Gardner Municipal Airport

DRAFT AIRPORT MASTER PLAN UPDATE

Chapters 1-4

AIP No. 3-25-0020-022-2023

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Contents

CHAPTER 1 – INTRODUCTION

The purpose of this chapter is to introduce the Airport Master Plan and Airport Layout Plan Update project, outline intended objectives, and provide background information about the Gardner Municipal Airport (GDM), including documenting master planning and project history at the airport.

1.1 GARDNER MUNICIPAL AIRPORT BACKGROUND

The Gardner Municipal Airport is a public use airport, owned by the Town of Gardner, Massachusetts, located in the town of Templeton, County of Worcester. The Airport is subject to the rules and regulations of Templeton. Situated in the north central portion of the state, GDM is located approximately 60 miles northwest of Boston, and 30 miles north of Worcester, on Route 2. GDM has one runway – Runway 18-36 (3,000 x 60 ft.). In the Town of Templeton, Airport property is located in a Residential - Agricultural 2 zoning district.

1.1.1 GOVERNANCE

The Airport is owned by the City of Gardner, operated through and by the Gardner Airport Commission. According to City Bylaws, The Airport Commission shall have the authority, with the approval of the City Council, to institute a system of charges and fees for use of the Gardner Municipal Airport. Current members of the Airport Commission include the following individuals, as appointed by City Council:

James Woods Chair
John Lavoie, Member
Phil Morrissey, Member
David Urqhuart, Member
Robert Swartz, Vice Chair
Andre Guertin, Member
Jim Morrissey, Member

1.1.2 AIRPORT HISTORY

Gardner Airport was first developed in or before the 1930s. At that time, the airport was owned and operated by the Gardner Flying Club and consisted of a 1,500-foot dirt airstrip. In 1931, the Airport Operations Building was constructed, and still acts as the Airport terminal building to this day. The Airport was eventually transferred to the control of the City of Gardner. Record keeping of Airport improvements did not begin until 1946, at which time the Federal Aviation Administration (FAA) funded the clearing, grubbing, drainage improvements and turfing of the landing strip, as well as construction of the access road and installation of landing strip markers.

In 1957, major improvements to the Airport included extending the runway to 2,000 feet, re-grading and paving. Five years later, in 1962, the airport was expanded through land acquisitions and the runway was extended to its current 3,000-foot length. As part of these improvements, land and easement rights were acquired in the approach zones to improve Airport safety. Also at that time, obstruction lights were installed to mark hazards in the airspace surfaces. Further upgrades in 1978 included pavement reconstruction and remarking, installation of upgraded runway lighting, reconstruction of the apron, installation of the rotating airport beacon, clearing the approaches, and additional land acquisitions.

Following the completion of the 1984 Master Plan, in 1988, FAA Airport Improvement Program (AIP) funding was used to improve the Airport access road, to construct the paved aircraft tie-down apron and to extend the taxiway to become the full-parallel taxiway it is today. In 1995 and 1998, projects to expand and improve the Airport's aprons occurred. At the same time, runway safety areas (RSAs) were improved to meet FAA standards. The Airport obtained FAA and MAC (now MassDOT, Aeronautics Division) funding assistance to purchase several pieces of snow removal and mowing equipment in 2001, complete crack sealing and marking on Runway 18-36 and the parallel taxiway in 2005, and rehabilitate two T-hangar taxilanes in 2007

1.1.3 MASTER PLANNING HISTORY

The most recent Master Plan Update for GDM was completed in 2008 and made recommendations for safety and infrastructure improvements. Since that time, the Airport has undertaken the following projects:

- Reconstruction of hangar taxilanes
- Removal of underground Avgas tank and installation of aboveground self-serve Avgas system
- Replacement of hazard beacons and installation of new rotating beacon with tip-down pole
- Preparation of an Environmental Notification Form to evaluate proposed projects
- Installation of fencing and gates
- Purchase of snow removal equipment
- Construction of T-Hangars
- Reconstruction of the airport access road
- Reconstruction of Runway 18-36 and Taxiway 'A'

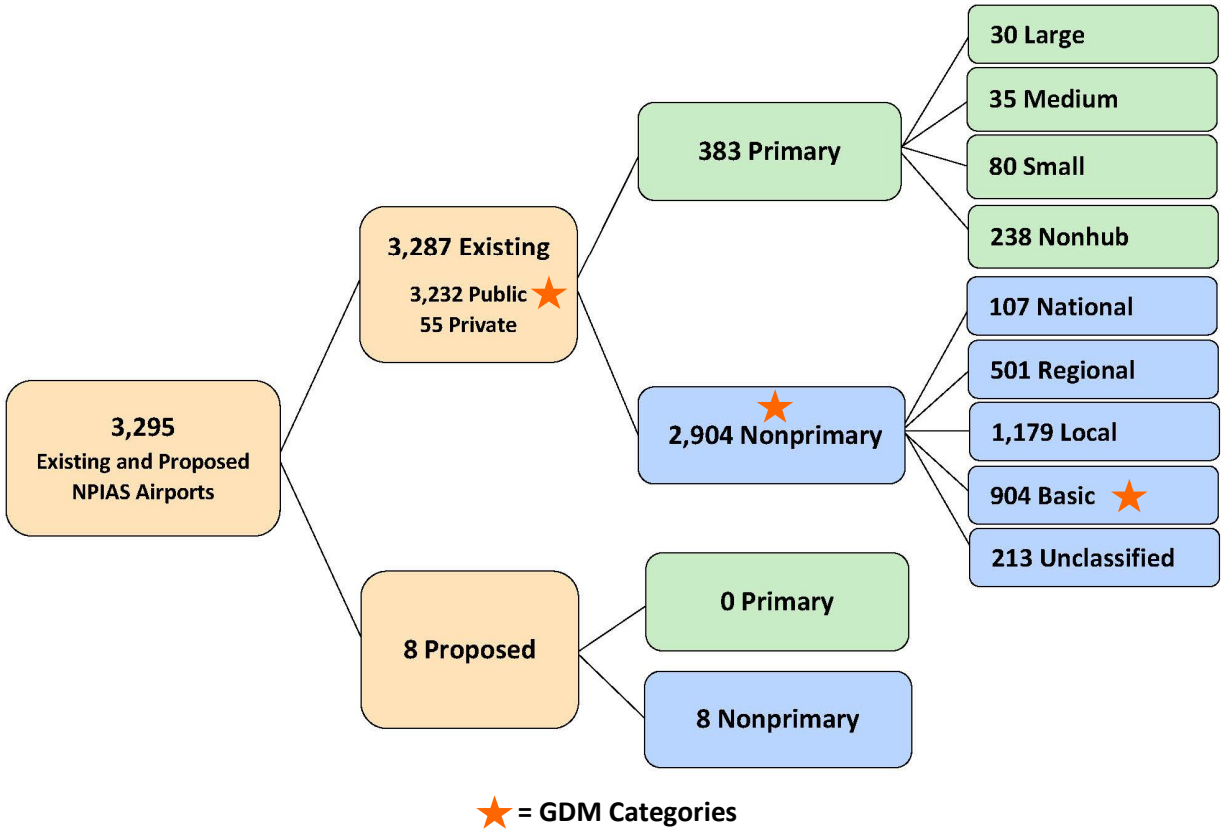
The above projects were proposed in the 2008 AMPU Schedule of Improvements. Projects identified in the 2008 Plan that have not yet been addressed include construction of an SRE building, reconstruction of the parking apron, and acquisition of the leasehold, due to funding constraints and other projects taking priority. These projects will be reevaluated and considered as part of this AMPU. The purpose of this study is to review the adequacy of the Airport's existing facilities with respect to compliance with FAA design and safety standards and their ability to meet current and future demand for the next 20 years. The plan will make recommendations for improvements to address noncompliant designs, safety issues, and capacity shortfalls and develop a schedule of improvements for the short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years) development periods. This study will be a "focused"

Master Plan Update" with emphasis on reevaluating the Airport's forecast of operational demand and facility requirements in an effort to guide the Airport Commission in making recommendations for future capital improvements at the Airport.

1.2 NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS

The National Plan of Integrated Airport Systems (NPIAS) is a plan developed by the FAA to identify airports considered important resources to the national transportation system and estimate federal funding for developments required to provide a "safe, efficient, and integrated system of public-use airports."[1] The NPIAS classifies airports meeting minimum criteria into categories that determine the amount of federal funding each airport is eligible for. To be included in the NPIAS, an airport must exhibit the essential attributes contained in Table 1-1A and 1-1B of FAA Order 5090.5. Currently, 3,287 public-use airports are included in the NPIAS. Airport are grouped into the following categories outlined in Table 1-1 below:

Table 1-1: NPIAS Category and Role



Because of its size, location, and contribution to the national air transportation system, GDM meets the criteria for inclusion in the NPIAS, making it eligible to receive federal grant money for safety, infrastructure, environmental, planning, and other critical projects. Under the NPIAS, GDM is classified as a public use, nonprimary, general aviation, basic airport. According to the NPIAS, "basic airports fulfill

[1] FAA Order 5090.5, Formulation of the NPIAS and ACIP, September 3, 2019

the principal role of a community airport providing a means for private general aviation flying, linking the community with the national airport system, and making other unique contributions. In some instances, the airport is the only way to access the community and provides emergency response access, such as emergency medical or firefighting and mail delivery. These airports have moderate levels of activity with an average of nine propeller-driven aircraft and no jets. Many of these airports are located in rural areas."[2]

1.2.1 AIRPORT MASTER PLAN UPDATE FUNDING

Financing for this AMPU is being provided by the FAA, MassDOT/Aeronautics Division (MassDOT/AD), and the City of Gardner (the Client Group). GDM is eligible to receive Federal funding assistance for this project pursuant to the AIP program. AIP funding is provided through a federal aviation trust fund, funded through "user fees" paid by passengers on commercial flights, aviation fuel tax, cargo fees, and over-flight fees. This project is receiving 90 percent of total project funding through the AIP program. MassDOT/AD is providing an additional 5 percent of total project costs, and the City of Gardner is financing the remaining 5 percent of total project costs.

1.2.2 HISTORY OF FEDERALLY FUNDED PROJECTS

A historic listing of AIP funded projects completed at GDM, which received federal and state funding, is contained in Table 1-2 below:

Table 1-2: History of AIP Funded Projects

Federal Fiscal Year	*Project Number*	*Project Description*	*Total FAA Grant*
1983	3-25-0020-01-1983	Conduct Airport Master Plan Study	$29,430
1985	3-25-0020-02-1985	Install Apron Lighting, Remove Obstructions, Construct Taxiway	$175,525
1988	3-25-0020-03-1988	Improve Access Road, Construct Apron, Extend Taxiway	$399,100
1993	3-25-0020-04-1993	Rehabilitate Runway	$694,823
1995	3-25-0020-05-1995	Expand Apron, Improve Runway Safety Area	$124,565
1998	3-25-0020-06-1998	Rehabilitate Apron, Improve Runway Safety Area	$466,091
2001	3-25-0020-07-2001	Acquire Snow Removal Equipment	$194,666
2005	3-25-0020-08-2005	Rehabilitate Apron	$219,154
2006	3-25-0020-09-2006	Update Airport Master Plan Study	$186,532
2007	3-25-0020-010-2007	Rehabilitate Taxiway (T-Hangar Taxilane)	$404,823

Source: FAA Records

[2] NPIAS Report 2023-2027

Table 1-2: History of AIP Funded Projects (Continued)

Federal Fiscal Year	*Project Number*	*Project Description*	*Funds*
2009	3-25-0020-011-2009	Improve Fuel Farm (Install New Avgas System – Phase I)	$118,221
2009	3-25-0020-012-2009	Install Airport Beacon (Replace Hazard Beacons (3) and Rotating Beacon)	$281,110
2009	3-25-0020-013-2009	Improve Fuel Farm (Install New Avgas System – Phase II)	$162,888
2010	3-25-0020-014-2010	Conduct Environmental Study (Bird Survey and Environmental Notification Form)	$54,54720
2012	3-25-0020-015-2012	Install Fence and Gates (Approx. 3,300 LF)	$298,970
2016	3-25-0020-016-2016	Purchase Snow Removal Equipment (SRE)	$169,619
2018	3-25-0020-017-2018	Construct T-Hangars	$927,504[3]
2020	3-25-0020-018-2020	CARES Act Funds	$30,000
2021	3-25-0020-019-2021	CRRSA Act Funds	$9,000
2022	3-25-0020-020-2022	General ARPA	$22,000
2022	3-25-0020-021-2022	Reconstruct Runway 18-36, Parallel Taxiway 'A' and Stub Taxiways; Install REILS; Construct Vault; and Remove Obstructions	$4,842,000
2023	3-25-0020-022-2023	Airport Master Plan Update	$149,810

Source: FAA Records

Table 1-3: History of State Funded Projects

State Fiscal Year	*Project Description*	*Total Cost*
1993	Reconstruct Runway 18-36	$778,000
1996	EA & Design of Safety Area Improvements for R/W 18-36, Paved Apron and Airfield Drainage Improvements (Design-Only)	$141,000
1999	Construction of Apron & Safety Areas	$528,016
2002	Purchase Snow Removal Equipment	$217,000
2006	Crack Seal & Pavement Marking R/W 18-36 &Parallel T/W	$205,000
2006	Purchase Mowing Equipment and Attachments	$72,290*
2006	Airport Master Plan & Airport Layout Plan Update	$198,000

Source: MassDOT Records **State-funded only, no federal participation*

[3] This project was funded with both AIP and ASMP funds as follows: AIP Grant $927,504, ASMP $532,171

Table 1-3: History of State Funded Projects (Continued)

State Fiscal Year	*Project Description*	*Total Cost*
2008	Design and Reconstruction of Two Airport Taxilanes	$450,300
2009	Install self-service Fuel System/ remove UST	$312,000
2010	Environmental Permitting (ENF) and Rare Species Survey	$60,000
2013	Install Security Fence and Gates	$336,000
2017	Purchased SRE	$190,000
2018	Purchase Loader Bucket for John Deere Tractor*	$7,500*
2019	Construct T-Hangars	$900,500
2020	Re-Bid T-Hangars*	$50,000
2020	Replace Fuel Payment System*	$21,125
2020	Construct T-Hangars (7,500 sf)[4]	$532,171
2023	Reconstruct Runway 18-36	$5,380,000

Source: MassDOT Records **State-funded only, no federal participation*

1.3 MASTER PLAN PROCESS

Guidance for the AMPU planning process comes from the FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans, and other relevant FAA ACs, Orders, and Federal Aviation Regulations (FARs), as applicable. Advisory Circulars, or ACs, are non-regulatory documents published by FAA to provide guidance for compliance with regulations, standards, operational, and other requirements. This AMPU planning process considers the needs and demands of airport tenants, users, and the public. This AMPU planning process provides opportunities for airport users, political entities, and the public to participate in the development of the Airport's aviation plans and goals, as outlined in section *1.3.1 Public Involvement*. These opportunities have been built into the process through public meetings of the Airport Commission. The Client Group responsible for contributing to and approving this Master Plan consists of members of the Airport Commission, the FAA, and MassDOT/AD.

This AMPU process will be broken down into phases at logical decision points:

- Initial data collection and aviation activity forecasts will make up the foundation from which other decisions in this project are made;
- Aviation facility needs analysis and alternative development options will be identified for each of the three planning periods (short, intermediate, and long term); and
- Environmental, financial, and graphical depictions (to be shown on the Airport Layout Plan) of the recommended airport development will complete the process.

[4] This project was funded with both AIP and ASMP funds as follows: AIP Grant $927,504, ASMP $532,171

1.3.1 PUBLIC INVOLVEMENT

Public involvement will be encouraged throughout the development of this Master Plan, in accordance with *FAA Advisory Circular 150/5070-6B, Airport Master Plans, Chapter 4, Public Involvement Program*. In advance of preparing this plan, a public notice announcing the project and defining the public participation process was posted at the airport administration building and published in the City's online announcements. As chapters of this document are developed, they will be posted on the Town's website where the public will be able to submit questions and comments to the Airport Manager. Additionally, all Master Plan chapters will be presented in draft format during regularly scheduled Airport Commission meetings, where the public will be encouraged to attend. The dedicated page on the City website where Master Plan chapters can be viewed is listed below:

https://www.gardner-ma.gov/264/Airport-Commission

Documentation of the public involvement program, including copies of advertisements, notices, and other relevant correspondence will be included in Appendix A.

1.4 HOW TO READ THIS REPORT

This report was written and organized so that information is presented in a logical, readable format with minimal duplication of information. The graphics contained in the report are to be found as follows:

Tables- all tables are located in the Chapters and sections to which they apply. At times, cross-references to tables are necessary, but these have been kept to a minimum. The tables are identified in numerical sequence starting with the Chapter number so that the third table in Chapter 3 is identified as Table 3-3, etc.

Figures- all figures are found in the Chapters and report sections to which they apply and are numbered sequentially starting with the Chapter number so that the second figure in Chapter 6 is identified as Figure 6-2, etc.

Sheets- sheets are Airport Layout Plan (ALP) sheets in their various stages of development. All sheets are located at the end of the report, before the appendices. Sheets will be developed in stages as the plan is developed, therefore not all plan sheets may be contained in the report until the full draft report has been prepared for final review by the Airport Commission, FAA, and MassDOT. Below is a listing of ALP contents as required by the Airport Commission, FAA, and MassDOT that will become part of the final Master Plan Report:

- Cover Page
- Data Sheet
- Existing Facilities Plan
- Ultimate Airport Layout Plan
- Approach Plans and Profile
- Part 77 Plan (Using obstruction data from the previous AMPU)
- Runway End Profiles
- Runway Departure Surface Drawing

CHAPTER 2 – INVENTORY OF EXISTING FACILITIES

This chapter documents all facilities and infrastructure on airport property, including dimensions, age, condition, and other information as may be relevant and available for the purpose of providing a comprehensive foundation from which facility requirements and improvement recommendations will be made. This inventory relies on facilities documented in the 2008 Airport Master Plan Update, as-built conditions from recent projects, and updates from the Airport regarding changes to facility conditions. See *Figure 2-1: Existing Conditions Plan* and Sheet 3 of the Airport Layout Plan (ALP) for a depiction of existing facilities.

2.1 GEOMETRY STANDARDS

FAA AC 150/5300-13B, Airport Design, provides standards and recommendations for the geometric layout and engineering design of airport facilities including runways and runway associated environments such as Runway Safety Areas (RSAs), Obstacle Free Zones (OFZs), Object Free Areas (OFAs), clearways and stopways, among other elements. Use of the design standards contained within AC 150/5300-13B is mandatory for all projects funded through the federal Airport Improvement Program (AIP).

2.1.1 CURRENT RUNWAY DESIGN CODE AND CRITICAL AIRCRAFT

Airports are designed according to their Runway Design Code (RDC). The RDC is determined in part by the dimensions and approach speed of the airport's "critical aircraft". A critical aircraft, as defined by FAA AC 150/5300-13B is , "the most demanding aircraft type, or grouping of aircraft with similar physical and operational characteristics, that make regular use of an airport. Regular use is 500 annual operations, excluding touch and-go operations." An operation is defined as one takeoff or one landing, so an aircraft that has landed and taken off from the same airport is considered to have made two operations at that airport. The dimensions and speed of the critical aircraft are used to determine the Aircraft Approach Category (determined by approach speed and denoted by letters A through E) and Airplane Design Group (determined by tail height and wingspan and denoted by Roman numerals I through V). Further, aircraft with a maximum takeoff weight (MTOW) lower than 12,500 pounds are categorized as "small" aircraft and are subject to less stringent design standards than larger aircraft. A summary of Aircraft Approach Category (AAC) and Airplane Design Group (ADG) standards can be found in Tables 2-1 and 2-2.

Table 2-1: Aircraft Approach Category

Aircraft Approach Category	*Approach Speed*
A	Speed less than 91 knots
B	**Speed 91 knots or more but less than 121 knots**
C	Speed 121 knots or more but less than 141 knots
D	Speed 141 knots or more but less than 166 knots
E	Speed 166 knots or more

Source: AC 150/5300-13B, Table 1-1

***Bold= GDM's Current Aircraft Approach Category**

Table 2-2: Airplane Design Group

Airplane Design Group	*Tail Height [ft. (m)]*	*Wingspan [ft. (m)]*
I	**< 20' (<6 m)**	**<49' (<15m)**
II	20' - < 30' (6m- <9m)	49'- <79' (15m- <24m)
III	30' - < 45' (9m- <13.5m)	79'- <118' (24m- <36m)
IV	45'- <60' (13.5m- <18.5m)	118'- 171' (36m- <52m)
V	60'- <66' (18.5m- <20m)	171'- <214' (52m- <65m)
VI	66'- <80' (20m- <24.5m)	214'- <262' (65m- <80m)

Source: AC 150/5300-13B, Table 1-2

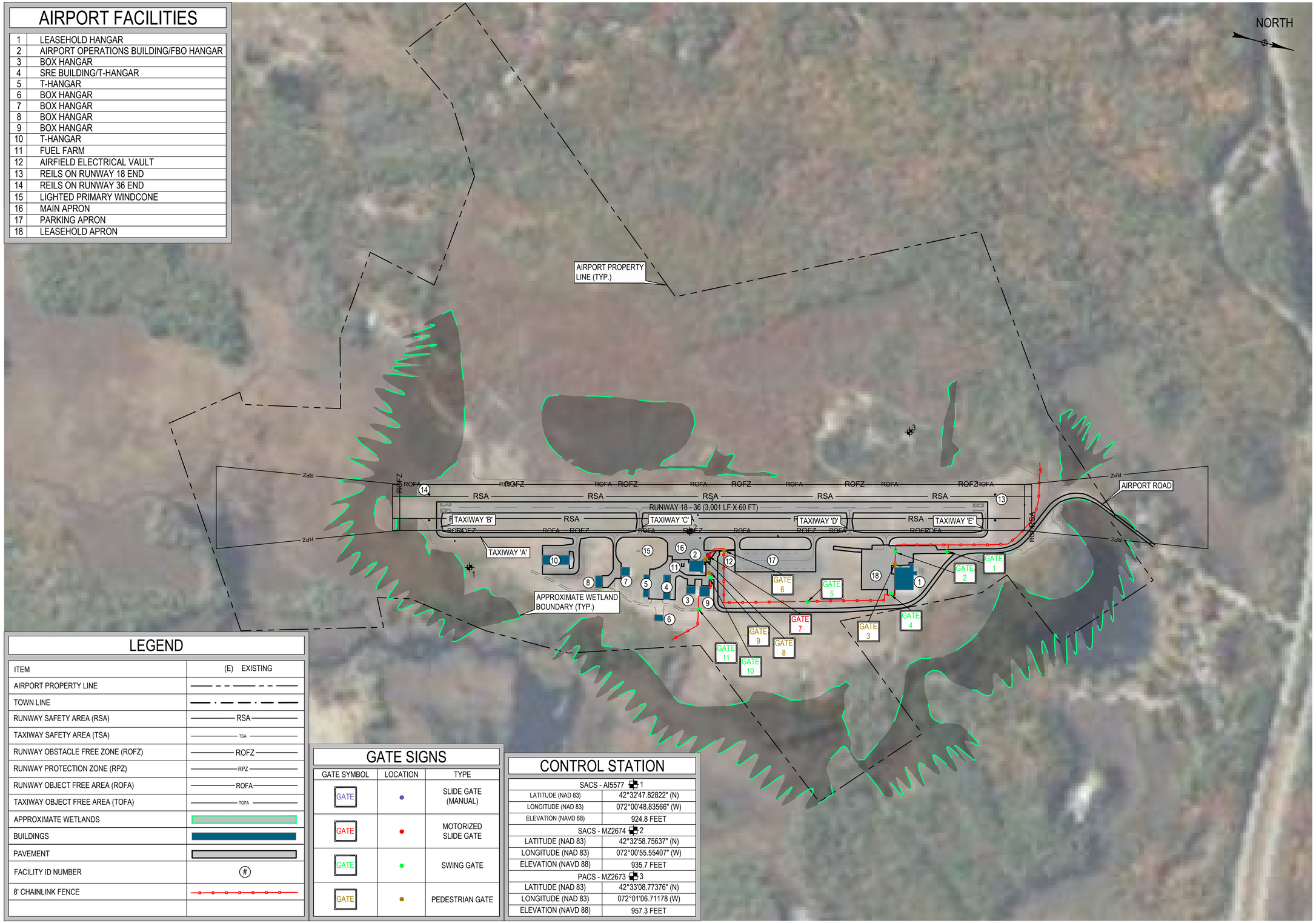
***Bold= GDM's Current Airplane Design Group**

The 2008 AMPU included an Airport Reference Code (ARC) verification, which discussed historic aircraft operations and an inventory of based aircraft at the time. This verification revealed that the Airport's based aircraft inventory was composed of small single and twin-engine aircraft having wingspans under 49 feet and approach speeds of less than 121 knots- aircraft in the A-I and B-I categories. At the time of the 2008 AMPU, the FAA's Terminal Area Forecast, discussions with the Airport Manager, FBO and Airport Commission members indicated that the character of the aircraft using the airport was not anticipated to change through the planning period. Because of limited facilities (lack of Jet-A fuel, relatively short runway, and potentially high instrument approach minima), heavier, larger aircraft were unlikely to make regular use of the airport in the foreseeable future. Therefore, the airport remained designated as a B-I (small) facility: Aircraft Approach Category B (aircraft with approach speeds 91 knots or more but less than 121 knots), Airplane Design Group I (wingspans under 49 feet in length, and tail heights under 20 feet), further designation as "small" due to aircraft 12,500 lbs. or less. The 2023 Runway 18-36 reconstruction project included a component to confirm the critical aircraft as part of the design, which was confirmed to be the Piper Twin Comanche (B-I small).

Figure 2-2: Piper Twin Comanche

AIRPORT FACILITIES

1	LEASEHOLD HANGAR
2	AIRPORT OPERATIONS BUILDING/FBO HANGAR
3	BOX HANGAR
4	SRE BUILDING/T-HANGAR
5	T-HANGAR
6	BOX HANGAR
7	BOX HANGAR
8	BOX HANGAR
9	BOX HANGAR
10	T-HANGAR
11	FUEL FARM
12	AIRFIELD ELECTRICAL VAULT
13	REILS ON RUNWAY 18 END
14	REILS ON RUNWAY 36 END
15	LIGHTED PRIMARY WINDCONE
16	MAIN APRON
17	PARKING APRON
18	LEASEHOLD APRON



LEGEND

ITEM	(E) EXISTING
AIRPORT PROPERTY LINE	
TOWN LINE	
RUNWAY SAFETY AREA (RSA)	RSA
TAXIWAY SAFETY AREA (TSA)	TSA
RUNWAY OBSTACLE FREE ZONE (ROFZ)	ROFZ
RUNWAY PROTECTION ZONE (RPZ)	RPZ
RUNWAY OBJECT FREE AREA (ROFA)	ROFA
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA
APPROXIMATE WETLANDS	
BUILDINGS	
PAVEMENT	
FACILITY ID NUMBER	#
8' CHAINLINK FENCE	

GATE SIGNS

GATE SYMBOL	LOCATION	TYPE
GATE	●	SLIDE GATE (MANUAL)
GATE	●	MOTORIZED SLIDE GATE
GATE	●	SWING GATE
GATE	●	PEDESTRIAN GATE

CONTROL STATION

SACS - AI5577 1	
LATITUDE (NAD 83)	42°32'47.82822" (N)
LONGITUDE (NAD 83)	072°00'48.83566" (W)
ELEVATION (NAVD 88)	924.8 FEET
SACS - MZ2674 2	
LATITUDE (NAD 83)	42°32'58.75637" (N)
LONGITUDE (NAD 83)	072°00'55.55407" (W)
ELEVATION (NAVD 88)	935.7 FEET
PACS - MZ2673 3	
LATITUDE (NAD 83)	42°33'08.77376" (N)
LONGITUDE (NAD 83)	072°01'06.71178 (W)
ELEVATION (NAVD 88)	957.3 FEET

GALE

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PROJECT
AIRPORT MASTER PLAN AND AIRPORT LAYOUT PLAN UPDATE
AIP NO. 3-25-0020-022-2023

OWNER
GARDNER MUNICIPAL AIRPORT
GARDNER, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	777121
CADD FILE	777121-03-EXIST
DESIGNED BY	DCQ
DRAWN BY	DCQ
CHECKED BY	JCM
DATE	DECEMBER 2023
DRAWING SCALE	SCALE: 1" = 250'

GRAPHIC SCALE
0 125 250 500
SCALE: 1" = 250'

SHEET TITLE

EXISTING CONDITIONS PLAN

DRAWING NO.
FIG 2-1

2.2 AIRSIDE FACILITIES

The facilities on an airfield that are accessible to aircraft are generally categorized as airside facilities. These areas primarily include runways, taxiways, and aprons and are outlined in the following sections.

2.2.1 RUNWAY 18-36

The Airport's primary runway, Runway 18-36, is 3,000 feet long and 60 feet wide. The reconstruction of Runway 18-36 is currently underway as of the summer of 2023. All "existing conditions" contained in this Master Plan will be documented based on the assumption that the runway reconstruction will be complete by the time this report is finalized. According to MassDOT/AD's 2021 Pavement Management Program (PMP) assessment, the runway had a Pavement Condition Index (PCI) rating of 48 out of 100 (poor) in 2021 and was expected to drop to a PCI rating of 45 (poor) by 2023. The MassDOT/AD PMP and PCI rating scale is further described in section *2.2.9, MassDOT/AD Pavement Management Program*.

Figure 2-3: Runway 18-36

2.2.2 RUNWAY SAFETY AREA

According to FAA Advisory Circular 150/5300-13B, a runway safety area (RSA) is "a defined area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway." The existing Runway 18-36 RSA is 120 feet wide, centered on the runway centerline, running parallel along the entire width of the runway, and extends 240 feet beyond each runway end.

2.2.3 RUNWAY OBJECT FREE AREA (ROFA)

A Runway Object Free Area (ROFA) is a protected area surrounding the runway that is required to be maintained clear of protruding objects (e.g. structures, vegetation, terrain), with the exception of those required for air navigation or aircraft ground maneuvering. The ROFA at GDM is 250 feet in width, centered on the runway center line, and extends 240 feet beyond each displaced threshold.

2.2.4 RUNWAY PROTECTION ZONE (RPZ)

A Runway Protection Zone (RPZ) is a trapezoid-shaped area at the end of a runway intended to enhance protection of people and property on the ground. FAA prefers that Airports acquire property interest in RPZs to control these areas and maintain them clear of incompatible objects and activities. Dimensions of the RPZ and other critical areas can be found on Figure 2-1, Existing Conditions Plan.

2.2.5 APPROACH PROCEDURES

Table 2-3 presents a summary of the approach procedures available via Runway 18-36 at the Airport:

Table 2-3: Circling Approach Procedures

	Minimums by Aircraft Category**			
*Category**	**A**	**B**	**C**	**D**
RNAV (GPS)-B CIRCLING	1800-1¼ 846 (900-1¼)	1800-1¼ 846 (900-1¼)	1980-3 1026 (1100-3)	
VOR-A CIRCLING	1760-1 805 (900-1)	1760-1¼ 805 (900-1¼)	1980-3 1025 (1100-3)	

**Terminal Instrument Procedures (TERPS), Aircraft Categories (ceiling in feet, visibility in nautical miles). Aircraft Categories A-D are defined in Table 2-1: Aircraft Approach Category*

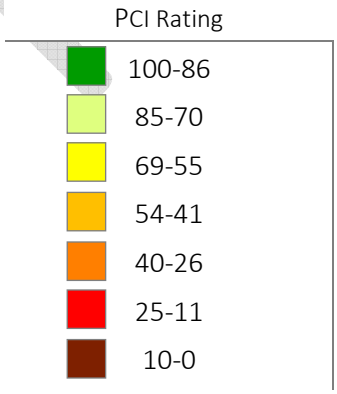
*** Minimums given by either (ceiling in feet- visibility in miles) or ceiling height/Runway Visibility Range*

Source: U.S. Terminal Procedures- NE-1, 10 AUG 2023 to 07 SEP 2023

2.2.6 MASSDOT PAVEMENT MANAGEMENT PROGRAM

In 2022, the MassDOT Aeronautics Division conducted a statewide assessment of airfield pavements under its Airport Pavement Management Program (PMP) to provide pavement condition index (PCI) information and recommendations for maintenance and rehabilitation for all airports across the state. The PMP contains "detailed information about each individual airport including inventory information, condition data, work history information, photographs, the proposed maintenance and rehabilitation plan, and a copy of the individual airport report."[1] Each segment of airport pavement is rated based on the scale summarized in Table 2-4 below:

Table 2-4: MassDOT Aeronautics Division
Pavement Management Program (PMP) Rating Scale



Source: MassDOT/AD Pavement Management System

Unless otherwise indicated, PMP condition reports are the basis for all pavement conditions documented in this chapter. According to the PMP, the appropriate repair action for any pavement above the state's "critical PCI" of 70 is localized preventative maintenance, while major rehabilitation is

[1] https://idea.appliedpavement.com/hosting/massachusetts/

recommended for pavement below the critical PCI. These ratings will assist in developing recommendations for improvements to airfield pavements in *Chapter 5, Facility Requirements*.

2.2.7 TAXIWAYS AND TAXILANES

Taxiways and taxilanes serve the purpose of moving aircraft between the runway, other taxiways/taxilanes, aprons, and other areas of the airfield. GDM currently has a system of five taxiways and several hangar taxilanes as indicated in Table 2-5.

Figure 2-4: Newly Constructed Stub Taxiway

Figure 2-5: Hangar Taxilane

Table 2-5: Inventory of Taxiways

Facility	*Segment*	*Year**	*PCI***
Taxiway 'A' *Full Length parallel taxiway to Runway 18-36 (3,001 feet x 25 feet)*	Parallel Taxiway	2023	100
Taxiway 'B' *Stub Taxiway (Approx. 90 feet x 25 feet)*	Runway 36 end stub	2023	100
Taxiway 'C' *Stub Taxiway (Approx. 90 feet x 25 feet)*	Stub between Runway 36 end and Main Apron	2023	100
Taxiway 'D' *Stub Taxiway (Approx. 90 feet x 25 feet)*	Stub between Runway 18 end and Main Apron	2023	100
Taxiway 'E' *Stub Taxiway (Approx. 90 feet x 25 feet)*	Runway 18 end stub	2023	100
Taxilanes *Taxilanes serving various hangar buildings*	SRE Building T-Hangars	2005	77
	Hangar 7 and 8 Taxilanes	1963	0
	2021 T-Hangar Taxilanes	2021	97

*Most recent construction or rehabilitation **MassDOT/AD APMS 2023 Projection

2.2.8 AIRPORT LIGHTING

Figure 2-6: Newly Installed Taxiway Light

Airfield lighting at GDM consists of medium intensity runway lights (MIRLs) along the edge of the entire length of Runway 18-36 and medium intensity taxiway lights (MITLs) along the edges of all taxiways. The lighting system was installed as part of the 2023 Runway 18-36 reconstruction project and is in new condition.

2.2.9 AIRFIELD GUIDANCE SIGNS

New airfield guidance signs were installed as part of the Runway 18-36 reconstruction project. An inventory of guidance signs can be found in Table 2-8 below.

Figure 2-7: Airfield Guidance Sign

2.2.10 NAVIGATIONAL AND APPROACH AIDS

Navigational and approach aids assist pilots by providing navigational, visual, and communication guidance to locate the airport in support of safe airport operations. The navigational and approach aids at GDM are further described below:

2.2.10.1 Windcone

A windcone provides visual information to pilots about wind direction and speed on the airfield. The Airport has one lighted windcone, installed in 2023 as part of the Runway 18-36 reconstruction project, which is located adjacent to the Main Apron.

Figure 2-8: Windcone

Figure 2-9: Hazard Beacon Installation 2010

2.2.10.2 Hazard Beacon

The Airport's three (3) hazard beacons are located off Airport property to the west of the airfield. The beacons are located on private properties in which the Airport has existing easements granting the Right of Use of the designated land for a hazard beacon(s). The beacons were installed in 2010, and all three beacons are no longer functional.

Figure 2-10: Rotating Beacon

2.2.10.3 Rotating Beacon

A rotating beacon is used to indicate the location of the Airport at night or during periods of low visibility to pilots. The Airport's rotating beacon, installed in 2010, consists of alternating green and white lights mounted on a tip-down pole, located to the north of the Airport Administration Building. The rotating beacon is in good condition.

2.2.11 APRONS

The Airport currently offers three areas for aircraft parking on its paved aprons, which are capable of accommodating approximately 31 aircraft. The Main Apron is located adjacent to the Administration building and does not include delineated spaces, the Tie-Down Apron is located north of the main parking lot, and the Leasehold Apron is located adjacent to the leasehold hangar, north of the Tie-Down Apron. An inventory of aprons, available tie-downs, and pavement conditions can be found in Table 2-6 below:

Table 2-6: Inventory of Aprons and Tie-Down Areas

Facility	*Tie-Down Spaces*	*Size*	*Year**	*PCI***
Main Apron	N/A	22,944 sf.	1978	56
Tie-Down Apron	18	53,124 sf.	1996	67
Leasehold Apron	13	55,151 sf.	1958	14

*Most recent construction or rehabilitation **MassDOT/AD APMS 2023 Projection

Figure 2-11: Main Apron

Figure 2-12: Tie-Down Apron

2.2.12 AIRFIELD PAVEMENT MARKINGS

Table 2-7 below presents an inventory of pavement markings on the airfield:

Table 2-7: Inventory of Pavement Markings

Location	*Marking*
Runway 36 End	Runway 36 Designation Marking
Runway 18-36	Runway Centerline
Runway 18 End	Runway 18 Designation Marking
Taxiway 'B' (36 End)	Holding Position Marking
Taxiway 'A' (at TW 'C' Intersection)	Holding Position Marking
Taxiway 'A' (at TW 'D' Intersection)	Holding Position Marking
Taxiway 'E' (18 End)	Holding Position Marking
Taxiway 'A'	Taxiway Centerline
Taxiway 'B'	Taxiway Centerline
Taxiway 'C'	Taxiway Centerline
Taxiway 'D'	Runway Hold Line
Taxiway 'D'	Taxiway Centerline
Taxiway 'E'	Runway Hold Line
Tie-Down Apron	Tie-Down Markings
Tie-Down Apron	Taxilane Centerline Markings
Leasehold Apron	Tie-Down Markings
T-Hangar 10 Taxilanes	Taxilane Centerline Markings

Source: Facility Inventory

2.2.13 AIRFIELD SIGNS

Table 2-8 below presents an inventory of lighted signs on the airfield:

Table 2-8: Inventory of Lighted Signs

Location	*Sign*
Taxiway 'B' at Runway 36 End	Taxiway B and Runway 36 Location Sign
Taxiway 'A' at Taxiway 'B' Intersection	Taxiway A Location and Taxiway B Directional Sign
Taxiway 'B' at Taxiway 'A' Intersection	Taxiway B Location and Taxiway A Directional Sign
Runway 36 End at Taxiway 'B' Intersection	Taxiway B Directional Sign
Runway 18-36 at Taxiway 'C' Facing RW 18 End	Taxiway C Directional Sign
Runway 18-36 at Taxiway 'C' Facing RW 36 End	Taxiway C Directional Sign
Taxiway 'A' at Taxiway 'C' Facing RW 18 End	Taxiway C and Runway 36-18 Location Sign
Taxiway 'A' at Taxiway 'C' Facing RW 36 End	Taxiway C and Runway 36-18 Location Sign
Taxiway 'C' at Taxiway 'A' Intersection	Taxiway C Location and Taxiway A Directional Sign
Taxiway 'A' at Taxiway 'C' Facing RW 18 End	Taxiway A Location and Taxiway C Directional Sign
Taxiway 'A' at Taxiway 'C' Facing RW 36 End	Taxiway A Location and Taxiway C Directional Sign
Runway 18-36 at Taxiway 'D' Facing RW 18 End	Taxiway D Directional Sign
Runway 18-36 at Taxiway 'D' Facing RW 36 End	Taxiway D Directional Sign
Taxiway 'A' at Taxiway 'D' Facing RW 18 End	Taxiway D and Runway 36-18 Location Sign
Taxiway 'A' at Taxiway 'D' Facing RW 36 End	Taxiway D and Runway 36-18 Location Sign
Taxiway 'D' at Taxiway 'A' Intersection	Taxiway D Location and Taxiway A Directional Sign
Taxiway 'A' at Taxiway 'D' Facing RW 18 End	Taxiway A Location and Taxiway D Directional Sign
Taxiway 'A' at Taxiway 'D' Facing RW 36 End	Taxiway A Location and Taxiway D Directional Sign
Taxiway 'E' at Runway 18 End	Taxiway E and Runway 18 Location Sign
Taxiway 'A' at Taxiway 'E' Intersection	Taxiway A Location and Taxiway E Directional Sign
Taxiway 'E' at Taxiway 'A' Intersection	Taxiway E Location and Taxiway A Directional Sign
Runway 18 End at Taxiway 'E' Intersection	Taxiway E Directional Sign

Source: Facility Inventory

Figure 2-13: Runway and Taxiway Location Sign

Figure 2-14: Taxiway Directional Sign

2.2.14 HANGARS

Hangars on airport property include a combination of T-hangars and box hangars capable of accommodating from 26 to 36 aircraft. Hangar condition and capacity information can be found in Table 2-9, below:

Table 2-9: Hangar Inventory

Hangar ID	*Hangar Type*	*Ownership*	*Hangar Use*	*Aircraft Capacity*	*Area (sf.)*	*Construction Date*	*Condition*
1	Box Hangar	Privately Owned	Aircraft Maintenance, Aircraft Storage	4-8	12,000±	Unknown	Poor
2	Maintenance Hangar	Airport lease to FBO	Aircraft Maintenance, Airport Operations	4-8	4,700±	1931	Fair
3	Box Hangar	Privately Owned	Aircraft Storage	1	2,000±	2000±	Good
4	T-Hangar 4 (SRE Building)	Airport Owned	Aircraft Storage, SRE Storage	4	3,800±	1980±	Poor
5	T-Hangar	Privately Owned	Aircraft Storage	3	3,600±	1990±	Good
6	Box Hangar	Privately Owned	Aircraft Storage	1	1,400±	1986±	Good
7	Box Hangar	Privately Owned	Aircraft Storage	1	2,300±	2005	Good
8	Box Hangar	Privately Owned	Aircraft Storage	2	2,220±	1995±	Good
9	Box Hangar	Privately Owned	Aircraft Storage	2	2,650±	2008	Good
10	T-Hangar	Airport Owned	Aircraft Storage	6	7,350±	2021	Good

Source: Airport Records

Figure 2-15: T-Hangar 10

2.2.15 SNOW REMOVAL EQUIPMENT BUILDING

The Airport's Snow Removal Equipment is currently being stored in Hangar Building 4, which was constructed in the 1980s. The building is in poor condition and crowded with equipment. Prior to being stored in Hangar Building 4, snow removal equipment was being stored outside and being exposed to the elements.

Figure 2-16: SRE Hangar

2.2.16 FUEL

The Airport's fuel system consists of a 6,000-gallon Avgas aboveground fuel storage tank (AST) with tank monitoring and a self-serve dispensing system, which was installed in 2010. The AST is a "skid type" system on a concrete pad surrounded by bollards and chain link fence. The system includes a credit card activated fueling system. The AST is located adjacent to the Airport's terminal apron. The Airport does not currently offer Jet-A fuel.

Figure 2-17: Fuel Facility

2.3 LANDSIDE FACILITIES

The facilities on an airfield that are inaccessible to aircraft are generally categorized as landside facilities, which are outlined in the following sections.

2.3.1 ADMINISTRATION BUILDING

Figure 2-18: Administration Building

The current airport administration building is a lean-to structure attached to the original hangar that was constructed in 1931. The administration building is approximately 1,000 square feet within the 4,700 square foot maintenance hangar/terminal building. It is located east of the runway, approximately at the runway midpoint. The facility includes two rooms which hold several chairs and tables, as well as an observation area, and restrooms. These rooms are also used by the Commission to conduct business and hold meetings. The electric and bathrooms are not up to code – wiring is knob and tube, and many of the hangars are included on the Airport's electrical meter, which means the Airport is currently paying for electricity for those tenants. In 2023, the Airport took steps to upgrade the interior of the administration building including new flooring including removal of asbestos, painting the walls.

2.3.2 AIRPORT BUSINESS

GDM supports a variety of aviation activities and offers a range of amenities to the flying community. There is currently one aviation business operating on the airfield, as follows:

Gardner Aviation Services, Inc.: Fixed Base Operator (FBO) providing A&P IA airplane maintenance services, avionics installations and repairs, annual 100-hour inspections, major and minor repairs, engine or cylinder replacement, and aircraft broker services.

2.4 MISCELLANEOUS FACILITIES AND EQUIPMENT

In addition to airside and landside facilities, the Airport has various support facilities and equipment to aide in safe and efficient operations. Miscellaneous facilities and equipment are outlined in the following sections.

2.4.1 AIRPORT UTILITIES

2.4.1.1 Water

The Airport is not connected to the municipal water system. Water is supplied from a well on Airport property, located directly behind the Administration Building/Maintenance Hangar. A leach field is located between Hangars 3 and 4, behind the Administration Building/Maintenance Hangar.

2.4.1.2 Electric

The Airport's electricity is provided by Templeton Light and Power and supports the runway and taxiway lighting system, beacon, lighted windcone, administration building, and hangars. There is no natural gas available at the Airport, and generally electricity is used to heat buildings.

2.4.2 AIRPORT EQUIPMENT

An inventory of maintenance and snow removal equipment (SRE) can be found in Table 2-10 below. It should be noted that many of the snow removal attachments are aging and in need of replacement.

Table 2-10: Inventory of Maintenance and Snow Removal Equipment (SRE)

Year	*Make*	*Condition*
2017	Freightliner 108SD Dump Truck with Fixed Angle Rollover Plow*	Good
2005	Brush Hog**	Good
2005	Zero Turn Mower**	Poor
2005	John Deere 5420 Tractor with 15' Mower Deck Attachment **	Good
2002	John Deere 44H Loader with Stewart & Stevenson Snowblower Attachment*	Good
2002	Ford F-350 Dump Truck with Plow Attachment*	Fair

** AIP Project with State and Local Share* ***MassDOT Project with Local Share* *Source: Airport Records*

Figure 2-19: 2017 Freightliner Dump Truck with Plow

2.4.3 VEHICLE PARKING

Designated vehicle parking for the Airport's administration building is located outside of the fence, north of the building and has capacity for 8 vehicles. There is also a designated parking lot outside of the fence, adjacent to the leasehold Hangar, which can accommodate several vehicles. The pavement was reconstructed as part of the 2021 access road project and is in good condition.

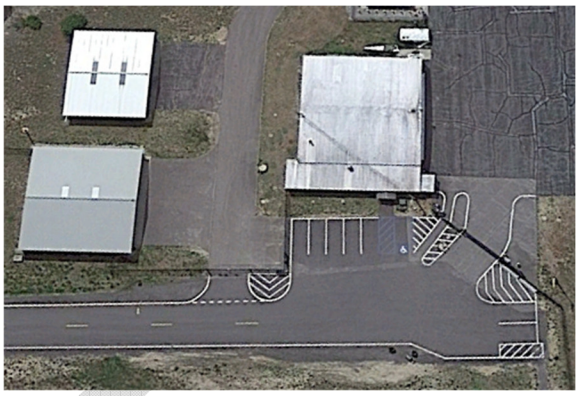


Figure 2-20: Administration Building Parking Lot

2.4.4 FENCING AND GATES

In 2012, the Airport installed 3,061 LF of fencing around a portion of Airport property. The fence begins in the terminal area, separating the parking lot from the Administration Building and Main Apron, runs along the perimeter of Airport Road, and terminates north of the Runway 18 end. The 2012 project also included installation of one (1) motorized slide gate with digital keyless entry near the primary access point to the airfield, as well as six (6) double swing gates and four (4) pedestrian gates located at key points to allow continued access as needed by airport staff and users.

Figure 2-21: Completed Fence in Terminal Area

2.4.5 LEASEHOLD PROPERTY

The leasehold property at the northernmost quadrant of the airport includes an office and hangar facility of nearly 12,000 square feet as well as an aircraft and automobile parking area of approximately 40,000 square feet. The current lease on the property is an agreement made in 1979 and expires in 2039. Currently, the terms of the lease require that only 50% of the operations at the property be aviation related. The leasehold hangar and attached gambrel-style structure appear to be in fair shape, but the paved apron, automobile parking area, and taxilane are in poor condition. A portion of the attached gambrel/office space is believed to violate the FAR Part 77 Transitional Surface to the runway. It is unknown to what extent this building penetrates the transitional surface. An aerial or ground survey is required to determine the exact setback and heights of buildings on the Airport.

2.4.6 EMERGENCY ACCESS AND MAINTENANCE ACTIVITIES

At this time, a direct abutter of the Airport has access to the airport and uses the runway for general aviation purposes. He assists the Commission with mowing, snow-blowing and other general airport maintenance and acts as a "watchman" at the Airport when staff are not on-site.

Table 2-11: Facility Conditions

Facility	*Date of Construction, Last Rehab. or Purchase*	*Condition/PCI**	*AIP Useful Life*	*End of Useful Life and Eligible for Replacement*
Runway 18-36	2023	100	20 Years	2043
Taxiway 'A'	2023	100	20 Years	2043
Taxiway 'B'	2023	100	20 Years	2043
Taxiway 'C'	2023	100	20 Years	2043
Taxiway 'D'	2023	100	20 Years	2043
Taxiway 'E'	2023	100	20 Years	2043
SRE Building Taxilanes	2005	77	20 Years	2025
Hangar 7 & 8 Taxilanes	1963	0	N/A	N/A
2021 T-Hangar Taxilanes	2021	97	20 Years	2041
Runway Lights	2023	Good	20 Years	2043
Taxiway Lights	2023	Good	20 Years	2043
Windcone	2023	Good	20 Years	2043
Rotating Beacon	2010	Good	15 Years	2025
Hazard Beacons (3)	2010	Failed	10 Years	2020
Main Apron	1978	56	20 Years	1998
Tie-Down Apron	1996	67	20 Years	2016
Leasehold Apron	1958	14	N/A	N/A
Fuel Facility	2010	Good	N/A	N/A
Administration Building	1931	Poor	N/A	N/A
Parking Lot	Unknown	Good	N/A	N/A
Fence and Gates	2012	Good	20 Years	2032
Hangar Buildings	See Table 2-9			
Airport Equipment	See Table 2-10			

CHAPTER 3 – EXISTING ENVIRONMENTAL CONDITIONS AND SENSITIVE AREAS

This chapter documents the existing environmentally sensitive areas and key environmental issues at the Airport using data from previously completed Master Plan studies, planning studies, environmental studies, and other readily available sources. This information is an integral component to the master planning process as consideration of environmental factors is critical to the evaluation of airport development alternatives and understanding subsequent environmental permitting requirements.

FAA Orders 1050.1F, *Environmental Impacts: Policies and Procedures*, and 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, provide policies and procedures for compliance with the NEPA, and requirements for airport actions pursuant to FAA authority. It is important to note that the environmental analysis included in this Master Plan Update is not a document intended to satisfy the need for formal NEPA analysis. Prior to the implementation of a proposed action, the Airport will need to coordinate with the FAA to determine the appropriate level of NEPA review. Depending on the required level of review, the following list of applicable environmental impact categories outlined in FAA Order 1050.1F may need be addressed:

- Air Quality
- Biological resources (including fish, wildlife, and plants)
- Climate
- Coastal resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous materials, solid waste, and pollution prevention
- Historical, architectural, archeological, and cultural resources
- Land use
- Natural resources and energy supply
- Noise and compatible land use
- Socioeconomic, environmental justice, and children's environmental health and safety risks
- Visual effects (including light emissions)
- Water resources (including wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers)

3.1 ENVIRONMENTAL CONDITIONS

The most recent comprehensive documentation of environmental conditions at the Airport occurred as part of the 2008 Airport Master Plan Update. The 2008 AMPU included a Wetland Resource Area and Wildlife Habitat Assessment (WRA/WHA) conducted by Baystate Environmental Consultants (BEC) to document the presence of wetlands and endangered and threatened species habitat on airport property. Further, in 2011, the Airport completed an Environmental Notification Form (ENF) to review projects proposed by the 2008 AMPU for potential impacts to NHESP resources. The 2011 ENF also included a Grassland Bird Survey to verify the presence or absence of threatened species at the Airport. The following sections outline known environmental impact categories that may be present at GDM and should be considered as future capital improvements are pursued.

3.1.1 WETLANDS

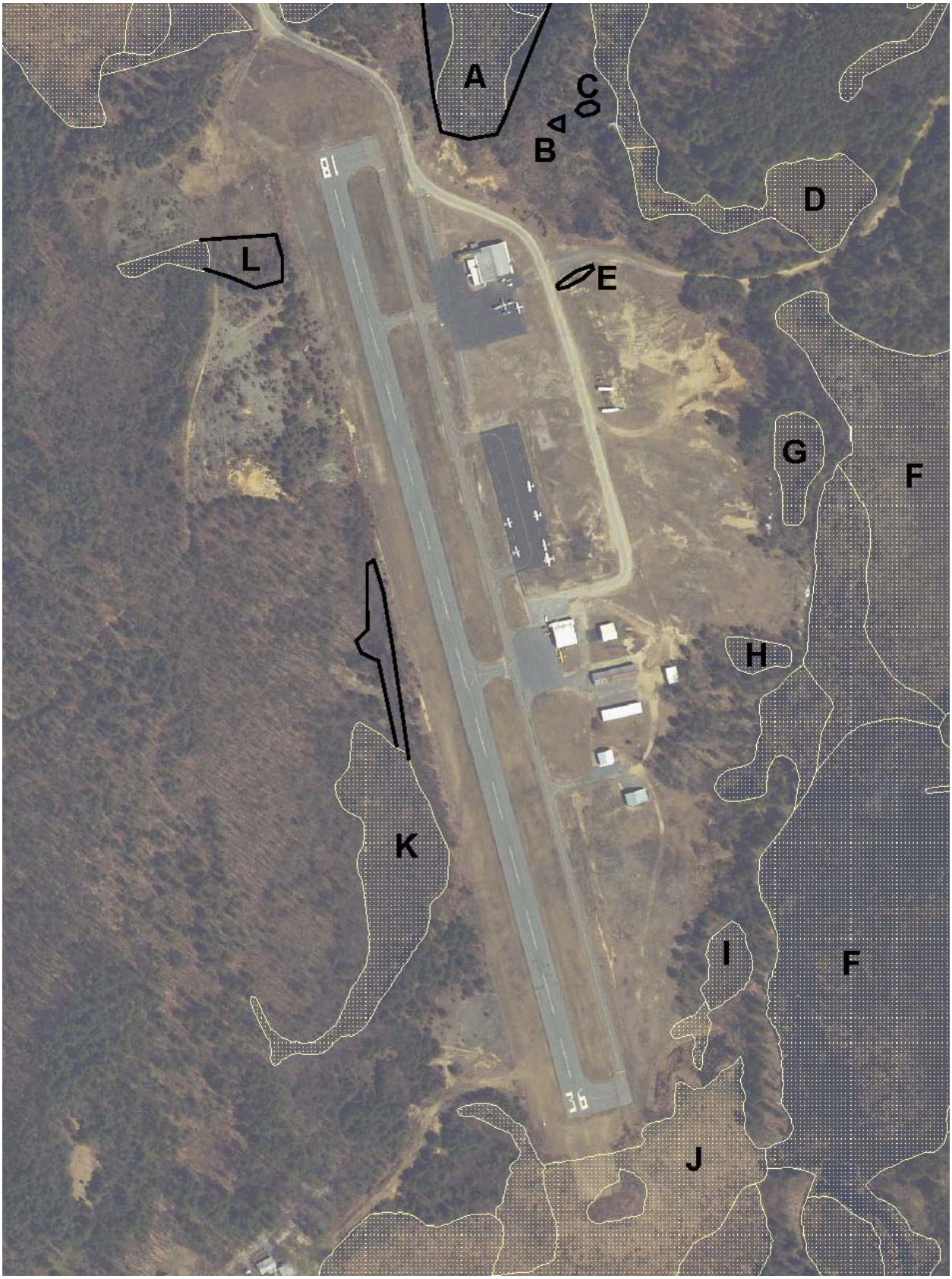
According to the Airport's 2008 Airport Master Plan Update, several classes of wetlands are present on airport property. There are a total of 12 wetland resource area complexes located on and around the airport. A summary of these wetlands is provided below, and a detailed description of each area can be found in the Wetland Resource Area and Wildlife Habitat Assessment attached to Appendix B of this Master Plan:

- Wetland Area A: A forested wetland approximately 2.5 AC in size, located approximately 200 feet from the paved runway/taxiway and extending outside of the airport property boundary.
- Wetland Area B: A small isolated vegetated wetland approximately 40 feet by 20 feet in size, located within a larger forest patch approximately 200 feet northeast of the Airport property boundary.
- Wetland Area C: A small isolated vegetated wetland approximately 70 feet by 30 feet in size, located within a larger forest patch approximately 75 feet northeast of Wetland Area B.
- Wetland Area D: An emergent wetland approximately 5 AC in size, located to the northeast of the Airport, likely just outside of the Airport property boundary.
- Wetland Area E: A small emergent wetland approximately 0.2 AC in size, located within the Airport boundary, south of the intersection of the airport access road and a dirt road extending east toward Weland Area D.
- Wetland Area F: An emergent wetland with large areas of open water and extensive beaver activity located to the west of Airport property.
- Wetland Area G: An open water emergent and shrub wetland approximately 0.8 AC in size, located within the eastern boundary of Airport property.
- Wetland Area H: An open water emergent shrub wetland, similar to Wetland G, approximately 0.4 AC in size, located 330 feet south of Wetland Area G.
- Wetland Area I: An open water emergent shrub wetland, similar to Wetlands G and H, approximately 0.6 AC in size, located to the east of the Runway 36 end.
- Wetland Area J: An extensive emergent and wet meadow wetland system located at the southern end of Airport property.
- Wetland Area K: Primarily a shrub wetland with some emergent wetland and open water approximately 4.5 AC in size, located 100 feet west of the runway.
- Wetland Area L: An emergent vegetative community with some shrubs approximately 1.3 AC in size, located approximately 100 feet west of the paved runway and 900 feet north of Wetland Araea K.

These areas are further depicted on Figure 3-1: Wetland Resource Area Map[1] below.

[1] BEC Consultants, Wetland Resource Area and Wildlife Habitat Assessment, February 2007

Figure 3-1: Wetland Resource Area Map



3.1.2 RARE, ENDANGERED OR THREATENED SPECIES

NHESP Grasshopper Sparrow

According to the Massachusetts Natural Heritage and Endangered Species Program (NHESP), several Massachusetts Endangered Species Act (MESA)-listed threatened, special concern, and endangered species have been observed and documented in the towns of Gardner and Templeton. A complete listing of MESA-listed species can be found in Figure 3-2: Massachusetts Endangered Species Act (MESA) Species. NHESP's MassMapper tool was consulted as part of the research for this Master Plan, which shows that a portion of Airport property is designated as PH 1679 (Priority Habitat of Rare Species) as well as Estimated Habitat of Rare Wildlife. These areas are noted on Figure 3-3: Natural Heritage and Endangered Species Program Map. According to the 2008 WLA/WHA, these areas are potential habitat for two threatened birds, the vesper sparrow and the grasshopper sparrow. As part of the 2011 ENF submission process, NHESP determined that the proposed improvements – including installation of navigational aids, construction of an SRE building, reconstruction of the airport access road, and construction of fencing – could be conditioned to minimize impacts and avoid a "take" of the state-listed grassland bird species. At that time, it was determined that preparation of an Environmental Impact Report (EIR) would not be required. Further, the 2011 Grassland Bird Survey completed as part of the ENF project reported that no vesper sparrows or grasshopper sparrows were present or breeding at the airport during the survey, and that the habitat may not be sufficient to support these species, at least not a consistent basis.

USFWS Northern Long-eared Bat

An IPaC Resource List was downloaded from the U.S. Fish and Wildlife Service (USFWS) as part of this Master Plan to document federally regulated species that may be present on or around airport property. According to the USFWS, no federally regulated endangered species are known or believed to occur on or around Airport property. One federally regulated threatened species, the Northern Long-eared Bat, and one candidate species, the Monarch Butterfly, are listed as "potentially affected by activities in this location." Additionally, the Resource List revealed that there are no critical habitats, as defined by USFWS, at this location.

Figure 3-2: Massachusetts Endangered Species Act (MESA) Species

Gardner – MESA-Listed Species Observations

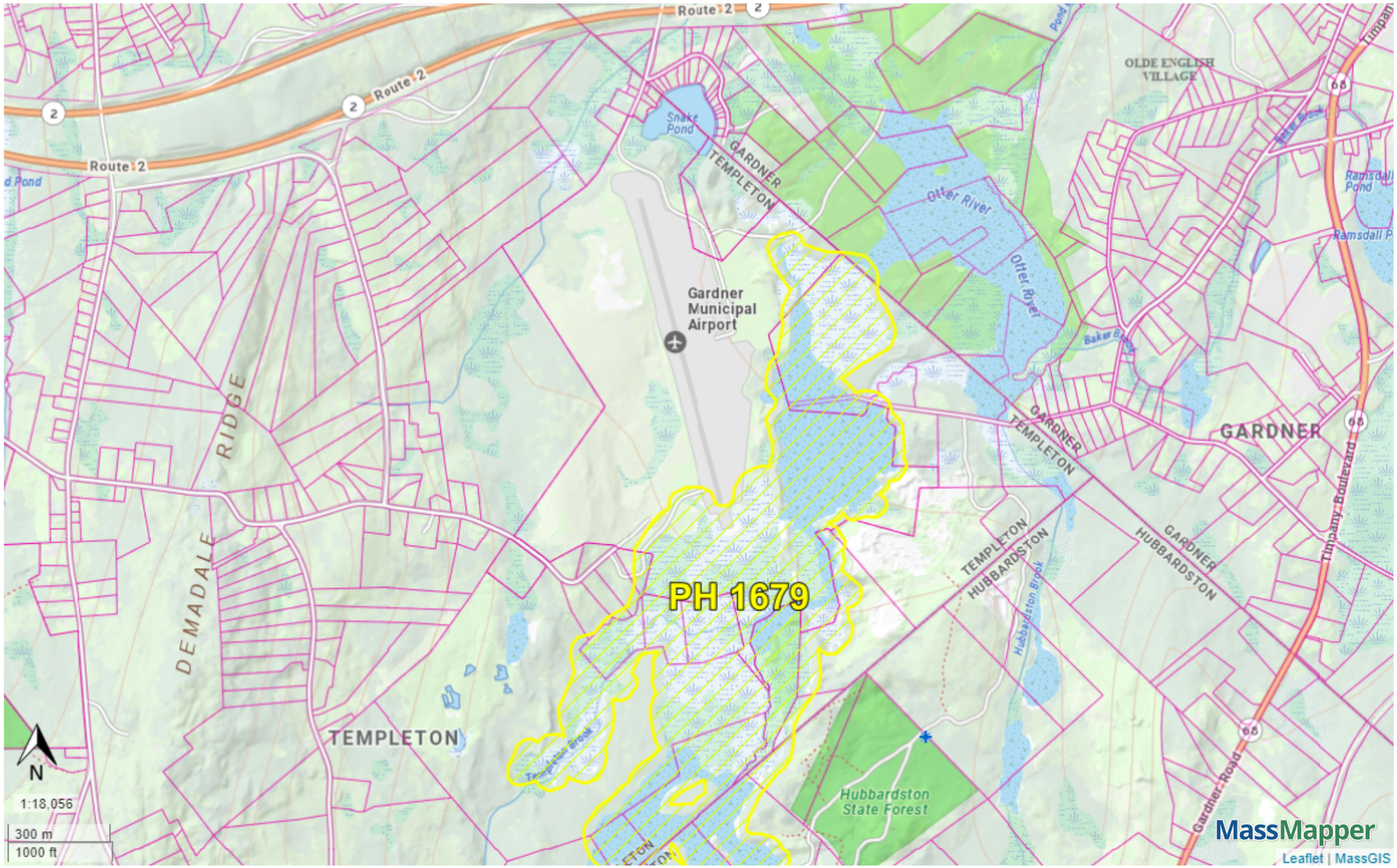
Common Name	Scientific Name	Taxonomic Group	MESA Status	Most Recent Obs.
American Bittern	Botaurus lentiginosus	Bird	Endangered	2021
Eastern Dwarf Mistletoe	Arceuthobium pusillum	Vascular Plant	Special Concern	2007
Pitcher Plant Borer	Papaipema appassionata	Butterfly/Moth	Threatened	2004
Tuckerman's Pondweed	Potamogeton confervoides	Vascular Plant	Threatened	2009
Wood Turtle	Glyptemys insculpta	Reptile	Special Concern	1988

Templeton – MESA-Listed Species Observations

Common Name	Scientific Name	Taxonomic Group	MESA Status	Most Recent Obs.
Adder's Tongue Fern	Ophioglossum pusillum	Vascular Plant	Threatened	Historic
American Bittern	Botaurus lentiginosus	Bird	Endangered	2017
Climbing Fumitory	Adlumia fungosa	Vascular Plant	Special Concern	1878
Eastern Whip-poor-will	Antrostomus vociferus	Bird	Special Concern	2016
Ebony Boghaunter	Williamsonia fletcheri	Dragonfly/Damselfly	Endangered	2003
Grasshopper Sparrow	Ammodramus savannarum	Bird	Threatened	1993
Green Adder's-mouth	Malaxis unifolia	Vascular Plant	Threatened	1899
Long-eared Owl	Asio otus	Bird	Special Concern	1978
Philadelphia Panic-grass	Panicum philadelphicum ssp. philadelphicum	Vascular Plant	Special Concern	1901
Pod-grass	Scheuchzeria palustris	Vascular Plant	Endangered	2019
Sand Violet	Viola adunca	Vascular Plant	Special Concern	2018
Vesper Sparrow	Pooecetes gramineus	Bird	Threatened	1993
Wood Turtle	Glyptemys insculpta	Reptile	Special Concern	2015

Source: https://www.mass.gov/info-details/rare-species-viewer
Downloaded: 8/31/2023

Figure 3-3: Natural Heritage and Endangered Species Program Map



NHESP Priority Habitats of Rare Species

NHESP Natural Communities

NHESP Estimated Habitats of Rare Wildlife

NHESP Ecoregions

NHESP Certified Vernal Pools

Property Tax Parcels

3.1.3 HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

The 2008 Airport Master Plan Update included a Phase I Archaeological Reconnaissance Survey completed by the University of Massachusetts Archaeological Services. The survey report revealed that much of airport property has low sensitivity for archaeological resources; however, several moderate to high sensitivity areas were identified. The report recommended that a Phase I B intensive locational survey be conducted should any future development be planned for sensitive areas.

A search of the Massachusetts Historical Commission's (MAC) Massachusetts Cultural Resource Information System (MACRIS) maps revealed that no MHC inventory points or areas are located on airport property.

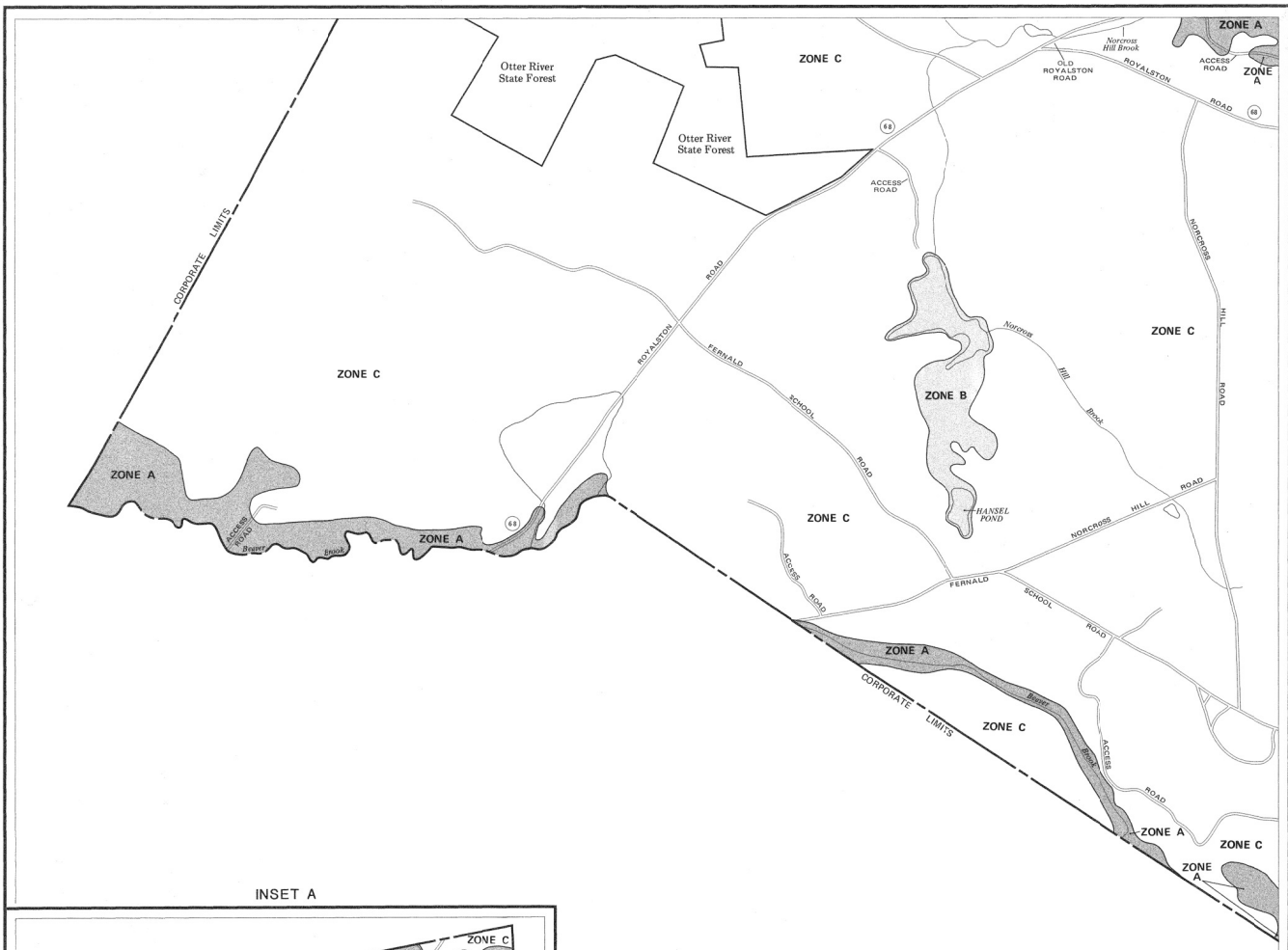
3.1.4 FLOODPLAIN

According to Federal Emergency Management Agency (FEMA) National Flood Hazard Maps, there is a small portion of the Airport that is categorized as Zone A. This area, which is associated with the Otter River and Templeton Brook in the area of the Runway 36 end, has a one percent annual chance of flooding. All other areas on Airport property are classified as areas of minimal flood hazard (see Figure 3-4: National Flood Hazard Map).

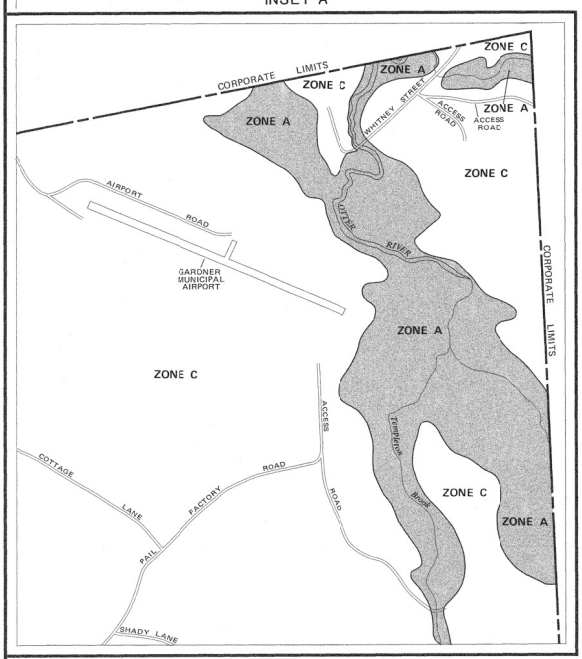
3.1.5 LAND USE

The Airport is located in the Town of Templeton, Massachusetts. Airport property abuts and is owned by the City of Gardner, Massachusetts. In the Town of Templeton, Airport property is located in a Residential – Agricultural 2 district, which is classified as Zoning Code R-A-2 and depicted in light green on the town's zoning map (see Figure 3-5: Town of Templeton, MA Zoning Map). Airport property is surrounded by R-A-2 properties in the Town of Templeton. Airport property abuts a Rural Residential District in the City of Gardner, which is classified as code RR2 and depicted in tan on the town's zoning map. This area is further classified as a Groundwater Protection Overlay District (GWPOD) and is identified by a dashed pink outline (see Figure 3-6: City of Gardner Zoning Map).

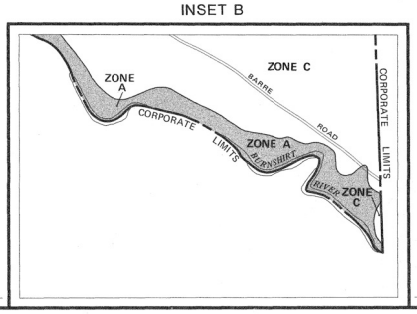
Figure 3-4: National Flood Hazard Map



INSET A



INSET B



KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1
Zone Designations*	ZONE A5
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
AUGUST 2, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
SEPTEMBER 10, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
MAY 17, 1982

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

TOWN OF TEMPLETON, MASSACHUSETTS
WORCESTER COUNTY

PANEL 15 OF 25
(SEE MAP INDEX FOR PANELS NOT PRINTED)

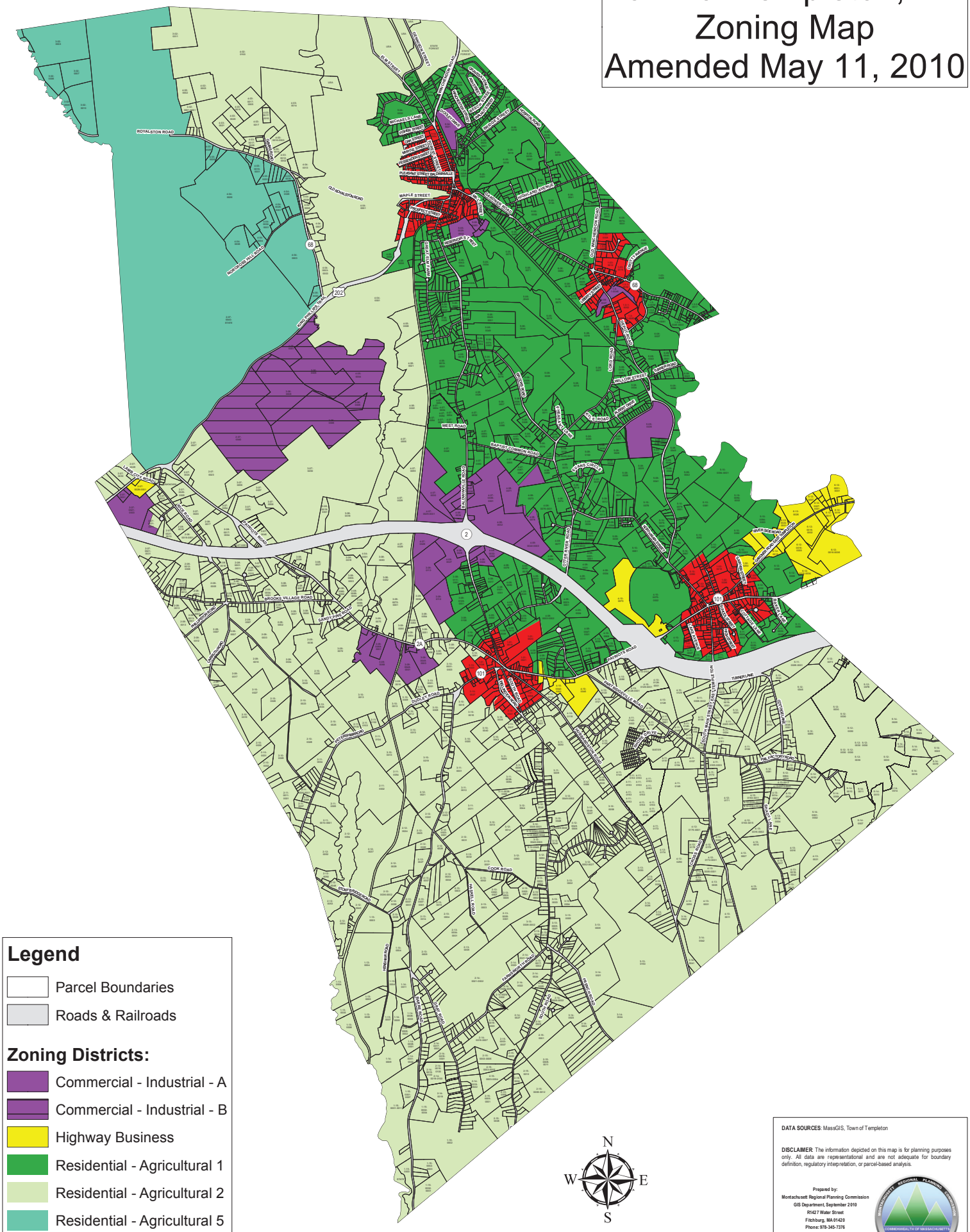
COMMUNITY-PANEL NUMBER
250339 0015 B

EFFECTIVE DATE:
MAY 17, 1982

Federal Emergency Management Agency

Figure 3-5

Town of Templeton, MA
Zoning Map
Amended May 11, 2010



Legend

- Parcel Boundaries
- Roads & Railroads

Zoning Districts:

- Commercial - Industrial - A
- Commercial - Industrial - B
- Highway Business
- Residential - Agricultural 1
- Residential - Agricultural 2
- Residential - Agricultural 5
- Village District

N
W E
S

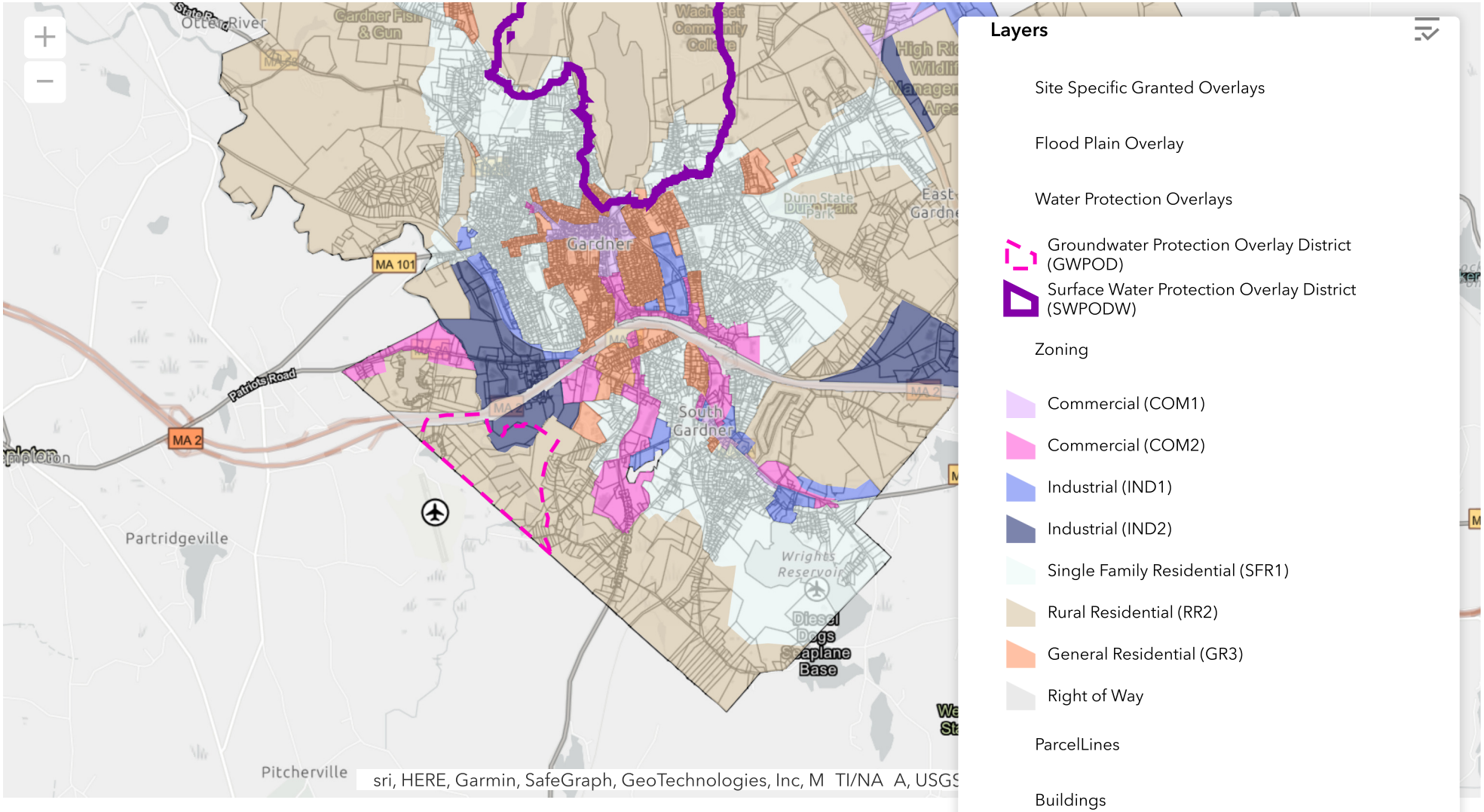
0 0.5 1 2 Miles

DATA SOURCES: MassGIS, Town of Templeton

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

Prepared by:
Montachusett Regional Planning Commission
GIS Department, September 2010
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Figure 3-6: City of Gardner Zoning Map



CHAPTER 4 – FORECASTS OF AVIATION DEMAND AND CAPACITY

This chapter reviews FAA forecasts, regional and national trends, and historic airport records of aircraft operations, based aircraft, and fuel sales to predict future growth at the airport over the planning period (2024-2043). The forecasted growth rate will assist the airport in planning for future improvements necessary to meet demand for facilities over the next 20 years.

The forecasts presented in this chapter provide short-(0-5 years), mid-(6-10 years), and long-term (11-20 years) projections of aviation activity at GDM for the years 2028, 2033, and 2043. It is important, however, to view the projections independently of specific years and to consider the actual growth of activity as the impetus that influences the need for future airport facilities. Similarly, slower than projected growth may warrant deferment of planned improvements. Actual growth activity should be periodically (i.e., annually) compared to projected growth, so scheduled corrections can be identified and implemented.

4.1 OVERVIEW OF AVIATION FORECASTS

The objective of forecasting an airport's activity is to identify the factors that influence aviation demand so that future infrastructure and facility needs can be determined. The FAA's Terminal Area Forecast (TAF)[1] is the standard benchmark of an airport's future activity and serves as the basis for FAA planning. Therefore, this forecast uses the most recent TAF (2022-2050) as a starting point for analysis. In addition to the TAF, FAA Aerospace Forecasts[2] and airport historic reports are reviewed and analyzed to further complement the TAF.

Forecasting aviation activity serves two primary purposes in the development of this master plan. Specifically, forecasts provide the basis for:

- Determining the necessary capacity of the airfield and terminal area; and
- Identifying the future facilities required to support demand, including determining the size and implementation thereof.

The demand for aviation facilities is typically expressed in terms of based aircraft and aircraft operations. Preparation of aviation activity forecasts is essential in assessing the needs and requirements for future aviation development. GDM's aviation forecasts serve as an overall planning guide for identifying airport capacity needs and as the basis for preparing development alternatives. This forecast consists of layers of information that build upon each other to provide a foundation to support final conclusions. These layers include:

- Defining the various forecasting methodologies employed;
- Historical aviation data upon which forecasting methods rely;
- Analysis of the validity of the forecast; and
- Provision of a summary of the forecast's findings.

[1] FAA Terminal Area Forecasts (https://www.faa.gov/data_research/aviation/taf/)
[2] FAA Aerospace Forecasts (https://www.faa.gov/data_research/aviation/aerospace_forecasts/)

Once the aviation forecasts are complete, the relationship between aviation demand, airfield capacity, and facilities is established. This is done in the next chapter, Chapter 5 – Facility Requirements.

The following terms are used frequently in airport forecasts, and their meanings are often confused with each other even though they are quite different. For clarification, the meaning of each of these terms is presented below.

Based Aircraft- this term refers to where an airplane makes its home or, in the case of GDM, an aircraft whose "home" is at the Airport.

Transient Aircraft- this term refers to an airplane whose "home" is at an airport other than the airport for which the forecast is being produced. In other words, any aircraft that uses GDM, but whose home base is at another airport is considered a transient aircraft.

Local Operation- a local operation is one where an aircraft operates within 20 nautical miles of the airport for which the forecast is prepared. A local operation can be performed by either a based or transient aircraft.

Itinerant Operation- an itinerant operation is one where an aircraft operates at a greater distance than 20 nautical miles of the airport for which the forecast is prepared. Again, an itinerant operation can be performed by either a based or transient aircraft.

4.1.1 TERMINAL AREA FORECAST

The Terminal Area Forecast (TAF) represents the FAA's forecast of aviation activity for U.S. airports and provides a summary of historical and forecast statistics on passenger demand and aviation activity. The TAF is prepared to meet the budget and planning needs of the FAA and provide information for use by state and local authorities, the aviation industry, and the public. Forecasts of itinerant general aviation operations and local civil operations at FAA facilities are based primarily on time series analysis. Because military operations forecasts have national security implications, the Department of Defense provides only limited information on future aviation activity. Hence, the TAF projects military activity at its present level except when FAA has specific knowledge of a change. These operation levels are held constant for the forecast unless otherwise specified by a local or regional FAA official.

4.1.2 FAA AEROSPACE FORECAST

The second set of FAA forecasts consulted were the FAA Aerospace Forecasts, FY 2023-2043. The Aerospace Forecast provides an overview of aviation industry trends and expected growth for the commercial passenger carrier, cargo carriers, and general aviation sectors. National growth rates in enplanements, operations, fleet growth, and fleet mix for the general aviation fleet are provided over a 20-year forecast horizon.

The FY 2023-2043 Aerospace Forecast focuses on the airline industry's recovery from the 2020 COVID-19 pandemic, in which air carriers experienced a period of unparalleled and significant financial losses. However, various emerging conditions in 2021, including the approval of vaccines and subsequent lifting of travel restrictions, resulted in air travel beginning to recover. In 2022, air carriers began to report that leisure travel was exceeding pre-pandemic levels. The 2023 Aerospace Forecasts predicts that aviation

demand will continue to be driven by economic conditions, with U.S. carrier domestic passenger growth to average 2.7% per year over the next 20-year period.

The General Aviation industry was impacted by the COVID-19 pandemic, but to a far lesser extent than the commercial sector. The Aerospace Forecast predicts growth of GA turbine and rotorcraft fleets, while the fixed-wing piston fleet will continue to shrink, resulting in a combined annual growth rate of 3.5%. Though GA operations at airports with FAA and Contract Traffic Control Service decreased significantly between 2019 and 2020, operation levels made a near full recovery in 2021 and surpassed pre-pandemic levels in 2022. GA operations at airports with FAA and Contract Traffic Control Service are predicted to increase at a rate of 0.5% per year between 2023 and 2032[3].

4.2 AIRPORT SERVICE AREA

Determining GDM's service area is an important component in estimating future aviation demand. The service area for airports is heavily influenced by a number of factors, including but not limited to:

- Proximity of an airport to an aircraft owner's home or business;
- Level of convenience, services and capabilities available at the airport;
- Level of convenience, services, and capabilities available at competing airports; and
- Population and economic characteristics from which the airport draws its users, both existing and potential.

In an effort to define GDM's service area, this report relies on the home zip codes of each based aircraft owner. Based on the proximity of the home zip code of each based aircraft owner to the airport, the service area was determined to be within a 20-mile radius of the GDM, as 80% of based aircraft owners reside within 20 miles of the airport. The following map shows the public use Airports located within approximately 20 miles of GDM, which are further described on page 4-4.

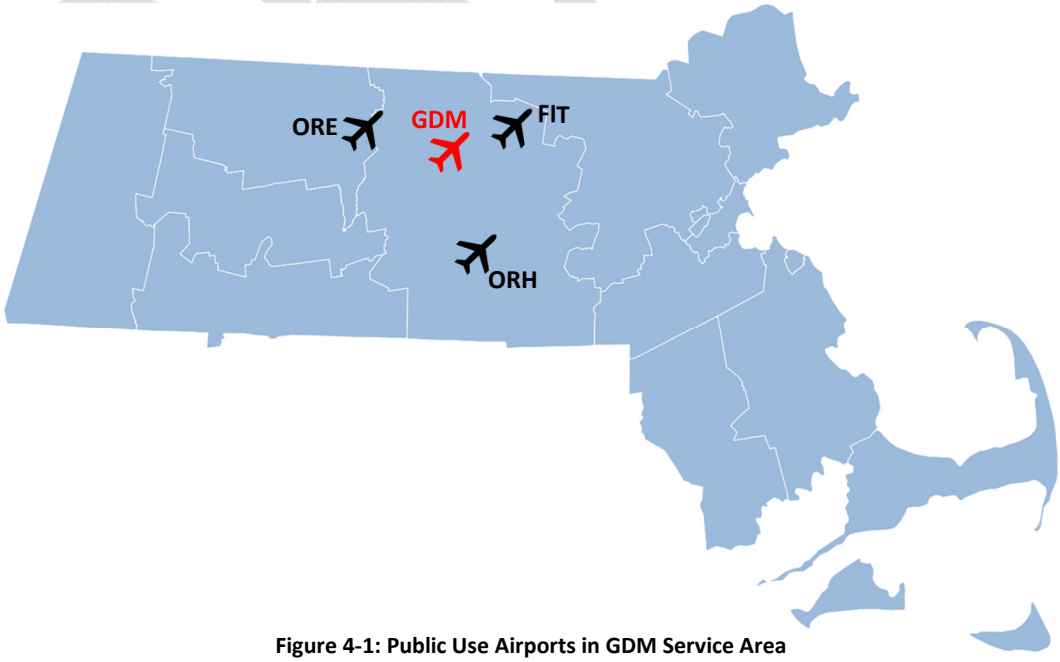


Figure 4-1: Public Use Airports in GDM Service Area

[3] FAA Aerospace Forecast, Fiscal Years 2023-2042, Table 32, Total Combined Aircraft operations at Airports with FAA and Contract Tower Service

Worcester Regional Airport (ORH), Worcester, MA: ORH is a primary, nonhub commercial service NPIAS airport with two paved runways – Runway 11-29 (7001 x 150 ft.), which is equipped with PAPIs and REILS on both runway ends and approach lights on the 11 end; and Runway 15-33 (5000 x 100 ft.), which is equipped with PAPIs and REILS on both runway ends. The Airport offers daily scheduled service to New York City and Florida, as well as a full complement of FBO services including but not limited to domestic and international handling, catering, limousine and car rental, charter flights, and fueling.

Fitchburg Municipal Airport (FIT), Fitchburg, MA: FIT is a regional general aviation NPIAS airport with one paved runway – Runway 14-32 (5001 x 100 ft.), which is equipped with PAPIs on both runway ends. The Airport offers a range of aviation services including aircraft parking (hangar or tie-down), 100-LL and Jet-A fuel, flight training, aircraft rental, discovery flights, aircraft maintenance, annual inspections, interior refurbishment, engine replacement, aircraft sales, avionic installations, experimental aircraft engine construction and repair, and aircraft upholstery services.

Orange Municipal Airport (ORE), Orange, MA: ORE is a local general aviation NPIAS airport with two paved runways – Runway 01-19 (5001 x 75 ft.), which is equipped with PAPIs on the runway 01 end, and Runway 14-32 (4800 x 75 ft.). The Airport is home to a range of aviation businesses including an FBO providing aircraft maintenance and repair and 100-LL and Jet-A fuel, a parachute training facility, and the longest operating aero club in the country.

4.3 HISTORIC AVIATION DATA

This section presents historical aviation statistics for GDM including based aircraft and annual operations. This information is used to help identify and evaluate factors that influence aviation demand, which in turn is used to develop forecasts of future aviation activity.

4.3.1 BASED AIRCRAFT

The FAA defines “based aircraft” as an aircraft that is operational and airworthy and is typically based at the facility in question for a majority of the year. Based aircraft categories include single-engine piston, multi-engine piston, jet, and rotorcraft.

According to the Massachusetts Department of Transportation Aeronautics Division (MassDOT/AD), “All airworthy aircraft based in Massachusetts or temporarily located in Massachusetts for sixty (60) or more cumulative days during a year must be registered with the MassDOT/AD by completing and submitting a registration form and paying the applicable annual registration fee.”

Based aircraft are major economic contributors to the airport. They help generate revenues in part from tie-down fees, hangar leases, fuel sales, and maintenance. Based aircraft forecasts are used to evaluate the size of the apron, number of required tie-downs and hangars, and other facilities necessary to support the continued growth of based aircraft.

At the time of the 2006 Airport Master Plan Update, GDM reported 26 total based aircraft, only 20 of which were operational. Since that time, the number of based aircraft at the airport has gradually decreased to 11 based aircraft today, according to Airport records. Table 4-1 presents a comparison of MassDOT and FAA TAF based aircraft counts at GDM over the past six years:

Table 4-1: GDM Based Aircraft History (2018-2023)

Year	*TAF Based Aircraft*	*MassDOT Based Aircraft*
2018	17	16
2019	18	18
2020	13	18
2021	13	12
2022	13	12[4]
2023	13	11[5]
AAGR	**-5.5%**	**-5.8%**

Source: FAA Terminal Area Forecast 2022-2050, MassDOT Records

4.3.2 REGIONAL BASED AIRCRAFT HISTORY

According to the FAA TAF, the New England Region experienced a decrease in the total number of based aircraft between 2013 and 2022 at an average annual rate of 1.5%. Table 4-2 presents regional based aircraft growth over the past decade:

Table 4-2: New England Based Aircraft History (2012-2021)

Year	*Based Aircraft*
2013	5,776
2014	6,060
2015	5,497
2016	5,724
2017	5,454
2018	5,322
2019	5,091
2020	4,928
2021	4,964
2022	5,011
AAGR	**-1.5%**

Source: FAA Terminal Area Forecast 2022-2050

[4] No records available for 2022 – presumed no change from 2021.
[5] Updated based aircraft count from GDM provided for the purposes of this AMPU.

4.3.3 NATIONAL BASED AIRCRAFT HISTORY

Between 2013 and 2022, the FAA TAF indicates that the number of based aircraft decreased at an annual rate of approximately 0.4% per year across the nation. Table 4-3 presents historic national based aircraft counts over the past decade:

Table 4-3: National Based Aircraft History (2012-2021)

Year	*Based Aircraft*
2013	166,002
2014	169,448
2015	163,149
2016	172,834
2017	166,052
2018	164,340
2019	161,831
2020	155,584
2021	158,188
2022	159,551
AAGR	**-0.4%**

Source: FAA Terminal Area Forecast 2022-2050

4.4 HISTORIC ANNUAL AIRCRAFT OPERATIONS

In airport planning terms, “airport operations” are defined as the number of arrivals and departures from an airport. Therefore, an airplane that arrives and then departs from an airport is considered to have made two operations. Operations are further classified as either local or itinerant.

- Local operations are performed by aircraft that: (a) operate in the local traffic pattern or within sight of the airport; (b) are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile radius of the airport; (c) execute simulated instrument approaches or low passes at the airport.
- Itinerant operations are all aircraft operations other than local operations, such as landing or take off of a flight departing from or arriving at another airport greater than 20 miles away.

Aircraft operations are also defined by type, such as air carrier, regional/commuter, air taxi, general aviation, or military. According to the TAF, aircraft operations at GDM over the past ten years have been comprised mainly of itinerant general aviation and local civil operations, though records indicate a small number of itinerant air taxi/commuter and miliary operations.

4.4.1 GDM HISTORIC OPERATIONS

Beginning in 2013, the TAF recorded 5,515 operations at the Airport. Over the past ten years, TAF operations have trended at an average annual decrease of 1.9% per year. It is important to note here that FAA TAF operations counts are based on information provided to the FAA via the Airport's annual 5010 Airport Master Record. Because GDM is a non-towered airport and does not have a GARD system in place, there is no mechanism for tracking operations. The counts provided to FAA for use in the TAF are estimates, and lacking better data, are often carried over from year to year. A summary of TAF operations is provided in Table 4-4 below:

Table 4-4: FAA TAF Operations History at GDM (2013-2022)

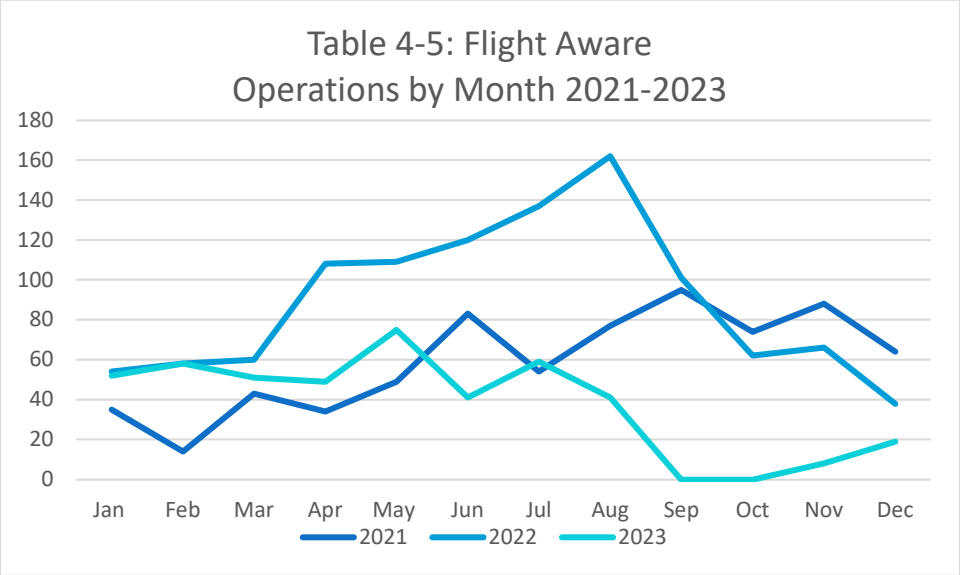
	Itinerant Operations			*Local Operations*	
Year	Air Taxi & Commuter	GA Operations	Military Operations	Civil Operations	*Total Operations*
2013	15	4,200	100	1,200	5,515
2014	15	4,200	100	1,200	5,515
2015	15	4,200	100	1,200	5,515
2016	15	3,800	100	1,100	5,015
2017	15	3,800	100	1,100	5,015
2018	15	3,800	100	1,100	5,015
2019	15	3,800	100	1,100	5,015
2020	10	3,500	100	1,000	4,610
2021	10	3,500	100	1,000	4,610
2022	10	3,500	100	1,000	4,610
				AAGR	**-1.9%**

Source: FAA Terminal Area Forecast 2022-2050

4.4.1.1 FlightAware

FlightAware is a flight tracking platform that provides real-time, historical, and predictive aircraft operations data worldwide. FlightAware data relies on Automatic Dependent Surveillance–Broadcast (ADS-B) technology, which is used by pilots to track their position via satellite navigation. ADS-B data automatically collected via an aircraft's navigation system and transmitted to ground control stations is then compiled via FlightAware's platform to provide aviation statistics for airports worldwide. It is important to note that ADSB does not capture all activity at an airport, and therefore this data is not being considered as a suitable counting system for the purposes of this forecast. However, FlightAware data provides additional insight into the Airport's busiest month (i.e., peak month) and fluctuations in activity during and following the COVID-19 pandemic. According to FlightAware, on average, the busiest month at GDM is August. Table 4-5[6] provides a summary of ADSB operations reported monthly for GDM via FlightAware over the past three years:

[6] It is assumed that the Airport saw no operations while Runway 18-36 was under construction, between August 14, 2023, and November 21, 2023. Operations from January 2023 through July 2023 were 40% lower than the same period in 2022, so it is assumed that operations from November 22, 2023 through December 31, 2023 will also be 40% lower than 2022 operations.



Source: FlightAware

4.4.1.2 Traffic Flow Management System Counts

Traffic Flow Management System Counts (TFMSC) is a data source provided by the FAA that includes information about traffic counts at each airport. The TFMSC "includes data for flights that fly under Instrument Flight Rules (IFR) and are captured by FAA's enroute computers. Most VFR and some non-enroute IFR traffic is excluded."[7] Because only IFR data is included in the TFMSC, this data is not being considered as a suitable counting system for the purposes of the forecast at GDM. However, it does provide some valuable insight into the year-to-year operations growth rate at the Airport. Historic TFMSC data for the years 2013 through 2022 indicate average annual growth in operations of 4.5%.

4.4.2 NEW ENGLAND REGION TRENDS

Historic aircraft options for the New England Region were obtained from the FAA TAF. As illustrated in Table 4-6, the New England Region experienced a decrease in operations from 2013-2022, down approximately 11.4% over this period at an average annual rate of approximately 1.2% per year. It should be noted that, since the time of the COVID-19 pandemic, aircraft operations in New England are trending towards recovering to pre-pandemic levels.

[7] https://aspm.faa.gov/aspmhelp/index/TFMSC.html

Table 4-6: New England TAF Operations History (2013-2022)

Year	*Total Operations*	*Growth*
2013	3,461,203	
2014	3,378,088	-2.4%
2015	3,267,272	-3.3%
2016	3,192,656	-2.3%
2017	3,108,682	-2.6%
2018	3,105,088	-0.1%
2019	3,128,372	0.7%
2020	2,698,319	-13.7%
2021	2,867,289	6.3%
2022	3,067,837	7.0%
	AAGR	**-1.2%**

Source: FAA TAF 2022-2050

4.4.3 NATIONAL TRENDS

Historic aircraft operations for the U.S. were obtained from the FAA TAF. As illustrated in Table 4-7, between 2013-2022, operations fluctuated, but increased overall by 1.3% at an average annual rate of approximately 0.2% per year. The nation experienced a sharp decrease in the number of aircraft operations between 2019 and 2020. Since 2020, operations have steadily increased, nearly reaching pre-pandemic levels.

Table 4-7: National TAF Operations History (2013-2022)

Year	*Total Operations*	*Growth*
2013	97,761,958	
2014	96,944,201	-0.8%
2015	97,252,415	0.3%
2016	96,694,419	-0.6%
2017	96,948,733	0.3%
2018	98,214,043	1.3%
2019	99,759,518	1.6%
2020	90,866,723	-8.9%
2021	94,102,204	3.6%
2022	98,992,198	5.2%
	AAGR	**0.2%**

Source: FAA Terminal Area Forecast 2022-2050

4.5 AVIATION GASOLINE CONSUMPTION

Gasoline consumption is a good indicator of growth at an airport. Fuel sales are an important way for airports to generate revenue and attract business by providing a critical service to airport users. GDM currently offers 100-LL AvGas via a self-serve fueling system. Complete records of the Airport's 100-LL fuel purchases were available for the years 2021 and 2022, with 5,424 gallons of fuel purchased in 2021 and 5,720 gallons of fuel purchased in 2022 (see Table 4-8 below). This equates to an increase in demand for 100-LL AvGas of 5.46% between 2021 and 2022.

Table 4-8 Historic GDM Fuel Purchases

Year	*AvGas*
2021	5,424
2022	5,720
2021-2022	**5.46%**

Source: Airport Records

4.5.1 NATIONAL GENERAL AVIATION FUEL TRENDS

According to the 2023-2043 FAA Aerospace Forecast of General Aviation fuel consumption, the historic number of gallons of AvGas consumed between 2010 and 2022 has fluctuated, but overall has increased at an average annual rate of 0.1% per year. Table 4-9 below outlines historic GA Avags consumption, as documented by the Aerospace forecast.

Table 4-9: GA AvGas Consumption (in Millions of Gallons)

Year	*AvGas*
2010	221
2015	196
2019	200
2020	204
2021	229
2022 (E)	224
AAGR 2010-2022	**0.1%**

Source: 2023-2043 FAA Aerospace Forecast

The Aerospace Forecast predicts that GA Avgas consumption will decrease over the long term, at an average annual rate of 0.6% between 2023-2043[8].

[8] FAA Aerospace Forecast, Fiscal Years 2023-2043, Table 23, Total Jet Fuel and Aviation Gasoline Fuel Consumption

4.6 AVIATION ACTIVITY FORECASTS

This section presents the aviation forecasts for GDM for the planning period of 2024-2043. The forecasts provide short-, mid-, and long-term projections for the years 2028, 2033, and 2043. These represent the 5-, 10-, and 20-year estimates of aviation activity at the Airport. Activity projections include based aircraft, itinerant operations, local operations, and total operations. The intent of this section is to review FAA's TAF. The TAF based aircraft forecast and the TAF aircraft operations forecast are presented in sections 4.6.1 and 4.6.2 below. The TAF predicts no growth at GDM over the planning period of 2024-2043; however, with the recent reconstruction of Runway 18-36, it is likely that the airport could experience a slight uptick in operations through the planning period. FAA AC 150/5070-6B provides guidance on the FAA review process, and states that the FAA will find a locally developed airport planning forecast acceptable if it meets any of the following three conditions for a general aviation and reliever airport:

1. The forecast differs less than 10% in the 5-year forecast period, and 15% in the 10-year forecast period;
2. The forecast activity levels do not affect the timing or scale of an airport project; or
3. The forecast activity levels do not affect the role of the airport as defined in FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems.

An alternative forecast is presented in Section 4.6.2.1 reflecting a modest growth rate, which will require review and approval by the FAA.

4.6.1 TAF BASED AIRCRAFT FORECAST

According to the FAA TAF, GDM is not projected to experience any changes in the number of based aircraft over the planning period of 2024-2043. Table 4-10 below shows the short-, mid-, and long-term TAF based aircraft forecast, which projects the Airport will remain at 13 based aircraft

Table 4-10: FAA TAF Based Aircraft Forecast (2024-2043)

Year	*Based Aircraft*
2023	13
2028	13
2033	13
2043	13
AAGR	**0%**

Source: FAA TAF 2022-2050

It should be noted that the FAA TAF does not reflect the Airport's most current based aircraft count of 11 aircraft in 2023, as documented by the Airport. Additionally, historic based aircraft records from the TAF and MassDOT indicate a fluctuation from year to year, from 11 to 13 based aircraft over the past three years, with even more fluctuation in prior years. Considering the historic fluctuation in based aircraft at GDM, it is unlikely that the TAF growth rate of 0% is an accurate estimate. Therefore, it is

recommended that GDM adopt a forecasted range in based aircraft through the planning period of 2024-2043, of between 11 to 13 based aircraft per year. This is highlighted in Section 4.9, Summary of Recommended Forecast.

4.6.2 AIRCRAFT OPERATIONS FORECAST

According to the FAA Terminal Area Forecast, operations at GDM are projected to experience no increase or decrease over the planning period of 2024-2043 (see Table 4-11 below).

Table 4-11: FAA TAF Operations Forecast (2023-2042)

Year	*Air Taxi & Commuter*	*Itinerant GA Operations*	*Itinerant Military Operations*	*Local Civil Operations*	*Total Operations*
2023	10	3,500	100	1,000	4,610
2028	10	3,500	100	1,000	4,610
2033	10	3,500	100	1,000	4,610
2043	10	3,500	100	1,000	4,610

Source: FAA TAF 2022-2050

4.6.2.1 Recommended Operations Forecast

Though the TAF predicts no increase or decrease in operations over the planning period, it is important to consider the recent reconstruction of Runway 18-36 as a unique local factor that has the potential to result in operations growth at the Airport. Additionally, recent fuel sales show increased demand, which also indicates growth. As indicated in Section 4.4.1.2, historic TFMSC data indicates an average annual growth rate of 4.5% in IFR operations over the last ten years. Though this growth rate does not represent growth across all operations at the Airport, it does indicate that a modest growth rate is reasonable. The following recommended forecast applies an overall growth rate of 4.5% to each operations category except for military, or a total of 203 operations at a growth rate of 0.22% per year, over the planning period of 2024-2043:

Table 4-12: FAA TAF Operations Forecast (2023-2042)

Year	*Air Taxi & Commuter*	*Itinerant GA Operations*	*Itinerant Military Operations*	*Local Civil Operations*	*Total Operations*
2023	10	3,500	100	1,000	4,610
2028	10	3,539	100	1,011	4,661
2033	10	3,579	100	1,023	4,711
2043	10	3,658	100	1,045	4,813

Source: FAA TAF 2022-2050

4.6.3 LOCAL VS. ITINERANT SPLIT

The type of aircraft utilizing the Airport plays a key role in planning future airport facilities. Lacking available operational data, it is difficult to ascertain the percentage split of local operations conducted by a based or transient aircraft at GDM. Therefore, for purposes of this section, it is assumed that local operations at GDM are generally performed by the Airport's based aircraft, 100% of which are single-engine piston aircraft. FAA's Traffic Flow Management System Counts (TFMSC) includes data for flights that fly under Instrument Flight Rules (IFR) and are captured by the FAA's enroute computers. Most VFR and some non-enroute IFR traffic are excluded. TFMSC source data are created when pilots file flight plans and/or when flights are detected by the National Airspace System (NAS), usually via RADAR, and therefore are assumed to be a reasonable representation of the fleet mix of itinerant operations. According to the TFMSC, Instrument Flight Rule (IFR) average operations at GDM from 2013-2022 were broken down into the following groups:

- Single-Engine Piston: 80.3
- Twin-Engine Piston: 7.8%
- Turboprop: 5.7%
- Rotorcraft: 5.4%
- Jets: 0.8%

4.6.3.1 Projected Operational Fleet Mix

While GDM is capable of supporting a variety of aircraft, the majority of current operations are estimated to be conducted by piston aircraft. As discussed in the previous section, the percent of operational fleet mix is based on available airport data and FAA's TFMSC. Utilizing the recommended operations forecast and estimated local vs. itinerant operations, Table 4-13 projects the operational fleet mix over the planning period.

Table 4-13: Projected Operational Fleet Mix

Aircraft Category	Itinerant			Local		
	2028	**2033**	**2043**	**2028**	**2033**	**2043**
Single Engine Piston	2,930	2,962	3,026	1,011	1,023	1,045
Twin Engine Piston	285	288	294	0	0	0
Turboprop	208	210	215	0	0	0
Jet	29	30	30	0	0	0
Rotorcraft	197	199	203	0	0	0
Total	**3,649**	**3,689**	**3,768**	1,011	1,023	1,045

Source: FAA TAF, Gale Analysis

4.7 PEAK ACTIVITY CONCLUSION

Many airport facility needs are related to the levels of activity during peak periods. Peak characteristics are typically defined as peak month, average day, and peak hour activity. When projecting future activity levels at an airport, it is important to identify and project peak period activity levels. These projections help facilitate future planning decisions and highlight an airport's ability to accommodate future aviation activity demand.

According to FlightAware data presented in Section 4.4.1.1, August is generally the busiest month at GDM, accounting for 12.5% of annual operations on average. Therefore, the peak activity month at GDM is identified as August. The values for average day peak month are calculated below by taking the number of operations in the peak month and dividing them by the number of days in the peak month. For planning purposes, the peak month is calculated assuming it represents 12.5% of total annual operations. As the Airport experienced 4,610 operations in 2022, 576 operations are expected to occur in the peak month, or approximately 19 operations per day. It is further assumed that 15% of the average day represents the number of peak hour operations. The calculation of peak activity is illustrated in the formula below and in Table 4-14:

[(Total Annual Operations*12.5%/31]*15% = Peak Hour (ADPM)

Table 4-14: Peak Activity Estimates

	Total Annual Operations	*Peak Month*	*Average Day in Peak Month*	*Peak Hour (ADPM)*
2022 (Baseline Year)	4,610	576	19	3
2028 (Short-Term)	4,661	583	19	3
2033 (Mid-Term)	4,711	589	19	3
2043 (Long-Term)	4,813	602	19	3

Source: FAA TAF, Airport Records, FlightAware, Gale Associates Analysis 2023

4.8 IDENTIFICATION OF DESIGN AIRCRAFT

As referenced in Chapter 2, airport facilities are designed according to the dimensions of an airport's "critical aircraft," which is the most demanding aircraft or group of aircraft with similar characteristics known to make regular use of an airport (i.e., at least 500 annual operations, excluding touch-and-go operations). The Airport Reference Code (ARC) verification completed as part of the Airport's 2008 AMPU revealed that the most demanding aircraft, the Piper Twin Comanche, was not anticipated to change through the planning period. At the time of the 2008 AMPU, the Piper Twin Comanche was identified as Aircraft Approach Category B (aircraft with approach speeds 91 knots or more but less than 121 knots) and Airplane Design Group I (wingspans under 49 feet in length, and tail heights under 20 feet), and further designated as a "small" aircraft due to a MTOW under 12,500 lbs. Since that time, the FAA's aircraft database has been updated to include the Piper Twin Comanche as an A-I (small) aircraft.

4.8.1 EXISTING CRITICAL AIRCRAFT

The current based aircraft listing indicates that aircraft currently based at GDM are single-engine aircraft with approach speeds under 91 knots, wingspans under 49 feet, and maximum takeoff weights of 12,500 lbs. or less, falling under category A-I (small). Additionally, as outlined in this chapter, the forecast anticipates that the airport will experience 500 annual operations by twin engine aircraft, turboprops and jets combined throughout the planning period. These aircraft typically account for higher approach speeds (over 91 knots but below 121 knots), under category B. Further, the recent reconstruction of Runway 18-36 was designed to B-I (small) standards. Though the reconstruction of Runway 18-36 has the potential to have a positive impact on aircraft operations and the number of aircraft willing to base at the airport, the limited available facilities, including a relatively short runway length, lack of Jet-A fuel, and high instrument approach minima, make an increase in the number of larger, heavier aircraft sustaining 500 annual operations at the airport unlikely, within the planning. There does not appear to be any evidence supporting a deviation from the existing design standards; therefore, the critical aircraft will remain a B-I (small) for the duration of the planning period.

4.9 SUMMARY OF RECOMMENDED FORECAST FOR GDM

Table 4-15 below represents the recommended forecast for GDM, which applies the Airport's historic TFMSC growth rate of 4.5% to FAA's TAF operations count for 2023 to show modest growth over the planning period of 2024-2043:

Table 4-15: Summary of Recommended Forecast

	Itinerant Operations	*Local Operations*	*Total Operations*	*Based Aircraft*
2023 (Baseline Year)	3,610	1,000	4,610	11
2028 (Short-Term)	3,649	1,011	4,661	11-13
2033 (Mid-Term)	3,689	1,023	4,711	11-13
2043 (Long-Term)	3,768	1,045	4,813	11-13

Source: FAA TAF, Airport Records, FlightAware, Gale Associates Analysis 2023