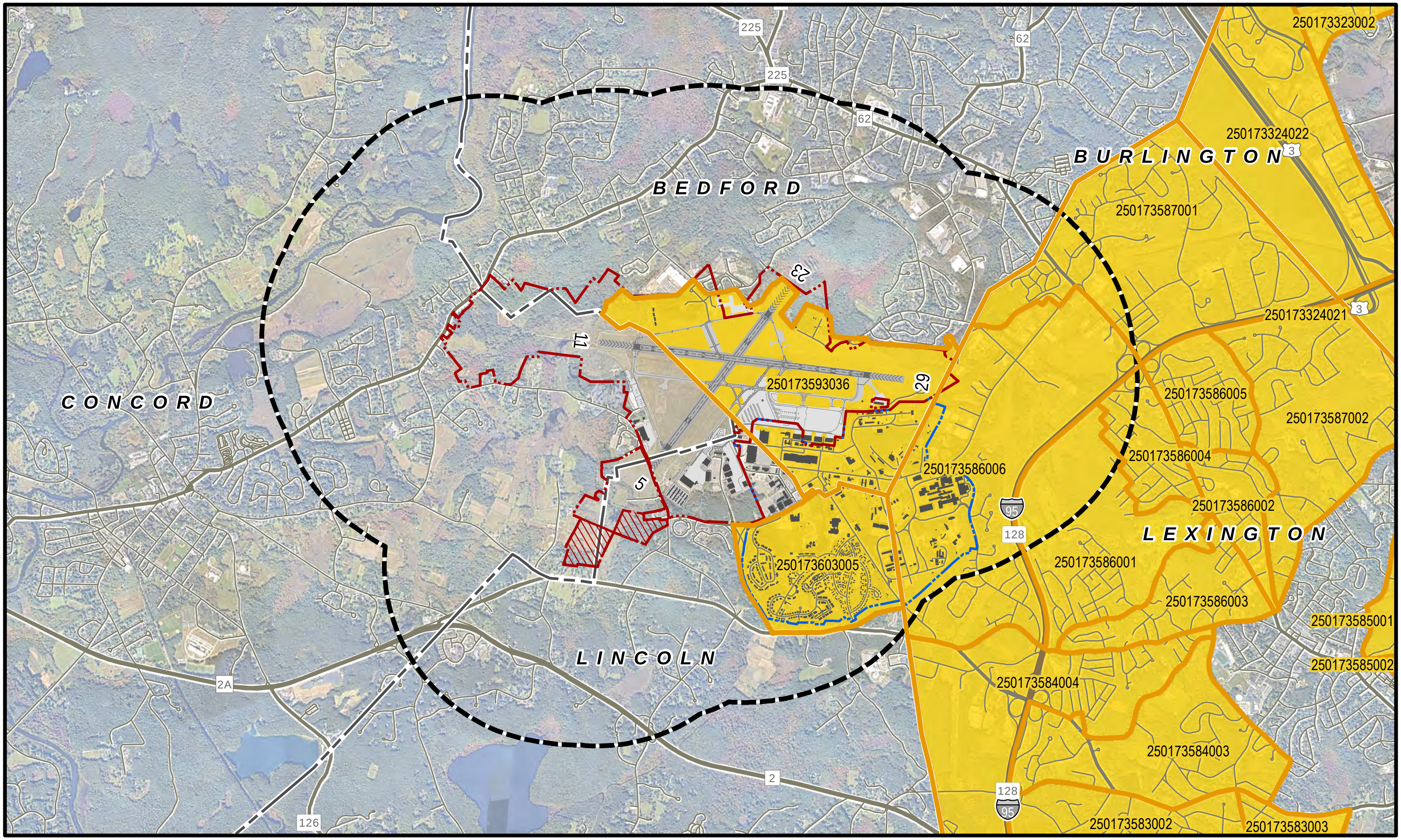
There are six census block groups that meet the EJ criteria defining the neighborhoods as "minority" within the EJ study area, indicating that minorities comprise 40 percent or more of the population. Race is self-identified by respondents to the U.S. Census.[330] There are no census block groups that meet other EJ criteria as defined by the Act within the study area. The identified block groups (or neighborhoods) are shown in **Table 11-7** below. The six census block groups are located in the towns of Lexington, Lincoln, and Bedford. Figure 11-7 shows the location of the census tracts on the map that meet the EJ criteria defining the neighborhood as "minority", including their 12-digit census block code for identification purposes. The first two digits represent the state of Massachusetts (25), the following three digits represent the county of Middlesex (017), the following four digits represent the census tracts, and the final three digits represent the block group.

Table 11-7. EJ Census Block Groups within 1 mile of Hanscom Field

Census Block Group	Census Tract	County	City	Total Population	Total % Minority	Median Household Income ($)	EJ Criteria Description
1	3586	Middlesex	Lexington	1,289	41.3	159,422	Minority
4	3586	Middlesex	Lexington	983	46.7	157,212	Minority
6	3586	Middlesex	Lexington	884	53.8	129,388	Minority
1	3587	Middlesex	Lexington	2,361	54.0	168,882	Minority
6	3593.03[1]	Middlesex	Bedford	103	62.1	216,346	Minority
5	3603	Middlesex	Lincoln	1,449	41.5	107,656	Minority

Notes: "Census tracts within a county are identified by a 4-digit basic code between 0001 and 9999 and may have a 2-digit suffix ranging from .01 to .98; for example, 6059.02. The decimal point separating the 4-digit basic tract code from the 2-digit suffix is shown in U.S. Census Bureau printed reports and maps. However, in computer-readable files prepared by the Census Bureau and for files uploaded for FCC Form 477, the decimal point is implied and does not appear." Source: https://transition.fcc.gov/form477/Geo/more_about_census_tracts.pdf
Source: MA EEA EJ Maps Viewer

[330] Massachusetts EEA. Environmental Justice Maps Update 2022. Frequently Asked Questions. https://www.mass.gov/doc/environmental-justice-maps-update-2022-frequently-asked-questions/download



North

0 2,000 4,000 Feet

Environmental Justice Study Area

EJ Block Group in which the Minority Population is >=40%

Hanscom Field Property Boundary

Massport Property within MMNHP Congressional Boundary

Hanscom AFB Property Boundary

Municipal Boundary

Interstate

Highway

Road

Data Sources: These data were obtained from https://www.mass.gov/info-details/massgis-data-2020-environmental-justice-populations; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) October 2, 2023

massport

L. G. Hanscom Field

2022 Environmental Status & Planning Report

Environmental Justice Study Area

Figure 11-7

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11.6.2 Massachusetts Department of Public Health Vulnerable Health Criteria

The Massachusetts Department of Public Health (DPH) EJ Tool[331] was used to determine if any of the identified EJ block groups exhibit vulnerable health criteria. Four vulnerable health criteria are tracked in the DPH EJ viewer:

- Heart Attack Hospitalization
- Childhood Lead Exposure
- Low Birth Weight
- Childhood Asthma Emergency Department Visits

The heart attack hospitalization and childhood asthma criterion are only available at the community level, while childhood lead exposure and low birth weight are available at the census tract levels. For all three communities, Bedford, Lincoln, and Lexington, the community rate for each of the vulnerable health criteria was less than the MEPA threshold, which is 110 percent of the statewide rate. This implies that the communities within the EJ study area do not meet the vulnerable health EJ criteria based on DPH data.

11.6.3 DPH EJ Tool "Other Polluting Sources"

The DPH EJ tool was used to identify other potential sources of pollution within the EJ study area that may pose a health risk to the public. Pollution sources that are identified in the DPH EJ tool include hazardous waste generators and storage sites, Superfund sites, and underground storage tanks. **Table 11-8** summarizes the number of these sources within the EJ study area and the number that are located within the identified EJ census block groups that fall within the EJ study area.

Table 11-8. Other Polluting Sources Identified by DPH EJ Tool

Polluting Source	Definition*	Number of Sources Within Study Area	Number of Sources in Identified Block Groups
Facilities with Air Operating Permits	Any facility that is a major source of air pollution, has the potential to emit above certain thresholds, or falls into a specific category needs an Operating Permit, which consolidates all air pollution control requirements into one enforceable document[1].	1	1
Large Quantity Generators of Hazardous Waste	Any facility that generates more than 1,000 kg of hazardous waste OR more than 1 kg of acute hazardous waste in a calendar month[2].	10	3
Large Quantity Users of Toxics	Any facility that is subject to the Toxic Use Reduction Act (TURA) reporting requirements[3] as a large quantity toxics user.	5	1

[331] Massachusetts EOHHS. "Environmental Public Health Tracking." https://matracking.ehs.state.ma.us/Environmental-Data/ej-vulnerable-health/environmental-justice.html

Polluting Source	Definition*	Number of Sources Within Study Area	Number of Sources in Identified Block Groups
Hazardous Waste Treatment, Storage/Disposal	Any facility that engages in the treatment, storage and/or disposal of hazardous wastes[4].	0	0
Hazardous Waste Recycler	Any facility that engages in the recycling of hazardous wastes[4].	0	0
MassDEP Tier Classified 21E Sites	Oil and/or hazardous material disposal sites that have been (1) reported and (2) Tier Classified under Massachusetts General Law Chapter 21E and the Massachusetts Contingency Plan (MCP)[5].	10	3
Massachusetts Tier II Facilities	Facilities that completed a 2018 Annual Tier II Report, which includes the locations and amounts of hazardous chemicals present in the calendar year. Submission of Tier II forms is required under EPA's Emergency Planning and Community Right-to-Know Act of 1986.[6]	24	5
MassDEP Sites with Activity and Use Limitations (AUL)	Oil or hazardous material release or disposal sites where an Activity and Use Limitation (AUL) has been filed.[4]	7	2
Underground Storage Tanks	A facility having one or more underground storage tank containing petroleum or hazardous substances.[7]	19	5
Superfund Sites	Polluted locations in the United States requiring long-term clean up under the EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).[8]	4	3
Toxic Release (since 2017)	Any facility that has released and/or managed one or many Toxic Release Inventory (TRI) chemical(s) as defined by the EPA since 2017.[9]	2	0

Source: MA DPH EJ Tool, Accessed 07/01/23
1. https://www.mass.gov/guides/massdep-operating-permit-compliance-program#:~:text=Any%20facility%20that%20is%20a%20major%20source%20of,pollution%20control%20requirements%20into%20a%20single%20enforceable%20permit.
2. https://www.epa.gov/hwgenerators/categories-hazardous-waste-generators#large
3. https://www.mass.gov/guides/massdep-toxics-use-reduction-program
4. https://matracking.ehs.state.ma.us/Glossary/map-layers-glossary.html?_gl=1*p12myx*_ga*MjA4ODU0NTg2NS4xNjczNTQ4NTQz*_ga_62P454925S*MTY5MTY5MzgxMS4yMi4xLjE2OTE2OTM4MTIuMC4wLjA.
5. https://www.mass.gov/info-details/massgis-data-massdep-tier-classified-oil-andor-hazardous-material-sites-mgl-c-21e
6. https://www.epa.gov/epcra/tier-ii-forms-and-instructions
7. https://www.epa.gov/ust/learn-about-underground-storage-tanks-usts
8. https://www.epa.gov/superfund/what-superfund
9. https://www.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools#tritools

11.6.4 EPA EJ Screen Environmental Indicators

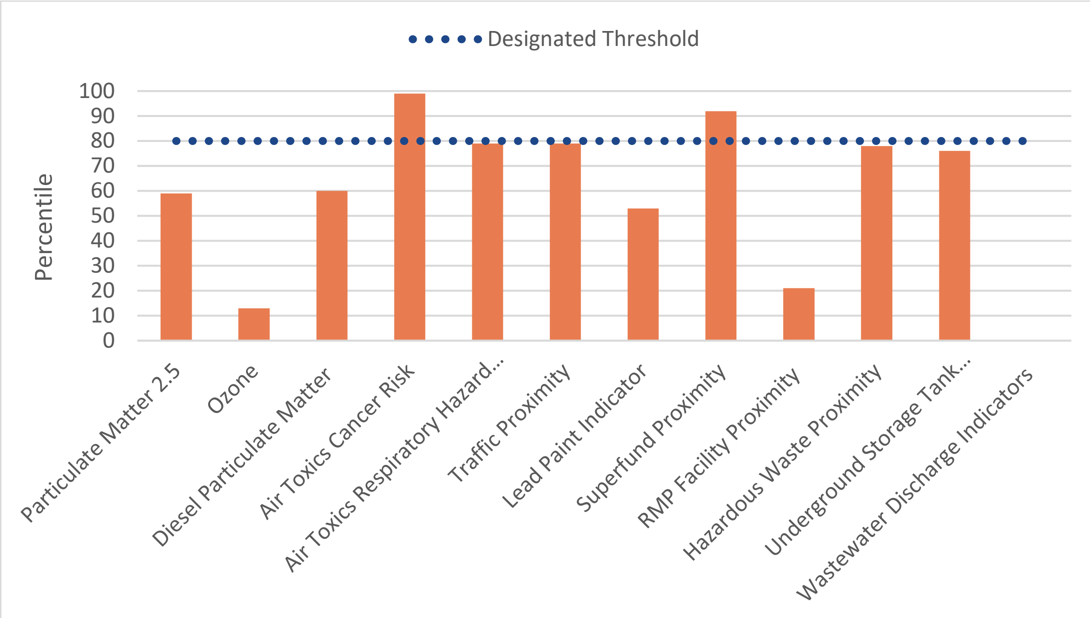
The EPA's EJScreen was utilized to evaluate twelve additional environmental indicators within the EJ study area to determine whether any environmental indicators fell at or above the 80th percentile by census block group as compared to the statewide average, as specified in the Scope Certificate. Percentiles allow comparison of local residents (census block groups) to all residents of the state of Massachusetts. **Figure 11-8** through **Figure 11-13** summarize the twelve environmental indicators for each identified EJ census block. **Figure 11-14** combines the data from the preceding individual census block figures. The following environmental indicators[332] were determined to be at or above the 80th percentile in multiple of the identified EJ census block groups within the EJ study area, as shown on **Figure 11-14**:

- Air Toxics Cancer Risk: Estimated lifetime cancer risk[333] from inhalation of air toxins or carcinogens in ambient outdoor air, as risk per lifetime per million people.
- Superfund Proximity: Total count of sites proposed and listed on the National Priorities List (NPL) in each block group within 5 km of the average resident in a block group, divided by distance.
- Traffic Proximity: Count of vehicles per day (average annual daily traffic) at major roads within 500 meters divided by distance in meters from the Census block centroid.
- Hazardous Waste Proximity: Total count of hazardous waste facilities including both hazardous waste treatment, storage, and disposal facilities and large quantity generators (LQGs) of hazardous waste in each block group within 5 km of the average resident in a block group, divided by distance.

For each identified block group, if the environmental indicator is at or above the 80th percentile, it means that the block group experiences equal or higher potential for exposure, risk, and/or proximity to certain facilities than do 80 percent of the residents of the state of Massachusetts. For example, the "Air Toxics Cancer Risk" indicator for Block Group 1, Tract 3586 in Lexington is at the 99th percentile in the state, as shown in **Figure 11-8**. This means that the block group experiences an air toxics cancer risk equal to or higher than 99 percent of residents in the state, as measured in lifetime risk per million residents.

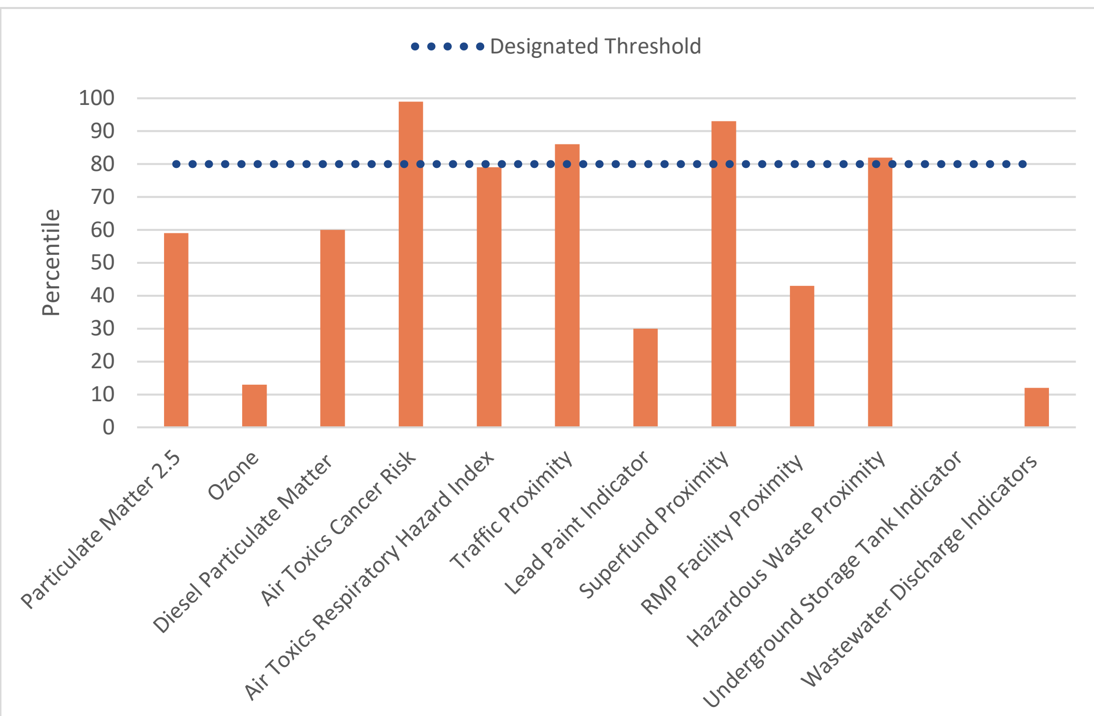
[332] EPA. "EJScreen Map Descriptions". https://www.epa.gov/ejscreen/ejscreen-map-descriptions
[333] EPA. "AirToxScreen Frequent Questions". https://www.epa.gov/AirToxScreen/airtoxscreen-frequent-questions#emm10

Figure 11-8. Environmental Indicators for Block Group 1, Tract 3586, Lexington



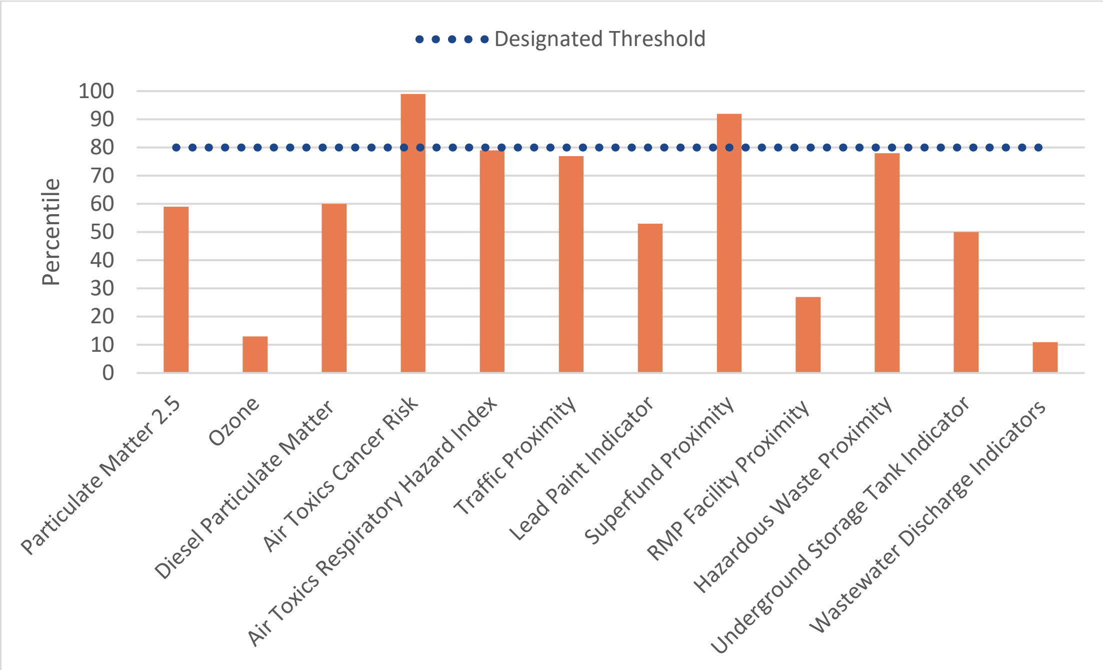
Source: EPA EJScreen: https://ejscreen.epa.gov/mapper/

Figure 11-9. Environmental Indicators for Block Group 1, Tract 3587, Lexington



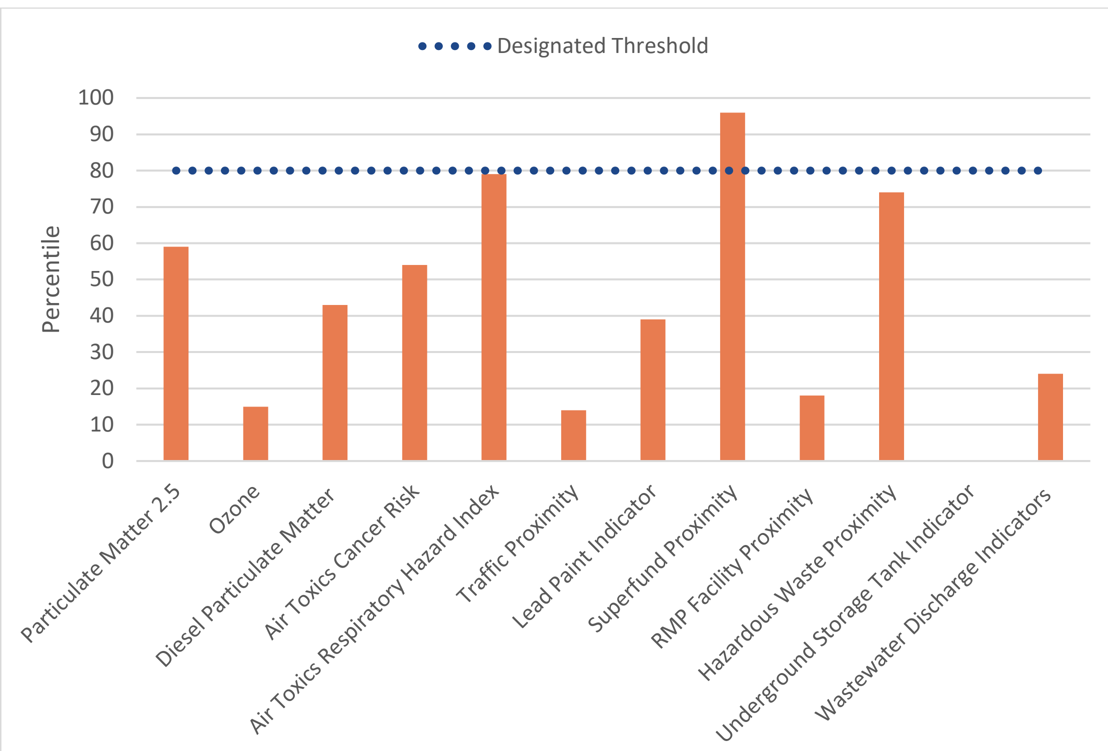
Source: EPA EJScreen: https://ejscreen.epa.gov/mapper/

Figure 11-10. Environmental Indicators for Block Group 4, Tract 3586, Lexington



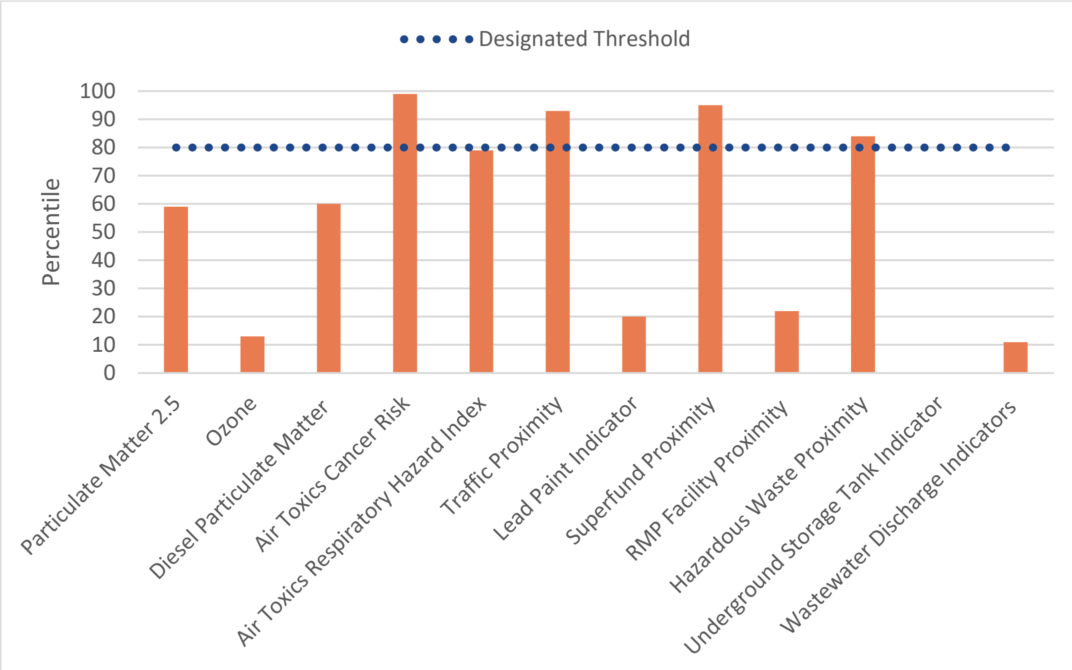
Source: EPA EJScreen: https://ejscreen.epa.gov/mapper/

Figure 11-11. Environmental Indicators for Block Group 5, Tract 3603, Lincoln



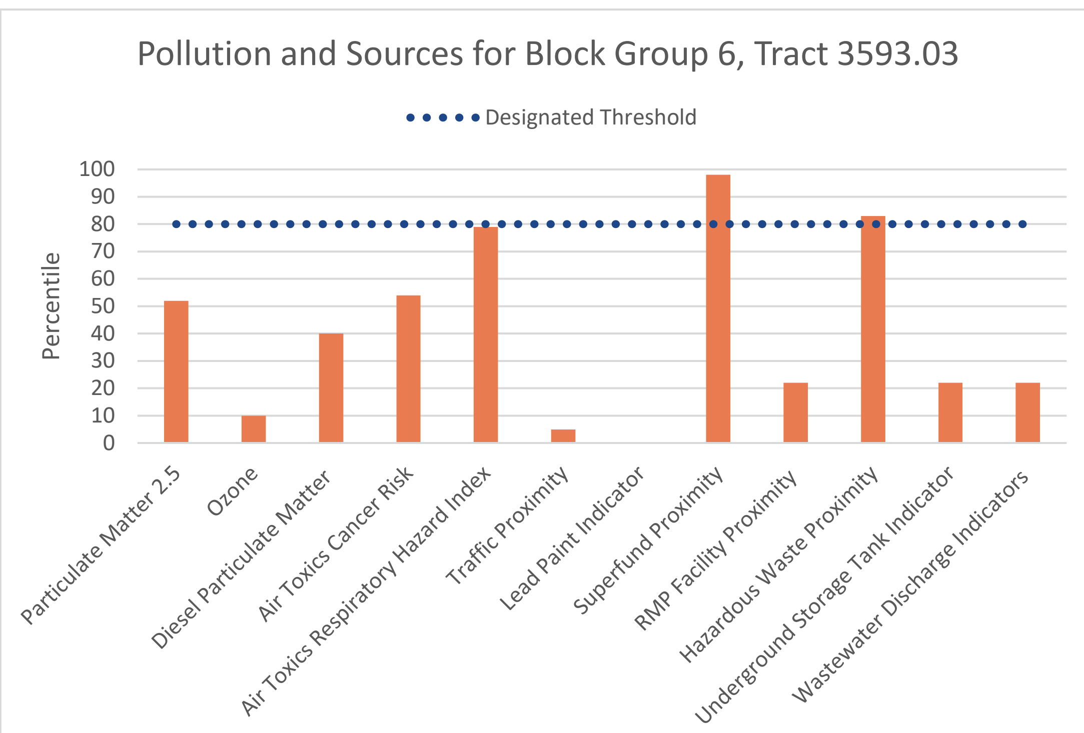
Source: EPA EJScreen: https://ejscreen.epa.gov/mapper/

Figure 11-12. Environmental Indicators for Block Group 6, Tract 3586, Lexington



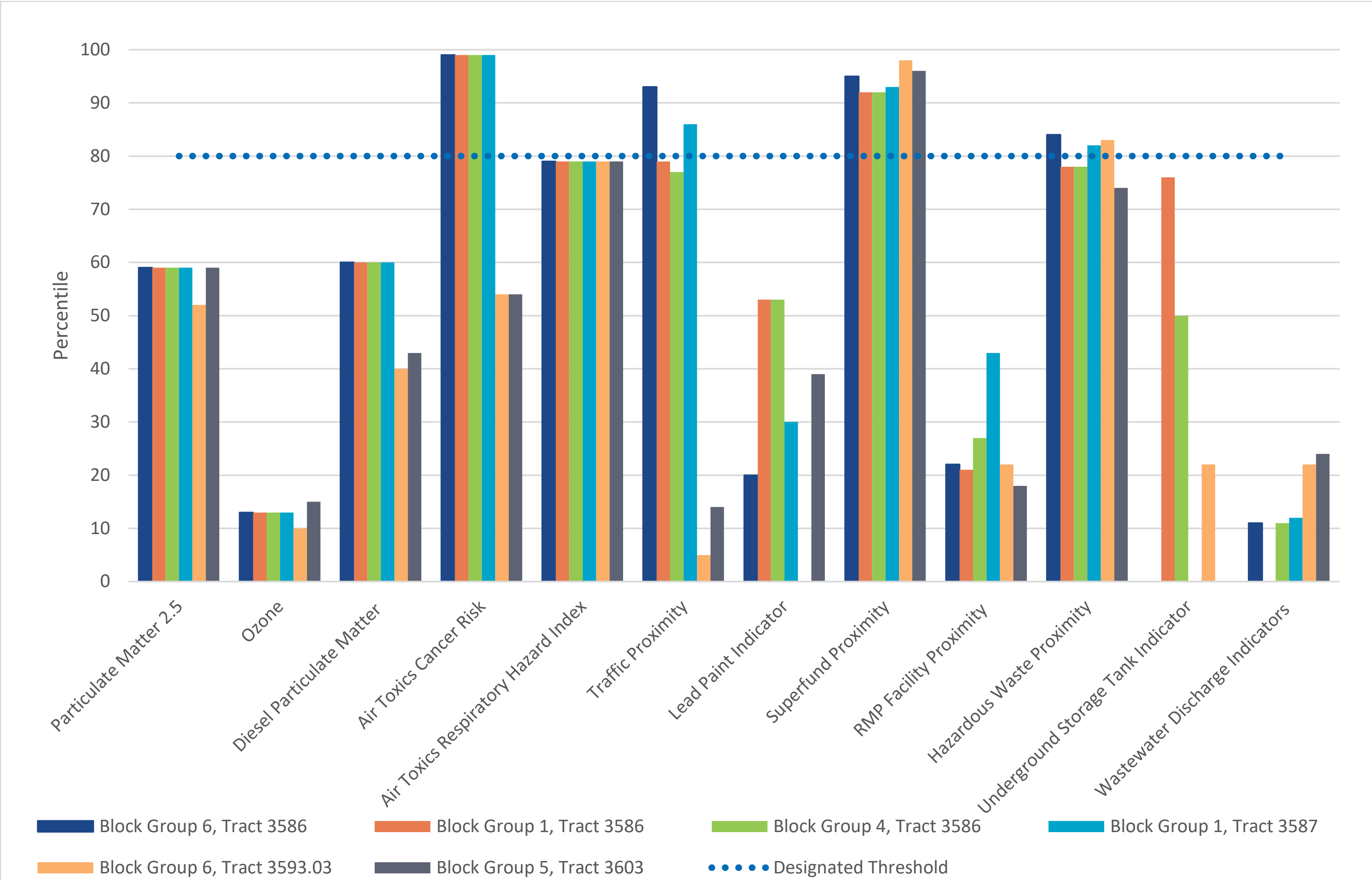
Source: EPA EJScreen: https://ejscreen.epa.gov/mapper/

Figure 11-13. Environmental Indicators for Block Group 6, Tract 3593.03, Bedford



Source: EPA EJScreen: https://ejscreen.epa.gov/mapper/

Figure 11-14. Environmental Indicators for EJ Census Block Groups in the EJ Study Area



Source: EPA EJScreen: https://ejscreen.epa.gov/mapper/

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11.6.5 Conclusion

EJScreen contains screening-level environmental indicators available for an identified geographical area. The data has inherent limitations and due to the nature of the data sources, it cannot be used to identify environmental impacts associated specifically with airport operations or to determine whether airport operations disproportionately affect EJ populations. Further, the ESPR is only intended to provide an overview of the operations, environment, and planning status of Hanscom Field as opposed to describing potential impacts of a specific project.

11.6.6 Public Engagement Practices

Massport's Community Relations & Government Affairs Department manages Massport's relations with community members and government officials through extensive and evolving public involvement practices that include engagement with EJ communities. The proposed ESPR scope was noticed in the *Environmental Monitor* with a 30-day public comment period. Additional public technical workshops will be held in the spring of 2024 to present an overview of the methodologies and findings of the ESPR. In addition, the ESPR document website link will be circulated to Massport's broad distribution list that includes MEPA's EJ Reference list with relevant community-based organizations and tribes/indigenous organizations.

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Acronyms and Glossary of Terms

Acronyms and Abbreviations

This is a list of acronyms and abbreviations that are found in the 2022 ESPR. The Glossary of Terms provides definitions for acronyms and abbreviations that have an asterisk (*).

A

ACAIS	Air Carrier Activity Information System
ACRP	Airport Cooperative Research Program
AC	Advisory Circular
ACI	Airports Council International
ADIP	Airport Data and Information Portal
AEDT	Aviation Environmental Design Tool
AEP	Annual Exceedance Probability
AFB*	Air Force Base
AFFF	Aqueous Film Forming Foam
AFV	Alternative Fuel Vehicle
AIP	Airport Improvement Program
ALP*	Airport Layout Plan
AMSL	Above Mean Sea Level
ANCA	Airport Noise and Capacity Act
AOG	Aircraft on Ground
AOPA	Aircraft Owners Pilot Association
APU*	Auxiliary Power Unit
AQI	Air Quality Index
ARFF	Airport Rescue and Fire Fighting
ARTS*	Automated Radar Terminal System
AST	Aboveground Storage Tanks
ASTM	American Society for Testing Materials
ATCT*	Airport Traffic Control Tower
ATR	Automatic Traffic Recorder

B

BC	Black Carbon
BCC	Bird of Conservation Concern
BDL	Bradley International Airport
BED	Hanscom Field
BGR	Bangor International Airport
BLSF*	Bordering Land Subject to Flooding
BMP	Best Management Practice
BOS	Boston Logan International Airport
BPDA	Boston Planning & Development Agency
BVW*	Bordering Vegetated Wetlands

C

C35	CONNECT NEC 2035
CAA	Clean Air Act
CAFÉ	Corporate Average Fuel Economy
CAGR	Compound Annual Growth Rate
CatEx	Categorical Exclusions
CBO	Community-Based Organization
CBP	United States Customs and Border Protection
CECP	Clean Energy and Climate Plan
CEQ	Council on Environmental Quality

CERCLA*	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CH_4	Methane
CIP	Capital Improvement Plan
CMLP	Concord Municipal Light Plant
CMR	Code of Massachusetts Regulations
CO*	Carbon monoxide
CO_2	Carbon dioxide
CONEG	Coalition of Northeastern Governors
CPI	Consumer Price Index
CTDOT	Connecticut Department of Transportation

D

DA	Drainage Area
dB*	Decibel
dBA*	A-weighted decibel
DCR	Department of Conservation
DEIR	Draft Environmental Impact Report
DEP	Department of Environmental Protection
DFE	Design Flood Elevation
DGA	Designated Geographic Area
DME	Distance Measuring Equipment
DNL*	Day-Night Sound Level
DoD	Department of Defense
DOE	Determined Eligible
DOT	Department of Transportation
DPH	Department of Public Health

E

EA*	Environmental Assessment
EAGLE	Eliminate Aviation Gasoline Lead Emissions
EDMS*	Emissions and Dispersion Modeling System
EEA	Energy and Environmental Affairs
eGSE	electric Ground Service Equipment
EIR*	Environmental Impact Report
EIS*	Environmental Impact Statement
EJ	Environmental Justice
EMAS	Engineering Materials Arresting System
ENF*	Environmental Notification Form
EONS	Economic Vitality, Operational Efficiency, Natural Resource Conservation, and Social Responsibility
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
ESG	Environmental, Social, and Governance
ESPR	Environmental Status and Planning Reports
EV	Electric Vehicle
eVTOL	Electrical Vertical Take-Off and Landing
EXP*	Total Noise Exposure

F

FAA	Federal Aviation Administration
FBO*	Fixed-Base Operator
FEMA	Federal Emergency Management Agency
FICON	Federal Interagency Committee on Noise
FIRM*	Flood Insurance Rate Map
FONSI*	Finding of No Significant Impact
FY	Fiscal Year
FYR	Fiscal Year Review

G

GA	General Aviation
GAMI	General Aviation Modifications, Inc.

GDP	Gross Domestic Product
GEIR*	Generic Environmental Impact Report
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GMNWR	Great Meadows National Wildlife Refuge
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
GPU*	Ground Power Unit
GRP	Gross Regional Product
GSA	General Services Administration
GSE*	Ground Service Equipment

H

HATS*	Hanscom Area Towns Committee
HDPUV	Heavy-Duty Pickup Trucks and Vans
HFAC*	Hanscom Field Advisory Commission
HIRL*	High Intensity Runway Lighting System
HMMH	Harris Miller Miller and Hanson Inc.
HO	Heating Oil
HOV*	High Occupancy Vehicle
HVN	Tweed New Haven Airport
HP	Horsepower

I

IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR*	Instrument Flight Rule
ILS*	Instrument Landing System
ILSF*	Isolated Land Subject to Flooding
INM*	Integrated Noise Model
IRA	Immediate Response Action
IRP*	Installation Restoration Program
ISI	Institute for Sustainable Infrastructure
ISO	International Organization for Standardization

J

JCA	Jordan Conservation Area

K

kWh	kilowatt-hours
kVA	kilovolt ampere

L

LEED*	Leadership in Energy and Environmental Design
Leq*	Equivalent Sound Level
LEV	Low Emissions Vehicle
LHD	Local Historic District
LID	Low Impact Development
LOS*	Level of Service
LRTP	Long-Range Transportation Plan
LTO*	Landing and Takeoff
LUC	Land Use Controls
LUCIP	Land Use Control Implementation Plan
LUWB*	Land under Water Bodies/ Waterways

M

M3TMA	Middlesex 3 Transportation Management Association
M.G.L.	Massachusetts General Laws
MAAQS	Massachusetts Ambient Air Quality Standards
MACRIS*	Massachusetts Cultural Resources Information System
MALSR*	Medium Intensity Approach Lighting System and Runway Alignment Indicator Lights
MAP	Million Annual Passengers

MAPC	Metropolitan Area Planning Council
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
Massport	Massachusetts Port Authority
MBTA	Massachusetts Bay Transportation Authority
MCAA	Massachusetts Clean Air Act
MC-FRM	Massachusetts Coast Flood Risk Model
MCP*	Massachusetts Contingency Plan
MEP	Multi-Engine Piston
MEPA*	Massachusetts Environmental Policy Act
MHC*	Massachusetts Historical Commission
MHT	Manchester-Boston Regional Airport
MICA	Massport Infrastructure Conditions Assessment
MIRL*	Medium Intensity Runway Lighting System
MIT	Massachusetts Institute of Technology
MIT-LL	Massachusetts Institute of Technology Lincoln Laboratory
MMNHP*	Minute Man National Historical Park
MNR	Metro-North Railroad
MOA	Memorandum of Agreement
MOVES*	Motor Vehicle Emission Simulator
MPO	Metropolitan Planning Organization
mph	miles per hour
MSASP	Massachusetts Statewide Airport System Plan
MSGP	Multi-Sector General Permit
MT	Metric tons
MWRA	Massachusetts Water Resources Authority

N

NAAQS*	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NAVAID*	Navigational Aid
NBAA	National Business Aviation Association
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEC	Northeast Corridor
NEPA*	National Environmental Policy Act of 1969
NERASP*	New England Regional Airport System Plan
NHESP*	Natural Heritage and Endangered Species Program
NHL	National Historic Landmark
NHTSA	National Highway Traffic Safety Administration
NO_2*	Nitrogen dioxide
NOI*	Notice of Intent
NOMS*	Noise and Operations Monitoring System
NOx*	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPIAS	National Plan of Integrated Airport Systems
NPL*	National Priority List
NPS	National Park Service
NR	National Register
NRCS	Natural Resource Conservation Service
NWIRP	Naval Weapons Industrial Reserve Plant

O

O_3*	Ozone
ORH	Worcester Regional Airport
OU*	Operable Unit

P

PAH	Polycyclic Aromatic Hydrocarbon
PAPI*	Precision Approach Path Indicators
Pb	Lead
PFAS	Per- and Poly- Fluoroalkyl Substances
PFOA	Perfluorooctanoic acid
PM*	Particulate matter (e.g., PM_{10}, $PM_{2.5}$)
ppb	parts per billion
ppm	parts per million
psi	pounds per square inch
PSM	Portsmouth International Airport
PSNC	Permanent Solution with No Conditions
PR	Preservation Restriction
PRI	Primary Rate Interface
PUB	Palustrine Unconsolidated Bottom
PV	Photovaltaic
PVD	Rhode Island T.F. Green International Airport
PWM	Portland International Jetport

R

RAO*	Response Action Outcome
RCRA	Resource Conservation and Recovery Act
REIL*	Runway end identifier light
RFG	Reformulated Gasoline
RMAT	Resilient MA Action Team
RNP	Required Navigation Performance
ROD*	Record of Decision
RPZ*	Runway Protection Zone
RSA*	Runway Safety Area
RSGCN	Regional Species of Greatest Conservation Need
RTN	Release Tracking Number
RV	Recreational Vehicle

S

SAF	Sustainable Aviation Fuel
SEL	Sound Exposure Level
SEP	Single-Engine Piston
SF	Square Feet
SFTA	Southern Flight Test Area
SIP*	State Implementation Plan
SMP	Sustainability Management Plan
SO_2*	Sulfur dioxide
SOV	Single Occupancy Vehicle
SPCC*	Spill Prevention Control and Countermeasure Plan
SR	State Register
SRDSG	Sustainability and Resiliency Design Standards and Guidelines
SWPPP*	Stormwater Pollution Prevention Plan

T

TA*	Time Above
TAF	Terminal Area Forecast
TCE*	Trichloroethylene
TDM*	Transportation Demand Management
TEL	Tetraethyl Lead
thm	Therms
TIA	Traffic Impact Assessment
TIM*	Time-in-Mode
TIP*	Transportation Improvement Plan
TMA*	Transportation Management Association
TMC	Traffic Movement Count
TMDL	Total Maximum Daily Load

TRACON*	Terminal Radar Approach Control
TRC	TRC Environmental Corporation
TSA	Traffic Study Area

U

UFP	Ultrafine Particles
ULCC	Ultra Low-cost Carriers
UMass	University of Massachusetts
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USDA	United States Department of Agriculture
USGBC	United States Green Building Council
USGS	United States Geological Survey
UST	Underground Storage Tank
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey

V

v/c	Volume-to-capacity
VISL	Vapor Intrusion Screening Level
VMP*	Vegetation Management Plan
VMT*	Vehicle Miles Traveled
VOC*	Volatile Organic Compounds
VPD	Vehicles Per Day
VOR*	Vehicle Occupancy Rate

W – Y

WO	Waste Oil
WPA*	Wetland 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.

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 Layout Plan (ALP) – A scaled drawing of existing and proposed land and facilities necessary for the operation and development of the airport.

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.

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.

Aviation Environmental Design Tool (AEDT) – A software program developed and used by the FAA to model aircraft performance to model fuel burn, air emissions and noise.

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.

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

Carbon Monoxide (CO) – A regulated air pollutant created from the combustion of fossil fuel.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – A federal law enacted by Congress on December 11, 1980, that provides federal authority to respond to releases or threatened releases of hazardous substances that may endanger public health or the environment (also known as the Superfund Act). 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

Day-Night Average Sound Level (DNL) – DNL is the FAA's primary metric for measuring aircraft noise and exposure. DNL is a metric that represents the total accumulation of all sound energy spread out over a 24-hour period, on an average annual basis. DNL includes a 10-decibel penalty for nighttime noise (between 10pm and 7am).

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.

E

Emissions and Dispersion Modelling 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.

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 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.

Equivalent Sound Level (L_{eq}) – 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.

F

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.

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 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 is 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 – 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.

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.

Ground Power Unit (GPU) – 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) – A 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.

Hanscom Noise Workgroup – 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.

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.

I-J

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 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 Meteorological Conditions - Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

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 used to be prescribed for all FAA-sponsored projects requiring environmental evaluation; however, INM has been replaced by AEDT.

Inventory of the Historic and Archaeological Assets of the Commonwealth – An 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) - Initial Approach Fix – 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 - Approximately 1,300-acre civilian airport in Bedford, Concord, Lexington, and Lincoln and operated by the Massachusetts Port Authority.

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 climb-out 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.

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 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 timelines 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 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 staff. 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. An 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.

Mesoscale air quality analysis – analysis and calculation of air emissions over a larger area, in comparison to a microscale analysis which focuses on smaller areas (e.g. an intersection).

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 Herz tone, which is received aurally and visually by compatible airborne equipment.

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.

MOVES – U. S. Environmental Protection Agency system to estimate and model the emission of criteria air pollutants, greenhouse gases and other air toxics from the operation of mobile sources (cars, trucks, buses, etc.).

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 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. In Massachusetts this program is administered by the EPA.

National Priority List (NPL) – List of hazardous waste sites eligible for long-term remedial action financed under the federal Superfund program.

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 passengers 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 (NO_2) – One of the Oxides of Nitrogen (NO_x) compounds. The U. S. EPA has established regulations, including a NAAQS, for nitrogen dioxide (NO_2).

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.

Nonmovement Area – Taxiways and apron (ramp) areas not under the control of air traffic.

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 overestimates previously reviewed, provided the increase does not meet or exceed any new 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.

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 Herz 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.

Oxides of Nitrogen (NO_X) – 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 (O_3) – 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 ($PM_{2.5}$) – 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 (PM_{10}) – Regulated coarse particle matter in the air with a diameter of 10 micron or less. One micron is one-millionth of a meter.

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.

R

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. 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 End Identifier Lights (REIL) – See Airport Lighting.

Runway Protection Zone (RPZ) – See Obstacle Free Zone.

Runway Safety Area (RSA) – See Obstacle Free Zone.

S

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 (SPCC) Plan - 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).

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 Outstanding Resource Water (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

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.

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.

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 spends 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.

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 non-radar).

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.

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.

Trip (vehicle) – A trip represents one vehicle entering or leaving a facility. A vehicle entering *and* leaving a facility represents two vehicular trips.

V

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.

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.

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).

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Printed copies of the *2022 L.G. Hanscom Field Environmental Status and Planning Report (EPSR)* Are available at the Bedford, Concord, Lexington, and Lincoln town libraries. The *2022 ESPR* is also available on the Massport website.[333]

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